



USER MANUAL

MIRO ALTITUDE | Professional laser power & energy meter

WARRANTY

Gentec-EO MIRO ALTITUDE power and energy laser meter carries a one-year warranty (from date of shipment) against material and/or workmanship defects, when used under normal operating conditions. The warranty does not cover damages related to battery leakage or misuse.

Gentec-EO Inc. will repair or replace, at Gentec-EO Inc.'s option, any MIRO ALTITUDE that proves to be defective during the warranty period, except in the case of product misuse.

Any attempt by an unauthorized person to alter or repair the product will void the warranty.

The manufacturer is not liable for consequential damages of any kind.

In case of malfunction, contact your local Gentec-EO distributor or nearest Gentec-EO Inc. office to obtain a return authorization number. The material should be returned to:

Gentec Electro-Optics, Inc.
445, St-Jean-Baptiste, Suite 160
Québec, QC
Canada G2E 5N7

Tel: (418) 651-8003
Fax: (418) 651-1174
e-mail: service@gentec-eo.com

Website: www.gentec-eo.com

CLAIMS

To obtain warranty service, contact your nearest Gentec-EO agent or send the product, with a description of the problem, and prepaid transportation and insurance, to the nearest Gentec-EO agent. Gentec-EO Inc. assumes no risk for damage during transit. Gentec-EO Inc. will, at its option, repair or replace the defective product free of charge or refund your purchase price. However, if Gentec-EO Inc. determines that the failure is caused by misuse, alterations, accident or abnormal conditions of operation or handling, you will be billed for the repair and the repaired product will be returned to you, transportation prepaid.

SAFETY INFORMATION

Do not use the MIRO ALTITUDE if the device or the detector seems to be damaged or if you believe that the MIRO ALTITUDE is not working 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 laser power is turned off. The surfaces of the detectors get very hot and there is a risk of injury if they are not allowed to cool down.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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

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1 MIRO ALTITUDE: LASER POWER AND ENERGY METER

1.1 INTRODUCTION

MIRO ALTITUDE is Gentec-EO's new flagship product for reading your laser power and energy measurements. More than an evolution from our current product line, we see it as a revolution in the laser beam measurement industry that helps engineers and technicians increase productivity thanks to numerous new features in both hardware and software. Enter the modern era of laser beam measurement with:

- ▶ 10" high-resolution, anti-glare touchscreen
- ▶ Remarkably strong and durable aluminum casing
- ▶ Robust, industrial-grade connectors
- ▶ Modern, quad-core processor
- ▶ On-board data storage
- ▶ 3 display modes: scope chart, needle, and bar graph
- ▶ Built-in file manager to save and view your recorded measurement sessions

To obtain optimum results from your MIRO ALTITUDE meter, we suggest you to carefully read this manual.



This user manual corresponds to MIRO ALTITUDE software version 1.00.06
Software updates will be provided on the Gentec-EO website:
www.gentec-eo.com/products/miro-altitude

1.2 WHAT'S INCLUDED WITH YOUR MIRO ALTITUDE

The following items are included with MIRO ALTITUDE:

Description
MIRO ALTITUDE power and energy meter
USB-C cable, 2 m
12 V power supply with 1.83 m barrel jack cable and country-specific outlet cable
Transportation sleeve
MIRO ALTITUDE box
Calibration certificate


The following item can be purchased separately:

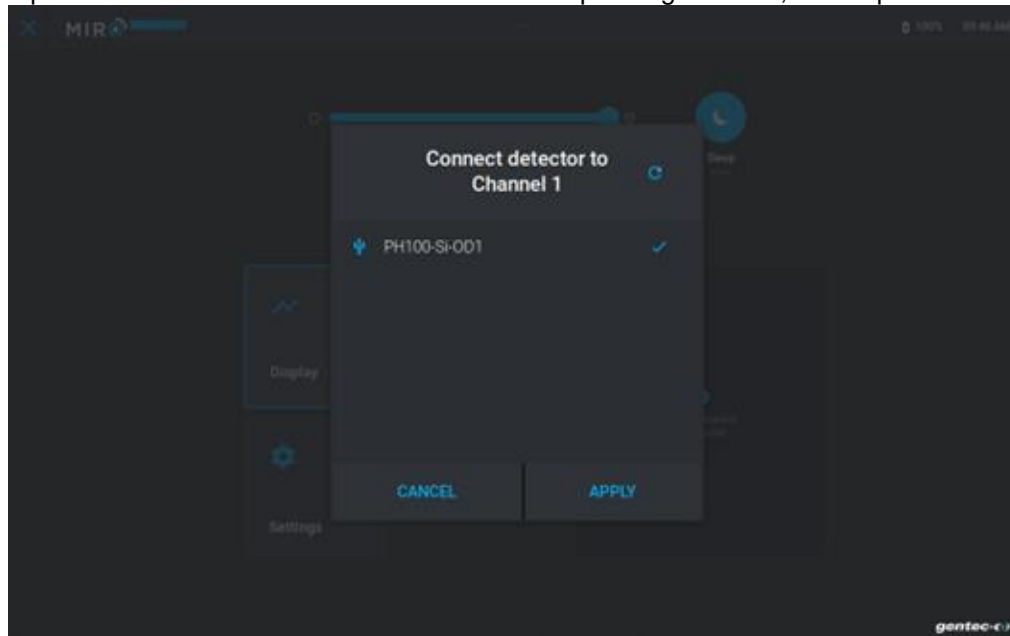
Description	Part name	Part number
Stand for MIRO ALTITUDE, 4 x 4in base, 3in arm, adjustable angle.	STAND-R-443	205609


1.3 QUICK LAUNCH GUIDE

In this section you will find how to take a power or energy laser measurement with the MIRO ALTITUDE device and a Gentec-EO power or energy detector. Detailed instructions of all the device's functionalities can be found in Section 2.

Quick procedure to measure power and energy:




1. Press the power button of the MIRO ALTITUDE to turn it on, which is in the upper right part of the front of the device.
2. Connect the power or energy detector to the input port of the MIRO ALTITUDE.
3. Tap the menu icon () to open the control center.
4. Tap on "Tap to connect a detector" and choose the corresponding detector, then tap APPLY.



5. Close the control center () or select "Display" to view the measurements. The software will be configured by default for power measurements when a power detector is connected. In the same way, the software will be configured by default for energy measurements when an energy detector is connected. The screen will show data in scope display, which is the default measurement display, with automatic adjustment of the range (power or energy level).



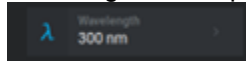
There are three display options of the average laser power or energy:

- a.  Chart mode: A scrolling graph in scope display to evaluate laser variations over time.
- b.  Needle mode: A digital pointer or needle allowing for a precise adjustment. This allows seeing the instantaneous variation of the laser power or energy.
- c.  Bar mode: A bar graph display for real time measurements.

6. Remove the protection cover of the sensor and power on the laser.

Wavelength adjustment

The wavelength can be set according to the laser being used. Tap on the wavelength setting in the left-hand tab:



A menu will appear which allows selection of the wavelength. MIRO ALTITUDE will then apply the calibration factor corresponding to the selected wavelength to convert the detector's signal into measured values.

(See section 2.3.6.1 for more details)

Zero offset


The power measurement of the MIRO ALTITUDE might not be exactly zero even if there is no laser beam on the sensor. The "ZERO" button sets the detector's current value to zero. Subsequent measurements will be taken based on this new zero power level.

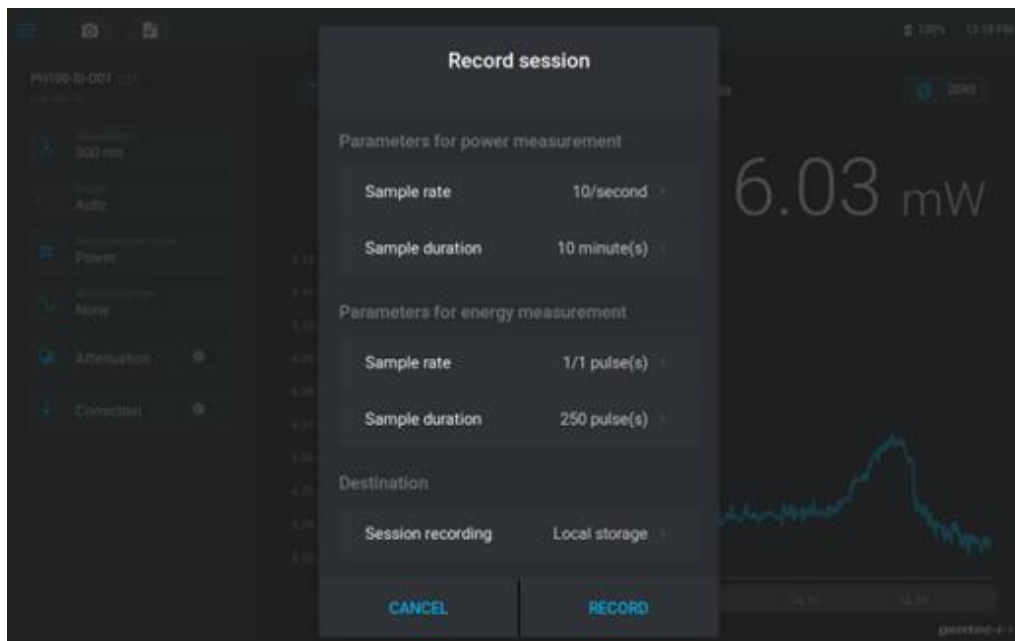
1. Place the detector in the optical path of the laser. The entire laser beam must be inside the detector aperture. Do not exceed the specified maximum energy or power density thresholds. Distribute the beam on 60% to 80% of the detection surface to obtain the most accurate measurements.
2. Wait a few minutes so the detector reaches thermal equilibrium.
3. **Thermal detectors:** Block any laser radiation towards the detector. Wait until the measurement is stable.
Photodiodes: Block the laser. There is no need to wait when using a photodiode.
4. Click on the "ZERO" button. The zero will be adjusted for the selected range and it will be adjusted for all the ranges if you are in automatic range mode.

Notes:

- ▶ Please refer to the specific documentation for your power detector to see the complete installation and operating instructions.
- ▶ Power detectors are sensitive to temperature variations.
- ▶ To perform high-precision measurements, we suggest the following:
 - Wait until the detector temperature is stable before adjusting the zero;
 - Do not touch the power detector. It is better to handle it touching its optical support;
 - Reduce air currents around the detector.

Data recording

The "Record session" button () opens the data recording settings. Start the recording by tapping on the "RECORD" button. MIRO ALTITUDE has an internal memory with enough space to store several recordings. (See section 2.3.5.3 for more details)



Session playback

The view function (🔍) in the file manager displays recorded data such as screenshots and recordings that are stored on the internal memory and on a USB drive. (See the relevant section for more details)



1.4 SPECIFICATIONS

The following specifications are based on a one-year calibration cycle, an operating temperature of 18 to 28 °C (64 to 82 °F) and a maximum relative humidity of 80%.

POWER METER SPECIFICATIONS	
Compatible detectors	XLP, HP, UP and PH
Power range	4 pW to 100 kW
Power scales ³ (PH series photodetectors)	300 pW, 10 nW, 30 nW, 100 nW, 300 nW, 1 µW, 3 µW, 10 µW, 30 µW, 100 µW, 300 µW, 1 mW, 3 mW, 10 mW, 30 mW, 100 mW, 300 mW, 1 W, 3 W
Power scales ³ (UP, HP, XLP thermal detectors)	300 µW, 1 mW, 3 mW, 10 mW, 30 mW, 100 mW, 300 mW, 1 W, 3 W, 10 W, 30 W, 100 W, 300 W, 1 kW, 3 kW, 10 kW, 30 kW, 100 kW
Resolution (digital)	Selected range / 8388608 (in power mode) Selected range / 3754 (in power mode, pyroelectric mode)
Monitor accuracy	± 0.5 % ± 3 µV, from 20 % to 100 % of the scale ¹
Data transfer rate ⁵	15 Hz at a 24-bit resolution 15 Hz at a 12-bit resolution (pyroelectric detectors) 1 reading per pulse (energy mode)
Statistics	Current value, max., min., average, standard deviation, RMS stability, PTP stability
Data storage	On the device, USB drive (FAT, FAT32), 10 days max
Analog Output Update Delay ²	730 ms
ENERGY METER SPECIFICATIONS	
Compatible detectors	QE, UP and XLP series in energy mode, calorimeters
Energy range	2 fJ to 30 kJ
Energy scales ³ (PH series photodetectors)	300 fJ, 1 pJ, 3 pJ, 10 pJ, 30 pJ, 300 pJ, 1 nJ, 3 nJ, 10 nJ, 30 nJ, 100 nJ, 300 nJ, 1 µJ, 3 µJ, 10 µJ, 30 µJ, 100 µJ, 300 µJ, 1 mJ, 3 mJ, 10 mJ, 30 mJ
Energy ranges ³ (QE and UP thermal detectors)	10 µJ, 300 µJ, 3 mJ, 10 mJ, 30 mJ, 100 mJ, 300 mJ, 1 J, 3 J, 10 J, 30 J, 100 J, 300 J, 1 kJ, 3 kJ, 10 kJ, 30 kJ
Resolution (digital) ⁴	Selected range / 3754
Accuracy ⁴	1.0 % ± 50 µV, < 500 Hz 2.0 % ± 50 µV, 500 Hz to 10 kHz
Default trigger level	2%
Software trigger level	0.1% to 99%, 0.1% resolution
Data transfer rate ⁵	10 kHz (maximum) 2.5 kHz (ASCII mode)
Frequency measurement	0.1 to 1000 Hz: 2 % ± 0.1 Hz 1000 to 10,000 Hz: 5 % ± 1 Hz
Statistics	Current value, max., min., average, standard deviation, RMS stability, PTP stability, number of pulses, repetition rate, average power
Data storage	On the device, USB drive (FAT, FAT32), 1 pulse up to 999999 pulses
Analog Output Update Delay ²	27.1 ms
GENERAL SPECIFICATIONS	
User input correction factors	1 multiplier and 1 offset (7 significant figures, floating comma)

Analog output	0 – 5 V, full scale, $\pm 1\%$
Analog Outout refresh Rate⁶	50 Hz
External trigger	Signal from 2.5 V to 24 VDC Not isolated
External trigger pulse length	1 μ s minimum
Temporal requirements for the external trigger	See below
Updates	USB drive
Dimensions	210 mm (L) x 190 mm (W) x 40 mm max (H)
Weight	1.57 kg
Power supply	Included power supply 12 VDC 3.33 A Can also be charged with USB-C (charger not included). At least 18 W required to charge battery while in use.

Specifications subject to change without notice

¹ When low-sensitivity detectors are used for low power measurements, the application of the polarization tension can produce a measurement error. It is fundamental to use the **ZERO** function to redefine the zero of the MIRO ALTITUDE before taking measurements under these conditions. It is a best practice to use the **ZERO** function.

² Analog output update time following a new measurement. Typical value. Hardware and firmware dependant. Takes into account the delay used by the monitor to interpret the measurement and update the analog output.

³ Values might vary according to the detector that is being used.

⁴ Including linearity.

⁵ This transfer rate depends on the PC that is being used. The host PC must be fast enough to receive and handle incoming data. Recommended hardware: Intel Duo Core processor with a clock speed of 2.4 GHz or more.

⁶ Typical value. Hardware and firmware dependant. Contact your nearest Gentec-EO agent for more information.

1.5 MECHANICAL DESCRIPTION



Front panel of the MIRO ALTITUDE



Top panel of the MIRO ALTITUDE



Left side panel of the MIRO ALTITUDE

Features:

1. Power button
2. Touchscreen
3. Detector input
4. BNC connectors
5. Programmable connectors (feature not yet available)
6. RS232 port
7. Ethernet port
8. USB-C port (PC connection)
9. Power input
10. USB-A connectors

1. Power button

To power on or off the MIRO ALTITUDE press the power button for half a second.

In case of a problem, to reboot the device, keep the button pressed for approximately 6 seconds.

If the green LED indicator on the button is on or flashing, this means that the device is charging.

2. Touchscreen

The MIRO ALTITUDE has a 10.1" multi touchscreen with an active surface of 217.56 (L) x 136.2(H) mm.

To clean your screen, it is recommended to use a cleansing cloth or a soft, dry, and lint-free cloth. If necessary, you can humidify the cloth with one of the following elements: water, isopropyl alcohol (IPA) 70% or lower, or a cleaner for eyeglasses.

3. Detector input

MIRO ALTITUDE has a female DB-15 connector to connect Gentec-EO detectors.

MIRO ALTITUDE works with most Gentec-EO energy and power detectors that have a DB-15 connector. See the table of specifications for additional information. The MIRO ALTITUDE device can read the calibration information stored in each energy and power detector, thus ensuring precise operation. Furthermore, it uses the specific data from your detector included in the *Personal Wavelength Correction*[™] certificate. MIRO ALTITUDE reads the information stored in the *Smart Interface* connector's memory (as from version 5) and proceeds to a customized correction of the wavelength based on the spectral data measured for your detector.

The MIRO ALTITUDE device might not recognize certain older sensors.



This DB-15 connector, though similar to that of the former TPM-310 and TPM-330 monitors, is incompatible with the power detector heads of PS-310 Series Version 1 and PS-330 Series Version 1. These heads used a different technology and do not have the same pin-out configuration.

4. BNC connectors

The analog output, synchronization signal output and the triggering signal input can be used with the BNCs on the device.

Analog output

Used to monitor the average laser power or energy with an independent device, such as a recorder, a computer with an analog interface, a voltmeter, etc. To use this feature, please use a standard BNC cable.

If you are making a power measurement, the output signal will be an analog DC voltage proportional to the amplified or anticipated signal. If you are making an energy measurement, the output signal will be an analog DC voltage corresponding to the pulse energy.

The user must specify the maximum output voltage and the maximum value of the power or energy range through the MIRO ALTITUDE application or the series commands. The measured power or energy is then converted to output voltage considering the measurement range specified according to the following equation:

$$V_{\text{output}} = (\text{Measurement} \times \text{Maximum output voltage}) / \text{Maximum of the output analog range}$$

For example, for a maximum output voltage of 2.0 V and an analog range with a maximum of 10 W:

2.0 V corresponds to 10 W

1.0 V corresponds to 5 W

Another practical example: to configure the analog output so that 1 V corresponds to a measured power of 56 W, with a maximum output voltage of 2 V, the analog output range must have a maximum power of 112 W, according to the following equation:

$$\text{Maximum of the output analog range} = 56 \times 2.0 = 112$$

Specifications of the analog output:

Maximum output voltage:	5.0 V
Connector type:	Female BNC
Precision at full range:	1% of the measured value, ± 5 mV

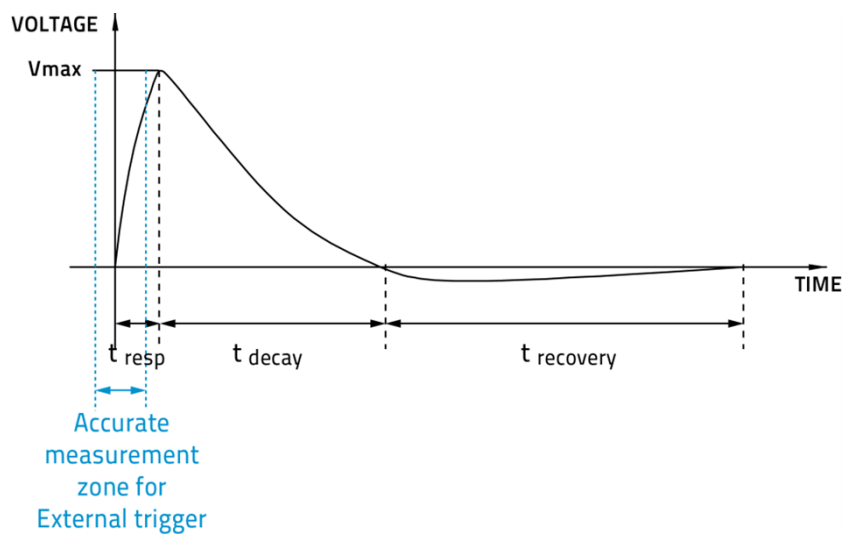
The analog output should be used with a high impedance load.

Synchronization output (coming soon)

Trigger signal

To perform energy measurements, you can connect the MIRO ALTITUDE to an external trigger, using a BNC cable.

The beginning of the external trigger signal must arrive in a time window relative to the beginning of the laser pulse. This window begins 20% of the rise-time before the laser pulse and ends one rise-time after the beginning of the pulse minus the minimum trigger pulse width.



5. Programmable connectors (coming soon)

6. RS232 port

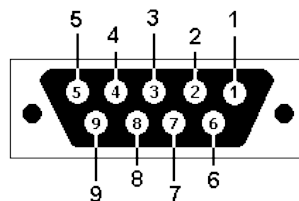
Any device that has a serial communication port (computer, terminal, or another) can receive the data of the MIRO ALTITUDE through the serial port and control it remotely.

Output pin configuration RS232 of the MIRO ALTITUDE device

Pin no.	Signal
1	Not connected
2	TX
3	RX
4	Not connected
5	GND signal
6	Not connected
7	Not connected
8	Not connected
9	Not connected

TX: Data transferred from the MIRO ALTITUDE (output)

RX: Serial commands received by the MIRO ALTITUDE (input)



DB9: Pin configuration of the female connector of the MIRO ALTITUDE RS232 connector

7. Ethernet port

This interface offers the possibility to send commands and transfer data between the MIRO ALTITUDE and a computer via the Ethernet port.

8. USB-C port (PC)

Through the USB-C communication port, a computer can receive data from the MIRO ALTITUDE and control it remotely.

The USB-C port can be used for charging the MIRO ALTITUDE. To charge the battery while the device is running, at least 18 W is required.

9. Power supply

The power supply included with the MIRO ALTITUDE provides 12 VDC 3.33 A.



The device can be permanently damaged if an external power supply other than the Gentec-EO P/N 205519 is used. Please call Gentec-EO or your local distributor if extra power supplies are needed or for more information.

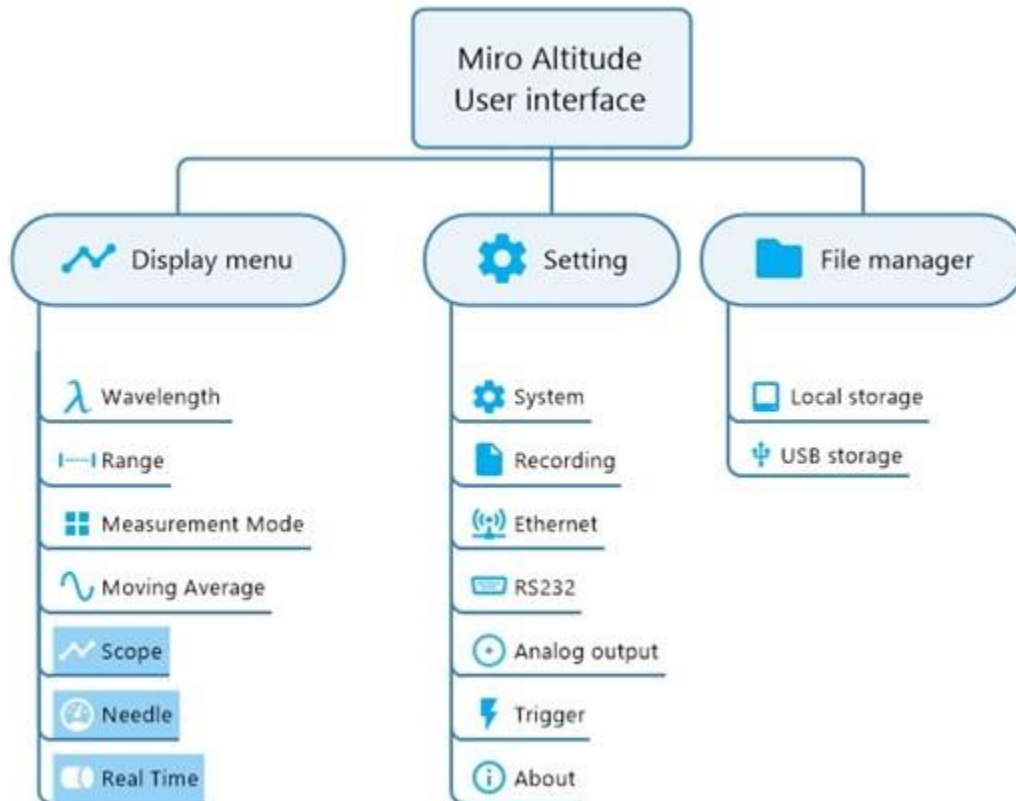
10. USB-A connectors

When a USB drive is plugged in one of these ports, it is possible to save data to it. It is also possible to manage the files on a USB drive via the file manager, where you can view, copy, delete, or rename the files.

2 USER INTERFACE


















2.1 USER INTERFACE STRUCTURE










The powerful processor of the MIRO ALTITUDE, combined with the on-board operating system, offers easy and intuitive access to all its functionalities. The user controls the intuitive interface using the touchscreen. To access options and functions, simply tap the related button on the touchscreen. To help you explore the different menus, the following image illustrates the MIRO ALTITUDE user interface structure. The items highlighted in blue are the 3 display modes. Only one is active at a time.











Different buttons and icons allow you to interact with the MIRO ALTITUDE user interface. The following table describes the different buttons and icons on the MIRO ALTITUDE.

Measurement menu (Display menu)








Icon	Name	Type	Description
NAVIGATION BAR			
	Menu	Button	Opens the MIRO ALTITUDE control center
	Screenshot	Button	Takes a screenshot and saves it to memory
	Data logging	Button	Opens the data logging menu to start a log
	Battery	Icon	Shows the battery level and status
MEASUREMENT SETTINGS PANEL			
	Wavelength	Button and Indicator	Opens the wavelength menu and displays the currently used wavelength
	Range	Button and Indicator	Opens the range menu and displays the current range
	Measurement mode	Button and Indicator	Opens the measurement mode selection menu and displays the active measurement mode
	Moving average	Button and Indicator	Opens the averaging time selection menu and displays the moving average time window
	XNR Anticipation™	Button and Indicator	Activates or deactivates the thermopile speed-up algorithm
	Attenuation	Button and Indicator	Activates or deactivates the calibrated value for the detector with attenuator (only available for certain detector models)
	Correction	Button	Shows the multiplier and offset options
	Multiplier	Button and Indicator	Opens the multiplier selection menu and identifies the multiplier that was entered
	Offset	Button and Indicator	Opens the offset selection menu and identifies the offset that was entered
MEASUREMENT DISPLAY AREA			
	Clear	Button	Clears (resets) the current chart and starts again with the time at zero
	Zero	Button	Sets the detector's signal to zero for all active ranges
	Scope	Button	Opens the scope display
	Needle	Button	Opens the needle display

	Bar graph	Button	Opens the bar display
	Maximum	Icon and Indicator	Displays the maximum measured value since the last reset
	Minimum	Icon and Indicator	Displays the minimum measured value since the last reset
	Average	Icon and Indicator	Displays the average of all measured values since the last reset
	Standard deviation	Icon and Indicator	Displays the standard deviation of all measured values since the last reset
	Repetition rate	Icon and Indicator	Displays the average repetition rate (for energy measurements only)
	PTP stability	Icon and Indicator	Displays the spread between the highest and lowest point in the sample as a percentage of the average.
	RMS stability	Icon and Indicator	Displays the spread of the data around the average value
	Average power	Icon and Indicator	Displays the average power when using a joulemeter. In power mode, it is equal to the average.








Control center

Icon	Name	Type	Description
	Display	Button	Opens the measurement screen
	File manager	Button	Opens the data file manager
	Settings	Button	Opens the system settings menu
	Tap to connect	Button	Opens the list of available detectors
	Disconnect	Button	Disconnects the detector
	Sleep	Button	Activates the sleep mode as configured in the settings
	Brightness	Slider	Adjusts the screen brightness
	Exit	Button	Exits the control center

System settings

Icon	Name	Type	Description
	System	Button	Opens the system settings menu
	Recording	Button	Opens the data recording settings menu
	Ethernet	Button	Opens the Ethernet connection settings menu
	RS232	Button	Opens the RS232 communication settings menu
	Analog output	Button	Opens the analog output settings menu
	Trigger	Button	Opens the measurement triggering level settings menu
	About	Button	Opens the MIRO ALTITUDE information menu

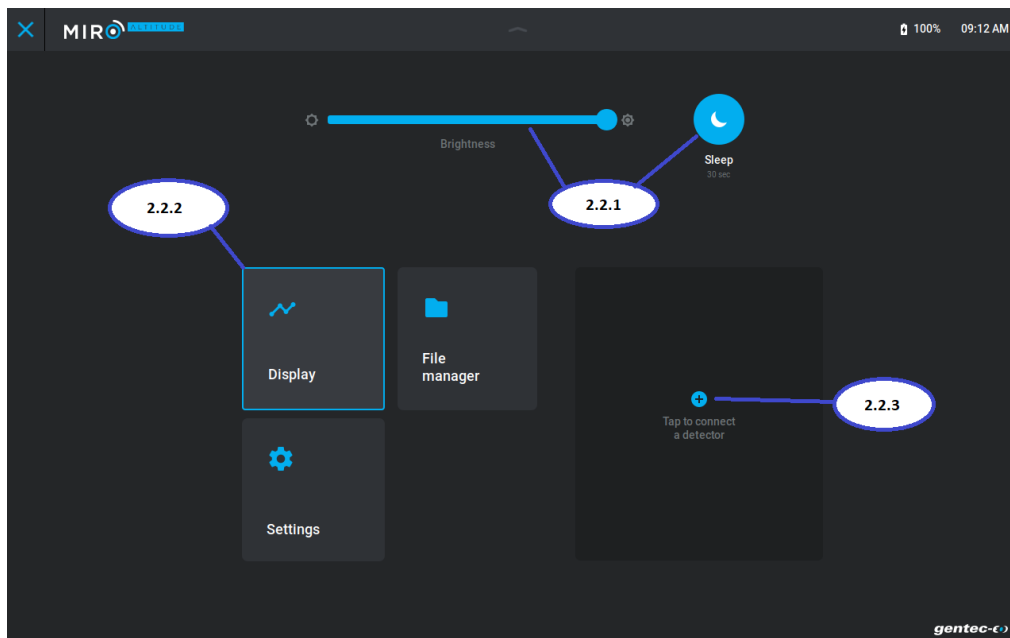
File manager

Icon	Name	Type	Description
	Local storage	Button	Opens the on-board storage folder
	USB storage	Button	Opens the file folder of an attached USB drive
	File / folder actions	Button	Displays file management options such as move, delete, and rename
	Open folder	Button	Opens the folder
	Read file	Button	Opens the file
	Recording	Icon	Indicates that a file is a recording
	Screenshot	Icon	Indicates that the file is a screenshot

2.2 CONTROL CENTER

The control center is the main hub of the software. It includes three sections:

1. **Quick controls** for commonly used device settings
2. **Navigation** buttons to access the display, file manager and settings
3. **Detector connection** panel



2.2.1 Quick controls

The screen's brightness can be adjusted by moving the cursor on the scroll bar.

Sleep mode can be activated or deactivated by pressing on the “Sleep” button. The button turns blue to indicate that the sleep mode is active. The delay time before sleep mode is entered is indicated in grey under the button. The delay time can be modified in the settings menu.

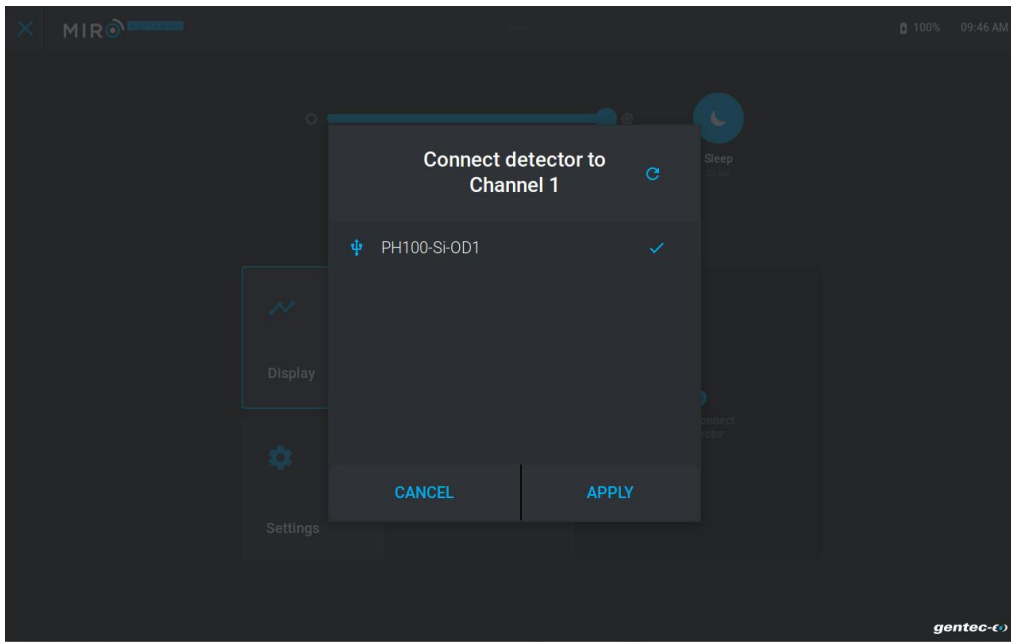
2.2.2 Navigation

The control center allows the user to quickly access the three main interfaces of the MIRO ALTITUDE by pressing the corresponding buttons. The active interface is identified with a blue border. When the instrument is turned on, it enters the Display interface.

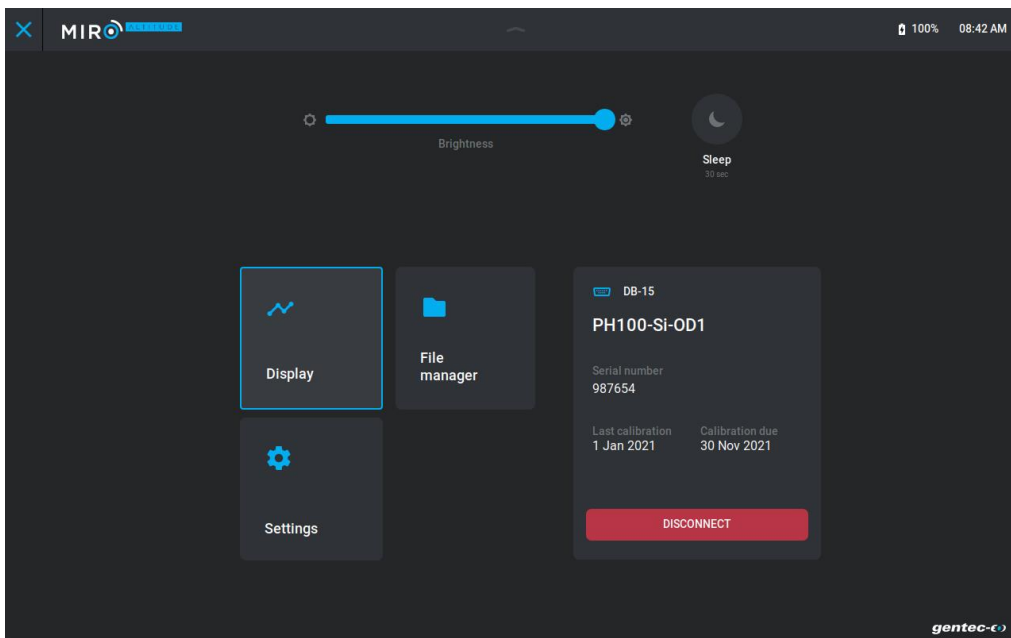
The active interface in the control center is shown according to the user's last choice. When the control center is closed by tapping on the "X" in the upper left corner, the user will return to the previous view (the one with the blue border).

2.2.3 Detector connection

To connect a detector that is currently plugged into the device, press on the “Tap to connect” button (+). A menu will be displayed with the list of currently available connectors. If a detector is connected to the instrument at that time, and it does not appear on the list, press the “refresh” button (↺) so that the software can look for it. When a detector is selected, a blue check mark will appear at the end of the line. By clicking on the “APPLY” button below, the detector will be connected.



The detector connection panel then shows the specific information of the detector. In this section you will find the detector's connection type, its name, its serial number, its calibration date, its next calibration due date, and a "DISCONNECT" button that will disconnect the detector from the MIRO ALTITUDE.



2.3 DISPLAY


The display interface is composed of 3 sections:

1. a **navigation bar** at the top of the display,
2. a **measurement settings** panel at the left of the display,
3. and the main part of the screen shows the **measurement area**.




2.3.1 Navigation bar

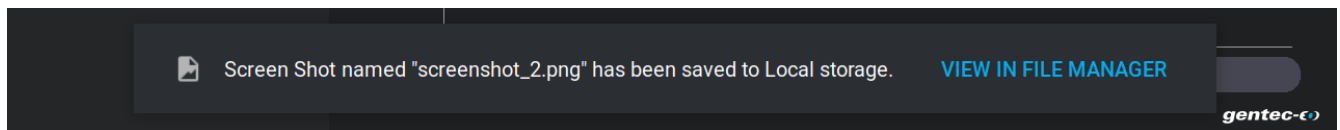
11. Open the control center

The navigation bar has a link  to the control center.




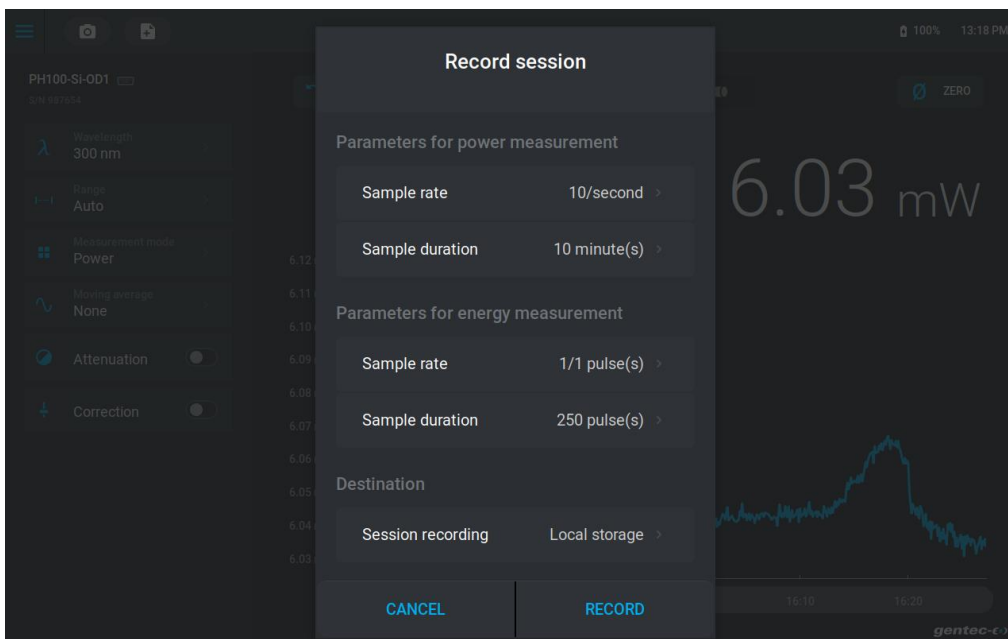
12. Screenshot

The following button  takes a screenshot of the MIRO ALTITUDE's screen. When you tap on it, a notification will appear in the lower part of the screen saying that the operation has been successful, and a direct link will also show up to see the screenshot as stored in the internal file system of the MIRO ALTITUDE.

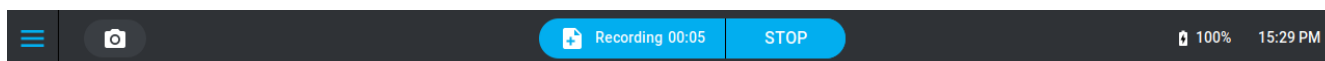


13. Recording

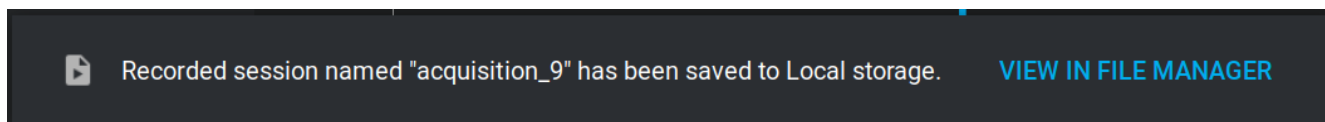
The following button  opens the data recording settings. Start the recording by pressing on the “RECORD” button. The MIRO ALTITUDE has an internal memory with enough space to store many recordings. It is possible to record directly on a USB drive or in the MIRO ALTITUDE’s internal memory. See the FILE MANAGER section for how to move recorded files. It is possible to set the default recording settings to facilitate data recording. To do this, please refer to the Settings menu section of this manual.



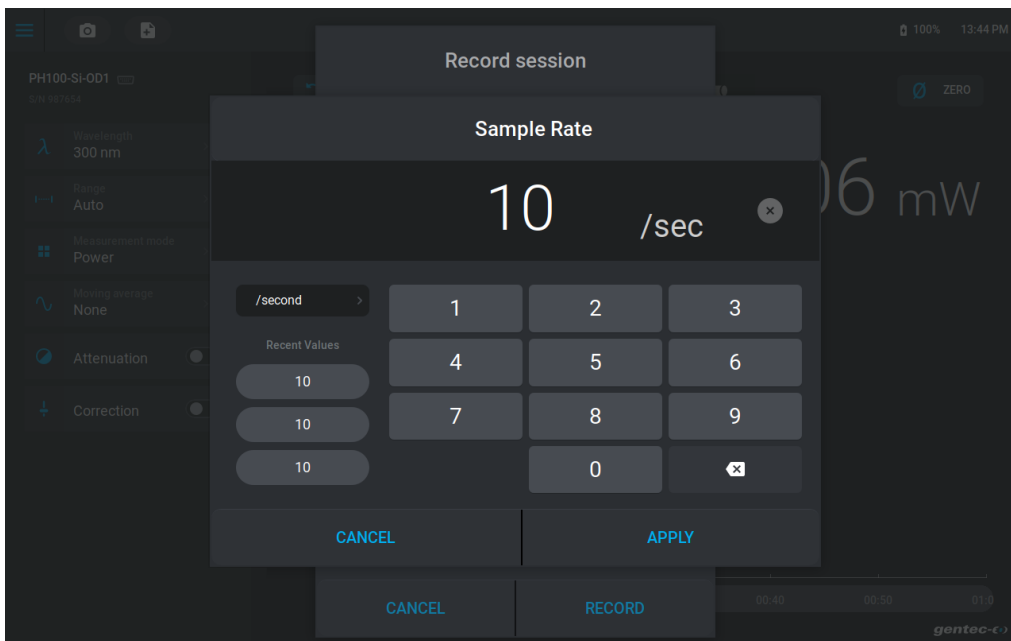
When a data recording session is active, a new item will appear in the center of the navigation bar. A timer indicates the current session length, and a “STOP” button is present that can terminate the recording before the time lapse that was predefined in the settings.



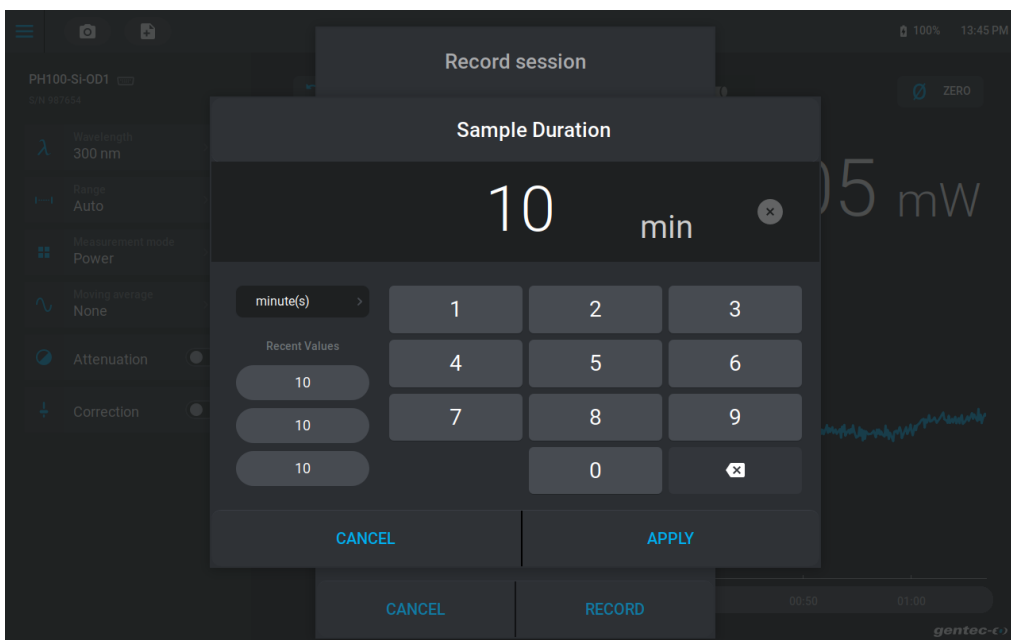
When a data recording session is automatically or manually terminated, a notification will appear in the lower part of the screen saying that the operation was successful, together with a direct link to see the recording on the internal file system of the MIRO ALTITUDE.



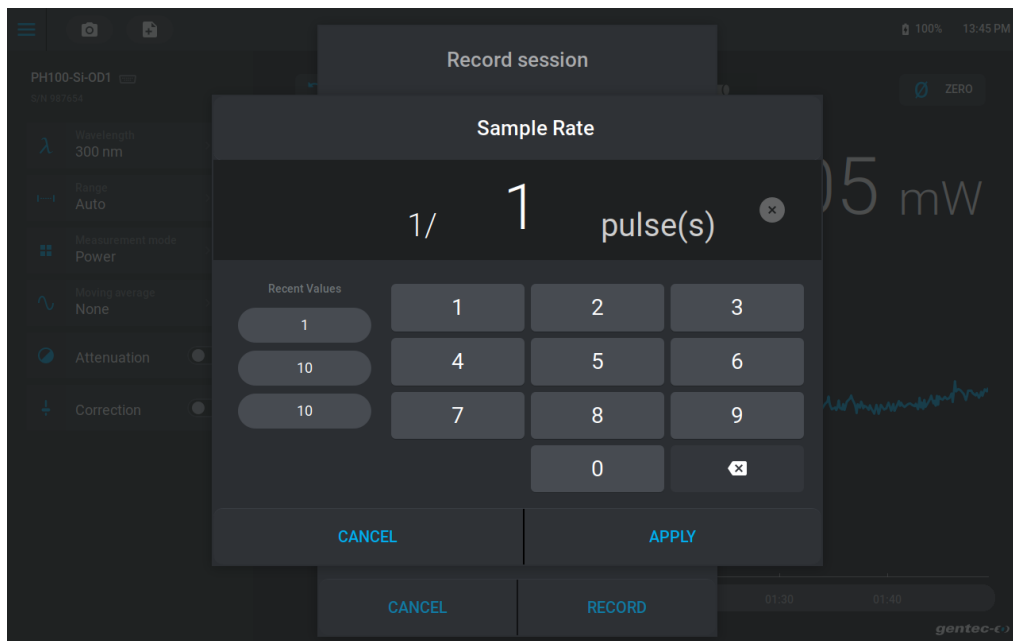
When logging data in power mode (wattmeter), the sample rate controls the speed at which data is saved. The maximum sample rate is 15 points per second and the minimum is 1 point per day. Available time units are: second, minute, hour, and day. In the following example for a wattmeter, the sample rate is 10 points per second, which is the default.



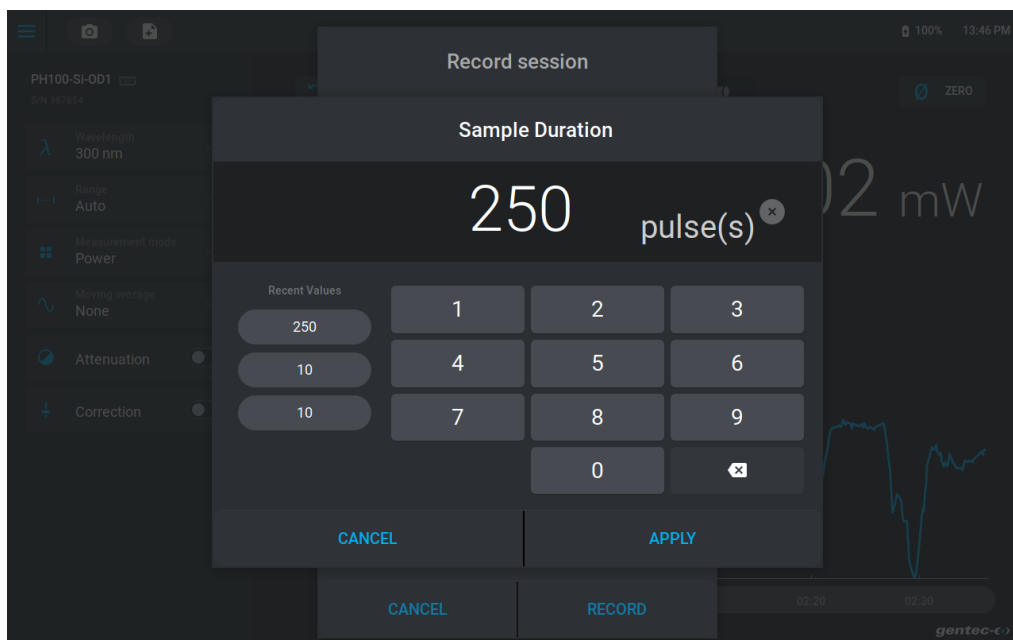
The sample duration defines the time during which the MIRO ALTITUDE will perform the data recording. Available time units are: second, minute, hour, and day. By default, the duration is 10 minutes. Minimum duration is 1 second and maximum duration is 10 days.



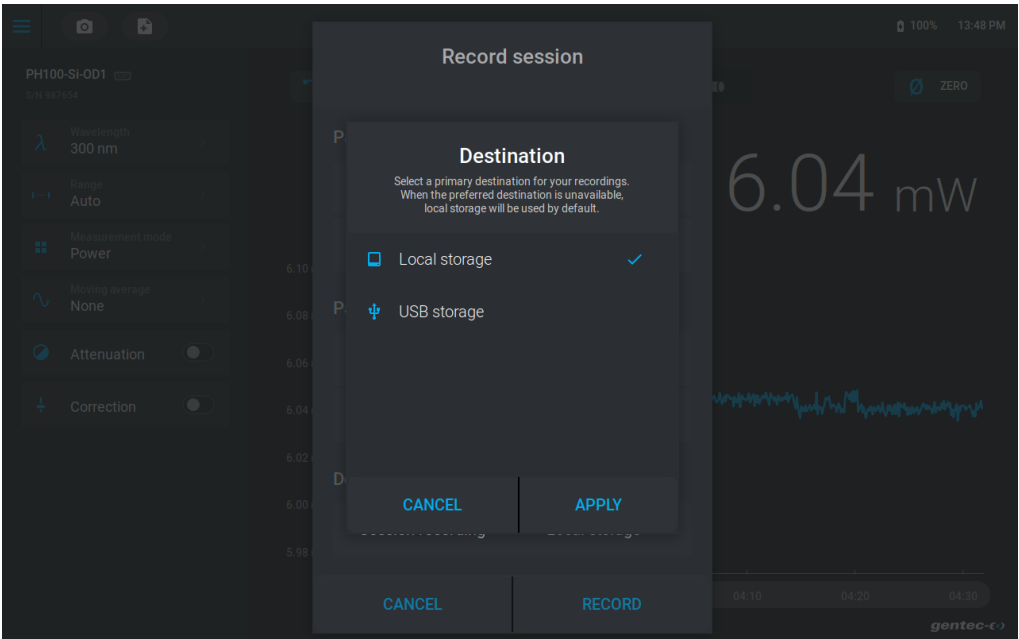
When acquiring data in energy mode (joulemeter), the sample rate is defined as the fraction (1/x pulses) of incoming pulses that were sampled. This setting is for both the statistics calculation and the data log. Maximum sampling will then be of 1/1 (all detected pulses) up to a fraction of 1/1,000,000 (one in every million pulses will be recorded).



The sampling duration in energy mode is defined as a total number of pulses and not as fixed time measurement. This said, in the following example, the recording will be possible if the MIRO ALTITUDE does not receive 250 pulses according to its sampling frequency. Accepted values are between 1 pulse up to 999999 pulses in total.



Finally, it is possible to define where the recording will be saved. By default, the recordings will be stored in the internal memory of the MIRO ALTITUDE, but it is also possible to record directly on a USB drive. Of course, you need to make sure you have enough space on the drive.



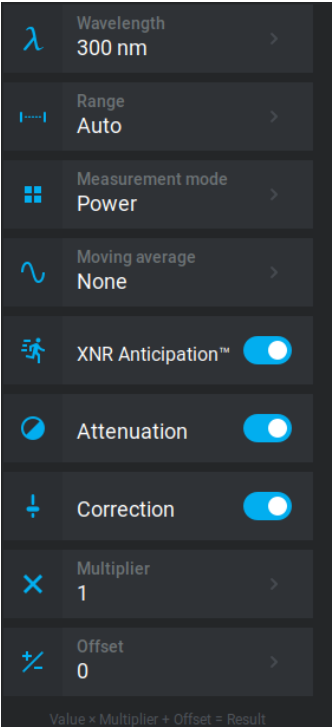
14. Battery

The MIRO ALTITUDE has a Lithium-Ion battery that offers 6 hours of running time. The status of the battery is represented by an icon and a percentage that indicates the available capacity. When the low battery icon appears (< 10 %), it is suggested to connect the device to the external power supply. The icon will change depending on if the instrument is charging.

15. Date and time (see Date and time section)

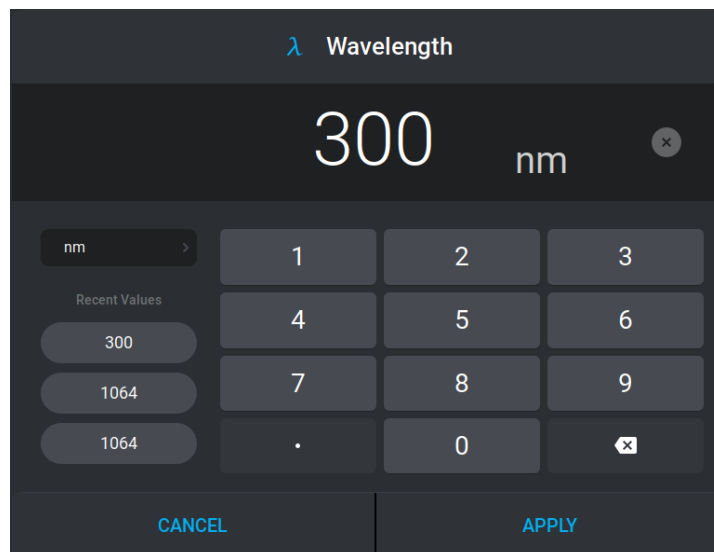
2.3.2 Measurement settings panel

The options listed on the left side of the screen define the measurement settings and can be set by the user. Certain settings are available only for specific detector types.



Wavelength

The wavelength can be set according to the laser that is being used. When the setting is tapped, a menu will show up to select the wavelength. A correction factor will thus be applied to the measurement to compensate the detector's absorption at different wavelengths. The wavelength selection menu proposes two choices of units: micrometers, or nanometers. Accepted values depend on the detector that is being used. The values that were previously entered are on the left of the menu to facilitate the selection.

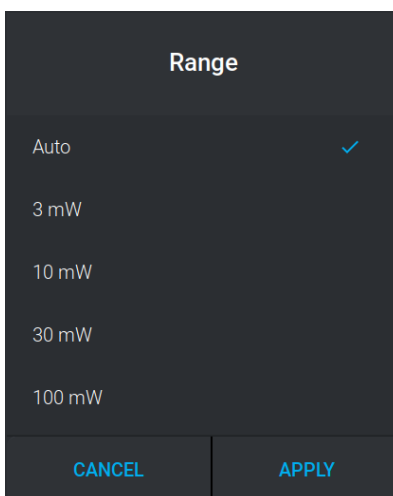


Range

The power or energy range menu is used to select the signal level that is being read by the detector to obtain the best possible measurement. When a detector is initially connected, the "Auto" range mode will be selected by default. In this operating mode, the MIRO ALTITUDE will select the proper range according to the current measurement. It is possible to manually select a fixed range amongst those available. When the reading is made in a manually selected range, you should always use the next highest range that will be measured. For example, if the current measurement is 200 mW, the 300 mW range will be ideal.

For energy measurements, please pay special attention if the pulse energy varies. In this case, you will need to make sure that each pulse is detected. As opposed to the power measurement, in which the automatic mode is continuously adjusted according to the measured value, the automatic mode of the energy measurement makes its range selection according to the previous pulse energy.

In self-triggering mode, the trigger threshold is set to 2 % of the current range. In other words, a pulse with an energy below 2 % of the current range will not be detected. To be able to measure the lowest energies, manually set the range at the lowest level, and then select the automatic range. By doing this, the MIRO ALTITUDE will start in the lowest scale, then automatically select higher scales as necessary; and afterwards, can automatically adjust to lower scales. While increasing scales, incoming pulses that exceed the current scale will be reported as out of scale and invalid, until the automatic system selects the correct scale.



Measurement mode

The measurement mode can sometimes be modified depending on the detector type.

According to the detector type, different measurement modes can be selected.

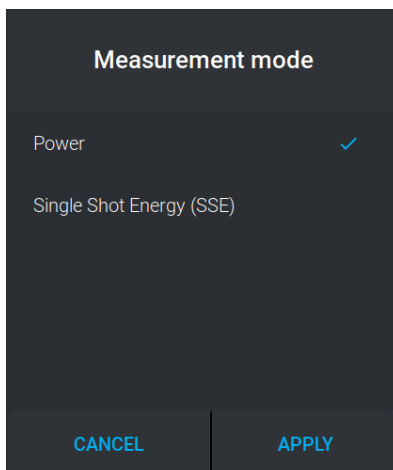
- ▶ Power detectors (thermopiles and photodiodes)
 - ♦ Power (watts)
 - ♦ Single-Shot Energy (joules) (energy mode/calorimeter)*
- ▶ Energy detectors (pyrometers and photodiodes)
 - ♦ Energy (joules)

** This function allows measuring the energy contained in a laser pulse using a Gentec-EO thermal power detector. This operating mode gives access to the same options as energy detectors. The only restriction is that the delay between the pulses must be compatible with the power detector's specifications. (Please refer to the user guide for the specific power detector you are using).*

$$Delay = \left(\frac{1}{Rep. Rate} \right)$$

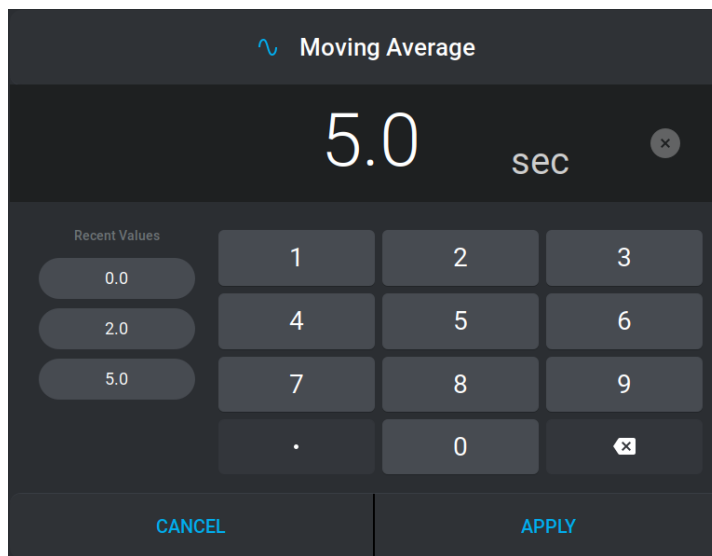
Keep in mind that power detectors are optimized to support a high average power and not a high peak energy. Always keep the energy density under the maximum energy density specified in the detector's specifications.

The energy mode is typically available for thermal power detectors with a typical sensitivity value. A $\pm 3\%$ uncertainty in pulse energy measurement can be achieved if the power detector is specifically calibrated for energy mode. Please contact your Gentec-EO distributor or the closest Gentec-EO office to obtain more information on how to obtain a pulse energy measurement calibration.



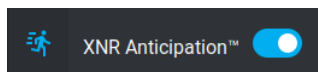
Moving average

The moving average smooths the measurements over an averaging period selected by the user. Accepted values are between 0 and 5 seconds. For example, if a user indicates 5 seconds, the currently displayed measurement will be an average of all the samples taken over the last 5 seconds.



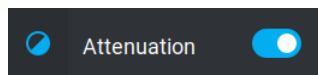
XNR Anticipation™

Activate the anticipation to activate the power meter acceleration software that provides an accelerated response of the detector. By using advanced algorithms and known physical properties of the detector, this function allows the MIRO ALTITUDE to provide a very accurate power measurement faster than the natural response of a thermopile power detector. It accelerates the natural response by a factor of up to 10. Turning off the anticipation will result in a slower response but will reduce the noise level and provide a more stable measured value in a noisy environment.



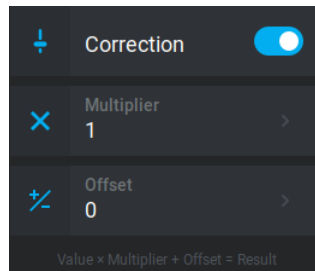
Attenuation

This setting is available for detectors that are calibrated by Gentec-EO with an attenuator (for example, QE series energy detectors with a QED attenuator, or PH series power detectors). Toggle the attenuation setting into the correct mode so that MIRO ALTITUDE can use the correct calibrated sensitivity. By activating the attenuation setting, only the wavelengths at which the detector is calibrated with the attenuator will be available in the wavelength menu.



Correction

This feature adds a custom correction multiplier and offset that are applied to the measurement. Correction factors are mostly useful when sampling a small percentage of a powerful laser beam or to compensate for absorption. The menu displays the values of the correction factors that are applied to the measurement.

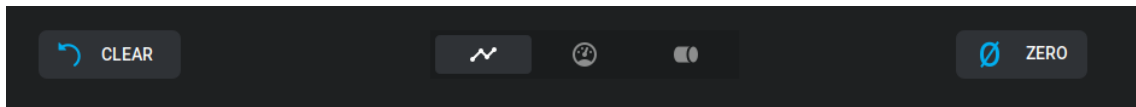


The default value for the multiplier is 1 and for the offset is 0. It is essential to ensure that the real measured value (before correction) is always within the power and energy limits of the detector.

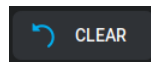
Only the automatic range setting is available when corrections are enabled. Please note that the statistics are only calculated for the corrected values.

2.3.3 Display area

At the top of the display area, there are three buttons for quick access to commonly used controls: “CLEAR”, “ZERO” and the display mode toggle.



Clear



The “CLEAR” button above the main view on the left erases the scope chart, resets the cursors in all displays, and resets the statistics.

Zero



The “ZERO” button sets the detector’s current value to zero. Subsequent measurements will be taken relative to this new zero power level. The purpose of this feature 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 MIRO ALTITUDE was turned on (for example, the hand or body of the user). This feature can also be used to take relative measurements. Use this function once your power meter has achieved thermal equilibrium to ensure accurate measurements.

Display mode toggle



The MIRO ALTITUDE offers three different display modes: scope (scrolling graphic), needle, and bar. This allows you to select the best way to display the measurements according to your specific needs. The transition from one display option to the other is made without affecting the measurement.

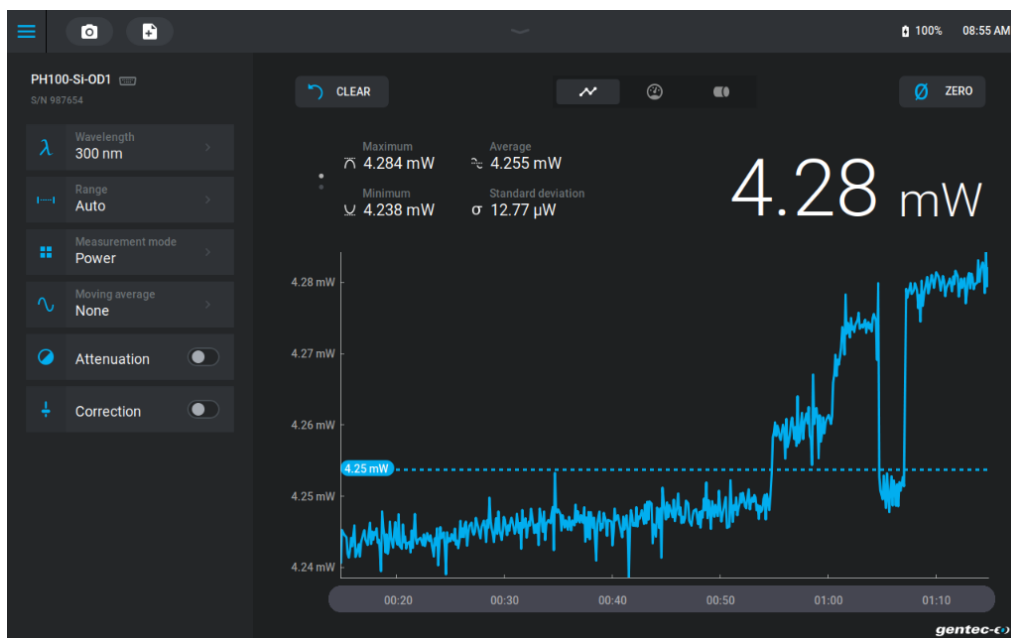
The selection of the display mode is done through these three buttons.

Scope display (scrolling graph)

The scope display gives a quick look at the laser beam's long-term stability and trend as a function of time (as could be seen on an oscilloscope). The chart's x-axis is 60 seconds. When at least one minute of recording has passed, the chart will scroll to show the most recent 60 seconds of data. You can scroll back by pressing and sliding on the timeline at the bottom. To go back to real time, tap on the button on the right side, below the graph.

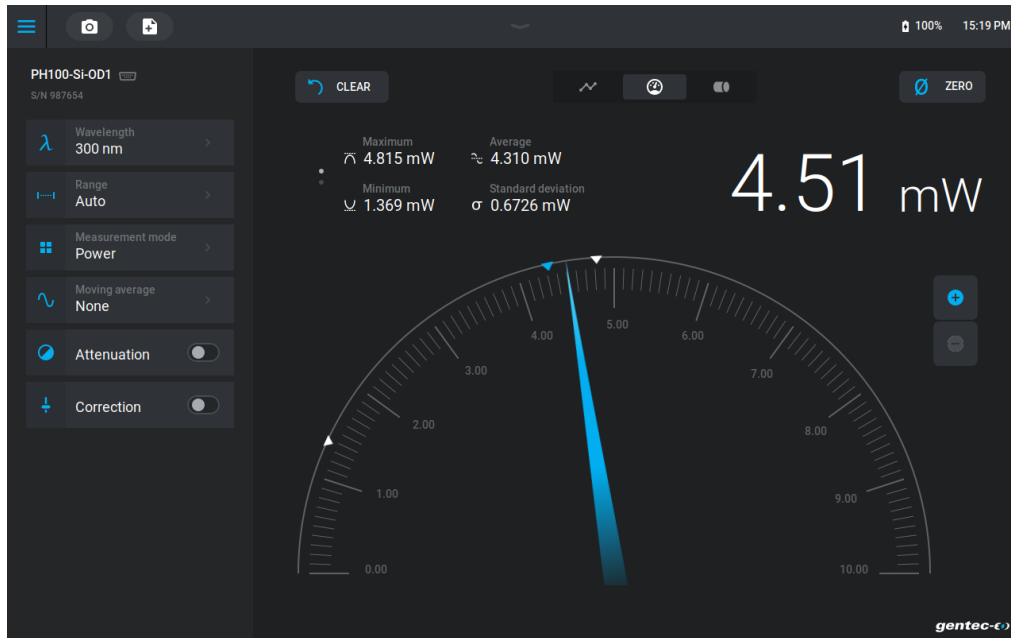


In the scope display, you may control whether the average cursor is visible or not. Press on the graph area for 1 second to activate or deactivate the average cursor. When the average cursor is activated in the scope display, it is also visible in the needle and bar displays.

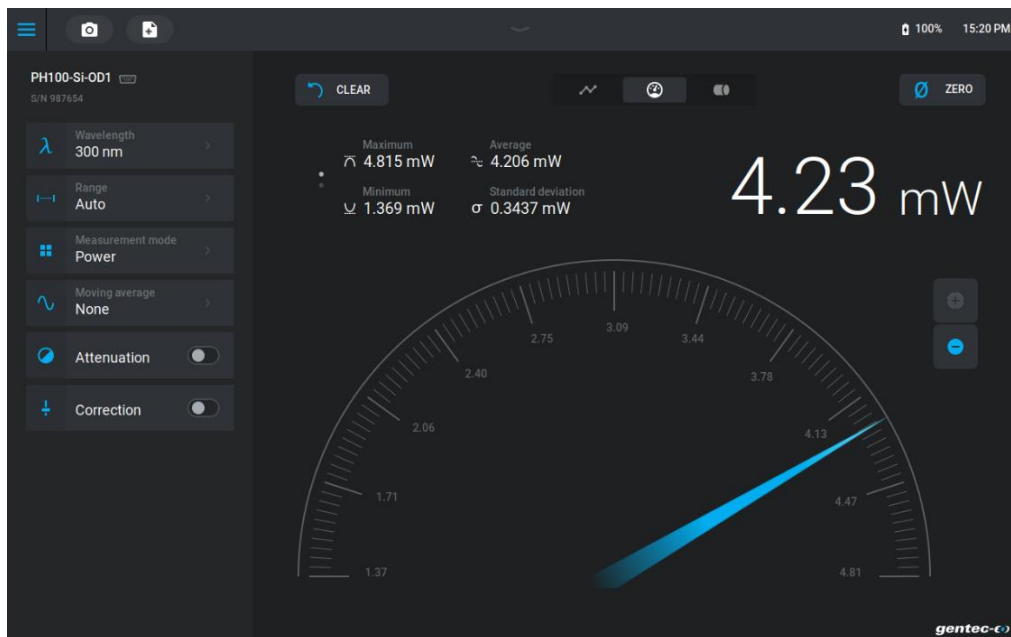


Needle display

Needle display is a simple and intuitive way to view the measured value. It is an excellent tool for laser tuning or alignment. The deflection of the digital needle is proportional to the real-time measurement. The 0 is on the left-hand side of the dial, whereas the range's maximum value is on the right-hand side. Minimum and maximum values are indicated by the small white triangles on the perimeter of the dial. As previously mentioned on the scope display section, if the average cursor has been activated, it will be visible through the small blue triangle.



It is possible to zoom with the "+" button on the right side of the screen to fine-tune the adjustment. When zoomed in, the dial is scaled from the minimum to the maximum measured values since the last "Clear". Please note that in zoom mode, the min, max and average values will disappear. To go back to normal mode, simply click on the "-" button.



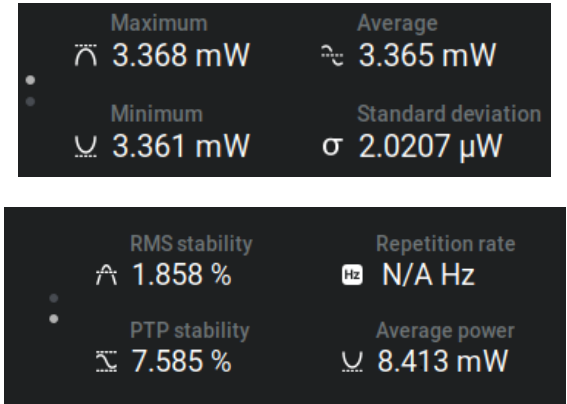
Bar display

This display features a large band that fills up in blue from left to right according to the measurement. The current measurement value is displayed in larger digits than in the scope and needle displays. Once again, the minimum and maximum values are indicated by the small white triangles. The average value is indicated by the small blue triangle if it has been previously activated in the scope display.



2.3.4 Statistics

All display modes show a complete analysis of the power or energy measurement statistics, which are updated in real time with each new measured value. The statistics panel is divided into two sections with four values which give eight different statistical measurements that can help you analyze your results. Scroll between the two sections by sliding up or down.



The statistics that are calculated can be found in the following table:

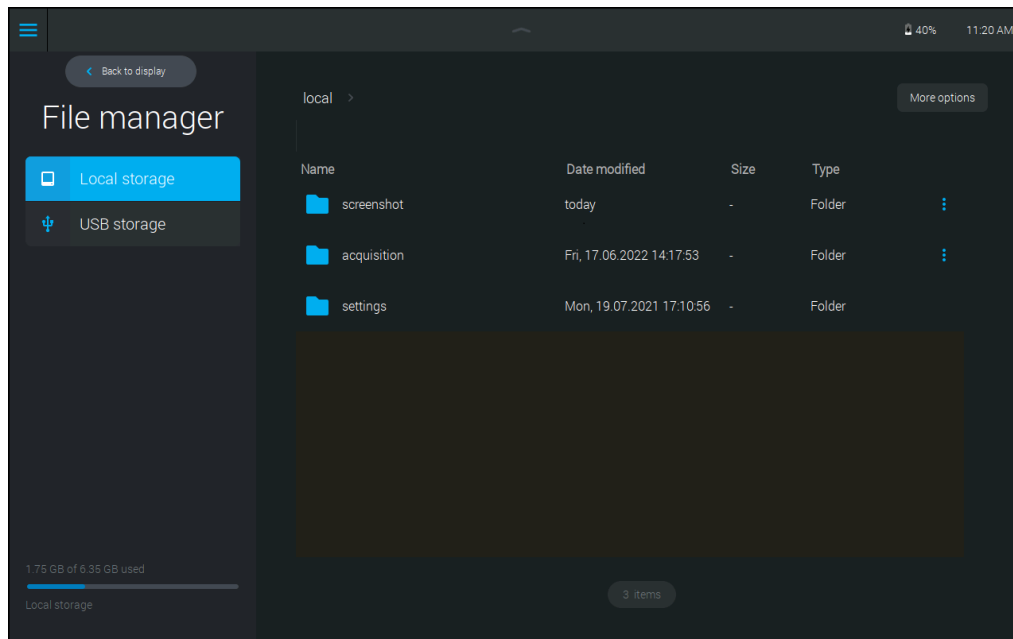
Statistical parameters	Power	Energy	Definition
Average value	✓	✓	Average from the start of values in the sample, E_{avg} or P_{avg}
Maximum value	✓	✓	Highest value in the sample period, E_{max} or P_{max}

Minimum value	✓	✓	Lowest value in the sample period, E_{min} or P_{min}
RMS stability	✓	✓	<p>Root mean square stability represents the standard deviation as a percentage of the average.</p> $RMS = \frac{STD}{E_{avg}} \times 100, \quad RMS = \frac{STD}{P_{avg}} \times 100$
PTP stability	✓	✓	<p>Shows the spread between the highest and lowest point in the sample as a percentage.</p> $PTP = \frac{E_{max} - E_{min}}{E_{avg}} \times 100, \quad PTP = \frac{P_{max} - P_{min}}{P_{avg}} \times 100$
STD deviation	✓	✓	<p>A measure of the spread of the data around the average.</p> $STD = \sqrt{\frac{\sum_{i=1}^n (E_i - E_{avg})^2}{n-1}}, \quad STD = \sqrt{\frac{\sum_{i=1}^n (P_i - P_{avg})^2}{n-1}}$
Repetition rate		✓	Frequency of pulses coming from the laser, PRR
Average power		✓	<p>Power calculated from the pulse energies and repetition rate.</p> $P_{avg} = E_{avg} \times PRR$

2.4 FILE MANAGER

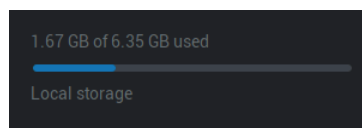
2.4.1 File management

The file manager shows the content of the internal memory of your MIRO ALTITUDE (local storage) and of any USB drives connected to the device (USB storage). In the file manager, you can: rename files and folders, delete them, move, or copy them to a USB drive to analyze the data on a PC or to share them with your colleagues. Finally, it is also possible to view the screenshots and data recordings.

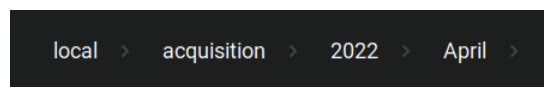


2.4.2 User interface













The control center icon (≡) in the top left of the screen opens the control center. Below, the "Back to display" button closes the file manager and goes directly to the live measurement display. The column on the left is the list of drives that can be explored. "Local storage" is always listed and "USB storage" appears if a USB drive is connected. In this menu you will find an indicator of the available and used on-board memory.















In the central part of the screen is the file manager. On the top, the breadcrumb navigator shows the currently opened folder and its parent folders. Each of the folder names can be tapped to quickly go back one or several levels in the folder hierarchy. Please note that the folder called "local" is the root of the onboard file system.





The files and the folders of the tree are presented in four columns: name, date modified, size, and type. Tap on the title of each column to sort the list. A first tap sorts in increasing order and a second click on the same column title sorts in decreasing order.









Name	Date modified	Size	Type	
 acquisition_1	today	17.93 KB	Session	 
 acquisition_2	today	1.33 KB	Session	 
 acquisition_3	today	298.62 KB	Session	 
 acquisition_4	today	1.15 MB	Session	 

Alphabetic order sort

Name	Date modified	Size	Type	
 acquisition_2	today	1.33 KB	Session	 
 acquisition_1	today	17.93 KB	Session	 
 acquisition_3	today	298.62 KB	Session	 
 acquisition_4	today	1.15 MB	Session	 

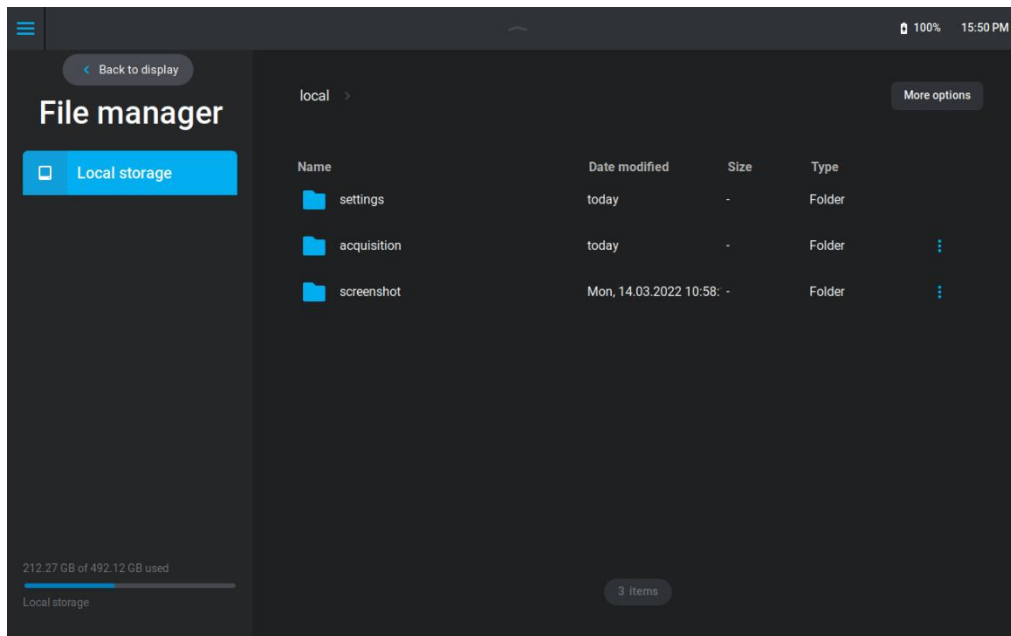
File size sort in increasing order

The items that are displayed in the file manager can be of three types: "Folder", "Session", and "Screenshot". For the last two, we can see a button () that opens a session recording or a screenshot directly on the MIRO ALTITUDE when tapped. For files and folders, there will be a vertical menu icon () for accessing a list of specific operations as we will see in section File and folders management.

Name	Date modified	Size	Type	
 media	Wed, 02.03.2022 09:49		Folder	
 acquisition_1	today	2.56 KB	Session	 
 screenshot_4	Mon, 14.03.2022 10:58	66.38 KB	Screenshot	 

2.4.3 Internal memory

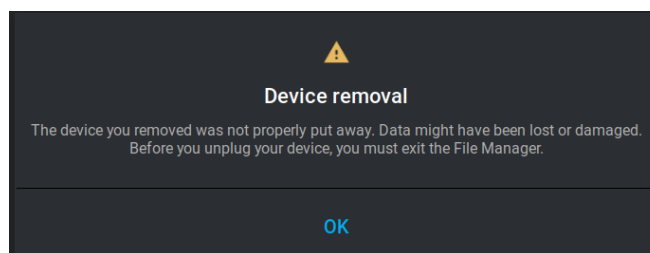
The MIRO ALTITUDE has a large internal memory which allows recording thousands of screenshots and recordings. A USB drive can be connected to expand storage. Certain folders are in the device by default, such as "Settings" that has the configuration and settings files of your MIRO ALTITUDE, "Acquisition" and "Screenshot" that are the default folders where data and screenshots are respectively stored. These three folders cannot be renamed, moved, or deleted.




2.4.4 USB drive

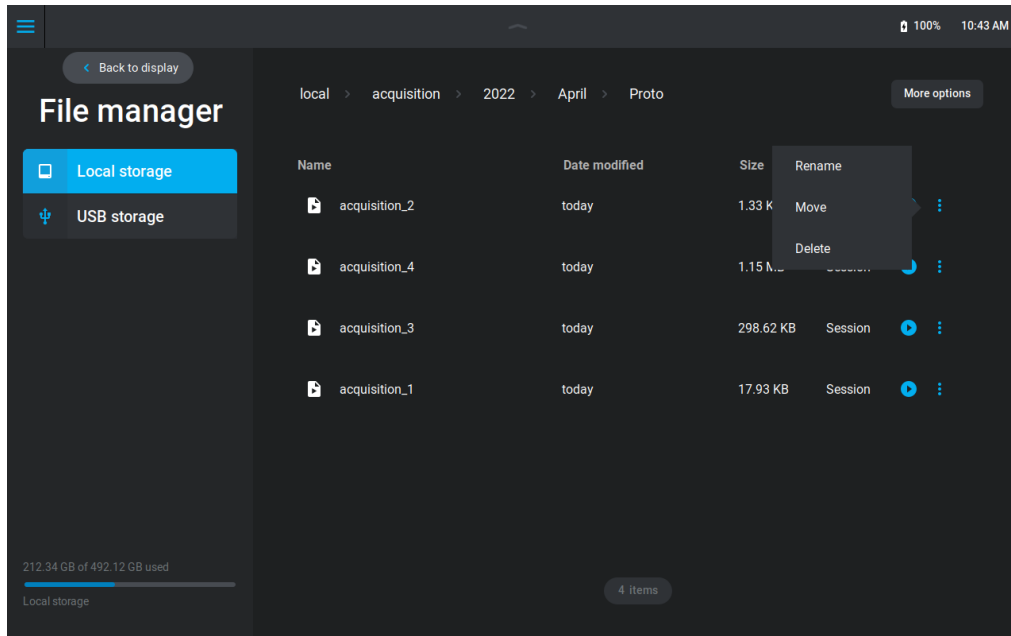
A USB drive (ideally in FAT32 format) can be plugged into to the MIRO ALTITUDE at any time. The file manager will be updated to show the "USB storage" drive. Files can be copied from the local storage drive to the external drive. It is not possible to move files from the USB drive to internal memory.

It is important to exit the file manager BEFORE removing the USB drive from the device to ensure the integrity of the files that were copied to the device.



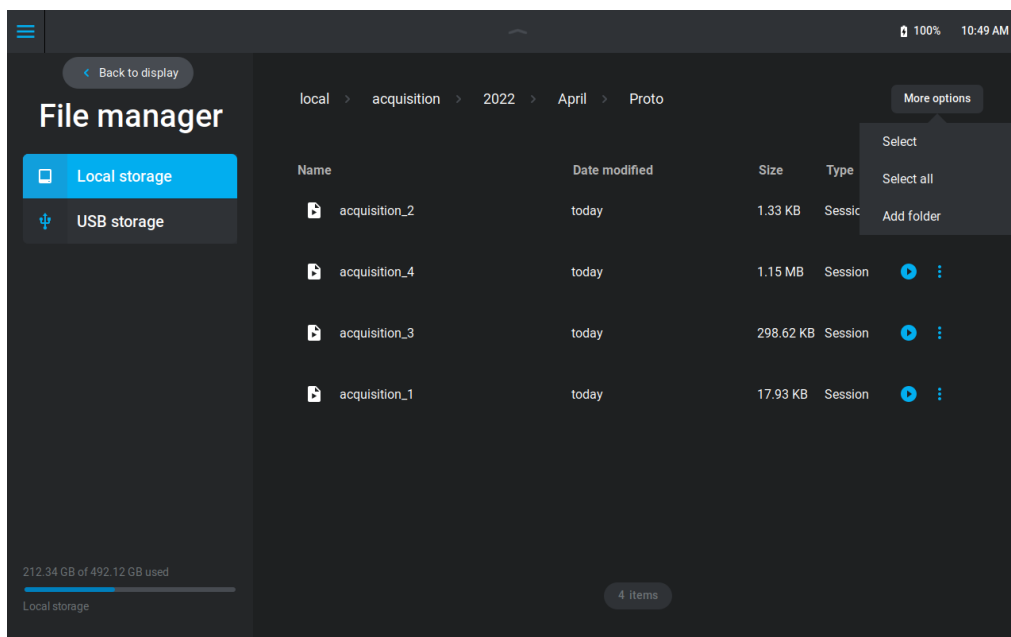
2.4.5 File and folders management

The file manager allows you to create a folder, rename a file or a folder, copy files and folders from the internal memory to a USB drive, and to delete files and folders. These operations can be performed on either single or multiple items in the list. To perform an operation on a single file or folder, tap on () next to the file or folder. A context menu will appear showing the available operations, as seen in the following example:

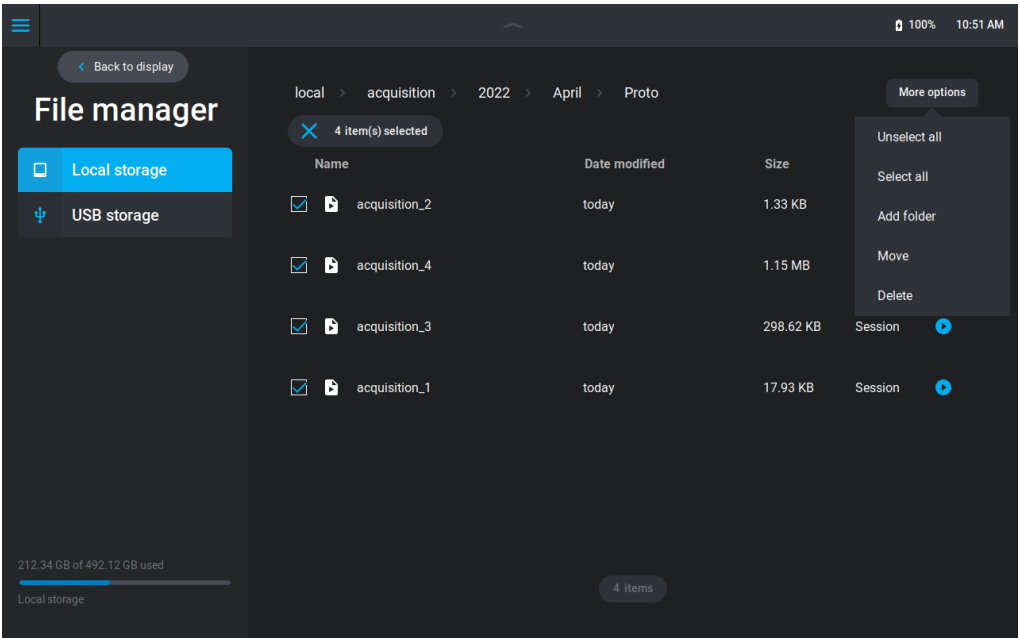


The "Rename" option allows you to rename this file or folder. The "Move" option will move a file or a folder and its contents to your USB drive. This option is only available if a USB drive is connected to your MIRO ALTITUDE.

The "More options" menu in the higher right part of the screen allows operations on several files at a time.

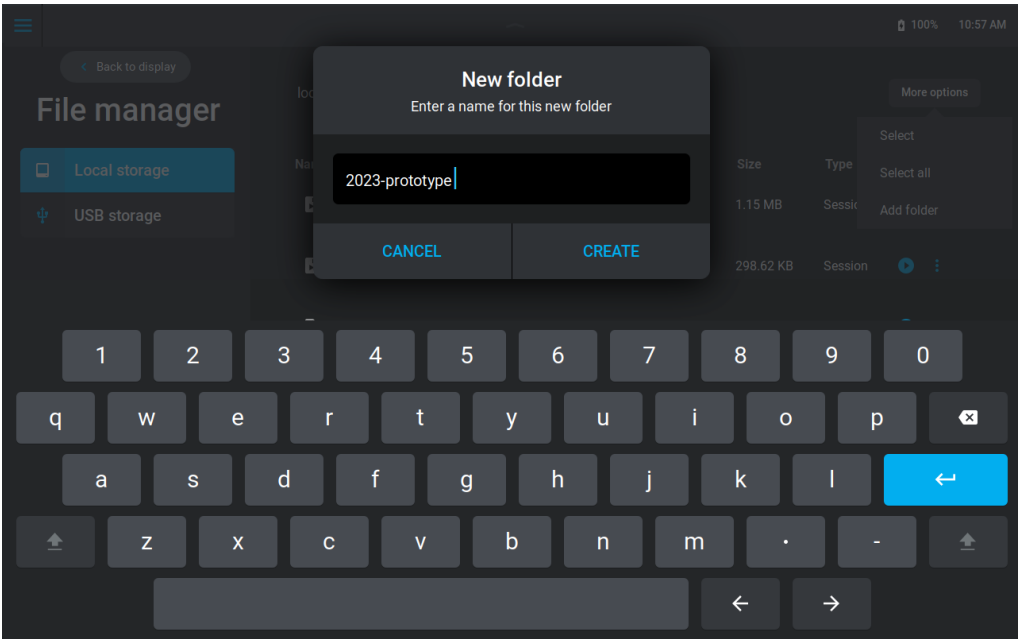


The choices in this menu are updated according to the items selected.



To exit multi selection mode, tap on the **X** button above the item list.

Folders can also be created from the More options menu.



2.4.6 Viewing screenshots and data recordings

The view function (▶) opens saved screenshots or recordings that are stored on the internal memory or on a USB drive. Tap on the “SHOW” button to confirm you want to view the file.

When viewing a screenshot, the saved image is displayed and the only available option for the user is to press on "CLOSE" to go back to the file manager.



When viewing a recording, the detector’s settings will be shown in the left panel. These settings are also written in a human-readable format in the .txt file log, when the log file is opened in a text editor on a PC:

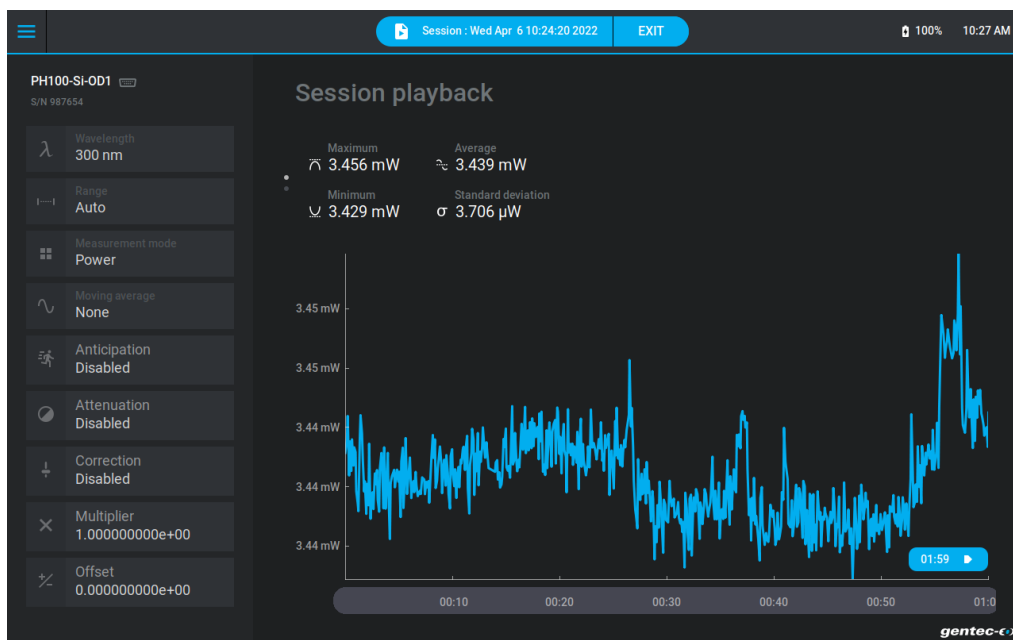
```
Name: PH100-Si-0D1
Serial Number: 987654
Input Source: DB-15
Wavelength: 300 nm
Range: Auto
Mode: Power
Moving Average: None
Anticipation: Disabled
Attenuation: Disabled
Correction: Disabled
Multiplier: 1
Offset: 0
Sample Rate: 10/sec
Total Duration: 2 min
```

index	Time	(realTime)	Measurement
0	0.000	(0.027)	1.600458054e-03
1	0.100	(0.094)	1.599687035e-03
2	0.200	(0.161)	1.601258991e-03
3	0.300	(0.237)	1.601141994e-03
4	0.400	(0.370)	1.600807998e-03
5	0.500	(0.495)	1.600453048e-03
6	0.600	(0.561)	1.600453048e-03
7	0.700	(0.695)	1.600307995e-03
8	0.800	(0.762)	1.598787960e-03
9	0.900	(0.962)	1.600150950e-03
10	1.000	(0.962)	1.600150950e-03

On your MIRO ALTITUDE, the user can press on the graph to see a vertical cursor that indicates the measurement at that point. By sliding your finger along the data, this cursor moves along for you to be able to easily view the desired data.

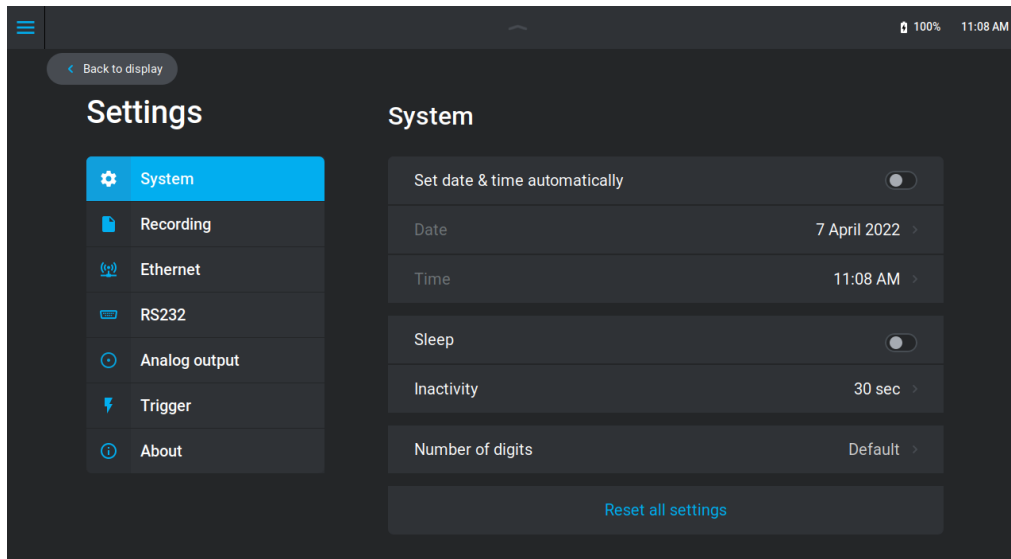


When the recording time is longer than the available time range, you can slide your finger on the time range to scroll through the data. To exit the recording viewer, press on "EXIT" in the upper part of the screen and confirm you want to exit the session playback.



2.5 SETTINGS

The settings menu allows the user to configure and save several useful settings that will help make the most of the MIRO ALTITUDE. You can configure the recorded data, the Ethernet connection, the RS232 connection, the analog output and the measurement trigger level. In addition, the “About” menu contains information on the MIRO ALTITUDE. The following image shows the settings menu.

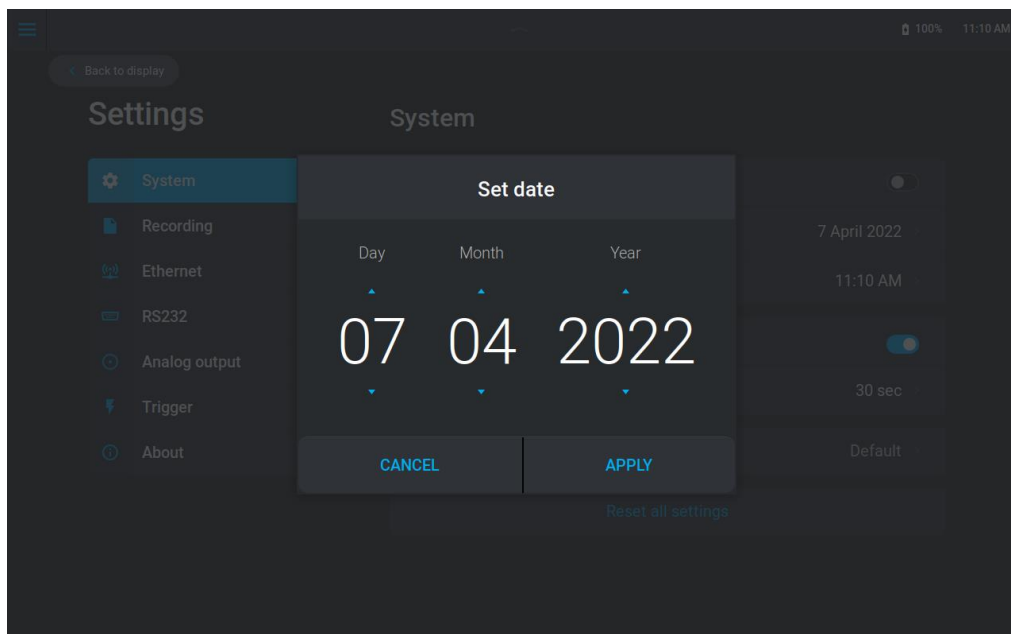


2.5.1 System

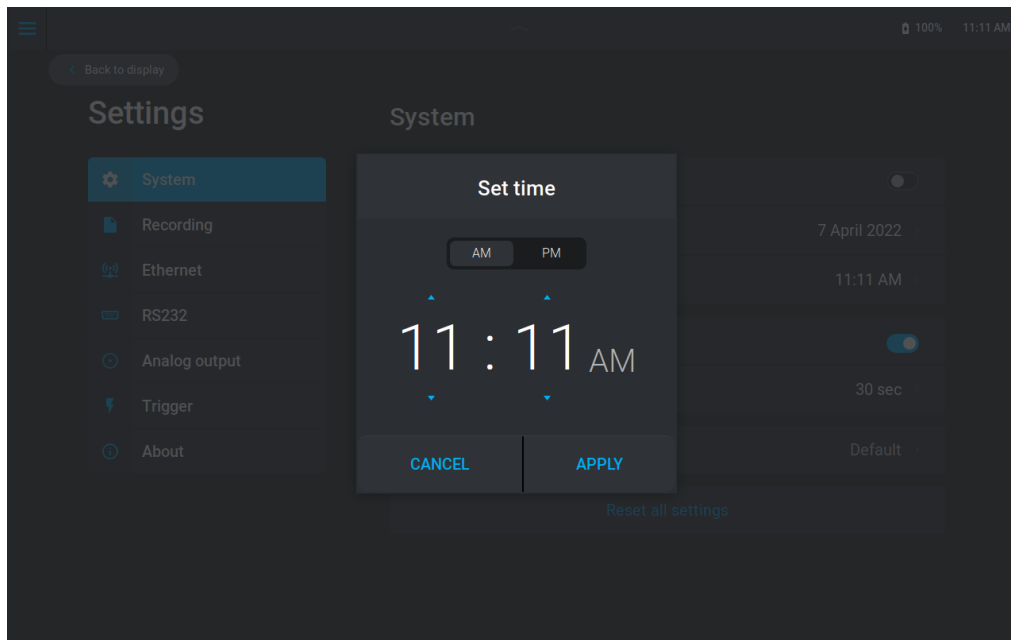
The system menu allows controlling certain parameters of the MIRO ALTITUDE.

Date and time

This option allows changing the date and time of the device. Press on the “Date” button to open the menu and adjust the date. Press on the arrows to adjust the day, month, and year.



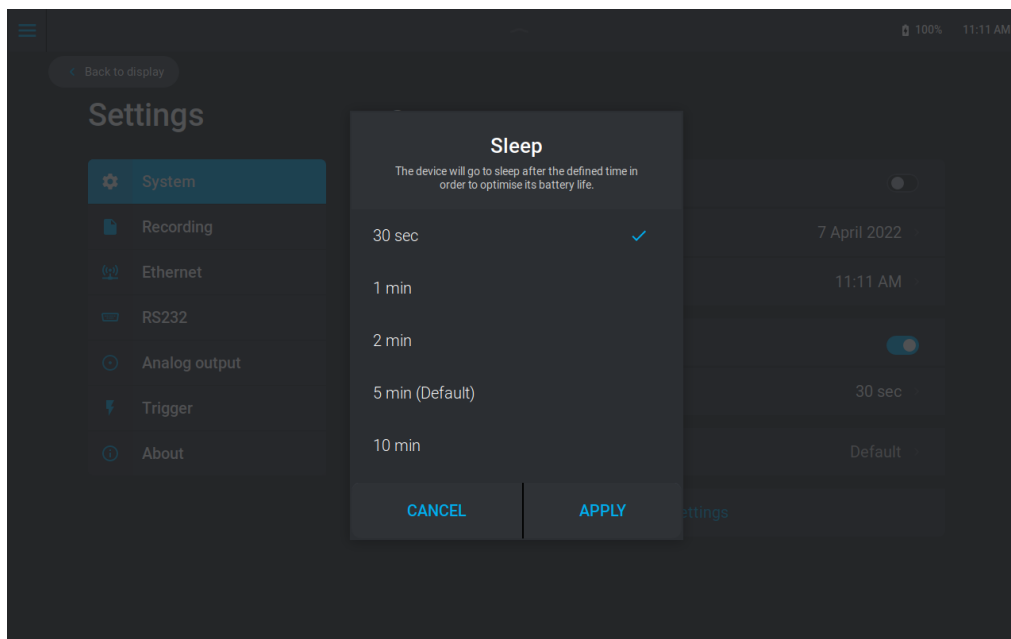
Press on the “Time” button to adjust the time, in the same way as the date adjustment, except that you can press on AM or PM.



Sleep

The sleep feature, which turns off the screen but keeps the instrument running, is used to prolong the battery's run-time. After the screen has not been touched for the specified amount of time, its brightness is reduced for 10 seconds, and then the display turns off completely. The MIRO ALTITUDE keeps working normally when the screen is off: if a recording is in progress, it will not be interrupted. Turn the screen back on with a short press on the power button.

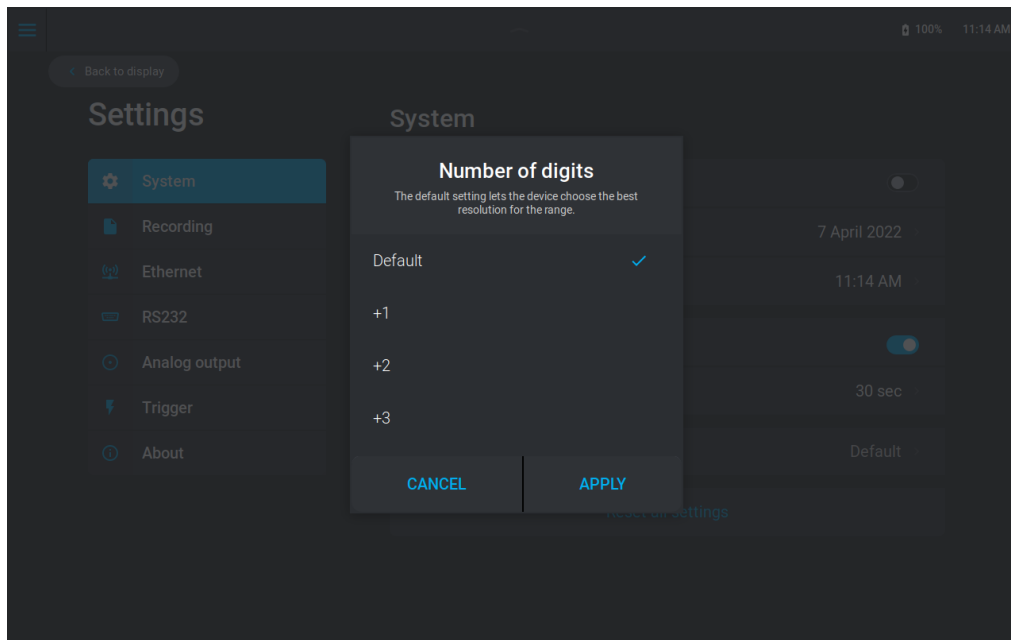
To choose the delay before entering sleep mode, press on “Inactivity” and choose the time.



Sleep mode can also be enabled by pressing on the “Sleep” button in the control center. Please see the control center section of this manual for more information.

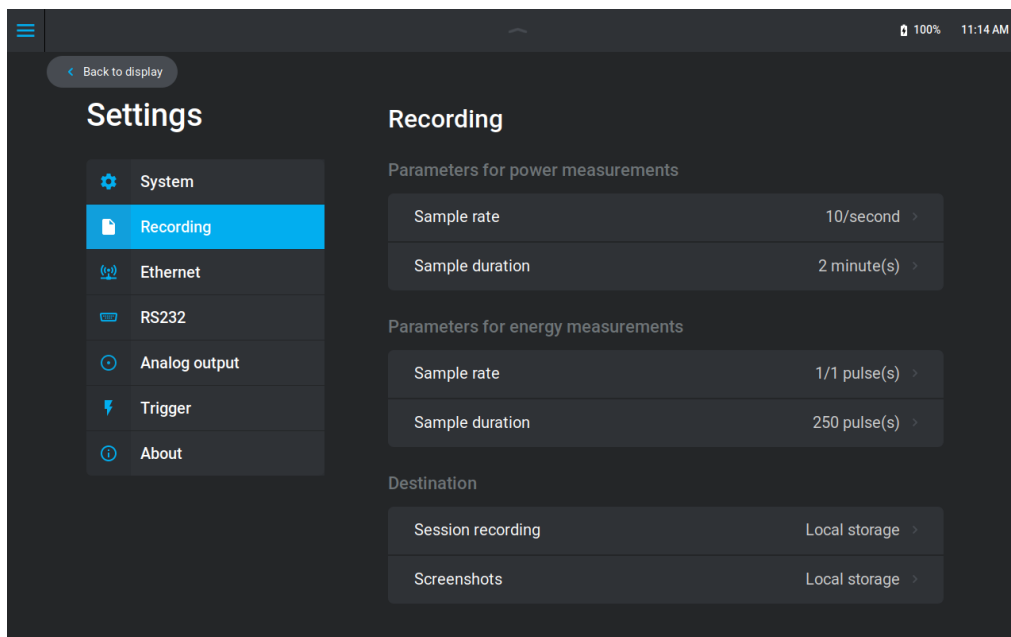
Number of digits

This setting changes the number of digits after the comma that are displayed when making a measurement. Press on the button to show the list of options. The default setting lets the device choose the best option according to the range. The absolute accuracy depends on the detector and the experimental conditions and is not changed in this menu. When the number of digits is selected, press on “APPLY” to save the change or press on “CANCEL” to discard the change.



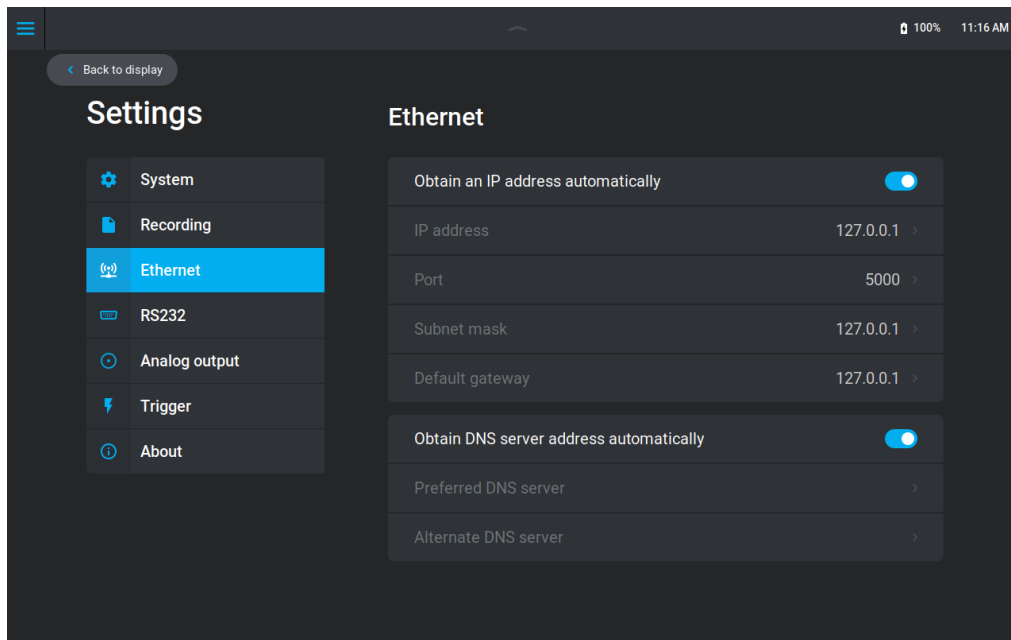
2.5.2 Recording

Recording settings allow saving the default settings when starting a recording. If the same recordings are regularly used, saving the default settings will prevent having to reconfigure the settings for each new recording. Adjustments in this section are made in the same way as when starting a recording.



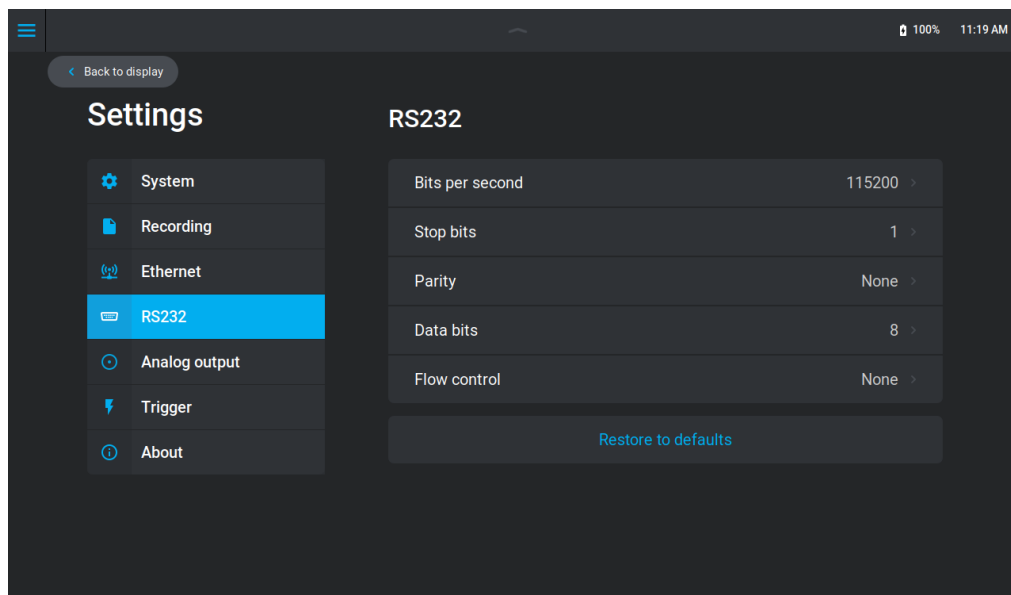
2.5.3 Ethernet

The Ethernet settings manage the Ethernet communication parameters of MIRO ALTITUDE. For the moment, these settings can be viewed but cannot be modified. These settings will be available soon in a new software update that will be accessible for download on the Gentec-EO website.



2.5.4 RS232

The RS232 settings manage the parameters for RS232 communication with MIRO ALTITUDE. For the moment, these settings can be viewed but cannot be modified. These settings will be available soon in a new software update that will be accessible for download on the Gentec-EO website.



2.5.5 Analog output

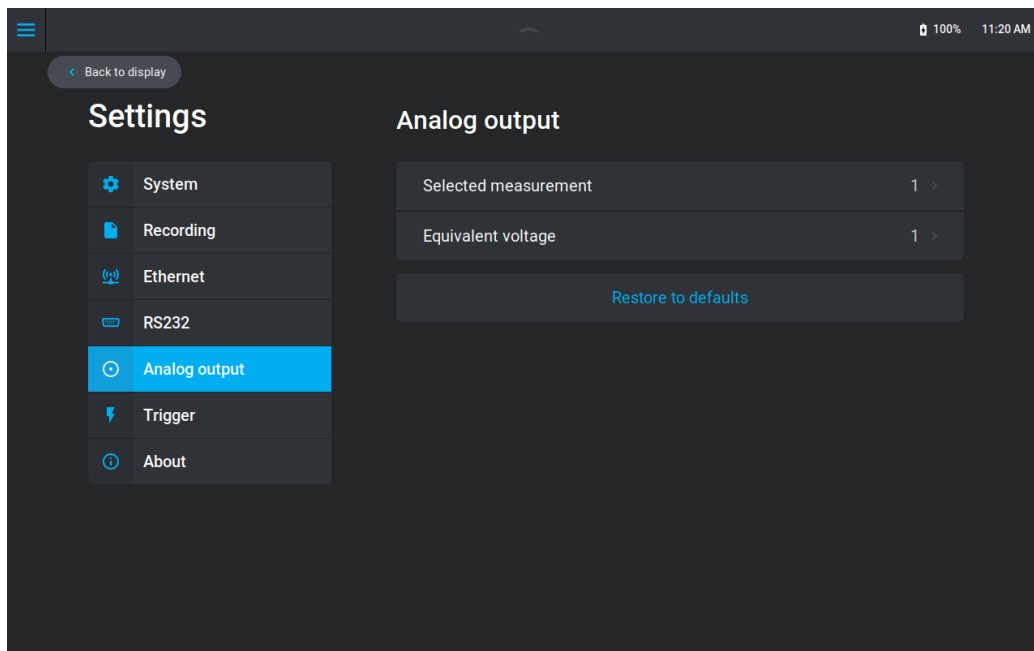
The analog output settings allow the user to obtain a signal coming from the MIRO ALTITUDE by using external equipment, such as a continuous line recorder, a computer with an analog interface, a voltmeter, etc. To use this feature, use a standard BNC cable.

This output voltage is proportional to the signal that comes from the detector. The user must configure two settings, the input measurement and the output voltage. The user must know the ratio to be obtained so as to be able to configure these two settings. For example, if the user wishes to obtain 500 mV for each measured watt, they must enter 1 W under *Selected measurement* and 0.5 V under *Equivalent voltage*. As it is a ratio, it could also have 2 W and 1 V as settings.

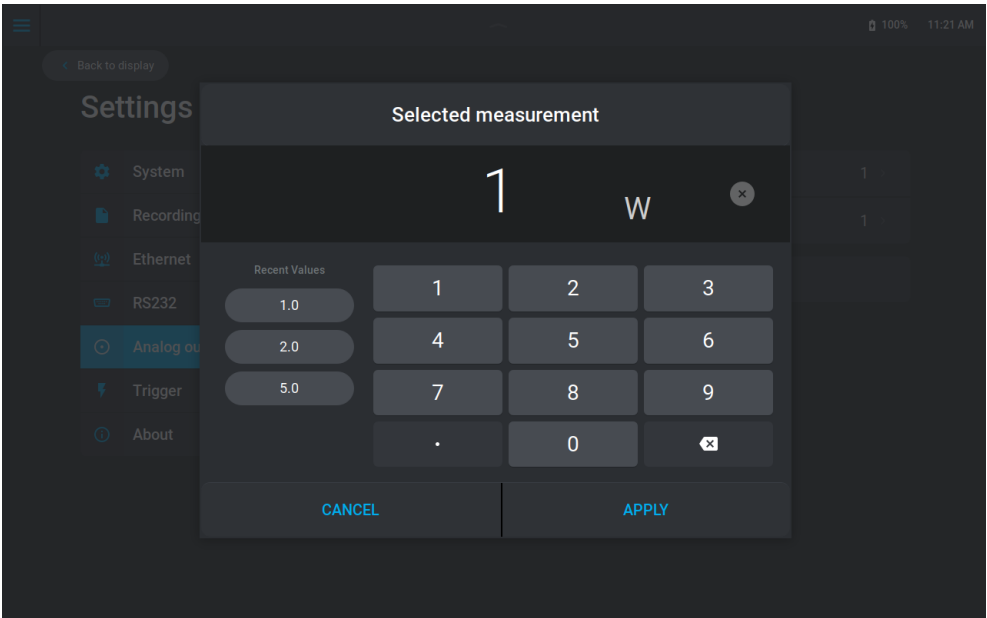
Specifications of the analog output:

Maximum output voltage:	5.0 V
Connector type:	Female BNC
Full range precision:	1% of the measured value

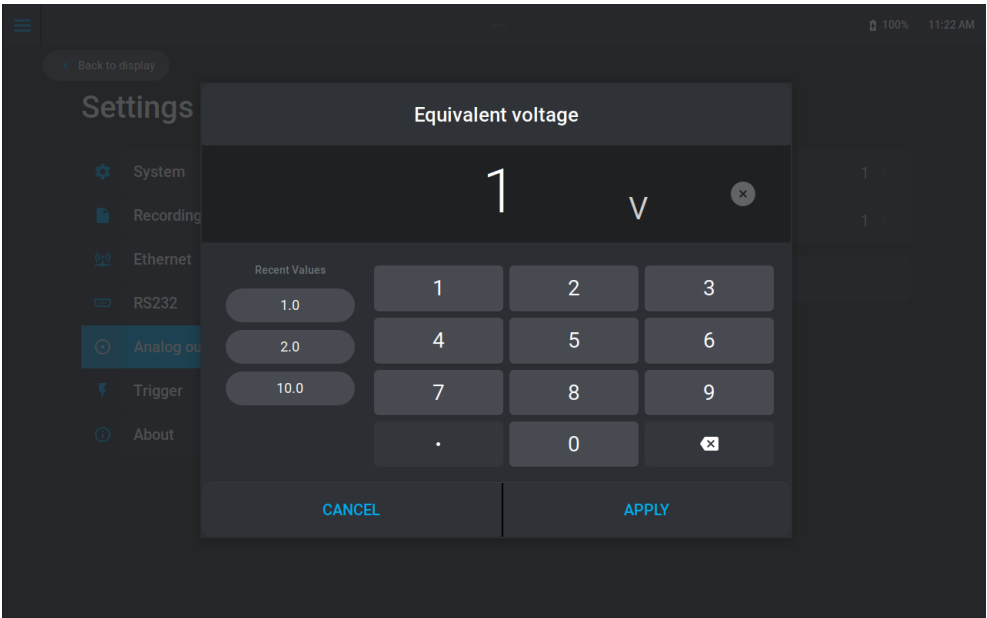
The analog output should be used with a high impedance charge.



To select the input signal that comes from the detector, you must press on “selected measurement.” The following menu will appear. The unit will be determined according to the connected detector. For a wattmeter, the unit will be W for watt and for a joulemeter the unit will be J for joule.

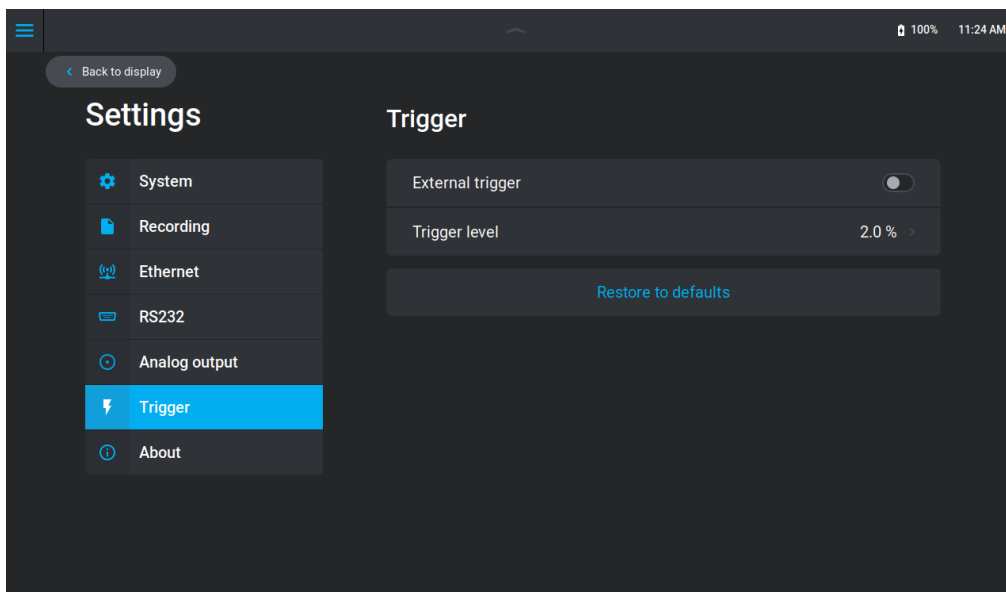


To select the output voltage, you must press on “equivalent voltage.” The following menu will appear. The unit will be V for volt. The maximum value that can be entered is 0.5 and the minimum value is 4.9.



2.5.6 Trigger

To analyze the energy of a pulse it is important to know the measurement trigger settings to make sure all pulses are properly detected and measured. Pyroelectric and photodiode energy detectors use the trigger, as well as thermal detectors in energy mode. The trigger signal can come from an external source connected to the BNC connector, or an internal, software trigger can be used.



External trigger

When the external trigger is activated, the trigger level option turns grey as it is not used. The external trigger allows connecting an external device such as a laser with a trigger output to the MIRO ALTITUDE to trigger the pulse measurement. See the specification table for electrical and pulse duration specifications. The meter detects a trigger on the rising edge of the external trigger signal.

The beginning of the external trigger signal must arrive in a time window relative to the beginning of the laser pulse. This window begins 20 % of the rise-time before the laser pulse and ends one rise-time after the beginning of the pulse minus the minimum trigger pulse width.

Example for QE12LP-H-MB detector:

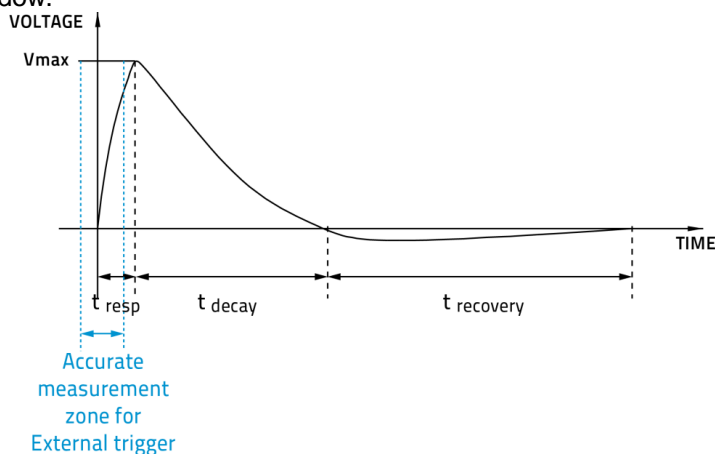
The following value is found in the QE series user manual.

Signal rise-time = 550 μ s

20% of rise-time = 550 X 20% = 110 μ s

Rise-time minus minimum trigger pulse width = 550 – 1 = 549 μ s

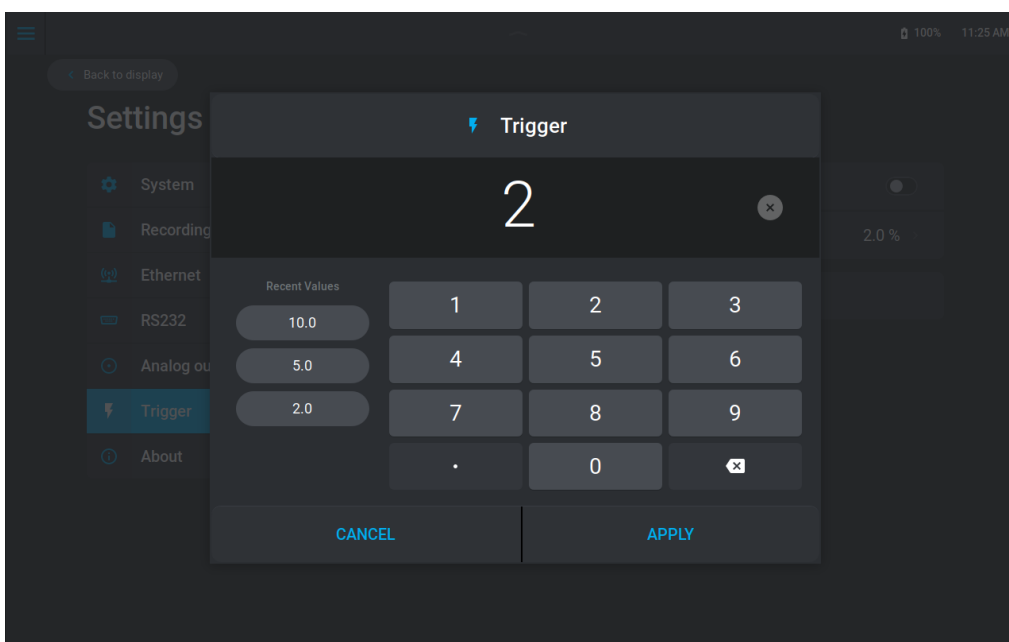
Therefore, the acceptable window for the beginning of the external trigger pulse is from 110 μ s before the laser pulse begins to 549 μ s after the laser pulse begins. Incorrect energy measurements may result if the trigger pulse arrives outside of this window.



Trigger level

For internal, software-triggered measurements, the trigger level setting sets the signal threshold as a percentage of the range. Only signals above this threshold will be measured. This can be useful in noisy environments. Acceptable values range from 0.1 % to 99.9 % with 0.1 % steps. Caution should be taken when choosing a lower trigger level than the 2 % default value in a high noise environment.

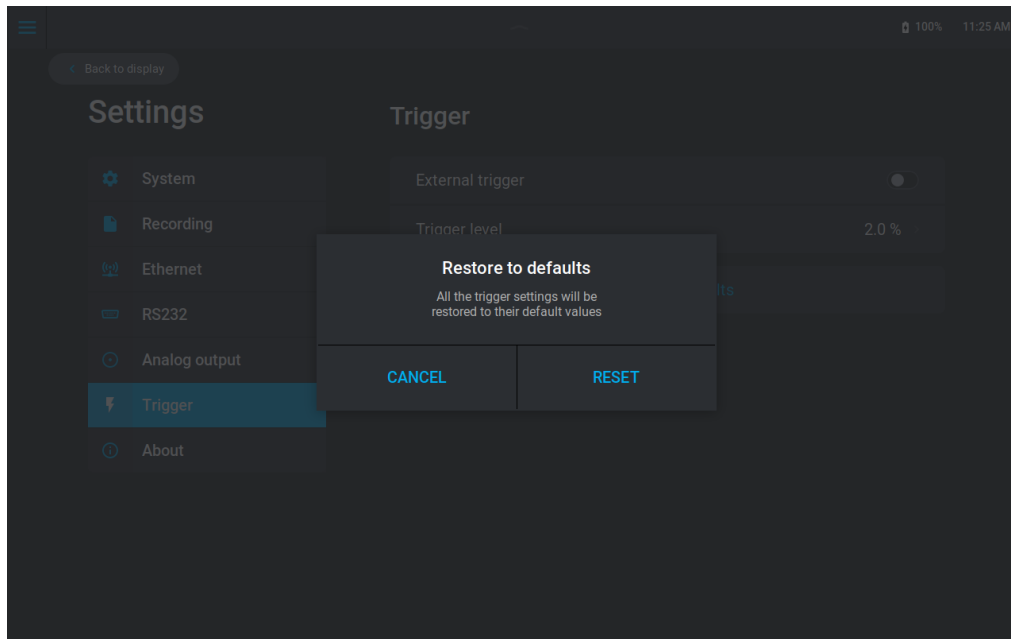
By pressing on the “Trigger level” setting, the following menu appears. Please note that this percentage is based on the selected range. For example, if the range is 10 J and the triggering level is at 10 %, no measurements will be made under 1 J. Please pay attention when there is a range change as if the range changes from 10 J to 30 J, only pulses above 3 J will be measured.



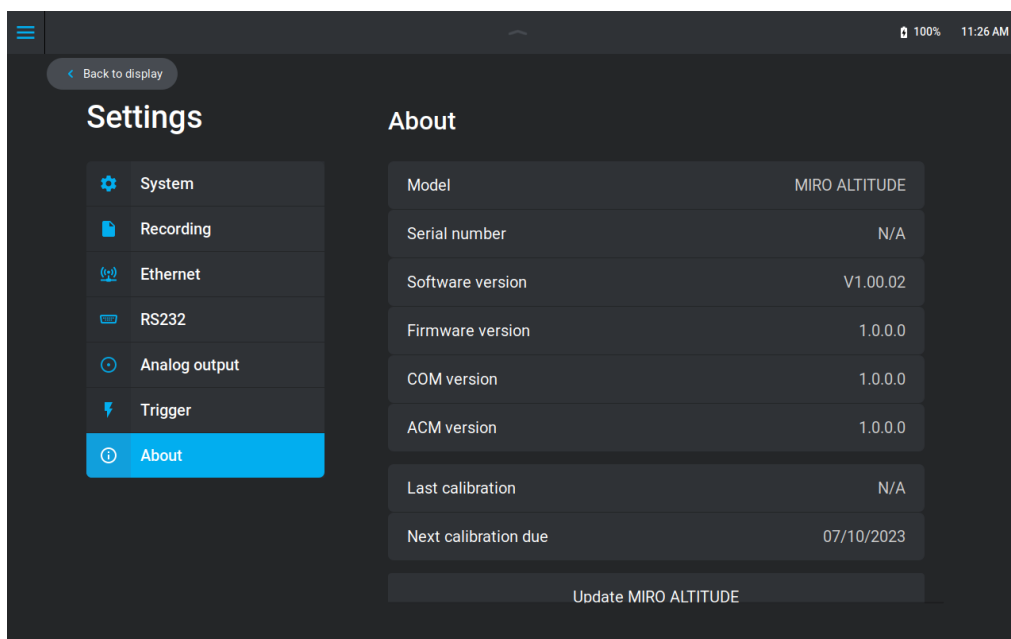
Warning: If you select a trigger level with a high value, the MIRO ALTITUDE might not be able to detect all the pulses of widely varying energy levels in **auto range mode**. The **auto range** function uses the energy level of the last measured pulse to establish the range level. Therefore, it will not detect the next pulses if they are lower than the trigger level. As a result, the auto range may become caught on a high range. To avoid this problem, select a lower value for the trigger level or change the range manually.

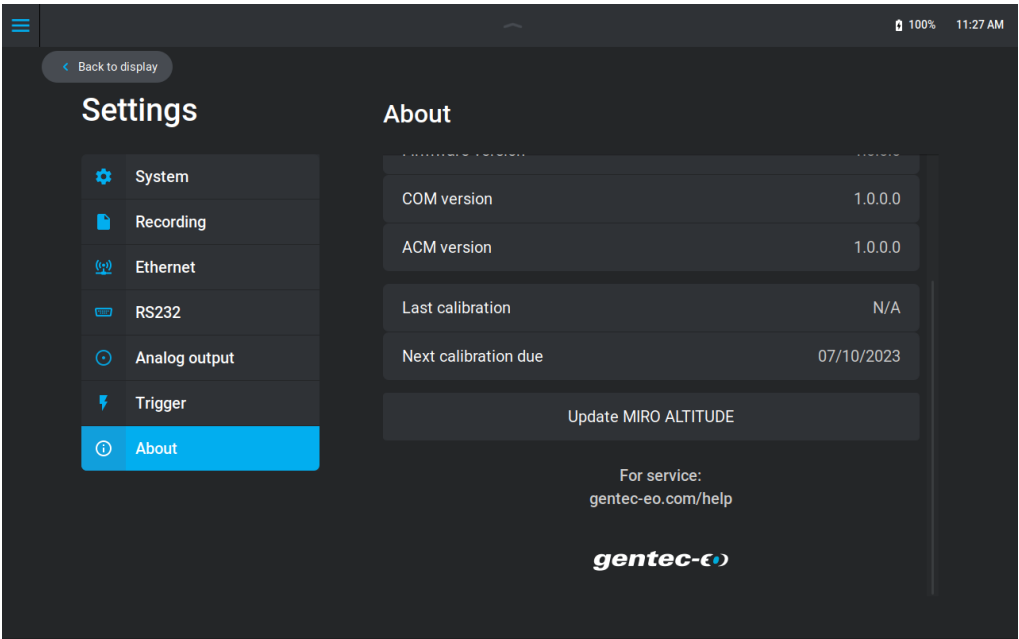
Default setting of the trigger

The user can quickly reset the default setting of 2 % by pressing the “Restore to defaults” button. Then, press “RESET”.

**2.5.7 About**

This section displays information about your MIRO ALTITUDE. The information to be regularly checked is the “Last calibration” date and the recommended “next calibration due” date. The software and firmware versions can be compared with the updates available on the website. This information will tell you if your device is up to date. If you must get in touch with one of our representatives regarding your MIRO ALTITUDE, they may ask you to provide the information in this section.





3 DECLARATION OF CONFORMITY

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

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



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

Type of Equipment: Laser wattmeter/joulemeter
Model Number: MIRO ALTITUDE
Year of test & manufacture: 2021

Declared conformity with the following regulations:

- Electromagnetic compatibility directive 2014/30/EU as part of the requirements leading to the CE marking
- FCC part 15 subpart B
- ICES-001 Issue 5 (2020), ICES-001(2020) calls CSA CISPR 11:19 as test standard, test parameters & limits
- EN61326-1 (2013) – Electrical equipment for measurement, control, and laboratory use. The immunity test requirements used for this qualification are for the equipment intended to be used in an industrial electromagnetic environment.

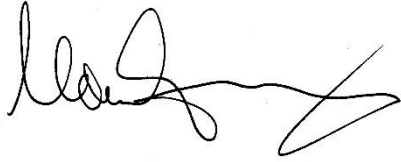
Product regulations

Test Name Standards	Test Specifications	Minimum Performance Criterion Required	EUT Test Configuration	EUT Serial Number	Results
Conducted Emissions FCC part 15 (2020) subpart B	Class A 150kHz-30MHz	N/A	DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Radiated Emissions FCC part 15 (2020) subpart B	Class A 30MHz-6GHz	N/A	Battery	LABCEM# 2840	Pass
			DC Jack Mode	LABCEM# 2841	Pass
			USB-C Mode	LABCEM# 2841	Pass
Conducted Emissions ICES-001 Issue 5 (2020)	CSA CISPR 11:19 Group 1 - class A 150kHz-30MHz	N/A	DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Radiated Emissions ICES-001 Issue 5 (2020)	CSA CISPR 11:19 Group 1 - class A 30MHz-1GHz	N/A	Battery	LABCEM# 2840	Pass
			DC Jack Mode	LABCEM# 2841	Pass
			USB-C Mode	LABCEM# 2841	Pass
Electrostatic Discharge Immunity IEC61000-4-2 (2008)	Contact: ±4kV Air: ±2kV, ±4kV, ±8kV	B	Battery	LABCEM# 2840	Pass
			DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Radiated Electromagnetic Field Immunity IEC61000-4-3 (2006) A1 (2007) A2 (2010)	80MHz-1000MHz: 10V/m 1GHz-2GHz: 3V/m 2GHz-2.7GHz: 1V/m	A	Battery	LABCEM# 2840	Pass
			DC Jack Mode	LABCEM# 2841	Pass
			USB-C Mode	LABCEM# 2841	Pass
Electrical Fast Transient Immunity IEC61000-4-4 (2012)	Power: ±2kV / 5kHz I/O Ports: ±1kV / 5kHz Communication Ports: ±1kV / 5kHz	B	DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Surge Immunity IEC61000-4-5 (2014)	Power: ±2kV L-PE / ±1kV L-L I/O Ports: N/A Communication Ports: N/A	B	DC Jack Mode	LABCEM# 2841	Pass
			USB-C Mode	LABCEM# 2841	Pass
Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields IEC61000-4-6 (2013)	Power: 3V I/O Ports: 3V Communication Ports: 3V	A	DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Power Frequency Magnetic Field Immunity IEC61000-4-8 (2009)	Continuous Field: 30A/m / 50Hz & 60Hz	A	Battery	LABCEM# 2840	Pass
			DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Voltage Dips, Short Interruptions and Voltage Variation Immunity on AC Input IEC61000-4-11 (2004) A1 (2017)	Voltage dips: 0%Un during half cycle 0%Un during 1 cycle 40%Un during 10 cycles (at 50Hz) 40%Un during 12 cycles (at 60Hz) 70%Un during 25 cycles (at 50Hz) 70%Un during 30 cycles (at 60Hz) Short interruptions: 0%Un during 250 cycles (at 50Hz) 0%Un during 300 cycles (at 60Hz)	B B C C C C C C	DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass

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

Place: Québec

Date: Wednesday, April 14, 2021

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke ending in a sharp point.

(President)

4 UKCA DECLARATION OF CONFORMITY

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

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

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

Type of Equipment: Laser wattmeter/joulemeter
Model Number: MIRO ALTITUDE
Year of test & manufacture: 2021



Declared conformity with the following regulations:

- Electromagnetic compatibility directive 2014/30/EU as part of the requirements leading to the CE marking
- FCC part 15 subpart B
- ICES-001 Issue 5 (2020), ICES-001(2020) calls CSA CISPR 11:19 as test standard, test parameters & limits
- EN61326-1 (2013) – Electrical equipment for measurement, control, and laboratory use. The immunity test requirements used for this qualification are for the equipment intended to be used in an industrial electromagnetic environment.

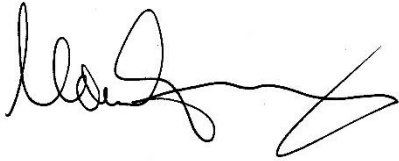
Product regulations

Test Name Standards	Test Specifications	Minimum Performance Criterion Required	EUT Test Configuration	EUT Serial Number	Results
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			USB-C Mode	LABCEM# 2840	Pass
Radiated Emissions FCC part 15 (2020) subpart B	Class A 30MHz-6GHz	N/A	Battery	LABCEM# 2840	Pass
			DC Jack Mode	LABCEM# 2841	Pass
			USB-C Mode	LABCEM# 2841	Pass
Conducted Emissions ICES-001 Issue 5 (2020)	CSA CISPR 11:19 Group 1 - class A 150kHz-30MHz	N/A	DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Radiated Emissions ICES-001 Issue 5 (2020)	CSA CISPR 11:19 Group 1 - class A 30MHz-1GHz	N/A	Battery	LABCEM# 2840	Pass
			DC Jack Mode	LABCEM# 2841	Pass
			USB-C Mode	LABCEM# 2841	Pass
Electrostatic Discharge Immunity IEC61000-4-2 (2008)	Contact: ±4kV Air: ±2kV, ±4kV, ±8kV	B	Battery	LABCEM# 2840	Pass
			DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Radiated Electromagnetic Field Immunity IEC61000-4-3 (2006) A1 (2007) A2 (2010)	80MHz-1000MHz: 10V/m 1GHz-2GHz: 3V/m 2GHz-2.7GHz: 1V/m	A	Battery	LABCEM# 2840	Pass
			DC Jack Mode	LABCEM# 2841	Pass
			USB-C Mode	LABCEM# 2841	Pass
Electrical Fast Transient Immunity IEC61000-4-4 (2012)	Power: ±2kV / 5kHz I/O Ports: ±1kV / 5kHz Communication Ports: ±1kV / 5kHz	B	DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Surge Immunity IEC61000-4-5 (2014)	Power: ±2kV L-PE / ±1kV L-L I/O Ports: N/A Communication Ports: N/A	B	DC Jack Mode	LABCEM# 2841	Pass
			USB-C Mode	LABCEM# 2841	Pass
Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields IEC61000-4-6 (2013)	Power: 3V I/O Ports: 3V Communication Ports: 3V	A	DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Power Frequency Magnetic Field Immunity IEC61000-4-8 (2009)	Continuous Field: 30A/m / 50Hz & 60Hz	A	Battery	LABCEM# 2840	Pass
			DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass
Voltage Dips, Short Interruptions and Voltage Variation Immunity on AC Input IEC61000-4-11 (2004) A1 (2017)	Voltage dips: 0%Un during half cycle 0%Un during 1 cycle 40%Un during 10 cycles (at 50Hz) 40%Un during 12 cycles (at 60Hz) 70%Un during 25 cycles (at 50Hz) 70%Un during 30 cycles (at 60Hz) Short interruptions: 0%Un during 250 cycles (at 50Hz) 0%Un during 300 cycles (at 60Hz)	B B C C C C C C	DC Jack Mode	LABCEM# 2840	Pass
			USB-C Mode	LABCEM# 2840	Pass

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

Place: Québec

Date: Wednesday, May 25, 2022

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke ending in a sharp point.

(President)

5 WEEE DIRECTIVE

Recycling and sorting procedure from WEEE Directive 2002/96/EC

This section is meant for the recycling center when the detector has reached its end life. Breaking the calibration seal or opening the device will void the MIRO ALTITUDE's warranty.

Sorting

Paper: Manual and certificate

Plastic: Button

Cables: USB-C cable and supply cable

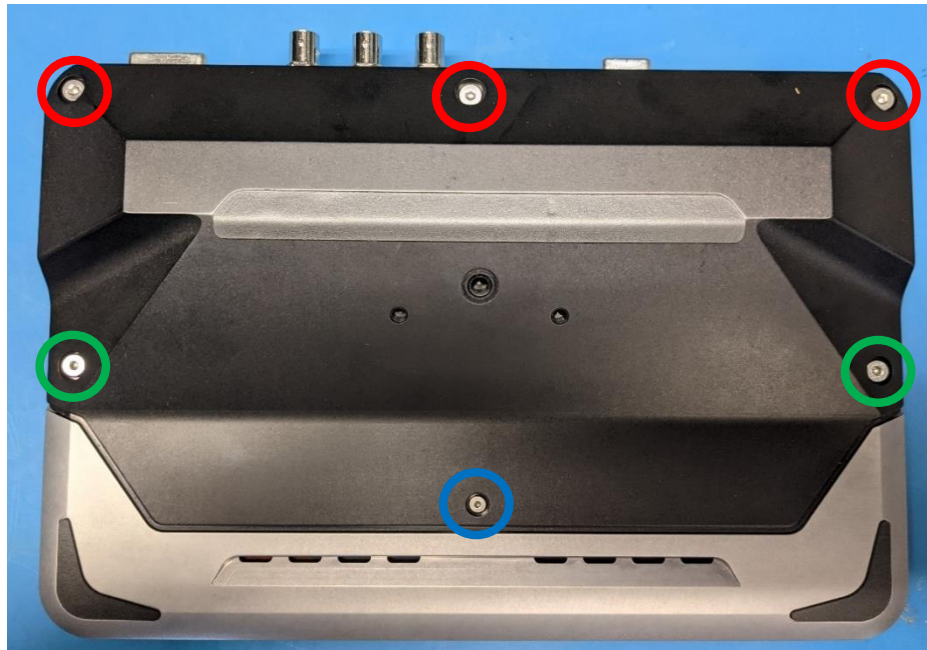
Printed circuit board: Inside the device and on the screen

Aluminum: Device casing

Glass: Screen

Opening the device

Remove the 6 screws in the back of the device (see below)



Remove the 3 screws with BNC in the front of the device (see below)



LEADER IN LASER BEAM MEASUREMENT SINCE 1972



POWER & ENERGY METERS



BEAM PROFILING



THZ MEASUREMENT

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114-0023, JAPAN