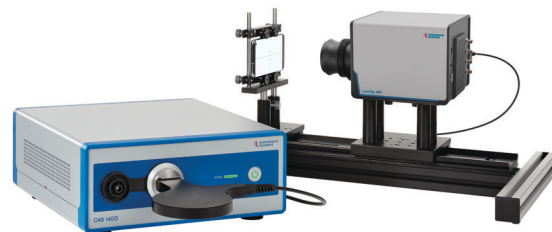


LumiTop X20

Spectrally enhanced imaging colorimeter

Key features at a glance

- ▲ CMOS camera with 20 megapixels
- ▲ Proven concept of LumiTop – spectrally enhanced imaging colorimeter
- ▲ Enhanced dynamics from mcd/m^2 to 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 X20		
Measurement quantities		
2D	Luminance, color	
Spot	Spectrum, luminance, color, flicker	
General specifications		
Operating system	Windows 10 (64 bit), Windows 11 (64 bit)	
Dimensions (l x w x h) ¹⁾	360 mm x 280 mm x 190 mm	
Weight ²⁾	7.5 kg	
Power supply	24 V	
Operating temperature range	15 – 35 °C	
Camera specifications		
Effective resolution (h x v)	5496 x 3672 pixels (20 megapixels, CMOS)	
Pixel size	2.4 μm x 2.4 μm	
AD converter	12 bit	
Size sensor	15.9 mm diagonal	
Interface camera	1 Gigabit Ethernet	
Accuracy and precision	Luminance	Color
Accuracy of camera (rel. to CAS) ³⁾	$\pm 0.4 \%$	± 0.0025
Instrumental precision camera ⁴⁾	$\pm 0.05 \%$	± 0.00015
Camera uniformity (RNU) ⁵⁾	$\pm 0.35 \%$	± 0.0013
Motorized focus specification		
Focus accuracy $\Delta\text{SFR}@0.1\text{cyc}/\text{px}$ ⁶⁾	0.1	
Focus precision $\Delta\text{SFR}@0.1\text{cyc}/\text{px}$ ⁷⁾	0.01	
Focus distance dependency of camera ⁸⁾	$\pm 1.3 \%$	± 0.0015
Flicker specification		
Flicker range	1.5 cd/m^2 – 7,000 cd/m^2	
Modulation frequency range	10 Hz – 1,500 Hz	

TECHNICAL SPECIFICATIONS

Camera specifications		
Measurement range		
Min./max. luminance ⁹⁾	0.0005 cd/m ² – 700,000 cd/m ²	
Max. luminance @ 60 Hz frame rate ¹⁰⁾	4,000 cd/m ²	
Limit of detection ¹¹⁾	0.00005 cd/m ²	
Measurement time (for 80 % signal level) ¹²⁾	Hybrid mode	Camera only mode
Measurement time @ 500 cd/m ²	1.1 s	0.6 s
Measurement time @ 10 cd/m ²	1.7 s	0.8 s

CAS specifications		
CAS 140D		
Interface CAS	USB, Gigabit Ethernet	
Measurement range CAS ¹³⁾	L _{min} = 0.0002 cd/m ²	
Accuracy and precision	Luminance	Color
Accuracy of CAS	±3.0 % ¹⁴⁾	±0.0015 ¹⁵⁾
Instrumental precision CAS ⁴⁾	±0.1 %	±0.0001
Focus distance dependency of CAS ¹⁶⁾	±0.5 %	±0.0003
Polarization sensitivity ¹⁷⁾	±2.0 %	±0.002

Spot size, field of spot size and field of view at selected working distances for 25 mm lens (f/1.4)							
Working distance [mm] ¹³⁾	300	500	700	900	1100	1300	1500
Spot size [mm]	8.3	16.1	24.0	31.8	39.6	47.5	55.3
Field of view [mm]	109 x 73	213 x 142	316 x 211	420 x 280	523 x 349	626 x 419	730 x 488
Field of view diagonal [in]	5.2	10.1	15.0	19.9	24.8	29.7	34.6

Spot size, field of spot size and field of view at selected working distances for 35 mm lens (f/1.4)							
Working distance [mm] ¹³⁾	300	500	700	900	1100	1300	1500
Spot size [mm]	6.1	11.8	17.5	23.2	29.0	34.7	40.4
Field of view [mm]	80 x 54	156 x 104	231 x 154	307 x 205	382 x 255	457 x 306	533 x 356
Field of view diagonal [in]	3.8	7.4	10.9	14.5	18.1	21.7	25.2

¹⁾ Inclusive lens and fiber exit.

²⁾ Without CAS, with mode mixer.

³⁾ Typical value for maximum deviation over the FOV relative to the CAS spot

⁴⁾ 2σ of repeated measurements of one instrument (L ≈ 100 cd/m², autoexposure).

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

⁶⁾ Mean value of repeated approaches to defocus position.

⁷⁾ 2σ of repeated approaches to defocus position.

⁸⁾ Max. deviation over complete measurement range.

⁹⁾ 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 120 μs. Limit can be extended by additional external ND filter.

¹⁰⁾ Measurement with 16.666 ms exposure time synchronized to display frame rate.

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

¹²⁾ 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/m² and 200 ms (camera) and 500 ms (CAS) for a white LED @ 10 cd/m². Depends mainly on PC processing capability.

¹³⁾ 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.

¹⁴⁾ Immediately after calibration relative to calibration standard.

¹⁵⁾ Immediately after calibration.

¹⁶⁾ Maximum deviation over full calibrated focus distance range.

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

¹⁸⁾ Distance between DUT and front plate of LumiTop.

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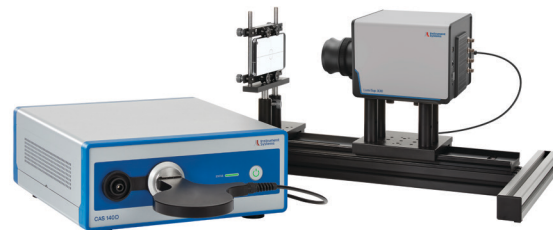
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LumiTop X30

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

TECHNICAL SPECIFICATIONS

Camera specifications							
Measurement range							
Min./max. luminance ⁹⁾	0.0005 cd/m ² – 2,000,000 cd/m ²						
Max. luminance @ 60 Hz frame rate ¹⁰⁾	4,500 cd/m ²						
Limit of detection ¹¹⁾	0.00005 cd/m ²						
Measurement time (for 80 % signal level) ¹²⁾	Hybrid mode			Camera only mode			
Measurement time @ 500 cd/m ²	1.0 s			0.5 s			
Measurement time @ 10 cd/m ²	1.6 s			0.7 s			
CAS specifications							
CAS specifications	CAS 140D						
Interface CAS	USB, Gigabit Ethernet						
Measurement range CAS ¹³⁾	L _{min} = 0.0002 cd/m ²						
Accuracy and precision	Luminance			Color			
Accuracy of CAS	±3.0 % ¹⁴⁾			±0.0015 ¹⁵⁾			
Instrumental precision CAS ⁴⁾	±0.1 %			±0.0001			
Focus distance dependency of CAS ¹⁶⁾	±0.5 %			±0.0003			
Polarization sensitivity ¹⁷⁾	±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] ¹⁸⁾	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] ¹⁸⁾	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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⁹⁾ 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.

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¹³⁾ 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.

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¹⁵⁾ Immediately after calibration.

¹⁶⁾ Maximum deviation over full calibrated focus distance range.

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

¹⁸⁾ Distance between DUT and front plate of LumiTop.

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