

# USB4000-FL Fluorescence Spectrometers

## Preconfigured Spectrometers for Fluorescence



The USB4000-FL, USB4000-FL-450 and USB4000-FL-395 Spectrometers are preconfigured for fluorescence measurements from 360-1100 nm. Each spectrometer comes with a 200  $\mu\text{m}$  slit and detector collection lens for increased light throughput and features plug-and-play operation, a high-performance 3648-element CCD-array detector and fast USB 2.0 connectivity.

There are three USB4000-FL options:

### - **USB4000-FL**

Our basic fluorescence spectrometer can be combined with various excitation sources and accessories for probe- and cuvette-based setups. We offer an extensive range of separate LEDs for excitation.

### - **USB4000-FL-450 and USB4000-FL-395**

These models offer all the advantages of our USB4000-FL, but with a direct-attach 470 nm LED (pictured) or 395 nm LED for excitation. The LED connects to the spectrometer via a 10-pin connector. The spectrometer powers and controls (through software) the LED. The direct-attach LED option provides you with a convenient, small-footprint package for your single-wavelength excitation needs.

### **Filtering Options**

USB4000-FLs can be used with our LVF-series Linear Variable Filters for simple yet effective separation of excitation and fluorescence energy. Use our LVF-L Linear Variable Low-pass Filter to fine-tune your excitation source for maximum signal with minimum overlap; our LVF-H Linear Variable High-pass Filter can be effective on the detection side. Additional blocking filter options are also available.

<b>Physical</b>	
Dimensions:	89.1 mm x 63.3 mm x 34.4 mm (spectrometer only); 89.1 mm x 120.3 mm x 34.4 mm (spectrometer w/LED)
Weight:	190 g (spectrometer only); 310 g (spectrometer w/LED)
<b>Detector Specifications</b>	
Detector:	Toshiba TCD1304AP Linear CCD array
Detector range:	200-1100 nm
Pixels:	3648 pixels
Pixel size:	8 $\mu\text{m}$ x 200 $\mu\text{m}$
Pixel well depth:	100,000 electrons
Sensitivity:	130 photons/count at 400 nm; 60 photons/count at 600 nm
<b>Optical Bench</b>	
Design:	f/4, Asymmetrical crossed Czerny-Turner
Focal length:	42 mm (input); 68 mm (output)
Entrance aperture:	200 $\mu\text{m}$ wide slit
Grating:	Grating #3 -- groove density 600 l/mm, set to 360-1000 nm, 500 nm blaze
Detector collection lens:	Yes, L4
Fiber optic connector:	SMA 905 to 0.22 numerical aperture single-strand optical fiber
<b>Spectroscopic</b>	
Wavelength range:	360-1000 nm
Optical resolution:	$\sim$ 10.0 nm FWHM
Signal-to-noise ratio:	300:1 (at full signal)
A/D resolution:	16 bit
Dark noise:	50 RMS counts
Dynamic range:	$2 \times 10^8$ (system), 1300:1 for a single acquisition
Integration time:	3.8 ms-10 seconds
Stray light:	<0.05% at 600 nm; 0.10% at 435 nm
Corrected linearity:	>99.8%
<b>LED Specifications for USB4000-FL-450 and USB4000-FL-395</b>	
Wavelength:	460-490 nm (USB4000-FL-450) and 380-410 nm (USB4000-FL-395)
Power consumption:	60 mA @ 5 VDC
Power output:	60 $\mu\text{W}$ (minimum) into a 600 $\mu\text{m}$ fiber
Stability:	+/-1.0% drift after 2-minute warm-up period
<b>Electronics</b>	
Power consumption:	250 mA @ 5 VDC
Data transfer speed:	Full scans to memory every 5 ms with USB 2.0 port
Inputs/Outputs:	Yes, 8 onboard digital user-programmable GPIOs
Analog channels:	No
Auto nulling:	Yes
Trigger modes:	4 modes
Strobe functions:	Yes
Connector:	22-pin connector