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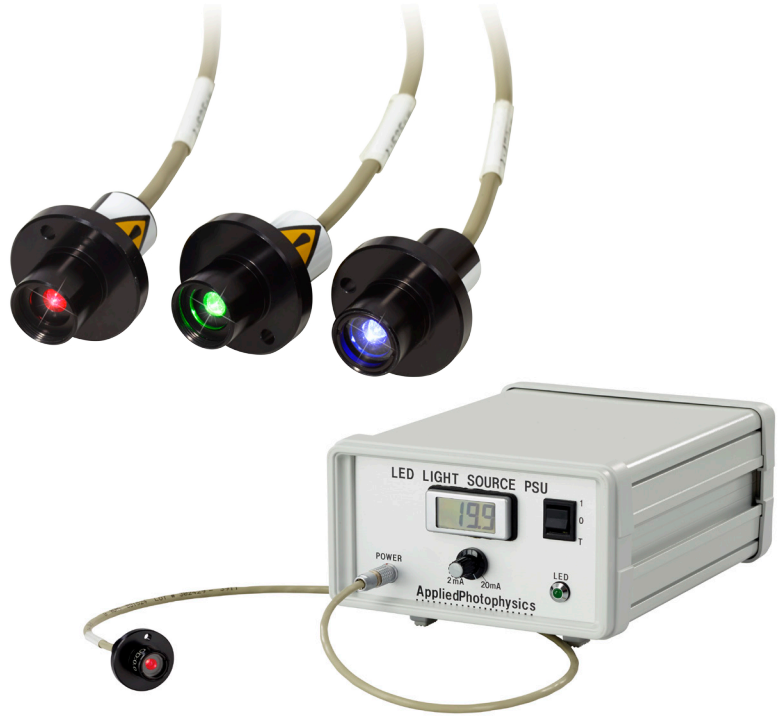
SX SERIES - UPGRADE INFORMATION

SX LED Light Source Stopped-Flow Upgrade

KEY BENEFITS

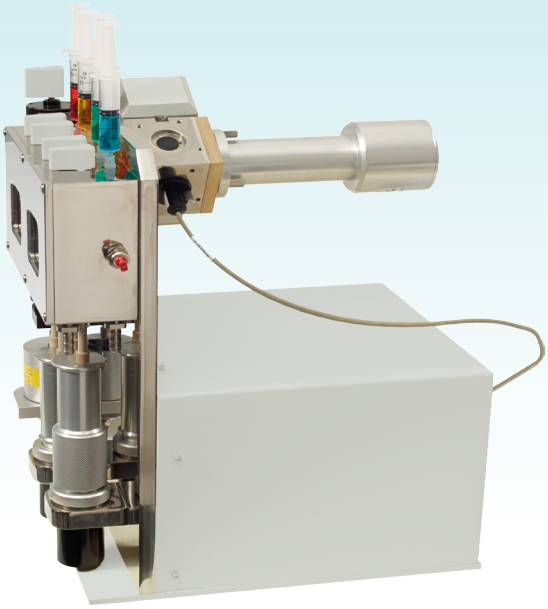
- Higher intensity and stability compared with xenon arc lamp
- Significantly improved signal-to-noise levels
- Ideal for all fluorescence measurements (including FP and emission scanning)
- Longer lifetime (5000 - 50000h)
- Simple to fit. No alignment procedure
- Compatible with all SX series stopped-flow models
- May be used to complement or replace existing xenon light source



The SX LED Light Source Upgrade is a cost-effective performance upgrade designed for stopped-flow fluorescence detection. The higher intensity and stability of the LEDs provide the greatest advance in detection sensitivity since the introduction of the SX series stopped-flow instrument in 1990.

The LED light source comprises a power supply and one or more of a selection of monochromatic LEDs covering the UV and visible range (280 – 760nm). The LED connects directly to the cell block of the sample handling unit in place of the fibre-optic light guide from the xenon light source and monochromator.

The upgrade may be used to complement the functionality of existing instruments or on older instruments to replace older xenon light sources at the end of their operational lifetime.



LED LIGHT SOURCE HARDWARE

The upgrade comprises an LED power supply that is normally positioned on the rear of the sample handling unit. The supply features a simple power switch and a running current selector to control LED output. On start-up the LED is normally ready for measurement within minutes.

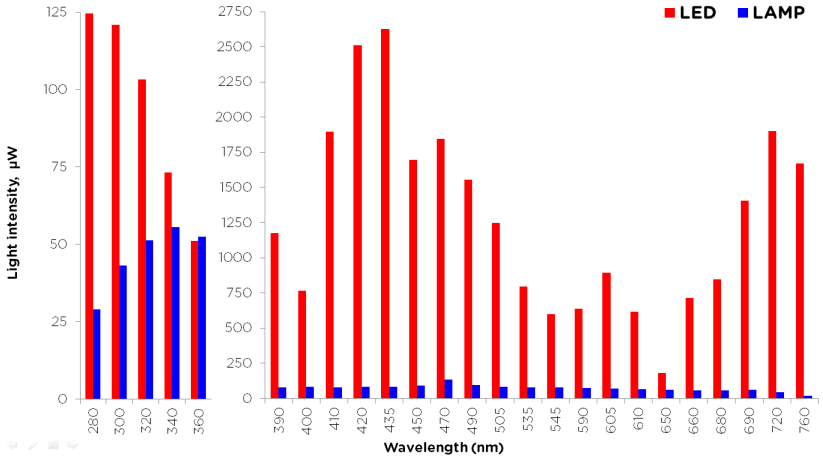
Each LED plugs into the power supply and connects to the cell block in place of the fibre-optic from the monochromator (a large range of wavelength-specific LEDs are available).

A range of optional filters are available for attenuating the output and bandwidth of LEDs if required. The filters fit directly onto the LED housing.

LED VS. XENON LAMP PERFORMANCE COMPARISON

The table opposite shows a selection of the monochromatic LEDs currently available and their corresponding bandwidths. Additional LEDs are available on request but are not held in stock.

LED Wavelength	Bandwidth FWHM
280	11
300	10
320	10
340	10
360	21
390	13
400	16
410	16
420	16
435	19
450	20
470	20
490	28
505	28
515	35
535	34
545	37
590	15
605	18
610	15
650	20
660	19
680	20
690	30
720	22
760	25



The intensity of each LED compared to an equivalent wavelength and bandwidth output from the standard xenon light source is shown in the figure above. The higher intensity LEDs used as an excitation source for fluorescence measurements produce a considerable increase in emission intensity. As a consequence, detection sensitivity and signal-to-noise levels are improved.

It should be noted that a greater performance improvement can reasonably be expected for older light sources where the fibre optic light guide and optical components are less efficient than on a new instrument.

ABSORBANCE MEASUREMENTS USING LEDS

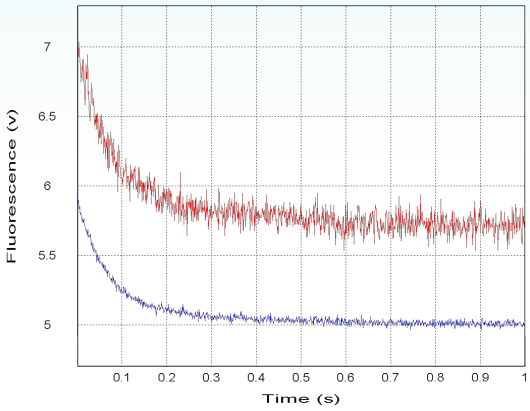
The LED light source may also be used for absorbance stopped-flow measurements. The higher intensity output provides reduced noise levels with exceptional stability improvements. Absorbance measurements often require the use of neutral density filters to attenuate the LED light output.

UV LED FLUORESCENCE EXCITATION EXAMPLE - TRYTOPHAN FLUORESCENCE (280nm)

UV region LEDs may be used as an alternative excitation source for intrinsic fluorescence in proteins.

In this example, N-bromosuccinimide quenching of tryptophanamide, the 280nm LED (blue curve) is shown to compare favourably with the standard xenon light source (red curve) at 280nm with 1mm monochromator slit setting. providing a x3 signal-to-noise improvement

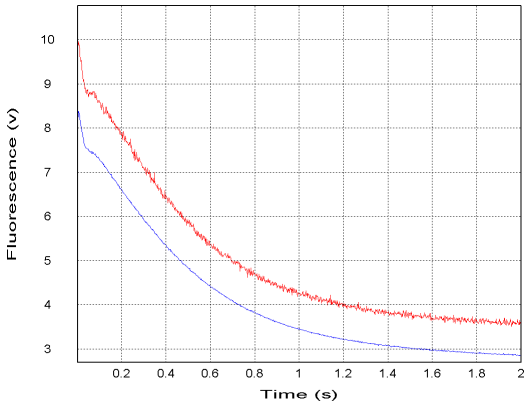
As a further signal-to-noise improvement for measurement of tryptophan fluorescence, we also recommend the use of the U360 interference filter in place of the 305 or 320nm cut-off filter.



VISIBLE LED FLUORESCENCE EXCITATION EXAMPLE – SYPRO-ORANGE DYE FLUORESCENCE (450nm)

Visible region LEDs offer the most significant performance improvement over the conventional xenon light source. The intensity of many of the LEDs exceed the xenon arc lamp by a factor of more than 10, pushing detection sensitivity limits to new levels and providing opportunities to significantly reduce working concentrations of reactants.

In this example for the lysozyme refolding in Sypro Orange dye, the 450nm LED provides a x6 signal-to-noise improvement over the xenon lamp.



SCANNING EMISSION MONOCHROMATOR ACCESSORY

Use of the LED light source in place of the conventional xenon light source does not require use of the original excitation monochromator. Hence, the monochromator could instead be utilised as an emission monochromator (i.e. between the optical cell and fluorescence detector). This provides a cost-effective solution for emission scanning, single-wavelength fluorescence detection and multi-wavelength spectra-kinetic measurements which previously required the use of two monochromators.

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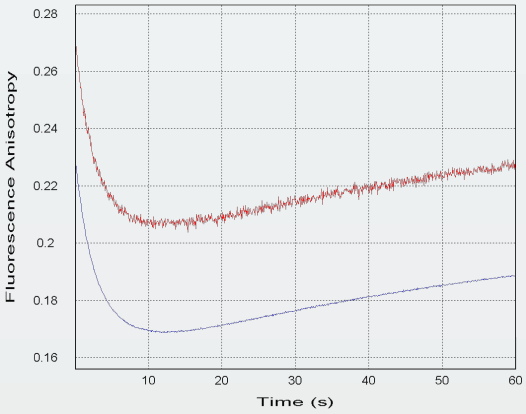

FLUORESCENCE POLARISATION ACCESSORY UPGRADE EXAMPLE - PHLOXINE B

In general, the LED Light Source Upgrade for the Fluorescence Polarisation accessory provides even greater signal-to-noise improvement than for other types of fluorescence measurement. The reduction in noise levels, in many cases by more than an order of magnitude, make reliable FP detection possible on the most challenging of samples.

The FP accessory LED upgrade features a simple adaptor fitted to the polariser assembly to accommodate the LED. The fibre optic light guide is no longer required for FP detection.

The data example shows the binding of the fluorescent dye, Phloxine B to Bovine Serum Albumin using a 515nm LED compared with the standard xenon light source at 515nm with a 2mm slit setting on the monochromator. In this example the noise is decreased by a factor of x8.

FULL COMPATIBILITY WITH SX, CHIRASCAN AND PISTAR

The LED Light Source Upgrade is compatible with all SX series stopped-flow instruments installed since 1990. It may also be fitted to PiStar and Chirascan CD stopped-flow instruments.

It is an ideal accessory for enhancing fluorescence detection or as a cost-effective replacement for older xenon light sources at the end of their operational lifetime.

The light source can easily be installed by the user without the need for a visit from an Applied Photophysics engineer.

To further discuss the upgrade with our support team, please contact us at support@photophysics.com

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Applied Photophysics was established in 1971 by
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