THORLABS

Optical Power Meter

PM100D
Quick Reference



2023

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Table of Contents

1 General Information 4
1.1 Safety 4
2 Unpacking 5
3 Operating the PM100D 5
3.1 Preparation 5
3.2 Operating Elements 6
3.3 Connecting a Power or Energy Sensor 8
3.4 Controlling the PM100D 8
3.4.1 Navigating the Menus 8
3.4.2 Power and Energy Measurement in the Numeric Display 10
3.4.3 Display Options 13
3.4.4 Analog Output 14
3.4.5 Battery Charging 14
3.5 Computer Interface 15
4 Maintenance and Repair 15
5 Warranty 16
6 Copyright 16
7 Certifications and Compliances 17
8 Thorlabs “End of Life” Policy (WEEE) 18
9 Thorlabs Worldwide Contacts 19

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1 General Information

The PM100D Handheld Optical Power and Energy Meter is designed to measure the optical power of laser light or other monochromatic or near monochromatic light sources and the energy of pulsed light sources.
The space-saving, battery powered design and compatibility to all Thorlabs “C-Series” Photodiode, Thermal, Pyroelectric sensors, and custom Photodiode, Thermal and Pyroelectric detectors, combined with a fast USB device interface open a wide range of applications in Manufacturing, Quality Control, Quality Assurance, and R&D for stationary and field use.
Please refer to the user manual on the data carrier supplied with the unit for detailed function description.

1.1 Safety

Attention

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.
Do not remove covers! Do not open the cabinet. There are no parts serviceable by the operator inside!
Only with written consent from *Thorlabs,* changes to single components may be carried out or components not supplied by *Thorlabs* may be used.
This precision device is only transportable if duly packed into the complete original packaging. If necessary, ask for a replacement package. Refer servicing to qualified personnel!

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2 Unpacking

Inspect the shipping container for damage.

If the shipping container seems to be damaged, keep it until you have inspected the contents and you have inspected the PM100D mechanically and electrically.

Verify that you have received the following items within the hard-case:

1. PM100D power/energy meter console
2. 8 GB SD memory card – installed in PM100D
3. Plug-In power supply with Interchangeable primary plug for USA, UK, Europe, and Australia
4. USB cable, type ‘A’ to ‘mini-B’
5. Quick-start guide
6. Certificate of Calibration

3 Operating the PM100D

3.1 Preparation

Configure the plug-in power supply with the primary plug for your local power supply.
Connect a suitable power or energy sensor. The sensors have a self-fixing mechanism. To plug or unplug a sensor slightly press from both sides on the pins in the connector housing.
Turn the unit on by pressing the power button in the side panel.
After switching on the unit, the graphics display will show the device status and then jump to the last measurement screen before power down.
The PM100D is immediately ready to use after turning on.

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3.2 Operating Elements



Function Keys:

Navigation: ▼▲◀▶
Enter/Edit: **OK**

Wavelength: **λ**
Relative Measure: **Δ**
Backlight: ☼

Figure 1 Front Panel

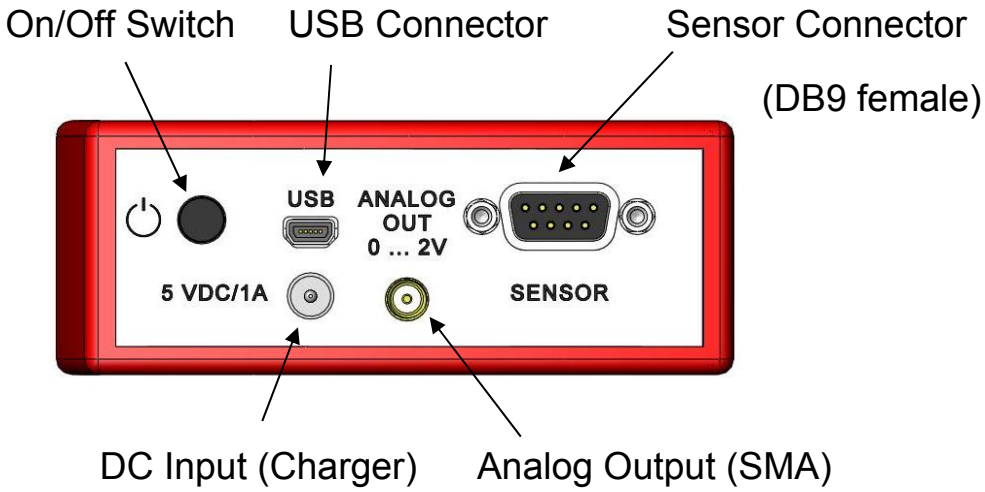


Figure 2 Side Panel

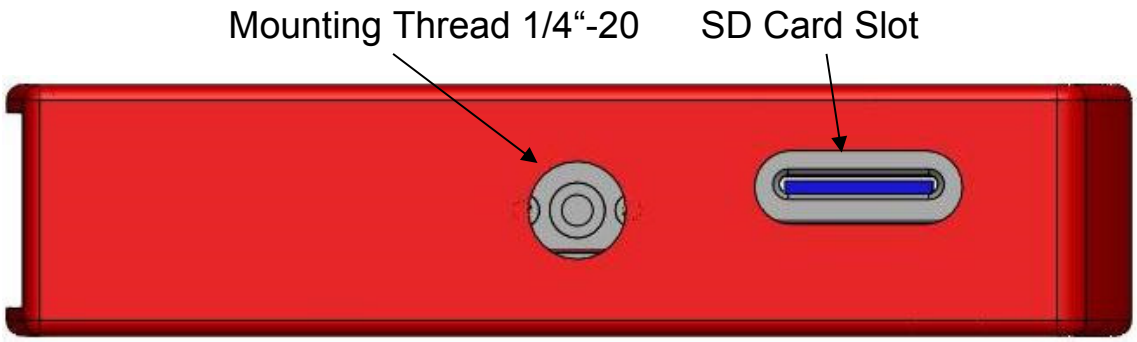


Figure 3 Bottom View

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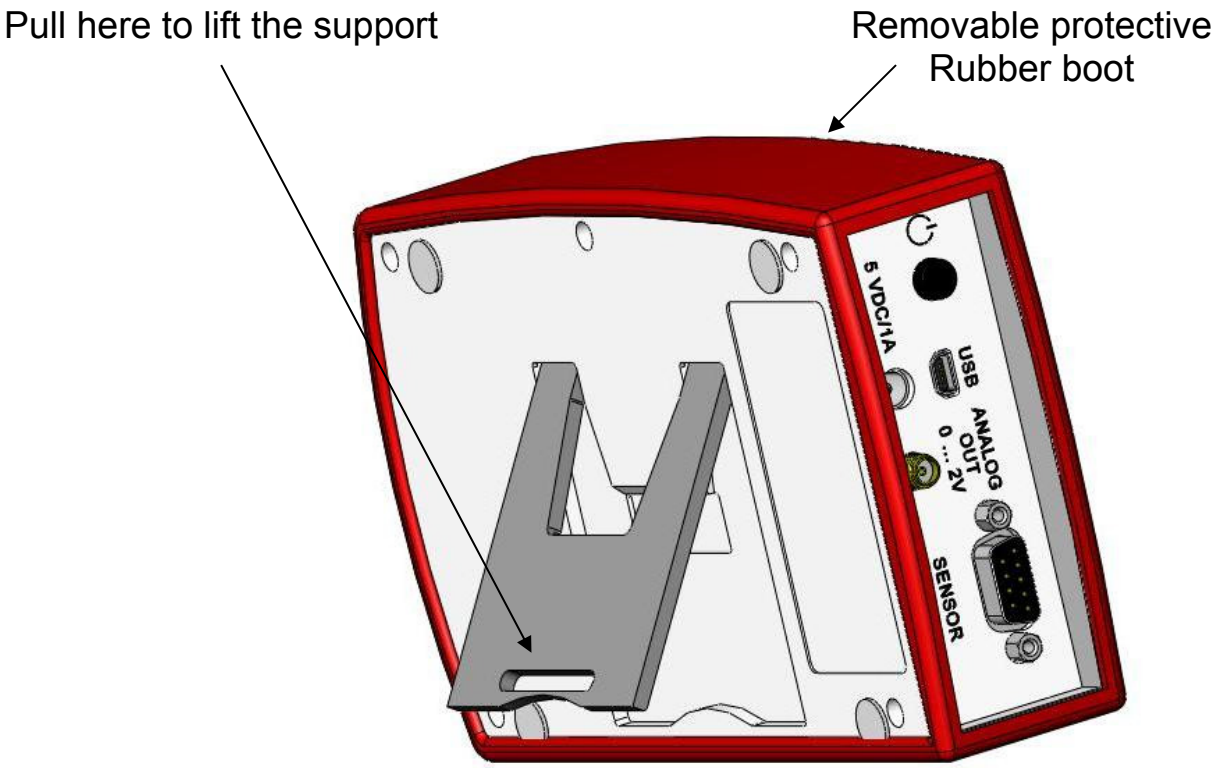


Figure 4 Rear View

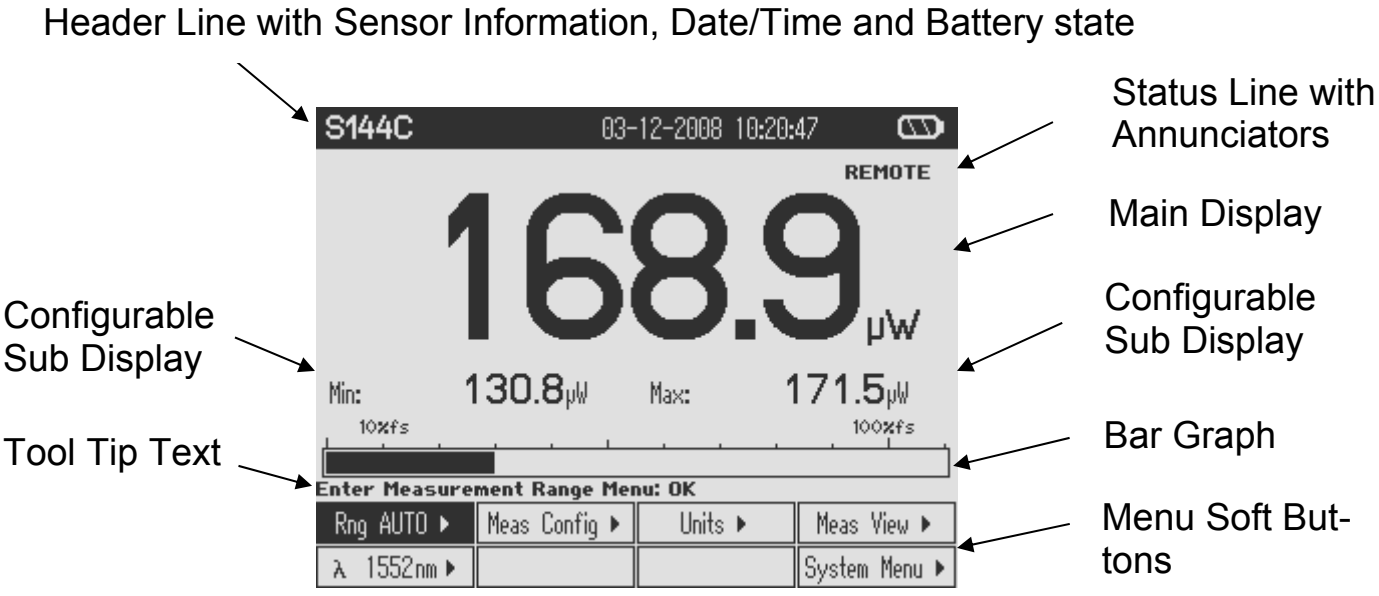


Figure 5 Numeric Display Setup

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3.3 Connecting a Power or Energy Sensor

The PM100D supports all Thorlabs 'C-Series' photodiode, thermal and pyroelectric sensors. These can easily identified against older versions of Thorlabs power or energy sensors by their red connector housing. The console will not recognize sensors from the 'A' and 'B' series. Please contact Thorlabs for upgrading of old sensors with 'C-Series' connectors.
To plug or remove a sensor slightly press the two bolts in the connector housing. Sensors can be 'hot-swapped' to the console, after recognizing a new valid sensor the type and calibration data will be downloaded to the console in approximately 2 seconds and the unit is ready to operate with the new sensor.

3.4 Controlling the PM100D

3.4.1 Navigating the Menus

Each measurement screen contains eight soft buttons that are arranged in 2 rows in the bottom of the graphics display. These can be controlled by the four navigation (▲▼◀▶), and the enter/edit (**OK**) key. An interactive help text above describes shortly the function of each selected button.
The soft buttons may be configured with the following functions:

Type	**Indicator**	**Function when pressing 'OK'**	**Example**
Menu	▶	Shows a sub menu, by rearranging the soft button labels	Meas Config ▶
Ring Control	▲▼	Scrolls up and down the ring with the up and down navigation buttons. The changes are valid immediately. A blinking button frame indicates that the control is active. Confirm with 'OK'	Range ▲▼
Function key	Label in capitals	Proceeds the described function	RESET
Radio button	✓	Selects the function of the pressed key. The active key gets the 'checked' mark (✓)	✓ W
Numeric	Key label contains a number	The button goes in the 'edit' mode. This is indicated by a blinking frame and one digit with a blinking underline. With the ◀▶ buttons navigate the digit to change; with the ▲▼ keys increment or decrement the digit. Confirm with 'OK'	1.550µm

Button Appearance: Focus on Button **Text Negative** Edit Mode Blinking frame

All sub menus can be left by navigating to the [EXIT] button at the down-right soft button location or to any empty [ ] button, and pressing the **OK** key.

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System Settings

System Menu ▸ The following sub menus will appear:

- **Measurement Settings**
  - Remote state — PM100D can be switched back to local mode
  - Line filter — Sets the unit to the local line frequency 50Hz/60Hz to avoid aliasing effects
  - Default sensor — Sets the PM100D in a mode to measure photo current, thermal voltage or peak voltage from a pyroelectric detector. See user manual.

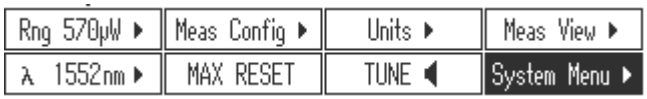
- **Console Settings**
  - Language — User interface language setting
  - Backlight — Switches the LCD and key backlight on and off (Same function as the ☼ key)
  - Brightness — Sets the brightness of the LCD and key backlight. The setting range is 0 – 100% in 1% increments
  - LCD Contrast — Adjusts the LCD contrast. The setting range is 0 – 100% in 1% increments
  - Sound — Switches on and off the key and warning sounds
  - Shutdown — The unit automatically powers off in battery operation after a certain time without user action. This feature can be set to 10 minutes, 1 hour or switched off; and is not active when an external power supply (AC adapter or USB) is connected.
  - Firmware Upload — Needs to be ‘enabled’ before uploading a new firmware version. The function will automatically reset to ‘disabled’ when powering down.

- Date and Time — Enters a submenu to set date and time. It is possible to chose various date and time formats.
- Console Info — Shows the console related information.
- Sensor Info — Shows the related information of the currently connected power or energy sensor.

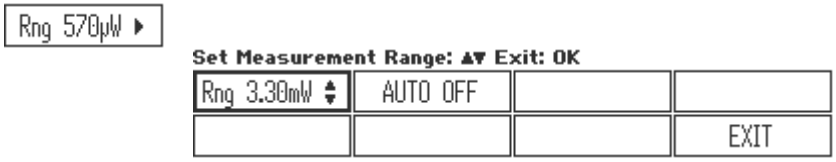
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3.4.2 Power and Energy Measurement in the Numeric Display

The numeric display contains a large configurable measurement value, two small sub displays for additional measurement information, and a bar-graph that shows the saturation degree of the chosen measurement range. To control and configure the numeric display the soft buttons in the top level are arranged as following:

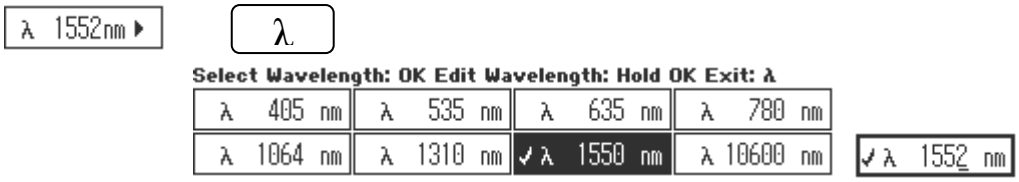


3.4.3.1 Range Control



Up to 6 power corresponding current and 4 power / energy corresponding voltage ranges can be chosen manually with the ▲ or ▼ keys. For power measurements an auto-ranging function is available.

3.4.3.2 Wavelength Correction



The menu offers 8 individually configurable sensor independent wavelength settings.
To edit a wavelength keep the **OK** key pressed for 1 second. Set the desired wavelength with the ▲▼◀▶ keys.

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3.4.3.3 Readout Configuration

Units ▸

Select Units of Main Display: OK

dBm	✓ Watt	Ampere	
Sub Left ▸	Sub Right ▸		EXIT

Depending on the connected sensor the units of measure for the large display can be configured to Watt, dBm, Joule, Volt or Ampere.

For additional information two small displays are arranged below the main display

Sub Left ▸

Hide left Sub Display: OK

Min Val	✓ Frequency	Temperature	Off
			EXIT

Min Val: Minimum level until MAX RESET is pressed. Same unit as main display.

Frequency: Displays the frequency of a power signal or the repetition rate for pulsed laser sources

Temperature: Shows the sensor head temperature.

Off: Hides the left sub-display

Sub Right ▸

Ratio Max/Min: OK

Max Val	✓ Max/Min	Area	Off
	Alt Unit		EXIT

Max Val: Maximum level until MAX RESET is pressed in main display unit.

Max/Min: Ratio between maximum and minimum.

Area: Calculates power and energy density from the set beam diameter.

Alt Unit: Shows the measurement in its alternate unit (e.g. W – dBm)

Off: Hides the right sub-display

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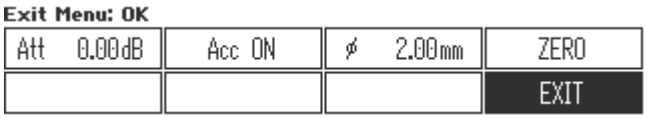
3.4.3.4 Measurement Configuration Menu

Meas Config ▸

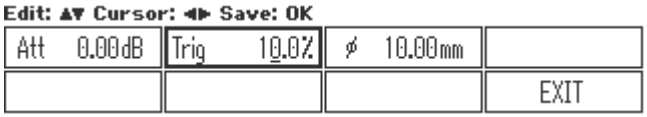
Photodiode Sensor



Thermal Sensor



Pyroelectric Sensor



Att:	Sets an attenuation or gain factor
BW:	Sets the bandwidth of the photodiode input stage to High or Low
Acc:	Switches the acceleration circuit for the thermal sensor input stage
Trig:	Sets the trigger level for laser pulse detection.
∅ x.xxmm	Set the input beam diameter for power or energy density calculation
ZERO	Performs a zeroing for thermal sensors and dark current adjustment for photodiode sensors.

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3.4.3.5 Max Reset Button

MAX RESET Sets back the Min, Max and Max/Min displays

3.4.3.6 Tuning Sound

TUNE ◀ Switches on and off an audible tone for laser tuning support

3.4.3.7 Relative Measurements

Δ Switches on and off the relative measurement mode

The main display will set to zero, the offset and the absolute power or energy value will be displayed in the sub displays. The bar graph and needle display will change to a measurement range from -10% to +10% of the set range.

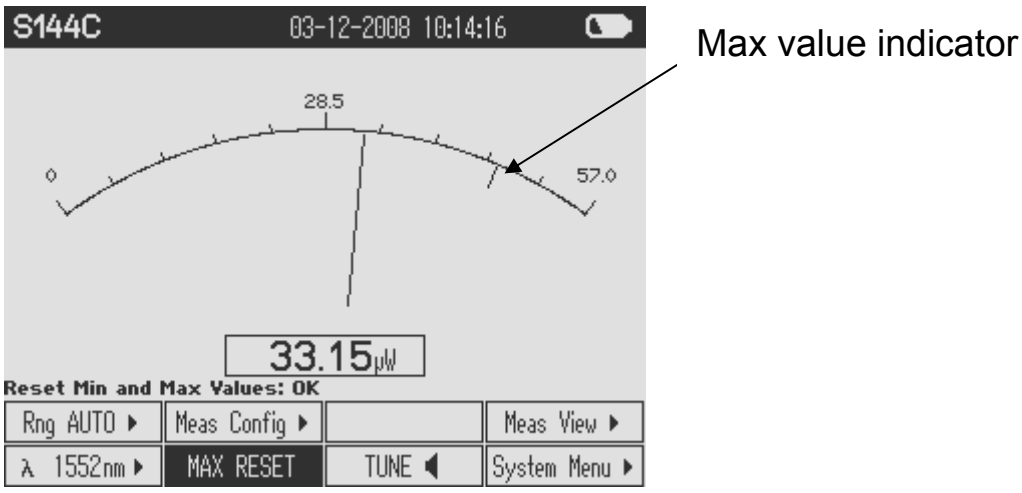
3.4.3 Display Options

Meas View ▶

Select Measurement Representation: OK

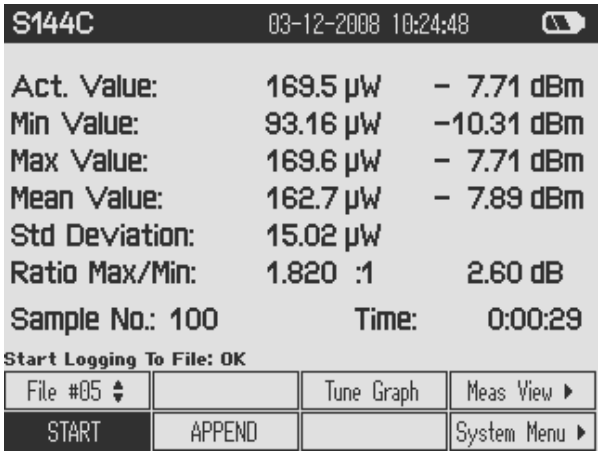
Numeric	Tune Graph	Statistics	✓ Needle
			EXIT

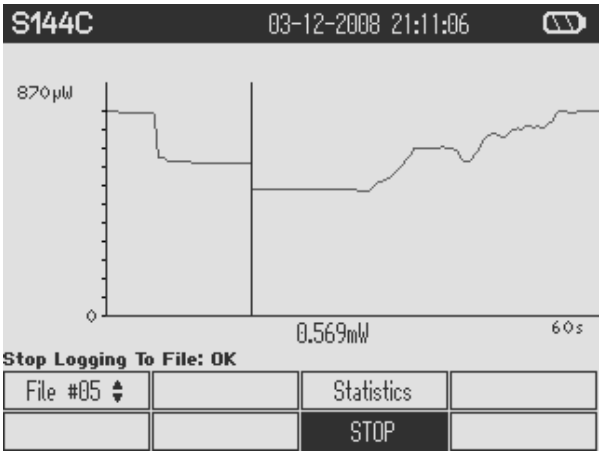
3.4.3.1 Needle Display



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3.4.3.2 Data Logging Screens





After pressing the START button the data that are sampled in these screens will be stored to the built in SD memory card on the selected file until STOP is pressed. With START the selected file will be overwritten.

3.4.4 Analog Output

The analog output provides the amplified photo-diode current or the amplified thermal or pyroelectric sensor voltage.
The signals from the analog outputs are not wavelength and zero corrected.
The analog output voltage is range dependent and can be calculated to:
$U_{Analog\ Out}$ = 2V / full scale range value x measurement value
The analog output voltage can range from -0.3V to +2.3V.

3.4.5 Battery Charging

The PM100D is powered by a 1 cell $LiPo^+$ battery that needs to be recharged intermittently by plugging the AC adapter or plugging the USB cable to a computer. To fully charge the battery it takes approximately 3-4 hours. A built in charging circuit automatically regulates and terminates the charging.
Following battery icons in the display header show the charging state from empty to full battery



The empty battery symbol starts blinking for one minute until the unit shuts off.
When an external power supply is plugged the symbols above change sequent until the battery is fully charged.

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3.5 Computer Interface

The PM100D optical power meter contains a USB 2.0 interface. When connecting the PM100D to the PC first time, a new hardware will be found. For proper installing the PM100D it requires a NI-VISA runtime version on the PC (available on the National Instruments website www.ni.com) or from the data carrier that comes with the instrument. Allow installing and follow the dialog instructions.
The PM100D comes with a utility software that easily enables remotely operating the PM100D (also PM100A and PM100USB) and visualizing and logging measurement data. Perform the setup.exe and follow the installing instructions.
The LabVIEW source code of this application is included on the data carrier as well and can be used to build own applications or to modify the utility program to specific requirements (LabVIEW 8.5.1 or higher required).

4 Maintenance and Repair

Protect the from adverse weather conditions, it's not water resistant.

The do not contain any serviceable by the user parts. Do not open the enclosures.

If your needs repair, please contact Thorlabs for return instructions, see section Thorlabs Worldwide Contacts

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5 Warranty

Thorlabs warrants material and production of the PM100D for a period of 24 months starting with the date of shipment. During this warranty period *Thorlabs* will see to defaults by repair or by exchange if these are still entitled to warranty. For warranty repairs or service the unit must be sent back to *Thorlabs Germany* or to a place determined by *Thorlabs*. The customer will carry the shipping costs back to *Thorlabs,* in case of warranty repairs *Thorlabs* will carry the shipping costs back to the customer. If no warranty repair is applicable the customer will also carry the costs for back shipment. If the unit is sent back to *Thorlabs* from abroad the customer will carry all shipping costs, duties etc. which should arise for sending the goods back to *Thorlabs*.

Thorlabs warrants the hardware and software determined by *Thorlabs* for this unit to operate without fault provided that they are handled according to our statements. However, *Thorlabs* does not warrant a fault free or uninterrupted operation of the unit, of the software or firmware for special applications nor this operation manual to be fault free. We will not carry responsibility for ensuing damages.

Restriction of warranty

The aforementioned warranty does not cover errors and defects being the result of improper treatment, software and interface not supplied by us, modification, misuse or operation outside the defined ambient conditions stated by us or unauthorized maintenance.

Further claims will not be consented to and will not be acknowledged. *Thorlabs* does explicitly not warrant the usability or the economical use for certain cases of application.

Thorlabs reserves the right to change this operation manual or the technical data of the described unit at any time.

6 Copyright

Thorlabs GmbH has taken every possible care in preparing this Operation Manual. We however assume no liability for the content, completeness or quality of the information contained therein. The content of this manual is regularly updated and adapted to reflect the current status of the software. We furthermore do not guarantee that this product will function without errors, even if the stated specifications are adhered to.

Under no circumstances can we guarantee that a particular objective can be achieved with the purchase of this product.

Insofar as permitted under statutory regulations, we assume no liability for direct damage, indirect damage or damages suffered by third parties resulting from the purchase of this product. In no event shall any liability exceed the purchase price of the product.

Please note that the content of this User Manual is neither part of any previous or existing agreement, promise, representation or legal relationship, nor an alteration or amendment thereof. All obligations of *Thorlabs GmbH* result from the respective contract of sale, which also includes the complete and exclusively applicable warranty regulations. These contractual warranty regulations are neither extended nor limited by the information contained in this User Manual. Should you require further information on this product, or encounter specific problems that are not discussed in sufficient detail in the User Manual, please contact your local *Thorlabs* dealer or system installer.

All rights reserved. This manual may not be reproduced, transmitted or translated to another language, either as a whole or in parts, without the prior written permission of *Thorlabs GmbH*.

Status: 2012

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7 Certifications and Compliances

EU Declaration of Conformity

in accordance with EN ISO 17050-1:2010

We: Thorlabs GmbH

Of: Hans-Boeckler-Str. 6, 85221 Dachau/München, Deutschland

in accordance with the following Directive(s):

2014/35/EU	Low Voltage Directive (LVD)
2014/30/EU	Electromagnetic Compatibility (EMC) Directive
2011/65/EU	Restriction of Use of Certain Hazardous Substances (RoHS)

hereby declare that:

Model: ***PM100D***

Equipment: ***Optical Power and Energy Meter***

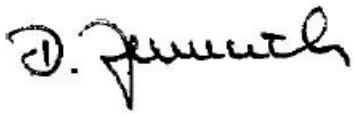
is in conformity with the applicable requirements of the following documents:

EN 61010-1	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use.	2010
EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements	2013

and which, issued under the sole responsibility of Thorlabs, is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, for the reason stated below:

does not contain substances in excess of the maximum concentration values tolerated by weight in homogenous materials as listed in Annex II of the Directive

I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications, and complies with all applicable Essential Requirements of the Directives.

Signed:  *On:* 02 December 2016

Name: Dorothee Jennrich

Position: General Manager

EDC - PM100D -2016-12-02

CE 16

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8 Thorlabs “End of Life” Policy (WEEE)

As required by the WEEE (Waste Electrical and Electronic Equipment Directive) of the European Community and the corresponding national laws, Thorlabs offers all end users in the EC the possibility to return “end of life” units without incurring disposal charges.

This offer is valid for Thorlabs electrical and electronic equipment

- sold after August 13th 2005
- marked correspondingly with the crossed out “wheelie bin” logo (see below)
- sold to a company or institute within the EC
- currently owned by a company or institute within the EC
- still complete, not disassembled and not contaminated

As the WEEE directive applies to self contained operational electrical and electronic products, this “end of life” take back service does not refer to other Thorlabs products, such as

- pure OEM products, that means assemblies to be built into a unit by the user (e. g. OEM laser driver cards)
- components
- mechanics and optics
- left over parts of units disassembled by the user (PCB’s, housings etc.).

If you wish to return a Thorlabs unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

Waste treatment on your own responsibility
If you do not return an “end of life” unit to Thorlabs, you must hand it to a company specialized in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.

Ecological background
It is well known that WEEE pollutes the environment by releasing toxic products during decomposition. The aim of the European RoHS directive is to reduce the content of toxic substances in electronic products in the future.
The intent of the WEEE directive is to enforce the recycling of WEEE. A controlled recycling of end of live products will thereby avoid negative impacts on the environment.



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9 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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