Edmund optics | worldwide

USER MANUAL

EO Series | Thermal Power Detectors

WARRANTY

First Year Warranty

The Edmund Optics thermal power detectors carry a one-year warranty (from date of shipment) against material and /or workmanship defects when used under normal operating conditions. The warranty does not cover recalibration or damages related to misuse.

Edmund Optics will repair or replace at its option any wattmeter or joulemeter which proves to be defective during the warranty period, except in the case of product misuse.

Any unauthorized alteration or repair of the product is also not covered by the warranty.

The manufacturer is not liable for consequential damages of any kind.

In case of malfunction, contact your local Edmund Optics distributor or nearest Edmund Optics office to obtain a return authorization number. The material should be returned to:

Edmund Optics, Inc
101 E. Gloucester Pike
Barrington, NJ 08007

P: 1-800-363-1992
F: 1-856-573-6295
E: techsup@edmundoptics.com
Web: www.edmundoptics.com

Lifetime Warranty

Edmund Optics will warranty any thermal power and energy detector head for its lifetime as long as it has been returned for recalibration annually from the date of shipment. This warranty includes parts and labor for all routine repairs including normal wear under normal operating conditions.

Edmund Optics will inspect and repair the detector during the annual recalibration. Exceptions to repair at other times will be at Edmund Optics' option.

Not included is the cost of annual recalibration or consequential damages from using the detector.

The only condition is that the detector head must not have been subject to unauthorized service or damaged by misuse. Misuse would include, but is not limited to, laser exposure outside Edmund Optics published specifications, physical damage due to improper handling, and exposure to hostile environments. Hostile environments would include, but are not limited to excessive temperature, vibration, humidity, or surface contaminants; exposure to flame, solvents or water; and connection to improper electrical voltage.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

1. ULTRA SERIES UP POWER DETECTORS

1.1. Introduction

The Edmund Optics EO Series Thermal Power Detector family includes 6 models (EO12-3S-H2, EO19K-15S-H5, EO19K-30H-VR, EO19K-50L-W5, EO19K-110F-H9 and EO55N-300F-H12) of opto-thermal sensors with various cooling modules (convection, heatsink and fan). The high power surface absorber sensors are designed for use at high average power densities.

Unit	Aperture	Power Range	Cooling Module	Absorber Type
EO12-3S-H2	12 mm Ø	1 µW to 3 W	Convection	Broadband
EO19K-15S-H5	19 mm Ø	1 mW to 15 W	Convection	Broadband
EO19K-30H-VR	18 mm Ø	2 mW to 30 W	Heatsink	Volume Absorber
EO19K-50L-W5	17 mm Ø	1 mW to 50 W	Large Heatsink	High Threshold
EO19K-110F-H9	19 mm Ø	3 mW to 110 W	Fan	Broadband
EO55N-300F-H12	55 mm Ø	15 mW to 300 W	Fan	Broadband

The EO detectors are supplied with a 180 cm flexible cable with a DB-15 "intelligent" male connector.

WARNING
To eliminate possible damage, do not carry the detector using the connector cable.

The EO detectors may also be used with a stand. Be aware that when using a detector with a heat sink, the fins should always be placed vertically.

Even though the Edmund Optics monitors automatically read the wavelength correction factor, you can also use your detector's "*Personal wavelength correction™ Certificate*" to adjust the power you read to a power corrected for a particular wavelength.

Call your nearest Edmund Optics distributor to replace the sensor disk and/or to recalibrate the head. For Edmund Optics's nearest office contact information, see p. i, Contacting Edmund Optics

1.2. Power Detector Connectors

1.2.1. DB-15 “intelligent” connector

The DB-15 male "intelligent" connector contains an EEPROM (Electrically Erasable Programmable Read-Only Memory) with different information such as the model of the detector, the calibration sensitivity, the applicable scales and the wavelength correction factor for up to 20 wavelengths related to the EO Series detector head in use.

This connector allows the Premier Power & Energy Meter and USB Power Meter monitors to adjust their characteristics automatically to the power detector. No calibration procedure is required when installing the power detector, allowing for a faster set-up.

The DB-15 connector pin-out is composed of:

1-	USED BY MONITOR
2-	" " " " "
3-	" " " " "
4-	" " " " "
5-	" " " " "
6-	SIGNAL (+)
7-	USED BY MONITOR
8-	" " " " "
9-	" " " " "
10-	" " " " "
11-	" " " " "
12-	" " " " "
13-	SIGNAL (-)
14-	USED BY MONITOR
15-	" " " " "
SHELL-	BODY GROUND

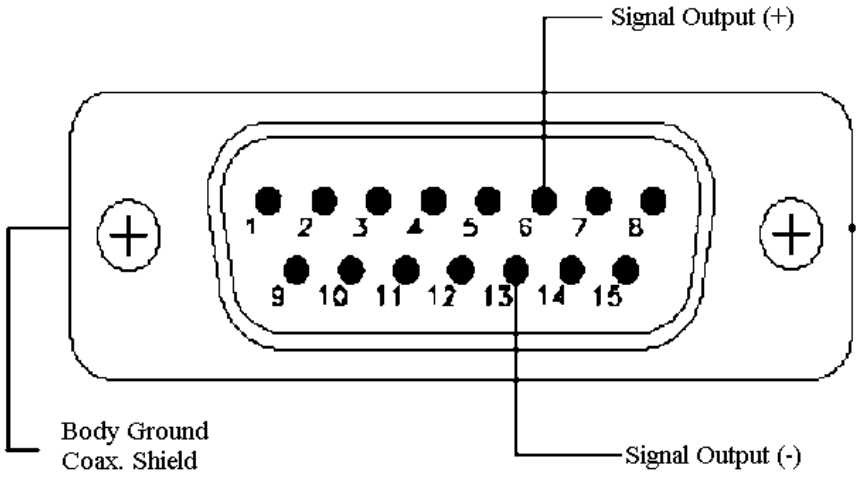

Fig. 1-1 DB-15 Connector Pin-Out

1.3. Specifications

The following specifications are based on a one-year calibration cycle, an operating temperature of 15°C to 28°C and a relative humidity not exceeding 80%. Storage 10°C to 65°C and relative humidity not exceeding 90%.

1.3.1. EO12-3S-H2

EO12-3S-H2		
Effective Aperture	12 mm Ø	
Spectral Range		
Full	0.19 µm – 20 µm	
Calibrated	0.248 – 2.5 µm and 10.6 µm [a]	
Noise Level [b, c]	± 0.5 µW	
Thermal Drift [d]	12 µW/°C	
Typical Rise time (0-95%)		
With anticipation	2.5 sec	
Without anticipation	27 sec	
Typical sensitivity	200 mV/W	
Calibration Uncertainty	± 2.5 %	
Linearity with Power	± 2 %	
Repeatability (Precision)	± 0.5 %	
Power Resolution	± 0.5 %	
Max. Average Power		
Continuous	3 W	
1 min (with 3 min cooling)	3 W	
Max. Average Power Density		
1.064 µm, 1 W CW	1 kW/cm^2	
Pulsed Laser Damage Thresholds	Max. Energy Density	Peak Power Density
1.064 µm, 360 µs, 5 Hz	5 J/cm^2	14 kW/cm^2
1.064 µm, 7 ns, 10 Hz	1 J/cm^2	143 MW/cm^2
532 nm, 7 ns, 10 Hz	0.6 J /cm^2	86 MW/cm^2
266 nm, 7 ns, 10 Hz	0.3 J /cm^2	43 MW/cm^2
Dimensions		
With Isolation Tube	73(H) x 73(W) x 72(D) mm	
Without Isolation Tube	73(H) x 73(W) x 20(D) mm	
Weight (head only, with tube)	0.312 kg	
Cooling	Convection	
Recommended Load Impedance	100 kΩ	
Linearity vs Beam Dimension	± 0.7 %	

[a] The calibrations at 2.1 to 2.5 µm and 10.6 µm are on special request only.
[b] Nominal value, actual value depends on electrical noise in the measurement system.
[c] Without anticipation. ± 5 µW with anticipation.
[d] At 150 µW. 12 µW/°C with Premier Power & Energy meter, 50 µW/°C with USB Power Meter.

Specifications subject to change without notice.

1.3.2. EO19K-15S-H5

EO19K-15S-H5		
Effective Aperture	19 mm Ø	
Spectral Range		
Full	190 nm – 20 µm	
Calibrated	0.248 – 2.5 µm and 10.6 µm [a]	
Noise Level		
With anticipation	2 mW	
Without anticipation	1 mW	
Typical Rise time (0-95%)		
With anticipation	0.6 sec	
Without anticipation	2.8 sec	
Typical sensitivity	0.65 mV/W	
Calibration Uncertainty	± 2.5 %	
Linearity with Power	± 2 %	
Repeatability (Precision)	± 0.5 %	
Power Resolution	± 0.5 %	
Max. Average Power		
Continuous	15 W	
1 min (with 3 min cooling)	30 W	
Max. Average Power Density [b]		
1.064 µm, 10W CW	36 kW/cm^2	
10.6 µm, 10W CW	11 kW/cm^2	
Pulsed Laser Damage Thresholds	Max. Energy Density	Peak Power Density
1.064 µm, 360 µs, 5 Hz	5 J/cm^2	14 kW/cm^2
1.064 µm, 7 ns, 10 Hz	1.0 J/cm^2	143 MW/cm^2
532 nm, 7 ns, 10 Hz	0.6 J /cm^2	86 MW/cm^2
266 nm, 7 ns, 10 Hz	0.3 J /cm^2	43 MW/cm^2
Dimensions	50(H) x 50(W) x 20.6(D) mm	
Weight (head only)	0.16 kg	
Cooling	Convection	
Recommended Load Impedance	100 kΩ	
Linearity vs Beam Dimension	± 0.5 %	

[a] The calibrations at 2.1 to 2.5 µm and 10.6 µm are on special request only.
[b] See graph at the end of this section.

Specifications subject to change without notice.

1.3.3. EO19K-30H-VR

EO19K-30H-VR		
Effective Aperture	18 mm Ø	
Spectral Range		
Full	0.266 - 2.5 µm	
Calibrated	0.3 – 2.5 µm [a]	
Noise Level		
With anticipation	4 mW	
Without anticipation	2 mW	
Typical Rise time (0-95%)		
With anticipation	2.5 sec	
Without anticipation	36 sec	
Typical Sensitivity	0.34 mV/W	
Calibration Uncertainty	± 2.5 %	
Linearity with Power	± 2 %	
Repeatability (Precision)	± 0.5 %	
Power Resolution	± 0.5 %	
Max. Average Power		
Continuous	30 W	
1 min (with 3 min cooling)	35 W	
Max. Average Power Density		
1.064µm, 10W CW	700 W/cm^2	
Pulsed Laser Damage Thresholds	Max. Energy Density	Peak Power Density
1.064 µm, 7 ns, 10 Hz	6 J/cm^2	860 MW/cm^2
532 nm, 7 ns, 10 Hz	4 J/cm^2	570 MW/cm^2
266 nm, 7 ns, 10 Hz	1 J/cm^2	143 MW/cm^2
1.064 µm, 360 µs, 10 Hz	40 J/cm^2	111 kW/cm^2
Dimensions	50(H) x 50(W) x 56.3(D) mm	
Weight (head only)	0.21 kg	
Cooling	Heatsink	
Recommended Load Impedance	100 kΩ	
Linearity vs Beam Dimension	± 0.5 %	

[a] The calibrations at 2.1 to 2.5 µm are on special request only.

Specifications subject to change without notice.

1.3.4. EO19K-50L-W5

EO19K-50L-W5		
Effective Aperture	17 mm Ø	
Spectral Range		
Full	190 nm – 10 µm	
Calibrated	0.248 – 2.5 µm [a]	
Noise Level		
With anticipation	2 mW	
Without anticipation	1 mW	
Typical Rise time (0-95%)		
With anticipation	1.4 sec	
Without anticipation	5 sec	
Typical Sensitivity	0.65 mV/W	
Calibration Uncertainty	± 2.5 %	
Linearity with Power	± 2 %	
Repeatability (Precision)	± 0.5 %	
Power Resolution	± 0.5 %	
Max. Average Power		
Continuous	50 W	
1 min (with 3 min cooling)	85 W	
Max. Average Power Density		
1.064 µm, 10 W CW	100 kW/cm^2	
Pulsed Laser Damage Thresholds	Max. Energy Density	Peak Power Density
1.064 µm, 150 µs, 10 Hz	100 J/cm^2	667 kW/cm^2
1.064 µm, 7 ns, 10 Hz	1.1 J/cm^2	157 MW/cm^2
532 nm, 7 ns, 10 Hz	1.1 J/cm^2	157 MW/cm^2
248 nm, 26 ns, 10 Hz	0.7 J/cm^2	27 MW/cm^2
Dimensions	76.2(H) x 76.2(W) x 74.7(D) mm	
Weight (head only)	0.48 kg	
Cooling	Large Heatsink	
Recommended Load Impedance	100 kΩ	
Linearity vs Beam Dimension	± 0.5 %	

[a] The calibrations at 2.1 to 2.5 µm are on special request only.

Specifications subject to change without notice.

1.3.1.EO19K-110F-H9

EO19K-110F-H9		
Effective Aperture	19 mm Ø	
Spectral Range		
Full	190 nm – 20 µm	
Calibrated	0.248 – 2.5 µm and 10.6 µm [a]	
Noise Level		
With anticipation	6 mW	
Without anticipation	3 mW	
Typical Rise time (0-95%)		
With anticipation	1.5 sec	
Without anticipation	4.5 sec	
Typical Sensitivity	0.23 mV/W	
Calibration Uncertainty	± 2.5 %	
Linearity with Power	± 2 %	
Repeatability (Precision)	± 0.5 %	
Power Resolution	± 0.5 %	
Max. Average Power		
Continuous	110 W	
1 min (with 3 min cooling)	150 W	
Max. Average Power Density [b]		
1.064 µm, 10W CW	45 kW/cm^2	
10.6 µm, 10W CW	14 kW/cm^2	
Pulsed Laser Damage Thresholds	Max. Energy Density	Peak Power Density
1.064 µm, 360 µs, 5 Hz	9 J/cm^2	25 kW/cm^2
1.064 µm, 7 ns, 10 Hz	1.0 J/cm^2	143 MW/cm^2
532 nm, 7 ns, 10 Hz	0.6 J/cm^2	86 MW/cm^2
266 nm, 7 ns, 10 Hz	0.3 J/cm^2	43 MW/cm^2
Dimensions	54.2(H) x 54.2(W) x 55.6(D) mm	
Weight (head only)	0.25 kg	
Cooling	Fan	
Recommended Load Impedance	100 kΩ	
Linearity vs Beam Dimension	± 0.5 %	

[a] The calibrations at 2.1 to 2.5 µm and 10.6 µm are on special request only.
[b] See graph at the end of this section.

Specifications subject to change without notice.

1.3.2. EO55N-300F-H12

EO55N-300F-H12		
Effective Aperture	55 mm Ø	
Spectral Range		
Full	190 nm - 20 µm	
Calibrated	0.248 – 2.5 µm and 10.6 µm [a]	
Noise Level		
With anticipation	30 mW	
Without anticipation	15 mW	
Typical Rise time (0-95%)		
With anticipation	2 sec	
Without anticipation	18 sec	
Typical Sensitivity	0.06 mV/W	
Calibration Uncertainty	± 2.5 %	
Linearity with Power	± 2 %	
Repeatability (Precision)	± 0.5 %	
Power Resolution	± 0.5 %	
Max. Average Power		
Continuous	300 W	
1 min (with 3 min cooling)	300 W	
Max. Average Power Density [b]		
1.064 µm, 10 W CW	45 kW/cm^2	
10.6 µm, 10 W CW	14 kW/cm^2	
Pulsed Laser Damage Thresholds	Max. Energy Density	Peak Power Density
1.064 µm, 360 µs, 5 Hz	9 J/cm^2	25 kW/cm^2
1.064 µm, 7 ns, 10 Hz	1.0 J/cm^2	143 MW/cm^2
532 nm, 7 ns, 10 Hz	0.6 J/cm^2	86 MW/cm^2
266 nm, 7 ns, 10 Hz	0.3 J/cm^2	43 MW/cm^2
Dimensions	89(H) x 89(W) x 116(D) mm	
Weight (head only)	1.41 kg	
Cooling	Fan	
Recommended Load Impedance	> 100 kΩ	
Linearity vs Beam Dimension	± 0.5 %	

[a] The calibrations at 2.1 to 2.5 µm and 10.6 µm are on special request only.
[b] See graph at the end of this section.

Specifications subject to change without notice.

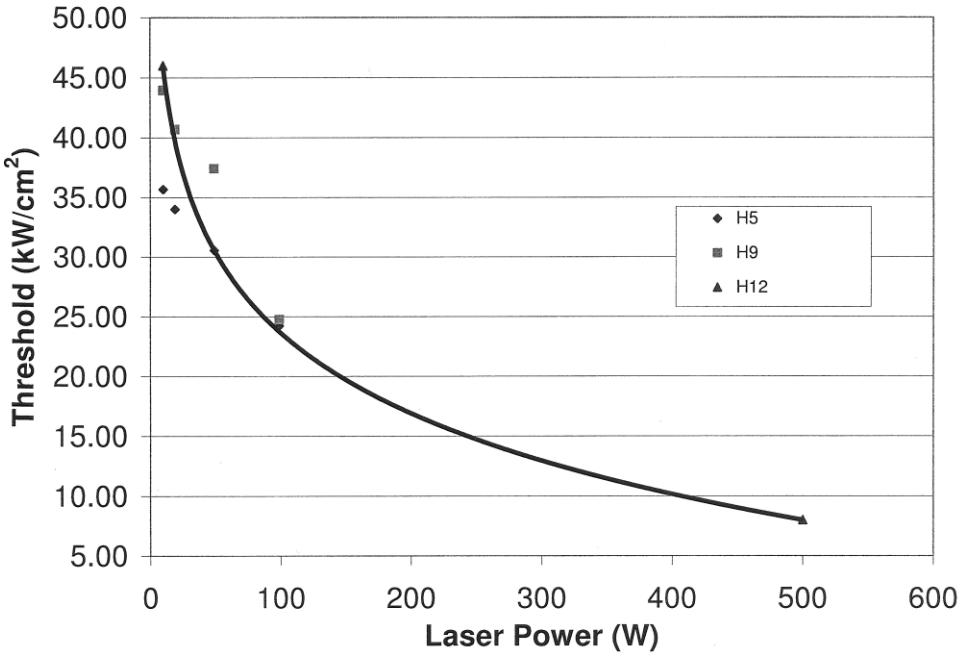

FIG. 1-2 Max Average Power Density for EO Detectors with H-Type Absorber at 1.064 µm.

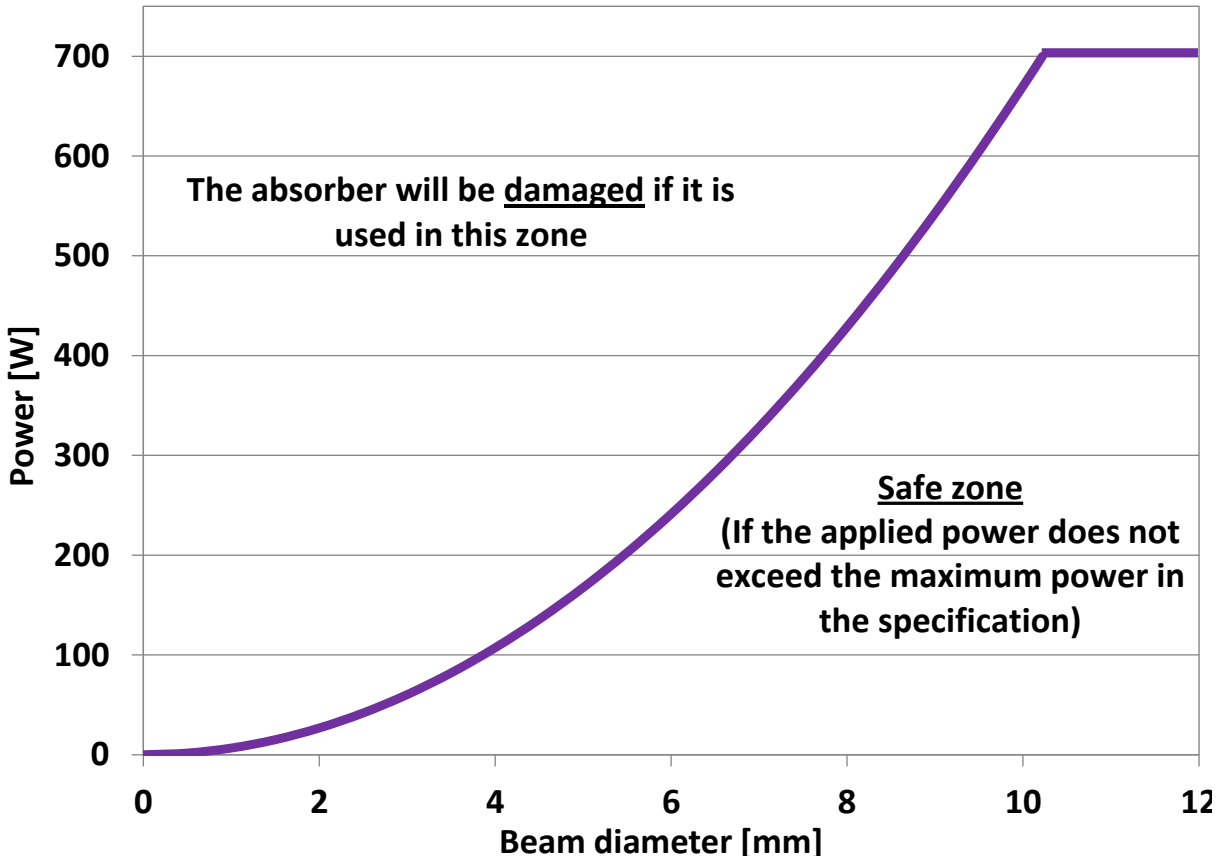

FIG. 1-3 Minimum Beam Sizes for EO Detectors with H-Type Absorber at 1.064 µm.

1.4. Energy Mode Specifications

The EO Series has an optional mode that is called calorimeter mode. It allows you to measure single shot pulse energy. This mode is accessible when you use an EO with a Edmund Optics monitor or with your own data acquisition system. For more information, refer to the monitor's instruction manual or call Customer Support at Edmund Optics, see p. i, Contacting Edmund Optics

	EO12-3S-H2	EO19K-15S-H5	EO19K-30H-VR	EO19K-50L-W5	EO19K-110F-H9	EO55N-300F-H12
Typical Sensitivity	25 mV/J	0.65 mV/J	0.10 mV/J	0.33 mV/J	0.23 mV/J	0.015 mV/J
Power Sensitivity / Energy Sensitivity	8 J/W	0.99 J/W	3.4 J/W	2 J/W	1 J/W	4.46 J/W
Typical Rise Time	1000 ms	264 ms	270 ms	400 ms	264 ms	1600 ms
Min Repetition Period	16 sec	4 sec	4.5 sec	5 sec	4 sec	12 sec
Max Pulse Width	300 ms	88 ms	90 ms	133 ms	88 ms	430 ms
Max Measurable Energy [a]	5 J	15 J	40 J	200 J	25 J	200 J
Noise Equivalent Energy	0.012 mJ	20 mJ	20 mJ	23 mJ	60 mJ	250 mJ
Accuracy	± 5 %	± 5%	± 5 %	± 5 %	± 5 %	± 5 %

[a] For 1,064 µm ; 360 µs pulses.
Higher pulse energy possible when customized for long pulse (ms), lower for short pulses (ns).

Specifications subject to change without notice.

2. Operating Instructions

In order to ensure a long lifetime of accurate measurements, it is recommended that EO wattmeters be held within the following ambient conditions stated in the specifications.

For a fan-cooled EO, connect the fan to the proper power supply.

Once appropriate cooling is achieved, the EO is ready to be aligned in the intended optical set-up.

1. Remove the power detector cover.

2. Align the detector in the optical set-up, using a safe low-powered beam.

3. For the most accurate measurements, the beam should be centered on the sensor face. The beam diameter on the sensor should ideally be the same size as the beam diameter of the original calibration, which corresponds to >98% encircled power centered on 50% of the sensor's surface (this complies with the International Electrotechnical Commission standard #1040: "Power and Energy Measuring Detector..."). Refer to calibration certificate for the exact calibration beam diameter.

WARNING
Be careful not to exceed the maximum levels stated in the specifications.

To make a measurement using an Edmund Optics monitor, continue with the following steps:

1. Connect the detector head to the input socket on the monitor (see the monitor's instruction manual).

2. Block off the detector head to prevent it from sensing heat from random sources.

3. Once the reading is thermally stable, the reading should be set to 0 W with the monitor's Zero (Offset) function (see the monitor's instruction manual).

4. Allow the detector head to thermally stabilize before making any subsequent measurement reading.

3. Safety Operation Notes

3.1.1. Diffusive surfaces

When using an OE Detector with an H, W or VR absorber, be aware of the diffused back reflection:

- H and W: ~ 5-15%
- VR: ~ 40-45%

As with any diffusive surface, the light on the sensor coating is scattered more or less uniformly as a Lambertian diffuser. It is recommended to use the head with a black protective sleeve. This will limit wide-angled diffused reflections.

3.1.2. Detector temperature while in operation

During usage, detectors can become hot enough to cause burns.

4. Damage to the Optical Absorber

Damage to the optical absorber material is usually caused by exceeding the manufacturer's specifications, such as:

- Incident Average Power Density
- Incident Pulse Energy Density

Refer to the specifications tables. Damage may also be caused if the absorber surface is contaminated. A slight discoloration of the coating does not affect the calibration.

In any case, the incident area of the beam should be > 10% of the detector's aperture. Please contact Edmund Optics to make measurements with such small beams.

In the event of significant damage to the coating, the EO Series detectors can be recoated. Contact your local Edmund Optics representative for information on repair and recalibration. See p. i Contacting Edmund Optics.

5. Appendix A: WEEE directive

5.1. Recycling and separation procedure for WEEE directive 2002/96/EC:

This section is used by the recycling center when the detector reaches its end of life. Breaking the calibration seal or opening the monitor will void the detector warranty.

The complete Detector contains

1 Detector with wires or DB-15.
1 instruction manual
1 calibration certificate

5.2. Separation:

Paper : Manual and certificate
Wires: Cable Detector.
DB-15: no need to separate (less then 10 cm^2
Aluminum: Detector casing.

6. Declaration of Conformity

Application of Council Directive(s): **2004/108/EC EMC Directive**

Manufacturer's Name: Gentec Electro Optics, Inc.
Manufacturer's Address: 445 St-Jean Baptiste, suite 160
(Québec), Canada G2E 5N7

Representative's Name: Laser Component S.A.S
Representative's Address: 45 bis Route des Gardes
92190 Meudon (France)

Type of Equipment: Laser Power/Energy Meter
Model No.: EO Series Thermal Power Detectors
Year of test & manufacture: 2011

Standard(s) to which Conformity is declared:
EN 61326-1: 2006 Emission generic standard

Standard	Description	Performance Criteria
CISPR11 :2009 +A1 :2010	Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement	Class A
EN 61000-4-2 2009	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 4.2: Electrostatic discharge.	Class B
EN 61000-4-3 2006+A2:2010	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 3: Radiated, Radio Frequency immunity.	Class A
EN 61000-4-4 2004 +A1:2010	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 4: Electrical fast transient/burst immunity.	Class B
EN 61000-4-6 2009	Electromagnetic compatibility (EMC) – Part 4: Testing and measurements techniques- Section 6: Immunity to conducted Radio Frequency.	Class A

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s)

Place: Quebec (Quebec)
Date : June 18, 2012

(President)

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