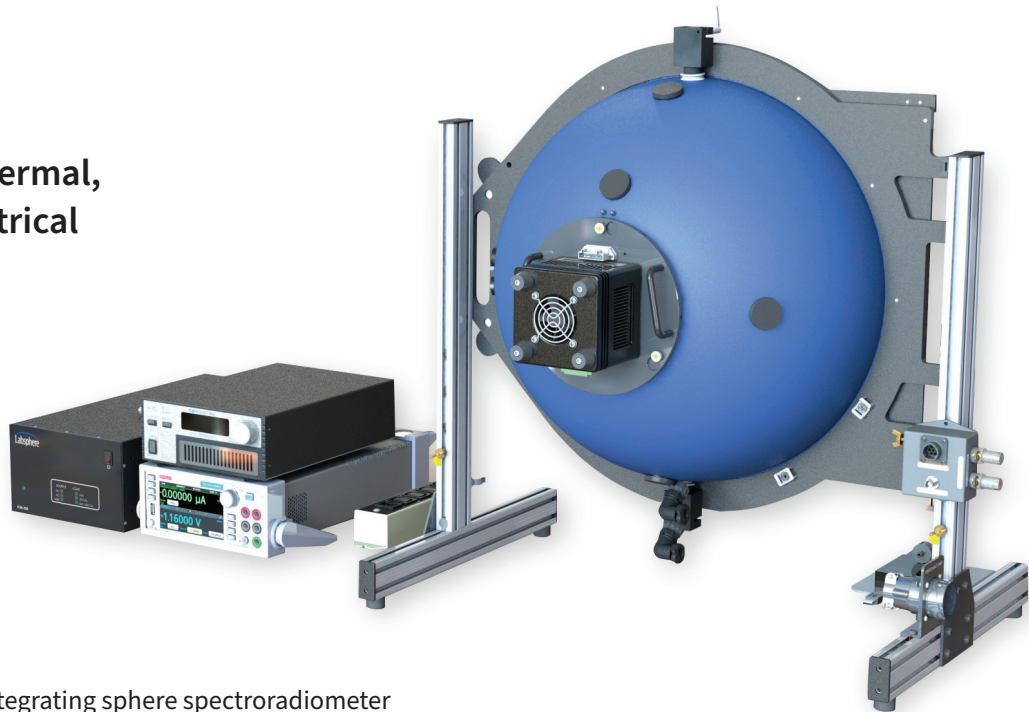# illumia®Pro3
LED Characterization System

Simultaneous thermal, optical, and electrical characterization of LEDs

The illumiaPro3 is an integrating sphere spectroradiometer designed specifically for the testing and characterization of high-power LEDs. With Labsphere's powerful Integral® software control, it's a turnkey solution with embedded routines that guide the user through industry test methods and standards, yet completely flexible for research, development, and quality inspection.

The 0.5 m integrating sphere spectrometer, coated with Labsphere's Spectraflect® diffuse white coating, comes standard with a 2π measurement geometry and is fitted with a thermal tech controller, industry-leading source meter, and Labsphere's stray light corrected spectrometer, for LIVT, pulsed modes, and DC testing of high-power LEDs.

LM-85 Test Methods:
• LM-85 Single pulse mode
• LM-85 Continuous pulse mode
• LM-85 DC mode

Measure:

• Total Spectral Flux

• Luminous Flux

• Radiant Flux

• Color Performance

• Wavelength Characteristics

• LIVT

• Continuous and Pulse Mode Control and Test
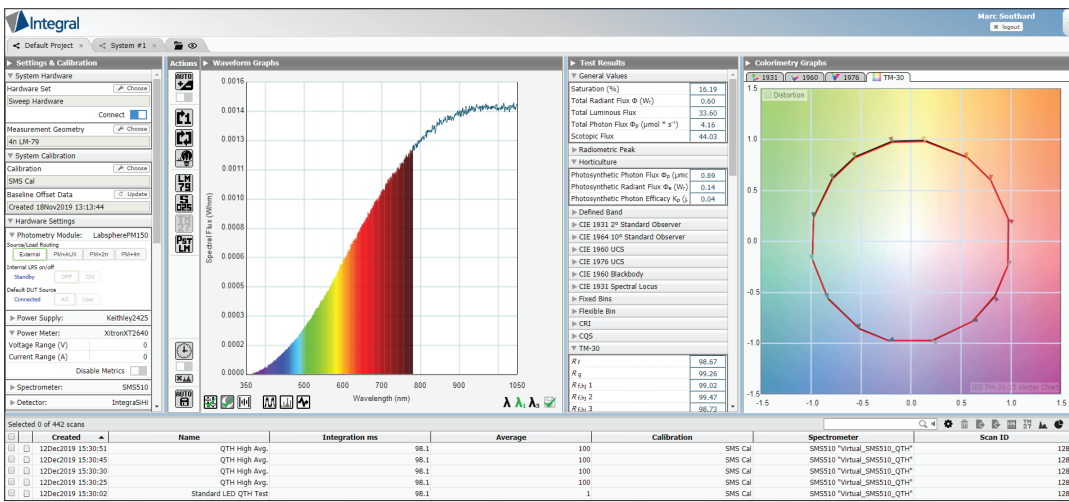
Integral Software

Included with the illumiaPro3 System, Integral provides a powerful, yet easy-to-use menu-driven operating environment. It allows users to control the LED temperature and operating current and voltage at specified ranges. This control enables the software to measure and characterize the device under test (DUT) over a wide range of temperatures. The software simultaneously collects electrical, optical, thermal and total spectral flux data which is graphed and viewed on screen or can be exported for further analysis.

LED LIVT with illumiaPro3

Fully characterize LEDs with independent control and test of forward and reverse voltage, LED drive current and temperature, and lumens with illumiaPro3 LIVT sweep features.

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

Example: LIVT Standard Settings

Example: LIVT Pulse Settings

LM-85 Testing with illumiaPro3

The photometric measurement of high-power LEDs can be difficult because they are highly sensitive to thermal operating conditions. LED manufacturers normally use pulse operation, however, highpower LEDs in actual lighting products, are operating in DC and at much higher temperatures where their photometric and colorimetric values tend to deviate significantly from those at the room temperature condition. To assist users, LED manufacturers make efforts to provide data on thermal characteristics for higher operating temperatures; however, because LEDs are usually binned by LED manufacturers for their optical and electrical characteristics at Tj equal to 25 °C, manufacturer data for higher operating temperatures is of limited use. To address the issue LM-85 was created to provide reproducible measurement methods of LEDs at a given junction temperature in pulse or DC mode and provides the grounds for the specification of LEDs at high-temperature conditions.

LM-85 describes the procedures to be followed and precautions to be observed in performing accurate measurements of total luminous flux, total radiant flux (optical power), total photon flux, electrical power, luminous efficacy, color quantities, and wavelength characteristics of high-power LEDs, including white LEDs and single-color LEDs. It covers LED packages, including those with multiple chips and remote phosphor LED packages. It also covers LED arrays or modules including remote-phosphor LED arrays or modules. IllumiaPlus3 guides users through LM-85 stabilization, electrical, optical, and thermal control for pulse operation as well as steady DC operation of LEDs.

LM-85 Settings

LM-85 Routine Running (completed)

Integer Multiple Calculator for Pulsed Measurements

DUT Test Results with the New Pulse Project Settings, Frequency Metric, DC Metrics, and CPM Metrics
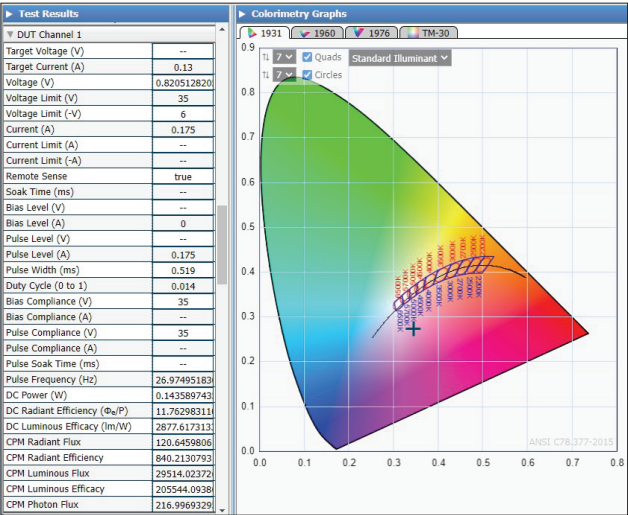
Ordering Information

Model Name:	**illumiaPro3 800-050**
Order Number:	**AA-41000-050**

The illumiaPro3 System includes:

- 50 cm Light Measurement Sphere
- CDS-800 Spectrometer
- Source Meter
- Temperature Controller
- ICM-500 Integral Control Module

- Spectral Flux Standard and Absorption Correction Lamps
- Integral Software
- Retouch 6080
- SMA Adaptor and Diffuser
- Tool Kit

System Performance Specifications

illumiaPro3 System

Spectral Range: (calibrated)	350 - 1000 nm
Wavelength Accuracy:	<+/- 0.3 nm
Integration Time:	40 µs to 5 s *
Stray Light [1] :	0.2 - 1%

Source Meter (Detailed Specifications on Page 6)

Voltage Range:	200mW to 100V
Current Range:	1 µA to 10A

Temperature Control

Temperature Stabilizations:	Polled every 5 seconds for ± 2% of set values (default setting)
Temperature Stabilization Routine:	Built into integral
Temperature Setting Specifications:	0.01 C

LM-85

Direct Current Method:	Built into Integral
Continuous Pulse Mode:	User selectable
Pulse Mode Characteristics:	Duty cycle 0-1
Frequency:	Output - based on the scan
Pulse Width :	10 µs – application specific
Continuous Pulse Current:	Integral will set the pulse (soak) time to 0 ms by default in sweep settings
CPM Calculation:	Built into Integral
Synchronized DUT Measurements:	Has the capability of measurement synchronized with the DUT current pulse through Integral

Typical Luminous Flux Range

	min	max
Tungsten Filament:	0.05	7500
Cool White LED:	0.04	7100
Warm White LED:	0.03	4500
Blue LED:	0.05	300
Red LED:	0.03	800
Upper Range:	Ambient temperature can not exceed 100°C	

*Refer to Labsphere's Component Datasheets for product performance specifications.
1. Stray light (Y-50 filter) is the average reported transmittance from 360 to 470 nm through a 500 nm cut-on filter.

Performance Specifications (cont.)

Integrating Sphere

Sphere Size:	50 cm
Required Footprint:	
closed	74.1 cm x 50.4 cm x 74.0 cm
open	103.7 cm x 89.9 cm x 74.0 cm
Sphere Weight:	20 k
Sphere Open Style:	Clam Shell
Sphere Coating:	Spectraflect®
Spectraflect Coating Reflectance:	> 97% (nominal)
Total Number of Ports:	6
External DUT 2π Port Size:	15 cm
Port Frame Reducer:	15 - 2.5 cm, 15 cm - 2.5 cm
Lamp Size: (LM-79) 4π geometry	<7 cm dia, 33 cm long (Max Recommended)
Max Port or DUT Area: (2π)	15 cm dia.; 71 cm^2
Linear DUT Dimension: (2/3 sphere diameter)	33 cm
Internal DUT Surface Area: (2% Rule, LM-79)	157 cm (Max Recommended)
Maximum Sphere Coating Temp:	100°C
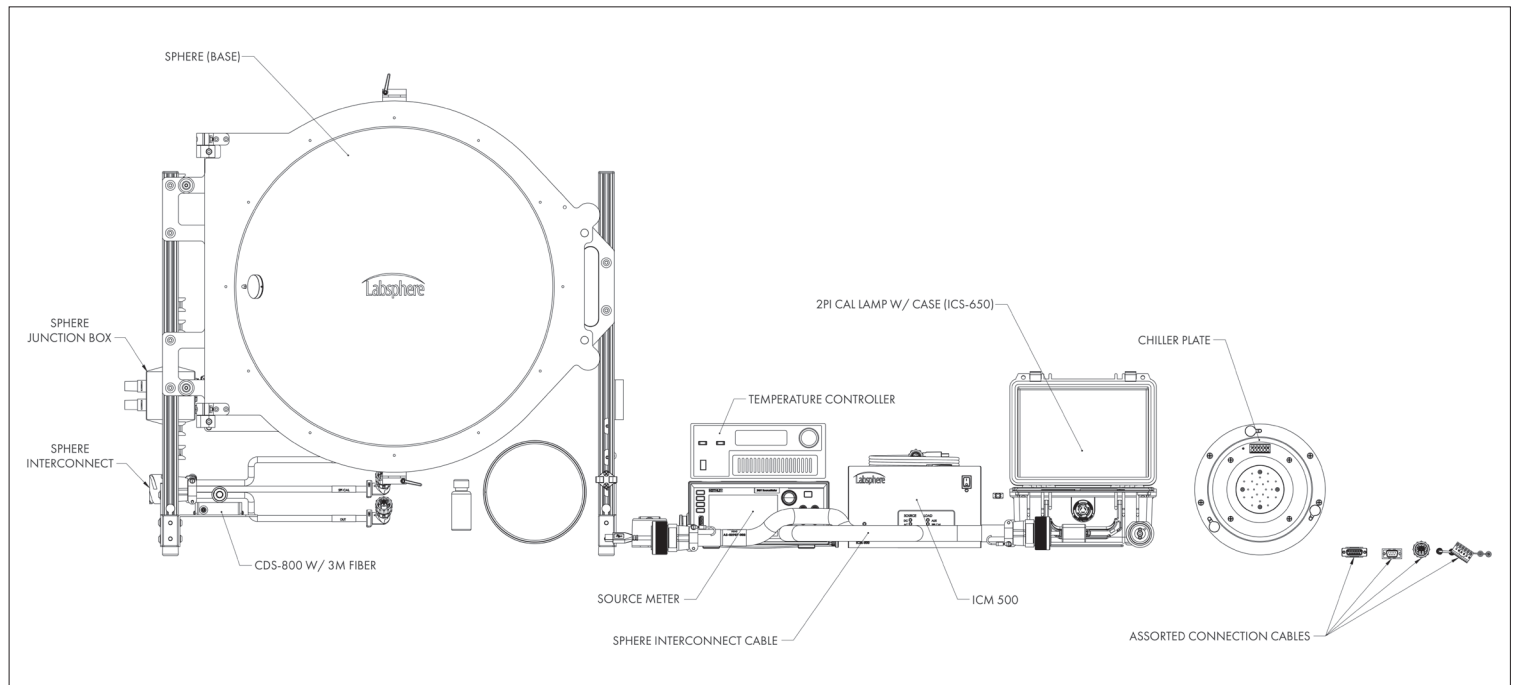
Source Meter Specifications and Limits

Voltage Specifications

Range	Max. DC Current	Source				Measure[3]		
		Resolution	Accuracy (23° ± 5°C) 1 Year ±(% setting + volts)	Noise (RMS) (<10 Hz)	Resolution[4]	Accuracy (23° ± 5°C) 1 Year ±(% rdg. + volts)	Digitizer Accuracy[5] (23° ± 5°C) 1 Year ±(% rdg. + volts)	
200.0000 mV	7.35 A	5 µV	0.015% + 200 µV	1 µV	100 nV	0.012% + 200 µV	0.05% + 1.2 mV
2.000000 V	7.35 A	50 µV	0.015% + 300 µV	2 µV	1 µV	0.012% + 300 µV	0.05% + 1.2 mV
7.000000 V	7.35 A	250 µV	0.015% + 2.4 mV	20 µV	1 µV	0.015% + 1 mV	0.05% + 8 mV
10.00000 V	5.25 A	250 µV	0.015% + 2.4 mV	20 µV	10 µV	0.015% + 1 mV	0.05% + 8 mV
20.00000 V	4.20 A	500 µV	0.015% + 2.4 mV	20 µV	10 µV	0.015% + 1 mV	0.05% + 8 mV
100.0000 V	1.05 A	2.5 mV	0.015% + 15 mV	100 µV	100 µV	0.015% + 5 mV	0.05% + 40 mV

Current Specifications

Range	Max. DC Voltage	Source				Measure[3]		
		Resolution	Accuracy (23° ±5°C) 1 Year ±(% setting + amps)	Noise (RMS) (<10 Hz)	Resolution[4]	Accuracy (23° ±5°C) 1 Year ±(% rdg. + volts)	Digitizer Accuracy[5] (23° ±5°C) 1 Year ±(% rdg. + amps)	
1.000000 µA	105 V	50 pA	0.025% + 1 nA	40 pA	1 pA	0.025% + 700 pA	0.05% + 4 nA
10.00000 µA	105 V	500 pA	0.025% + 1.5 nA	40 pA	10 pA	0.025% + 1 nA	0.05% + 8 nA
100.0000 µA	105 V	5 nA	0.020% + 15 nA	100 pA	100 pA	0.020% + 10 nA	0.05% + 80 nA
1.000000 mA	105 V	50 nA	0.020% + 150 nA	1 nA	1 nA	0.020% + 100 nA	0.05% + 800 nA
10.00000 mA	105 V	500 nA	0.020% + 1.5 µA	10 nA	10 nA	0.020% + 1 µA	0.05% + 8 µA
100.0000 mA	105 V	5 µA	0.020% + 15 µA	100 nA	100 nA	0.020% + 10 µA	0.05% + 80 µA
1.000000 A	105 V	50 µA	0.050% + 750 µA	5 µA	1 µA	0.050% + 500 µA	0.05% + 1 mA
4.000000 A	21 V	250 µA	0.100% + 3 mA	25 µA	1 µA	0.100% + 2.5 mA	0.10% + 5 mA
5.000000 A	10.5 V	250 µA	0.100% + 3 mA	25 µA	1 µA	0.100% + 2.5 mA	0.10% + 5 mA
7.000000 A	7.35 V	500 µA	0.150% + 6 mA	125 µA	1 µA	0.150% + 5 mA	0.15% + 10 mA
10.000000 A[7]	7.35 V	500 µA	0.150% + 6 mA	125 µA	10 µA	0.150% + 5 mA	0.15% + 10 mA

Optional Accessories and Services Ordering Information

Model Name	Description	Order Number
IP3-800-050	4π Kit for the illumiaPro3 0.5 meter sphere system Includes the 4π post for 0.5 meter sphere, SCL-650 Spectral Flux Standard, lamps post and socket, and 4π measurement conversion baffles	AA-41001-050
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
AUX-650	Absorption Correction Lamp	AS-02986-650

Service	Description
Uncertainty:	Labsphere provides specimen Expanded Uncertainty of calibrated IllumiaPro3 and contributing parameters for set of DUTs, Labsphere can support customer uncertainty analysis through our service options