



**InternationalLight**  
TECHNOLOGIES

# CALIBRATION CERTIFICATE

## ELECTRICAL INSTRUMENTATION CALIBRATION REPORT

This document states that the instrument described below meets or exceeds all manufacturer specifications. The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable to NIST and through NIST to the International System of Units (SI). ILT is Accredited to ISO 17025:2005. Calibration conforms to ANSI/NCSI Z540.1-1994 and ANSI/NCSI Z540.3-2006.

Date: 12-Mar-14      Certificate #: 1403121207E      SO#: 145615  
Temp: 24 Degrees C      Humidity: 23 %      Procedure: TP-0113:08NOV2011

Rendered To: LOT-QuantumDesign

InstrumentModel-S/N: IL1700 #2338

Calibration/Repair Remarks: None

Parts (If Needed): None

As Found Tolerance In Out	As Found Readings	As Found Permissible Error	Applied Current	Adjusted Readings	Permissible Adjustment Error	As Left Tolerance In Out
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.001E-3	+/- 0.5%	1.000E-3	1.000E-3	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.002E-4	+/-0.5%	1.000E-4	1.001E-4	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.001E-5	+/-0.7%	1.000E-5	1.000E-5	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.008E-6	+/-1.0%	1.000E-6	1.000E-6	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.002E-7	+/-1.0%	1.000E-7	9.970E-8	+/- 0.5%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.006E-8	+/-1.0%	1.000E-8	1.001E-8	+/- 0.5%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.010E-9	+/-1.0%	1.000E-9	1.004E-9	+/- 0.5%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.005E-10	+/-1.5%	1.000E-10	1.000E-10	+/- 1.0%	<input checked="" type="checkbox"/> <input type="checkbox"/>

Tolerance after repair and/or calibration:  In       Out

Measurement Uncertainty: 1mA=±0.065%, 100uA=±0.062%, 10uA=±0.062%, 1uA=±0.065%, 100nA=±0.073%, 10nA=±0.079%, 1nA=±0.084%, 100pA=0.26%

The above Instrument was compared to the Keithley Current Calibrator/Source Model 263 S/N 0621350 calibrated on 2/2/2014 which is traceable to NIST. Calibration Due: 2/2/2015

Calibrated By: *Paul DeLauri*  
Electrical Calibration Tech. Paul DeLauri

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# CALIBRATION CERTIFICATE

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Date: 12-Mar-14 Certificate #: 1403121208E SO#: 145615  
Temp: 24 Degrees C Humidity: 23 % Procedure: TP-0113:08NOV2011

Rendered To: LOT-QuantumDesign

InstrumentModel-S/N: IL1700 #330

Calibration/Repair Remarks: Main display failing intermittently and has been replaced.

Parts (If Needed): Main display.

As Found Tolerance In Out	As Found Readings	As Found Permissible Error	Applied Current	Adjusted Readings	Permissible Adjustment Error	As Left Tolerance In Out
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.002E-3	+/- 0.5%	1.000E-3	1.000E-3	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.003E-4	+/-0.5%	1.000E-4	1.001E-4	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.001E-5	+/-0.7%	1.000E-5	1.000E-5	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.003E-6	+/-1.0%	1.000E-6	1.000E-6	+/- 0.2%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/>	1.008E-7	+/-1.0%	1.000E-7	9.950E-8	+/- 0.5%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/> <input checked="" type="checkbox"/>	1.017E-8	+/-1.0%	1.000E-8	1.001E-8	+/- 0.5%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/> <input checked="" type="checkbox"/>	1.030E-9	+/-1.0%	1.000E-9	1.002E-9	+/- 0.5%	<input checked="" type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/> <input checked="" type="checkbox"/>	1.053E-10	+/-1.5%	1.000E-10	1.000E-10	+/- 1.0%	<input checked="" type="checkbox"/> <input type="checkbox"/>

Tolerance after repair and/or calibration:  In  Out

Measurement Uncertainty: 1mA=±0.065%, 100uA=±0.062%, 10uA=±0.062%, 1uA=±0.065%, 100nA=±0.073%, 10nA=±0.079%, 1nA=±0.084%, 100pA=0.26%

The above Instrument was compared to the Keithley Current Calibrator/Source Model 263 S/N 0621350 calibrated on 2/2/2014 which is traceable to NIST. Calibration Due: 2/2/2015

Calibrated By: *Paul DeLauri*  
Electrical Calibration Tech. Paul DeLauri

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# CALIBRATION CERTIFICATE

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Rendered-to: LOT-QUANTUMDESIGN

Detector: SED240 #5676 Input Optic W #10237

Filter: UVB-1 #23781 Misc.: N/A #

Calibrated With: IL1700 #2338 +5V Bias On

(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 07-May-2014

1.383E-5 (A)(cm<sup>2</sup>)(W-1) assuming monochromatic irradiance at 290nm

21.42% \*Change In Sensitivity From Previous Calibration Dated: 03-Dec-2001

Tolerance As Found:  In  Out Tolerance As Left:  In  Out

Unit will read directly in watts per square centimeter when used with an IL1700

REFERENCE PLANE: Groove ONE formed by filter or diffuser elements and next element, counted from front surface of assembly.

\*difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response

I219 - November 2005 - NIST Test No. 844/272521-05 : U1023 - January 1997 - NIST Test No. 844/257423-96/2 : D204 - January 1997 - NIST Test No. 844/257423-96/1

INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRANSFER STANDARDS:

U522 U1023 N/A

ILT Transfer Uncertainty to Customer = +/- 5.5% plus NIST Uncertainty of: +/- 1%

LIGHT SOURCE: 19J Hg-Xe LAMP OUTPUT: 7.00E-3 W/cm2

INSTRUMENTATION: #1029/SCS280/W PROCEDURE: OP-0007

TEMPERATURE: 22.8 degrees C HUMIDITY: 25%

CALIBRATED BY: [Signature]

Calibration Technician: Cathy Olson

THIS CERTIFICATE APPLIES ONLY TO THE ITEMS IDENTIFIED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE SPECIFIC WRITTEN APPROVAL BY INTERNATIONAL LIGHT TECHNOLOGIES, INC.

Calibration Date: 5/7/2014 Certificate No: 405074721 Sales Order #: 145615





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# CALIBRATION CERTIFICATE

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Rendered-to: LOT-QUANTUMDESIGN

Detector: SED240 #5676

Input Optic W #7743

Filter: ACT5 #23008

Misc.: N/A #

Calibrated With: IL1700 #2338

+5V Bias On

(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 07-May-2014

3.90E-4 (A)(cm<sup>2</sup>)(eff W-1) assuming monochromatic irradiance at 270nm

Unit will read directly in effective watts per square centimeter when used with an IL1700

REFERENCE PLANE: Groove ONE formed by filter or diffuser elements and next element, counted from front surface of assembly.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response

I219 - November 2005 - NIST Test No. 844/272521-05 : U1023 - January 1997 - NIST Test No. 844/257423-96/2 : D204 - January 1997 - NIST Test No. 844/257423-96/1

INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRANSFER STANDARDS:

U1023

U522

N/A

ILT Transfer Uncertainty to Customer = +/- 4.5% plus NIST Uncertainty of: +/- 1%

LIGHT SOURCE: SpectroPro1500/1000W Xe

LAMP OUTPUT: 9.64E-7 W/cm<sup>2</sup>

INSTRUMENTATION: SED240 #3355

PROCEDURE: LP-0041 Rev B

TEMPERATURE: 22.8 degrees C

HUMIDITY: 25%

CALIBRATED BY: *Cathy Olson*

Calibration Technician: Cathy Olson

THIS CERTIFICATE APPLIES ONLY TO THE ITEMS IDENTIFIED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE SPECIFIC WRITTEN APPROVAL BY INTERNATIONAL LIGHT TECHNOLOGIES, INC.

Calibration Date: 5/7/2014 Certificate No: 405074720

Sales Order #: 145615



**International Light Technologies, Inc.**

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Form F-074 (Rev H)

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# CALIBRATION CERTIFICATE

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Rendered-to: LOT-QUANTUMDESIGN

Detector: SED033 #7059

Input Optic W #10237

Filter: UVA #23821

Misc.: N/A #

Calibrated With: IL1700 #2338

+5V Bias Off

(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 07-May-2014

7.20E-3 (A)(cm<sup>2</sup>)(W-1) assuming monochromatic irradiance at 360nm

-2.70% \*Change In Sensitivity From Previous Calibration Dated: 03-Dec-2001

Tolerance As Found:  In

Out

Tolerance As Left:  In

Out

Unit will read directly in watts per square centimeter when used with an IL1700

REFERENCE PLANE: Groove ONE formed by filter or diffuser elements and next element, counted from front surface of assembly.

\*difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response

I219 - November 2005 - NIST Test No. 844/272521-05 : U1023 - January 1997 - NIST Test No. 844/257423-96/2 : D204 - January 1997 - NIST Test No. 844/257423-96/1

INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRANSFER STANDARDS:

SED400 #139

SED400 #1490

IL #01

ILT Transfer Uncertainty to Customer = +/- 4.5% plus NIST Uncertainty of: +/- 1%

LIGHT SOURCE: 19J Hg-Xe

LAMP OUTPUT: 2.73E-3 W/cm<sup>2</sup>

INSTRUMENTATION: #4544/UVA/W

PROCEDURE: OP-0007

TEMPERATURE: 22.8 degrees C

HUMIDITY: 25%

CALIBRATED BY:

Calibration Technician: Cathy Olson

THIS CERTIFICATE APPLIES ONLY TO THE ITEMS IDENTIFIED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE SPECIFIC WRITTEN APPROVAL BY INTERNATIONAL LIGHT TECHNOLOGIES, INC.

Calibration Date: 5/7/2014 Certificate No: 405074719

Sales Order #: 145615



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# CALIBRATION CERTIFICATE

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Rendered-to: LOT-QUANTUMDESIGN

Detector: SED033 #4776 Input Optic R #415

Filter: F #16702 Misc.: N/A #

Calibrated With: IL1700 #2338 +5V Bias Off

(PRR) PEAK RADIANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 07-May-2014

8.98E-4 (A)(cm<sup>2</sup>)(sr)(W-1) assuming monochromatic radiance at 600nm

1.35% \*Change In Sensitivity From Previous Calibration Dated: 26-May-2010

Tolerance As Found:  In  Out Tolerance As Left:  In  Out

Unit will read directly in watts per square centimeter per steradian when used with an IL1700

REFERENCE PLANE: Average F.O.V. +/-0.75 Degrees

\*difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response  
I219 - November 2005 - NIST Test No. 844/272521-05 : U1023 - January 1997 - NIST Test No. 844/257423-96/2 : D204 -  
January 1997 - NIST Test No. 844/257423-96/1

INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRANSFER STANDARDS:

IL #01 IL #02 SED033 #3275

ILT Transfer Uncertainty to Customer = +/- 3% plus NIST Uncertainty of: +/- 0.31%

LIGHT SOURCE: IL 1000W QTH/Reflectance Tablet LAMP OUTPUT: 9.17E-6 W/cm<sup>2</sup>/sr

INSTRUMENTATION: #6400 PROCEDURE: OP-0041

TEMPERATURE: 22.8 degrees C HUMIDITY: 25%

CALIBRATED BY:

Calibration Technician: Cathy Olson

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Calibration Date: 5/7/2014 Certificate No: 405074718 Sales Order #: 145615



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# CALIBRATION CERTIFICATE

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Rendered-to: LOT-QUANTUMDESIGN

Detector: SED033 #4776

Input Optic W #5599

Filter: F #16702

Misc.: N/A #

Calibrated With: IL1700 #2338

+5V Bias Off

(PIR) PEAK IRRADIANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 07-May-2014

1.120E-2 (A)(cm<sup>2</sup>)(W<sup>-1</sup>) assuming monochromatic irradiance at 600nm

-1.50% \*Change In Sensitivity From Previous Calibration Dated: 26-May-2010

Tolerance As Found:  In

Out

Tolerance As Left:  In

Out

Unit will read directly in watts per square centimeter when used with an IL1700

REFERENCE PLANE: Groove ONE formed by filter or diffuser elements and next element, counted from front surface of assembly.

\*difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response

I219 - November 2005 - NIST Test No. 844/272521-05 : U1023 - January 1997 - NIST Test No. 844/257423-96/2 : D204 - January 1997 - NIST Test No. 844/257423-96/1

INTERNATIONAL LIGHT TECHNOLOGIES PRIMARY TRANSFER STANDARDS:

IL #01

IL #02

SED033 #3275

ILT Transfer Uncertainty to Customer = +/- 3% plus NIST Uncertainty of: +/- 0.31%

LIGHT SOURCE: IL 1000W QTH

LAMP OUTPUT: 2.95E-5 W/cm<sup>2</sup>

INSTRUMENTATION: #6400

PROCEDURE: OP-0029

TEMPERATURE: 22.8 degrees C

HUMIDITY: 25%

CALIBRATED BY:

Calibration Technician: Cathy Olson

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Calibration Date: 5/7/2014 Certificate No: 405074717

Sales Order #: 145615



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# CALIBRATION CERTIFICATE

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Rendered-to: LOT-QUANTUMDESIGN

Detector: SED038 #1386

Input Optic W #3728

Filter: Y #5485

Misc.: N/A #

Calibrated With: IL1700 #330

+5V Bias Off

(VIS) PHOTOPIC ILLUMINANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 07-May-2014

3.67E-8 (A)(ft2)(lm-1) assuming 3215 K Color Temperature

3.410E-09 (A)(lux-1) assuming 3215 K Color Temperature

-0.54% \*Change In Sensitivity From Previous Calibration Dated: 27-May-2010

Tolerance As Found:  In

Out

Tolerance As Left:  In

Out

Unit will read directly in lumens per square foot (footcandles) or lux when used with an IL1700

REFERENCE PLANE: Groove ONE formed by filter or diffuser elements and next element, counted from front surface of assembly.

\*difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response

SED033 #4528 / Y #16218 - December 8, 2005 - NIST Test No.: 844/272571-05/1 - Calibration Due: December 8, 2015

ILT Transfer Uncertainty to Customer = +/- 4.3% plus NIST Uncertainty of: +/- 0.5%

LIGHT SOURCE: 1L 1000W QTH

LAMP OUTPUT: 224 lm/ft2

INSTRUMENTATION: #6400/Y

PROCEDURE: OP-0070

TEMPERATURE: 22.8 degrees C

HUMIDITY: 25%

CALIBRATED BY: 

Calibration Technician: Cathy Olson

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Calibration Date: 5/7/2014 Certificate No: 405074716

Sales Order #: 145615



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Rendered-to: LOT-QUANTUMDESIGN

Detector: SED038 #1386 Input Optic R #172

Filter: Y #5485 Misc.: N/A #

Calibrated With: IL1700 #330 +5V Bias Off

(YLS) PHOTOPIC LUMINANCE RESPONSE SENSITIVITY FACTOR AS CALIBRATED ON: 07-May-2014

5.97E-10 (A)(fL-1) assuming 3215 K Color Temperature

1.742E-10 (A)(m2)(cd-1) assuming 3215 K Color Temperature

-1.49% \*Change In Sensitivity From Previous Calibration Dated: 27-May-2010

Tolerance As Found:  In  Out Tolerance As Left:  In  Out

Unit will read directly in foot-Lamberts when used with an IL1700

REFERENCE PLANE: Average F.O.V. +/-0.75 Degrees

\*difference includes intrinsic detector change, NIST recertification updates, lab experimental error or modifications to the hardware adjustments.

PRIMARY STANDARD: U.S. National Institute of Standards and Technology Detector Response  
SED033#4528/Y#16218/R#204 - December 14, 2005 - NIST Test No.:844/272571-05/3

ILT Transfer Uncertainty to Customer = +/- 4.3% plus NIST Uncertainty of: +/- 0.5%

LIGHT SOURCE: 1L 1000W QTH/Reflectance Tablet LAMP OUTPUT: 217 fL

INSTRUMENTATION: #6400/Y PROCEDURE: OP-0071

TEMPERATURE: 22.8 degrees C HUMIDITY: 25%

CALIBRATED BY:

Calibration Technician: Cathy Olson

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Calibration Date: 5/7/2014 Certificate No: 405074715 Sales Order #: 145615

