



# USER MANUAL

PC-Gentec-EO | Universal PC Application Software

## 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 monitor or the detector looks damaged or if you suspect that the device is not operating properly.

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

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

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

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

## SYMBOLS

The following international symbols are used in this manual:



Refer to the manual for specific warning or caution information to avoid any damage to the product.



DC, Direct Current

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# 1. PC-GENTEC-EO

## 1.1. INTRODUCTION

The PC-Gentec-EO software is a simple and intuitive PC interface that allows you to control and display the readings from various Gentec-EO devices. The PC-Gentec-EO software supports the P-LINK, the HP, the INTEGRA, the U-LINK and the MAESTRO. Previous PC-MAESTRO users will find it easy to navigate, since the PC-Gentec-EO interface is very similar.

## 1.2. SPECIFICATIONS

The following specifications are based on a one-year calibration cycle, an operating temperature of 18 °C to 28 °C (64 °F to 82 °F) and a relative humidity not exceeding 80%. Monitors must be stored in an environment between -20 °C to 60 °C (-4 °F to 140 °F) and a relative humidity not exceeding 90%.

	General Specifications
Compatible devices	MAESTRO U-LINK P-LINK INTEGRA HP
Serial communication: MAESTRO P-LINK U-LINK INTEGRA HP	USB 2.0, RS-232, Ethernet USB 2.0, RS-232 USB 2.0, RS-232 USB 2.0, RS-232 USB 2.0
Transfer rate for energy measurements (no missing points)	MAESTRO: 500 Hz <sup>1</sup> INTEGRA: 5,200 Hz <sup>2</sup> U-LINK: 10,000 Hz <sup>2</sup>
Accuracy for frequency measurements: MAESTRO U-LINK INTEGRA	See monitor user manual for specifications.
Displays	Real time, scope, needle, averaging, histogram, statistics
Correction factors	One multiplier and one offset (seven-digit floating point)
Statistics	Current value, average value, maximum value, minimum value, RMS stability, PTP stability, repetition rate, average power, STD deviation
Data storage	*.acq file for acquisition and statistics *.geo file for saved settings
Software trigger level	0.1% to 99.9%, 0.1% resolution
Internet upgrades	<a href="https://www.gentec-eo.com/resources/download-center">https://www.gentec-eo.com/resources/download-center</a>
File size	4.39 MB
Average RAM allocation	9 MB to 23 MB
Recommended PC requirements	Dual core processor 3 Gb of RAM
Operating system compatibility	Windows 11, Windows 10, Windows 8

<sup>1</sup> For higher repetition rates, you need to use the internal data acquisition function on the MAESTRO. In a full-size statistics window, with no scope display and no serial communication, the repetition rate will be higher.

<sup>2</sup> Depending on the computer. If capturing data or performing statistics at high repetition rates, the use of a modern computer, one produced in the last 7 years, is recommended.

## 2. QUICK START PROCEDURE

1. Install the **PC-Gentec-EO software** on a PC.
2. Install the detector on an optical stand.
3. Connect the device to the PC with the appropriate USB cable.
4. If you are using a MAESTRO, verify that it *is not* in **Solo2 Serial Compatibility or Binary Mode Measurement** and that it is configured to use the USB port (in the MAESTRO monitor, go to Home ▶ Set Device ▶ Serial Commands).
5. Start the PC-Gentec-EO software and power up your monitor (if applicable).
6. Choose the appropriate display for your measurements:

- |    |   |                          |    |   |            |
|----|---|--------------------------|----|---|------------|
| a. |  | Real time with bar graph | d. |  | Averaging  |
| b. |  | Scope                    | e. |  | Histogram  |
| c. |  | Needle                   | f. |  | Statistics |



7. Press the **Connect** button located in the top left corner of the main menu and change the measurement and display options in the appropriate tabs.
8. Remove the protective cover from the detector and start the laser.
9. Put the detector in the laser beam path. Leave it there for a few minutes or until the detector temperature has stabilized. The entire laser beam must be within the aperture of the sensor. Do not exceed maximum specified densities, energies or powers. For the most accurate measurements, spread the beam across 60% to 80% of the sensor area.

**Warning:** Power detectors can be used with both CW and pulsed lasers.  
Energy detectors can only be used with pulsed lasers.

10. Adjust the **Zero**:

Even when there is no incident power, the measured value may not be 0. For power measurements, this is because the detector is not thermally stabilized OR there was a heat source in the field of view of the detector when you connected the PC-Gentec-EO software. For photo detectors, zeroing will remove the offset on the detector.

- ▶ **Power and energy detectors:** block all laser radiation on the detector. To reset the zero, wait until the reading has stabilized and click **Set Zero** in the main menu.
- ▶ **Photo detectors:** block all laser radiation on the detector. Click **Set Zero** in the main menu. In some software versions, a message will appear requesting you to put the black cover over your photo detector. Press the **OK** button after you have done so. The software passes through all the ranges to determine the zero for each range.

11. All done! You are now ready to make measurement.

See *notes*.

**Notes:**

- a. Refer to the specific power detector documentation for complete installation and operating instructions.
- b. Power detectors are thermal sensors and are thus sensitive to temperature variations.
- c. For high-precision measurements, it is recommended to:
  - i. Allow the power detector to thermally stabilize before zeroing the software.
  - ii. Touch only the stand when handling the power detector. Do not touch the detector itself. This is especially true for highly sensitive detectors.
  - iii. Do not adjust the zero for energy detectors, such as the QE series.
  - iv. Avoid forced airflow or drafts around the detector.

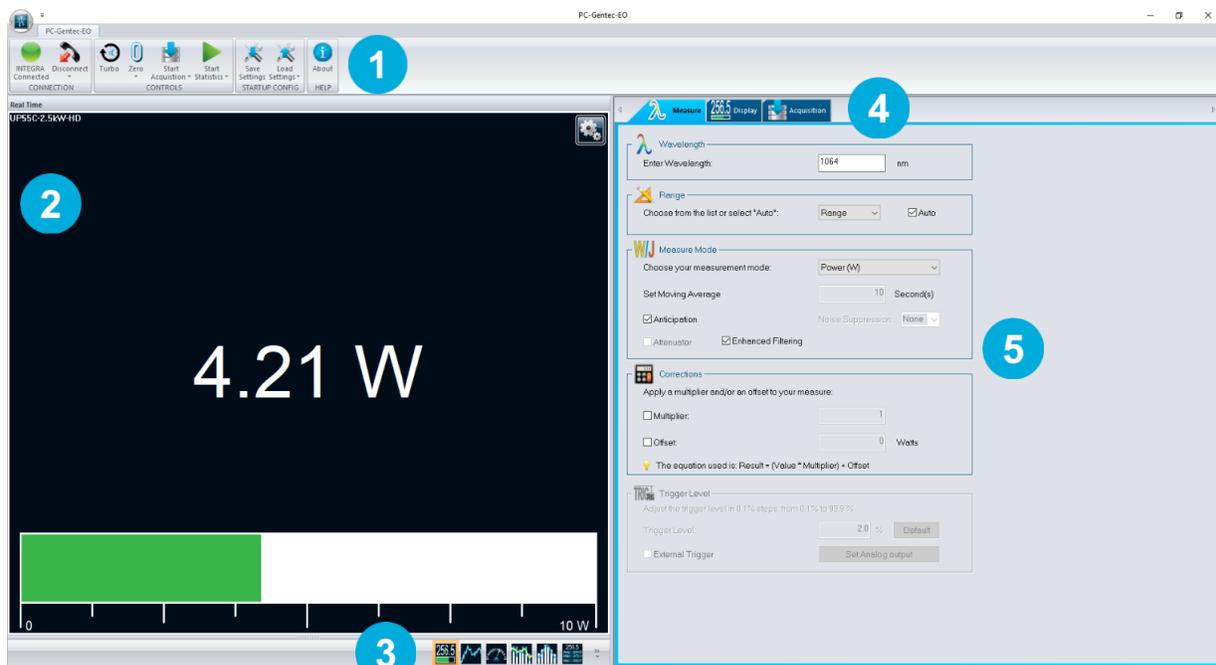
**3. USER INTERFACE**

Figure 1. PC-Gentec-EO software user interface

- 1 Main controls**  
All the main functions of the PC-Gentec-EO software are controlled using this tab ribbon. The functions are separated into categories: connection, controls, startup config and help.
- 2 Display panel**  
This section of the software displays the value in the user's selected **Display** mode. Only one display at a time is allowed.
- 3 Change display**  
At any time, it is possible to change the type of display by selecting the desired graphic.
- 4 Setup panel – selector tabs**  
Choose the desired set of controls using the **Setup** panel tabs.
- 5 Setup panel – controls**  
This section contains the different options allowing to control the display, the measurement and the acquisition parameters.

### 3.1. THE MAIN MENU

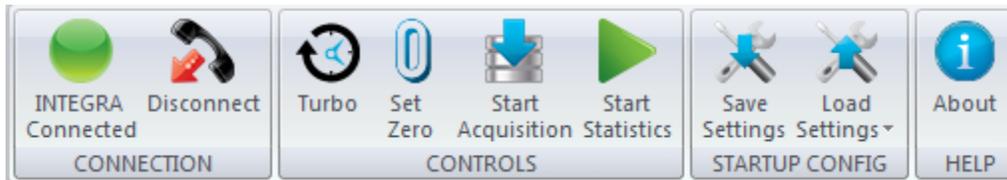


Figure 2. Main controls

You can minimize the main menu by right clicking on it and choosing **Minimize** the ribbon. This will maximize the **Display** panel.



Figure 3. PC-Gentec-EO software with and without the main menu

#### 3.1.1. Connection

##### Automatic Connect/Disconnect button



Figure 4. Connection menu

This button is used to automatically connect or disconnect a Gentec-EO device from the PC. By clicking on the main button, there is no need to make a port selection. The PC-Gentec-EO software will automatically find a connected Gentec-EO device or any available ports on the PC and will connect to it.



Figure 5. Selecting your device

If, however, you have multiple Gentec-EO devices and you wish to select a specific communication port, you can do so by clicking the lower portion of the **Connect** button. Click on **Select your device (com port)**, and a window will prompt you to select the desired port. If the Gentec-EO device was connected after the window appeared, just click on the **Refresh** button to find all available new ports.

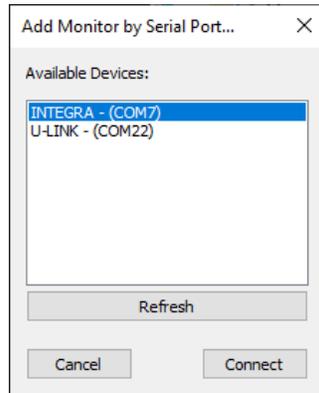


Figure 6. Connecting a monitor via USB



Warning

If a USB Bluetooth adapter is present on a PC, it is possible that the connection will take longer. Some USB Bluetooth adapters use the same virtual port as the PC-Gentec-EO software, but the delay in verifying the connection to the Bluetooth port is longer than the traditional serial port.

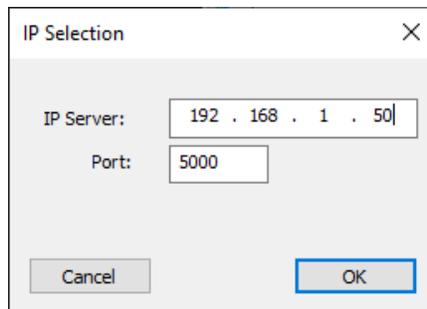


Figure 7. Connecting a monitor via Ethernet

It is also possible to connect your MAESTRO device via Ethernet. Connect your MAESTRO to your Ethernet network. Go to HOME/SET DEVICE/ETHERNET CONFIG and note the IP address of the MAESTRO and port number. In the PC-Gentec-EO software, click on **Select your device (IP address)** and enter the IP address information.

### 3.1.2. Controls



Figure 8. Controls menu

#### 3.1.2.1. Turbo mode

The **Turbo** mode is used by energy detectors to transfer data from the device. It switches the monitor into **Binary** mode to accelerate the data transfer from the USB port. Turning off the **Turbo** mode will put the device in **ASCII** mode. For optimal use, the **Turbo** mode should always be on.

#### 3.1.2.2. Set Zero

This button adjusts the zero on the detector. It resets the zero-reading level. It does this by subtracting the power reading on the display as soon as the **Set Zero** button is pressed. Subsequent measurements will be relative to this zero-power level. The main purpose of this option is to remove reading offset caused by thermal noise in the environment. Thermal noise is caused by a detector that has not been thermally stabilized or there was a heat source in the field of view of the detector when the PC-Gentec-EO software was connected (for example, the hand or body of the user). Use this function once your power meter has achieved thermal equilibrium to ensure accurate measurements.

For instructions on the correct way to make a zero offset, refer to step 10 in Section 2 – Quick start procedure.

In **Energy** mode zeroing clears the current value.

#### 3.1.2.3. Start/Stop Acquisition

This button starts and stops the acquisition of a logging file. The different options for the acquisition can be made in the **Set Acquisition** tab. The Gentec-EO device must be connected to start the acquisition.



Tips

To save statistics at the end of the acquisition file, select **Save Statistics** in the **Acquisition** menu.

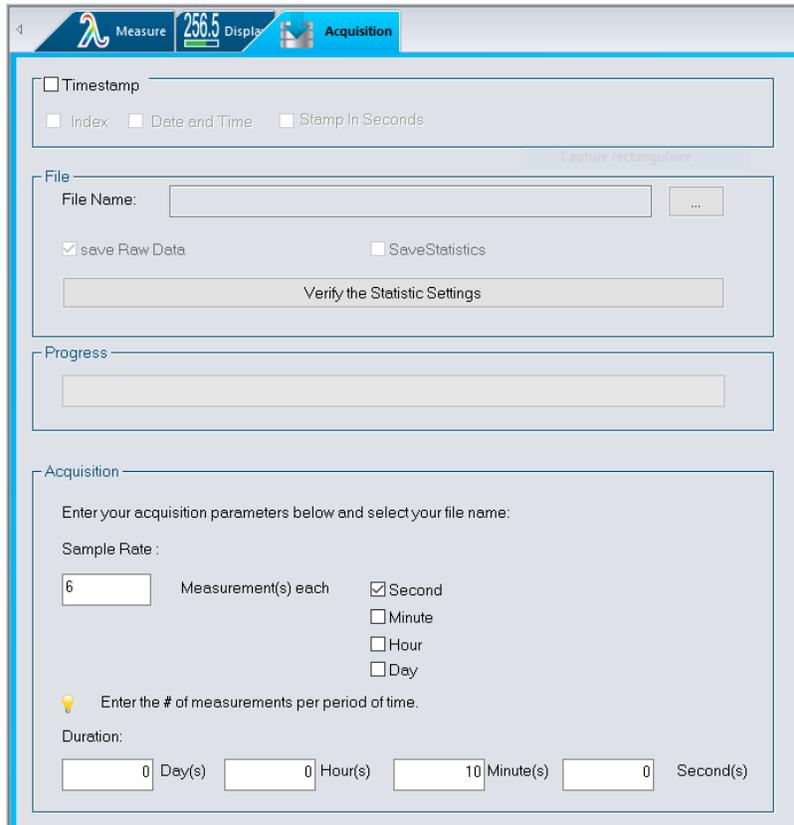
Changing the duration settings of the acquisition will automatically change the duration settings of the statistics, as both are linked.

The data is saved to an ACQ file, which can be opened in your favorite data analysis software, like Excel.

A new acquisition will not concatenate the new data with the old one; it will erase old data and save only the new one. You must use a new file name if you want to keep both old and new data.

## Set your acquisition parameters in Power mode

In **Power** mode, you can use the **Acquisition** menu to choose the **Sample Rate and Duration** of an acquisition. The sample rate is defined as a specific number of measurements in a fixed interval (for example, 3 measurements/minute or 100 measurements/hour). The total duration can also be set in seconds, minutes, hours or days. The file name for data logging, the file location and the option to add a timestamp to each value can also be set using this menu.



The screenshot shows the 'Acquisition' menu in a software interface. At the top, there are tabs for 'Measure', '256.5 Displa', and 'Acquisition'. Below the tabs, there are several sections:

- Timestamp:** A checkbox labeled 'Timestamp' is unchecked. Below it are three sub-options: 'Index', 'Date and Time', and 'Stamp In Seconds', all of which are also unchecked.
- File:** A section with a 'File Name:' label and an empty text box followed by a browse button (...). Below this are two checkboxes: 'save Raw Data' (checked) and 'SaveStatistics' (unchecked). A 'Verify the Statistic Settings' button is located at the bottom of this section.
- Progress:** A section with a 'Progress' label and an empty progress bar.
- Acquisition:** A section with the instruction 'Enter your acquisition parameters below and select your file name:'. It contains:
  - Sample Rate:** A text box with the value '6' and the label 'Measurement(s) each'. To the right are four radio buttons: 'Second' (checked), 'Minute', 'Hour', and 'Day'.
  - Duration:** A section with the instruction 'Enter the # of measurements per period of time.' and four text boxes for 'Day(s)', 'Hour(s)', 'Minute(s)', and 'Second(s)'. The 'Minute(s)' box contains the value '10'.

Figure 9. Settings for the **Acquisition** menu in **Power** mode

## Set your acquisition parameters in Energy mode

In **Energy** mode, you can use the **Acquisition** menu to choose the **Sample Rate** and **Duration** of an acquisition. The sample rate is defined to measure 1 pulse every X pulses (for example, 1 measurement every 10 pulses). The total duration is also set in a specified number of pulses. The file name for data logging, the file location and the option to add a timestamp to each value can also be set using this menu.

Figure 10. Settings for the **Acquisition** menu in **Energy** mode



### Warnings

The number of pulses acquired is the number of pulses that the PC-Gentec-EO software received via the USB port. Depending on the device, this can be different from the number of pulses read by the monitor. Please refer to Section 1.2 – Specifications.

For the MAESTRO, the repetition rate is limited to 500 Hz. The MAESTRO will perform a subsampling at higher repetition rates. If you need to make an acquisition using all the points measured by the MAESTRO, please use the MAESTRO monitor and store the file on a USB key.

#### 3.1.2.4. Start/Stop Statistics

This button starts and stops the calculation of statistics. The different options for the statistic calculations can be made in the **Set Display** menu of the **Statistics** display. Changing the **Duration** settings of the statistics will automatically change the duration settings of the acquisition, as both are linked. Statistics can also be saved to a file, as long as a file name has been provided.

To save only the statistics to a file, select **Save Statistics** in the **Acquisition** menu and start only the statistics, not the acquisition. To save statistics at the end of the acquisition file, select **Save Statistics** in the **Acquisition** menu and start the acquisition. Starting the acquisition when the **Save Statistics** option is selected will also start the statistics. The statistics and acquisition routines produce an ACQ file which can be opened in your favorite data analysis software, like Excel.

### 3.1.3. Startup Config



Figure 11. **Startup Config** menu

**Save Settings:** save the current display and graphic settings in a GEO file.

**Load Settings:** load a GEO file with previously saved settings.

All modifications to the PC-Gentec-EO software options (**Set Measure** options, **Set Display** options of each graphic and **Set Acquisition** options) can be saved to a GEO file.

1. Make all the necessary modifications to the settings of the PC-Gentec-EO software.
2. Press the **Save Settings** button and save your settings to a file.
3. When next you open the PC-Gentec-EO software, press the **Load Settings** button and choose your settings file.



Tips

To go back to the original settings, press the **Default Settings** button.  
For previous PC-MAESTRO users, the settings saved in a MAESTRO file will be compatible.

### 3.1.4. Help



Figure 12. **Help** menu

#### 3.1.4.1. **About**

To learn more about the PC-Gentec-EO software, the connected Gentec-EO device and the detector that is connected to your monitor, press the **About** button.

This menu also allows you to verify if your version of PC-Gentec-EO software is up to date.



Warning

An internet connection is needed to verify if an update is available.



Tip

You can also obtain the latest PC-Gentec-EO software version on our website at <https://www.gentec-eo.com/resources/download-center>.

### 3.2. THE DISPLAYS

The PC-Gentec-EO software offers six graphical displays to view and analyze your measurements. Every display shows the real-time value of the signal on top of the graphic, except the real-time graph, which displays the real-time value in large digits in the center of the panel.



**Real Time:** a real-time display of the signal value shown in the center of the **Graph** panel with the corresponding bar graph below.



**Scope:** a real-time display of the signal value presented in a **Scope** mode.



**Needle:** a real-time display of the signal value presented by a needle.



**Averaging:** a scope-like display which presents the minimum, maximum and average values of the last 50 values for a given period.



**Histogram:** a real-time graph that displays the power or energy distribution of the last desired number of samples in the desired number of bars. For example, a distribution, in real time, of the last 1,000 samples in 50 different bars.



**Statistics:** shows different measured and calculated information about the signal for a specified duration and sample rate.

For all displays, you can access the specific display options by clicking the **Settings**  button on the top right of the **Graph** panel. This operation will open the corresponding option panel for the current display, located on the right-hand side of the software.

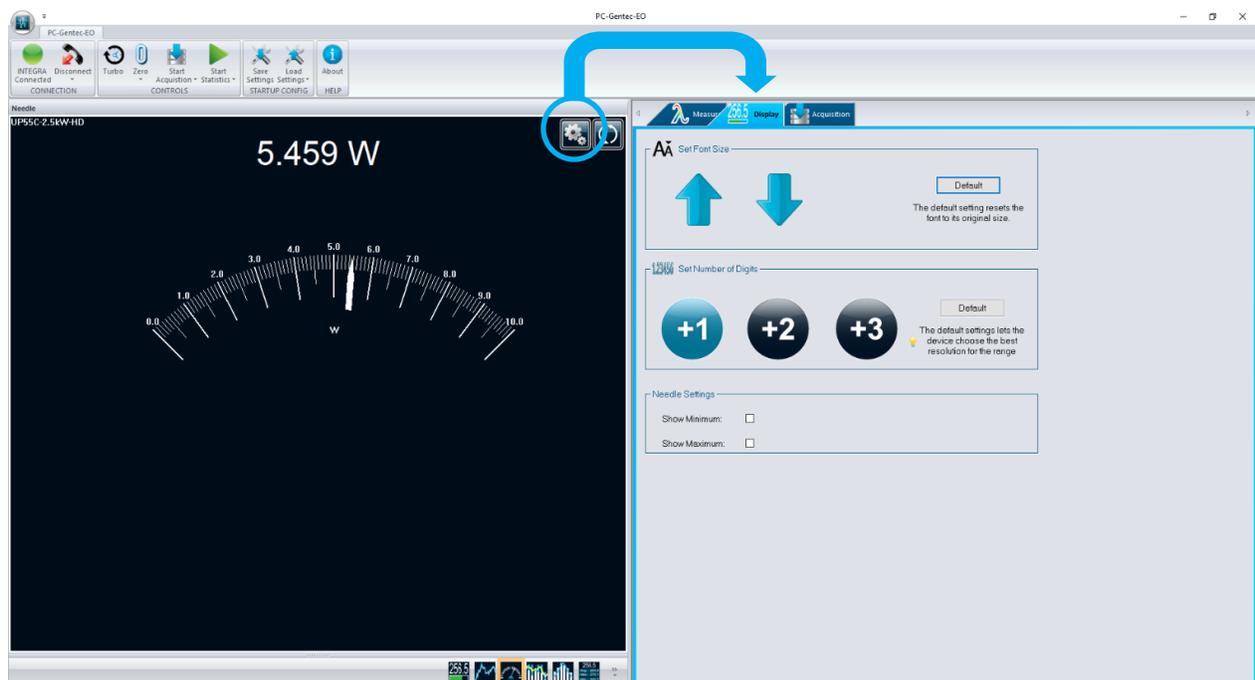


Figure 13. Graphical display with the **Settings** menu

### 3.2.1. Real Time

A large, simple, real-time value with a bar graph that allows you to see what is going on in real time. The large digits make it perfect to read from a distance. For HP series, information about the water flow and the water temperature appears below the power measurement. Warnings will appear in red.

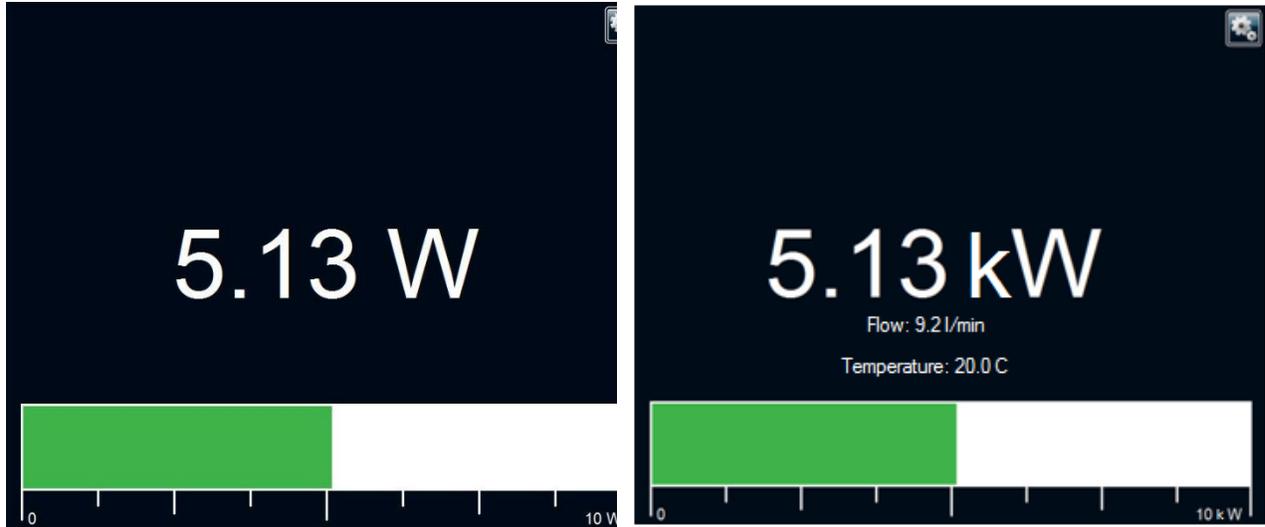


Figure 14. Real-time display with bar graph

By resizing the window, you can also hide the bar graph. When the window becomes too small to show the bar graph, the software will automatically hide it and keep only the real-time value, as shown below.



Figure 15. Real-time display without bar graph

## Settings

In the real-time display, you can change the number of digits that are displayed. The **Default** button lets the device choose the best resolution for the range. The “+1”, “+2” and “+3” buttons let you add one, two or three digits to the resolution.



Figure 16. Settings for the real-time display

You can also change the font size display using the **Set Font Size** control. This control changes the font size in the real-time display using the up and down arrows. The **Default** button lets the default font size for display.



Figure 17. Set font size for the real-time display

### 3.2.2. Scope

See the evolution in real time of your signal, as you would see on an oscilloscope. This mode can also show the minimum, maximum and average values of your signal over a determined period of time.

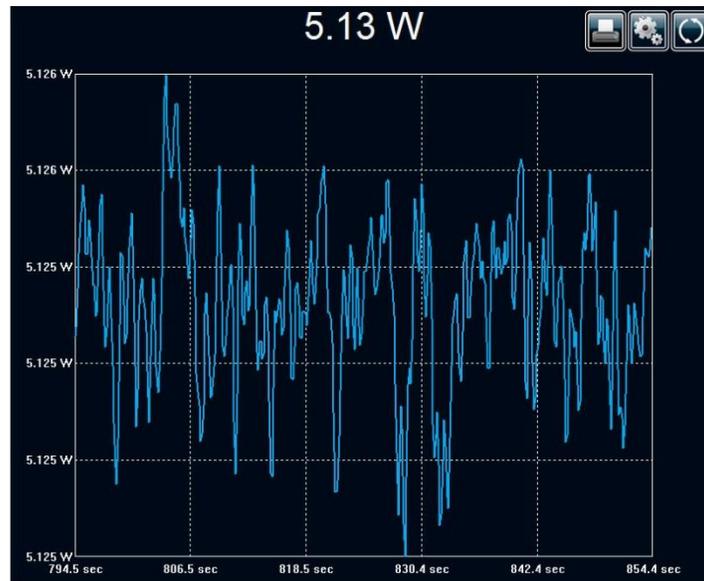


Figure 18. Scope display

It is possible to have live on-screen statistics with this graphical mode. Simply go to the **Set Display** menu using the **Settings**  button and click **Display Stats**. To restart the graph, use the **Refresh**  button directly in the **Display** panel.

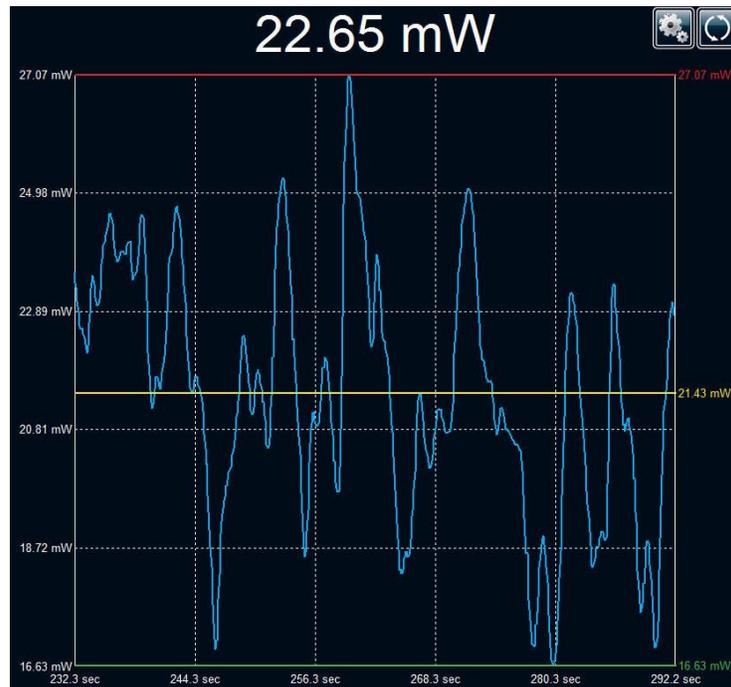


Figure 19. **Scope** display with statistics

## Settings

In the **Scope** display, you can:

- ▶ Change the number of digits (+1, +2 or +3).
- ▶ Adjust the period of the graph (in seconds).
- ▶ Change the values of the y-axis (either user-set or **Same as Range**).
- ▶ Show/hide statistics.

Figure 20. Settings for the **Scope** display

### 3.2.3. Needle

This is a simple and intuitive way to see your current signal value. It is the ideal tool for laser tuning.



Figure 21. **Needle** display

It is possible to add green and red needles indicating the minimum and maximum values in this graphical mode. Simply go to the **Set Display** menu using the **Settings**  button and click **Show Minimum** or **Show Maximum**. To refresh the Min/Max needles, use the **Refresh**  button directly in the **Display** panel.



Figure 22. **Needle** display with minimum and maximum values

## Settings

In the **Needle** display, you can change the number of digits and show/hide the minimum and maximum values on the graph.

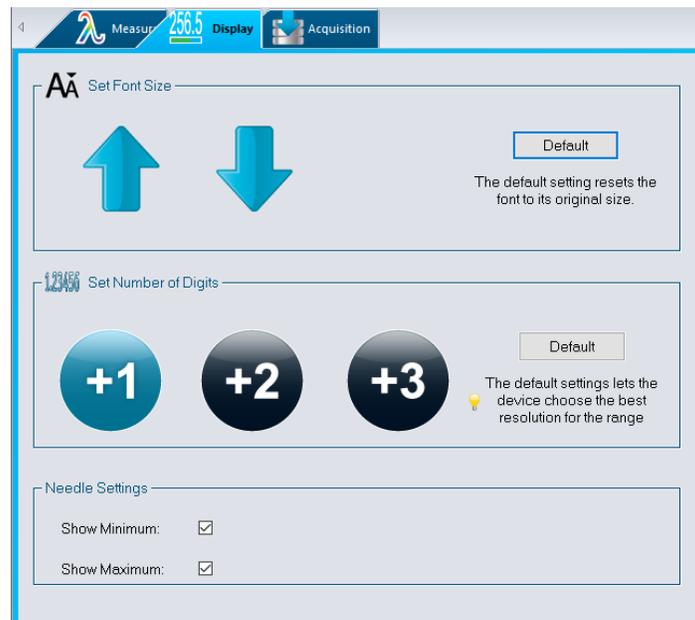


Figure 23. Settings for the **Needle** display

### 3.2.4. Averaging

The **Averaging** display is the perfect tool for checking laser stability over time. The **Averaging** display is a bar graph that presents the statistics of a set of measurements as a function of time. The PC-Gentec-EO software measures a series of data during a user-defined period of time. Each bar represents the maximum (in blue), average (in yellow) and minimum (in white) values of the measured data. The top of the white bar represents the minimum value, while the top of the blue bar represents the maximum value. The yellow line represents the average value for each set of bars. This allows you to quickly evaluate the trends of the average, maximum and minimum values over time.

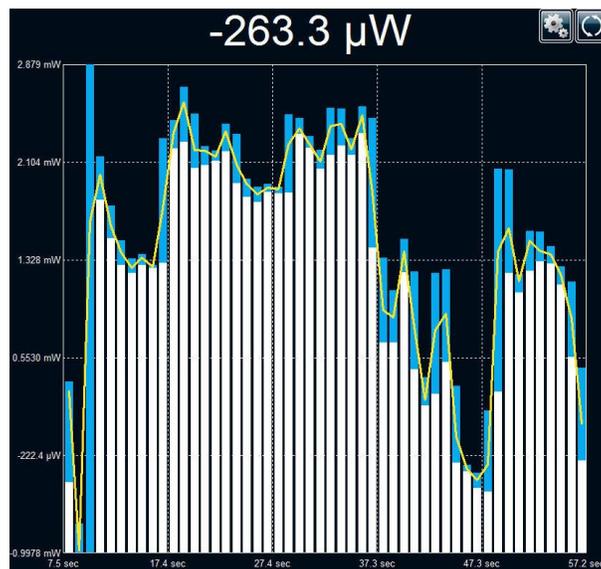


Figure 24. Averaging display

### For power detectors

In the **Averaging** display, a power measurement is the average value defined in the settings. For optimum averaging, when measuring the average power of a pulsed laser, it is preferable to use a sample period that is a multiple of your laser repetition rate. For instance, if you are running at 1 Hz, use an averaging period of 1, 2, 3, etc. seconds. If it is at 1.5 Hz, use 3, 6, 9, etc. seconds, as the sample period. Take note that if one data point is out of the current range, the resulting period average will be OUT. You should set the range higher than your maximum unfiltered measurement to avoid this situation.

### For energy detectors and power detectors in Energy mode

In the **Averaging** display mode, an energy measurement is the average value defined in the averaging settings.

### Settings

The **Settings** panel for the **Averaging** display allows you to control the number of digits and to change the averaging period (the period of one bar on the graph). Whatever the period entered, the total number of bars (once the screen is filled) is 50. To refresh the screen and accumulate new data, use the **Refresh**  button directly in the **Display** panel.

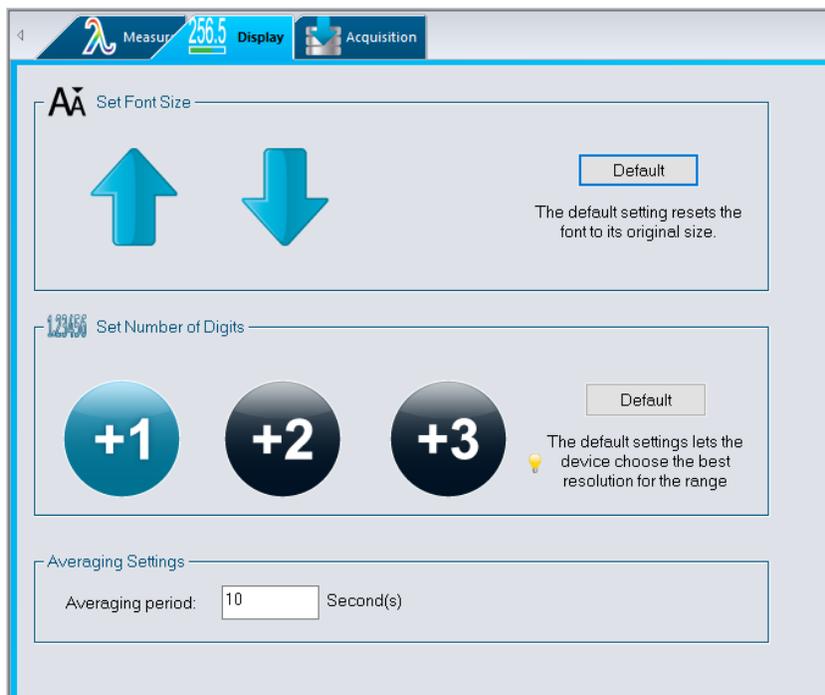


Figure 25. Settings for the **Averaging** display

### 3.2.5. Histogram

This is a simple way to see, in real time, the power or energy distribution of a signal.

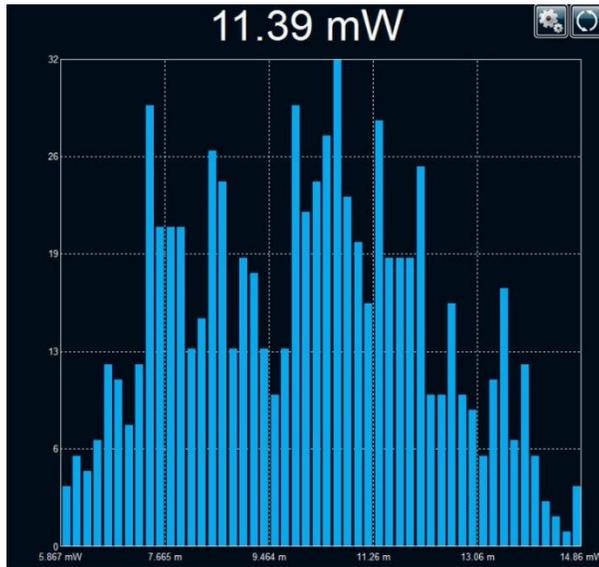


Figure 26. Histogram display

#### Settings

The **Settings** panel for the **Histogram** display allows you to control the number of digits and the number of bars and period of the graphic.



Warning

The number of samples is not related to the repetition rate of the signal; it is the number of samples that the Gentec-EO device sends through the serial port.

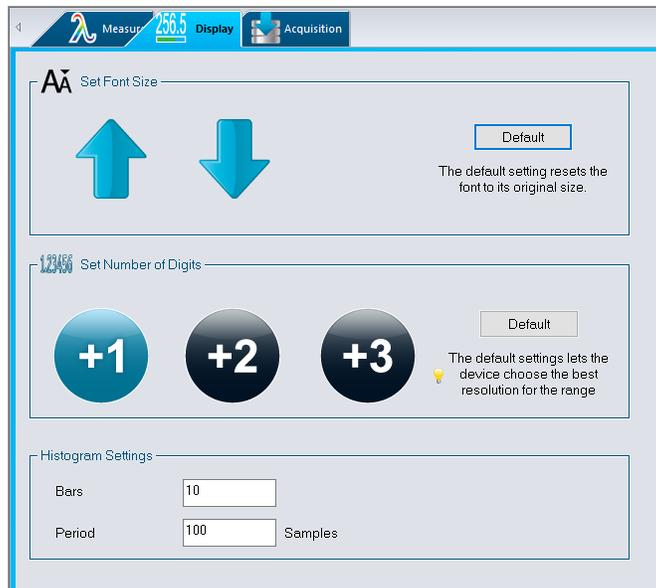


Figure 27. Settings for the Histogram display

### 3.2.6. Statistics

Statistics in the PC-Gentec-EO software are calculated from the values that come from the serial port of the Gentec-EO device.



Warning

Statistics in PC-Gentec-EO software are calculated from all the entry points coming from the serial port of the Gentec-EO device. Depending on the device, this can be different from the number of points received by the monitor. Please refer to Section 1.2 – Specifications.



Tip

MAESTRO users who want to accumulate statistics from all acquired points at rates greater than 500 Hz must use the MAESTRO internal **Statistics** mode and store them to a USB key.

The statistics available depend on the type of detector that is plugged in, as can be seen in the pictures below.

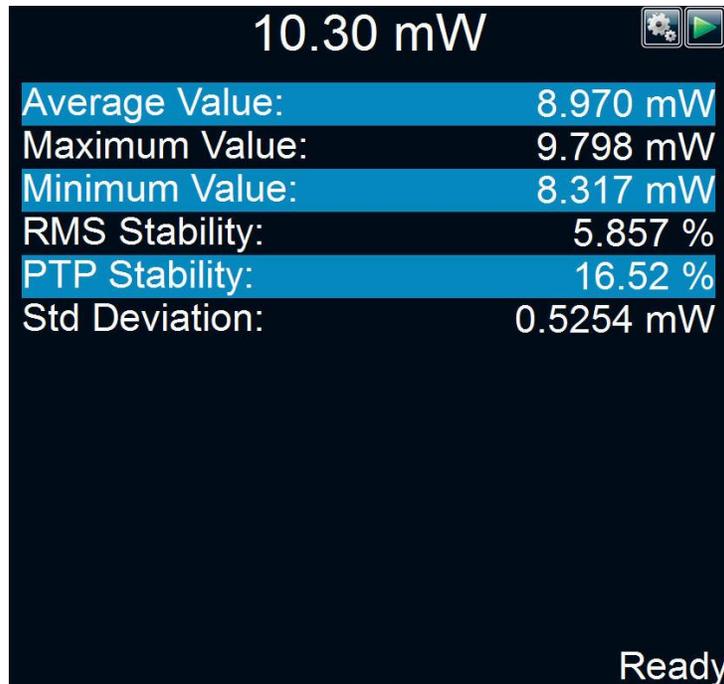


Figure 28. **Statistics** display in **Power** mode

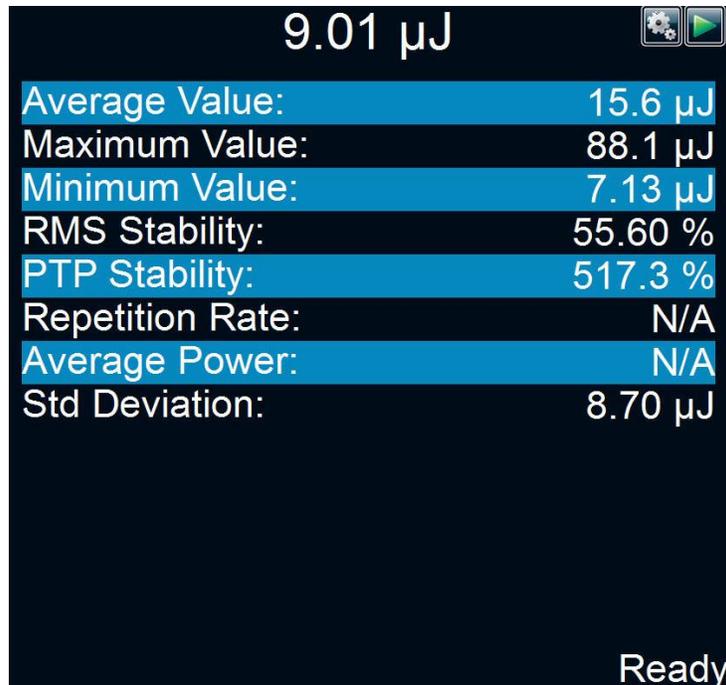


Figure 29. **Statistics** display in **Energy** mode

### Settings

The **Settings** panel for the **Statistics** display allows you to control the period and the sample rate for the calculations. In **Power** mode, the duration is set in days, hours, minutes or seconds.

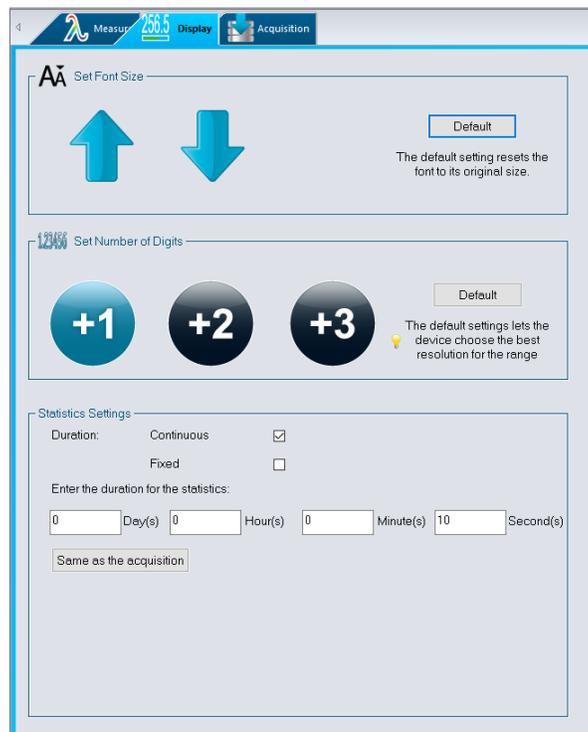


Figure 30. Settings for the **Statistics** display in **Power** mode

In **Energy** mode, the duration is set in number of pulses.

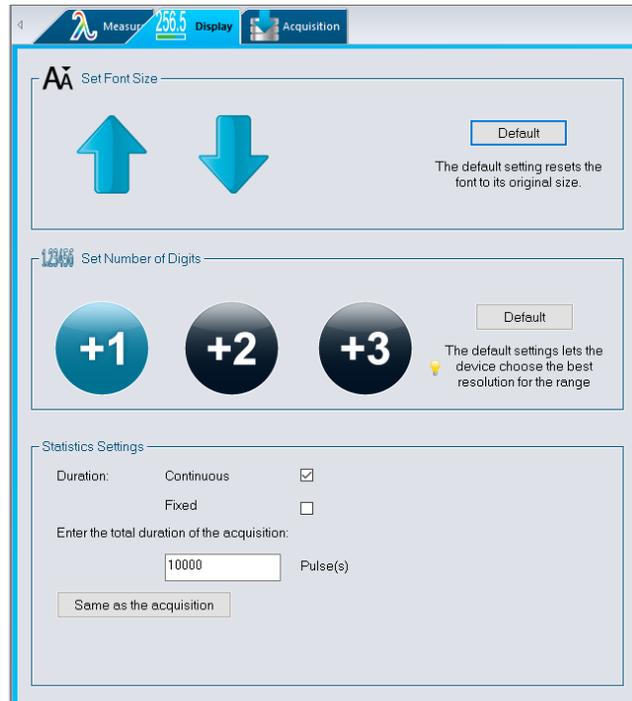


Figure 31. Settings for the **Statistics** display in **Energy** mode

### Continuous vs. fixed statistics

In both **Statistics** modes, the calculations start and reset with the **Start Statistics** button in the **Controls** menu.

You can also use the **Play**  button at the top right corner of the **Statistics** display.

In the **Fixed** mode, the statistics will stop automatically after the duration period. With the **Continuous** mode, the statistics, after the duration period has ended, will automatically reset and start again with the same duration period. This will continue until the **Stop**  button is pressed.



#### Tips

If the **Save Statistics** option is selected in the **Acquisition** menu, the **Continuous** mode cannot be used. Since the statistics are entered in a file at the end of the duration period, you must use the **Fixed** duration.

The file used for the statistics is the same as the one used for the acquisition. Therefore, if the file name of the statistics is changed, the acquisition file name will be changed automatically.

To store only the statistics in a file, select the **Save Statistics** option and start the statistics. To add statistics at the end of an acquisition file, select the **Save Statistics** option and start the acquisition. The statistics will automatically start at the same time and will be entered in the file at the end of the acquisition.

Parameter	Power	Energy	Definition
Current value	✓	✓	The value that is currently measured
Average value	✓	✓	The average of all the values measured since the beginning of the sample period, $E_{avg}$ or $P_{avg}$
Maximum value	✓	✓	The highest value measured since the beginning of the sample period, $E_{max}$ or $P_{max}$
Minimum value	✓	✓	The lowest value measured since the beginning of the sample period, $E_{min}$ or $P_{min}$
RMS stability	✓	✓	The root mean square (RMS) stability represents the standard deviation as a percentage of the average: $RMS = \frac{STD}{ E_{avg} } \times 100$ , $RMS = \frac{STD}{ P_{avg} } \times 100$
PTP stability	✓	✓	The peak-to-peak (PTP) stability shows the spread between the highest and lowest points in the sample in percentage: $PTP = \left  \frac{E_{max} - E_{min}}{E_{avg}} \right  \times 100$ , $PTP = \left  \frac{P_{max} - P_{min}}{P_{avg}} \right  \times 100$
Repetition rate		✓	The frequency of the pulsed laser, $PRR$
Average power		✓	The average power calculated from the pulsed energies and repetition rate: $P_{avg} = E_{avg} \times PRR$
STD deviation	✓	✓	A measure of the spread of the data around the average: $STD = \sqrt{\frac{\sum_{i=1}^n (E_i - E_{avg})^2}{n-1}}$ , $STD = \sqrt{\frac{\sum_{i=1}^n (P_i - P_{avg})^2}{n-1}}$

## 4. OPERATING INSTRUCTIONS

### 4.1. CONNECTING YOUR GENTEC-EO DEVICE

#### When there is only one Gentec-EO detector:

1. Connect your Gentec-EO device to the PC using a USB cable.
2. Install the PC-Gentec-EO software on the PC.
3. If necessary, power up the Gentec-EO device.
4. Start the PC-Gentec-EO software.



5. Click the **Connect** button in the main menu. The software will scan each port on your computer and connect to the first port connected to a Gentec-EO device that is detected.

#### When there is more than one Gentec-EO detector:

1. Connect your Gentec-EO devices to the PC using USB cables.
2. Install the PC-Gentec-EO software on the PC.
3. If necessary, power up the Gentec-EO devices.
4. Start the PC-Gentec-EO software.



5. Click the down arrow under the **Connect** button in the main menu and then click **Select your device**.
6. The screen below will appear.



7. The software will scan each port on your computer and display all the ports connected to a Gentec-EO device. Simply choose the device you want to connect and click the **Connect** button.

### 4.2. DISCONNECTING YOUR GENTEC-EO DEVICE



Click the **Disconnect** button in the main menu.

### 4.3. MODIFYING THE MEASUREMENT SETTINGS

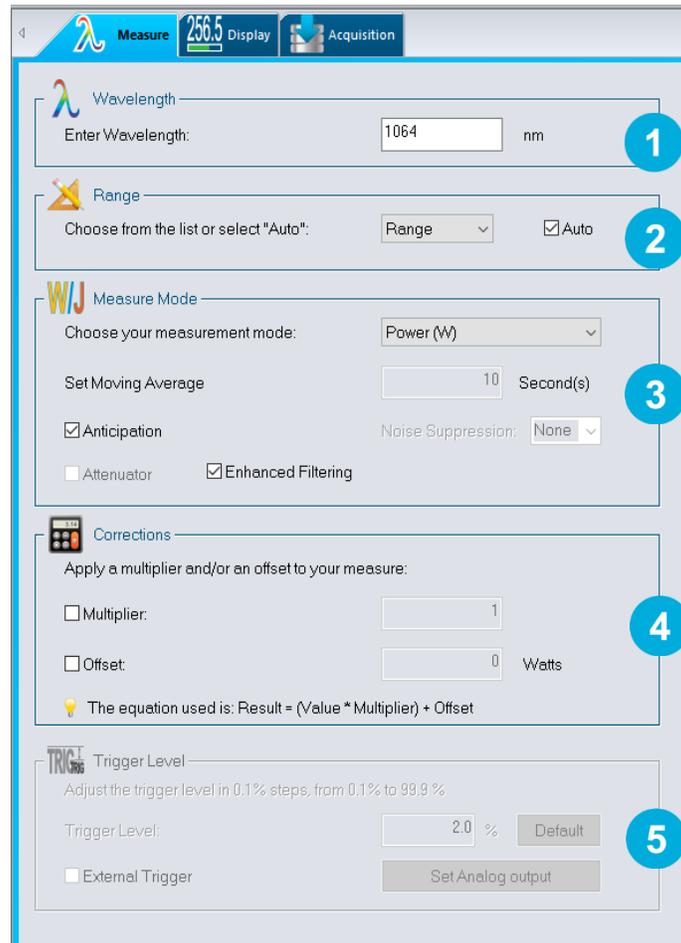


Figure 32. Measure menu

- 1 Wavelength**  
Enter the desired wavelength in nm.
- 2 Range**  
Use the drop-down menu to select the desired range. The chosen value will be the maximum that the PC-Gentec-EO software will measure before displaying **OUT**. By default, the Gentec-EO device is in **Auto** mode.
- 3 Measure mode**  
Use the drop-down menu to set the **Measure** mode (power, single-shot energy, moving average, etc.). Please note that it can take up to 3 seconds for the software to switch between measurement modes. The **Anticipation**, **Attenuator** and **Enhanced Filtering** options are controlled in this menu.
- 4 Corrections**  
Use these settings to set a **Multiplier** or **Offset** to your measurement. The equation used is: result = (value \* multiplier) + offset.
- 5 Trigger level**  
Adjust the trigger level in 0.1% steps, from 0.1% to 99.9%. Trigger level is not available in **Power** mode. **External Trigger** option is not available in **Power** mode and with Integra. Default value is 2%.

### 4.3.1. Wavelength

The **Wavelength** menu is used to select the proper wavelength at which the detector is used. It applies a correction factor to compensate for the variation in absorptivity at different wavelengths. Pre-programmed wavelength correction factors specific to each detector are available and automatically loaded from the EEPROM of the detector (for version 5 detectors and higher). When a new detector is plugged in, the calibration wavelength is the default selection.

The PC-Gentec-EO software automatically recognizes the latest energy and power detector for accurate auto-calibration. More importantly, it takes advantage of our personal wavelength correction certificate.

The PC-Gentec-EO software only allows you to choose values that fall within the detector's range. If you enter an invalid value, a menu pops up to signal the error, and the PC-Gentec-EO software automatically selects the default value, which is the wavelength used for calibration at Gentec-EO during manufacturing or subsequent service.



Tip

#### The personal wavelength correction certificate

To fill the gaps between the NIST references, Gentec-EO offers you the only NIST traceable calibration in nm steps, from 250 nm to 2.5  $\mu\text{m}$ . We achieve this using our proprietary setup that is based on a NIST traceable spectrophotometer. This way, instead of supplying you with typical values, we offer you a NIST traceable calibration. What you get is an overall accuracy that is not more than  $\pm 1\%$  away from the original calibration accuracy, in the spectrum of 300 nm to 2200 nm.

Each Gentec-EO detector comes with a personal wavelength correction certificate. The correction factors are based on measurements that were made with your detector. They are not based on the general curve of the absorbing material or the general response of equivalent products. This means you get the best wavelength correction tool available on the market. This data is stored in the Smart interface of your Gentec-EO detector. You just have to select the wavelength in your monitor (or software) to get the most precise laser measurements on the market.

### 4.3.2. Range

The **Range** menu is used to select the signal level read by a detector. When a new detector is plugged in, the **Auto** mode is the default option. In this mode, the PC-Gentec-EO software automatically selects the best range for the value being measured. You can also choose a fixed range. The PC-Gentec-EO software only shows range values that fall within the detector's range. You can only choose from these available ranges.

When in a manually selected range, you should always use the next higher range to the measured value, for maximum precision. For example, when measuring around 200 mW, choose the 300 mW range.

Special care must be taken in the case of widely varying pulse energies to ensure that every pulse is detected. Contrary to power measurements, where the **Auto** mode continuously adjusts the range to the measured value, in **Energy** mode, the Auto range selects the range based on the energy of the previous pulse. A pulse with energy less than 2% of the current range will not be detected. Always set the range to the best one available. To be sure to measure lower energies, set the range manually to the lowest level or use the **Auto** range so the PC-Gentec-EO software automatically chooses the best range. In this case, the pulses that saturated the range while the **Auto** range was searching for the best range will be invalid.

### 4.3.3. Measure mode

Depending on the type of detector, you can choose different **Measure** modes.

#### Energy detectors

- ▶ Energy in joules

#### Power detectors

- ▶ Power in watts (default)
  - ▶ Single-shot energy in joules<sup>3</sup> (**Energy mode/Calorimeter mode**)
  - ▶ Moving average in watts

#### Photo detectors

- ▶ Power in watts (default)
  - ▶ Moving average in watts
  - ▶ Power in dBm (dBm = Log [power in Watts/0.001W])

The **Moving Average** algorithm is directly calculated in the PC-Gentec-EO software and will not activate the moving average setting on the monitor.

Deselect **anticipation** to deactivate the power meter acceleration software that provides accelerated response. By using advanced algorithms and known properties of the detector, this software allows the PC-Gentec-EO software to provide a very accurate power measurement (a few seconds faster than the natural response of a power detector). It accelerates the natural response by a factor of 5 to 10. Turning off the anticipation will result in a slower response but will reduce the noise level and provide more stable measurements in a noisy environment.

**Noise suppression** is only available for pyroelectric detectors (QE and UM) when combined with an INTEGRA joulemeter or U-LINK. This function will greatly improve the accuracy of the lowest scale or any scale when used in a noisy environment.

---

<sup>3</sup> This function allows you to measure the energy contained in a laser pulse with a Gentec-EO **power detector**. This mode of operation gives access to the same options as an energy detector. The only restriction is that the time delay between pulses  $Delay = \left( \frac{1}{Rep. Rate} \right)$

must be compatible with the specifications of the detector (please refer to the user manual for the specific power detector you are using.). You must select the range manually because the **Auto** range is deactivated when you select **Energy** mode. Keep in mind that the power detectors are optimized to sustain high-average power, not high-peak energy. Always keep the energy density below the maximum energy density quoted in the manual for that specific detector. The **Energy** mode is always available for power detectors with a typical sensitivity value. A precision of  $\pm 3\%$  in the pulse energy measurement can be achieved if the power detector is specifically calibrated in **Energy** mode. Please contact your local Gentec-EO distributor or nearest Gentec-EO office for more information on obtaining a pulse energy measurement calibration.

The INTEGRA or U-LINK will need to measure the number of pulses selected in the noise suppression selector before the algorithm will settle to the noise-reduced value, see Figure 33. Once the readings have stabilized, any subsequent reading will be stable until the number of pulses selected is changed. The system will then stabilize to the noise-reduced value after the new number of pulses has been measured. Larger sample sizes will result in increased noise suppression. Noise suppression works best with the external trigger.

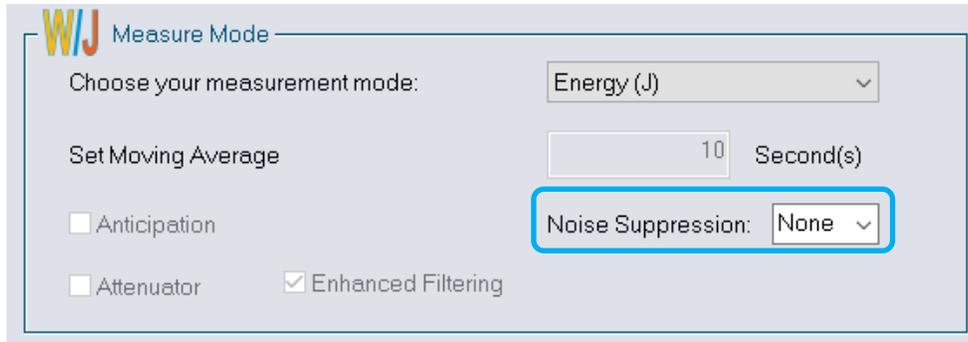


Figure 33. Noise suppression selector

By default, the **enhanced filtration** is activated for power detectors. The enhanced filtration uses our noise reduction algorithm for increased signal quality. By deactivating the enhanced filtration, the response time of the detector will decrease (the measurements will be faster), but you will have a slightly higher noise level.

Version 7 energy detectors have been calibrated with and without the **Attenuator** at a chosen wavelength. When activating the **Attenuator**, only the wavelength at which it has been calibrated will be available in the **Wavelength** menu. Similarly, photo detectors have been calibrated with and without the **Attenuator** at chosen wavelengths. When activating the **Attenuator**, the PC-Gentec-EO software will open the **Wavelength** menu because the available wavelengths with and without the attenuator are different. Note that the **Attenuator** function when used with QE and U-LINK will have no effect.

#### 4.3.4. Corrections

The user can apply a **Multiplier** or an **Offset** to the measurements. Correction factors are most useful when sampling a percentage of a powerful laser beam or correcting for absorption along an optical chain.

The default value for the multiplier is 1, and the default for the offset is 0. You can enter any multiplier value between 0.0002 and 5,000 and any offset value between -10,000 and +10,000. To change the value of the correction factors, you first need to activate them by checking the appropriate box.



Example

##### Adjusting your measurements using correction factors

For example, if you are measuring a laser beam passing through the 99.9% back reflector of a laser (giving 1/1000<sup>th</sup> of the real value), choose **Multiplier** and enter 1000 in the dialog box. The PC-Gentec-EO software will display the laser power rather than the measured 0.1% sample.



Warning

It is essential to make sure that the actual measured value also complies with the power and energy limits of the detector.

The **Auto** range option is the default selection. You can select a specific range, but it must always be based on the actual measured values and not on the corrected values. Of course, the displayed values and the display range selection are then calculated to take into account the correction factors.



Tip

The statistics are computed for the corrected values only.

#### 4.3.5. Trigger level

The **Trigger level** only works if an energy detector is connected or if a power detector is used with the **Single-Shot Energy (SSE)** mode. This option allows you to change the **Trigger level**. The default value is 2% of the full range. This has proved to be especially useful in noisy environments. Acceptable values range from 0.1% to 99.9% with 0.1% steps. Caution should be taken when choosing a trigger level lower than the 2% default value in a noisy environment.

The PC-Gentec-EO software will not detect pulses with a value under the trigger level. If the trigger level is high, be careful to select a range that is close to the measured value. To reset the default value to 2.0%, simply click the **Default** button.



Warning

If you select a high value trigger level, the PC-Gentec-EO may not be able to detect all the values of widely varying energy levels in **Auto** range mode. The **Auto** range function uses the energy level of the last pulse to set the range level. Therefore, it will not detect the next pulses if they are lower than the trigger level. As a result, the **Auto** range may become caught at a high range value. To avoid this problem, select a lower value for the trigger level, change the range manually or reset the **Auto** range mode by reselecting **Auto** in the **Range** menu.



Erratic triggering?

In electrically noisy environments, it is possible that the PC-Gentec-EO software will inadvertently trigger on the noise. If this is the case, increase the trigger level to 3% or higher if necessary.

It is always good practice to reduce electrical noise generation or shield the detector and monitor when measuring very low pulse energies.

You can also set the device to be triggered externally. Just click the **External Trigger** check box (not available on the INTEGRA).

## 5. TROUBLESHOOTING

### 5.1. PC-GENTEC-EO SOFTWARE CANNOT FIND THE MONITOR

The following warning message is displayed: **Please select a valid serial port.** Try the following steps until your connection is active.

- ▶ Make sure the USB drivers are installed.
- ▶ Verify all your connections. Verify that a Gentec-EO device is powered on and connected to the PC with a USB cable.
- ▶ For a MAESTRO monitor, go to the **Home** menu ▶ **Set Device** ▶ **Serial Commands**.
  - Verify that the MAESTRO *is not* in **Solo2 Serial Compatibility (ASCII Only)** mode.
  - Verify that the MAESTRO *is not* in **Binary Mode Measurement (Energy Mode only)** mode.
  - Verify that USB (if a USB cable is used) or RS-232 (if a RS-232 cable is used) is selected.
  - Restart the MAESTRO.
- ▶ Unplug the Gentec-EO device.
- ▶ Restart the PC-Gentec-EO software.
- ▶ Restart your computer.
- ▶ If none of these steps have worked, contact Gentec-EO support at [service@gentec-eo.com](mailto:service@gentec-eo.com).

### 5.2. MOVING AVERAGE IS NOT WORKING WITH AN ENERGY DETECTOR

This is because this feature is not yet available for energy detectors.

### 5.3. MY SETTINGS WILL NOT LOAD

Settings can be saved exclusively for one type of detector. For example, you cannot use power detector settings with a photo detector.

We recommend following this procedure for each new detector type:

1. Connect your first detector (for example, a photo detector).
2. Customize the PC-Gentec-EO software to your needs.
3. Save the settings to a file using the **Save Settings** button in the **Controls** menu (for example, "Photodetector.geo").
4. Disconnect your first detector.
5. Connect your second detector (for example, a power detector). Note that all the settings from the first detector are still active.
6. Verify the options in the **Set Measure** menu.
7. Save the new settings to a file (for example, "Power.geo").

After that, you can plug any of your different detectors and load the corresponding settings without a problem.

#### **5.4. REPETITION RATE AND AVERAGE POWER ARE NOT ACCURATE IN THE STATISTICS MODE**

Make sure that you activate the **Turbo** mode with an INTEGRA or U-LINK and that you comply with the PC recommended requirements. The MAESTRO does not have a **Turbo** mode, but it can go up to 500 Hz using the PC-Gentec-EO software.

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