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SPECTROMETERS | LASERS | TOTAL SOLUTIONS

Spectrometer

Exemplar™

Smart CCD Spectrometer

The Exemplar™ is the next step in the evolution of miniature CCD spectrometers. It is the first smart spectrometer featuring on board data processing, USB 3.0 communication, and temperature compensation. The Exemplar is also optimized for multi-channel operation featuring ultra-low trigger delay, ultra low gate jitter, and super speed data transfer. Additionally, the Exemplar features a 2048 element detector, and built-in 16-bit digitizer with a >2.0 MHz readout speed.

The Exemplar is ideal for most UV, Vis, and NIR applications with spectral configurations from 200nm to 1050nm and resolutions between 0.5nm and 4.0nm. Custom configurations are available for OEM applications.

Applications:

- **UV, Vis, and NIR: Spectroscopy / Spectroradiometry / Spectrophotometry**
- **Wavelength Identification**
- **Absorbance**
- **LIBS**
- **Multi-point Sampling**
- **OEM Systems Integration**

Features:

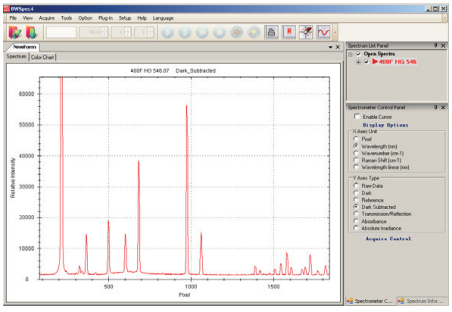
- On Board Data Processing, Including Averaging and Smoothing
- Temperature Compensation for Ultra-low Thermal Drift
- Ultra-low Trigger Delay (14ns) and Gate Jitter (+/-1ns)
- Supports Up to 16 Simultaneous Channels
- Automatic Dark Compensation
- UV - NIR (200nm - 1050nm)
- < 0.5nm Spectral Resolution
- 1ms Minimum Integration Time
- >2.0 MHz Readout Speed

Accessories:

- Fiber Patch Cords
- Light Sources
- Cuvette Holders
- Inline Filter Holders
- Fiber Optic Probes

Software:

BWSpec™ is a spectral data acquisition software with a wide range of tools that are designed to perform complex measurements and calculations at the click of a button. It allows the user to choose between multiple data formats and offers optimization of scanning parameters, such as integration time. In addition to powerful data acquisition and data processing, other features include automatic dark removal, spectrum smoothing, and manual/auto baseline correction.

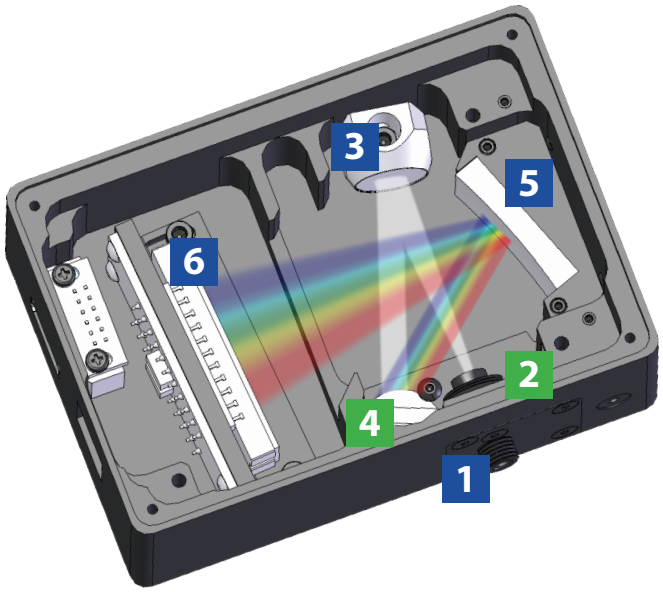


Specifications:

Power Input	USB @ < 0.5 Amps
Detector Type	Response Enhanced Linear CCD Array
Detector Pixel Format	2048 x 1 Elements @ 14µm x 200µm Per Element
Spectrograph f/#	3.6
Spectrograph Optical Layout	Crossed Czerny-Turner
Dynamic Range	275 (Typical)
Digitizer Resolution	16-bit or 65,535:1
Data Transfer Speed	Up to 900 Spectra per Second in Burst Mode
Readout Speed	>2.0 MHz
Minimum Integration Time	1ms, Adjustable in 1µs Increments
Thermal Drift	~29 Counts/°C (Max)
Aux Port	External Trigger, Digital IOs
Operating Temperature	5°C - 35°C
Operational Relative Humidity	85% Noncondensing
Weight	~ 0.75 lbs (0.34 kg)
Dimensions	4.02in x 2.64in x 1.34in (102mm x 67mm x 34mm)
Computer Interface	USB 3.0 / 2.0 / 1.1
Operating Systems	Windows: XP, Vista, 7 (32-bit & 64-bit)

Technical Details

Exemplar™



Standard

Fiber Coupler

1 Secures Fiber to Ensure Repeatable Results

By coupling a fiber optic to the SMA 905 adaptor, light will be guided to the slit and optically matched, ensuring reproducibility. For free space sampling, a diffuser or lens assembly can be connected directly to the SMA 905 adaptor.

Configurable

Entrance Slit

2 Determines Photon Flux and Spectral Resolution

Light entering into a spectrometer's optical bench is vinyetted by a pre-mounted and aligned slit. This ultimately determines the spectral resolution and throughput of the spectrometer after grating selection. We offer a variety of slit widths to match your specific application needs: from 10µm - 200µm wide, with custom slits available.

Slit Option	Dimensions	Approx. Resolution 350-1050nm
10µm	10µm wide x 1mm high	~1.0nm
25µm	25µm wide x 1mm high	~1.5nm
50µm	50µm wide x 1mm high	~2.2nm
100µm	100µm wide x 1mm high	~4.0nm
200µm	200µm wide x 1mm high	Call
Custom Slit Widths Available		

Standard

Collimating Mirror

3 Collimates and Redirects Light Towards Grating

Both mirrors are *f*/# matched focusing mirrors coated with $AlMg_2$, which produces approximately 95% reflectance when working in the UV-Vis spectrum. Aluminum (Al) provides reflectance and magnesium (Mg_2) protects the aluminum from oxidation.

Configurable

Diffraction Grating

4 Diffracts Light, Separating Spectral Components

The groove frequency of the grating determines two key aspects of the spectrometer's performance: the wavelength coverage and the spectral resolution. When the groove frequency is increased, the instrument will achieve higher resolution, but the wavelength coverage will decrease. Inversely, decreasing the groove frequency increases wavelength coverage at the cost of spectral resolution.

The blaze angle or blaze wavelength of the grating is also a key parameter in optimizing the spectrometer's performance. The blaze angle determines the maximum efficiency that the grating will have in a specific wavelength region.

Best Efficiency	Spectral Coverage (nm)	Grating
UV / NIR	200 - 850	600/250
UV / NIR	350 - 1050	600/400
Vis	380 - 750	900/500
Vis / NIR	550 - 1050	830/800
NIR	750 - 1050	1200/750
Custom Configurations Available		

Standard

Focusing Mirror

5 Refocuses Dispersed Light onto Detector

Both mirrors are *f*/# matched focusing mirrors coated with $AlMg_2$, which produces approximately 95% reflectance when working in the UV-Vis spectrum. Aluminum (Al) provides reflectance and magnesium (Mg_2) protects the aluminum from oxidation.

Standard

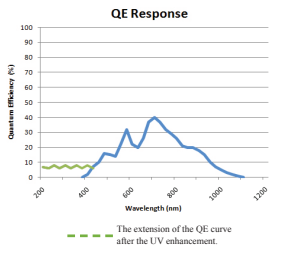
Array Detector

6 Measures Entire Spectrum Simultaneously

The Exemplar features a 2048 x 1 linear CCD array detector with a 14µm pixel width and > 2000 active pixels. As the incident light strikes the individual pixels across the CCD, each pixel represents a portion of the spectrum that the electronics can then translate and display with a given intensity using BWSpec™ software.

The quantum efficiency (QE) and noise level of the array detector greatly influences the spectrometer's sensitivity, dynamic range and signal-to-noise ratio. The spectral acquisition speed of the spectrometer is mainly determined by the detector response over a wavelength region.

Specifications	
Wavelength Range	200nm - 1050nm
Pixels	2048
Pixel Size	14µm x 200µm
Well Depth	~1,000,000 e
Digitization Rate	>2.0 MHz



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For more technical information, visit www.bwtek.com/technical