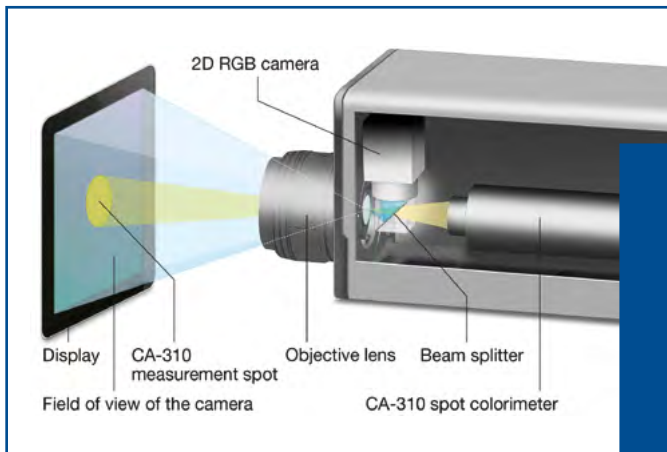


LumiCol 1900

Fast and precise 2-in-1 imaging colorimeter




We bring quality to light.



Design concept of the LumiCol 1900.

Product highlights

- ▲ Fast one-shot characterization of flat panel displays
- ▲ Built-in spot colorimeter including all features of CA-310
- ▲ User calibration guarantees highest accuracy
- ▲ Flexible lens focus
- ▲ Powerful and user-friendly software  LumiSuite

\\ All-round talent for display production

The LumiCol 1900 was designed to serve in particular the requirements of display testing in production lines.

Fast and accurate

Thanks to its 2-in-1 design, the LumiCol 1900 allows for performing fast and accurate optical characterizations of whole displays.

Cost effective

The LumiCol 1900 offers substantial time and cost savings, as it acquires 2D images very fast and combines the functionality of two measurement devices into a single device, i.e. reduces the number of test stations required.

Easy to integrate

The SDK of the new LumiSuite software is optimized for easy and flexible integration into production lines.

Principle

The innovative 2-in-1 display measurement device uses the very accurate tristimulus measurement of Konica Minolta's CA-310 spot colorimeter as a reference for the 2D RGB images of the CMOS camera.

The integrated beam splitter allows for simultaneous measurement of the camera and the spot colorimeter.

The colorimeter is used as reference during the calibration process and as live-reference for every camera measurement. As calibration source, a standard monitor displaying a large set of different colors is used. A calibration matrix transforms the RGB values of the CMOS camera into XYZ. A further increase of the accuracy is achieved by an additional correction applied after the transformation. This value is determined from the live comparison of colorimeter and camera results and is renewed with every measurement performed.

As a result, the high accuracy of the CA-310 XYZ measurement is transferred to the 2D image of the CMOS camera. The specifications for luminance and color measurements with the LumiCol 1900 can keep up with state-of-the-art filter-wheel based imaging colorimeters. A striking advantage over such colorimeters is the extremely high measurement speed, which is achieved by capturing all color and

luminance information with a single exposure.

Two devices in one

Combining two devices, the LumiCol 1900 offers all typical functions of a CMOS camera and a spot colorimeter:

- ▲ Measurement of color and luminance
- ▲ Determination of color and luminance uniformity
- ▲ Contrast measurement
- ▲ Measurement of white balance, gamma, color-gamut etc.
- ▲ Flicker measurements (model F)

The LumiCol 1900 is available in two variants, the type Flicker (F), which is optimized for liquid crystal displays and allows for JEITA and contrast flicker measurements, and the type Universal (U) for the investigation of all types of displays.

The LumiCol 1900 comes with a new software platform, the LumiSuite, which is optimized for the typical processes of automated production or quality control, as well as for R&D applications.

Technical specifications

LumiCol 1900							
Models	Description						
Universal (U)	All display types, no flicker measurement						
Flicker (F)	For liquid crystal displays, including flicker measurement (Contrast and JEITA method)						
Measurement quantities							
2D	Luminance, color						
Spot	Luminance, color, flicker (only model F)						
Camera specifications							
Effective resolution (h x v); Pixel size	~1900 x 1180 pixels (2.2 megapixels); 5.86 μm x 5.86 μm						
AD converter	12 bit						
Size CMOS sensor	1/1.2", 13.3 mm diagonal						
General specifications							
Interface; Operating system	Gigabit Ethernet; Windows 7						
Dimensions (l x w x h, incl. lens); Weight	222 mm x 100 mm x 131 mm; 2.5 kg						
Power supply	12 V						
Operating temperature range	10 °C - 35 °C						
Measurement performance							
Measurement range ¹⁾	$L_v = 0.01 \text{ cd/m}^2 - 5000 \text{ cd/m}^2$ (extended: 50000 cd/m^2)						
Luminance accuracies ²⁾	1000 cd/m^2 (ND filter)	100 cd/m^2	1 cd/m^2	0.3 cd/m^2			
Accuracy to reference instrument ³⁾	1.2 %	1.2 %	2.0 % / 1.5 % ⁴⁾	3.5 % / 2.0 % ⁴⁾			
Instrumental precision CA-310 ⁵⁾	0.1 %	0.1 %	0.35 % / 0.3 % ⁴⁾	1.5 % / 1.0 % ⁴⁾			
Instrumental precision camera ⁶⁾	0.5 %	0.5 %	0.7 %	2.5 %			
Polarization sensitivity ⁷⁾	1.0 %	1.0 %	-	-			
Color accuracies ²⁾	1000 cd/m^2 (ND filter)	100 cd/m^2	1 cd/m^2	0.3 cd/m^2			
Accuracy to reference instrument ³⁾	0.0015	0.0015	0.0025 / 0.0015 ⁴⁾	0.0040 / 0.0030 ⁴⁾			
Instrumental precision CA-310 ⁵⁾	0.0002	0.0002	0.002 / 0.0015 ⁴⁾	0.005 / 0.0030 ⁴⁾			
Instrumental precision camera ⁶⁾	0.0015	0.0015	0.003	0.004			
Polarization sensitivity ⁷⁾	0.0025	0.0025	-	-			
Measurement time	1000 cd/m^2 (ND filter)	100 cd/m^2	1 cd/m^2	0.3 cd/m^2			
Measurement time hybrid mode ⁸⁾	0.5 s	0.5 s	1.5 s	3.5 s			
Measurement time CA-310 only	65 ms	65 ms	330 ms	1 s			
Flicker (only model LumiCol 1900 F)							
Measurement range	> 15 cd/m^2						
Display range (Contrast method)	0...999 %						
Accuracy (Contrast method)	$\pm 1 \%$ / $\pm 2 \%$ (30 Hz/60 Hz; 10 % sine wave)						
Instrument precision (Contrast method, 2σ)	1 % (30 Hz; 10 % sine wave)						
Accuracy (JEITA method)	$\pm 0.5 \text{ dB}$ (30 Hz; 10 % sine wave)						
Instrument precision (JEITA method, 2σ)	0.3 dB (30 Hz; 10 % sine wave)						
Lens 28 mm							
Minimum working distance (at focus); Aperture	220 mm; f/2.8						
Spot size and field of view at selected working distances							
Working distance ⁹⁾ [mm]	220	550	1000	1500	2000	2500	3000
Spot size [mm]	12	34	64	97	131	164	198
Field of view [mm]	69 x 43	198 x 123	374 x 232	570 x 353	765 x 475	961 x 596	1156 x 717
Field of view diagonal [in]	3.2	9.2	17.3	26.4	35.4	44.5	53.6

¹⁾ $L_v = 0.01 \text{ cd/m}^2$ valid for the 2D chroma mode (camera only; SNR 10:1); for hybrid mode: 0.1 $\text{cd/m}^2 - 5000 \text{ cd/m}^2$ up to 50000 cd/m^2 with ND filter (OD1).

²⁾ All measurement accuracies apply to a threefold standard deviation (3σ).

³⁾ Compared to a high-precision spectroradiometer as reference instrument measured on a reference display using hybrid mode; for OD1 filter results: measured on white LED light source after single-point user-calibration. Uncertainty of reference instrument not considered.

⁴⁾ Measured with low luminance mode.

⁵⁾ Repeated measurements of unchanged setup.

⁶⁾ Max. standard deviation of 25 images (8 x 8 binning) obtained from unchanged setup. Auto exposure used for 100 cd/m^2 ; fixed exposure of 1 s / 3 s for 1 cd/m^2 / 0.3 cd/m^2 .

⁷⁾ Max. deviation from mean with linear polarized light.

⁸⁾ Depends on PC processing capability. Auto exposure for 100 cd/m^2 ; fixed exposure of 1 s / 3 s for 1 cd/m^2 / 0.3 cd/m^2 .

⁹⁾ Distance between DUT and front plate of LumiCol 1900.

\\ Ordering information

Order number	Description
LCO1900-100-FB	2-in-1 imaging colorimeter with 1900 x 1180 pixels (built-in CA-310 spot colorimeter; incl. 28 mm lens, calibration, SDK and LumiSuite; Gigabit Ethernet interface); type: Flicker; color: black
LCO1900-100-FG	As above; type: Flicker; color: gray
LCO1900-100-UB	As above; type: Universal; color: black
LCO1900-100-UG	As above; type: Universal; color: gray



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