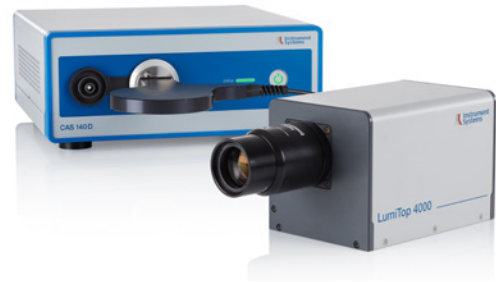


# LumiTop 4000

## Spectrally enhanced imaging colorimeter

### Key features at a glance

- ▲ Production grade 3-in-1 test station saves time, space and money
- ▲ 2D measurements with unprecedented accuracy enabled by the high-end reference spectroradiometer CAS 140D
- ▲ Hardware trigger for perfect timing



### \\ TECHNICAL SPECIFICATIONS

LumiTop 4000		
<b>Measurement quantities</b>		
2D	Luminance, color	
Spot	Spectrum, luminance, color, flicker	
<b>General specifications</b>		
Operating system	Windows 10/11 (64 bit)	
Dimensions (l x w x h) <sup>1)</sup>	286 mm x 190 mm x 121 mm	
Weight <sup>2)</sup>	4.1 kg	
Power supply	24 V	
Operating temperature range	15 – 35 °C	
Lens	29 mm	
<b>Camera specifications</b>		
Effective resolution (h x v)	4096 x 3000 pixels (12 megapixels, CMOS)	
Pixel size	3.45 μm x 3.45 μm	
Dynamic range	70 dB	
AD converter	12 bit	
Size CMOS sensor	1.1" (17.52 mm diagonal)	
Interface camera	Gigabit Ethernet, M12 12-Pin Female	
Measurement range 2D <sup>3),4)</sup>	L = 0.02 cd/m <sup>2</sup> – 270,000 cd/m <sup>2</sup>	
<b>Accuracy and precision</b>	<b>Luminance</b>	<b>Color</b>
Accuracy of camera (rel. to CAS) <sup>5)</sup>	±0.4 %	±0.002
Instrumental precision camera <sup>6)</sup>	±0.03 %	±0.0001
Camera uniformity (RNU) <sup>7)</sup>	±0.35 %	±0.0013
<b>Measurement time <sup>8)</sup></b>		
Measurement time hybrid mode	0.7 s	
Measurement time camera only	0.7 s	

## \\ TECHNICAL SPECIFICATIONS

CAS specifications	CAS 140D			CAS 120			
Interface CAS	USB, Gigabit Ethernet			USB			
Measurement range CAS <sup>3) 9)</sup>	L = 0.003 cd/m <sup>2</sup> – 4 x 10 <sup>7</sup> cd/m <sup>2</sup>			L = 0.10 cd/m <sup>2</sup> – 1.5 x 10 <sup>8</sup> cd/m <sup>2</sup>			
Accuracy and precision	Luminance	Color		Luminance	Color		
Accuracy of CAS	±3.0 % <sup>10)</sup>	±0.0015 <sup>11)</sup>		±4.0 % <sup>10)</sup>	±0.002 <sup>11)</sup>		
Instrumental precision CAS <sup>6)</sup>	±0.1 %	±0.0001		±0.1 %	±0.0002		
Polarization sensitivity <sup>12)</sup>	±2.0 %	±0.002		±2.0 %	±0.002		
Flicker specifications							
Flicker range	5 cd/m <sup>2</sup> – 600 cd/m <sup>2</sup>						
Flicker accuracy <sup>13)</sup>	±1 dB						
Flicker instrumental precision <sup>13) 14)</sup>	±0.02 dB						
Spot size and field of view at selected working distances for 29 mm lens (f/2.8)							
Working distance <sup>15)</sup> [mm]	385	400	500	700	800	1000	1200
Spot size [mm]	11.0	11.5	14.9	21.7	25.1	31.9	38.6
Field of view [mm]	156 x 114	163 x 119	211 x 155	307 x 225	355 x 260	450 x 330	546 x 400
Field of view diagonal [in]	7.6	8.0	10.3	15.0	17.3	22.0	26.6

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<sup>1)</sup> Inclusive lens and fiber exit.

<sup>2)</sup> Without CAS, with mode mixer.

<sup>3)</sup> External neutral density filters on the lens (OD 0.3/0.6/0.9) are available for increasing the upper measurement limit or measuring modulated light sources.

<sup>4)</sup> Lower measurement limit based on a signal to noise ratio of 10:1 for maximum exposure time (10 seconds). Upper measurement limit based on a signal level < 80 % for a white (non-modulated) LED light source using for minimum exposure time (27 μs).

<sup>5)</sup> Typical value for maximum deviation over the FOV relative to the CAS spot; calculated for an image with 21 pixels cropped at each edge and 13 by 13 pixels binning (34 averages) immediately after calibration with reference used for flat-field correction.

<sup>6)</sup> 2σ of repeated measurements of one instrument (L ≈ 100 cd/m<sup>2</sup>, autoexposure).

<sup>7)</sup> RNU (response non-uniformity) is defined as 99.7 % percentile of the deviation of the mean image value; calculated for an image with 21 pixels cropped at each edge and 13 by 13 pixels binning (34 averages) immediately after calibration with reference used for flat-field correction.

<sup>8)</sup> Time between beginning of two subsequent measurements using the SDK; determined with a camera exposure time of 20 ms and CAS exposure time of 200 ms for a white LED (L ≈ 500 cd/m<sup>2</sup>). Depends mainly on PC processing capability.

<sup>9)</sup> Lower measurement limit based on a signal to noise ratio of 10:1 for maximum exposure times 65 s for CAS 140D and 20 s for CAS 120. Upper measurement limit based on a signal level < 80 % for a white (non-modulated) LED light source using a CAS internal optical density filter OD4 and minimum exposure time (4 ms). Values valid for CAS 120 with 100 μm and CAS 140D with 250 μm slit width.

<sup>10)</sup> Immediately after calibration relative to calibration standard.

<sup>11)</sup> Immediately after calibration.

<sup>12)</sup> Maximum deviation from average of repeated CAS measurements with a linear polarized light source and varying polarization angle.

<sup>13)</sup> L ≈ 150 cd/m<sup>2</sup>, 30 Hz, 10 % sine wave.

<sup>14)</sup> 2σ of repeated measurements of one instrument.

<sup>15)</sup> Distance between DUT and front plate of LumiTop.