THORLABS

PM60A, PM60C, PM60CH
PM61A, PM61C, PM61CH

Field Service Fiber Optic Power Meter

User Guide



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Chapter 1 Introduction

1.1 Intended Use

The PM60 and PM61 series devices are designed for laboratory and field service use to measure the optical power from fiber light sources. The devices may not be used or integrated into equipment that is applied in pharmaceutical, medical, or military applications.

The product may only be used in accordance with the instructions described in this manual. Any other use will invalidate the warranty.

1.2 Explanation of Safety Warnings

⚠WARNING Warning indicates a hazard with a medium level of risk that, if not avoided, could result in death or severe injury.

NOTICE Indicates information considered important, but not hazard-related, such as damage to the product.


Laser Radiation Warning

CE The CE marking on the product is the manufacturer's declaration that the product complies with the essential requirements of the relevant European health, safety, and environmental protection legislation.


The symbol on the product, the accessories or packaging indicates that this device must not be treated as unsorted municipal waste but must be collected separately.

1.3 Description

The PM60 and PM61 Series Fiber Optic Power Meters are simple to use, fast tools that allow power measurements of optical signals and signal power trends. They also feature convenient data storage and remote connectivity. Each unit contains a long-lasting rechargeable battery which can be recharged via a USB-C connector or wirelessly through a built-in inductive charging coil (PM61 series only), ensuring the power meter can be operated continuously throughout an extended workday.

The compact size and rugged design of the PM60 and PM61 series power meters makes them ideal for laboratory and field use. Each unit comes with a 2.5 mm ferrule adapter to connect to the most commonly used fiber tips, such as FC or SC. Thorlabs also offers additional adapters for different fiber connectors.

The PM61 series has additional features like the built-in visual fault locator that emits light in three different modes to trace fibers and identify breaks. It further comes with Bluetooth connectivity and a wireless charging coil.

1.4 Technical Data

1.4.1 Specifications

All technical data are valid at 23 ± 5 °C and 45 ± 15% relative humidity (non-condensing).

Item #	PM60A, PM61A	PM60C, PM61C	PM60CH, PM61CH
Sensor Specifications			
Optical Power Range	-65 dBm to 16 dBm (300 pW to 40 mW)	-70 dBm to 13 dBm (100 pW to 20 mW)	-55 dBm to 23 dBm (3 nW to 200 mW)
Spectral Range	400 - 1100 nm	800 - 1700 nm	
Detector Type	Silicon	InGaAs	
Sensor Size	3.6 mm x 3.6 mm	Ø3 mm	
Aperture Thread	SM05 Thread (0.535”-40) for Fiber Adapters 2.5 mm Ferrule Adapter Included (Item # **PM20-25**)		
Measurement Uncertainty	±0.25 dB		
Measurement Standard	NIST / PTB Traceable		
General Device Specifications			
Display Type	2.8” IPS with Capacitive Touchscreen		
Power Ranges	21 Current Ranges from 2 nA to 10 mA, Represented in Watts		
Resolution	16 bits		
Sample Rate	Up to 100 kS/s via USB		
Power Units	dBm, dB, pW, nW, µW, mW, W		
Dimensions (H x W x D)	136.0 mm x 79.0 mm x 33.4 mm		
Weight	0.25 kg		
Operating Temperature	5 °C to 40 °C		
Storage Temperature	-20 °C to 70 °C		
Power Management			
Battery Operation	Internal LiPo, 2300 mAh, 3.7 W		
Charger	USB C, Inductive Charging Coil (PM61 Series Only), 5 W		
Remote Operation			
Interface	USB 2.0 with USB Type C connector Bluetooth Low Energy (PM61 Series Only)		
Data Storage			
Internal Memory	eMMC (≥ 4 GB), Accessible via USB C		
Visual Fault Locator (PM61 Series Only)			
Wavelength	650 nm		
Output Power	≤1 mW (Class 2 Laser)		
Operation	CW, Flashing: 1 Hz, 3 Hz		
Connector	2.5 mm Ferrule		

1.4.2 Main Features

Features	PM60 Series	PM61 Series
2.8” IPS Color Display	✓	✓
Capacitive Touchscreen	✓	✓
Physical Control Buttons	✓	✓
Rubber Protection and Foldable Stand	✓	✓
Rechargeable Battery	✓	✓
Fast Charging via USB-C Connector	✓	✓
Embedded Wireless Charging Coil	✗	✓
Data Storage to Internal Flash Memory	✓	✓
Internal Flash Memory Access via USB	✓	✓
Pass / Fail Analysis	✗	✓
Admin / User Levels	✗	✓
Physical Menu Button Configuration	✗	✓
Visual Fault Locator (VFL)	✗	✓
USB 2.0 Full Speed Interface	✓	✓
Bluetooth Low Energy Connectivity	✗	✓
Compatible with “OPM” Remote Software	✓	✓
Firmware Updates via USB	✓	✓
Softshell Storage Bag for Device	✗	✓

1.4.3 Mechanical Drawings

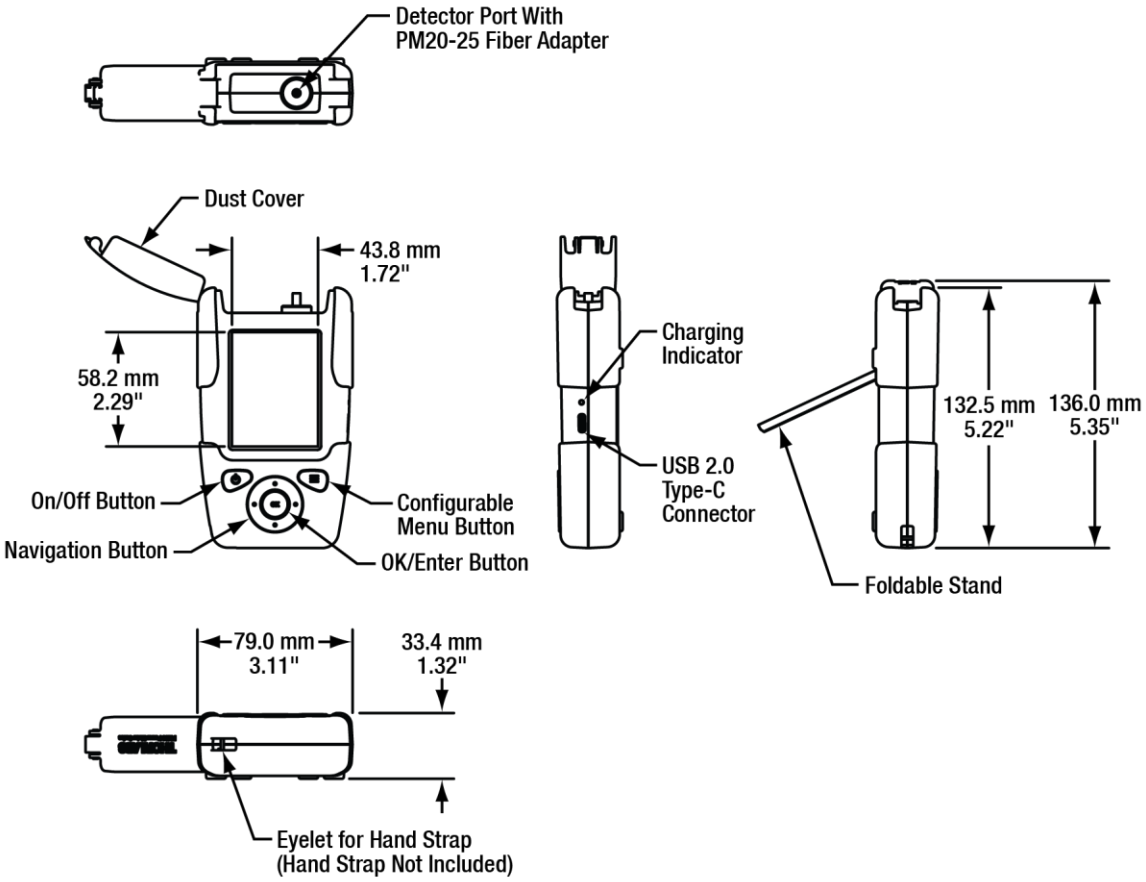


Figure 1 PM60 Series Mechanical Drawing

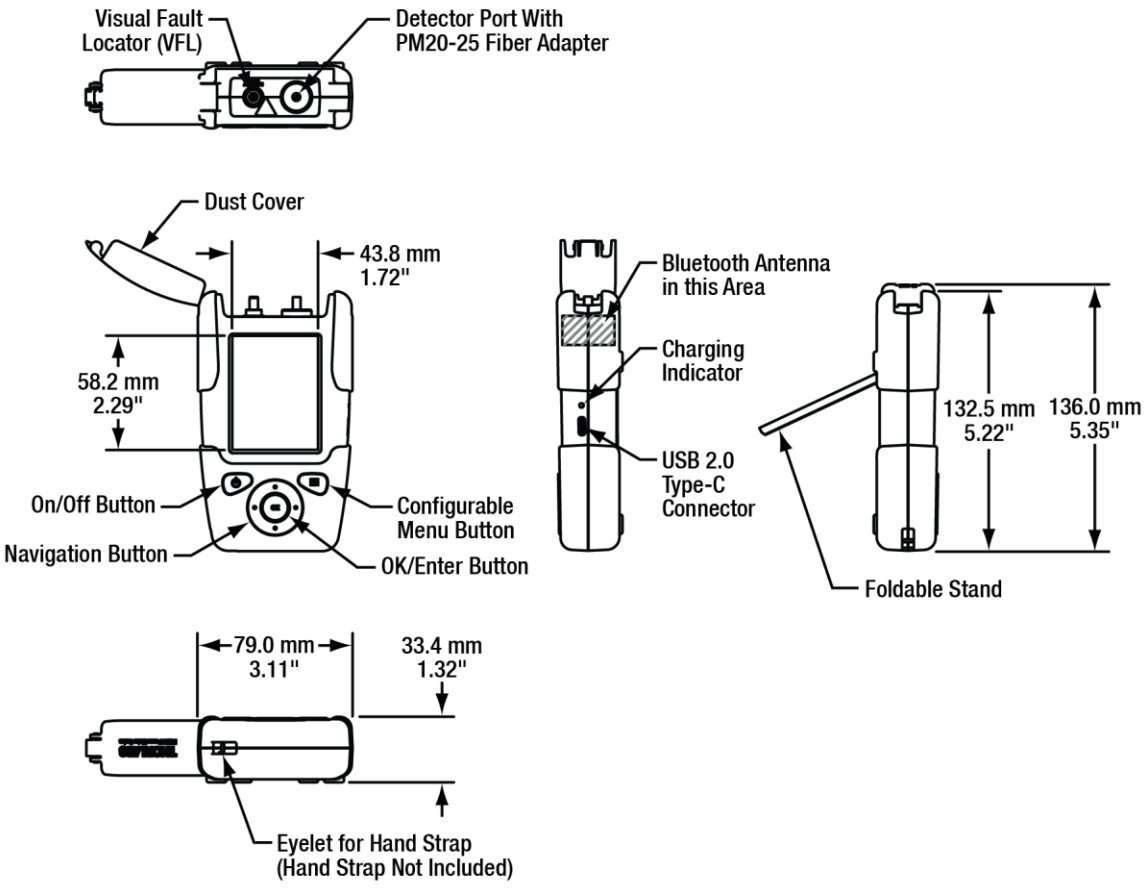


Figure 2 PM61 Series Mechanical Drawing

1.5 Components



Figure 3 PM60 and PM61 Series Front Panel

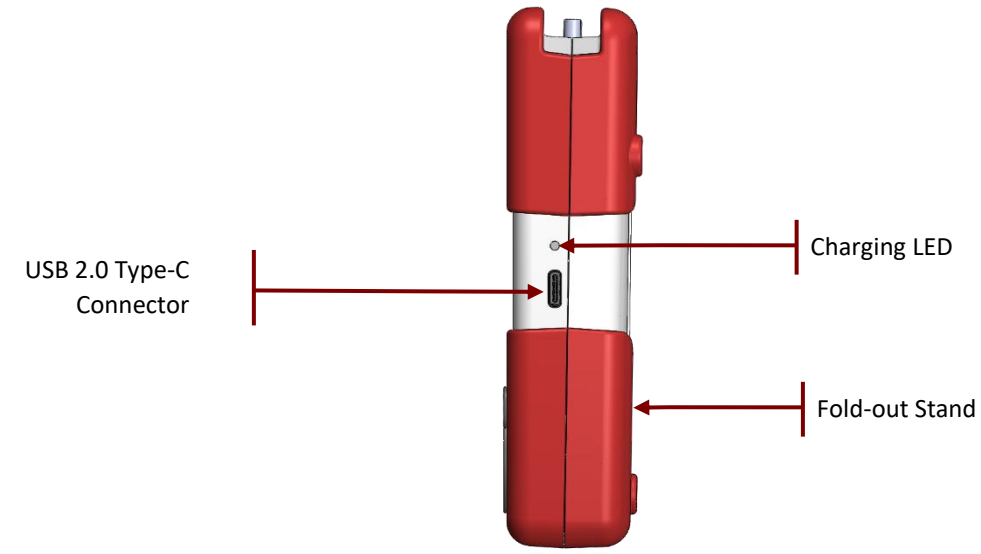


Figure 4 PM60 and PM61 Series Side Panel

1.6 Simplified Declaration of Conformity

Hereby, Thorlabs declares that the radio equipment type u-Blox NINA-B112 is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: **Fiber Optic Power Meters with Internal Sensor (thorlabs.com)**

1.7 FCC Designation

Class B FCC Designation:
The following statement applies to the products covered in this manual, unless otherwise specified herein. The statement for other products will appear in the respective accompanying documentation

Note: This equipment has been tested and found to comply with the limits for a Class B 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 and, if not installed and used in accordance with the instructions, 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, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Users that change or modify the product described in this manual in a way not expressly approved by Thorlabs (party responsible for compliance) could void the user's authority to operate the equipment.

Thorlabs is not responsible for any radio television interference caused by modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by Thorlabs. The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user.

The use of shielded I/O cables is required when connecting this equipment to all optional peripheral or host devices. Failure to do so may violate FCC and ICES rules.

This product has been tested and found to comply with the limits according to IEC 61326-1 for using connection cables shorter than 3 meters (9.8 feet).

1.8 General Wireless Compliance Related Information

The PM61 series devices have an internal radio module with an integrated antenna to which the following information applies:

This product does not contain any wireless user serviceable components. Any unauthorized product changes or modifications will invalidate warranty and all applicable regulatory certifications and approvals.

The module used is NINA-B112 from **u-blox**.

The device is designed to work in the Bluetooth® 2.4 GHz band.

The radio module can be deactivated by the user.

Hereby, Thorlabs declares that the radio equipment type NINA-B112 is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: **https://www.u-blox.com/en**

US / Canada Registration Number and Labeling on the Device:

This device contains
FCC ID: XPYNINAB1
IC: 8595A-NINAB1

China Registration Number:

本设备包含型号核准代码(分别)为: CMIIT ID: 2021DJ2218的无线电发射模块。

Japanese Giteki Mark and Registration Number:

R 204-610006

Brazil Registration Number:

ANATEL
03882-16-05903

Korean KC Mark and Registration Number:

MSIP-CRM-ULX-NINA-B111

"Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário."

Chapter 2 Safety

The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly as it was designed for.

Changes to this device cannot be made nor may components not supplied by Thorlabs be used without written consent from Thorlabs.

⚠WARNING

Explosion Warning
The PM60 and PM61 series devices must not be operated in explosion endangered environments!

NOTICE

Do not open the instrument. Apart from the battery replacement described in Chapter 5.5, there are no user-serviceable parts inside!

2.1 Laser Safety Information (PM61 Series Only)

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly.

⚠WARNING

Warning: Avoid Exposure – Radiation Emitted from Apertures
Do not look into the laser aperture while the laser is on. Injury to the eye may result.

Warning: Laser Radiation
The PM61 series field service optical power meters qualify as class 2 laser instruments due to safety measurements. When operated incorrectly, such as opening the internal mechanism of the device, this can cause severe damage to your eyes and health! Be sure to pay strict attention to the safety recommendations of the appropriate laser safety class, as stated for the used light source. Please ensure appropriate laser safety measures.

The PM61 series is compliant with the IEC 60825-1:2022 standard. Laser radiation may be encountered at the optical output port.

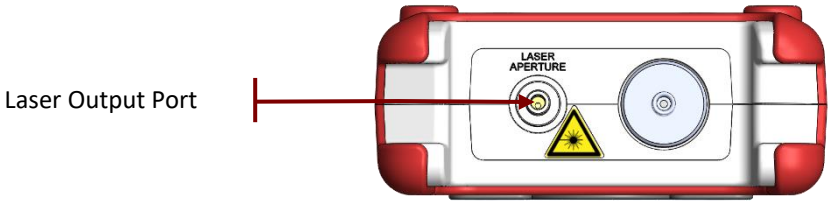


Figure 5 PM61 Series Laser Output Aperture

The following information on the sticker, located under the stand on the back of the device, indicates the presence of the built-in laser, including the symbol “DO NOT STARE INTO BEAM”:



IEC 60825-1:2022, λ: 650 ± 10 nm, P_{out} ≤ 1 mW

Chapter 3 Installation

3.1 Warranty Information

The precision PM60 and PM61 series devices are only serviceable if returned and properly packed into the complete original packaging including the complete shipment plus the cardboard insert that holds the enclosed devices. If necessary, ask for replacement packaging. Refer servicing to qualified personnel.

3.2 Packing List/Special Tools Required for Installation

Lists of items:

- PM60 Series or PM61 Series Fiber Optic Power Meter with Mounted **PM20-25** 2.5 mm Ferrule Fiber Adapter
- USB Cable, Type A to Type C
- Certificate of Calibration
- Quick Reference
- PM61 Series Only: Softshell Storage Bag for Device

3.3 Installation Instructions

The PM60 and PM61 series fiber power meters are ready to operate out of the box. However, to regulatory requirements, the unit will be shipped with a battery charge level of less than 30%, so it is advisable to fully charge the battery prior to first use. Connect the PM60 or PM61 series to a compatible wall plug adapter or PC with a USB power port using the supplied USB connector and then allow the power meter to fully charge (usually within 2 hours).

In case the PM60 or PM61 series should be operated remotely, install the **Optical Power Monitor** software from the Thorlabs website. It comes with all required instrument drivers, examples, and an application to perform all settings and visualize or record the measurement results. It includes useful tools like firmware update wizard, user calibration, and laser calculator.

3.4 Changing Fiber Adapters

The PM60 and PM61 series are equipped with the **PM20-25** 2.5 mm ferrule adapter that allows the accommodation of any FC, SC, ST or E2000 fiber tips. The large active area of the photodiode is also tolerant for angled connectors like FC/APC.

To allow a steady connection of the fiber or for SMA or LC fibers, Thorlabs offers various adapters from the PM20 adapter series to replace the attached PM20-25 adapter. To remove an adapter, unscrew the installed adapter counterclockwise and replace it by the desired PM20 series adapter.

3.5 First Measurements

Some hints to perform accurate laser power measurements:

- Press the power on/off button to turn on the PM60 and PM61 series fiber power meters.
- Make sure there is no dirt on the fiber ends and clean them if necessary.
- Open the dust cap.
- Connect the fiber tip to the installed PM20-25 2.5 mm ferrule adapter. See Chapter 3.4 for separately available fiber adapters of the PM20 series.
- Navigate to the main measurement screen - out of the box default screen.
- Set the wavelength of your laser light source.
- Turn the unit to auto-ranging or select an appropriate measurement range.
- Perform a zeroing with switched off laser.
- Turn on the laser and read the displayed measurement result.

Chapter 4 Operation

4.1 Switching On and Off the Device

The PM60 and PM61 series powers up after pressing the button with the standby symbol (⏻) on the front left of the device. The unit is ready to operate after a few seconds for booting and checking the sensor calibration data. For most standard measurement applications, no additional warm-up time is required.

To turn off the instrument, press and hold the standby button (⏻) for longer than 0.3 seconds and release when the display shows "shutting down". In case the unit hangs up for any reason, keep the button pressed (>1 second) until the unit is forced to shut off.

The devices are equipped with a configurable shutdown timer to extend battery capacity, for more details refer to the chapter **personalization\timers**.

There is also an emergency shutdown in case of low battery. In this case, you should recharge the battery as quickly as possible by connecting it to a USB power supply or, only for the PM61 series, by placing it on a wireless charging station.

4.2 Navigation with Touch Screen and Physical Buttons

The PM60 and PM61 series devices can be operated by the touchscreen or the physical buttons or any combination of both.

All screens consist of a header with access to the menu (☰), different display pages, and information symbols for battery (charging) state, remote interfaces, and when the internal memory is mapped to a PC. Up to four circular dots show the screen position in the measurement screen carousel. In the measurement views, the header can

be expanded by a down swipe to show the current date and time, battery State of Charge (SoC), and device item number.

All measurement views consist of a menu footer containing up to twelve buttons that are arranged in groups of four.

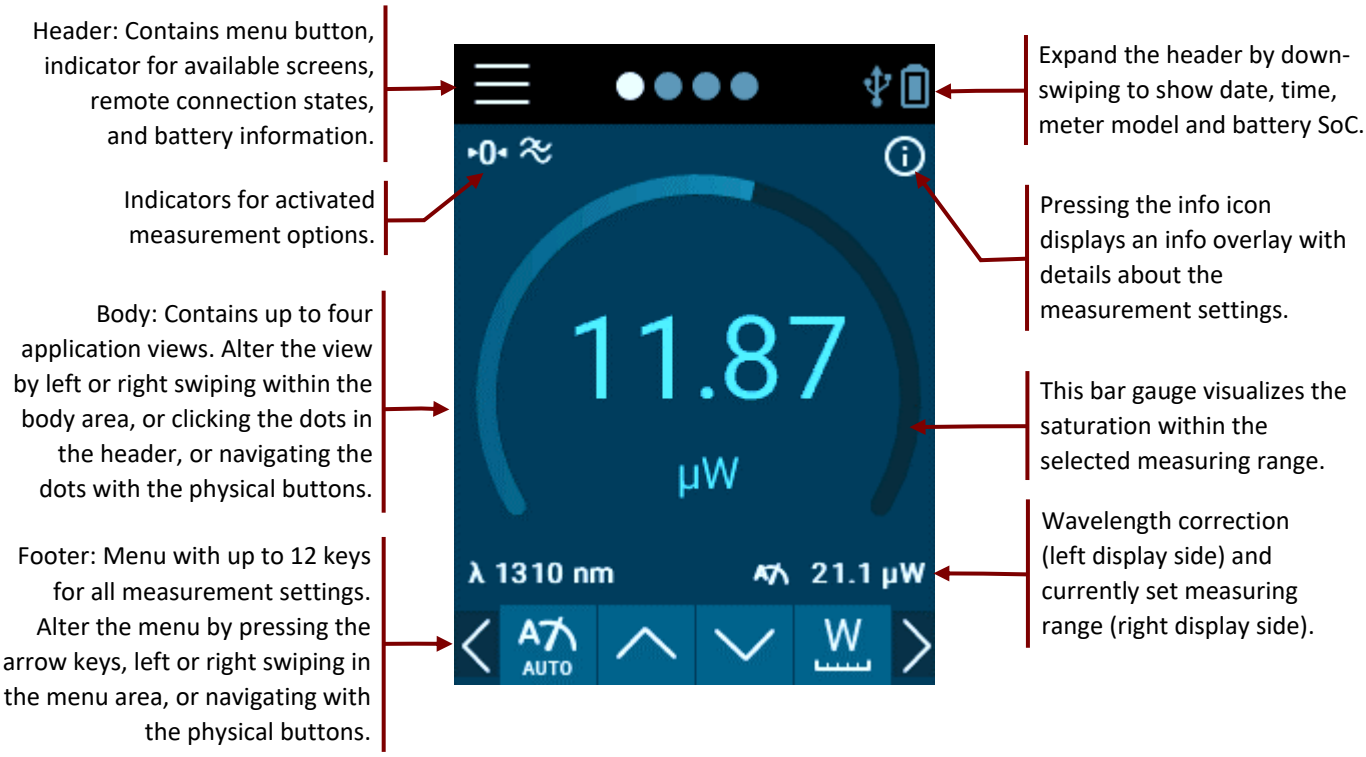


Figure 6 PM60 and PM61 Series Measurement Screen

4.2.1 Button States

The touchscreen has multiple button styles, each with a color-coded state or behavior or frame indicator.

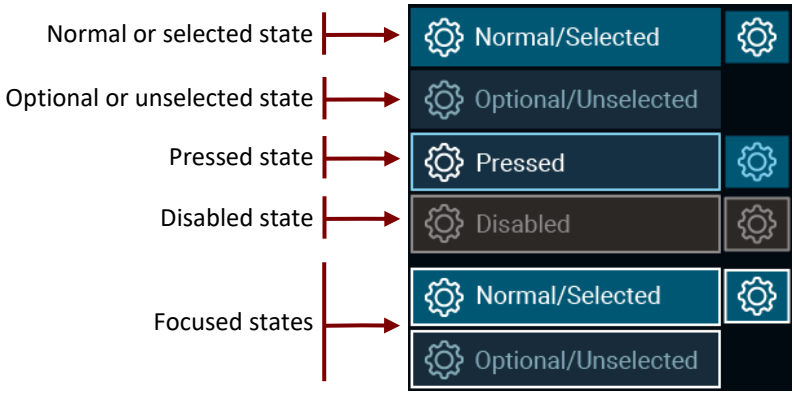


Figure 7 Button States

Focus status is only displayed when navigating with the physical buttons. The button you are currently navigating to will be focused and displayed with a white border. The white frame disappears after 3 seconds of inactivity and can be reactivated by pressing the OK button.

4.2.2 Navigating Measurement Screens

There are three ways to switch between the measurement views arranged horizontally in the carousel.

- Perform a swipe gesture to left or right within the measurement window to navigate the next view.
- Click on the horizontal dots in the header bar, the screens will change to the next right view.
- Use the physical buttons to navigate to the dots in the header, they will receive focus, indicated by a frame around them. Press the OK button to swap the views. The frame will disappear after three seconds of inactivity.

4.2.3 Navigating the Footer Menu

For fast access to the most essential functions, there is a horizontal menu button row at the bottom of the display. There are up to four buttons visible with direct access that can swap with further sections of four buttons. A white arrow showing indicates if more buttons are available and which direction they are located.

- Perform a swipe gesture over the menu buttons in the direction the white arrow shows to display the next section of menu buttons.
- Press the white arrows.
- Use the physical up or down buttons to navigate to the footer menu. The active button will get highlighted and can be pressed with the OK button. Use the left and right button to navigate between the menu buttons and menu sections.

4.2.4 Screen Lock

The touch screen and physical button functions can be locked to avoid accidental inputs. Simultaneously press the physical Up and Menu keys to lock the touch and button functions. When the touch and button functionality is deactivated, a lock sign will appear in the header row between menu icon and the dot icons for the number of available measurement views. Locking the screen in any menu will set the device to the last active measurement screen.

To unlock the touch screen and physical button functions, press the physical Up and Menu keys simultaneously. The touch screen lock is also disabled after each restart of the device.

4.2.5 Screenshot Function

By simultaneously pressing the physical Down and Menu buttons, it is possible to drag an image from the current view, which gets automatically stored to the internal memory. The bitmap can be downloaded via USB connection after mapping the internal flash memory to the connected PC. Browse to the SCREENSHOTS folder in the displayed PM60 and PM61 Series drive.

4.3 Main Menu

Enter the main menu by pressing the physical Menu button (≡) or the menu icon in the left upper corner of the touch display. To exit the menu, press the physical Menu button again or in the touch screen the left arrow button (exits for one level) or the home button (exits to the last measurement screen).

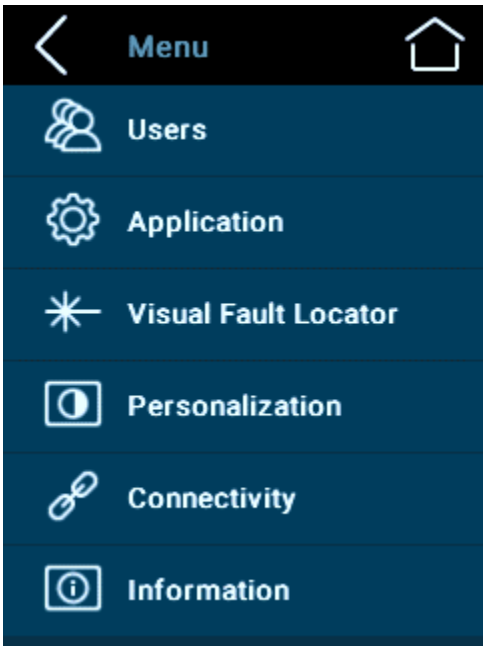


Figure 8 PM60 and PM61 Series Main Menu Screen

4.3.1 Users (PM61 Series only)

The PM61 Series offers the option of creating up to three users whose usage rights can be restricted or adapted to the target application. When delivered, only the administrator is set up with all rights. To enter or configure users, enter the “Admin” section, and enter the configurable 4-digit pin code (the factory code is 0000).

In the upcoming window, it is possible on the one hand to configure the device for the admin user or change the pin code; on the other hand, to activate up to three individual users with pre-configured settings, applications, or restrictions.

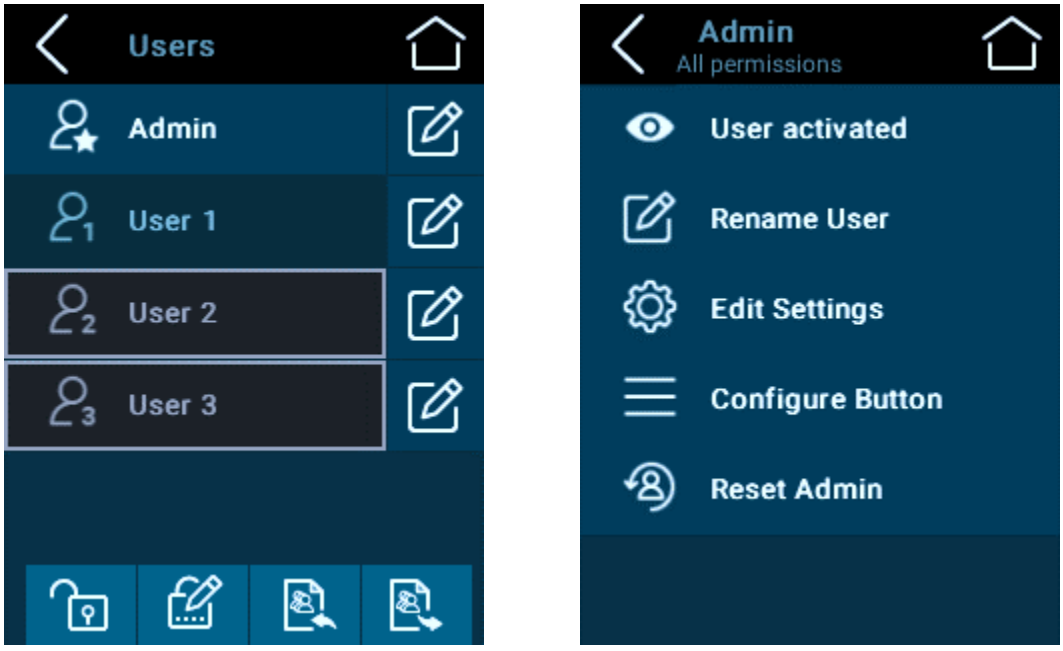


Figure 9 PM61 Series User Configuration Menu

4.3.2 Application

In this menu and its submenus, all operationally relevant settings are arranged in a table with selectable rows.

On the PM61 Series, the “Application” menu item with its entire setting range is only visible and configurable for the administrator. Please enter the “Users” menu with administrator privileges, to apply all settings for ordinary users.

1. **Measurement**

   The measurement menu gives an overview of all measurement settings. A complete configuration can be done here, or in the measurement screen, using the footer menu buttons. For a better overview and to avoid scrolling, the menu is divided into 2 pages that can be navigated using the arrow keys in the footer of the menu window.

Measurement Menu Page 1

Range:	Shows the actual measurement range or auto-ranging. Pressing the entry, a window will open to select between 21 power ranges or auto-ranging.
Δ Delta Mode:	Switch on and off relative measurements.
Units:	Select between a linear measurement representation in Watts or a logarithmic in dBm.
λ Wavelength:	Shows the selected wavelength setting. Pressing the entry will show a new window with four preconfigured wavelength settings. By long-pressing on an entry, the correction wavelength can be adjusted within a number picker dialog.
Correction:	Allows entry of a value in dB for attenuation or gain, and in percent for transmission to compensate for external optical elements in the fiber network.

Measurement Menu Page 2

Update:	Sets the update rate, in combination with an averaging of the displayed measurement value between 1/s with 1000 times averaging, 3/s with 333 times averaging and 10/s with 100 times averaging.
Analog Filter:	The analog filter restricts the full analog bandwidth of up to 100 kHz, depending on the chosen measurement range, down to 16 Hz for all measurement ranges.
Acquisition:	The PM60 and PM61 series can detect maximum power levels by a software peak detection algorithm. The acquisition menu can be set for CW beams with permanent readout or for two kinds of maximum value detection, the peak mode for pulsed signals down to several µs pulses or sinusoidal or triangular signals; and the top mode for rectangular signals. Both peak and top mode get armed when the signal exceeds the trigger level, that was set under the trigger menu.

Trigger: For proper peak detection, the trigger level should be set between 50% and 90% of the expected peak power level.

2. Pass / Fail (PM61 Series Only)

The pass / fail analysis function allows setting limits for power or loss, in which the target power level should be. The absolute power limits can be set in Watts (W) or dBm while the relative loss limits always need to be set in dB or % representation. The settings can be individually configured for each user. For a better overview and to avoid scrolling, the menu is divided into 2 pages that can be navigated using the arrow keys in the footer of the menu window.

Min: Enter the minimum acceptable power level in W or dBm; or the minimum acceptable loss value in dB or %. Pressing the value will open the numerical input dialogue screen. Pressing the 👁/🚫 eye labels deactivates or activates the low limit.

Max: Enter the maximum acceptable power level in W or dBm; or the maximum acceptable loss value in dB or %. Pressing the value will open a numerical input dialogue window. Pressing the 👁/🚫 eye labels deactivates or activates the low limit.

For quality documentation purposes, it is possible to record the results in a file to the internal memory. The stop record criteria and interval can be configured between measurements on the second page of the pass / fail menu.

Stop: Configure the stop criteria in number of samples, time to record, or chose manual to stop the recording by hitting the stop button in the footer menu.

Interval: The record interval can be set from 1 ms up to 1 second in millisecond increments.

3. Logging

The PM60 and PM61 series meters allow data logging over time and store the results to the internal flash drive. The configuration of stop criteria, interval, and measurement units can be individually set for each user (PM61 series only).

Stop: Configure the stop criteria in number of samples, time to record, or chose manual to stop the recording by hitting the stop button in the footer menu.

Interval: The record interval can be set from 1 ms up to 1 second in millisecond increments.

Units: Select between a linear measurement representation in Watts or a logarithmic in dBm.

4.3.3 Personalization

The personalization menu allows individual settings and consists of following sub menus:

Language: The device language can be switched between English, German, Chinese (simplified), Spanish, French and Japanese.

Scheme: Switches the GUI design between dark, bright, and black.

Brightness: Sets the display brightness level in 5 steps. The brightness level has a significant influence on the battery operating time. It is advisable to use the brightness dimming function.

Timers: There are individual timers for the display dimming function ( ) and the auto shut-down function ( ). Both timers can be individually set for battery operation (b) and external power supply operation ( ).

Date/Time: The PM60 and PM61 series have a built-in real-time clock that is constantly powered when the battery is connected and can provide the extremely low operating current required. Setting the correct date and time can be done remotely or using the date and time scales in this menu.

Key tone: When activated, each physical button operation will be confirmed with a beep sound. There is no tone on touch screen events.

4.3.4 Visual Fault Locator (PM61 Series Only)

The PM61 series devices feature an integrated visual fault locator (VFL), useful for identifying fibers in a fiber bundle or detecting cable breaks. The VFL consists of a Class 2 red guide laser with 2.5 mm ferrule pickup that can be switched on in CW mode or in two different flashing modes with a frequency of 1 Hz and 3 Hz.

The VFL function can be enabled or disabled in the admin and user settings.

4.3.5 Connectivity

The connectivity menu consists of following functions and information:

Go To Local: Press this button to lock out from remote operation and return to device operation.

Bluetooth On/Off: For the PM61 series, the Bluetooth transmitter can be permanently switched off in the interface menu, for example, for radio-critical environments. The Bluetooth function is activated by default and will also be activated again after a factory reset.

SD Memory: Per default and after each restart, the built-in NAND flash memory (eMMC) is mapped to the power meter file system to allow measurement data storage.

To access eMMC, the PM60 or PM61 series device must first be connected to a computer via a USB cable. After pressing the SD Memory menu, the icon will switch to “PC” and the connected computer will detect a flash drive with folders for data records, screenshots, and device logs. The data can be exchanged by drag and drop. After data exchange, press again on the SD Memory menu to switch the memory back to the PM60 or PM61 series device.

When pressing the SD Memory menu without connected PC, a warning will appear, and the memory will remain in possession of the power meter. It further appears a dialogue to switch back the memory to the PM60 or PM61

series device, when trying to start data logging while the memory is mapped to a PC.

USB-ID: The USB-ID consists of a vendor ID (0x1313 for Thorlabs), the device ID (0x80BB for PM60 and PM61 Series), and the device serial number.

4.3.6 Information

This menu shows the device's serial number and sensor information. There are three buttons on the right side of the footer menu to display firmware and hardware revisions, detailed battery information, and free flash memory. The middle button shows an information and error log, and the left button performs a reset to the factory settings.

4.4 Glossary of Symbols

Header Line



Menu button. This icon is left in the header line and its graphic is used on the right physical button.



Back button. In sub menus, the “Menu” icon swaps with an arrow showing to the left side. The meaning is “go back” or go one level higher.



Home button. Pressing this button quits the menu and jumps to the last measurement screen.

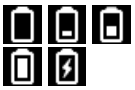


Quit button. Quit sub-menu.



Scroll to the next view.

Header Line Symbols for Information Only, Without Touch Function:



Battery symbol shows state of charge (<10%, 50%, 100%), or charging.



Device connected to computer USB port; active communication; programming error.



Device is paired and connected per Bluetooth, the icon turns green after receiving a valid command and red at a programming error.



Device error; sensor temperature error.



Touch screen and physical buttons are locked. Release by simultaneously pressing the physical “Up” and “Menu” buttons.

4.4.1 User Management (PM61 Series Only)



User menu. Enter the user management menu.



Admin user. Admin user with all privileges.



Ordinary user. User has restricted privileges, needs to be configured by the admin user. There are up to three ordinary users that can have individual configurations.



Edit button. Enter the user menu or rename a user.



Activates or deactivates a user or a function.



Resets a user to the factory settings.



Digital menu button. Configures the physical menu button to a predefined action. This can be a one-time auto-ranging, starting/stopping the data logging, or activating the VFL. By default, the button is configured to access the menu.



Enter the settings to configure the available options for each user, including the admin user. A 4-digit password is necessary to access the settings. The factory default password is <0000>.



Change the administrator password. A factory reset, that can only be performed by the admin user, will reset the password to default <0000>.



Export / Import all device settings to a JSON file (java script object notation). This feature can be used after entering the password, to apply the same settings to multiple devices.

4.4.2 Measurement Application and Option Settings



Settings button. Enter the measurement and option settings menu.



Sensor button. Enter the measurement settings.



Pass / fail button. Enter the pass / fail analysis configuration (PM61 Series Only).



Graph button. Enter the logging configuration.

4.4.3 Visual Fault Locator (PM61 Series Only)



VFL button. Enter the VFL configuration (PM61 Series Only).

4.4.4 Connectivity



Interface button. Enter the remote-control interface menu.



Local button. Return from USB remote to local operation.



Activates or deactivates the Bluetooth transmission (PM61 Series Only).



Allocates the device flash memory to the device (default) or to a per USB connected computer, accessible as a mass storage device.

4.4.5 Device Management



Enter the device settings.



Enter the device information menu.



Factory reset button. Performs a factory reset. All device settings will be set to default.



Shows the device log.



Configures the device log from info log to debug and info mode.



Save button. Save info or debug log to internal memory.



Delete button. Delete current info or debug log.



Reset button. Reset device log.



Information button. Shows detailed device information, like firmware and hardware revision, battery state and free flash memory.

4.4.6 Measurement View



Ranging function button. Switches between auto-ranging and manual ranging



Up / down buttons. Turns the measurement one range more insensitive (up) or sensitive (down). After pressing one of the arrow icons, the unit goes in manual ranging.



The auto-set function can on one hand perform a “one-time-auto-ranging”, while the instrument remains in manual ranging; or in peak or top mode, find the optimal measurement range and trigger level setting.



Switches the measurement units between linear representation of the measurement value in Watts or logarithmic representation in dBm.



Wavelength button. Opens the dialogue for the spectral correction to change the user wavelength.



Delta button. Turns on and off the relative measurement view by taking the measurement value at the time of pressing the button as reference value.



Zero button. Zeroes the measurement value to compensate for dark current or backlight.



Correction button. Opens a dialogue to make a gain or attenuation correction of the measurement value.



Bandwidth button. Limits the analog bandwidth from up to 100 kHz to 16 Hz for an effective noise reduction.



Update button. Along with the display update rate, that can be set between 1/s, 3/s and 10/s, there is a dynamic averaging for digital filtering.





Mode button. Switches the measurement mode from permanent updating CW mode to peak or top mode, where the measurement value update is triggered by exceeding a predefined trigger level and waiting for maximum detection.



Trigger button. Set the trigger level for peak and top mode between 3% and 90% of the measurement range



Laser button. Turns on and off the laser of the visual fault locator.



Pops out the measurement information overlay.

Measurement View Symbols for Information Only, Without Touch Function:



VFL is active. (PM61 Series Only)



Peak mode: Waiting for trigger; valid trigger condition.

4.4.7 Pass / Fail Analysis (PM61 Series Only)



Pass / fail mode buttons. Switches the pass-fail analysis between absolute and relative measurement.



Record button. Starts and stops the pass-fail analysis record. The measurement data automatically get stored to the internal memory.



Delete button. Deletes the last record.



Live button. Turns back from record mode to live mode.



Settings button. Enter the pass/fail settings



Reset the reference value for the loss measurement to the actual power level

4.4.8 Logging and Statistics



Record button. Starts and stops the recording of data. The measurement data automatically get stored to the internal memory.



Graphical representation between strip chart showing the last 10 seconds or the complete graph from start.



Delete button. Deletes the last record.



Defines the stop criteria of the recording. It can be set to manual operation or stopping after a certain time, or number of recorded samples.



Define the interval between 1 ms and 1 s intervals.

4.5 Number and Text Dialogues

For entering numbers or renaming text strings, numerical or alphanumerical dialogues are used. In the numerical input windows, usually there is a standard number pad and additional buttons for the selection between different units or to toggling the exponents within one unit button. The entry limits are shown in a header line. To delete numbers, use the backspace button (⌫), to confirm the entry use the (OK) button. On some dialogues, there are buttons with toggling functions, like switching between pW, nW, µW, mW, and W.

The alphanumerical display keyboard has the backspace button (⌫) to delete single characters, or when keeping pressed, deleting all characters. The (OK) button is to confirm the entry and a three-state button to switch between upper- and lower-case characters and numbers.

To exit the dialogue screen without changes, press the quit button (⊗) in the header line.

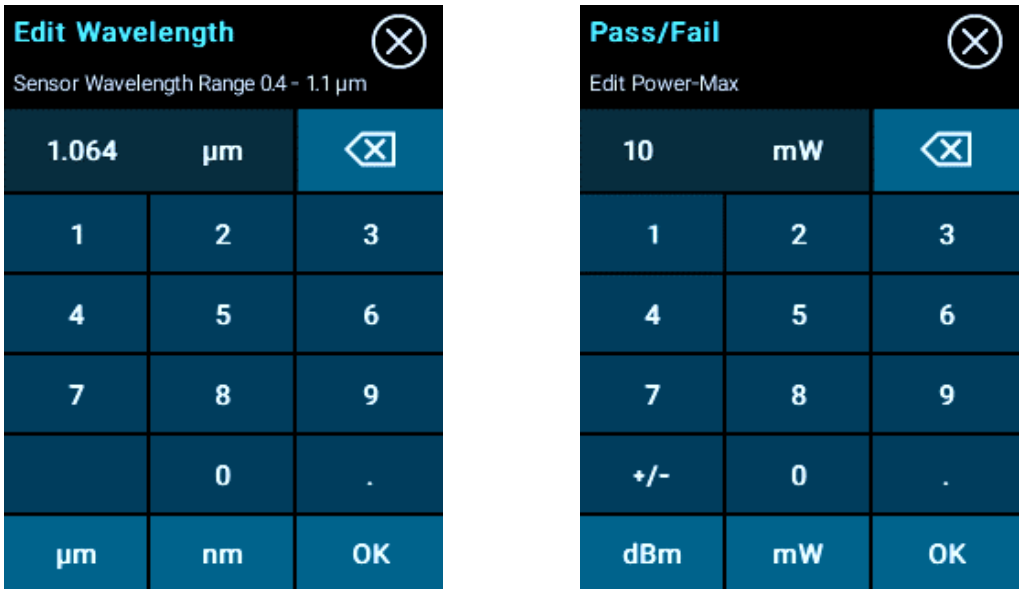


Figure 10 Wavelength and Pass/Fail Analysis Numerical Entry

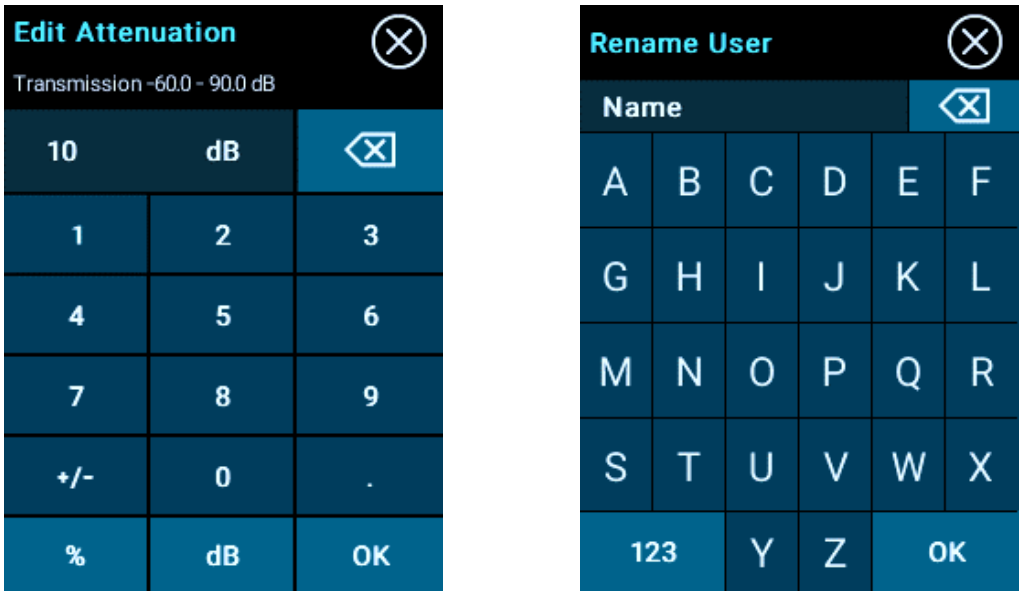


Figure 11 Attenuation Numerical Entry and Alphanumerical Entry

4.6 Power Measurements

The main measurement screen shows a large digit numerical representation of the actual power value, supported by a circular level display indicating the level within the selected measurement range.

All settings can be done with the button carousel in the footer menu.

Clicking or navigating and confirming on the information sign (ⓘ) will add an overlay with all relevant measurement configurations. Clicking within the information frame will close the dialogue.

4.6.1 CW Mode

This is the basic power measurement, where the measurement value continuously gets updated. Enabled options like attenuation, zeroing, filtering, or auto ranging are indicated as icons right to the set wavelength.



Figure 12 Main Measurement Screen and Information Overlay.

4.6.2 Peak and Top Mode

To perform peak power measurements, browse to the first footer menu by left arrow, swiping the menu to the right side, or navigating with the physical buttons. Change the setting from CW to either top or peak, set trigger and measurement range or perform a “auto-set”. The measurement units will get the suffix PK. There is also a trigger indicator that turns yellow when pulses or levels that exceed the trigger threshold are detected.

The measurement values only get updated on successful trigger conditions.



Figure 13 Measurement Screen in Top or Peak Mode

4.6.3 Visual Fault Locator (PM61 Series Only)

The visible laser can be switched on by the left button in the measurement screen. When the laser is on, it is not possible to switch screens until it is turned off. Switch between the CW and 1 Hz / 3 Hz flashing modes by pressing the right setup button.

A laser warning sign in the upper left corner of the measurement screen indicates that the laser is activated.



Figure 14 PM61 Series Only: Visual Fault Locator Activated

Figure 15

4.7 Data Logging and Statistics

4.7.1 Data Logging

The data logging function allows recording of the measured power levels over time. After pressing the start button (icon with the red circle), the recording to a file on the internal flash memory gets started with the configured time interval. The stop condition can be set automatically after a certain number of samples or after a certain time, but can also be stopped manually by pressing the stop button. During the recording, the graph can be shown from the beginning or as strip chart over 10 seconds by pressing the toggling 0...t / Δt buttons.

After stopping the recording, it is possible to delete the just recorded file, as long it is visible on the screen, by pressing the trash-bin icon and confirming to delete the file.

The files are stored under the folder RECORDS on the internal flash drive with the record date and time in the file name in a csv format. The files can be accessed by mapping the memory to an external PC via USB connection. The files include all relevant device and sensor information, the most important settings, the start time, and csv sign separated relative time and measurement value table. Please note that the separator is comma, and the decimal separator is period like it is usual in many countries. When loading to an Excel spreadsheet consider this in the language settings or make the adjustment in text- or notepad in advance.

By pressing the cogwheel icon, the record settings can be modified. PM61 series only: The admin user can directly access the configuration menu. All ordinary users do not have the cogwheel icon and must be pre-configured by the admin user.

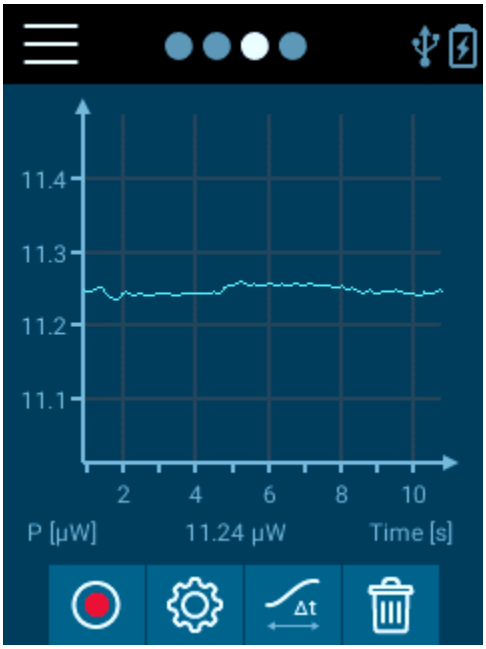


Figure 16 Data Logging

4.7.2 Statistics

In combination with the graphical representation of the data logging, there is a statistic view on the same set of data. During and after the record it is possible to switch between both views by swiping right or left or navigating over the dots in the header line.

The statistics view offers, along with the number of samples, time elapsed and the interval time, the mean value, the ratio, and minimum and maximum value of the data record in an overview.

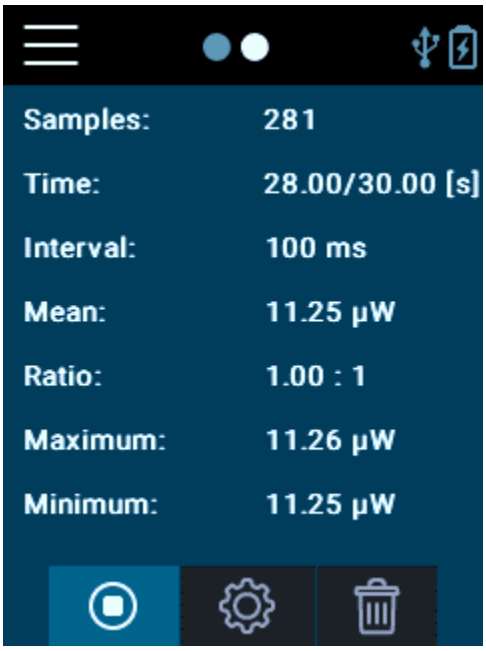


Figure 17 Statistics View

4.8 Pass/Fail Analysis (PM61 Series Only)

The pass-fail analysis function is an extremely useful tool for quality control in production and service. It gives visual attention to whether the measurement value is within a predefined power range without the need of reading the exact power value. The Limits can be configured for absolute power and relative loss measurements by the admin user for themself and the ordinary users.

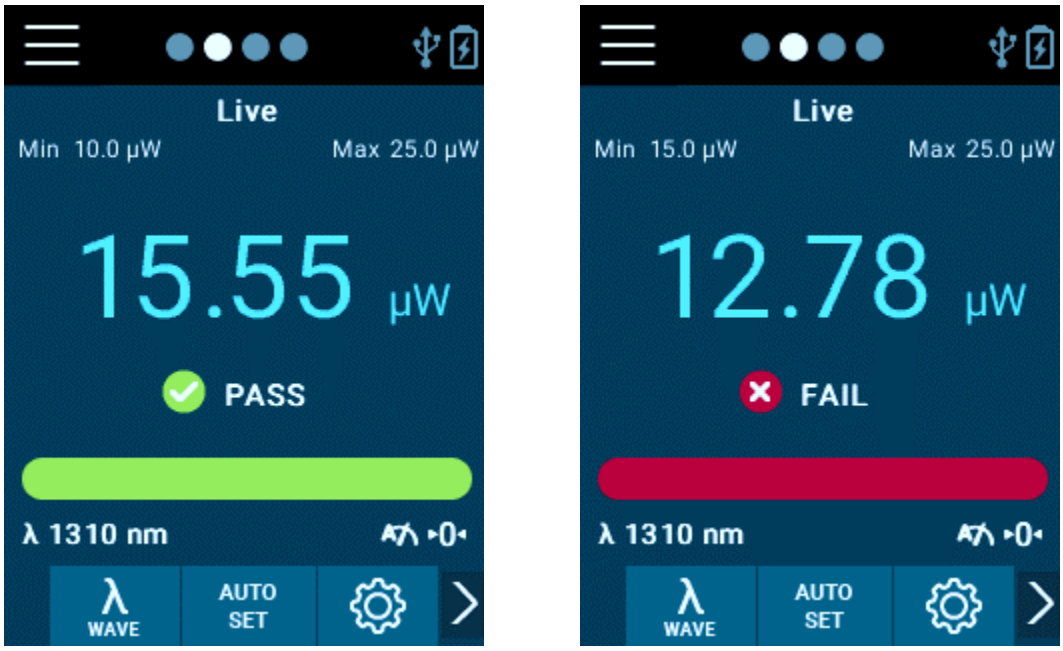


Figure 18 PM61 Pass-Fail Analysis for Absolute Power Levels

The loss pass-fail analysis can be used to check fiber connections or other fiber components, like attenuators, splitters, couplers, or circulators. Perform a measurement with a reference fiber and without the component to analyze and press the toggling Φ_{ABS} / Φ_{LOSS} button to perform the reference measurement. The reference measurement can be renewed with the Φ_{REF} update button. The loss measurement can be viewed like a delta measurement; a power loss is displayed with a negative sign and a power gain with a positive sign.

In the pass/fail settings menu, it is also possible to omit one of the limits by pressing the eye label 👁 and unselecting one of the Min or Max markers. The corresponding line in the menu will then be shown as disabled and the eye label shows 🚫.

The limit not considered is then displayed in the measurement window as “------”.



Figure 19 PM61 Pass-Fail Analysis for Relative Power Levels (Loss)

In both cases, it is possible to record the measurements to a file on the internal flash memory. Therefore, the admin user can configure the stop condition and the measurement interval in the logging menu for themself and for the ordinary users. During and after the record, the screen will change and show minimum and maximum level and the analysis result. The data will automatically be stored in the PASS_FAIL folder on the flash memory. The last record can be deleted right after recording. To access the files in csv format, connect the PM61 series power meter to a computer via USB connection and allow access to the internal memory (Menu\SD Memory). The files include all relevant device and sensor information, the most important settings, the start time, and csv sign separated relative time, measurement value, and pass-fail result table. Please note that the separator is comma, and the decimal separator is period like it is usual in many countries. When loading to an Excel spreadsheet consider this in the language settings or make the adjustment in text- or notepad in advance.

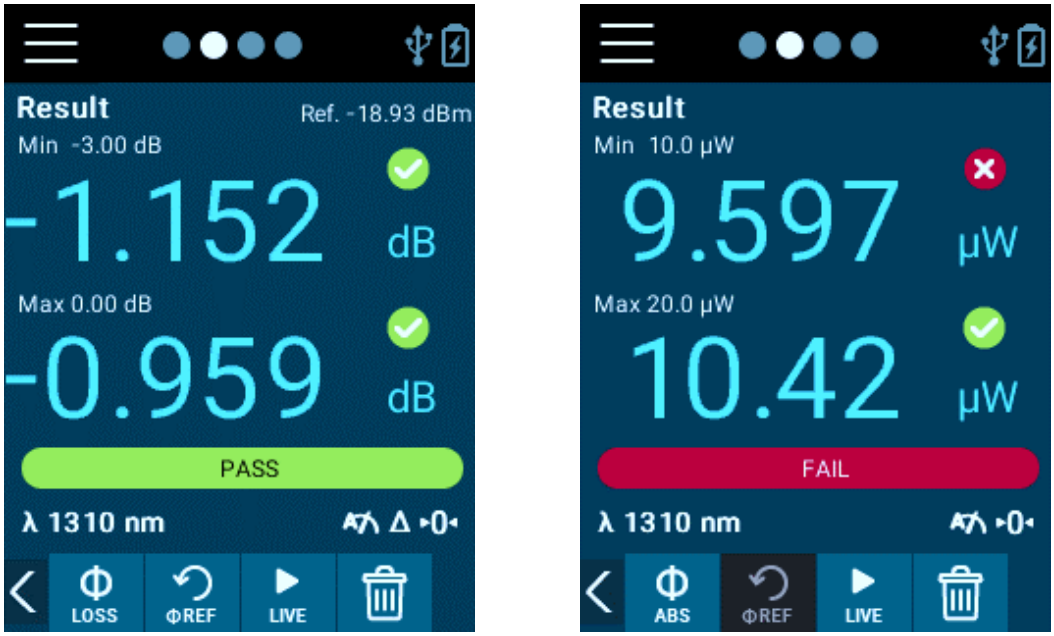


Figure 20 PM61 Series Pass-Fail Record for Loss and Absolute Power

4.9 Battery Usage and Charging

The PM60 and PM61 series power meters are sourced from a lithium-polymer (LiPo) rechargeable battery, which has sufficient capacity for a long working day with continuous instrument use. The operating time can be extended by keeping the backlight on a medium level and using the display dimming and shut-down timers.

The instrument's battery can be recharged by using the provided USB type C to type A cable and connecting it to any USB power supply or computer USB port; the smart charging circuit configures automatically for the available and optimum charging voltage and current. To protect the battery, the maximum charging current is limited to 1 A, which results in the fastest possible charging time of approximately 2.5 hours.

The PM61 series also features a wireless charging coil integrated into the foldable stand. It can be charged with any compatible wireless charging transmitter rated at 5 W with up to 1 A. Place the instrument with the cross mark on top of the wireless charging transmitter and check if the charging LED on the PM61 series starts flashing green.

The charging LED has the following states:

- Off: Device runs on battery. If turned on, check the battery state in the display or in the device info menu.
- Flashing green: Device is connected to an external power source and battery is charging.
- Permanently green: Device is fully charged and connected to an external power supply.
- Red: Battery is overheated, or there is a problem with the connected power supply. The battery will not get charged, please see **Chapter 6** troubleshooting and repair.

4.10 Remote Operation

4.10.1 USB 2.0 Interface

The PM60 and PM61 series power meters can be controlled remotely via the USB 2.0 interface. The straightforward way is to download the Optical Power Monitor software - **OPM** - from the Thorlabs website. It comes with all required instrument drivers, programming examples, command reference, and a bunch of useful tools, like firmware update, driver switcher, and laser calculator.

After starting the software, it automatically scans for connected Thorlabs power meters and other supported devices, lists them, and connects to the first found instrument. The range of functions of the software covers the possibilities of individual device functions to a wide extent.

All Thorlabs optical power meters are devices that follow the USBTMC (test & measurement class) protocol. This is a USB device class that allows communication with testing and measuring devices, using SCPI (Standard Commands for Programmable Instruments) commands. The specification is based on USB 2.0 and was approved at the end of 2002 by the IVI (Interchangeable Virtual Instrumentation) foundation. USBTMC is supported by the VISA (Virtual Instrument Software Architecture) standard and defines a USB488 subclass for devices that transmit messages based on IEEE 488.1 and IEEE 488.2 (GPIB).

Mandatory to integrating a USBTMC device is to have an installation of VISA. VISA is a widely used application programmable interface (API) in the test and measurement industry and available for most operating systems. Most common are the **NI-VISA™** or **PyVISA**, but to get rid of the need to installing third-party software packages,

Thorlabs developed their own version of VISA that uses the Thorlabs standalone TLPMX drivers and that automatically installs with the Thorlabs OPM software package.

It is important to note that both NI-VISA™ and TLPMX drivers can be installed at the same time, but only one of them can be assigned to an instrument at a time. Switching the drivers needs administrators' rights; it can be performed in the device manager, or more convenient, with the Thorlabs Driver Switcher App, that is embedded in the Thorlabs OPM software.

During an active remote session, it is not possible to perform settings that may influence the measurement result, like changing the wavelength or measurement range.

Please refer to the **Thorlabs** website and the resources around the Thorlabs **OPM** optical power monitoring software for more information and full command reference.

4.10.2 Bluetooth Interface (PM61 Series Only)

The PM61 series has a built in Bluetooth module, following the Bluetooth Low Energy (BLE) standard. When activated, it is possible to establish a wireless connection to computers or mobile devices.

Prior to a connection with data transmission, it is necessary to pair the PM61 Series with the target device. Therefore, open the Bluetooth settings on the target device and perform a scan for PM61 Bluetooth devices in the surrounding. On Windows PCs, as well as on mobile devices, it will show as "PM61". Connect to the found PM61 Series device.

Communication is then possible via SCPI commands, using the drivers, or using an app. The Thorlabs optical power meter software can also be used to communicate via Bluetooth low energy.

Check out the **Thorlabs** website for iOS and Android applications that support communication with Thorlabs BLE devices.

Chapter 5 Maintenance and Cleaning

5.1 General Guidelines

- Before usage, consistently clean and examine fiber-optic connectors.
- Maintain a dust-free environment for the unit.
- Wipe the unit casing and front panel with a slightly damp cloth.
- For cleaning the touch screen, a commercial screen cleaner is acceptable.
- When storing the unit, apply the dust caps to the fiber port(s) and keep it in a clean and dry area at room temperature, avoiding direct sunlight.
- Steer it clear of high humidity and substantial temperature fluctuations.
- Avoid exposure to unnecessary shocks and vibrations.
- The unit is not waterproof! In the event of liquid spillage, power off, disconnect from external sources, and allow the unit to thoroughly dry before use.

5.2 Cleaning Detector Ports

NOTICE Always cover detectors with protective caps when the unit is not in use.

1. Unscrew the fiber adapter from the detector.
2. Inspect the filter surface and blow off any dust with compressed air.
3. Polished filter surfaces, like the absorptive ND filters for PM6xA, PM6xC, and PM6xCH can be cleaned with a swab, moistened with alcohol, or other optical cleaning fluids.

NOTICE Do not mechanically rub on any diffused surfaces, this may lead to changes in the sensor responsivity!

5.3 Cleaning the VFL Connector

The visual fault locator has a built-in ferrule tip that can be cleaned using a mechanical cleaner like the Thorlabs **FBC250**.

⚠WARNING

Risk of Eye Damage
Verifying the surface of the connector with a fiber-optic microscope while the unit is active may result in permanent eye damage.

1. Switch off the unit by pressing the on/off power button for > 0.3 seconds.
2. Refer to user manual of the mechanical bulkhead and connector cleaner.

5.4 Recalibration

Thorlabs recommends a calibration interval of 12 months. Please contact the Thorlabs technical support team for submitting a calibration request to issue an RMA number along with the item number and the serial number of your PM60x or PM61x power meter.

Please use the following Item #s for either factory or ISO 17025 accredited calibration services of the PM6xA power meters:

- **CAL-PD** - Manufacturer Recalibration Service for Single-Power-Range Silicon Photodiode Power Sensors
- **CAL-PDD** - ISO 17025 Accredited Calibration Service for Single-Power-Range Silicon Photodiode Power Sensors

Please use the following Item #s for either factory or ISO 17025 accredited calibration services of the PM6xC and PM6xCH power meters:

- **CAL-IRPD** - Manufacturer Recalibration Service for Single-Power-Range Germanium or InGaAs Photodiode Power Sensors
- **CAL-IRPDD** - ISO 17025 Accredited Calibration Service for Single-Power-Range Germanium or InGaAs Photodiode Power Sensors

Or fill out the following form to submit a calibration request:

https://www.thorlabs.com/rma/request.cfm

5.5 Battery Replacement

⚠WARNING

The PM60 and PM61 series meters use smart lithium-polymer (LiPo) batteries. These batteries with built-in protection have been verified with Thorlabs optical power meter instruments. For this reason, only Thorlabs approved batteries of the same type and model (2P/LPP 503562) can be used.
Depending on country-specific policies, please contact your local Thorlabs technical support for assistance.

NOTICE

Dispose of used batteries appropriately by recycling them in accordance with local regulations. Refrain from placing them in regular garbage receptacles.

1. If applicable, disconnect attached USB cables and optical fibers.
2. Turn off the unit.
3. Place the unit on a level and tidy surface, positioning the display facing downward.
4. Remove the 4 screws in the rear shell by using a Torx© TX8 driver turning counterclockwise.
5. Raise the rear shell by gripping and holding the front panel together with the front shell, ensuring both front shell and front panel remain together.
6. In case the unit is equipped with a wireless charging coil, take care of the wires that connect to the power meter circuit board.
7. Disconnect the battery and remove it from the holder in the rear shell.
8. Take a battery of the same type and rating and place it in the rear case bracket with the cables facing downwards in the cable channel.
9. Attach the sticky rubber spacer. The spacer from the old battery can be reused on top of the new battery.
10. Plug in the battery.
11. Carefully put the rear shell in place, insert the screws and tighten them gently.

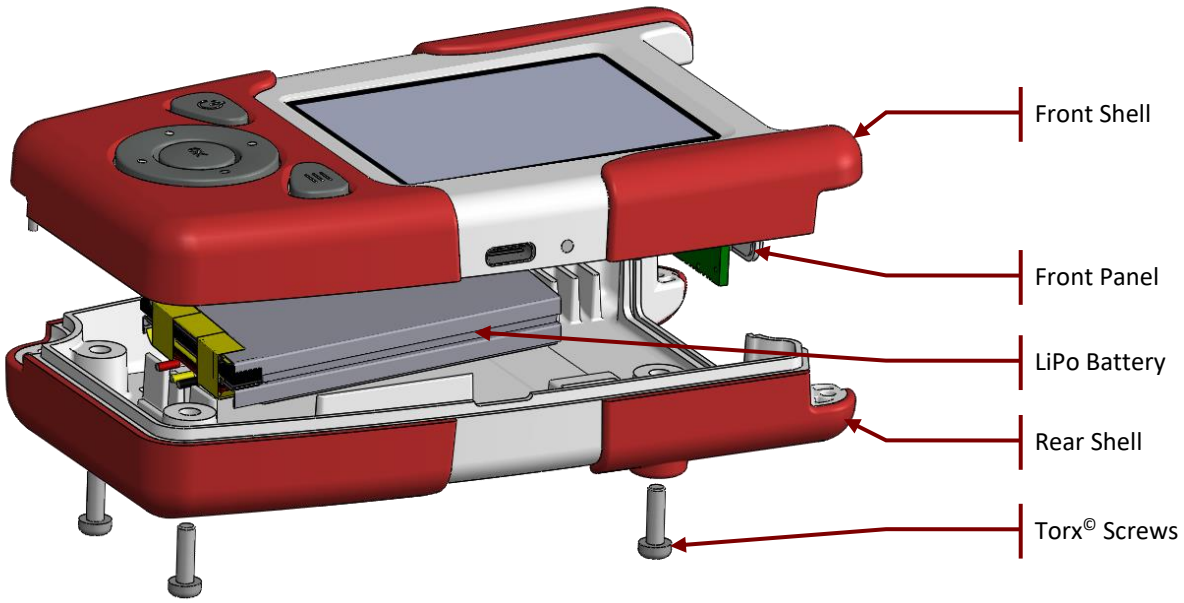


Figure 21 Battery Replacement

5.6 Firmware Update

1. Turn on the unit.
2. Connect the USB cable to a free port of the computer and to the PM60 or PM61 series.
3. Download the new firmware package from the Thorlabs website to your local drive.
4. Open the optical power meter software.
5. Browse to Help\Tools\Firmware Update Tool
6. Select the new firmware file and follow the instructions.
7. Wait until installation is complete, do not turn off the unit during installation!
8. Restart the instrument with the updated firmware.

5.7 Change the Hinge Position of the Protective Cover

The protective cap of the PM60 or PM61 series device is intended to cover the fiber connectors simply and effectively when the meter is carried around. It is possible to change the opening direction or completely remove the cover.

1. If applicable, disconnect attached USB cables and optical fibers.
2. Turn off the unit.
3. Place the unit on a level and tidy surface, positioning the display facing downward.
4. Loosen the 4 screws in the rear shell by 2-3 turns counterclockwise by using a Torx© TX8 driver.
5. Carefully raise the rear shell by gripping and holding the front panel, ensuring it remains attached to the front shell as far as the hinge of the cover gets released.
6. Take off the protective cover and place it in mirrored position or remove it completely.
7. Check the proper position of the front panel, press both shells together and fix the 4 screws clockwise.

Chapter 6 Troubleshooting and Repair

Below are a few checks to help in troubleshooting problems that may arise. Please contact your local Thorlabs Technical Support office with any questions.

Failure	Troubleshooting
Unit Does Not Turn On	Ensure that the battery is sufficiently charged; otherwise, connect the device to an external power supply. If not completely charged, press the standby button for > 3 seconds, and try to start the device again by short pressing the standby button.
Battery Does Not Charge	Check for the charging LED; it must blink green during charge. In case the LED lights red, check the power supply or check for abnormal heating of the device.
Unit Automatically Switches Off	Check the battery status. The unit turns off to protect the battery below 6% SOC. Check also the automatic switch off feature in the device settings.
Measurement Value Does Not Update	Check if the unit is in peak mode or top mode. The measurement will only update on valid trigger conditions. Otherwise restart the instrument.
Unit is Frozen and Does Not React to Any Interaction	Press the power button until the device powers down. Restart the device.
Wireless Charging Function Does Not Work	Check the correct orientation of the charging transmitter. Check that the transmitter has power and is turned on. The PM61 series charging LED should flash to indicate charging or be solid when fully charged.

Chapter 7 Disposal



Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return “end of life” Annex I category electrical and electronic equipment sold after August 13, 2005, to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out “wheelie bin” logo (see right), were sold to and are currently owned by a company or institute within the EC and are not dissembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. “End of life” units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site. It is the user’s responsibility to delete all personal data stored on the device prior to disposal.

Chapter 8 Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at **www.thorlabs.com/contact** for our most up-to-date contact information.



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