USER MANUAL

UM-B Series | Radiometers for Low Power Measurements

gentec-eo
PARTNERS for ACCURACY

121-103772

WARRANTY

First Year Warranty

The Gentec-EO thermal power and energy 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.

Gentec-EO 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 the case of a malfunction, contact the local Gentec-EO distributor or nearest Gentec-EO office to obtain a return authorization number. Return the material to the appropriate address below.

Contacting Gentec Electro-Optics Inc.

To help us answer your calls more efficiently please have the model number of the detector you are using ready before calling Customer Support.

All customers:

Gentec-EO, Inc.
445 St-Jean-Baptiste, Suite 160
Quebec, QC, G2E 5N7
Canada

Tel: (418) 651-8003
Fax: (418) 651-1174
Email: service@gentec-eo.com
Web: www.gentec-eo.com

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS 3

1 GENERAL INFORMATION 5

1.1 INTRODUCTION 5
1.2 UM9B-BL-D0 SERIES “SMART INTERFACE” CONNECTOR 6
1.3 UM-B SERIES SPECIFICATIONS 8

2 OPERATING INSTRUCTIONS 9

2.1 When used with a compatible monitor (UM9B-BL-D0) 9
2.1.1 ....General Instructions 10
2.2 Working at other wavelengths than 1.064µm with the UM9B-BL-D0 10
2.3 When using an oscilloscope (UM9B-BL-L-D0): 11
2.3.1 ....General Instructions 11
2.3.2 ....Working at other wavelengths than 633 nm with the UM9B-BL-L-D0 13

3 DAMAGE TO THE OPTICAL ABSORBER MATERIALS 14

4 OPTIONAL ACCESSORIES 15

4.1 Other Accessories: 15

5 APPENDIX A 16

5.1 Recycling and separation procedure for WEEE directive 2002/96/EC. 16
5.2 Separation: 16

6 DECLARATION OF CONFORMITY 17

7 UKCA DECLARATION OF CONFORMITY 18

LIST OF ILLUSTRATIONS

Fig. 1-1 DB-15 “Smart Interface” connector Pin-out 7

Fig. 2-1 UM9B-BL-D0 wattmeter with monitor 9

Fig. 2-1 UM9B-BL-L-D0 wattmeter with oscilloscope 11

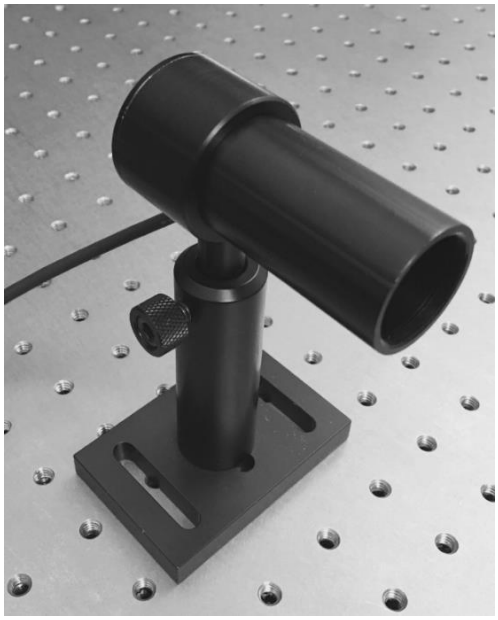
1 GENERAL INFORMATION

1.1 INTRODUCTION

The Gentec-EO UM-B Series is a line of high performance and high accuracy pyroelectric wattmeters. Each unit is built for durability, compactness and ease of operation.

The UM-B optical absorber exhibits flat spectral response and a very low reflection.

The UM9B-BL-D0 benefits from the use of a DB-15 male, “Smart Interface” connector, containing an EEPROM (Erasable Electrical Programmable Read-Only Memory) programmed with the calibration sensitivity, the spectral correction factors at different wavelengths and other data related to the specific UM-B Series wattmeter head. This connector allows the monitor to automatically adjust its setting to those of the wattmeter being connected. It also includes a light tube attached to the housing that enhances immunity to radiated EMI noise and minimizes the effects of air currents on the stability of measurement.



The UM9B-BL-D0 offers an exceptionally wide dynamic range from 300 nW to 25 mW. It is compatible with our MAESTRO and U-LINK monitors. It must be used with an Optical Chopper running at 10 +/- 1 Hz.

The UM9B-BL-L-D0 model is designed to be used with the APM (D) (201848) and does not have the “Smart Interface” function. These wattmeters cannot be used with a monitor. They must be used with an APM and an acquisition system, example: an oscilloscope, lock in amplifier or OEM signal acquisition system.

UM9B-BL-L-D0 is calibrated in V/W and is documented in the calibration certificate of each unit. The spectral correction is also documented in the “Personal wavelength correction” certificate.

1.2 UM9B-BL-D0 SERIES “SMART INTERFACE” CONNECTOR [1]

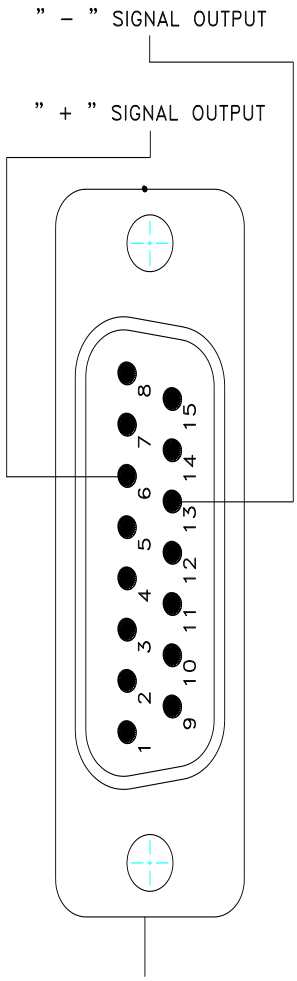
The DB-15 male “Smart Interface” connector contains an EEPROM (Erasable Electrical Programmable Read-Only Memory) programmed with the calibration sensitivity and other data related to the specific UM-B wattmeter in use. Faster set-ups are obtained because the monitor automatically adjusts to the characteristics of the wattmeter, when the “Smart Interface” is connected to the monitor.

The DB-15 “Smart Interface” connector pin-out is (see Fig. 1-1):

1-	USED BY MONITORS
2-	" " " "
3-	" " " "
4-	" " " "
5-	" " " "
6-	“+” SIGNAL OUTPUT
7-	‘’-’’ SUPPLY VOLTAGE UM-B ONLY
8-	USED BY MONITORS
9-	‘’+’’ SUPPLY VOLTAGE UM-B ONLY
10-	USED BY MONITORS
11-	" " " "
12-	" " " "
13-	“-“ SIGNAL OUTPUT
14-	USED BY MONITORS
15-	" " " "
SHELL-	COAX. SHIELD / BODY GRND

NOTE : Verify with Gentec-EO for supply voltage requirements.

DB–15 "Smart Interface" connector Pin–out Fig. 1–1



1.3 UM-B SERIES SPECIFICATIONS

The following specifications are based on a one-year calibration cycle, an operating temperature of 15 to 28ºC and a relative humidity not exceeding 80% and a storage temperature from 5 to 45 ºC with relative humidity not exceeding 80%.

	UM9B-BL-D0	UM9B-BL-L-D0
Monitor Compatibility	MAESTRO, U-LINK (with latest firmware version only)	APM(D) only
NIG	202024 (without stand) 202111 (with stand)	202241
Effective Aperture Diameter	Ø9 mm	
Sensor	Pyroelectric	
Absorber	BL	
Spectral Range	0.1 - 20 µm	
Calibrated Spectral Range	0.248 – 2.5 µm[a]	633 nm[b]
Max. Average Power	With MAESTRO : 20 mW With U-LINK : 25 mW	200 µW
Max. Average Power Density	50 mW/cm^2	
Power Noise Level (RMS)	300 nW	5 nW
Optical Chopper Frequency	10 ± 1 Hz	5 ± 1 Hz
Typical Rise time (0-95%)	< 0.2s	
Typical sensitivity	120 V/W	20 000 V/W
Calibration Uncertainty	± 4.0 % @ 1064 nm	± 4.0 % @ 633 nm
Dimensions (mm)	Ø38.1 x 26.2	Ø38.1 x 26.2
Weight	91 g	

[a] The calibrations at 2.1 to 2.5 µm and 10.6 µm are on special request only.
[b] Typical wavelength correction factors are provided for 0.19 to 2.1 µm

Specifications subject to change without notice.

2 OPERATING INSTRUCTIONS

2.1 When used with a compatible monitor (UM9B-BL-D0)

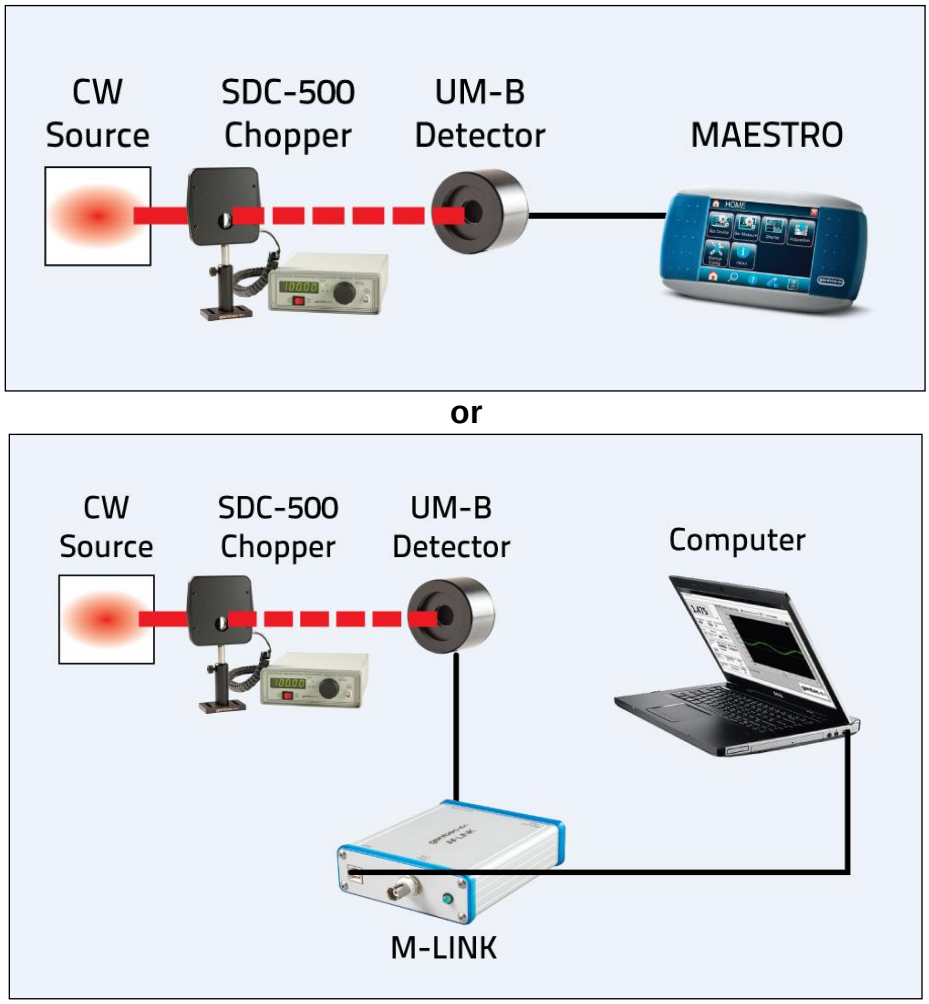


Figure 2.1: UM9B-BL-D0 with monitor

Refer to the user manual of each monitor for further information.

2.1.1 General Instructions

1- Place the wattmeter on its optical stand (Must use a delrin post).

2- Connect the wattmeter to a compatible Gentec-EO laser power monitor (see Fig. 2-1). (Refer to specifications)

NOTE: The parameters programmed in the DB-15 “Smart Interface” are for a 1 MΩ load impedance.

3- Remove the detector's protective cover, when applicable.

4- Put the optical chopper (SDC-500 or equivalent) into the laser beam path and adjust the frequency at 10Hz (laser beam must be contained within the aperture).

5- Put the wattmeter head into the laser beam path after the chopper. Make sure the laser beam is aligned to the center of the 9 mm detector area.

CAUTION: Be careful not to exceed the maximum levels and/or average power densities specified in the specification table.

NOTE: As with all pyroelectric devices, these detectors have some position and beam size linearity. For the most accurate measurements, the beam should be centered on the sensor surface.

2.2 Working at other wavelengths than 1.064µm with the UM9B-BL-D0

The monitor will automatically configure himself using the data stored in the EEPROM of the DB-15 “Smart Interface”. This includes the calibration sensitivity and wavelength corrections for 20 current wavelengths [2, 3].

For more precise measurements with a UM-B Series wattmeter at wavelengths other than those already corrected by the “Personal wavelength correction ™” [2] data programmed into the “Smart Interface”, a correction factor[3] is automatically set in the monitor to compensate for the change in sensitivity of the wattmeter caused by the change in absorption of the optical absorber at different wavelengths. This automatic correction is a linear interpolation between two measured values of the ‘’Personal wavelength correction’’.

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2 Refer to the spectral curve of the “ Personal Wavelength Correction ™ “ certificate supplied with the wattmeter

3 Refer to the monitor manuals for instructions.

2.3 When using an oscilloscope (UM9B-BL-L-D0):

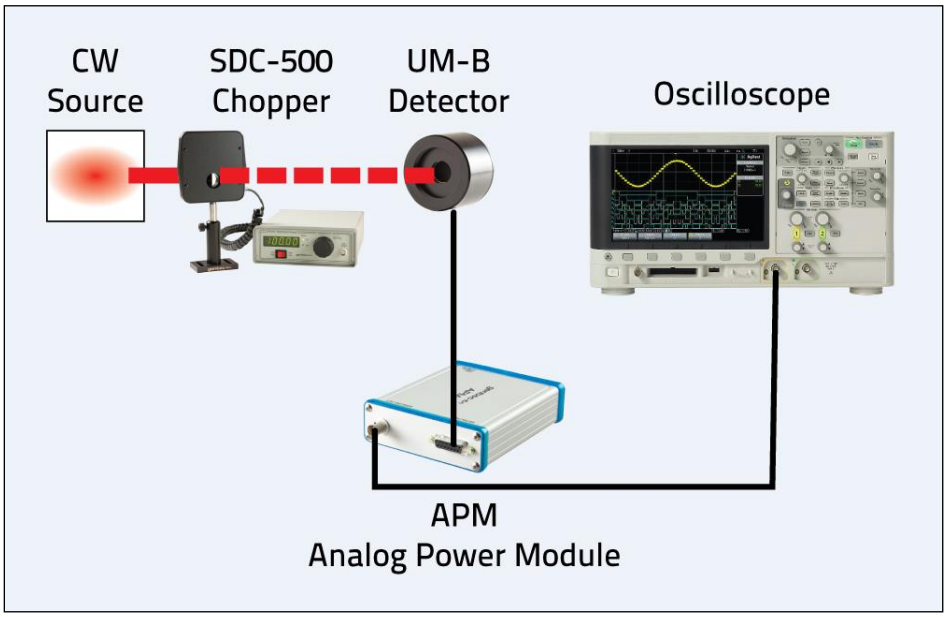


Figure 2.2: UM9B-BL-L-DO with oscilloscope

2.3.1 General Instructions

1- Install the wattmeter on its optical stand using a Delrin post.

2- Connect the wattmeter to the APM and switch it on. (Battery or power supply needed)

3- Connect the APM to the oscilloscope.

NOTE: The required load impedance is 1 MΩ and ≤ 30 pF.

4- Put the optical chopper (SDC-500 or equivalent) into the laser beam path and adjust the frequency at 5 Hz (laser beam must be contained within the aperture).

5- Put the wattmeter head into the laser beam path after the chopper (laser beam must be contained within the aperture).

CAUTION: Be careful not to exceed the maximum levels and average power density specified for this detector.

NOTE: As with all pyroelectric devices, these detectors have some position and beam size sensitivity. For the most accurate measurements, the beam should be centered on the sensor surface.

6- Adjust the oscilloscope so it triggers on the wattmeter pulse or on the chopper synch output signal. For low optical power levels we suggest synching the oscilloscope to the chopper for optimum performance.

7- Measure the baseline to peak voltage generated by the wattmeter.

8- Determine the wattmeter sensitivity (V/W) of the detector from the calibration certificate.

9- Calculate the optical power using the following equation:

Power = (V_{peak}-$V_{baseline}$) / Calibration sensitivity

Ex:

- V_{peak}-$V_{baseline}$ = 200 mV
- Detector calibration sensitivity (20 000 Volts / Watt)

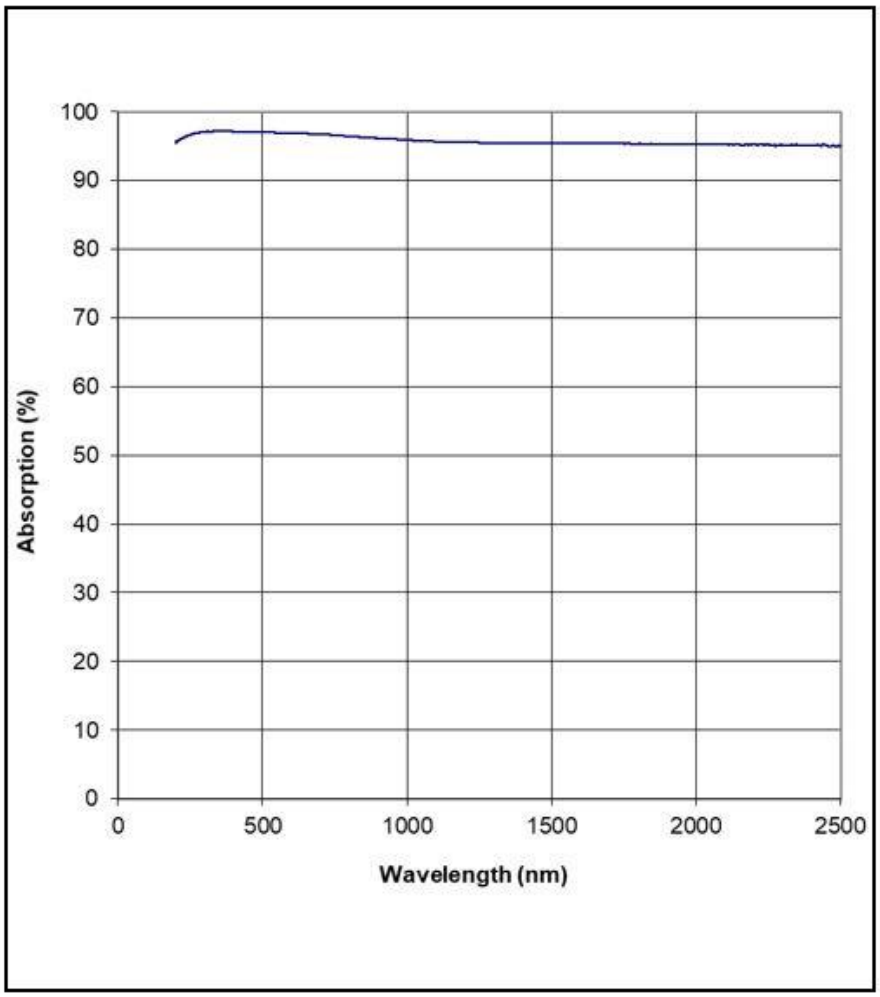
Power = 200 mV / 2E+4 V/W = 10 µW

2.3.2 Working at other wavelengths than 633 nm with the UM9B-BL-L-D0

For measurements with a UM9B-BL-L-D0 wattmeter at wavelengths other than 633 nm, a correction factor must be set to compensate for the change in sensitivity of the wattmeter caused by the change in absorption of the optical absorber at different wavelengths.

To correct for the change in absorption refer to the spectral curve of the " Personal Wavelength Correction ™ " certificate supplied for the wattmeter and calculate the **Multiplier** by taking the percentage difference between the absorption @ 633 nm and that at the desired wavelength.

The UM9B-BL-L-D0 does not come with a "Personal Wavelength Correction ™" certificate because of the flatness of the absorption curve. To use the detector at another wavelengths than 633 nm, please use the typical Multiplier shown in this figure.



Personal Wavelength Correction ™

Wavelength*** (nm)	Correction Multiplier	Uncertainty
193	1.016	
213	1.009	
248	1.002	
266	1.000	
308	0.997	
337	0.997	
355	0.997	
488	0.998	
514	0.998	
532	0.999	
578	0.999	
633*	1.000	
694	1.001	
720	1.002	
810	1.005	
980	1.009	
1064	1.012	
1550	1.015	
2100	1.016	
10600 **	0.986	N/A

* Calibration wavelength
** Typical value

Adjustment multiplier for wavelength under 248 nm are not traceable.

For Gentec-EO monitors, select the proper wavelength in menu

For other monitors, multiply by the correction multiplier
Power corrected = Power read x correction multiplier
Example: Power (720 nm) = 10mW x 1.002 = 10.02 mW

Figure 2.3: Typical wavelength correction

3 DAMAGE TO THE OPTICAL ABSORBER MATERIALS

At any time, the beam's incident area should not be less than 10% of the detector's aperture. Please check with Gentec-EO to make measurements with such small beams.

Damage is usually caused by exceeding the manufacturer is specified maximum tolerances:

- Average Power Density
- Peak Power Density
- Single Pulse Energy Density

Refer to the UM-B Series wattmeter specifications pages. Damage can also be caused when using a detector with a contaminated absorber or attenuator surface.

The damage thresholds specified in the specifications section refer to a visible alteration of the absorber surface. In practice, a slight alteration will not affect the wattmeter's response. Consider the wattmeter to be damaged and/or out of calibration when large-scale damage is evident or you can see the metal electrode beneath the coating[4].

In the case of a TEM_{00} (Gaussian) beam, the maximum peak power and energy density can be calculated using the following equation:

$$\text{Density (power or energy)} \approx \frac{2I_0}{\pi W^2}$$

Where I_0 is the total beam power or energy

W is the beam radius at $1/e^2$ and $\pi \approx 3.1416$

NOTE: The beam waist for a TEM_{00} beam is the radius of a circle centered on the beam axis and containing 86 % of the beam energy. Ref.: SIEGMAN, A.E., An Introduction to Lasers and Masers, p. 313 (Mcgraw-Hill Series in the Fundamentals of Electronic Science).

Example of energy density calculation;

I_0 = 1 joule (total energy)
W = 1 cm

$$\text{Energy density} = \frac{2 \times 1 \text{ joule}}{\pi \times (1 \text{ cm})^2} = 0.64 \text{ joule/cm}^2$$

Example of power density calculation;

I_0 = 1 MegaWatt (total power)
W = 1 cm

$$\text{Power density} = \frac{2 \times 1 \text{ MW}}{\pi \times (1 \text{ cm})^2} = 0.64 \text{ MW/cm}^2$$

[4] Contact Gentec-EO for evaluation, repair, recalibration, or replacement (refer to the WARRANTY instructions).

4 OPTIONAL ACCESSORIES

4.1 Other Accessories:

Contact Gentec-EO for a complete list of accessories, their specifications and features.

Partial list:

- APM(D) Part #201848 (required to power and connect the UM9B-BL-L-DO or UM9B-BL-D0 to an oscilloscope or Lock In Amplifier).
- MAESTRO or U-LINK for use with UM9B-BL-D0
- SDC-500 Optical Chopper (required for both UM9B probes)
- Carrying Case
- Interchangeable IR windows

5 APPENDIX A

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 detector will void the detector warranty.

The complete detector contains
- 1 detector with wires or DB-15
- 1 calibration certificate
- 1 Personal Wavelength Correction (UM9B-BL-D0 model only)

5.2 Separation:

Paper: certificates
Wires: detector cable
Printed circuit board: inside the detector and DB-15, no need to separate (less than 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.: **UM**
Year of test & manufacture: **2011**

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

Standard	Description	Performance Criteria
CISPR 11 :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 4-2: Testing and measurement techniques- Electrostatic	Class B
EN 61000-4-3:2006 +A2:2010	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques- Radiated, Radio Frequency, electromagnetic field immunity	Class A

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

Place: Québec (Québec) Date : June 11, 2012

(President)

7 UKCA 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.: UM
Year of test & manufacture: 2011

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

Standard	Description	Performance Criteria
CISPR 11 :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 4-2: Testing and measurement techniques- Electrostatic	Class B
EN 61000-4-3:2006 +A2:2010	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques- Radiated, Radio Frequency, electromagnetic field immunity	Class A

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

Place: Québec (Québec) Date : December 02, 2021

(President)

gentec-eo
PARTNERS for ACCURACY

WWW.GENTEC-EO.COM

LEADER IN LASER BEAM MEASUREMENT **SINCE 1972**

POWER & ENERGY METERS

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THZ MEASUREMENT

CANADA

445 St-Jean-Baptiste, Suite 160
Quebec, QC, G2E 5N7
CANADA

T (418) 651-8003
F (418) 651-1174

info@gentec-eo.com

UNITED STATES

5825 Jean Road Center
Lake Oswego, OR, 97035
USA

T (503) 697-1870
F (503) 697-0633

info@gentec-eo.com

JAPAN

Office No. 101, EXL111 building,
Takinogawa, Kita-ku, Tokyo
114-0023, JAPAN

T +81-3-5972-1290
F +81-3-5972-1291

info@gentec-eo.com

CALIBRATION CENTERS

- 445 St-Jean-Baptiste, Suite 160
  Quebec, QC, G2E 5N7, CANADA
- Werner von Siemens Str. 15
  82140 Olching, GERMANY
- Office No. 101, EXL111 building,
  Takinogawa, Kita-ku, Tokyo
  114-0023, JAPAN