



WESTBORO  
PHOTONICS

SMART SERIES IMAGING  
PHOTOMETERS

USB3 CMOS

P230U, P501U, P1230U

## USB3 CMOS

### KEY FEATURES

Fastest Measurements

Up to 12 Megapixels  
Resolution

Small Size, Low Power

Exceptional Sensitivity

Wider Dynamic Range

### APPLICATIONS

Near Eye Displays

Display Testing

Beam Pattern of Lamps  
and Luminaires

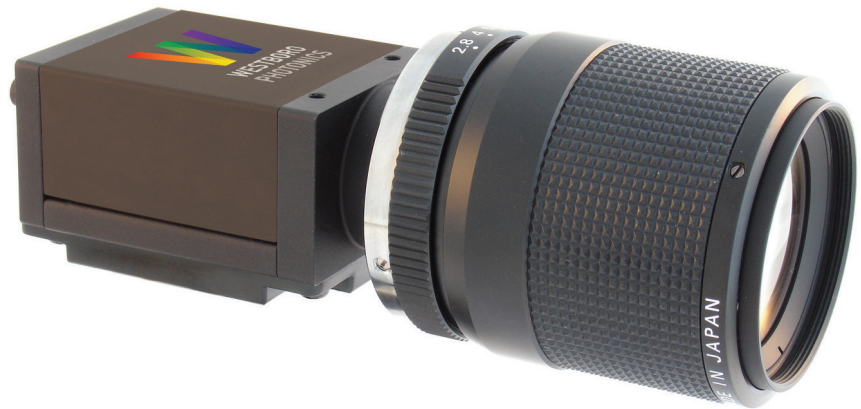
Roadway Lighting

Automotive and Avionics  
Lighting

Architectural Scenes

Theatrical and  
Commercial Lighting

Human Factors  
Engineering



The new CMOS Smart Series imaging photometers set the benchmark for measurement performance and value.

#### HIGH RESOLUTION

With several lens choices and resolutions of 2.3, 5.0 or 12.3 megapixels, these photometers have your application covered.

#### MATCHED LENSES

Each photometer has a lens series that is matched to the sensor resolution and size, providing optimally crisp and clear images. Standard lenses offer fields of view from 10° to as much as 82°. Microscope lenses are also available.

#### SUPERIOR SENSORS

Using Sony's latest Pregius® CMOS sensors, the photometric measurements are faster, more precise and more sensitive than previously possible. The specifications for dynamic range, quantum efficiency, full well capacity, sensitivity and noise are all improved. The Pregius sensors also have markedly lower noise as compared to the latest CCD sensors.

#### HIGH DYNAMIC RANGE

As a result of the improved noise performance and large full well capacity, a single exposure

measurement can reliably report a wider dynamic range of luminance values (>70dB). Up to 1,000,000:1 dynamic range can be acquired using HDR imaging methods.

#### COMPACT

Weighing just 300 g (with a typical lens) the photometer is easier and less costly to mount. Its small footprint allows for installation into tight spaces and the locking USB3 cables ensure reliable connectivity.

#### CAPABLE SOFTWARE

Photometrica® software and optional software packages provide extensive options for measurement and analysis. The optional Photometrica Software Development Kit (SDK) allows for the creation of fully customized solutions using built-in scripting or external control.

#### LOW POWER (<4.5W)

The photometers can be powered over the USB3 cable or via the photometer's GPIO connector. Most importantly, the low power consumption results in cooler operation and less noise.

# SMART SERIES USB3 CMOS

SPECIFICATIONS		P230U	P501U	P1230U
Sensor Model, Diagonal Size, Pixel Pitch		IMX174, 1/1.2", 5.86 µm	IMX250, 2/3", 3.45 µm	IMX253, 1.1", 3.45 µm
Sensor Type		Sony Pregius, 12-bit, global shutter CMOS		
Sensor Megapixels		2.3	5.0	12.3
Pixel Array		1920 x 1200	2448 x 2048	4096 x 3000
Full Well (e-)		32 500	10 200	
System Dynamic Range (single exposure, per pixel)		73 dB	71 dB	
High Dynamic Range (multi-exposure)		> 1 000 000:1		
Temporal Dark Noise (e-)		6.83	2.37	2.43
Luminance Minimum (cd/m <sup>2</sup> )*, Limit of Detection		0.001		
Luminance Minimum (cd/m <sup>2</sup> )*, SNR = 60		0.002		
Luminance Minimum (cd/m <sup>2</sup> )*, SNR = 100		0.003		
Luminance Maximum (cd/m <sup>2</sup> )**		250 000	3 500 000	
System Accuracy***		Luminance (Y) ± 4 %		
Short-Term Repeatability†		Luminance (Y) ± 0.02 %		
Near Eye Display Lenses with 5mm Entrance Pupil††	8 mm NED	67° horizontal FOV (with side and corner clipping)	53° horizontal FOV	67° horizontal FOV (with side and corner clipping)
	10 mm NED	55° horizontal FOV	41° horizontal FOV	68° horizontal FOV
Standard Lenses Field of View at ∞ (H x V) Field of View at Minimum Focus Distance Focus Distance	5 mm lens		82.0° x 68.6°; 197 mm x 164 mm; 16 cm to ∞	
	8 mm lens	70.1° x 43.8°; 172 mm x 107 mm; 19 cm to ∞	54.0° x 45.2°; 133 mm x 111 mm; 16 cm to ∞	
	12 mm lens	48.8° x 30.5°; 290 mm x 181 mm; 35 cm to ∞	39.1° x 32.7°; 80.7 mm x 67.5 mm; 15 cm to ∞	55.9° x 40.9°; 125.0 mm x 91.6 mm; 18 cm to ∞
	16 mm lens	38.9° x 24.3°; 221 mm x 138 mm; 35 cm to ∞	30.0° x 25.1°; 61.1 mm x 51.1 mm; 15 cm to ∞	44.0° x 32.2°; 93.5 mm x 68.5 mm; 18 cm to ∞
	25 mm lens	25.8° x 16.1°; 141 mm x 88.3 mm; 35 cm to ∞	20.0° x 16.7°; 36.7 mm x 30.7 mm; 15 cm to ∞	28.9° x 21.2°; 86.0 mm x 63.0 mm; 24 cm to ∞
	35 mm lens	18.4° x 11.5°; 96.8 mm x 60.5 mm; 35 cm to ∞	14.3° x 12.0°; 23.4 mm x 19.6 mm; 18 cm to ∞	20.8° x 15.2°; 70.0 mm x 51.3 mm; 28 cm to ∞
	50 mm lens	12.8° x 8.0°; 107 mm x 66.9 mm; 35 cm to ∞	10.1° x 8.4°; 19.1 mm x 16.0 mm; 18 cm to ∞	14.6° x 10.7°; 70.0 mm x 51.3 mm; 38 cm to ∞
Calibrated Iris Positions		Four: f/1.4, f/2.8, f/4, f/8	Two: typically f/2, f/16	
Minimum Measurement Time at 100 cd/m <sup>2</sup> (sec)		0.3	0.4	0.6
Spatial Measurement Capabilities		Luminance, Illuminance, Luminous Intensity, Uniformity, Contrast, Gamma, User Defined		
Units		cd/m <sup>2</sup> , fL, lux, fc, cd		
Communication Interface		USB3		
Power		5 V over USB or 12 V over GPIO Connector (recommended), 4.5 W max		
Dimensions Excluding Lens (H x W x D)		44 mm x 29 mm x 58 mm		
Weight		110 g for photometer; 200 to 350 g with a typical lens attached		
Operating Temperature		0 to 50°C, to specifications: 18 to 24°C		
Operating Humidity		10% to 90% (no condensation)		
Compliance		CE, FCC, KCC, RoHS. The ECCN for this product is: EAR099.		

\* Using 7x7 pixel area

\*\* Using smallest iris and no density filters

\*\*\* Based on measurements of illuminance A, 20 x 20 pixel area

† Using 90 x 90 pixel area

†† LS-8L has a pupil position at 13.4 mm, LS-10L pupil position is at 17.5 mm

## SYSTEM RECOMMENDATIONS

- 3.0 GHz and 8 cores
- 16 - 32 GB RAM
- Windows 7 or 10, 64 bit
- Dual-monitor video output
- USB 3.1 port. (USB 3.1 PCIe card included with system)

All photometers include Photometrica software, PCI express card with two USB 3.1 ports and a 3 meter USB 3.0 Type-A to Micro-B cable with locking screws. Lenses are selected separately.

