USER MANUAL

HP Series | High Power Detectors

gentec-eo
PARTNERS for ACCURACY

121-101761

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 request:

https://www.gentec-eo.com/contact-us/support-rma-request

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 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 laser power is applied. The surfaces of 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 their 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.

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1. HP Series Power Detectors

1.1. Included with your HP

The following items are included with HP series power detectors:

Description	Part name	Part number
HP series power detector with 2 m DB15 cable		
Protective cover		
Calibration certificate		
Personal Wavelength Correction™ certificate		
Carrying case		
5 m USB cable		
Metric adaptor for water fittings (-MET models only)	Varies	Varies

The following items can be purchased separately:

Description	Part name	Part number
Water filter, imperial	HP-WF-IMP	202990
Water filter, metric	HP-WF-MET	202984
Metric adaptors for water fittings (3/8 to 10 mm) 2 pcs.	HP-W-ADAPTOR-IMP/MET	201993
Metric adaptors for water fittings (1/2 to 12 mm) 2 pcs.		205327
Stand	See website	See website

The following transport cases are available:

Instrument	Included transport case	Optional transport case
HP100A	Standard case	Rigid lockable case PEL1450
HP100A-TUBE	Standard case	Rigid lockable case PEL1550
HP60A-10KW	Standard case	Rigid lockable case PEL1450
HP60A-15KW	Rigid lockable case BOX-380H160	
HP60A-15KW-TUBE	Rigid lockable case BOX-505	
HP125A	Standard case	Rigid lockable case PEL1450
HP125A-TUBE	Rigid lockable case BOX-505	
HP280A	Wood crate	Rigid lockable case, without wheels PEL1600 Rigid lockable case, with wheels PEL1630

1.2. Introduction

To obtain full performance from your HP, we recommend that you read this manual carefully.

Gentec-EO HP series laser power meters are precision laser instruments for measuring high laser powers. These specialized instruments provide accurate optical power measurements for demanding high power applications. Using Gentec-EO proprietary calorimetric measurement, excellent accuracy is attained across a wide range of laser powers.

1.3. Connectors

1.3.1. DB-15 "Intelligent" connector

The DB-15 male "intelligent" connector contains an EEPROM (Electrically Erasable Programmable Read-Only Memory) with information related to the HP Series detector head in use: detector model, calibration sensitivity, applicable scales and wavelength correction factors for the entire usable range of wavelengths.

This connector allows the U-LINK, S-LINK, SOLO 2, UNO, TUNER, and MAESTRO 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.

Please note the limitations on maximum measurable power when using the DB-15 connector.

Monitor	Maximum measurable power
S-LINK	10 kW
SOLO 2	10 kW
TUNER	10 kW
MAESTRO	30 kW
UNO	100 kW
U-LINK	100 kW

The DB-15 connector pin-out is as follows:

5 - Analog output signal +
6 - Analog output signal –
Shell - shield ground

All other pins are reserved and may be internally connected. If you are using your own instrumentation via the DB-15 connector, the HP must be powered by USB.

1.3.2. USB connector

The USB connector is used to provide power to the HP and allows communication with a PC. The PC software, PC-Gentec-EO, features statistical calculation, graphical displays and data logging options. It also gives real time measurement of the cooling fluid 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.

1.3.3. Analog output and DC power supply

Custom-order options are available for both a DC power input and an analog signal output. The allowable DC power input range is from 12 – 24 V. Many different connectors are available including barrel jacks or industrial M12 options.

A programmable output allows an analog signal up to 12 V, with sensitivity adjustable at the factory. This configuration is only possible if the external power supply option is selected as well. The maximum analog output voltage is the lesser of 12 V or the input power voltage minus 3 V. For example, if you are using a 12

V power supply, the maximum analog signal will be 9 V. The sensitivity of the signal can be set to a pre-programmed value and/or can be adjusted via serial commands. Contact Gentec-EO for details.

1.3.4. RS232

HPs can be ordered with optional RS232 output. Contact Gentec-EO for details.

1.3.5. Cooling water

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

- MET suffix detectors include metric fitting adaptors.
- Fittings must be used with plastic pressure tube systems (like PE or Nylon tubes).
- Fittings are not compatible with copper or stainless-steel tubes.
- The metric versions of the HP are supplied with an adapter kit, as the fittings on HP are imperial.
  - The kit contains two push-to-connect tube adapters and two 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 (10mm, 3/8", 12mm 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. Contact us if you intend to use different fluids.
- Use filtered (< 50µm) water to avoid any residue.
- Gentec-EO can provide an external water filter if water quality is an issue.

  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 kΩ-cm (1000 Ω-m)
- 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. Different coatings are available for 10 kW to 30 kW, contact Gentec-EO for details.
- If an algicide must be used in the chiller, we recommend 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 remain 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 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 a function of water flow. Variations 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. All parameters should remain in the ranges stated in the specifications.

1.4. HP series specifications

The following specifications are based on a one-year calibration cycle, an operating temperature of 18 to 28°C (64 to 82F) and a relative humidity not exceeding 80%.

Specifications are subject to change without notice.

1.4.1. General specifications

	DB15 connector
Recommended load Impedance	> 100 kΩ
Output Impedance	< 675 Ω
Max output signal [2]	2.0 V
	Electrical specifications
PCB electrical supply	USB or Gentec-EO monitors
Maximum current consumption	30 mA
USB / RS232 measurement rate	10 Hz

1.4.2. HP100A-4KW-HE

	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	0.248 – 2.1 µm	
Available Extra Calibrated Ranges [1]	2.1 µm – 2.5 µm OR 10.6 µm	
Power Noise Level	± 3 W	
Typical Rise Time (0 – 95 %) [12]	7 s	
Natural Rise Time (0 – 95 %)	53 s	
Sensitivity (DB-15 output) [2]	0.4 mV/W	
Calibration Uncertainty	± 5 % @ 1.064 µm & 1.070 µm	
Linearity with Power	± 1.5 %	± 2%
Repeatability (Precision)	± 2%	
Linearity vs beam dimension [6]	± 1.0 %	
Linearity vs beam position [7]	± 1.7 %	
Min. Average Power (continuous) [3]	100 W	
Max. Average Power (continuous)	4 000 W	
Max. Average Power (2 min.)	4 500 W	
Max. Average Power Density [4]	10 kW/cm² @ 0.5 kW 6 kW/cm² @ 2 kW 4 kW/cm² @ 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
	Coolant circuit	
Coolant fluid	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	
Fluid fitting push-in tube size	3/8” OD	
Cooling pressure drop	< 6 psi / < 41 kPa	< 15 psi / < 103 kPa
Cooling maximum input pressure	60 psi / 413 kPa	

1.4.3. HP100A-12KW-HD

	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	0.248 – 2.1 µm	
Available Extra Calibrated Ranges [1]	2.1 µm – 2.5 µm OR 10.6µm	
Power Noise Level	± 10 W	
Typical Rise Time (0 – 95 %) [12]	9 s	
Natural Rise Time (0 – 95 %)	37 s	
Sensitivity (DB-15 output) [2]	0.15 mV/W	
Calibration Uncertainty	± 5 % @ 1.064 µm & 1.070 µm	
Linearity with Power	± 2%	
Repeatability (Precision)	± 2%	
Linearity vs beam dimension [6]	± 1.0 %	
Linearity vs beam position [7]	± 1.7 %	
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/cm² @ 0.5 kW 6.5 kW/cm² @ 5 kW 3.5 kW/cm² @ 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
	Coolant circuit	
Coolant fluid	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	
Fluid fitting push-in tube size	3/8" OD	
Cooling pressure drop	< 11 psi / < 75 kPa	< 20 psi < / 138 kPa
Cooling maximum input pressure	60 psi / 413 kPa	

1.4.4. HP60A-10KW-GD

	HP60A-10KW-GD
Back Reflections	~ 10 %
Aperture Diameter	60 mm conical Optimized for 35 mm
Spectral Range	0.8 - 12 µm
Calibrated Spectral Range	0.8 – 2.1 µm
Available Extra Calibrated Ranges [1]	2.1 µm – 2.5 µm OR 10.6µm
Power Noise Level	± 10 W
Typical Rise Time (0 – 95 %) [12]	12 s
Natural Rise Time (0 – 95 %)	82 s
Sensitivity (DB-15 output) [2]	0.2 mV/W
Calibration Uncertainty	± 5 % @ 1.064 µm & 1.070 µm
Linearity with Power	± 2%
Repeatability (Precision)	± 2%
Linearity vs beam dimension [6]	± 2.0 %
Linearity vs beam position [7]	± 3.0 % [9]
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/cm² @ 10 kW [8]
Dimension (mm)	127 (H) x 127 (W) x 95 (D)
Weight (head only)	6 kg
	Coolant circuit
Coolant fluid	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
Fluid fitting push-in tube size	3/8" OD
Cooling pressure drop	< 10 psi / < 75 kPa
Cooling maximum input pressure	60 psi / 413 kPa

1.4.5. HP60A-15KW-GD

	HP60A-15KW-GD	HP60A-15KW-GD-TUBE
Back Reflections	~ 5-10 %	1-2 % with Ø 70 mm aperture
Aperture Diameter	Ø 60 mm conical Optimized for Ø 50 mm	Ø 60 mm detector aperture Ø 70 mm tube aperture Optimized for Ø 50 mm
Tube length	N/A	205 mm
Spectral Range	0.8 - 12 µm	
Calibrated Spectral Range	0.8 – 2.1 µm	
Available Extra Calibrated Ranges [1]	2.1 µm – 2.5 µm OR 10.6µm	
Power Noise Level	± 15 W	
Typical Rise Time (0 – 95 %) [12]	15 s	
Natural Rise Time (0 – 95 %)	86 s	
Sensitivity (DB-15 output) [2]	0.125 mV/W	
Calibration Uncertainty	± 5 % @ 1.064 µm & 1.070 µm	
Linearity with Power	± 2%	
Repeatability (Precision)	± 2%	
Linearity vs beam dimension [6]	± 2.5 %	
Linearity vs beam position [7]	± 4.0 %	
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]	< Ø 50 mm 10 kW/cm² @ 15 kW > Ø 50 mm 1.5 kW/cm² @ 15 kW	
	Coolant circuit	
Coolant fluid	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	
Fluid fitting push-in tube size	3/8” OD	
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

1.4.6. HP60A-15KW-GD-QBH

	HP60A-15KW-GD-QBH
Back Reflections	1-2 % with Ø 70 mm aperture and fiber adaptor
Aperture Diameter	Ø 60mm detector aperture Ø 70mm 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	0.8 – 2.1 µm
Available Extra Calibrated Ranges [1]	2.1 µm – 2.5 µm OR 10.6µm
Power Noise Level	± 15 W
Typical Rise Time (0 – 95 %) [12]	15 s
Natural Rise Time (0 – 95 %)	86 s
Sensitivity (DB-15 output) [2]	0.125 mV/W
Calibration Uncertainty	± 5 % @ 1.064 µm & 1.070 µm
Linearity with Power	± 2 %
Repeatability (Precision)	± 2 %
Linearity vs beam dimension [6]	± 2.5 % with Ø 70mm aperture ± 1.5 % with the fiber adapter
Linearity vs beam position [11]	± 4.0 % with Ø 70mm aperture < 0.5 % with the fiber adapter
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]	< Ø 50 mm 10 kW/cm² @ 15 kW > Ø 50 mm 1.5 kW/cm² @15 kW
Dimension (mm)	153 (H) x 153 (W) x 391 (D)
Weight (head only)	16 kg
	Coolant circuit
Coolant fluid	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
Fluid fitting push-in tube size	3/8" OD
Cooling pressure drop	< 27 psi / < 262 kPa
Cooling maximum input pressure	60 psi / 413 kPa

1.4.7. HP125A-15KW-HD

	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	0.248 – 2.1 µm	
Available Extra Calibrated Ranges [1]	2.1 µm – 2.5 µm OR 10.6µm	
Power Noise Level	± 15 W	
Typical Rise Time (0 – 95 %) [12]	15 s	
Natural Rise Time (0 – 95 %)	34 s	
Sensitivity (DB-15 output) [2]	0.125 mV/W	
Calibration Uncertainty	± 5 % @ 1.064 µm & 1.070 µm	
Linearity with Power	± 2 %	
Repeatability (Precision)	± 2 %	
Linearity vs beam dimension [6]	± 1.0 %	
Linearity vs beam position [7]	± 1.0 %	
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/cm² @ 0.5 kW 6.5 kW/cm² @ 5 kW 3.5 kW/cm² @ 10 kW 1.5 kW/cm² @ 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
	Coolant circuit	
Coolant fluid	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	
Fluid fitting push-in tube size	3/8” OD	
Cooling pressure drop	< 15 psi / < 104 kPa	< 30 psi / < 262 kPa
Cooling maximum input pressure	60 psi / 413 kPa	

1.4.8. HP280A-30KW-HD

	HP280A-30KW-HD
Back Reflections	~ 15 %
Aperture Diameter	280 mm x 280 mm
Spectral Range	0.19 – 20 µm
Calibrated Spectral Range	1.064 – 1.070 µm
Available Extra Calibrated Ranges [1]	0.248 – 2.1 µm 2.1 µm – 2.5 µm
Power Noise Level	± 30 W
Typical Rise Time (0 – 95 %) [12]	25 s
Natural Rise Time (0 – 95 %)	49 s
Sensitivity (DB-15 output) [2]	0.065 mV/W
Calibration Uncertainty	± 5 % @ 1.064 µm & 1.070 µm
Linearity with Power	± 2 %
Repeatability (Precision)	± 2 %
Linearity vs beam dimension [6]	± 1.0 %
Linearity vs beam position [7]	± 1.0 %
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/cm² @ 10 kW 1.5 kW/cm² @ 15 kW 0.2 kW/cm² @ 30 kW
Dimension (mm)	305 (H) x 324 (W) x 89 (D)
Weight (head only)	16 kg
	Coolant circuit
Coolant fluid	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
Fluid fitting push-in tube size	1/2" OD
Cooling maximum input pressure	80 psi / 552 kPa

1.4.9. Footnotes

1. Both options will incur additional charges. It is not possible to have both 2.1 µm to 2.5 µm and 10.6 µm calibration added to a single detector. Contact a Gentec-EO representative to learn more about these calibration options or get a quote.
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 the sections on safe operation and optical damage for more details on the appropriate beam size as a function of measured power.
5. These specifications are for gradual changes over a period > 1 minute. Abrupt changes may affect measurements.
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.
8. For the HP60A-10KW-GD with serial number inferior to 276600, the maximum average power density is 10 kW/cm^2 (10 kW).
9. For a beam size of 10 % of the aperture area, moved across a circle of Ø35 mm.
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.
12. With anticipation algorithm. This algorithm is enabled by default.

2. Operating instructions

- 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 bottoms out.
- The direction of flow through the head is very important. Incorrect flow direction will destroy the detector.
- 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. Push in 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 the 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. 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 the section on optical absorber damage for detailed information.

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 a Gentec-EO Monitor (DB-15)

To use the HP, connect the instrument to the DB-15 input socket of the laser power monitor (see the monitor’s instruction manual). **Note that when using the DB-15 output, the water flow and temperature measurements are unavailable.** These data are only available through USB or RS232.

Some monitors do not supply power via the DB-15 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.

	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) U-LINK RS232	SOLO PE DUO S-LINK ETHERNET (if two HP are used simultaneously) P-LINK RS232

Note that there is no advantage when using a U-LINK USB, P-LINK USB, or S-LINK USB with HP, because there is already a USB port on HP.

If a DB-15 extension cable is used to connect the HP to a monitor, the HP must be powered via the USB port.

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.

Please note that some monitors have limitations on maximum measurable power. Refer to the connector section for more details.

2.2. PC-Gentec-EO Software

PC-Gentec-EO is a user-friendly communication software specially made for Gentec-EO monitors, including the HP series. PC-Gentec-EO lets you control, visualize and save the HP's information, while saving data.

Start by installing the drivers for your HP. All drivers are included in one installation package. Please find the latest version on our website (https://www.gentec-eo.com/resources/download-center) in the Resources / Download Center section.

After the download is completed, follow the instructions of the installer. The PC might need to reboot after installation.

Also available in the Download Center is PC-Gentec-EO. Download and run the installer to install the software on your PC. Please refer to the PC-Gentec-EO manual also available on our website.
HP can be connected to your PC either via USB or by the optional RS-232 connection.

3. Serial commands

Serial commands can be used to control your HP using a terminal emulator or your own automation software. Configurations are not saved in permanent (non-volatile) memory. Default settings are restored when power is removed.

Two sets of serial command sets exist in HP products. The legacy serial command set is supported by detectors with serial number 277830 and below. Newer detectors support a standardized serial command set that share common commands across several Gentec-EO products.

For HP detector with a serial number above 277830, it is still possible to use the legacy serial command set. Send the serial command *LGM and the device will revert to the legacy serial command set. To return to the standard serial commands, send the command *STM. Note that removing the electrical power from the HP detector will revert the detector to the new serial commands.

If your HP uses the legacy serial command set, it will automatically send 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 star (*) is part of each command and the commands are case sensitive. Please note that you must enter the exact number of characters and numerical values required. Don't put any space between characters or numerical values. A carriage return (enter) is not required at the end of a command.

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= 506.6 Ti= 23.081 F= 6.163

A 506.6 W reading at 23.081 °C and 6.163 LPM

Use your favourite serial terminal emulator to connect to the COM port. Some example serial terminal programs are:

- CoolTerm: https://freeware.the-meiers.org/
- PuTTY: http://www.putty.org/
- RealTerm: https://realterm.sourceforge.io/

If you need to know the COM port number, you can find it in the Windows device manager.

Use the following communication parameter settings:

	HP < 277830	HP > 277830
Bits per second	57600	Any setting
Data bits	8	Any setting
Parity	None	Any setting
Stop bits	1	Any setting
Flow control	None	Any setting

3.1. Serial numbers below 277830

Command	Description
*RST	Hardware Reset The HP will return to default settings.
*VER	Returns information about HP type and firmware version Example: HP__A-_KW-H_, Version X.XX.XX
*F01	Returns information about HP Serial number, calibration wavelength (nm), DB15 sensitivity (mV/W) Example: SerialNumber: 123456, Lambda : 1064, Sensitivity: 0.X00000
*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
*PWC	Set wavelength Wavelength correction command (5+ characters). Example : *PWC00808 to selects the wavelength 808 nm
*OFF	Sets the thermal (zero) offset
*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
*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
*ANE	Enable anticipation (default) Note this will also affect the signal on the DB-15 connector.
*AND	Disable Anticipation Note this will also affect the signal on the DB-15 connector.
*CAU	Start automatic sending of data
*CVU	Stop automatic sending of data and return a single measurement Example : *CVU Pw= 0.0 Ti= 20.000 F= 0.000
*CSU	Stop automatic sending of data

3.2. Serial numbers above 277830

The following serial commands are available.

Command	Command Name	Description
DATA ACQUISITION		
*CVU	Query Current Value	Gets the current power measurement in ASCII

*CAU	Send Continuous Transmission of Data	Continuously sends the power measurement in ASCII or binary to the serial port at the measurement sample rate
*CSU	Stop the CAU Command	Stops the *CAU output
SETUP		
*PWC	Set Personal Wavelength Correction in nm	Specifies the wavelength in nm
*PWM	Set Personal Wavelength Correction in microns	Specifies the wavelength in microns
*GWL	Get Wavelength	Returns the wavelength in nm
CONTROL		
*ANE	Set Anticipation	Turns the anticipation algorithm on
*AND	Clear anticipation	Turns the anticipation algorithm off
*GAN	Get Anticipation Status	Returns the anticipation status
*SOU	Set Zero Offset	Zeroes the reading
*COU	Clear Zero Offset	Undoes the zeroing of the reading for a power detector
*GZO	Get Zero Offset	Returns the zero-offset power value
*MUL	Set User Multiplier	Sets the multiplier value
*GUM	Get User Multiplier	Returns the current multiplier value
*OFF	Set User Offset	Sets the offset value
*GUO	Get User Offset	Returns the current offset value
INSTRUMENT AND DETECTOR INFORMATION		
*VER	Query Version	Gets firmware version of the monitor
*STS	Query Status	Retrieves the HP status structure
*GFW	Query firmware version	Return firmware identification number

3.3. Detailed description of the serial commands

3.3.1 Data Acquisition

*CVU - Query Current Value

This command is used to query the three values that are currently being measured by the monitor. The three values are the power measurement in Watts, the water temperature at the intake pipe in °C, and the water flow in litres per minute (LPM).

Command	Parameters	Answer
CVU	None	Power measurement, water input temperature, water flow

Example

For example, a 506.6 W reading at 23.081 °C and 6.163 LPM

would be displayed like this:

Command: *CVU	Answer: Pw= 506.6 Ti= 23.081 F= 6.163

*CAU - Send Continuous Transmission of Data

This command is used to send the measurement data continuously (see command *CVU). The data will arrive at 10 Hz. The command *CSU stops the continuous transmission of measurement data.

Command	Parameters	Answer
CAU	None	Power measurement, water input temperature, water flow

Example

For example, a reading of 506.6 W at 23.081 °C and 6.163 LPM would be displayed like this until the command *CSU is sent:

Command: *CAU	Answer: Pw= 506.6 Ti= 23.081 F= 6.213<CR><LF> Pw= 504.8 Ti= 23.120 F= 6.152<CR><LF> Pw= 506.9 Ti= 23.121 F= 6.168<CR><LF> Pw= 507.1 Ti= 23.098 F= 6.122<CR><LF> Pw= 505.9 Ti= 23.085 F= 6.118<CR><LF> Pw= 506.8 Ti= 23.113 F= 6.315<CR><LF> ...

*CSU - Stop the CAU Command

This command is used to stop the real time transfer enabled by the CAU command.

Command	Parameters	Answer
CSU	None	ACK

3.3.2 Setup

*PWC - Set Personal Wavelength Correction in nm

This command is used to specify the wavelength in nm being used on the HP. The internal memory contains measured spectral data for a wide range of wavelengths. A valid value is set between the lowest and highest wavelengths supported by the device, and it should not be a floating-point value. The input parameter must have 5 digits. If the desired wavelength does not have 5 digits you must enter a zero-padded number. For example, to set the wavelength at 514 nm, you must enter 00514.

Specifying zero as a wavelength or providing an out-of-bound value as a parameter has no effect.

Command	Parameters	Answer
PWC	Wavelength nm (5 digits)	Active wavelength and correction factor

Default: Calibration wavelength, (typically 1064 nm)

Example

The following example sets the wavelength to 1550 nm.

Command: *PWC01550	Answer: Wavelength = 1550.000000 nm, factor = 1.000000<CR><LF>

*PWM - Set Personal Wavelength Correction in microns

This command is used to specify the wavelength in microns. The internal memory contains measured spectral data for a wide range of wavelengths. A valid value is set between the lowest and highest wavelengths supported by the device. The input parameter must have 5 digits and can be a floating-point value. If the desired wavelength does not have 5 digits you must enter a zero-padded number. For example, to set the wavelength at 10.6 micron, you must enter 010.6. Please note that the resolution is limited as follows:

Wavelength Range	Resolution limit
Less than 100 µm	10 nm
Greater than 99.99 µm or less than 1000 µm	100 nm
Greater than 999.9um	1 µm

Specifying zero as a wavelength or providing an out-of-bound value as a parameter has no effect.

Command	Parameters	Answer
PWM	Wavelength µm (5 digits)	Active wavelength and correction factor

Default: Calibration wavelength, (typically 1064 nm)

Example

The following example sets the wavelength to 25 microns (25000 nm).

Command: *PWM025.0	Answer: Wavelength = 25000.000000 nm, factor = 1.000000<CR><LF>

*GWL - Get Wavelength

This command returns the wavelength setting in nm.

Command	Parameters	Answer
GWL	None	Returns the wavelength in nm

Example

Command: *GWL	Answer: 1064.000000 nm<CR><LF>

3.3.3 Control

*ANE - Set Anticipation

This command is used to enable the anticipation algorithm. Please see section 1.3.9 for more details on the anticipation algorithm and how it affects the power measurement.

Command	Parameters	Answer
ANE	None	None

Default: On

Example

The following example sets the anticipation On.

Command: *ANE	Answer:

*AND – Clear Anticipation

This command is used to disable the anticipation algorithm. Please see section 1.3.9 for more details on the anticipation algorithm and how it affects the power measurement.

Command	Parameters	Answer
AND	None	None

Default: On

Example

The following example sets the anticipation Off.

Command: *AND	Answer:

*GAN - Get Anticipation Status

This command returns the anticipation status.

Command	Parameters	Answer
GAN	None	on or off

Example

Command: *GAN	Answer: Anticipation on<CR><LF>

*SOU - Set Zero Offset

This command subtracts the current value from all future measurements the moment the command is issued to set a new zero point.

Command	Parameters	Answer
SOU	None	Zero value

Example

Command: *SOU	Answer: Zero value = 253.120000 W<CR><LF>

*COU - Clear Zero Offset

This command undoes the zero offset command to set the zero point at zero.

Command	Parameters	Answer
COU	None	Zero value

*GZO - Get Zero Offset

This command returns the zero offset power value.

Command	Parameters	Answer
GZO	None	Zero Value

Example

Command: *GZO	Answer: Zero Value = 1619.352000 W<CR><LF>

*MUL - Set User Multiplier

This command is used to set the value of the user-specified multiplier. Note that the multiplier cannot be set at 0.

Command	Parameters	Answer
MUL	8-character numerical value	Multiplication factor

Default: 1

Example

The following example sets multiplier = 33

Command: *MUL00000033 Or *MUL3.3000e1	Answer: Multiplication factor = 33.000000<CR><LF>

*GUM - Get User Multiplier

This command returns the multiplier value.

Command	Parameters	Answer
GUM	None	Current multiplier value

Example

Command: *GUM	Answer: Multiplication factor = 33.000000<CR><LF>

*OFF - Set User Offset

This command is used to set the value of the user-specified offset.

Command	Parameters	Answer
OFF	8-character numerical value	None

Default: 0

Example

The following example sets the offset to 500 W

Command: *OFF500.0000 or *OFF5.0000e2	Answer: Offset factor = 500.000000<CR><LF>

The other option available is the zero offset. The zero offset operation is done first, before the User Multiplier and User Offset are added to the calculation.

***GUO - Get User Offset**

This command returns the offset value.

Command	Parameters	Answer
GUO	None	Current offset value

Example

Command: *GUO	Answer: Offset factor: 500.000000<CR><LF>

3.3.4 Instrument and Detector Information

***VER - Query Version**

This command is used to query the device to get information about the firmware version and the HP model.

Command	Parameters	Answer
VER	None	Version and device type

Example

Command: *VER	Answer: HP100A-12KW-HD Version 1.00.00<CR><LF>

***STS - Query Status**

This command is used to query the device to get supplementary information.

Command	Parameters	Answer
STS	None	A hexadecimal structure described in the table below.

The first byte represents the validity of the structure: 0 represents a valid line while 1 is the end of the structure. The next 4 bytes represent the address line and the last 4 bytes are the actual value. The values are written on 32 bits, which means that all the values are written on two lines. The first line represents the LSB and the second line represents the MSB.

The following table shows the output with an HP100A-12KW-HD

STS command data structure

Hexadecimal Structure			Converted Value	Definition
Valid	Address	Value		
:0	0000	0002	2	Reserved
:0	0001	0428	1064	Current wavelength in nanometers
:0	0002	0001	1	Anticipation algorithm enabled
:0	0003	0000	0	Reserved
:0	0004	0000	0	Reserved
:0	0005	0000	0	Reserved
:0	0006	0000	0	Reserved
:0	0007	0000	0	Reserved
:0	0008	0000	0	Reserved
:0	0009	3F80	0	Reserved
:0	000A	5048	P H	Detector name, in ASCII (HP100A-12KW-HD)
:0	000B	3031	0 1	
:0	000C	4130	A 0	
:0	000D	312D	1 -	
:0	000E	4B32	K 2	
:0	000F	2D57	- W	
:0	0010	4448	D H	
:0	0011	0000	0	Reserved
:0	0012	0000	0	Reserved
:0	0013	0000	0	Reserved
:0	0014	0000	0	Reserved
:0	0015	0000	0	Reserved
:0	0016	0000	0	Reserved
:0	0017	0000	0	Reserved
:0	0018	0000	0	Reserved
:0	0019	0000	0	Reserved
:1	0000	00 00		End of structure

*GFW – Return firmware version

Returns the version number of the firmware installed in the U-Link.

Command	Parameters	Answer
GFW	None	Version number

Example

Command: *GFW	Answer: NIG = 105377, Firmware version = 1.00.00 RC6

Error Messages

Error	Comment
Invalid command	Command is invalid. Please check spelling and if the letters are uppercase.

4. Safe operation

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.

Detector temperature

Detectors can become hot enough during usage to cause burns.

5. 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 [1] [kW/cm²]	Min. 1/e² Beam Diam [2 3] [cm]
0.5	10	1.0[4]
1	8	1.0[4]
2	6	1.3
3	5	1.8
4	4	2.3

1 Peak Intensity.
2 Diameter of a circle corresponding to 86% of the entire beam power.
3 For Gaussian beam profile, the peak intensity is twice the beam power. Including a security factor of 50%
4 Minimum beam diameter corresponding to 10% of aperture diameter.

Laser	HP60A-10KW-GD (Beam diameter < Ø 50 mm) SN > 276600		HP60A-10KW-GD (Beam diameter < Ø 35 mm) SN ≤ 276600	
Beam Power [kW]	Damage Threshold [1] [kW/cm²]	Min. 1/e² Beam Diam [2,3] [cm]	Damage Threshold [1] [kW/cm²]	Min. 1/e² Beam Diam [2,3] [cm]
0.5	80	0.6[4]	40	0.6[4]
1	70	0.6[4]	35	0.6[4]
2	60	0.6[4]	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

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 [1] [kW/cm²]	Min. 1/e² Beam Diam [2,3] [cm]	Damage Threshold [1] [kW/cm²]	Min. 1/e² Beam Diam [2,3] [cm]
0.5	80	0.6[4]	16	-
1	70	0.6[4]	14	-
2	60	0.6[4]	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[5]

[5] **Maximum beam diameter corresponding to 80% of aperture area or 90% of aperture diameter.**

Laser	HP100A-12KW-HD HP100A-12KW-HD-TUBE		HP125A-15KW-HD HP125A-15KW-HD-TUBE	
Beam Power [kW]	Damage Threshold [1] [kW/cm²]	Min. 1/e² Beam Diam [2,3] [cm]	Damage Threshold [1] [kW/cm²]	Min. 1/e² Beam Diam [2,3] [cm]
0.5	16	1.0[4]	16	1.25[4]
1	14	1.0[4]	14	1.25[4]
2	12	1.0[4]	12	1.25[4]
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 [1] [kW/cm²]	Min. 1/e² Beam Diam [2,3,6] [cm]
5	6.5	2.8[4]
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.

[6] **Including a security factor of 40%.**

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

Type of Equipment: Laser detector
Model No.: HP-BLU
Year of test & manufacture: 2019

Standard(s) to which Conformity is declared:
EN61326-1 (2013) Radiated Emissions Heavy Industrial Standard
EN61326-1 (2013) Conducted Emissions Heavy Industrial Standard
EN61326-1 (2013) Power Line Harmonics Heavy Industrial Standard (RS232 Version)
EN61326-1 (2013) Power Line Voltage Fluctuation & Flicker Standard (RS232 Version)

Table 1 Product standards

Test Name Standards	Test Specifications	Minimum Performance Criterion Required	EUT Serial Number	Results
Conducted Emissions FCC part 15 (2018) subpart B	Class A 150kHz-30MHz	N/A	Labcem#2340	Pass
			Labcem#2341	N/A
Radiated Emissions FCC part 15 (2018) subpart B	Class A 30MHz-1GHz	N/A	Labcem#2340	Pass
			Labcem#2341	Pass
Conducted Emissions ICES-003 (2016)	Class A 150kHz-30MHz	N/A	Labcem#2340	Pass
			Labcem#2341	N/A
Radiated Emissions ICES-003 (2016)	Class A 30MHz-1GHz	N/A	Labcem#2340	Pass
			Labcem#2341	Pass
Conducted Emissions CISPR11 (2015) A1 (2016)	Group 1 - class A 150kHz-30MHz	N/A	Labcem#2340	Pass
			Labcem#2341	N/A
Radiated Emissions CISPR11 (2015) A1 (2016)	Group 1 - class A 30MHz-1GHz	N/A	Labcem#2340	Pass
			Labcem#2341	Pass
Electrostatic Discharge Immunity IEC61000-4-2 (2008)	Contact: ±4kV Air: ±2kV, ±4kV, ±8kV	B	Labcem#2340	Pass
			Labcem#2341	Pass
		A	Labcem#2340	Pass

Test Name Standards	Test Specifications	Minimum Performance Criterion Required	EUT Serial Number	Results
Radiated Electromagnetic Field Immunity IEC61000-4-3 (2006) A1 (2007) A2 (2010)	80MHz-1000MHz: 10V/m 1.4GHz-2GHz: 3V/m 2GHz-2.7GHz: 1V/m		Labcem#2341	Pass
Electrical Fast Transient Immunity IEC61000-4-4 (2012)	Power: ±2kV / 5kHz I/O Ports: N/A Communication Ports: N/A	B	Labcem#2340	Pass
			Labcem#2341	N/A
Surge Immunity IEC61000-4-5 (2014)	Power: ±2kV L-PE / ±1kV L-L I/O Ports: ±1kV / N/A Communication Ports: ±1kV / N/A	B	Labcem#2340	Pass
			Labcem#2341	N/A
Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields IEC61000-4-6 (2013)	Power: 3V I/O Ports: N/A Communication Ports: N/A	A	Labcem#2340	Pass
			Labcem#2341	N/A
Power Frequency Magnetic Field Immunity IEC61000-4-8 (2009)	Continuous Field: 30A/m / 50Hz & 60Hz	A	Labcem#2340	Pass
			Labcem#2341	Pass
Voltage Dips, Short Interruptions and Voltage Variation Immunity on AC Input IEC61000-4-11 (2004)	Voltage dips: 0%Un during 1 cycle	B	Labcem#2340	Pass
	Voltage dips: 40%Un during 10 cycles (at 50 Hz)	B	Labcem#2340	Pass
	Voltage dips: 40%Un during 12 cycles (at 60 Hz)	C	Labcem#2340	Pass
	Voltage dips: 70%Un during 25 cycles (at 50 Hz)	C	Labcem#2340	Pass
	Voltage dips: 70%Un during 30 cycles (at 60 Hz)	C	Labcem#2340	Pass
	Short interruptions: 0%Un during 250 cycles (at 50 Hz)	C	Labcem#2340	Pass
	Short interruptions: 0%Un during 300 cycles (at 60 Hz)	C	Labcem#2340	Pass

Table 2 Performance criteria

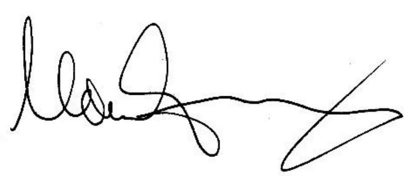
Performance Criteria	Description
Criteria A	The DUT does not have any noticeable deviations in its performance before, during or after the application of the EMC test. If a range of performance is specified as normal operation, the DUT did not have any readings outside of this range before, during or after the application of the EMC test.

Performance Criteria	Description
Criteria B	The DUT does not have any deviations of performance before or after the application of the EMC test, but during the application a deviation is noted that is not considered normal operation. When the EMC test is paused or completed the DUT recovered on its own and did not require any user intervention to return it to normal operation. If a range of performance is specified as normal operation, the DUT's performance was outside of this range during the application of the test, but recovered on its own and operated within its normal range after the application of the EMC test. No permanent damage occurred to the DUT or any AE as a result of the disturbance.
Criteria C	The DUT was operating normally before the application of the EMC test, but during the application, the DUT stopped operating normally, and did not recover after the application of the EMC test until an operator intervened. This includes but is not limited to: - Power cycling the DUT, - Restarting the exercising software on the DUT, and - Unplugging and re-plugging the DUT or any AE The act of "recovering" the DUT must be something that could be accomplished by the customer with little training. No permanent damage occurred to the DUT or any AE as a result of the disturbance.
Additional Criteria	No incorrect data recorded while logging: HP-BLU measure wasn't affected by more than 1 % during test

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

Place: Québec (Québec)

Date: September 06, 2019



(President)

Appendix B: UKCA Declaration of Conformity

UK
CA

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

Type of Equipment: Laser detector
Model No.: HP-BLU
Year of test & manufacture: 2019

Standard(s) to which Conformity is declared:
EN61326-1 (2013) Radiated Emissions Heavy Industrial Standard
EN61326-1 (2013) Conducted Emissions Heavy Industrial Standard
EN61326-1 (2013) Power Line Harmonics Heavy Industrial Standard (RS232 Version)
EN61326-1 (2013) Power Line Voltage Fluctuation & Flicker Standard (RS232 Version)

Table 3 Product standards

Test Name Standards	Test Specifications	Minimum Performance Criterion Required	EUT Serial Number	Results
Conducted Emissions FCC part 15 (2018) subpart B	Class A 150kHz-30MHz	N/A	Labcem#2340	Pass
			Labcem#2341	N/A
Radiated Emissions FCC part 15 (2018) subpart B	Class A 30MHz-1GHz	N/A	Labcem#2340	Pass
			Labcem#2341	Pass
Conducted Emissions ICES-003 (2016)	Class A 150kHz-30MHz	N/A	Labcem#2340	Pass
			Labcem#2341	N/A
Radiated Emissions ICES-003 (2016)	Class A 30MHz-1GHz	N/A	Labcem#2340	Pass
			Labcem#2341	Pass
Conducted Emissions CISPR11 (2015) A1 (2016)	Group 1 - class A 150kHz-30MHz	N/A	Labcem#2340	Pass
			Labcem#2341	N/A
Radiated Emissions CISPR11 (2015) A1 (2016)	Group 1 - class A 30MHz-1GHz	N/A	Labcem#2340	Pass
			Labcem#2341	Pass
Electrostatic Discharge Immunity IEC61000-4-2 (2008)	Contact: ±4kV Air: ±2kV, ±4kV, ±8kV	B	Labcem#2340	Pass
			Labcem#2341	Pass

Test Name Standards	Test Specifications	Minimum Performance Criterion Required	EUT Serial Number	Results
Radiated Electromagnetic Field Immunity IEC61000-4-3 (2006) A1 (2007) A2 (2010)	80MHz-1000MHz: 10V/m 1.4GHz-2GHz: 3V/m 2GHz-2.7GHz: 1V/m	A	Labcem#2340	Pass
			Labcem#2341	Pass
Electrical Fast Transient Immunity IEC61000-4-4 (2012)	Power: ±2kV / 5kHz I/O Ports: N/A Communication Ports: N/A	B	Labcem#2340	Pass
			Labcem#2341	N/A
Surge Immunity IEC61000-4-5 (2014)	Power: ±2kV L-PE / ±1kV L-L I/O Ports: ±1kV / N/A Communication Ports: ±1kV / N/A	B	Labcem#2340	Pass
			Labcem#2341	N/A
Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields IEC61000-4-6 (2013)	Power: 3V I/O Ports: N/A Communication Ports: N/A	A	Labcem#2340	Pass
			Labcem#2341	N/A
Power Frequency Magnetic Field Immunity IEC61000-4-8 (2009)	Continuous Field: 30A/m / 50Hz & 60Hz	A	Labcem#2340	Pass
			Labcem#2341	Pass
Voltage Dips, Short Interruptions and Voltage Variation Immunity on AC Input IEC61000-4-11 (2004)	Voltage dips: 0%Un during 1 cycle	B	Labcem#2340	Pass
	Voltage dips: 40%Un during 10 cycles (at 50 Hz)	B	Labcem#2340	Pass
	Voltage dips: 40%Un during 12 cycles (at 60 Hz)	C	Labcem#2340	Pass
	Voltage dips: 70%Un during 25 cycles (at 50 Hz)	C	Labcem#2340	Pass
	Voltage dips: 70%Un during 30 cycles (at 60 Hz)	C	Labcem#2340	Pass
	Short interruptions: 0%Un during 250 cycles (at 50 Hz)	C	Labcem#2340	Pass
	Short interruptions: 0%Un during 300 cycles (at 60 Hz)	C	Labcem#2340	Pass

Table 4 Performance criteria

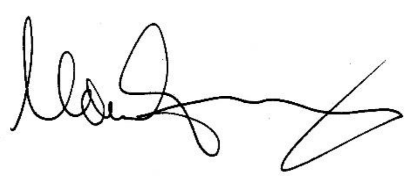
Performance Criteria	Description
Criteria A	The DUT does not have any noticeable deviations in its performance before, during or after the application of the EMC test. If a range of performance is specified as normal operation, the DUT did not have any readings outside of this range before, during or after the application of the EMC test.

Performance Criteria	Description
Criteria B	The DUT does not have any deviations of performance before or after the application of the EMC test, but during the application a deviation is noted that is not considered normal operation. When the EMC test is paused or completed the DUT recovered on its own and did not require any user intervention to return it to normal operation. If a range of performance is specified as normal operation, the DUT's performance was outside of this range during the application of the test, but recovered on its own and operated within its normal range after the application of the EMC test. No permanent damage occurred to the DUT or any AE as a result of the disturbance.
Criteria C	The DUT was operating normally before the application of the EMC test, but during the application, the DUT stopped operating normally, and did not recover after the application of the EMC test until an operator intervened. This includes but is not limited to: - Power cycling the DUT, - Restarting the exercising software on the DUT, and - Unplugging and re-plugging the DUT or any AE The act of "recovering" the DUT must be something that could be accomplished by the customer with little training. No permanent damage occurred to the DUT or any AE as a result of the disturbance.
Additional Criteria	No incorrect data recorded while logging: HP-BLU measure wasn't affected by more than 1 % during test

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

Place: Québec (Québec)

Date: November 23, 2021



(President)

Appendix C: WEEE directive

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 device will void the HP's warranty.

The complete device contains:

- 1 HP detector
- 1 USB cable (USB model)
- 1 Calibration certificate

Separation

Paper: Manual and certificate
Plastic: Water connectors
Wires: USB cable and power supply plug
Printed circuit board: Inside the device
Aluminum and/or nickel-plated copper: Device enclosure
Brass: Water connectors fittings, flow meter and thermocouple fittings: Inside the detector
Steel and stainless steel: screws
Rubber: gasket inside the detector
Lithium Ion battery: Inside the detector
Lithium-metal battery: Inside the detector

Opening the Device

Remove all the screws on the outside of the HP.
Lift the aluminium cover.
Unplug all the wires connecting to the PCB and the screws holding the PCB in place.
Remove the aluminium plate supporting the water connectors.
Remove the screw holding the plastic blocks.
Remove the washer under the plastic blocks.
Remove the thermocouple fitting on the plastic blocks.
Remove the water connector and the flow meter from the plastic blocks.
Remove the four back screws to open the backside of the water coolant circuit.
Remove the four front screws to remove the metal front cover.

All the parts are now disassembled