

# LumiTop X30

## Spectrally enhanced imaging colorimeter

### Key features at a glance

- ▲ Cooled CMOS camera with 31 megapixels and global shutter
- ▲ Proven concept of LumiTop – spectrally enhanced imaging colorimeter
- ▲ Extended measurement range from  $\text{mcd/m}^2$  to  $\text{Mcd/m}^2$
- ▲ High flexibility in field of view by high-precision motorized lens
- ▲ Combination of 2D-RGB sensor with spectroradiometer and flicker sensor



### \\ TECHNICAL SPECIFICATIONS

LumiTop X30		
<b>Measurement quantities</b>		
2D	Luminance, color	
Spot	Spectrum, luminance, color, flicker	
<b>General specifications</b>		
Operating system	Windows 10 (64 bit), Windows 11 (64 bit)	
Dimensions (l x w x h) <sup>1)</sup>	360 mm x 280 mm x 190 mm	
Weight <sup>2)</sup>	7.5 kg	
Power supply	24 V	
Operating temperature range	15 – 35 °C	
<b>Camera specifications</b>		
Effective resolution (h x v)	6464 x 4852 pixels (31 megapixels, CMOS)	
Pixel size	3.45 $\mu\text{m}$ x 3.45 $\mu\text{m}$	
AD converter	12 bit	
Size sensor	27.9 mm diagonal (APS-C)	
Interface camera	CoaXPress	
<b>Accuracy and precision</b>	<b>Luminance</b>	<b>Color</b>
Accuracy of camera (rel. to CAS) <sup>3)</sup>	$\pm 0.4$ %	$\pm 0.0015$
Instrumental precision camera <sup>4)</sup>	$\pm 0.03$ %	$\pm 0.00015$
Camera uniformity (RNU) <sup>5)</sup>	$\pm 0.35$ %	$\pm 0.0013$
<b>Motorized focus specification</b>		
Focus accuracy $\Delta\text{SFR}@0.1\text{cyc/px}$ <sup>6)</sup>	0.1	
Focus precision $\Delta\text{SFR}@0.1\text{cyc/px}$ <sup>7)</sup>	0.01	
Focus distance dependency of camera <sup>8)</sup>	$\pm 0.8$ %	$\pm 0.001$
<b>Flicker specification</b>		
Flicker range	1.5 $\text{cd/m}^2$ – 7,000 $\text{cd/m}^2$	
Modulation frequency range	10 Hz – 1,500 Hz	

## \\ TECHNICAL SPECIFICATIONS

Camera specifications							
Measurement range							
Min./max. luminance <sup>9)</sup>	0.0005 cd/m <sup>2</sup> – 2,000,000 cd/m <sup>2</sup>						
Max. luminance @ 60 Hz frame rate <sup>10)</sup>	4,500 cd/m <sup>2</sup>						
Limit of detection <sup>11)</sup>	0.00005 cd/m <sup>2</sup>						
Measurement time (for 80 % signal level) <sup>12)</sup>	Hybrid mode			Camera only mode			
Measurement time @ 500 cd/m <sup>2</sup>	1.0 s			0.5 s			
Measurement time @ 10 cd/m <sup>2</sup>	1.6 s			0.7 s			
CAS specifications		CAS 140D					
Interface CAS	USB, Gigabit Ethernet						
Measurement range CAS <sup>13)</sup>	L <sub>min</sub> = 0.0002 cd/m <sup>2</sup>						
Accuracy and precision	Luminance			Color			
Accuracy of CAS	±3.0 % <sup>14)</sup>			±0.0015 <sup>15)</sup>			
Instrumental precision CAS <sup>4)</sup>	±0.1 %			±0.0001			
Focus distance dependency of CAS <sup>16)</sup>	±0.5 %			±0.0003			
Polarization sensitivity <sup>17)</sup>	±2.0 %			±0.002			
Spot size and field of spot size and field of view at selected working distances for 25 mm lens (f/1.4)							
Working distances [mm] <sup>18)</sup>	300	400	500	700	900	1100	1300
Spot size [mm]	13.8	20.4	26.9	40.0	53.1	66.2	79.3
Field of view [mm]	185 x 139	272 x 204	360 x 270	535 x 401	709 x 532	884 x 664	1059 x 795
Field of view diagonal [in]	9.1	13.4	17.7	26.3	34.9	43.5	52.1
Spot size and field of spot size and field of view at selected working distances for 35 mm lens (f/1.4)							
Working distances [mm] <sup>18)</sup>	300	500	700	900	1100	1300	1500
Spot size [mm]	10.2	19.7	29.3	38.8	48.4	57.9	67.5
Field of view [mm]	136 x 102	263 x 197	391 x 293	518 x 389	646 x 485	773 x 580	901 x 676
Field of view diagonal [in]	6.7	13.0	19.2	25.5	31.8	38.1	44.3

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

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

<sup>3)</sup> Typical value for maximum deviation over the FOV relative to the CAS spot.

<sup>4)</sup> 2σ of repeated measurements of one instrument (L ≈ 100 cd/m<sup>2</sup>, autoexposure).

<sup>5)</sup> RNU (response non-uniformity) is defined as 99.7 % percentile of the deviation of the mean image value.

<sup>6)</sup> Mean value of repeated approaches to defocus position.

<sup>7)</sup> 2σ of repeated approaches to defocus position.

<sup>8)</sup> Max. deviation over complete measurement range.

<sup>9)</sup> Lower measurement limit based on a signal to noise ratio of 10:1 for exposure time of 60 seconds. Upper measurement limit based on a signal level < 80 % for a white (non-modulated) LED light source using for minimum exposure time of 38 μs. Limit can be extended by additional external ND filter.

<sup>10)</sup> Measurement with 16.666 ms exposure time synchronized to display frame rate.

<sup>11)</sup> Limit of detection based on a signal to noise ratio of 1:1 for 60 s exposure time.

<sup>12)</sup> Time between the beginning of two subsequent measurements using the SDK; determined with an exposure time of 5 ms (camera) and 10ms (CAS) for a white LED @ 500 cd/m<sup>2</sup> and 200 ms (camera) and 450 ms (CAS) for a white LED @ 10 cd/m<sup>2</sup>. Depends mainly on PC processing capability.

<sup>13)</sup> Lower measurement limit based on a signal to noise ratio of 10:1 for maximum exposure times 65 s for CAS 140D with 250 μm slit width.

<sup>14)</sup> Immediately after calibration relative to calibration standard.

<sup>15)</sup> Immediately after calibration.

<sup>16)</sup> Maximum deviation over full calibrated focus distance range.

<sup>17)</sup> Maximum deviation from average of repeated CAS measurements with a linear polarized light source and varying polarization angle.

<sup>18)</sup> Distance between DUT and front plate of LumiTop.