



USER MANUAL

HP Series | High Power Detectors

121-101761

gentec-eo
PARTNERS for ACCURACY

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 our 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 the 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:

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SAFETY INFORMATION

Do not use the HP if the device or the detector looks damaged, or if you suspect that the HP is not operating properly.

Appropriate installation must be done for water-cooled detectors. Refer to the specific instructions for more information. Wait a few minutes before handling the detectors after power is applied. Surfaces of the detectors get very hot and there is a risk of injury if they are not allowed to cool down.

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 when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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

WARRANTY	I
SAFETY INFORMATION.....	II
TABLE OF CONTENTS.....	III
LIST OF ILLUSTRATIONS.....	III
1. HP SERIES POWER DETECTORS	1
1.1. INTRODUCTION.....	1
1.2. POWER DETECTOR CONNECTORS.....	3
1.2.1. DB-15 “intelligent” connector.....	3
1.2.2. USB connector	4
1.2.3. Analog output	4
1.2.4. Cooling water.....	5
1.3 HP SERIES SPECIFICATIONS.....	7
2 OPERATING INSTRUCTIONS	15
2.1 WITH ANY GENTEC-EO MONITOR.....	16
2.2 WITHOUT A GENTEC-EO MONITOR	17
2.3 WITH PC GENTEC-EO.....	17
2.3.1 Warnings.....	18
2.4 VERIFY COM PORT	19
2.5 USB DRIVER INSTALLATION	19
2.6 WITH SERIAL COMMANDS	19
3 SAFETY OPERATION NOTES	22
3.1 Diffusive surfaces	22
3.2 Detector temperature.....	22
4 DAMAGE TO THE OPTICAL ABSORBER MATERIAL	23
5 CE MARK DECLARATION OF CONFORMITY	25
APPENDIX A: WEEE DIRECTIVE.....	26

LIST OF ILLUSTRATIONS

FIG. 1-1 DB-15 CONNECTOR PIN-OUT	3
FIG. 2-2 A & B PC INTERFACE WARNINGS.....	18
FIG. 2-3 A & B PC INTERFACE WARNINGS.....	18

1. HP SERIES POWER DETECTORS

1.1. INTRODUCTION

The Gentec-EO HP Series power detector family includes HP100A-4KW-HE, HP60A-10KW-GD, HP100A-12KW-HD, HP60A-15KW-GD-D0, HP125A-15KW-HD and HP280A-30KW-HD-D0.

When relevant, the same specifications apply to beam dump versions: BD-4KW-HE and BD-12KW-HD.

- The **HP100A-4KW-HE** detector has dimensions of 127 mm x 127 mm and an aperture of 100 mm.
- The **HP100A-4KW-HE-TUBE** detector has dimensions of 127 mm x 127 mm and a removable aperture of 70 mm.
- The **HP60A-10KW-GD** detector has dimensions of 127 mm x 127 mm and an aperture of 60 mm.
- The **HP100A-12KW-HD** detector has dimensions of 127 mm x 127 mm and an aperture of 100 mm.
- The **HP100A-12KW-HE-TUBE** detector has dimensions of 127 mm x 127 mm and a removable aperture of 70 mm.
- The **HP60A-15KW-GD** detector has dimensions of 153 mm x 153 mm and an aperture of 60 mm.
- The **HP60A-15KW-GD-TUBE** detector has dimensions of 153 mm x 153 mm and a removable aperture of 70 mm.
- The **HP60A-15KW-GD-QBH** detector has dimensions of 153 mm x 153 mm and a removable aperture of 70mm. The detector also has a second removable aperture to which a fiber optic adapter is attached.
- The **HP125A-15KW-HD** detector has dimensions of 153 mm x 153 mm and an aperture of 125 mm.
- The **HP125A-15KW-HD-TUBE** detector has dimensions of 153 mm x 153 mm and a removable aperture of 70 mm.
- The **HP280A-30KW-HD-D0** detector has dimensions of 324 mm x 305 mm and an aperture of 280 mm.
- The high power surface absorber sensors are designed for use at high average power densities.

The HP detectors can measure between

- 100 W and 4 kW of average power for HP100A-4KW-HE & HP100A-4KW-HE-TUBE
- 300 W and 10 kW of average power for HP60A-10KW-GD
- 300 W and 12 kW of average power for HP100A-12KW-HD & HP100A-12KW-HD-TUBE
- 500 W and 15 kW of average power for HP60A-15KW-GD-D0, HP60A-15KW-GD-TUBE, HP60A-15KW-GD-QBH-D0, HP125A-15KW-HD & HP125A-15KW-HD-TUBE
- 1 kW and 30 kW of average power for HP280A-30KW-HD-D0

*For lower power, consult Gentec-EO

The HP-D0 detectors are supplied with a 180 cm length flexible cable with output connection options of a DB-15 "intelligent" male connector.

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

HP detectors can be supplied with an optional stand. For the HP280A-30KW-HD-D0, Gentec-EO strongly recommends the use of the optional stand. The stand will improve safety and reduce the risk of damage to the detector.

For cases where Gentec-EO's monitors don't automatically read the wavelength correction factor, you can use your detector's "*Personal wavelength correction™ Certificate*" to adjust the power you read to a power corrected for a particular wavelength.

Version 3.8

Call your nearest Gentec-EO distributor to replace the sensor disk and/or to recalibrate the head. For
Gentec-EO's nearest office contact information, see p. ii, **Contacting Gentec Electro-Optics Inc.**

2

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 related to the HP Series detector head in use: detector model, calibration sensitivity, applicable scales and wavelength correction factor for up to 20 wavelengths.

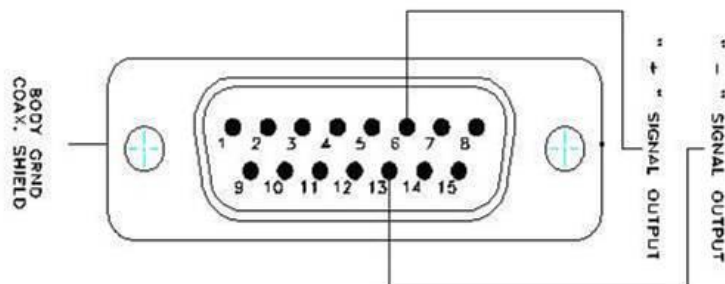
This connector, available in the HP, allows the U-LINK, S-LINK, SOLO 2, UNO, TUNER, MAESTRO (detector model, calibration sensitivity, scale and wavelength correction factor) monitors to adjust their characteristics automatically to the power sensor being connected. No calibration procedure is required when installing the power heads, allowing for faster set-up.

The DB-15 connector pin-out is composed of (see Fig. 1-1):

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

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



1.2.2. USB connector

The USB connector allows using the HP on a PC. The PC interface, *PC-Gentec-EO*, features statistical calculation, graphics displays and data logging options. It also gives real time measurement of the cooling flow rate and temperature.

A standard USB cable of 5 meters is supplied with the HP. If a longer cable is required, please contact Gentec-EO for more information.

In some particular cases, the HP must be powered with a USB power supply. For example, when a DB15 extension is used between a HP and a Gentec-EO monitor, or if the DB15 connector is used for analog reading and is not connected to a Gentec-EO monitor.

The USB power adapter (201221) can be ordered with the required AC plug ; USA (201222), UK (201223), European (201224) and Australian (201225).

1.2.3. Analog output

An optional configuration allows an analog output up to 12 VDC. This configuration is only possible if the 24 V external power supply option is selected too. Only available upon request. Contact Gentec-EO for details.

1.2.4. Cooling water

The fluid used to cool the HP must be clean water.

Water fittings and tubing :

- The HP is equipped with 3/8" (OD) push-to-connect fittings for detectors with maximum average power up to 15 kW. Detectors with higher maximum average power are equipped with 1/2" (OD) push-to-connect fittings.
- It must be used with plastic pressure tube systems (like PE or Nylon tubes).
The fittings are not compatible with copper or stainless steel tubes.
- The metric version of the HP is supplied with an adapter kit (201993) for 10 mm (OD) tube or (205327) for 12 mm (OD) tube.
 - The kit contains two push-to-connect tube adapters and two coupling tube stems 3/8" to 10 mm tube adapters and two 3/8" coupling tube stems.
 - The coupling stem is inserted between the HP and the adapter.
 - Please note that the tube size is written on the adapter output (10, 3/8, 12 or 1/2).

Water quality:

- The HP series cooling fluid must be water, do not use glycol or other additive that changes the coolant's heat capacity.
- Use filtered (< 50µm) water to avoid any residue.
Gentec-EO can provide an external water filter if water quality is an issue. (202984 Metric or 202990 Imperial). If you require an external 1/2" water filter, please contact your local Gentec-EO representative.

Note: The water filter provided by Gentec-EO is a chemical resistant filter. **However, it is not compatible with mineral acids.**

- The resistivity of the water must be over 100 kOhm-cm.
- Distilled water can be used, but it is not recommended to use highly deionized ultra-pure water because the water cavity is not completely inert.
A bare copper version is available for 10KW to 30KW versions, contact Gentec-EO for details.
- If an algacide must be used in the chiller, we recommended Optishield Plus or equivalent.
- If chloride is present in the system, the concentration should not exceed 25 PPM and the PH maintained between 6.0 to 8.0. (Low PH will remove the protective oxide layer)

Water temperature:

- The cooling water can be between 15 and 25°C **but must always remains above the dew point.**
- The ideal set point is 20.0°C, where the HP is calibrated.
- Water temperature stability is very important since variations (1 to 60 seconds) in the temperature can be interpreted as laser power fluctuation.
- Regulate the temperature with a chiller or a re-circulator.
- The water temperature can be monitored with the PC interface.

Water flow rate:

- Flow rate stability is very important since the measured power is directly proportional to the flow. Variation (1 to 60 seconds) in the flow rate can be interpreted as laser power fluctuation.
- The flow rate must be adjusted with a valve. A lower flow rate causes a slower response while increasing the signal to noise ratio. A higher flow rate causes a faster response, reducing signal to noise ratio.
- The water flow rate can be monitored with the PC interface.
- NOTE: the water pressure at the HP input must never exceed 60 psi / 413 kPa.

Note: All these parameters should remain in the range stated in the specifications.

1.3 HP SERIES SPECIFICATIONS

HP...	HP100A-4KW-HE	HP100A-4KW-HE-TUBE
Back Reflections	~ 15%	< 4% with Ø 70 mm aperture
Aperture Diameter	100 mm	Ø 100 mm detector aperture Ø 70 mm tube aperture
Tube Length	N/A	150 mm
Spectral Range	0.19 - 20 µm	
Calibrated Spectral Range ¹	0.248 – 2.5 µm and 10.6 µm	
Power Noise Level	± 3 W	
Typical Rise Time (0 – 95 %)	7 s	
Sensitivity ²	0.4 mV/W	
Calibration Uncertainty	± 5 % @ 1.064 µm & 1.070 µm	
Linearity with Power	± 1.5 %	± 2%
Repeatability (Precision)	± 2%	
Min. Average Power (continuous) ³	100 W	
Max. Average Power (continuous)	4 000 W	
Max. Average Power (2 min.)	4500 W	
Max. Average Power Density ⁴	10 kW/cm ² (0.5 kW) 6 kW/cm ² (2 kW) 4 kW/cm ² (4 kW)	
Dimension (mm)	127 (H) x 127 (W) x 74 (D)	127 (H) x 127 (W) x 234 (D)
Weight (head only)	1.8 kg	6.0 kg
Detector Cooling	Water	
Cooling flow rate	4 – 6 LPM	
Cooling flow rate stability ⁵	< ± 1 LPM/min	
Cooling temperature	15 - 25 °C	
Cooling temperature stability ⁵	< ± 3 °C/min	
Cooling pressure drop	< 6 psi / < 41 kPa	< 15 psi / < 103 kPa
Cooling maximum input pressure	60 psi / 413 kPa	
Recommended load Impedance	> 100 kΩ	
Output Impedance	< 675 Ω	
Linearity vs beam dimension ⁶	± 1.0 %	
Linearity vs beam position ⁷	± 1.7 %	

¹ The calibrations from 2.1 to 2.5 µm and at 10.6 µm are on special request only. The traceability at 248 nm is obtained with the help of a traceable reference at 250 nm, since our spectrophotometer has a 4 nm spectral bandwidth at 248 nm.

² An optional configuration allows an analog output up to 12 VDC. Only available upon request. Contact Gentec-EO for details.

³ For lower power, consult Gentec-EO.

⁴ Damage thresholds are valid at 1.064, 1.070, 1.080 & 10.6 µm. Refer to section 4 for more details on the appropriate beam size in function of measured power.

⁵ On a period > 1 minute.

⁶ For a centered beam size from 10 % to 80 % of the aperture area.

⁷ For a beam size of 20 % of the aperture area, moved across 80 % of the aperture area.

PCB electrical supply	USB or Gentec-EO monitors
Maximum current consumption	30 mA
Max output signal ²	2.0 V

Specifications subject to change without notice.

HP...	HP100A-12KW-HD	HP100A-12KW-HD-TUBE
Back Reflections	~ 15%	< 4% with Ø 70 mm aperture
Aperture Diameter	100 mm	Ø 100 mm detector aperture Ø 70 mm tube aperture
Tube Length	N/A	150 mm
Spectral Range	0.19 - 20 µm	
Calibrated Spectral Range ¹	0.248 – 2.5 µm and 10.6µm	
Power Noise Level	± 10 W	
Typical Rise Time (0-95%)	9 s	
Sensitivity ²	0.15 mV/W	
Calibration Uncertainty	± 5 % @ 1.064 µm & 1.070 µm	
Linearity with Power	± 2%	
Repeatability (Precision)	± 2%	
Min. Average Power (continuous) ³	300 W	
Max. Average Power (continuous)	12 000 W	
Max. Average Power (2 min.)	12 000 W	
Max. Average Power Density ⁴	16 kW/cm ² (0.5 kW) 6.5 kW/cm ² (5 kW) 3.5 kW/cm ² (10 kW)	
Dimension (mm)	127 (H) x 127 (W) x 70 (D)	127 (H) x 127 (W) x 230 (D)
Weight (head only)	3.3 kg	7.5 kg
Detector Cooling	Water	
Cooling flow rate	6 – 10 LPM	
Cooling flow rate stability ⁵	< ± 1 LPM/min	
Cooling temperature	15 - 25 °C	
Cooling temperature stability ⁵	< ± 3 °C/min	
Cooling pressure drop	< 11 psi / < 75 kPa	< 20 psi < / 138 kPa
Cooling maximum input pressure	60 psi / 413 kPa	
Recommended load Impedance	> 100 kΩ	
Output Impedance	< 675 Ω	
Linearity vs beam dimension ⁶	± 1.0 %	
Linearity vs beam position ⁷	± 1.7 %	
PCB electrical supply	USB or Gentec-EO monitors	
Maximum current consumption	30 mA	
Max output signal ²	2.0 V	

Specifications subject to change without notice.

HP...	HP60A-10KW-GD
Back Reflections	~ 10 %
Aperture Diameter	60 mm conical Optimized for 35 mm
Spectral Range	0.8 - 12 μm
Calibrated Spectral Range ¹	0.8 – 2.5 μm and 10.6 μm
Power Noise Level	± 10 W
Typical Rise Time (0-95%)	12 s
Sensitivity ²	0.2 mV/W
Calibration Uncertainty	± 5 % @ 1.064 μm & 1.070 μm
Linearity with Power	± 2 %
Repeatability (Precision)	± 2 %
Min. Average Power (continuous) ³	300 W
Max. Average Power (continuous)	10 000 W
Max. Average Power (2 min.)	10 000 W
Max. Average Power Density ⁴	20 kW/cm ² (10 kW) ⁸
Dimension (mm)	127 (H) x 127 (W) x 97 (D)
Weight (head only)	6 kg
Detector Cooling	Water
Cooling flow rate	6 – 8 LPM
Cooling flow rate stability ⁵	< ± 1 LPM/min
Cooling temperature	15 - 25 °C
Cooling temperature stability ⁵	< ± 3 °C/min
Cooling pressure drop	< 10 psi / < 75 kPa
Cooling maximum input pressure	60 psi / 413 kPa
Recommended load Impedance	> 100 k Ω
Output Impedance	< 675 Ω
Linearity vs beam dimension ⁶	± 2.0 %
Linearity vs beam position ⁷	± 3.0 % ⁹
PCB electrical supply	USB or Gentec-EO monitors
Maximum current consumption	30 mA
Max output signal ²	2.0 V

Specifications subject to change without notice.

⁸ For the HP60A-10KW-GD with serial number inferior to 276600, the maximum average power density is 10kW/cm² (10kW).

⁹ For a beam size of 10 % of the aperture area, moved across a circle of $\varnothing 35\text{mm}$.

HP...	HP60A-15KW-GD	HP60A-15KW-GD-TUBE
Back Reflections	~ 5-10 %	1-2 % with \varnothing 70mm aperture
Aperture Diameter	\varnothing 60 mm conical Optimized for \varnothing 50 mm	\varnothing 60mm detector aperture \varnothing 70mm tube aperture Optimized for \varnothing 50mm
Tube length	N/A	205 mm
Spectral Range	0.8 - 12 μ m	
Calibrated Spectral Range ¹	0.8 – 2.5 μ m and 10.6 μ m	
Power Noise Level	\pm 15 W	
Typical Rise Time (0-95%)	15 s	
Sensitivity ²	0.125 mV/W	
Calibration Uncertainty	\pm 5 % @ 1.064 μ m & 1.070 μ m	
Linearity with Power	\pm 2%	
Repeatability (Precision)	\pm 2%	
Min. Average Power (continuous) ³	500 W	
Max. Average Power (continuous)	15 000 W	
Max. Average Power (2 min.)	15 000 W	
Max. Average Power Density ⁴	< \varnothing 50 mm 10 kW/cm ² (15 kW) > \varnothing 50 mm 1.5 kW/cm ² (15 kW)	
Dimension (mm)	153 (H) x 153 (W) x 97 (D)	153 (H) x 153 (W) x 302 (D)
Weight (head only)	10 kg	15 kg
Detector Cooling	Water	
Cooling flow rate	8 – 10 LPM	
Cooling flow rate stability ⁵	< \pm 1 LPM/min	
Cooling temperature	15 - 25 $^{\circ}$ C	
Cooling temperature stability ⁵	< \pm 3 $^{\circ}$ C/min	
Cooling pressure drop	< 12 psi / < 83 kPa	< 27 psi / < 262 kPa
Cooling maximum input pressure	60 psi / 413 kPa	
Recommended load Impedance	> 100 k Ω	
Output Impedance	< 675 Ω	
Linearity vs beam dimension ⁶	\pm 2.5 %	
Linearity vs beam position ⁷	\pm 4.0 %	
PCB electrical supply	USB or Gentec-EO monitors	
Maximum current consumption	30 mA	
Max output signal ²	2.0 V	

Specifications subject to change without notice.

HP...	HP60A-15KW-GD-QBH
Back Reflections	1-2 % with $\varnothing 70\text{mm}$ aperture and fiber adaptor
Aperture Diameter	$\varnothing 60\text{mm}$ detector aperture $\varnothing 70\text{mm}$ tube aperture
Tube length	205 mm
Fiber compatibility	QB, QBH
Minimum divergence (half angle) ¹⁰	50 mrad
Maximum divergence (half angle) ¹⁰	110 mrad
Spectral Range	0.8 - 12 μm
Calibrated Spectral Range ¹	0.8 – 2.5 μm and 10.6 μm
Power Noise Level	± 15 W
Typical Rise Time (0-95%)	15 s
Sensitivity ²	0.125 mV/W
Calibration Uncertainty	± 5 % @ 1.064 μm & 1.070 μm
Linearity with Power	± 2 %
Repeatability (Precision)	± 2 %
Min. Average Power (continuous) ³	500 W
Max. Average Power (continuous)	15 000 W
Max. Average Power (2 min.)	15 000 W
Max. Average Power Density ⁴	< $\varnothing 50$ mm 10 kW/cm ² (15 kW) > $\varnothing 50$ mm 1.5 kW/cm ² (15 kW)
Dimension (mm)	153 (H) x 153 (W) x 386 (D)
Weight (head only)	16 kg
Detector Cooling	Water
Cooling flow rate	8 – 10 LPM
Cooling flow rate stability ⁵	< ± 1 LPM/min
Cooling temperature	15 - 25 °C
Cooling temperature stability ⁵	< ± 3 °C/min
Cooling pressure drop	< 27 psi / < 262 kPa
Cooling maximum input pressure	60 psi / 413 kPa
Recommended load Impedance	> 100 k Ω
Output Impedance	< 675 Ω
Linearity vs beam dimension ⁶	± 2.5 % with $\varnothing 70\text{mm}$ aperture ± 1.5 % with the fiber adapter
Linearity vs beam position ^{7,11}	± 4.0 % with $\varnothing 70\text{mm}$ aperture < 0.5 % with the fiber adapter
PCB electrical supply	USB or Gentec-EO monitors
Maximum current consumption	30 mA
Max output signal ²	2.0 V

Specifications subject to change without notice.

¹⁰ The angles of divergence are for use with the fiber optic adapter.

¹¹ The fiber optic adapter centers the laser beam on the detector, thus there is no contribution of linearity VS beam position.

HP...	HP125A-15KW-HD	HP125A-15KW-HD-TUBE
Back Reflections	~ 15 %	~ 2-4 %
Aperture Diameter	125 mm x 125 mm	120 mm x 120 mm detector aperture Ø 70 mm tube aperture
Tube Length	N/A	205 mm
Spectral Range	0.19 - 20 µm	
Calibrated Spectral Range ¹	0.248 – 2.5 µm and 10.6µm	
Power Noise Level	± 15 W	
Typical Rise Time (0-95%)	15 s	
Sensitivity ²	0.125 mV/W	
Calibration Uncertainty	± 5 % @ 1.064 µm & 1.070 µm	
Linearity with Power	± 2%	
Repeatability (Precision)	± 2%	
Min. Average Power (continuous) ³	500 W	
Max. Average Power (continuous)	15 000 W	
Max. Average Power (2 min.)	15 000 W	
Max. Average Power Density ⁴	16 kW/cm ² (0.5 kW) 6.5 kW/cm ² (5 kW) 3.5 kW/cm ² (10 kW) 1.5 kW/cm ² (15 kW)	
Dimension (mm)	153 (H) x 153 (W) x 71 (D)	153 (H) x 153 (W) x 272 (D)
Weight (head only)	5 kg	10 kg
Detector Cooling	Water	
Cooling flow rate	8 – 10 LPM	
Cooling flow rate stability ⁵	< ± 1 LPM/min	
Cooling temperature	15 - 25 °C	
Cooling temperature stability ⁵	< ± 3 °C/min	
Cooling pressure drop	< 15 psi / < 104 kPa	< 30 psi / < 262 kPa
Cooling maximum input pressure	60 psi / 413 kPa	
Recommended load Impedance	> 100 kΩ	
Output Impedance	< 675 Ω	
Linearity vs beam dimension ⁶	± 1.0 %	
Linearity vs beam position ⁷	± 1.0 %	
PCB electrical supply	USB or Gentec-EO monitors	
Maximum current consumption	30 mA	
Max output signal ²	2.0 V	

Specifications subject to change without notice.

HP...	HP280A-30KW-HD
Back Reflections	~ 15 %
Aperture Diameter	280 mm x 280 mm
Spectral Range	0.19 - 20 μm
Calibrated Spectral Range ¹	0.248 – 2.5 μm and 10.6 μm
Power Noise Level	± 30 W
Typical Rise Time (0-95%)	25 s
Sensitivity ²	0.065 mV/W
Calibration Uncertainty	± 5 % @ 1.064 μm & 1.070 μm
Linearity with Power	± 2 %
Repeatability (Precision)	± 2 %
Min. Average Power (continuous) ³	1 000 W
Max. Average Power (continuous)	30 000 W
Max. Average Power (2 min.)	30 000 W
Max. Average Power Density ⁴	3.5 kW/cm ² (10 kW) 1.5 kW/cm ² (15 kW) 0.2 kW/cm ² (30 kW)
Dimension (mm)	305 (H) x 324 (W) x 89 (D)
Weight (head only)	16 kg
Detector Cooling	Water
Cooling flow rate	15 – 18 LPM (0 – 30 KW) 12 – 15 LPM (0 – 10 KW)
Cooling flow rate stability ⁵	< ± 1 LPM/min
Cooling temperature	15 - 25 °C
Cooling temperature stability ⁵	< ± 3 °C/min
Cooling maximum input pressure	80 psi / 552 kPa
Recommended load Impedance	> 100 k Ω
Output Impedance	< 675 Ω
Linearity vs beam dimension ⁶	± 1.0 %
Linearity vs beam position ⁷	± 1.0 %
PCB electrical supply	USB or Gentec-EO monitors
Maximum current consumption	30 mA
Max output signal ²	2.0 V

Specifications subject to change without notice.

2 OPERATING INSTRUCTIONS

In order to ensure a long lifetime of accurate measurements, it is recommended that HP is held within the following ambient conditions:

- Storage environment temperature: 10 to 65 °C, RH < 90 %
- Operating environment temperature: 15 to 28 °C, RH < 80 %.

Condensation must not be present at anytime on the detector in operation or storage.

It is possible to store and operate your Gentec-EO UP wattmeter beyond this range. For any specific requirement, please contact your local Gentec-EO representative.

- Connect the detecting head (equipped with 3/8" or 1/2" tube push-to-connect fittings) to a water cooling supply.

NOTE: Ensure that the connection is water-tight by cutting the end of the tube perpendicular to the tubing. The portion of the outer tubing wall that slips into the fitting must not be deformed or damaged.

- To connect the detector head fittings to the water supply tubing: push the tubing into the fitting until it comes to the end.
- **The direction of flow through the head is very important. The measured power will be negative if the direction is inverted.**
- Once you have connected the fittings, check them for leaks. If you find a leak, check to see if the tubes are pushed in far enough and that the tubing has not been damaged.
- To disconnect the detector head fittings, remove the water pressure and drain the water from the tubing. Press the black part of the fitting and pull out the tubing.

NOTE: Water will usually remain in the detector head after it is disconnected. **Never used compressed air** to blow it out. Tilt the power meter with connector side down to drain the water. Be careful not to blow the water on yourself or on the detector aperture. Dry the detector body and absorber off before storing it.

- Be sure that flow rates satisfy the minimum values, as indicated on the specifications page.
- Time variations in water flow rates or water temperature will cause corresponding oscillations in measurements.
- **The water temperature and flow rate can be monitored with the PC interface.**

For the most accurate measurements, center the beam 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 70 – 90 % of the sensor's surface (this complies with the International Electrotechnical Commission standard #1040: "Power and Energy Measuring Detector..."). Refer to the calibration certificate for the exact calibration beam diameter.

WARNING:

Be careful not to exceed the maximum levels and densities stated in the specifications, refer to section 4, *Damage to the optical absorber material*, for detailed informations.

Strong fluctuations in the zero level are usually caused by one of the following :

- 1) Rapid fluctuations in water temperature.**
- 2) Rapid fluctuations in the water flow rate.**

2.1 WITH ANY GENTEC-EO MONITOR

- To operate the HP detector, connect the detector head to the input socket of the monitor (see the monitor's instruction manual).

Compatibility	HP detector powered by the monitor	External power supply required
Monitor	MAESTRO, SOLO 2, UNO, TUNER, TPM-300CE, S-LINK ETHERNET (if only one HP is used).	SOLO PE, DUO, P-LINK RS232, S-LINK ETHERNET (if two HP are used simultaneously).

- Some monitors do not supply power via the DB15 connector. To power the HP in these cases, the USB cable must be attached to a PC or other USB power supply. Contact Gentec-EO for more details.
Note that there is no advantage when using a U-LINK USB, P-LINK, or S-LINK USB with HP, because there is already a USB port on HP.
- If a extension cable is used to connect the HP to a monitor, the HP must be powered from a PC via the USB port or with an optional USB power adapter.
- Before taking measurements, block off the detector head to prevent it from sensing heat from random sources. To obtain an accurate reading, the monitors must be zero adjusted.
- Allow the detector head to thermally stabilize before making any measurements. Let the signal stabilize for a few seconds before adjusting the offset. Refer to the monitor's operating instructions for further details.

2.2 WITHOUT A GENTEC-EO MONITOR

- The HP must be powered from a PC via the USB port or with an optional USB power adapter.
- Connect the power head DB15 connector to a precision microvoltmeter, or data acquisition system, with a load impedance that is >100 kΩ. Because of the very low voltages at lower power levels for some of these detectors, analog or digital filtration may be required to remove ambient electromagnetic interference.
- Put the power head into the laser beam path (the laser beam must be contained within the sensor area) for about a minute.
- Switch on the voltmeter and adjust its voltage range to the range required for the measurement. To determine the voltage range to be measured, refer to the detector head specifications:

$$V_{out} = (\text{expected power}) \times (\text{sensitivity of power detector})$$
- Block off any laser radiation to the detector.
- Wait until the signal has stabilized, then measure the zero level voltage offset from the detector.
- Apply the laser beam to the power head.
- Wait until the signal has stabilized (between one to three minutes for optimum measurements), then measure the voltage output from the detector .
- The measured power is calculated as follows:

$$\begin{aligned} \text{Measured power [W]} &= (\text{output voltage [V]} - \text{zero level voltage [V]}) / \text{sensitivity [V/W]} \\ &= 1000 \times (V_{out} [\text{mV}] - V_{zero \text{ level}} [\text{mV}]) / \text{sensitivity [mV/W]} \end{aligned}$$

2.3 WITH PC GENTEC-EO

The PC-Gentec-EO is a user-friendly communication software specially made for Gentec-EO monitors, including the HP series. It is available for free through our website (www.gentec-eo.com). This software replaces the PC-HP which is now obsolete. The PC-Gentec-EO lets you control, visualize and save the HP's information, while saving data.

You can download the PC-Gentec-EO software. Access our website and go to the [Downloads](#) section. Click on the file name and download it to your PC. The specific actions necessary vary by browser and browser settings. After it is transferred, open the file on your PC and follow the instructions to decompress and install it.

Please refer to the PC-Gentec-EO manual also available on our website.

If you try to install the same PC-Gentec-EO version twice on your computer, you will have the following warning:

Installation Summary:
No software will be installed or removed.

In such a case, please press enter and continue using the installed version of PC-Gentec-EO.

2.3.1 Warnings

The PC Interface show cooling water status in real time.

- The flow rate and temperature are shown in white fonts in normal conditions (FIG 2.2 A).
- If the water temperature is not stable a message will appear (FIG 2.2 B).
- If the flow rate (FIG 2.3 A) or temperature (FIG 2.3 B) are too high or low the fonts will change to red as a warning that the measurements will be affected.

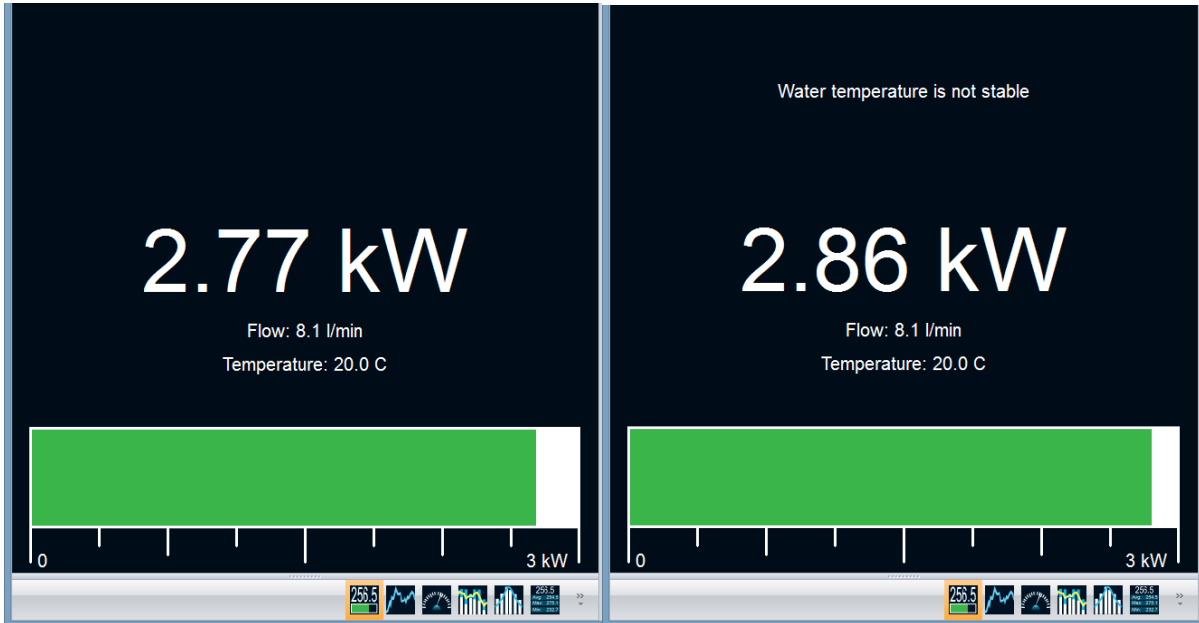


FIG. 2-2 A & B PC INTERFACE WARNINGS

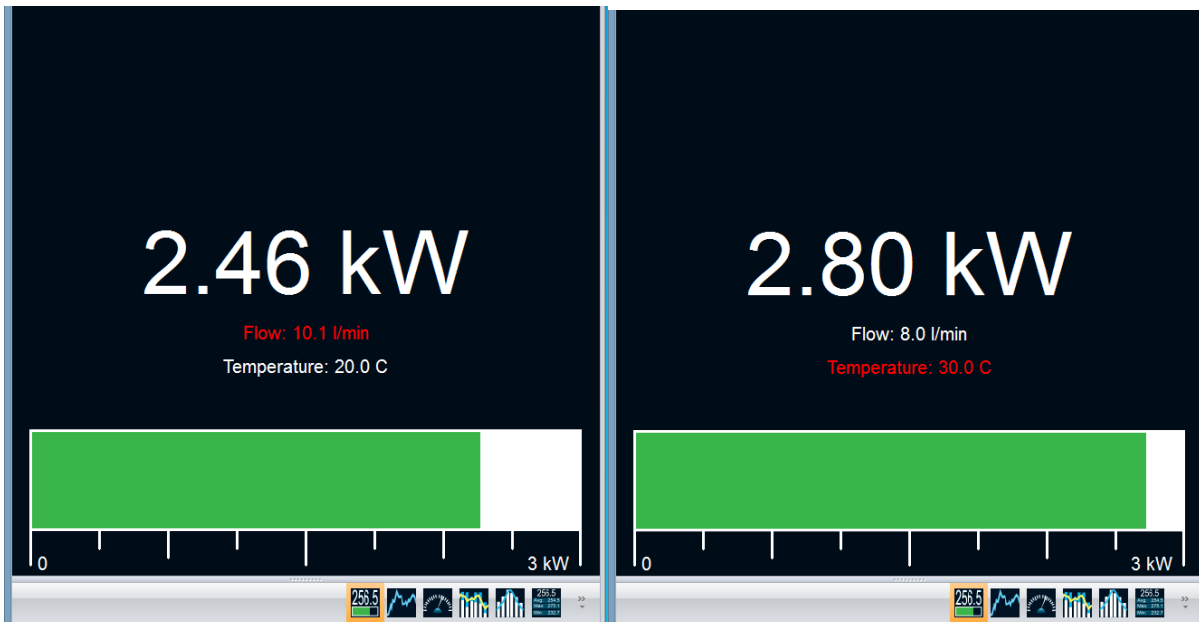


FIG. 2-3 A & B PC INTERFACE WARNINGS

2.4 VERIFY COM PORT

To verify the USB installation and find the COM port number click:

Start → Settings → Control Panel → System → Device Manager

Scroll down to Ports (COM & LPT) and double click that line. One of the options should be USB-to-Serial Port (COM#)

Note the COM port number. You need it for the next step.

2.5 USB DRIVER INSTALLATION

Plug the HP into a USB port on the PC. If the PC supports USB 1.1, Windows detects the new device and prompts you for the software drivers. A window will open that says Found New Hardware – USB Device and after several seconds to a minute, the Found New Hardware Wizard will appear.

For Windows 2000, XP or Vista: Cancel the wizard and download the “USB driver installer-r2” in the USB Driver folder from the website.

Please note that old monitors without the (R2) at the end of the product name need a different USB drivers which are available on our web site. They do not support Windows VISTA, unless noted on the web site.

At the end of this process, a new serial COM port will be added to the list of communication ports. It may be used as any other serial port. You will need to know the COM port number to set up the serial connection to the HP.

2.6 WITH SERIAL COMMANDS

There are two sets of serial commands, the legacy set and the Gentec-EO standardised serial commands set. To know which set of serial commands applies to your product, you must check the serial number. If the serial number is above 277830, you must use the Gentec-EO standardised serial commands set. If the serial number of your product is under 277830, you must use the legacy serial commands set.

For HP detector with a serial number above 277830, it is still possible to use the legacy serial commands list. All you need to do is to send the serial command *LGM and the device will only accept the legacy serial commands. To return to the standard serial commands list, you need to send the serial command *STM. Note that removing the electrical power from the HP detector will revert the PCB to the standard serial commands list.

If your HP uses the legacy serial commands set, it will automatically send out the data. If your HP uses the Gentec-EO standardised serial commands set, you need to send the serial command *CAU to receive measurement data.

The HP sends the measurement data in the following format:

Data	ID	Units
Power	Pw=	Watts
Water Temperature	Ti=	Celsius
Water Flow	F=	Liters per minute

Example) Pw= 0.0 Ti= 20.000 F= 0.000

HP communication parameters:

- a. Bits per second: 57600
- b. Data bits : 8
- c. Parity: None
- d. Stop bits: 1
- e. Flow control: None

Legacy Serial Commands List:

The star (*) is part of each command and the commands are case sensitive. Please note that you must type the exact number of characters or numerical values required and don't put any space between characters or numerical values.

Command	Description	Applies to
*RST	Hardware Reset The HP will return to default settings.	USB and DB-15 connector
*VER	Returns information about HP type and firmware version Example: HP__A-_KW-H_, Version X.XX.XX	USB only
*F01	Returns information about HP Serial number, calibration wavelength (nm), DB15 sensitivity (mV/W) Example: SerialNumber: 123456, Lambda : 1064, Sensitivity: 0.X00000	USB only
*F02	Returns information about HP current status Current wavelength (nm), Thermal offset (W), Offset factor (W), Multiplication factor and Anticipation status (On/Off). Example: Wavelength: 1064, Thermal Offset : 0, Offset : 0, Multiplier : 1, Anticipation: On	USB only
*PWC	To set the Wavelength Wavelength correction command (5+ characters). Example : *PWC00808 to selects the wavelength 808 nm	USB only
*OFF	Sets the thermal (zero) offset	USB only
*MUL	Modifies the multiplication factor (+ 8 characters) Example : *MUL1.00E+01 selects a multiplication factor of 10 *MUL10.00000 selects a multiplication factor of 10	USB only
*ADD	Modifies the offset factor (8 characters) Example : *OFF2.00E+02 selects a user offset of +200 watts *OFF-200.000 selects a user offset of -200 watts	USB only
*ANE	Enable the anticipation (default)	USB and DB-15 connector
*AND	Disable the Anticipation	USB and DB-15 connector
*CVU	Stop the HP to send data automatically (push mode) and returns a single measurement	USB only

	Example : *CVU Pw= 0.0 Ti= 20.000 F= 0.000	
--	--	--

Gentec-EO standardised serial commands list :

Please refer to the HP-Blu manual 205216 to retrieve the standardised serial commands list.

3 SAFETY OPERATION NOTES

3.1 Diffusive surfaces

When using the HP be aware of the diffused back reflection (~ 10-15% for most models, see the table of specifications for more details).

As on any diffusive surface, the light on the sensor coating is scattered more or less uniformly as a Lambertian diffuser.

3.2 Detector temperature

Detectors can become hot enough during usage to cause burns.

4 DAMAGE TO THE OPTICAL ABSORBER MATERIAL

The HP series are high power meters that can measure up to 15KW. The beam diameter should always be as large as possible to avoid damage to the absorber. **We recommend between 50 % and 80 % of the head aperture area**, e.g. 7 cm in diameter for the HP100A, 2.5 cm in diameter for the HP60A-10KW/15KW-GD.

The damage threshold is decreasing with the laser beam power. The following table calculates the diameter corresponding to the damage threshold for a Gaussian beam profile. The “minimum 1/e² beam diameter” is calculated to obtain a peak intensity 50% lower than the damage threshold and should be considered as the “safe” minimum diameter. If there are “hot spots” in the beam profile, they must be considered in the calculation of the peak intensity. The damage threshold is valid at a wavelength of 1.064, 1.070, 1.080 and 10.6µm.

Laser	HP100A-4KW-HE	
	HP100A-4KW-HE-TUBE	
Beam Power [kW]	Damage Threshold ¹² [kW/cm ²]	Min. 1/e ² Beam Diam ^{13 14} [cm]
0.5	10	1.0 ¹⁵
1	8	1.0 ¹⁵
2	6	1.3
3	5	1.8
4	4	2.3

Laser	HP60A-10KW-GD (Beam diameter < Ø 50 mm) SN > 276600		HP60A-10KW-GD (Beam diameter < Ø 35 mm) SN ≤ 276600	
	Damage Threshold ¹² [kW/cm ²]	Min. 1/e ² Beam Diam ^{13 14} [cm]	Damage Threshold ¹² [kW/cm ²]	Min. 1/e ² Beam Diam ^{13 14} [cm]
0.5	80	0.6 ¹⁵	40	0.6 ¹⁵
1	70	0.6 ¹⁵	35	0.6 ¹⁵
2	60	0.6 ¹⁵	30	0.6
3	50	0.6	25	0.8
4	40	0.7	20	1.0
6	30	1.0	15	1.4
8	25	1.3	12	1.8
10	20	1.6	10	2.3

¹² Peak Intensity.

¹³ Diameter of a circle corresponding to 86% of the entire beam power.

¹⁴ For Gaussian beam profile, the peak intensity is twice the beam power. Including a security factor of 50%

¹⁵ Minimum beam diameter corresponding to 10% of aperture diameter.

Laser	HP60A-15KW-GD HP60A-15KW-GD-TUBE HP60A-15KW-GD-QBH (Beam diameter < Ø 50 mm)		HP60A-15KW-GD HP60A-15KW-GD-TUBE HP60A-15KW-GD-QBH (Beam diameter > Ø 50 mm)	
	Beam Power [kW]	Damage Threshold ¹² [kW/cm ²]	Min. 1/e ² Beam Diam ^{13 14} [cm]	Damage Threshold ¹² [kW/cm ²]
0.5	80	0.6 ¹⁵	16	-
1	70	0.6 ¹⁵	14	-
2	60	0.6 ¹⁵	12	-
3	50	0.6	9.7	-
4	40	0.7	7.9	-
6	30	1.0	5.6	-
8	25	1.3	4.3	-
10	20	1.6	3.5	-
12	15	2.0	2.5	-
15	10	2.8	1.5	5.4 ¹⁶

Laser	HP100A-12KW-HD HP100A-12KW-HD-TUBE		HP125A-15KW-HD HP125A-15KW-HD-TUBE	
	Beam Power [kW]	Damage Threshold ¹² [kW/cm ²]	Min. 1/e ² Beam Diam ^{13 14} [cm]	Damage Threshold ¹² [kW/cm ²]
0.5	16	1.0 ¹⁵	16	1.25 ¹⁵
1	14	1.0 ¹⁵	14	1.25 ¹⁵
2	12	1.0 ¹⁵	12	1.25 ¹⁵
3	9.7	1.3	9.7	1.3
4	7.9	1.6	7.9	1.6
6	5.6	2.3	5.6	2.3
8	4.3	3.1	4.3	3.1
10	3.5	3.8	3.5	3.8
12	2.5	4.9	2.5	4.9
15	-	-	1.5	7.1

Laser	HP280A-30KW-HD	
Beam Power [kW]	Damage Threshold ¹² [kW/cm ²]	Min. 1/e ² Beam Diam ^{13 14 17} [cm]
5	6.5	2.8 ¹⁵
10	3.5	3.5
15	1.5	6.5
20	0.50	13.0
25	0.25	20.6
30	0.20	25.2

In the event of major damage to the coating, the HP Series sensors can be recoated. Contact your local Gentec-EO representative for information on repair and recalibration. See p. ii **Contacting Gentec Electro-Optics Inc.**

¹⁶ Maximum beam diameter corresponding to 80% of aperture area or 90% of aperture diameter.

¹⁷ Including a security factor of 40%.

5 CE MARK DECLARATION OF CONFORMITY

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

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

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

Type of Equipment: Laser Power Detector
 Model No.: HP Series
 Year of test & manufacture: 2008

Emissions:

Product Standard	Test Standard	Description
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012)	CISPR 11:+A1:2010 Class A	Radiated Emissions
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012)	Radiated Emissions FCC part 15 2013) subpart B	Radiated Emissions

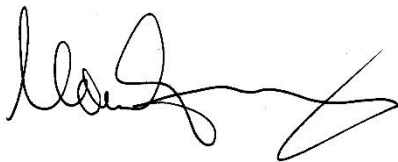
Immunity:

Product Standard	Test Standard	Description	Performance Criteria
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012)	IEC 61000-4-2:2008Ed.2	Electrostatic Discharge Immunity	Criteria B
EN 61326-1_Ed2:2013 (IEC 61326-1_Ed2:2012)	IEC 61000-4-3:2006+A1:2007+A2:2010	RF Conducted Immunity	Criteria A

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

Place: Québec (Québec)

Date : January 20, 2017



 (President)

Appendix A: WEEE directive**- Recycling and separation procedure for WEEE directive 2002/96/EC:**

This section is used by the recycling center when the detector reaches the end of its 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 calibration certificate

- Separation:

Paper : Manual and certificate

Wires: Detector cable.

Printed circuit boards:

Inside the detector

DB-15, no need to separate (less than 10 cm²).

Aluminum: Detector casing.

Plastic: Parts inside the detector.

LEADER IN LASER BEAM MEASUREMENT SINCE 1972



POWER & ENERGY METERS



BEAM PROFILING



THZ MEASUREMENT

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