HR4000 Spectrometer

User-Configured for Flexibility

HR4000

Inside the HR4000 Spectrometer is a 3648-element CCD-array Toshiba detector that enables optical resolution as precise as 0.02 nm (FWHM). Responsive from 200-1100 nm, the HR4000 can be customized for your setup needs through a choice of gratings, slits and other optical bench options.

The HR4000 gives you the freedom to set integration time and features an electronic shutter that helps minimize saturation – even with 3.8 ms integration.

The HR4000 interfaces easily with your computer or PLC through USB 2.0 or RS-232 ports. And, with its 10 user-programmable digital inputs/outputs, the HR4000 offers unparalleled connectivity with external equipment.

Features

- Onboard microcontroller and electronic shutter
- 0.02 nm optical resolution (FWHM) possible
- Choice of configurations and accessories

Technical Tip

The dynamic range of a system is the full scale signal divided by the minimum resolvable signal. For our spectrometers, the minimum resolvable signal is the standard deviation of the dark signal. A common misunderstanding is to interchange dynamic range and A/D resolution. However, a dynamic range measurement includes the system's minimum noise level (e.g., detector readout noise and electronic noise). It's most applicable to low light level applications because it defines minimum detectable signal.

Physical	
Dimensions:	148.6 mm x 104.8 mm x 45.1 mm
Weight:	570 g
Detector	
Detector:	Toshiba TCD1304AP linear CCD array
Detector range:	200-1100 nm
Pixels:	3648 pixels
Pixel size:	8 µm x 200 µm
Pixel well depth:	~100,000 electrons
Sensitivity:	130 photons/count at 400 nm; 60 photons/count at 600 nm
Optical Bench	
Design:	f/4, Symmetrical crossed Czerny-Turner
Focal length:	101.6 mm input and output
Entrance aperture:	5, 10, 25, 50, 100 or 200 µm wide slits or fiber (no slit)
Grating options:	Multiple gratings, UV through Shortwave NIR
HC-1 grating option:	Provides 200-1050 nm range (best efficiency)
Detector collection lens option:	Yes, L4
OFLV filter options:	OFLV-200-1100
Other bench filter options:	Longpass OF-1 filters
Collimating and focusing mirrors:	Standard or SAG+UPG-HR
UV enhanced window:	Yes, UV4 quartz window
Fiber optic connector:	SMA 905 to 0.22 numerical aperture single-strand optical fiber
Spectroscopic	
Wavelength range:	Grating dependent
Optical resolution:	~0.02-8.4 nm FWHM
Signal-to-noise ratio:	300:1 (at full signal)
A/D resolution:	14 bit
Dark noise:	12 RMS counts
Dynamic range:	3.4×10^6 (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%
Electronics	
Power consumption:	450 mA @ 5 VDC
Data transfer speed:	Full scans to memory every 4 ms with USB 2.0 port
Inputs/Outputs:	Yes, 10 onboard digital user-programmable GPIOs
Analog channels:	One 13-bit analog input; one 9-bit analog output
Auto nulling:	No
Breakout box compatibility:	Yes, HR4-BREAKOUT
Trigger modes:	4 modes
Strobe functions:	Yes
Gated delay feature:	No
Connector:	30-pin connector