

# illumia®Pro2 Light Characterization Systems

Simultaneous thermal, optical, and electrical characterization of LEDs



## **Accurately test for thermal variances**

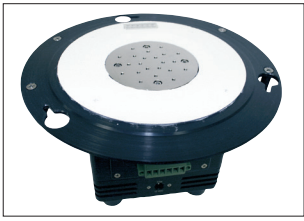
Thermal variances at the junction can affect an LED's performance in terms of color, output, life expectancy, luminous efficacy, and linearity performance. Labsphere's illumia®Pro2 systems allow users to quickly and accurately test for thermal variances of the device under test.

## **Improve productivity**

- Wide dynamic range which allows a single sphere to measure a wide range of light levels
- NIST traceable standards for in-house recalibration
- Spectral results in milliseconds
- Spectrafect® interior sphere coating
- Conforms to national standard measurement geometries

## **Measure**

- Total Spectral Flux
- Luminous Flux
- Radiant Flux
- CCT and CRI
- Peak Wavelength
- Dominant Wavelength
- I, V, and Luminous Efficacy
- Thermal: Case Temperature Control vs Electrical and Optical Parameters



## TEC - Thermal Element

### Features

Complete thermal, optical and electrical analysis  
 Automated data acquisition and analysis  
 TEC temperature control and monitoring  
 Measure optical properties as a function of temperature and operating current  
 Available in 0.5, 1, 1.65 and 1.95 meter sphere diameters  
 Ambient air temperature control available

Labsphere's illumia®Pro2 Thermal, Optical and Electrical Characterization Systems allow users to quickly, accurately and simultaneously measure the optical and thermal characteristics of various LEDs and arrays.

LED manufacturers, integrators and users are paying more attention to the thermal and electrical characteristics of LEDs because thermal variances at the junction can affect an LED's performance in terms of color, output, life expectancy, luminous efficacy and linearity performance.

### Measure

Electrical: I, V, Electrical Watts  
 Optical: Flux, Color, Luminous Efficiency  
 Thermal: Case Temperature Control vs. Electrical and Optical Parameters

### Applications

Packaged LEDs	Modules & Arrays
Backlight Displays	Solid State Lighting

### Measurement Functions

ILV @ constant T: step & control I, stabilize T, measure L & V  
 VLI @ constant T: step & control V, stabilize T, measure L & I  
 TLV @ constant I: step & control T, stabilize T, measure L & V  
 TLI @ constant V: step & control T, stabilize T, measure L & I  
 ILV/T: perform ILV @ constant T, step T and repeat at each T  
 VLI/T: perform VLI @ constant T, step T and repeat at each T  
 Key: L = Lumens, V = Voltage, I = Current, T = Temperature



## Spectrometer

The highly sensitive SMS-500 Mini CCD Array Spectrometer offers low noise and a broad spectral response with a calibrated range from 350 to 1050 nm.

Within the illumia®Pro2 Thermal Measurement System, the spectrometer avoids the inherent photometric errors associated with filter-based photometers. Data is accurate even for narrow-band light sources such as LEDs, fluorescent lamps, and discharge lamps.

The Labsphere SMS-500 CCD Array Spectrometer is a multi-channelled spectral analyzer designed for real-time spectral analysis. Instantaneous spectral acquisition provides the radiometric, photometric and color characteristics of the device under test (DUT). Fast results help to increase the rate of product development, decrease the time to market, and reduce development costs.



## Keithley®

### Keithley® 2400 Series SourceMeters® **REQUIRED**

We are pleased to offer Keithley 2400 Series SourceMeters for optimum operation of the illumia®Pro2 Systems. The Keithley SourceMeter is a required component for operating the illumia®Pro2 Systems however it is **NOT** included with the system. For user convenience, the instrument can be supplied by the user and sent to Labsphere for integration into the electronics rack, or it may be purchased directly from Labsphere. **One of the models listed in our Ordering Information must be chosen to complete the system.** Our sales engineers can assist you in choosing the right model for your application.

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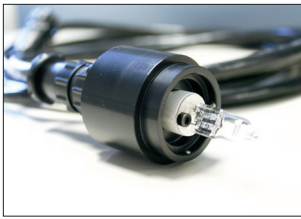


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## Lamps

### Auxiliary Lamps for Absorption Correction

Industry standards and Labsphere recommend applying absorption correction techniques. Self-absorption correction is critical, since the physical size and shape of SSL products and lamps under test are typically very different from the reference lamp size and shape. The use of an absorption correction lamp can correct for self-absorption errors.

Lamp assemblies mount onto a Labsphere 1 inch port frame and auxiliary lamp port on our light measurement spheres with no modifications required.

### Calibrated Lamp Standards

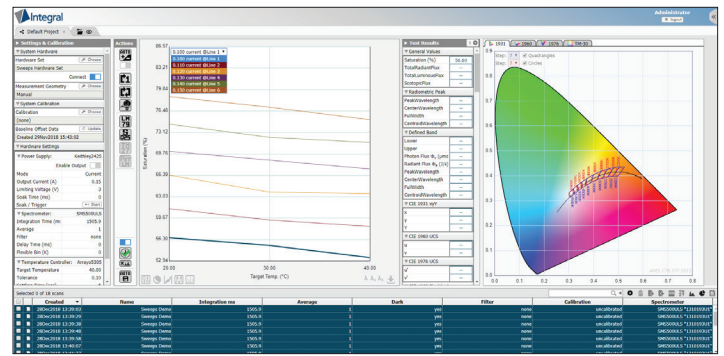
Labsphere's Total Spectral Flux Lamp Standards are selected for their stability and reproducibility. A calibration certificate verifying traceability to NIST is provided with each lamp. Each lamp has been carefully screened, seasoned, and calibrated at our manufacturing facility under the guidelines recommended by the NVLAP accredited ISO 17025 practices for the highest degree of confidence.



## Agilent®

### Agilent A3634A Programmable DC Power Supply

This single output power supply gives you the flexibility to select from a dual output range. Therefore you can drive the calibration lamp and the auxiliary correction lamp from one power supply. The output load is protected against overvoltage and overcurrent, which is easily monitored and adjusted from the front panel and Integral software.



## Integral® Software

Included with the illumia®Pro2 System, Integral provides a powerful, yet easy-to-use menu driven operating environment. It allows users to control the LED temperature and operating current at specified ranges. This control enables the software to measure and characterize the device under test (DUT) over a wide range of temperatures.

System software automates procedures for measuring the spectral characteristics and controlling current and temperature. Software simultaneously collects electrical, optical and thermal data which is graphed and viewed on screen or can be exported for further analysis.



## Cube

The CL100 "Cube" is a mini, fan-less, PC that runs on the latest version of Windows®. Labsphere's Integral software is pre-installed in it. The Cube resides inside of the illumia®Pro2 control rack and is connected to internal and external hardware via USB. Connection can be made to a mouse and keyboard through its USB ports, and to a video monitor through one of its HDMI ports.



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# illumia®Pro2 Systems Ordering Information

System:	illumia®Pro2 500-050	illumia®Pro2 500-100	illumia®Pro2 500-165	illumia®Pro2 500-195
Order Number:	AA-80610-050	AA-80610-100	AA-80610-165	AA-80610-195
Port Size:	6 inch	13 inch	21 inch	25 inch
Sphere Size: (m)	0.5	1.00	1.65	1.95
Spectrometer:	SMS-500	SMS-500	SMS-500	SMS-500
Port Reducer:	6" -> 1"	13" -> 6" -> 1"	21" -> 6" -> 1"	25" -> 6" -> 1"
Spectrally Calibrated Lamp:	2PI-1-INT-650	2PI-1-INT-1400	2PI-1-INT-1400	2PI-1-INT-1400
Aux Lamp:	AUX-100-35	AUX-100-75	AUX-100-75	AUX-100-75
Software:	Integral	Integral	Integral	Integral

All systems include: Rack, Agilent Power Supply, Thermal System, Retouch 6080, Tool Kit, SMA Adaptor and Diffuser

**All systems require but do not include: Keithley Multimeter, Keyboard, Mouse and Display**

## Required Keithley SourceMeter Models

One of the options listed below must be chosen to complete the system.

Keithley 2400: AA-80007-000

Keithley 2420: AA-80007-001

Keithley 2425: AA-80007-002

Keithley 2440: AA-80007-003

SourceMeter Integration Fee: (for customer supplied Keithley) AA-80007-004

## Optional Accessories Ordering Information

4 $\pi$  Kit (To perform 4 $\pi$  measurement geometry with 2 $\pi$  systems. Includes lamp post, baffle, junction box, does not include calibration lamp)

AA-80201-050

AA-80201-100

AA-80201-165

AA-80201-195

2PI-1-INT-650	Single Spectral Flux Standard	AS-80003-100
2PI-3-INT-650	Set of 3 Single Spectral Flux Standards	AA-80003-101
2PI-1-INT-1400	Single Spectral Flux Standard	AS-80004-000
2PI-3-INT-1400	Set of 3 Single Spectral Flux Standards	AA-80004-001
AUX-650	Absorption Correction Lamp	AS-02986-650
AUX-1400	Absorption Correction Lamp	AS-02986-140



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## Performance Specifications (lumens)

System:	illumia®Pro2 500-050		illumia®Pro2 500-100		illumia®Pro2 500-165		illumia®Pro2 500-195	
Spectral Range: (calibrated)	350 - 1050 nm		350 - 1050 nm		350 - 1050 nm		350 - 1050 nm	
Wavelength Accuracy:	<+/- 0.3 nm		<+/- 0.3 nm		<+/- 0.3 nm		<+/- 0.3 nm	
QTH LUMENS Noise Equiv. Lumens:	1.833E-01		7.33E-01		2.79E+00		2.00E+00	
QTH POWER NEP: (W)	1.516E-02		6.06E-02		2.31E-01		1.65E-01	
350 - 400 nm average W/nm:	8.433E-06		3.37E-05		1.28E-04		9.19E-05	
425 - 475 nm W/nm:	6.788E-06		2.72E-05		1.03E-04		7.40E-05	
525 - 575 nm W/nm:	8.887E-06		3.55E-05		1.35E-04		9.69E-05	
625 - 675 nm W/nm:	1.478E-05		5.91E-05		2.25E-04		1.61E-04	
Min Luminous Power (lm) w/100:1 S/N:	3.666E-2		1.47E-01		5.58E-01		4.00E-01	
Min Power in 350 - 400 nm Range (W) with 100 S/N Ratio:	1.054E-4		4.22E-04		1.60E-03		1.15E-03	
Min Power in 425 - 475 nm Range (W) with 100 S/N Ratio:	8.485E-05		3.39E-04		1.29E-03		9.25E-04	
Min Power in 525 - 575 nm Range (W) with 100 S/N Ratio:	1.111E-4		4.44E-04		1.69E-03		1.21E-03	
Min Power in 625 - 675 nm Range (W) with 100 S/N Ratio:	1.848E-4		7. 7.39E-04		2.81E-03		2.01E-03	
	min	max	min	max	min	max	min	max
Tungsten Filament:	0.05	7500	0.20	16300	0.54	41000	0.75	57000
Cool White LED:	0.04	7100	0.16	14500	0.41	37000	0.58	52000
Warm White LED:	0.03	4500	0.13	13800	0.37	34000	0.52	47000
Blue LED:	0.05	300	0.20	1200	0.54	2700	0.76	3800
Red LED:	0.03	800	0.12	1100	0.35	3500	0.50	5000
Upper Range:	Ambient temp can not exceed 100°C		Ambient temp can not exceed 100°C		Ambient temp can not exceed 100°C		Ambient temp can not exceed 100°C	



## System Spectrometer Specifications

<b>Spectrometer:</b>	<b>SMS-500</b>
Detector:	2048 element Linear CCD
Spectral Range: (spectrograph)	350 - 1050 nm
Resolution:	1.4 nm
Integration Time:	1.1 ms - 4 sec
Linearity:	+/- 0.3%
Average % Noise on 100% Line:	0.23%
Stray Light: (Y-50 filter) <sup>1</sup>	39.0% (5.78% for ULS)
Stray Light LED/Laser:	3.4E04 - 450 - 550 nm
Focal Length:	75 mm
Optical Input:	600 um, 2 m long
Dynamic Range: (single scan)	436.7
Average Spectral Sample Interval:	1 nm
Blaze Wavelength of Grating:	500 nm
Peak Responsivity Wavelength:	475 nm
x, y Chromaticity Accuracy:	<0.001 for x, y
Software Stray Light Correction:	Yes
Mechanical Shutter:	No
AD Converter:	16 bit
PC Interface:	USB 2.0
Trigger: hardware:	Yes
Trigger: software:	Yes

## Cube Specifications

Front I/O:	1 USB 3.0 Port 1 USB Type C Port 1 Audio jack; Speaker/Mic-in
Rear I/O:	2 HDMI Ports 1 Display Port 1 Gb LAN 2 USB 3.0 Ports 1 DC Input Jack (12 V)
Processor:	Intel Celeron N3150
Processor Generation:	Braswell
Processor Cores:	4
Graphics/GPU:	Intel HD Graphics
Memory Type:	DDR3L SO-DIMM (non-ECC)
Memory Capacity:	16 GB (8 GB installed)
Memory Storage:	64 GB SSD
Memory Speed:	1600 MHz
LAN Controller:	Realtek RT8111G
Input Voltage:	12 V
Power Input:	Onboard DC Jack
Operating Temperature:	0°C ~ 40°C
Dimensions: (mm)	116.75 W x 36.7 H x 112 D
Case Material:	Steel and Cast Aluminum
Mounting:	DIN mount, Wall-mount

## Integrating Sphere Specifications

<b>System:</b>	<b>illumia®Pro2 500-050</b>	<b>illumia®Pro2 500-100</b>	<b>illumia®Pro2500-165</b>	<b>illumia®Pro2 500-195</b>
Sphere Size: (m)	0.5	1.00	1.65	1.95
Sphere Assembly Frame Style:	H Frame	H Frame	H Frame on Rails	H Frame on Rails
Sphere Coating Reflectance:	97 - 98% @600 nm	97 - 98% @600 nm	97 - 98% @600 nm	97 - 98% @600 nm
TE Mounting Plate:	76.2 mm diameter	76.2 mm diameter	76.2 mm diameter	76.2 mm diameter
2π/TEC Port Size: (mm)	152	330	533	635
Sphere Assembly Dimensions: (W x H x D) (m)	0.73 x 0.74 x 0.46	1.28 x 1.75 x 0.90	1.96 x 2.14 x 1.83 - 2.85	2.20 x 2.33 x 1.88 - 2.85
Recommended Lamp Size: (LM-78)	<0.07 m diameter	<0.14 m diameter	<0.23 m diameter	<0.27 m diameter
MAX Lamp Wattage:	Ambient temp ≤100°C	Ambient temp ≤100°C	Ambient temp ≤100°C	Ambient temp ≤100°C

1. Stray light (Y-50 filter) is the average reported transmittance from 360 to 470 nm through a 500 nm cut-on filter.