USER MANUAL

PH and PE series | Photodetectors

gentec-eo
PARTNERS for ACCURACY

121-200774

WARRANTY

All Gentec-EO products carry a one-year warranty from the date of shipment on material or workmanship defects when used under normal operating conditions.

Gentec-EO will repair or replace, at its sole discretion, any product that proves to be defective during the warranty period.

The warranty does not cover damages caused by product misuse, product modifications, accidents, abnormal operating or handling conditions, or third-party battery leakage. Any attempt by an unauthorized person to alter or repair the product voids the warranty. Gentec-EO is not liable for consequential damages of any kind.

CLAIMS

For warranty service, please contact your Gentec-EO representative or fill out an RMA here: Support & RMA request - Gentec-EO.

To help us answer your request more efficiently, please have your product serial number ready before contacting customer support.

Upon receipt of return authorization, ship the product according to the RMA instructions. Do not ship items without a return authorization. Transport is at the customer’s expense, in both directions, unless the product has been received damaged or non-functional. Gentec-EO assumes no responsibility for the damage caused in transit.

SAFETY INFORMATION

Do not use a Gentec-EO device if the monitor or the detector looks damaged or if you suspect that the device is not operating properly.

Appropriate installation must be done for water-cooled and fan-cooled detectors. Refer to the specific instructions for more information. Wait a few minutes before handling the detectors after they were used. The surfaces of the detectors get very hot, and there is a risk of injury if they have not cooled.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, try to correct the interference by taking one or more of the following steps:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and receiver.
- Connect the equipment to an outlet that is on a different circuit than the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications not expressly approved in writing by Gentec-EO Inc. may void the user’s authority to operate this equipment.

TABLE OF CONTENTS

1. PH AND PE SERIES PHOTODETECTORS

1.1. INCLUDED WITH YOUR PH OR PE

The following items are included with PH series laser power detectors and PE series laser energy detectors:

Description	Part name	Part number
PH or PE series detector		
Protective cover		
Calibration certificate		
Personal wavelength correction™ certificate		
Calibrated attenuation filter, mounted in SM1-threaded holder (models with attenuator only)		

The following items can be purchased separately:

Description	Part name	Part number
Stand	STAND-D-233 STAND-D-233-M	200428 205657
Uncalibrated ND filter, mounted in SM1-threaded holder	ND0.5 ND1.0 ND2.0 ND3.0ND4.0 ND5.0 NDSET-6 NDSET-3	201094 201045 201046 201047 202600 206601 202605 202601
Fiber adaptor	FOA-FULL-FC FOA-FULL-FCA FOA-FULL-SMA FOA-FULL-ST	202367 205916 202368 202369
Extension cable	Call	Call
Isolation tube with SM1 thread	XLP12-TUBE	Call

1.2. INTRODUCTION

The Gentec-EO photodetector family includes two series of products:

- PH series of laser power detectors based on the use of photodiodes
- PE series of laser energy detectors based on the use of photodiodes

Photodiodes are devices made of semiconductor materials that convert light into an electrical current. The responsivity of this device depends on the bandgap of the material and varies greatly with wavelength. Both the PH and PE series include different options of photodiode sensor material, that provide enhanced sensitivity for different wavelength ranges.

Compared to thermopiles, photodiodes are faster, are less affected by temperature fluctuations and have lower noise levels. On the other hand, their high sensitivity makes them susceptible to noise coming from ambient light.

All our PH an PE models are built with the same compact, cylindrical housing with is easy to integrate in any optical setup. Various output options are provided, detailed in Section 1.4.

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

Call your nearest Gentec-EO distributor to replace the sensor or to recalibrate the detector.

1.3. PRODUCT NAME STRUCTURE

All products in the PH and PE series are named using the same structure. The table below explains each part of the product name, with the following product as an example: PH100-Si-HA-OD1-INT-D0

Product family	Aperture	Power supply	Sensor type
PH	100		Si-HA
PH: Photodiode, power PE: Photodiode, energy	Diameter in mm, or sensor area indication	B: Reverse bias (empty): None	Si-HA: Silicon SiUV: UV-enhanced silicon GE: Germanium IN: InGaAs

Attenuator	All-in-one meter	Connector type
OD1	INT	D0
OD0.3: Calibrated attenuator, with an optical density of 0.3 OD1: Calibrated attenuator, with an optical density of 1 OD2: Calibrated attenuator, with an optical density of 2 (empty): No attenuator	INT: Integra, USB IDR: Integra, RS232 (empty): no meter	D0: Standard (if no meter: DB15) *Custom:* M0: Molex C0: Coaxial-BNC Etc.

1.4. CONNECTORS AND ALL-IN-ONE METERS

The standard cable length (including the connector) is 1.8 m.

1.4.1. “Smart” DB15 connector

The smart DB15 male connector contains an EEPROM (Electrically Erasable Programmable Read-Only Memory) containing information such as the model of the detector, the calibration sensitivity, and other data relating to the specific detector in use.

This connector allows Gentec-EO displays and PC interfaces to adjust their characteristics automatically to the connected power sensor. No calibration procedure is required when installing the power detectors, allowing for fast set-up.

The DB15 connector pin-out is composed of (see Fig. 1):

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

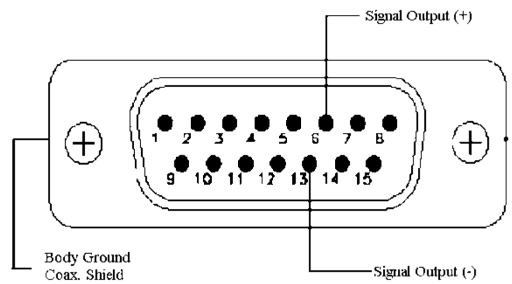


Figure 1. DB15 connector pin-out

NOTE: Consult Gentec-EO for supply voltage requirements.

1.4.2. INT: Integra all-in-one meter with USB connector

Integra USB is an integrated meter that allows you to plug your detector directly into a computer. It communicates via serial commands (see the INTEGRA user manual) and can use our free PC-Gentec-EO software. All specifications are the same as the DB15 version, except for:

- Wattmeter and joulemeter heads a noise ~1.3 x higher.
- Joulemeter repetition rate is limited to 5200 Hz maximum.

1.4.3. IDR: Integra all-in-one meter with RS232 connector

Integra RS232 is an integrated meter that allows you to plug your detector directly into a computer. It communicates via serial commands (see the INTEGRA user manual) and can use our free PC-Gentec-EO software. All specifications are the same as the USB version, except for:

- For repetition rates above 200 Hz, values are sampled.
- Power supply is required. See the INTEGRA user manual for more details.

1.4.4. Custom connectors

If your application requires another type of connector, contact Gentec-EO for a custom product quote.

1.5. SPECIFICATIONS

1.5.1. General 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 70%. Store between 10 °C to 50 °C and relative humidity not exceeding 70%.

Photodiodes are sensitive to temperature and more specifically for longer wavelengths. It is the best to keep the temperature in the range of 22 °C to 25 °C, close to the calibration temperature.

All PH and PE detectors	
Aperture threading	1.035”-40 (SM1)
Mounting holes	Two mounting holes: 8x32 and M4x0.7
Dimensions - With attenuator - Without attenuator	 38.1 mm Ø x 36D mm except PH100-SiUV-OD0.3: 38.1 mm Ø x 46.3D mm 38.1 mm Ø x 27.4D mm
Weight - With attenuator - Without attenuator	 130 g 91 g

Specifications are subject to change without notice.

1.5.2. Footnotes

Footnotes for the specifications tables are combined here:

a. For lowest noise, warm up until the reading without laser power is stable for several minutes, then null the offset (“Zero”). Half an hour warm-up is recommended for measuring low powers.
b. Minimum power = 30 x NEP.
c. Also compatible with legacy displays: SOLO 2 and SOLO PE
d. Short pulsed lasers can momentarily saturate the photodiode sensor or an electronic amplification stage, even if not saturating in averaged power. When measuring power with short pulses, it is recommended to manually set the measurement scale at least 5 times higher than the measured power (reading <20% of scale). It’s also possible to check for signal saturation by comparing the measurements with and without an attenuating filter.
e. Prior to reaching ± 3% linearity error.
f. This photodiode is calibrated at one wavelength and spectrally corrected according to a typical curve.
g. For low energy measurements, the photodiode must be protected from ambient light and ideally used in the dark.

1.5.3. PH100-Si-HA

	PH100-Si-HA	PH100-Si-HA-OD1	PH100-Si-HA-OD2
Detector used without attenuator			
Calibrated spectral range	350 to 1080 nm		
Maximum power, at 1064 nm	36 mW [at 36 mW/cm^2]		
Minimum power[a], at 980 nm	0.3 nW		
Noise equivalent power (NEP)[b], at 980 nm	10 pW		
Uncertainty	350-399 nm: ± 5.0% 400-449 nm: ± 2.0% 450-809 nm: ± 1.5% 810-899 nm : ± 2.0% 900-1009 nm: ± 4.0% 1010-1080 nm: ± 7.5%		
Peak sensitivity	0.5 A/W at 980 nm		
Detector used with attenuator			
Calibrated spectral range	N/A	400 to 1080 nm	630 to 1080 nm
Maximum power, at 1064 nm		300 mW	750 mW
Minimum power[a], at 980 nm		6 nW	60 nW
Noise equivalent power (NEP)[b], at 980 nm		200 pW	2 nW
Uncertainty		400-419 nm: ± 5.0% 420-899 nm: ± 4.0% 900-1009 nm: ± 5.0% 1010-1080 nm: ± 7.5%	630-899 nm: ± 4.0% 900-1009 nm: ± 5.0% 1010-1080 nm: ± 7.5%
General specifications			
Aperture	10 mm Ø		
Absorber	Silicon		
Response time (10-90 %)	0.2 sec INTEGRA: 0.45 sec		
Monitor compatibility[c]	MIRO ALTITUDE, MAESTRO U-LINK, M-LINK, P-LINK, S-LINK UNO, TUNER		
Minimum repetition rate for pulsed lasers[d]	1000 Hz		
Damage threshold (maximum average power density)	100 W/cm^2		
Typical detector saturation current[e]	6.3 mA/cm^2		
Temperature offset dependence	20 pA/°C		
Beam position dependence	± 1% at 780 nm ± 3% at 1064 nm		

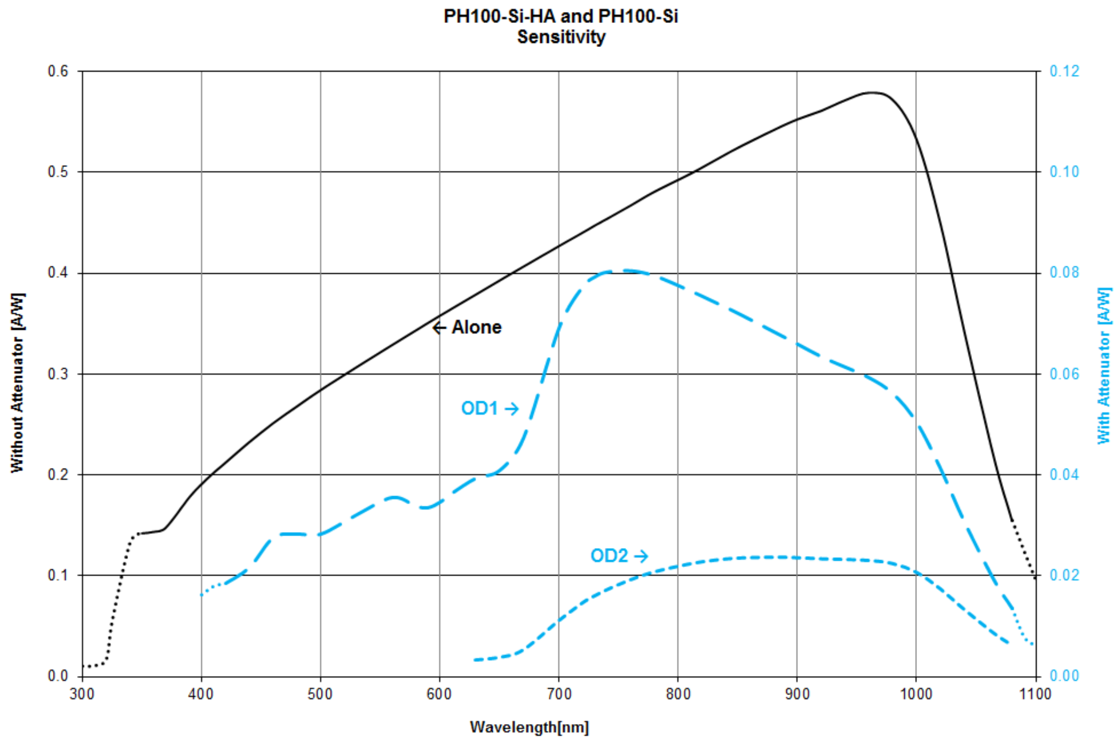


Figure 2. PH100-Si, PH100-Si-HA typical spectral response

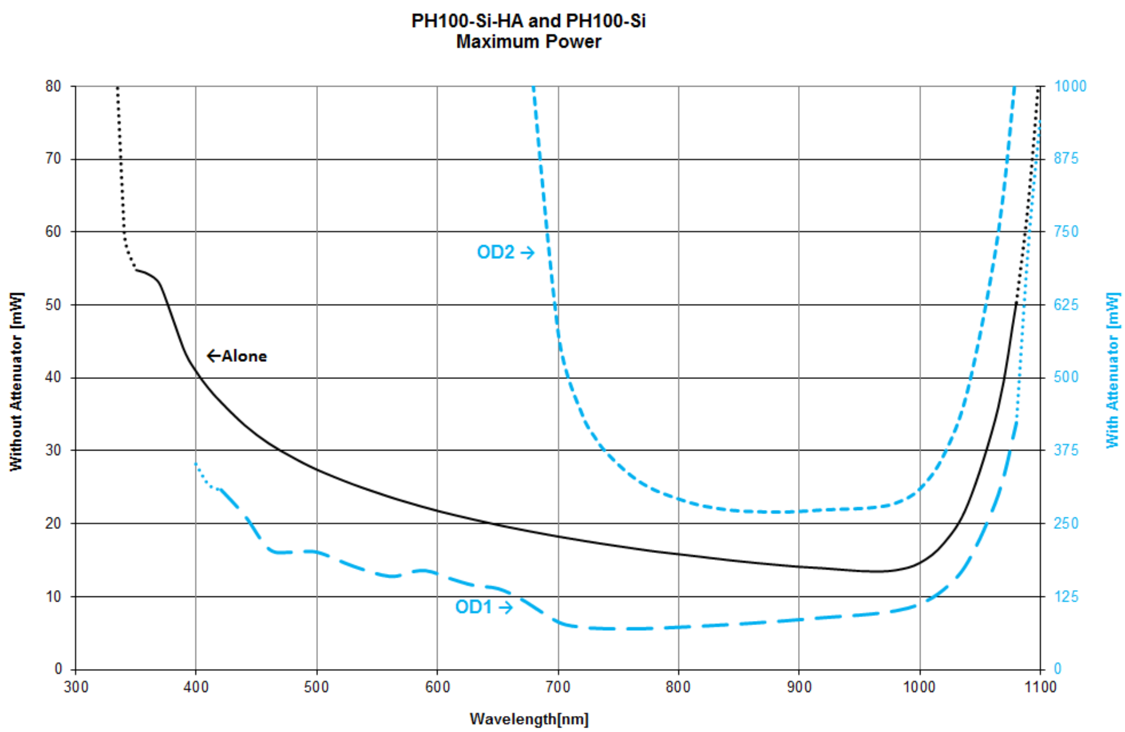


Figure 3. PH100-Si, PH100-Si-HA maximum power

1.5.4. PH100-SiUV

	PH100-SiUV	PH100-SiUV-OD0.3	PH100-SiUV-OD1
Detector used without attenuator			
Calibrated spectral range	210 to 1080 nm		
Maximum power, at 532 nm	4 mW [65 mW/cm²]		
Minimum power[a], at 850 nm	0.3 nW		
Noise equivalent power (NEP)[b], at 850 nm	10 pW		
Uncertainty	210-229 nm: ± 18% 230-254 nm: ± 8.0% 255-399 nm: ± 6.5% 400-899 nm: ± 2.5% 900-1009 nm: ± 4.0% 1010-1080 nm: ± 7.5%		
Peak sensitivity	0.5 A/W at 980 nm		
Detector used with attenuator			
Calibrated spectral range	N/A	210 to 1080 nm	400 to 1080 nm
Maximum power		16 mW at 300 nm	38 mW at 532 nm
Minimum power[a], at 850 nm		0.6 nW	6 nW
Noise equivalent power (NEP)[b], at 850 nm		20 pW	200 pW
Uncertainty		210-229 nm: ± 18% 230-254 nm: ± 8.0% 255-399 nm: ± 6.5% 400-1009 nm: ± 5.0% 1010-1080 nm: ± 7.5%	400-1009 nm: ± 5.0% 1010-1080 nm: ± 7.5%
General specifications			
Aperture	10 mm Ø		
Absorber	UV-Silicon		
Response time (10-90 %)	0.2 sec INTEGRA: 0.45 sec		
Monitor compatibility[c]	MIRO ALTITUDE, MAESTRO U-LINK, M-LINK, P-LINK, S-LINK UNO, TUNER		
Minimum repetition rate for pulsed lasers[d]	1000 Hz		
Damage threshold (maximum average power density)	100 W/cm²		
Typical detector saturation current[e]	17.6 mA/cm²		
Temperature offset dependence	20 pA/°C		
Beam position dependence	± 1% at 652 nm ± 3% at 1064 nm		

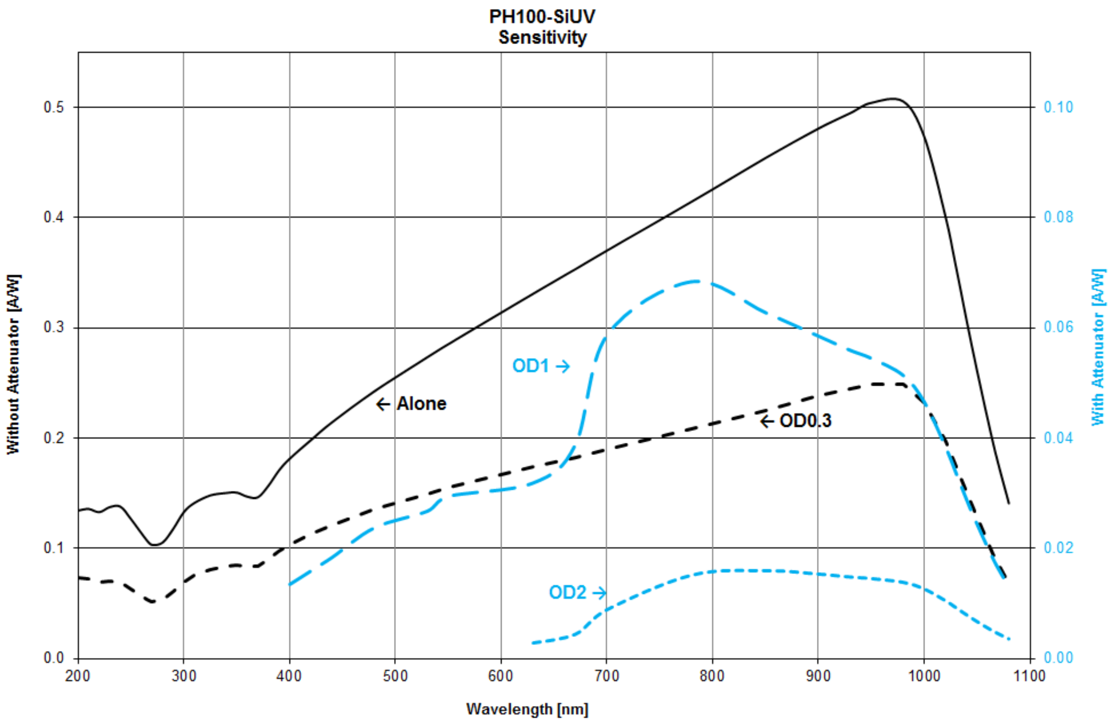


Figure 4. PH100-SiUV typical spectral response

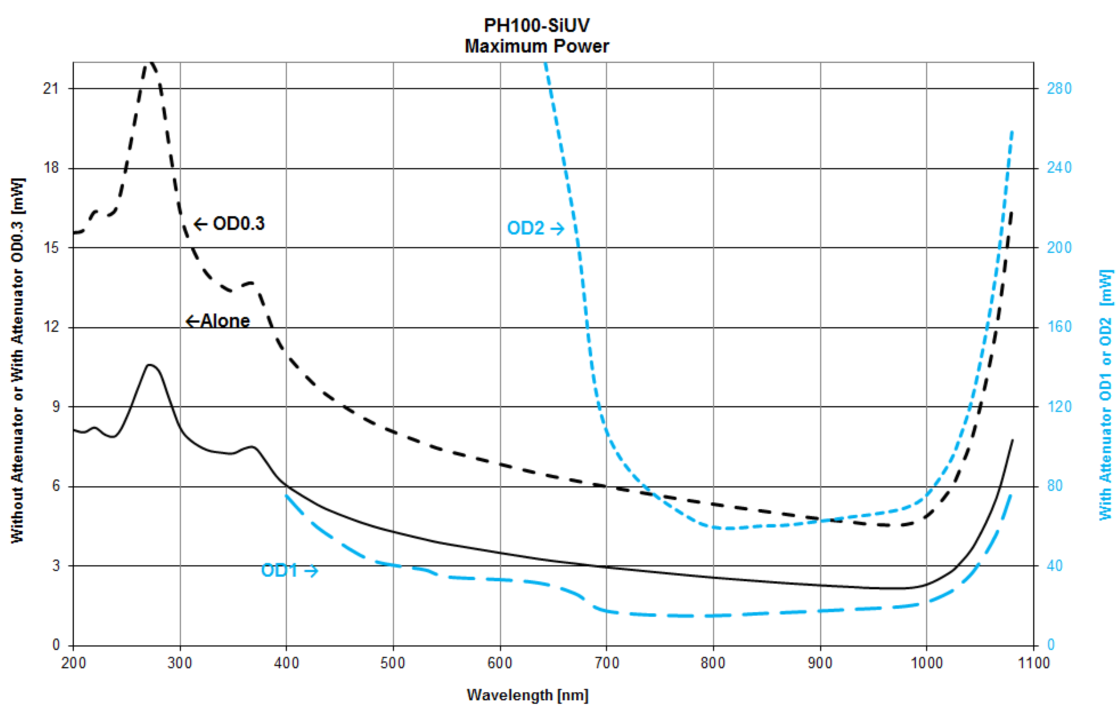


Figure 5. PH100-SiUV maximum power

1.5.5. PH20-GE

	PH20-GE	PH20-GE-OD1	PH20-GE-OD2
Detector used without attenuator			
Calibrated spectral range	800 to 1650 nm		
Maximum power, at 1064 nm	30 mW [< 320 mW/cm^2]		
Minimum power[a], at 1550 nm	2 nW		
Noise equivalent power (NEP)[b], at 1550 nm	60 pW		
Uncertainty	800-1049 nm: ± 5.0% 1050-1559 nm: ± 3.5% 1560-1629 nm: ± 7.0% 1630-1650 nm: ± 10%		
Peak sensitivity	0.98 A/W at 1550 nm		
Detector used with attenuator			
Calibrated spectral range	N/A	900 to 1650 nm	950 to 1650 nm
Maximum power, at 1064 nm		300 mW	0.50 W
Minimum power[a], at 1550 nm		20 nW	200 nW
Noise equivalent power (NEP)[b], at 1550 nm		60 pW	600 pW
Uncertainty		900-1559 nm: ± 5.0% 1560-1629 nm: ± 7.0% 1630-1650 nm: ± 10%	950-1559 nm: ± 5.0% 1560-1629 nm: ± 7.0% 1630-1650 nm: ± 10%
General specifications			
Aperture	5 mm Ø		
Absorber	Germanium		
Response time (10-90 %)	0.2 sec INTEGRA: 0.45 sec		
Monitor compatibility[c]	MIRO ALTITUDE, MAESTRO U-LINK, M-LINK, P-LINK, S-LINK UNO, TUNER		
Minimum repetition rate for pulsed lasers[d]	1000 Hz		
Damage threshold (maximum average power density)	100 W/cm^2		
Typical detector saturation current[e]	< 140mA/cm^2		
Temperature offset dependence	100 pA/°C		
Beam position dependence	± 1 % at 1064 nm ± 3% at 800 nm		

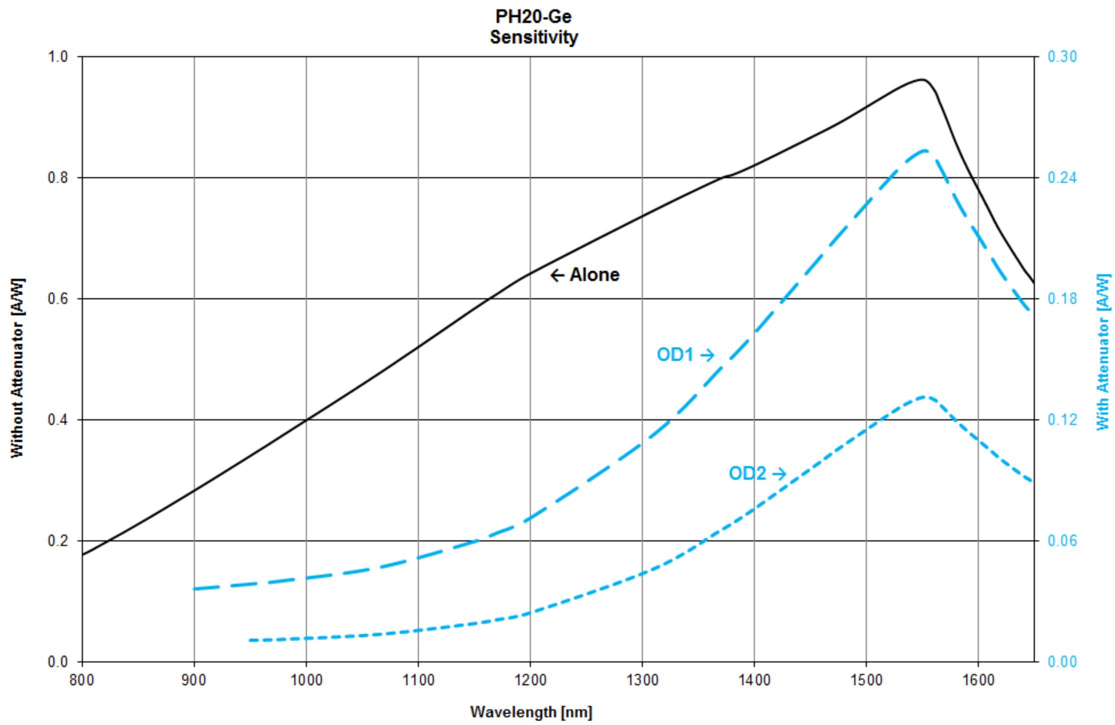


Figure 6. PH20-Ge typical spectral response

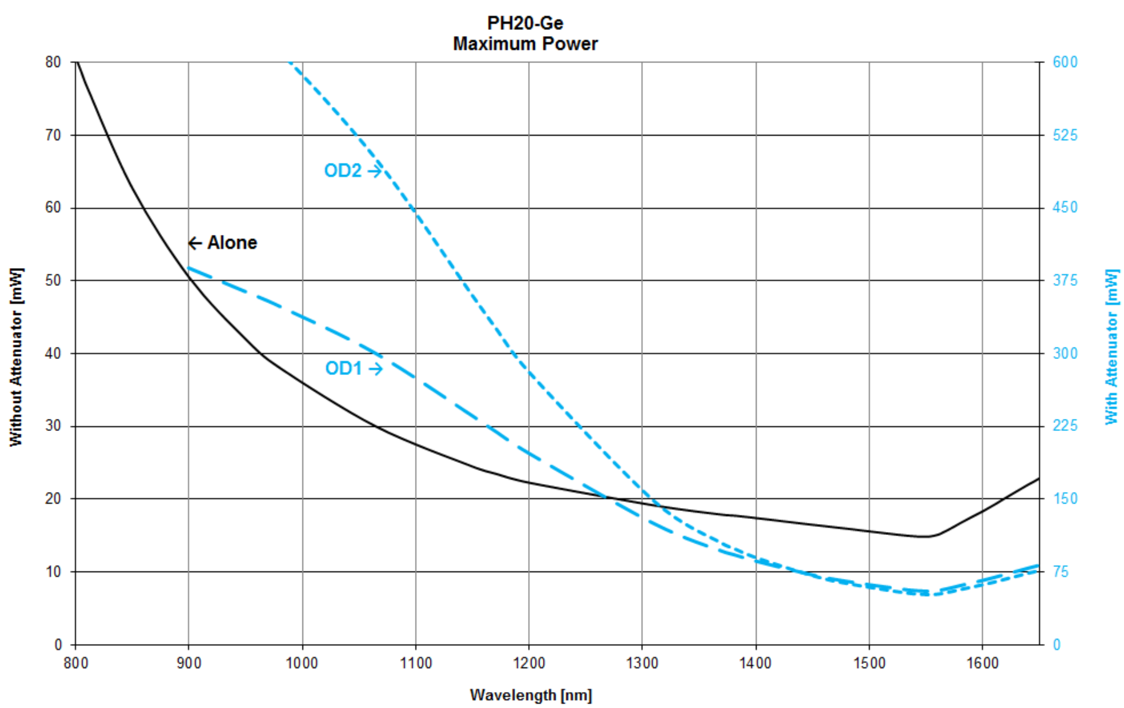


Figure 7. PH20-Ge maximum power

1.6.1. PE-B series

	PE10B-Si	PE5B-Ge	PE3B-Si	PE3B-In
Aperture	10 mm Ø	5 mm Ø	3 mm Ø	3 mm Ø
Absorber	UV-Silicon	Germanium	Silicon UV	InGaAs
Spectral range	210 to 1080 nm	800 to 1650 nm	210 to 1080 nm	900 to 1700 nm
Calibrated spectral range	210 to 1080 nm	800 to 1650 nm	634 nm only[f]	1310 nm[f]
Maximum measurable energy, with: - U-LINK and M-LINK - INTEGRA and S-LINK - MAESTRO	(at 634nm) 0.075 µJ 0.081 µJ 0.069 µJ	(at 1310 nm) 2.2 nJ 2.4 nJ 2.0 nJ	(at 634 nm) 22 pJ 24 pJ 20 pJ	(at 1310 nm) 223 pJ 245 pJ 200 pJ
Noise equivalent energy[g]	1.5 pJ at 634nm	1 pJ at 1310 nm	8 fJ at 634nm	30 fJ at 1310nm
Uncertainty	210-229 nm: ± 18% 230-254 nm: ± 8.0% 255-399 nm: ± 6.5% 400-899 nm: ± 2.5% 900-1009 nm: ± 4.0% 1010-1080 nm: ± 7.5%	800-1049 nm: ± 5.0% 1050-1559 nm: ± 3.5% 1560-1629 nm: ± 7.0% 1630-1650 nm: ± 10%	± 4% *only* at 634 nm	± 4% *only* at 1310 nm
Rise time (0-100%)	30 µs	25 µs	15 µs	12 µs
Max pulse width	10 µs			
Max repetition rate	1000 Hz			
Peak sensitivity	30 MV/J at 634 nm	1 GV/J at 1310 nm	100 GV/J at 634 nm	10 GV/J at 1310 nm
Monitor compatibility	MAESTRO, U-LINK, M-LINK, S-LINK			
Maximum energy density	5 µJ/cm^2	5 µJ/cm^2	N/A	N/A
Max average power density (at 1064 nm)	65 mW/cm^2 (at 532 nm)	< 320 mW/cm^2 (at 1064 nm)	N/A	N/A
Beam position dependence	± 1% at 652 nm ± 3% at 1064 nm	± 1% at 1064 nm ± 3% at 800 nm	N/A	N/A

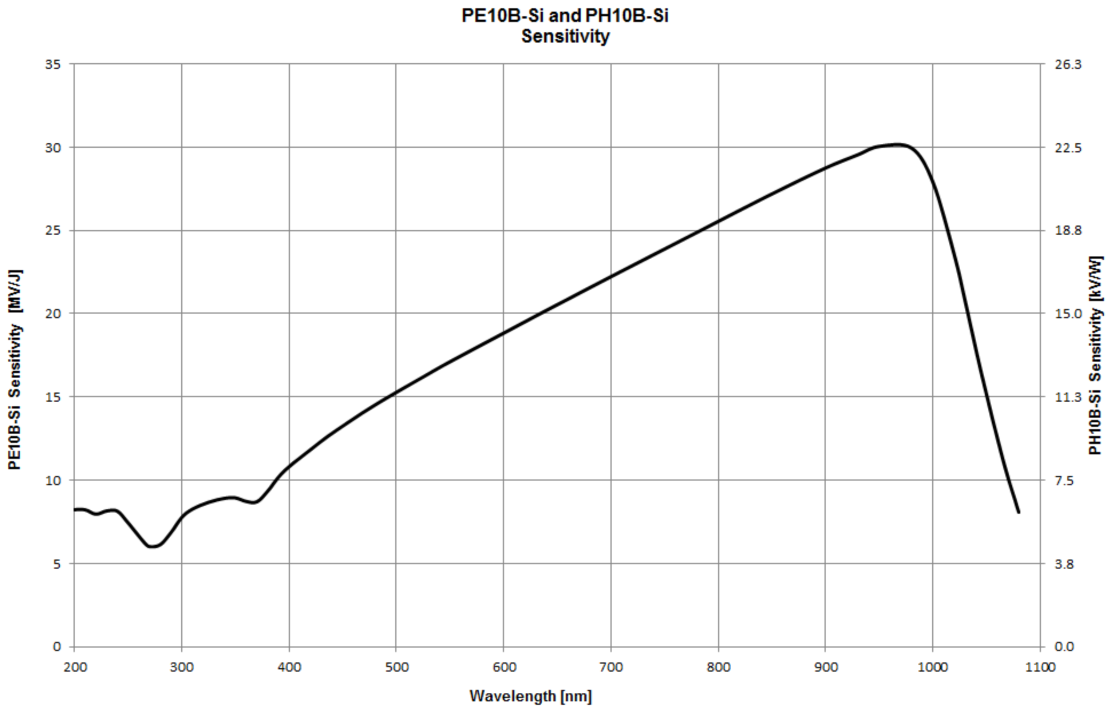


Figure 8. PE10B-Si, PH10B-Si spectral response

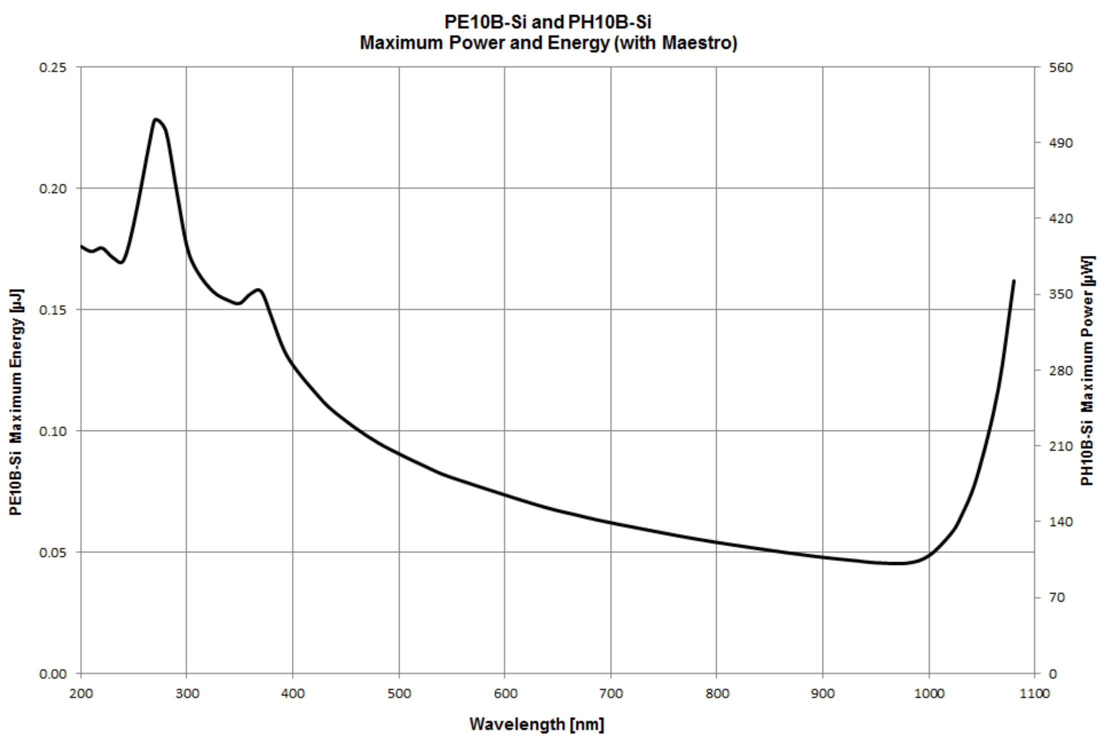


Figure 9. PE10B-Si, PH10B-Si maximum power with MAESTRO

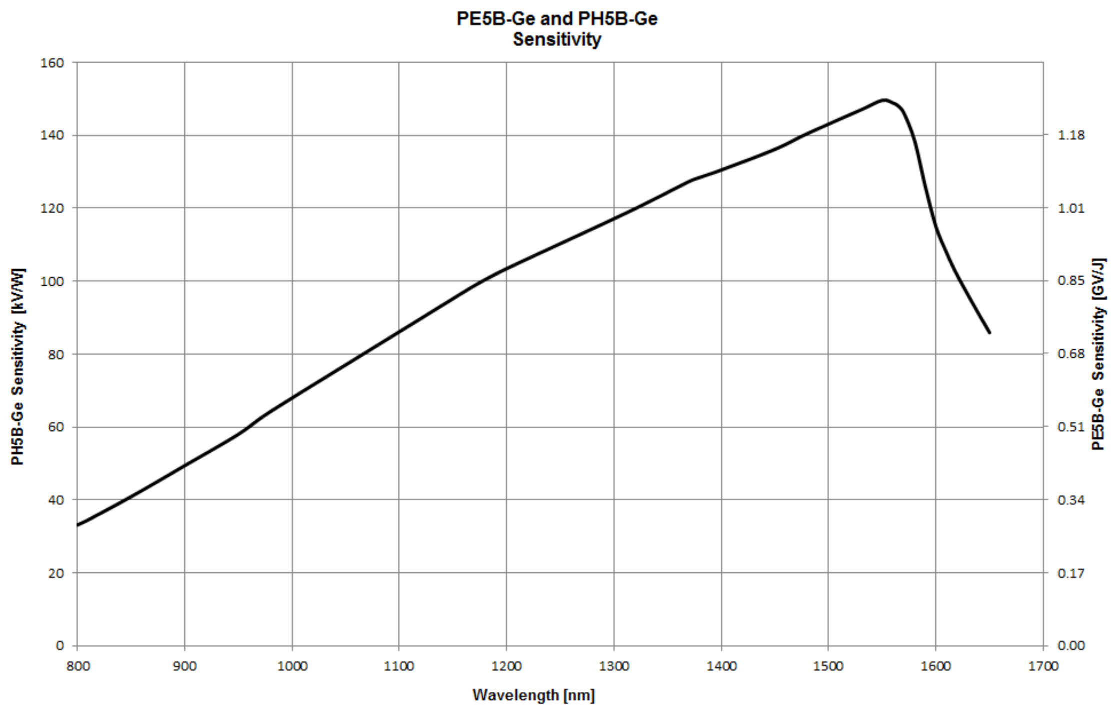


Figure 10. PE5B-Ge, PH5B-Ge typical spectral response

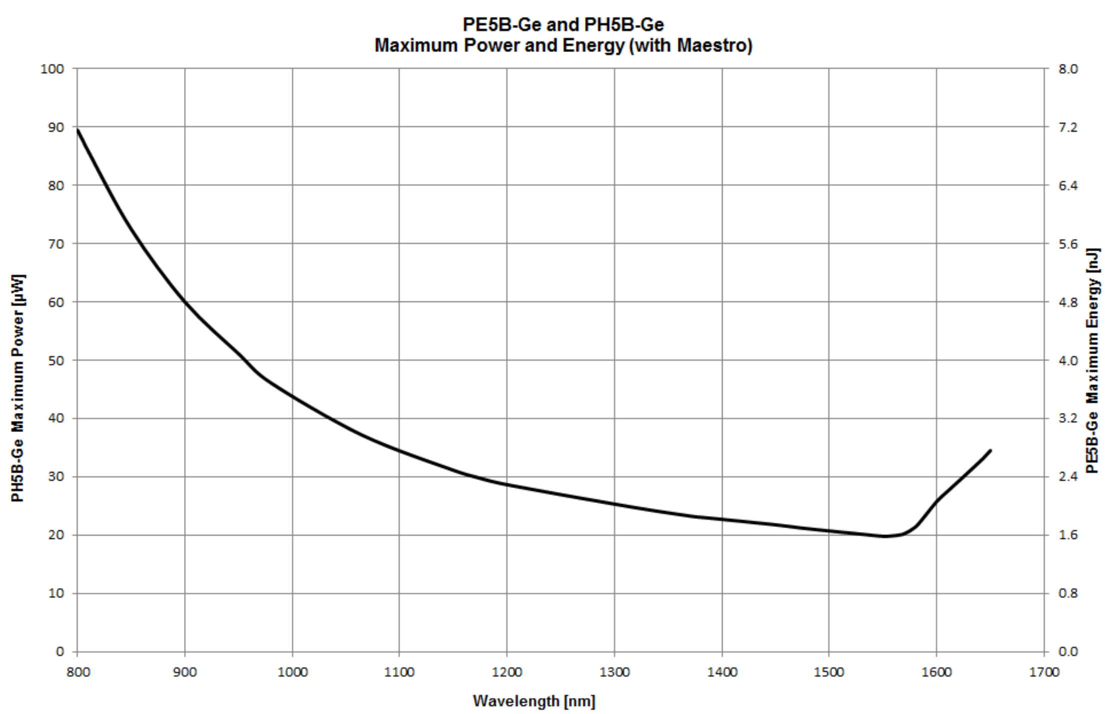


Figure 11. PE5B-Ge, PH5B-Ge typical spectral response

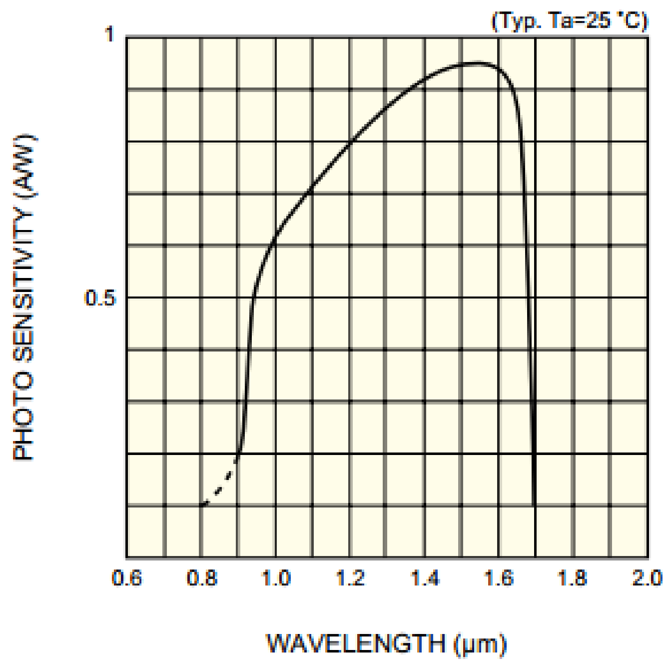


Figure 12. PE3B-IN typical spectral response

2. OPERATING INSTRUCTIONS

2.1. QUICK-START GUIDE

To make a measurement Gentec-EO monitor, continue with the following steps:

1. Install the detector in the optical setup.

   NOTE: The detector should be protected from ambient light, ideally used in the dark to avoid noise.
2. Connect the detector head to the monitor (see the monitor's instruction manual).
3. The monitor will default to autoscale and the lowest wavelength without attenuator available.
   If you want to obtain measurements in dBm rather than watts, select Settings >> Power Unit >> dBm.
4. Select the proper wavelength.
5. Remove the detector's protective cover.
6. Place the sensor into the laser beam path. The entire laser beam must be within the sensor aperture. Do not exceed the maximum specified density, energy or power. For the most accurate measurements, spread the beam across 90% of the sensor area.

Adjusting the zero (steps 7 to 9) – only needed for power measurements

7. Wait until the reading has stabilized. The power read by the monitor when no laser beam is incident on the detector may not be exactly zero if the detector or monitor is not thermally stabilized. Warm up until the reading without laser power is stable for several minutes. A half-hour warm up is recommended for measuring low powers.
8. Block off the laser radiation to the detector.
9. Set the zero offset or offset (refer to the monitor user manual). A message may appear requesting you to put the cover on your photodiode. Put it on to block all light if you do not want to compensate for background illumination. Do not put it on if you want to remove the signal from ambient light. Press OK after taking the appropriate action with the cover.

   The monitor passes through all the scales to determine the compensation to null each one.

   The message "Zero Done" appears when the monitor has finished. You are now ready to make an accurate measurement.
10. Apply the laser beam to the detector head. The monitor displays the measurement.

2.2. TIPS FOR ACCURATE MEASUREMENTS

Several error sources may affect your measurements. Here are tips on how to improve the repeatability and accuracy of your measurements.

2.2.1. Offset

Zero the offset before any measurement, otherwise all measurements will include a component not related to the laser power. This will add a systematic error to absolute power measurements. This error may disappear from relative power measurements. When you subtract two measurements made under identical conditions, the offset in the second measurement cancels the offset in the first if they are identical. We recommend zeroing the offset for all measurements to eliminate any drift that occurs between measurements.

2.2.2. Wavelength

The photodiode response varies with the wavelength. You may select your wavelength with the Settings/Wavelength menu of your Gentec-EO display or PC interface.

If you decide to use the photodetector without a Gentec-EO monitor, you will have to use the sensitivity given by the photodetector calibration certificate to calculate the power on your laser beam. If your wavelength is not given by the calibration certificate, you will have to make a linear interpolation between two of the available calibration values.

Linear interpolation formula:

$$Sensitivity_{desired\_\lambda} = Sens_{LOW\_\lambda} + \Delta\lambda * Slope$$

$$\Delta\lambda = \lambda_{DESIRED} - \lambda_{LOW}$$

$$Slope = \frac{(Sens_{HIGH\_\lambda} - Sens_{LOW\_\lambda})}{(\lambda_{HIGH} - \lambda_{LOW})}$$

$Sensitivity_{desired\_\lambda}$:	the sensitivity at the desired wavelength
$Slope$:	the slope of the linear interpolation
$Sens_{LOW\_\lambda}$:	sensitivity at λ_{LOW}
$Sens_{HIGH\_\lambda}$:	sensitivity at λ_{HIGH}
λ_{LOW}:	the next lowest available wavelength near your desired wavelength
λ_{HIGH}:	the next highest available wavelength near your desired wavelength
$\lambda_{DESIRED}$:	desired wavelength
$\Delta\lambda$:	the difference between the desired wavelength and the inferior wavelength

Example

You have a PH100-Si, and your laser is at 632.8 nm.

See your certificate of calibration for the sensitivity of your power detector as a function of the wavelength.

Wavelength (nm)	Sensitivity (A/W)
630	0.35
640	0.37

632.8 nm is between 630 nm and 640 nm therefore,

$Sens_{LOW\_\lambda}$ = 0.35 A/W, $Sens_{HIGH\_\lambda}$ = 0.37 A/W
λ_{LOW} = 630 nm, λ_{HIGH} = 640 nm

$\Delta\lambda$ = 632.8 - 630 = 2.8 nm
$Slope$ = (0.37-0.35)/(640-630) = 0.002

$Sensitivity_{desired\_\lambda}$ = 0.35 + 2.8 * 0.002= 0.356 A/W

2.2.3. Saturation

The maximum power varies with the wavelength, the power density and from one diode to another. When making measurements close to the saturation power, you must verify the saturation effect with a calibrated attenuator.

To check for saturation with a known transmission value attenuator:

1. Make the measurement with and without the filter.
2. Your power ratio should be equal to the transmission value of the filter.

Attenuator calibration procedure:

1. Make sure your stable power source is far below the saturation point.
2. Make the measurement with and without the filter.
3. The transmission value is the ratio of the measurement with the filter/without the filter.

2.2.4. Measurement of the average power of a pulsed laser beam

Conditions to be met :

- The repetition rate must be higher than the specified minimum.
- The peak power must not saturate the detector.

To know if the detector is saturated, use the procedure 2.2.3. Be careful when making the attenuator calibration in pulsed mode. The peak power must be in the linear region of the photodiode.

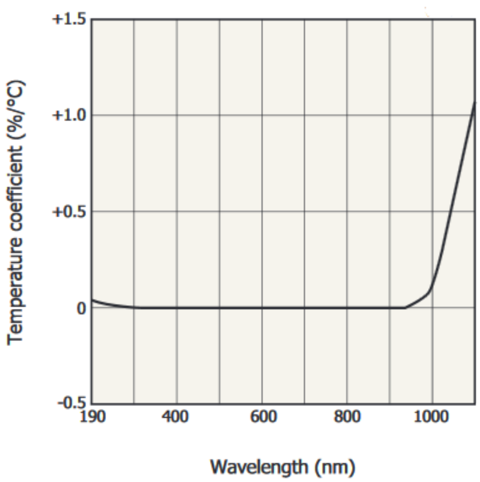
Peak power = energy per pulse/pulse width.

Energy per pulse = average power/repetition rate.

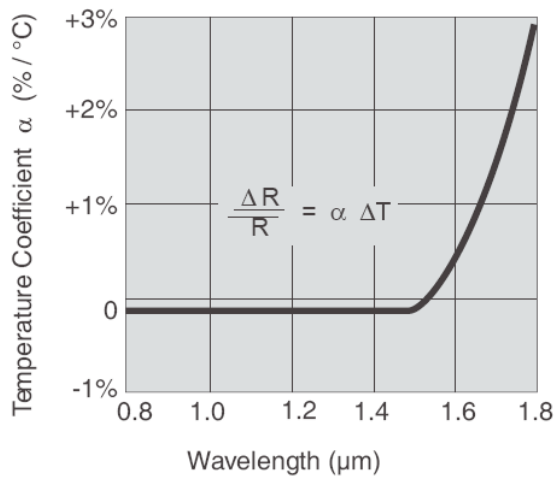
2.2.5. Offset drift due to temperature

The photodiode shunt resistor is sensitive to temperature. This affects the offset value. When making very low power level measurements, allow your system to warm up for 30 minutes or until the offset power is stable for several minutes.

The sensitivity of the photodiode also has temperature dependence. The figures below show the typical temperature sensitivity dependence over the spectral range for Ge, Si and SiUV.



(a) Silicon and UV-Silicon



(b) Germanium

Figure 13. Typical temperature dependence vs. the wavelength

3. DAMAGE TO THE OPTICAL ABSORBER MATERIAL

Damage to the optical absorber material is usually caused by exceeding the manufacturer specified maximum incident in the average power density.

Refer to the specification pages for damage thresholds and operation conditions.

Cleaning: use alcohol and a clean cotton cloth.

4. DECLARATION OF CONFORMITY

Application of Council Directive(s): 2014/30/EU The EMC Directive

Manufacturer name: Gentec Electro Optics, Inc.
Manufacturer address: 445, avenue Saint-Jean-Baptiste, Suite 160
Québec (Québec) Canada G2E 5N7

European representative name: Laser Components S.A.S.
Representative address: 45 bis Route des Gardes
92190 Meudon (France)

Type of equipment: Photodiode
Model No.: PH Series
Year of test and manufacture: 2016

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 discharge.	Class B
EN61000-4-3 2006+A2:2010	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques- Radiated, Radio Frequency, electromagnetic field immunity test.	Class A
EN61000-4-4 2012	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques- Electrical fast transient/burst immunity test.	Class B
EN 61000-4-5 2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques- Surge immunity test.	Class B
EN 61000-4-6 2013	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurements techniques- Immunity to conducted Radio Frequency.	Class A
EN 61000-4-11 2004	Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques- Voltage dips, short interruptions and voltage variations immunity tests. Voltage dips: 0% during 1 cycle 40% during 10 cycles 70% during 25 cycles Short interruptions: 0% during 250 cyles	 Class B Class B Class C Class C
EN 61000-3-2:2006 +A1:2009	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)	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: July 14, 2016

(President)

5. UKCA DECLARATION OF CONFORMITY

Application of Council Directive(s): 2014/30/EU The EMC Directive

Manufacturer Name: Gentec Electro Optics, Inc.
Manufacturer Address: 445, avenue Saint-Jean-Baptiste, Suite 160
Québec (Québec) Canada G2E 5N7

European representative name: Laser Components S.A.S.
Representative address: 45 bis Route des Gardes
92190 Meudon (France)

Type of equipment: Photodiode
Model No.: PH Series
Year of test and manufacture: 2016

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 discharge.	Class B
EN61000-4-3 2006+A2:2010	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques- Radiated, Radio Frequency, electromagnetic field immunity test.	Class A
EN61000-4-4 2012	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques- Electrical fast transient/burst immunity test.	Class B
EN 61000-4-5 2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques- Surge immunity test.	Class B
EN 61000-4-6 2013	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurements techniques- Immunity to conducted Radio Frequency.	Class A
EN 61000-4-11 2004	Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques- Voltage dips, short interruptions and voltage variations immunity tests. Voltage dips: 0% during 1 cycle 40% during 10 cycles 70% during 25 cycles Short interruptions: 0% during 250 cyles	 Class B Class B Class C Class C
EN 61000-3-2:2006 +A1:2009	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)	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: November 30, 2021

(President)

APPENDIX A: WEEE DIRECTIVE

Recycling and separation procedure for WEEE directive 2012/19/EU

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:

- One detector with wires or DB15
- One calibration certificate
- One electronic PCB (INTEGRA option)
- One plastic enclosure (INTEGRA option)

Separation

- Paper : certificate
- Wires: cable detector
- Printed circuit board: inside the detector or DB15, no need to separate (less than 10 cm2)
- Aluminum: detector casing. Inside the INTEGRA enclosure, no need to separate (less than 10 cm2)
- Aluminum: detector casing
- Plastic: INTEGRA enclosure

APPENDIX B. CUSTOM AND DISCONTINUED MODELS

These tables are presented for convenient reference only. For discontinued models, contact us for the most accurate specifications. For custom products, refer to the specifications included with your order.

PH100-Si

	PH100-Si
Aperture	10 mm diameter
Calibrated spectral range	320 to 1100 nm
Maximum power [at power density]	36 mW [36 mW/cm^2] (at 1064 nm)
Noise equivalent power (NEP)	10 pW at 980nm
Noise (peak to peak)	5 pA
Minimum power	0.3 nW at 980 nm
Resolution	1.5 pW INTEGRA: 1 fW
Temperature offset dependence	20 pA/°C
Response time (10-90 %)	0.2 sec INTEGRA: 0.45 sec
Peak sensitivity	0.5 A/W at 980 nm
Uncertainty	320-399 nm: ± 6.5% 400-899 nm: ± 2.5% 900-1009 nm: ± 4.0% 1010-1100 nm: ± 7.5%
Monitor compatibility	MAESTRO, U-LINK, M-LINK, P-LINK, UNO, TUNER, SOLO 2, SOLO PE
Absorber	Silicon
Minimum repetition rate for pulsed lasers	(20 mA to 1 mA) 155 kHz (1 mA to 20 µA) 155 kHz (20 µA to 2 µA) 155 kHz (2 µA to 0.1 µA) 145 Hz (0.1 µA to 1 nA) 80 Hz Integra : (25 mA to 1 µA) 155 kHz (1 µA to 1 nA) 1700 Hz
Damage threshold [maximum average power density]	100 W/cm^2
Typical detector saturation current	6.3 mA/cm^2
Beam position dependence	± 1% at 780 nm ± 3% at 1064 nm
With attenuator	**PH100-Si – OD1/OD2**
Maximum power typical w/ OD-1	300 mW at 1064 nm
Minimum power w/ OD-1	6 nW at 980 nm
Spectral range w/ OD-1	400 to 1100 nm

	PH100-Si
Maximum power typical w/ OD-2	0.75 W at 1064 nm
Minimum power w/ OD-2	60 nW at 980 nm
Spectral range w/ OD-2	630 to 1100 nm
Uncertainty w/ OD-1 or OD-2	400-1009 nm: ± 5.0% 1010-1100 nm: ± 7.5%

PH-B series specifications

Detector	PH10B-Si	PH5B-Ge
Monitor compatibility	MAESTRO, U-LINK, M-LINK, S-LINK	
Absorber	Silicon UV	Germanium
Spectral range	210 to 1080 nm	800 to 1650 nm
Peak sensitivity	980 nm	1550 nm
Sensitivity, typical	15 kV/W at 633 nm	80 kV/W at 1047 nm
Maximum measurable power	M-LINK: 200 µW S-LINK: 175 µW U-LINK/MAESTRO : 150 µW (at 633 nm)	M-LINK: 40 µW S-LINK: 30 µW U-LINK/MAESTRO : 25 µW (at 1310 nm)
Maximum average power density	65 mW/cm^2 (at 532 nm)	< 320 mW/cm^2 (at 1064 nm)
Noise equivalent power	50 pW (at 633 nm)	40 pW (at 1310 nm)
Minimum power	1.5 nW (at 633 nm)	1.2 nW (at 1310 nm)
Damage threshold [maximum average power density]	100 W/cm^2	100 W/cm^2
Uncertainty	210-229 nm: ± 18% 230-254 nm: ± 8.0% 255-399 nm: ± 6.5% 400-899 nm: ± 2.5% 900-1009 nm: ± 4.0% 1010-1080 nm: ± 7.5%	800-1049 nm: ± 5.0% 1050-1559 nm: ± 3.5% 1560-1629 nm: ± 7.0% 1630-1650 nm: ± 10%
Aperture	10 mm diameter	5 mm diameter
Active area	0.9 cm^2	0.2 cm^2
Rise time 0-100%	≤ 0.2 sec	≤ 0.2 sec
Beam position dependence	± 1% at 652 nm ± 3% at 1064 nm	± 1% at 1064 nm ± 3% at 800 nm

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PARTNERS for ACCURACY

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