

/ ProMetric I

Технические характеристики

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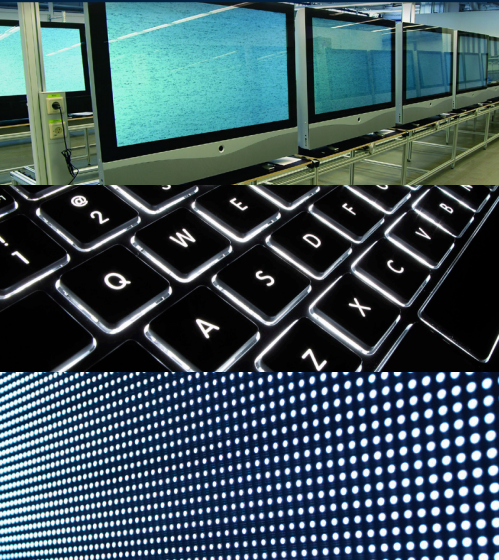
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ProMetric® I

Imaging Colorimeter



Purpose-built for manufacturing test of displays, illuminated keyboards, and surfaces.

ProMetric I Highlights

- Optimized for speed, resolution, and measurement accuracy
- Delivers color and light measurements that are precisely correlated with human visual perception
- Tristimulus color filters with innately close match to CIE color-matching functions
- Multiple lens choices with Smart Calibration™ for a wide range of focus and aperture settings
- Flexible system, capable of addressing multiple applications for lit and non-lit components
- Seamless integration with TrueTest™ Automated Visual Inspection Software and specialized software packages



The world's fastest and most accurate high-resolution imaging colorimeter

ProMetric I is designed to address the demands for high-volume manufacturing of displays, backlit components, light sources, and electronic devices. Whether expanding test coverage or increasing throughput, ProMetric I delivers the required performance for highly accurate color and luminance measurements in an automated manufacturing environment. ProMetric I is designed around scientific-grade image sensors in a range of high-resolution options. These sensors enable pixel-level measurements of displays (LCD, OLED), inter- and intra-character luminance measurements on backlit keyboards and panels, and accurate measurements of LED luminance and color in luminaires with large LED arrays.

ProMetric I incorporates **Smart Technology™** innovations, which simplify setup and ensure accurate measurement results.

- **Smart Control™** for fast, precise setup: Smart Control allows users to electronically adjust both focus and aperture settings of the lens from software.
- **Smart Touch™** for ease of use: Smart Touch provides a touchscreen display interface that supports measurement setup, data acquisition, and measurement review on the imaging colorimeter.
- **Smart Calibration™** for accuracy: Smart Calibration monitors lens focal distance and aperture settings and automatically applies the correct flat-field calibration.

A production line is a harsh environment and reliable communications can be a challenge. ProMetric I supports USB and/or Ethernet communications, providing highly reliable operation over long distances, even in the most demanding manufacturing environments.

ProMetric I comes standard with ProMetric Software to operate the colorimeter in a manual mode or to support programming via an API. ProMetric I is optimized for automation via optional TrueTest™ Automated Visual Inspection Software and a range of application-specific software modules. TrueTest Software provides a complete, turnkey solution for production-level test sequencing using a library of light measurement and inspection software tools. From absolute accuracy in product design to optimal efficiency in light and color quality control on the line, ProMetric I is designed specifically for your application.

Specifications

Parameter	ProMetric I2	ProMetric I8	ProMetric I29	ProMetric I61
Primary Application	Uniformity Testing, R&D			
Sensor Pixel Resolution	1600 x 1200	3296 x 2472	6576 x 4384	9568 x 6380
Sensor Megapixels	1.9	8.1	28.8	61.0
Sensor Type	CCD			CMOS
System Dynamic Range (single exposure, per pixel)	59 dB (1 x 1 binning)			76 dB (1 x 1 binning)
Luminance (Minimum)*	0.00001 cd/m ² Limit of Detection 0.0001 cd/m ² @ SNR = 60 0.0005 cd/m ² @ SNR = 100			0.0005 cd/m ² Limit of Detection 0.0010 cd/m ² @ SNR = 60 0.0015 cd/m ² @ SNR = 100
Luminance (Maximum)	10 ¹⁰ cd/m ² with optional ND filters			
System Accuracy**	Illuminance $\pm 3\%$; Luminance (Y) $\pm 3\%$; Color Coordinates (x,y) ± 0.003			
Short-term Repeatability*	Illuminance $\pm 0.02\%$; Luminance (Y) $\pm 0.02\%$; Color Coordinates (x,y) ± 0.00005			
Lens Type	Electronically controlled focus and aperture			
Focal Distances Available	24, 35, 50, 100, 200 mm		50, 100, 200 mm	
Field of View (Full Angle, H x V degrees)	24 mm 20° x 15° 35 mm 14° x 10° 50 mm 10° x 8° 100 mm macro 5° x 4° 200 mm 3° x 2°	24 mm 38° x 30° 35 mm 29° x 22° 50 mm 21° x 16° 100 mm macro 10° x 8° 200 mm 5° x 4°	50 mm 40° x 28° 100 mm macro 20° x 14° 200 mm 11° x 7°	
Minimum Measurement Time***	0.3 sec - photopic 1.1 sec - color	0.4 sec - photopic 1.2 sec - color	0.9 sec - photopic 2.4 sec - color	0.6 sec - photopic 1.8 sec - color
Spatial Measurement Capabilities	Luminance, Radiance, Illuminance, Irradiance, Luminous Intensity, Radiant Intensity, CIE Chromaticity Coordinates, L*a*b* Color Scale, Correlated Color Temperature (CCT), Dominant Wavelength			
Units	foot-lambert, cd/m ² , nit, W/sr/m ² , foot-candles, lux, lux-s, W/m ² , W-s/m ² , candela, W/sr. CIE (x, y) and (u', v'), Kelvin (CCT)			
Communication Interface	Ethernet 100/1000, USB 2.0			10 Gigabit Ethernet (10 GigE)
Power	100-240 V, 50-60 Hz, 140 Watts			
LCD Touch Panel	Resolution: 800 x 600; Diagonal: 125 mm			
Dimensions (H x W x D)	238 mm x 181 mm x 230 mm			
Weight	4.9 kg			4.6 kg
Operating Temperature	0 - 30° C			5 - 35° C
Operating Humidity	20 - 70% non-condensing			

Specifications subject to change without notice.

* Based on a virtual detector size of 100 x 100 pixels.

** Based on illuminant A or user calibration for specific spectra. Based on a virtual detector size of 100 x 100 pixels and a minimum exposure time of 10ms.

*** For 100 cd/m², using Ethernet.

Lens	Calibrated Apertures
Canon EF 24 mm f/2.8 USM	f/4.7 f/8
Canon EF 35 mm f/2.0 USM	f/2.3 or f/4.0† f/8
Canon EF 50 mm R f/2.0 USM	f/2.8 f/8
Canon EF 100 mm f/2.8L Macro IS USM	f/3.3 f/8
Canon EF 200 mm f/2.8 USM	f/3.3 f/8

† f/4.0 for 29MP and 61MP systems

ProMetric I-series imaging colorimeters, and the electronically-controlled lenses supplied with them, are factory-calibrated over all possible distances and two specific aperture settings. Because the lenses are electronically controllable for focus (working distance) and aperture, the colorimeter will automatically apply the appropriate flat-field correction.



System Specifications

- Intel® Core™ i7-8086 CPU @ 4.00 GHz
- 32 GB installed RAM

System Requirements

- Windows® 10, 64 bit
- Ethernet 100/1000 or USB 2.0 port (I2, I8, and I29)
- Desktop: PCI-E x8 lane slot (I61)
- Laptop: Thunderbolt 3 Port (I61)

ProMetric® I-SC Solution

Imaging Colorimeter & Integrated Spectrometer

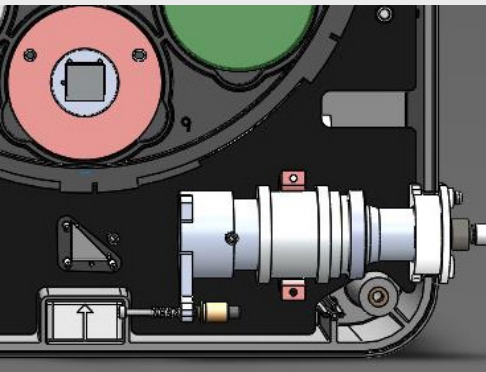


Combination imaging colorimeter & spectrometer for complete color measurement in one solution

ProMetric® I imaging colorimeters are designed to address inspection demands for high-volume manufacturing of displays, illuminated components, light sources, and surfaces. These systems use tristimulus color filters, which provide an innately close response to standard CIE color-matching functions. This enables the most accurate evaluation of color based on the human visual experience (380 nm - 780 nm) to ensure quality as perceived by users of light-emitting devices. With scientific-grade image sensors in a range of high-resolution options, ProMetric imaging colorimeters can perform subpixel-level measurement of luminance and chromaticity as well as inspect numerous precise details across large fields of view.

The ProMetric I-SC Solution uses a polarization-insensitive mirror to combine the functions of an enhanced ProMetric I imaging colorimeter with a high-end CAS 140D spectroradiometer from Instrument Systems GmbH. This innovative design is based on patented technology developed by Radiant Vision Systems (US Patent No. 8482652). Using a measurement image acquired by the connected imaging colorimeter, the ProMetric I-SC simultaneously measures spectral data at the center point while quantifying and comparing spatial luminance (cd/m^2) and chromaticity (CIE x, y and u', v') values across the image to evaluate a device. Both systems are controlled using a single software platform, which also provides a centralized interface for data visualization and output. From software, users can initiate spectral data capture on demand or program the solution to capture a spectrum automatically with each measurement. Reference spectral data can be applied directly to the imaging colorimeter for in-line color calibration to new devices and device states, ensuring a consistent match between camera response and CIE measurement functions. As a directly integrated system, ProMetric I-SC operates continuously without intervention, ensuring repeatable accuracy, efficiency, and ease of use.

ProMetric I-SC colorimeters are optimized to work with industry-leading TrueTest™ Automated Visual Inspection Software from Radiant Vision Systems. TrueTest provides a complete turnkey solution for production-level test sequencing using a library of light measurement and inspection software tools. From absolute accuracy in product design to optimal efficiency for in-line quality control, the ProMetric I-SC Solution is engineered specifically to address end-to-end metrology applications.



The ProMetric I-SC employs a mirror mounted inside the imaging colorimeter on the color filter wheel to redirect light through a fiber-optic cable to the spectrometer.

ProMetric I-SC Highlights

- Optimized for speed, resolution, and measurement accuracy
- Captures spectral and spatial measurement data simultaneously using a single solution
- References spectral data to calibrate the tristimulus imaging colorimeter according to CIE color-matching functions
- Works seamlessly with Radiant Vision Systems TrueTest™ Automated Visual Inspection Software packages
- Offers multiple sensor resolution options and lens choices with Smart Calibration™ for a wide range of distance and aperture settings

ProMetric® I-SC Solution Specifications

Spectrometer Specifications

Parameter	Spectroradiometer
Luminance Minimum	0.02 cd/m²
Luminance Maximum (using ND3 filter)	1,000,000 cd/m²
Spectroradiometer Absolute Accuracy	Color Coordinates (x,y) ± 0.0015 for CIE standard illuminant A
Short-term Repeatability	± 0.1% (2 sigma)
Minimum Measurement Time	200 ms
Measurement Spot Size	Corresponding to ~600 I61 imaging colorimeter sensor pixels (in diameter)
Communication Interface	Ethernet 100/1000
Power supply	Wide-range input 100 - 240 VAC 50/60 Hz
Dimensions (H x W x D)	144 mm x 341 mm x 359 mm
Weight	9 kg
Operating Temperature	15 - 35° C
Operating Humidity	Relative humidity 0 - 70 % max., non-condensing

Imaging System Specifications

Parameter	ProMetric I61-SC
Primary Application	Uniformity Testing, R&D Settings, Production Line Testing, Display Testing, Color Correction
Sensor Pixel Resolution	9568 x 6380
Sensor Megapixels	61.0
Sensor Type	CMOS
System Dynamic Range (single exposure, per pixel)	76 dB (1 x 1 binning)
Luminance (Minimum)*	0.0005 cd/m² Limit of Detection 0.0010 cd/m² @ SNR = 60 0.0015 cd/m² @ SNR = 100
Luminance (Maximum)	10 ¹⁰ cd/m² with optional ND filters
Imaging Colorimeter Accuracy**	Illuminance ± 3%; Luminance (Y) ± 3%; Color Coordinates (x,y) ± 0.003
Short-term Repeatability*	Illuminance ± 0.02%; Luminance (Y) ± 0.02%; Color Coordinates (x,y) ± 0.00005
Lens Type	Electronically controlled focus and aperture
Focal Distances Available	50, 100 mm
Field of View (Full Angle, H x V degrees)	50 mm 40° x 28° 100 mm macro 20° x 14°
Minimum Measurement Time***	0.6 sec - photopic 1.8 sec - color
Spatial Measurement Capabilities	Luminance, Radiance, Illuminance, Irradiance, Luminous Intensity, Radiant Intensity, CIE Chromaticity Coordinates, L*a*b* Color Scale, Correlated Color Temperature (CCT), Dominant Wavelength
Units	foot-lambert, cd/m², nit, W/sr/m², foot-candles, lux, lux-s, W/m², W-s/m², candela, W/sr, CIE (x, y) and (u', v'), Kelvin (CCT)
Communication Interface	10 Gigabit Ethernet (10 GigE)
Power	100-240 V, 50-60 Hz, 140 Watts
LCD Touch Panel	Resolution: 800 x 600; Diagonal: 125 mm
Dimensions (H x W x D)	238 mm x 181 mm x 230 mm
Weight	4.6 kg
Operating Temperature	5 - 35° C
Operating Humidity	20 - 70% non-condensing

Specifications subject to change without notice.

ProMetric® I-SC Colorimeter



ProMetric I-SC imaging colorimeters, and the electronically-controlled lenses supplied with them, are factory-calibrated over all possible distances and two specific aperture settings. Because the lenses are electronically controllable for focus (working distance) and aperture, the colorimeter will automatically apply the appropriate flat-field correction.

Lens	Calibrated Apertures
Canon EF 50 mm R f/2.0 USM	f/4 f/8
Canon EF 100 mm f/2.8L Macro IS USM	f/4 f/8

ProMetric I-SC imaging colorimeters optionally can be fitted with an AR/VR Lens to measure near-eye displays in augmented (AR), virtual (VR), or mixed reality (MR) headsets.

System Specifications

- Intel® Core™ i7-8086 CPU @ 4.00 GHz and 8 cores
- 32 GB Installed RAM

System Requirements

- Windows® 10, 64 bit
- Ethernet 100/1000
- Desktop: PCI-E x8 lane slot (I61-SC)
- Laptop: Thunderbolt 3 Port (I61-SC)

* Based on a virtual detector size of 100 x 100 pixels.
** Based on illuminant A or user calibration for specific spectra. Based on a virtual detector size of 100 x 100 pixels and a minimum exposure time of 10 ms.
*** For 100 cd/m², using Ethernet.

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