THORLABS

Optical Power Meter Interfaces

PM101, PM101A, PM101R, PM101U
Operation Manual

2019

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Contents

We aim to develop and produce the best solutions for your applications in the field of optical measurement techniques. To help us to live up to your expectations and constantly improve our products, we need your ideas and suggestions. We and our international partners are looking forward to hearing from you.

Thorlabs GmbH

Warning

Sections marked by this symbol explain dangers that might result in personal injury or death. Always read the associated information carefully before performing the indicated procedure.

Attention

Paragraphs preceded by this symbol explain hazards that could damage the instrument and the connected equipment or may cause loss of data.

Note

This manual also contains "NOTES" and "HINTS" written in this form.

Please read this advice carefully!

1 General Information

The PM101x Optical Power Meter Interfaces measure the optical power of laser light or other monochromatic or near monochromatic light, detected by a connected sensor. The PM101x power meter interfaces are compatible with all Thorlabs "C-Series" Photodiodes, Thermal Sensors, and respective custom sensors.

To flexibly integrate the PM101x into a setup, the PM101x models offer different electronic interfaces ⌐2⌐ for instrument control and output:

- PM101: USB port and DA-15 connector

- PM101A: USB port (Input and Output) and SMA analog interface (Output only)

- PM101R: USB port and serial DE-9 connector

- PM101U: USB port only

The USB port features a fixture for secure connection of the cable to the housing.

For the PM101U and PM101A power meters, instrument control and power supply are facilitated via the USB port. The PM101R can be controlled via the DE-9 port. The PM101 can alternatively use the DA-15 interface for instrument control and to connect a power supply. For more information on the special features of the PM101x models, please see the table PM101x Model Comparison ⌐2⌐ below.

For instrument control and data analysis through a connected PC, tablet or laptop, Thorlabs offers the Optical Power Monitor (OPM) software, available for download. Alternatively, the user can write custom made software. For information on driver and SCPI commands, please refer to the manual WriteYourOwnApplication (WYOA) for the PM101x.

In summary, the PM101x models give the customer the choice of different interfaces, provided with a supplied control and analysis software and the option to use custom made software. Further, the PM101 can even be controlled via an external micro-controller, supplied by the customer. These features allow for maximum flexibility to integrate the instrument in test and measurement systems and a wide range of industrial and scientific applications in Manufacturing, Quality Control, Quality Assurance, and R&D for stationary and field use.

Attention

Please find all safety information and warnings concerning this product in the chapter Safety ⌐21⌐ in the Appendix.

1.1 PM101x Model Comparison

	PM101 [9]	PM101A [10]	PM101R [11]	PM101U [11]
USB Connector and Operation [12]	√	√	√	√
Serial DE-9 Output Connector [20]			√	
SMA Output Connector [10]		√		
DA-15 Universal Connector [20]	√			
RS232 Operation [12]	√		√	
Analog Output Operation [14]	√	√		
Autonomous Operation to [14] Analog Output [14]	√	√		
Real Analog Output [14]	√			
Sensitivity Configurable [14] Analog Output [14]	√	√		
UART Operation [13]	√			
2 Auxiliary I/O ports [13]	√			
NTC Input [15]	√			
Power Supply +5V to +36V [15]	√			

Table 1

1.2 Ordering Codes and Accessories

PM101   Power Meter Interface with DA-15 Connector; USB, RS232, or UART Operation. Digital or Analog Signal Output; Two Auxiliary I/O Ports; NTC Input; USB Interface for Control and Power Supply.

PM101A   Power Meter Interface with SMA Connector for Analog Output; USB Interface for Control and Power Supply.

PM101R   Power Meter Interface with DE-9 Connector; RS232 Operation for Control and Read Out; USB Interface for Control and Power Supply.

PM101U   Power Meter Interface with USB Connector and USB Operation for Control, Read Out, and Power Supply.

Included Accessories:

The PM101x Power Meters include certain cables. Further cables are recommended in [Op-tional Accessories](#) 3.

PM101:   DA-15 Connector and Connector Housing
           USB Cable, Type A to Mini B, with locking screw, 1.5m

PM101A: USB Cable, Type A to Mini B, with locking screw, 1.5m

PM101R: RS232 cable, DE-9 male to DE-9 female, 1.8m
           USB Cable, Type A to Mini B, with locking screw, 1.5m

PM101U: USB Cable, Type A to Mini B, with locking screw, 1.5m

Optional Accessories:

To run the PM101x power meter, additional cables or mounting devices may be required.

Cables

- PM101A: SMA cable: please provide a cable with a SMA connector with your PM101A. Thorlabs offers a variety of [SMA connector cables](#).
- PM101: Cable to attach to the provided DA-15 connector housing.

Mounting

- Horizontal Mounting Clamp (ECM225) to mount the PM101x onto a post.
- Vertical Mounting Clamp (ECM100) to mount the narrow side of the PM101x onto a post.
- Double Sided Horizontal Mounting Clamp (EPS225) to securely mount two devices on top of each other.

Please visit our homepage http://www.thorlabs.com for various accessories like power and thermal sensors, fiber adapters, posts and post-holders.

1.3 Requirements

Hardware Requirements

PM101: Please provide an appropriate cable to be attached to the DA-15 connector.

PM101A: Please provide an appropriate cable to connect to the SMA port.

Software Requirements

All models of the PM101x can be run with the Thorlabs' OPM software. Please see the requirements for the OPM on the website.

Sensor Requirements

Thorlabs C-Series Sensors

The PM101x supports all Thorlabs C-Series photodiode and thermal sensors. The C-Series can be easily identified by the red connector-housing of the DE-9 connector, compared to older versions of Thorlabs power sensors.

Please refer to the chapter Connecting a Power Sensor 6 on how to use older Thorlabs sensors or custom sensors.

2 Getting Started

Please inspect the shipping container for damage. Please do not cut through the cardboard. You might need the box for storage or for returns.

If the shipping container seems to be damaged, inspect the contents for completeness and test the PM101x mechanically and electrically. Keep the container for storage or in order to return the product in case of future problems.

Verify that you have received the following items within the package:

2.1 Parts List

1. PM101x Optical Power Meter Interface
2. USB Cable, Type A to Mini B, with Locking Screw, 1.5 m
3. PM101R: RS232 cable, DE-9 Male to DE-9 Female, 1.8 m
4. PM101: DA-15 Connector and Connector Housing
5. Quick Reference
6. Certificate of Calibration

3 Operating Instructions

3.1 How To

This chapter describes how to install the PM101x for standard measurements.

3.1.1 PM101x Setup

- Download and install the [Optical Power Monitor](#) software on the device that will be used to control the power meter interface (PC, laptop or tablet).

  Note

  Install the software prior to connecting the power meter interface to the PC (see [Software](#) 15).

- Connect the PM101x to a PC or other power source via the USB port.
  - The PM101 accepts external power supplies with 5 V to 36 V via the DA-15 interface. When connecting the USB port while using an external power supply via the DA-15 port, connecting the USB port will automatically switch to the 5 V power supply via USB.
  - The status LED for the power supply is yellow in USB mode and green when connected to an external power supply via the DA-15 connector.

- Connect the PM101x to a readout instrument (PC) using the USB cable or a matching cable for the respective output port (DE-9, SMA or DA-15). For PM101A and PM101, please provide cables.

- [Connect a suitable sensor](#) 6 to the PM101x.

  The sensor status LED indicates, when a sensor has been detected (green) or when no sensor or no recognizable sensor is connected (red).

  The Power Meter is now ready for operation and is recognized by the OPM software.

Note

For detailed instructions on controlling the PM101x through the OPM software, please download the OPM [manual](#).

3.1.2 Connecting a Power Sensor

The PM101x supports all Thorlabs C-Series photodiode and thermal sensors, that can be identified by the red connector-housing of the DE-9 connector, compared to older versions of Thorlabs power sensors. Sensor type and calibration data are saved in the non-volatile memory of the DE-9 connector. Upon connection, this information is automatically sent to the PM101x and to the control device and software. The software will automatically recognize the sensor.

To plug-in or remove a sensor, slightly press on the two bolts in the connector housing, that fix it by tension.

DE-9 connector
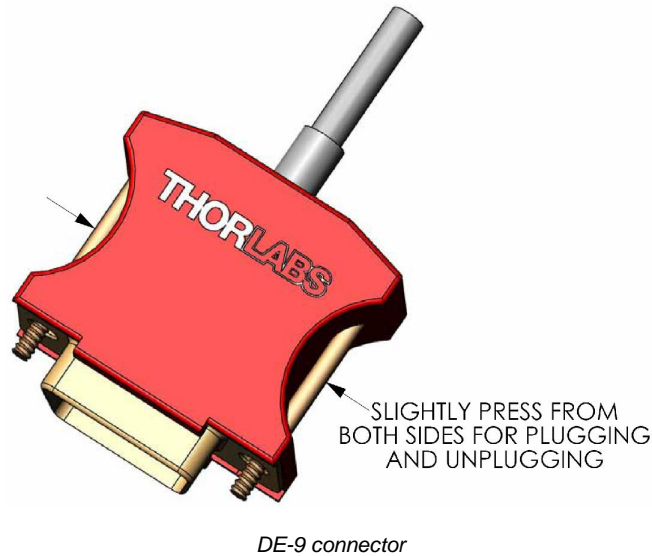
Sensors can be hot-swapped to the power meter interface. After recognizing a new valid sensor, the type and calibration data will be downloaded to the power meter interface in approximately 2 seconds and the unit is ready to operate with the new sensor.

Note

Older Thorlabs Sensors without a DE-9 connector

The PM101x will **NOT** automatically recognize sensors lacking a DE-9 connector, as for the case of the 'A' and 'B' series. Please contact Thorlabs 25 for an upgrade of old sensors with DE-9 connectors.

Note

Custom Sensors

To use sensors without a DE-9 connector, manufactured by Thorlabs or else, the user may provide an appropriate adapter. To build the adapter, refer to the Pin-out of the DE-9 connector shown in the Appendix 21. The adapter will per default automatically be recognized by the application Optical Power Monitor as "Photodiode adapter". This can then be adjusted in the software.

3.2 Power Meter Interface Features

PM101x optical power meters offer full functionality to process signals from <u>compatible photodi-ode or thermal sensors</u> 6 to be displayed and analyzed on a connected PC.

PM101x general features

- All PM101x models have a <u>non-volatile memory</u> 13 which prevents power meter settings from being lost upon shutting down or rebooting.
- A fast <u>readout rate</u> 13 of 1 kilo-sample per second permits online signal monitoring.
- Finely graduated thermal power ranges permit optimal resolution for thermal power measurements.
- A <u>Reset Button</u> 13 allows quick rebooting of the micro controller.
- The PM101x is powered either via the USB interface or via the DA-15 interface. A status LED indicates appropriate connection to a power supply.

Beyond the above functions, the group of PM101x models offer individual electrical interfaces for integration into different systems in industrial and scientific applications. The different electrical interfaces come with further <u>functions</u> 2, described in the following chapters.

3.2.1 PM101x Sensor Connector

All models of the PM101x have the same connector shown here to the left side. The Pin assignment is engraved on the front of the PM101x.
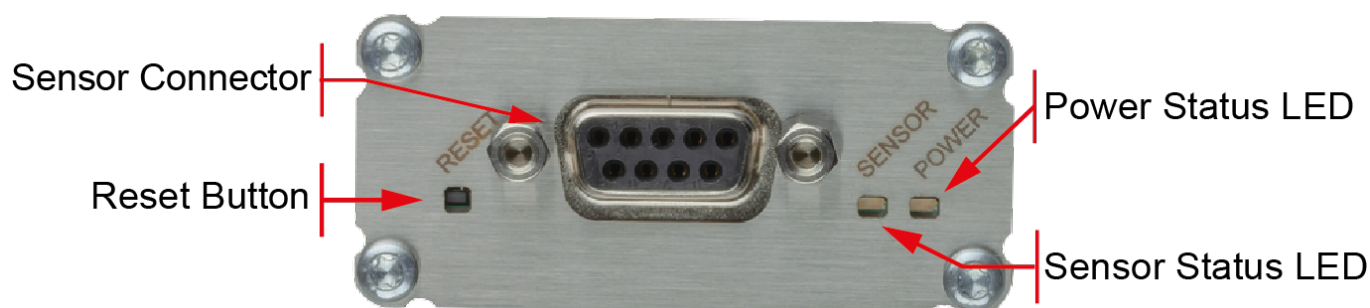
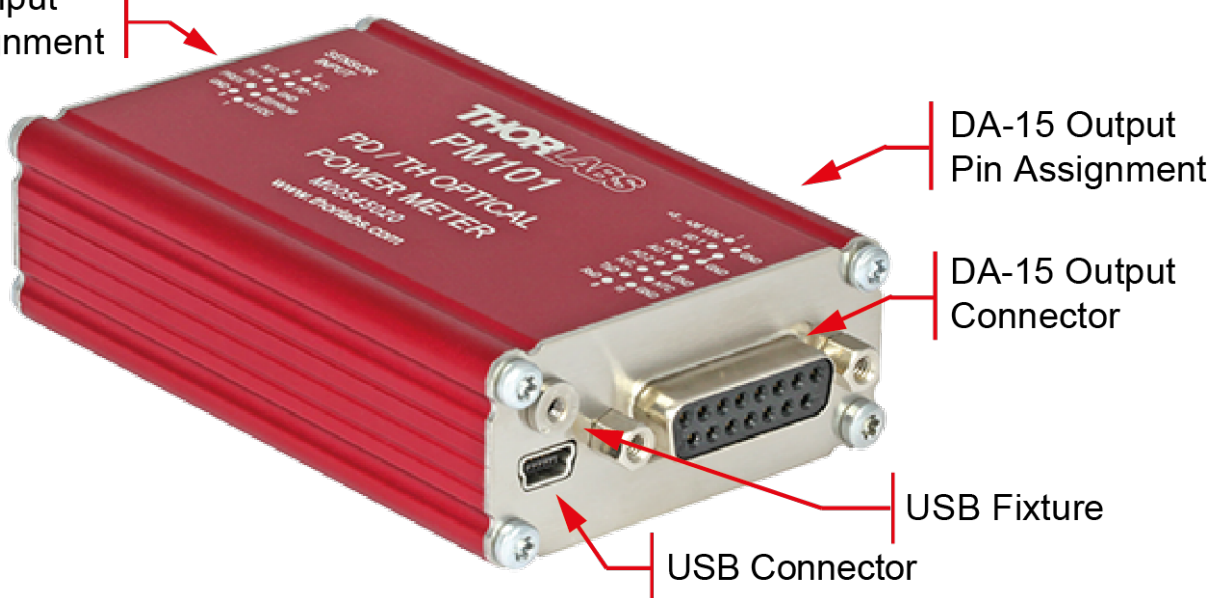## 3.2.2 PM101

Sensor Input
Pin Assignment

DA-15 Output
Pin Assignment

DA-15 Output
Connector

USB Fixture

USB Connector

PM101 Special Features

The PM101 features a number of additional options, due to the DA-15 output connector.

The PM101 is per default configured to RS232 configuration (+/- 5 V voltage level). This can be changed to a UART configuration (0/5 V voltage level) so that the PM101 can be accessed by external micro-controllers for instrument control and data export. The PM101 can also be adjusted to accommodate micro-controllers using 3.3 V.

1. DA-15 Interface [20]

2. Two Auxiliary I/O ports [13]

3. NTC input [15]

4. Two Analog Output Ports [14]

5. Real Analog Output [14]

6. Autonomous Operation to Analog Output [14]

7. Optional Use of 5 V - 36 V Power Supply [15]

8. RS232 Operation [12]

9. Adjustable Baud Rate [13] via USB or Serial Communication (SCPI commands); The default BAUD Rate is 115200 Bit/s.

10. UART Operation [13] (i.e. for Control via an External Micro-Controller)

11. Instrument Control using SCPI commands (Serial Communication)

12. Power Meter Control and Output via USB

3.2.3 PM101A

Sensor Input
Pin Assignment

USB Fixture

SMA Output
Connector

USB Connector
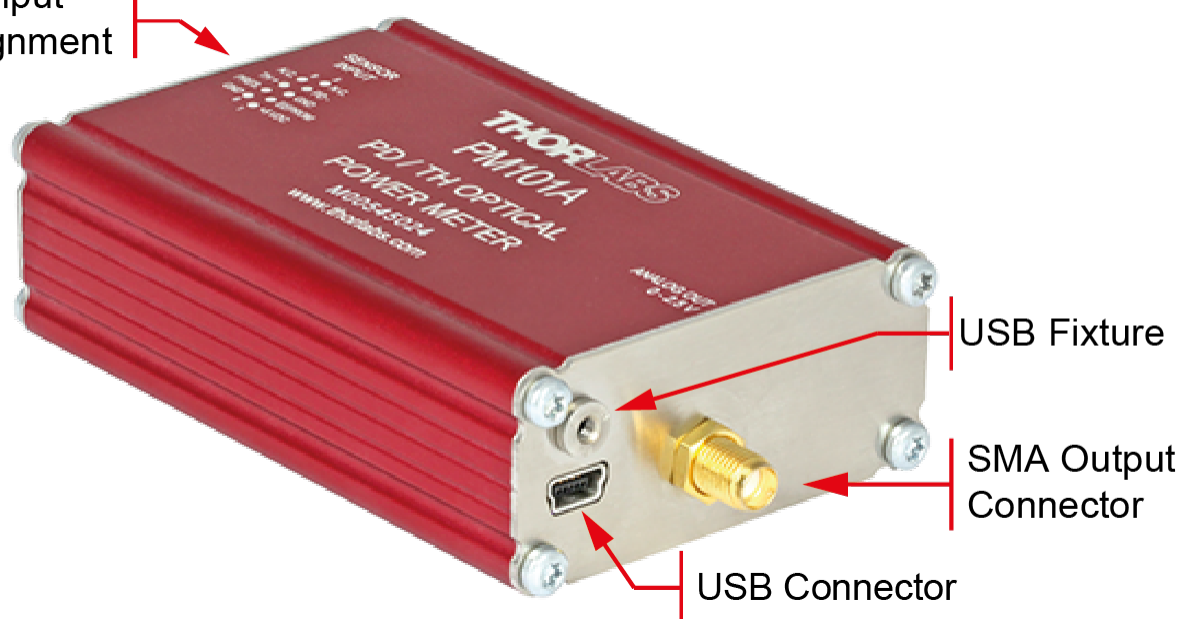
PM101A Special Features

1. [Autonomous Operation to analog output.](#) 14
2. [Configurable Analog Output](#) 14
3. Power Meter Control and Output via USB

3.2.4 PM101R

Sensor Input
Pin Assignment

DE-9 Output
Pin Assignment

DE-9 Output
Connector

USB Fixture

USB Connector
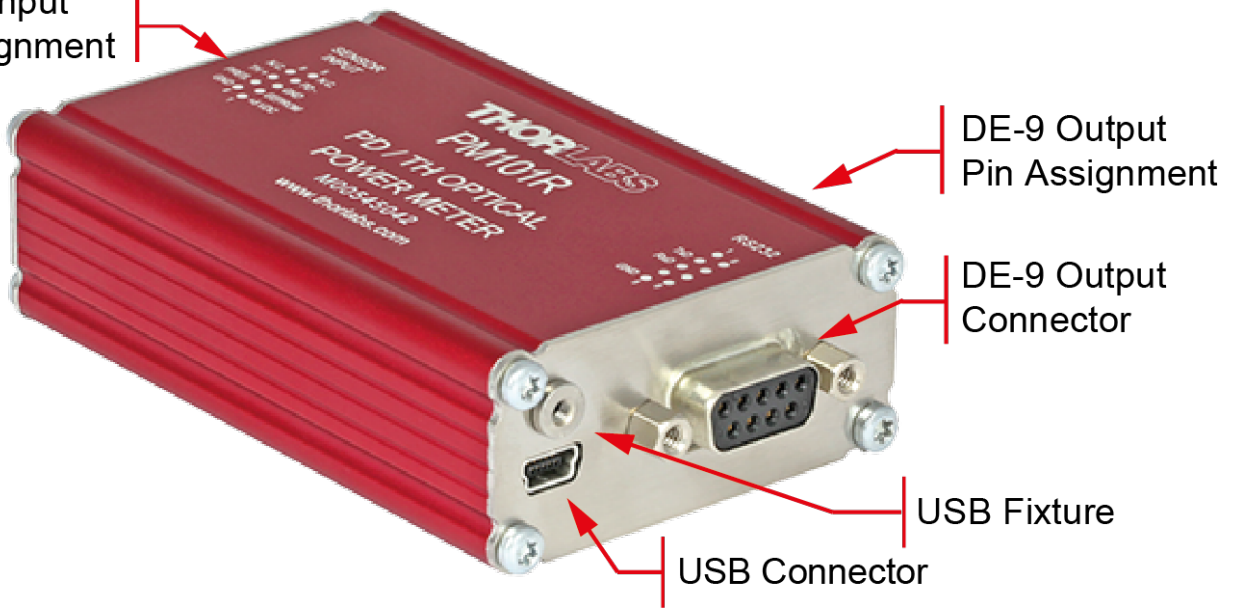
PM101R Special Features

1. RS232 Operation [12]
2. Adjustable Baud Rate [13] via USB or serial communication (SCPI commands); The default BAUD Rate is 1152000 Bit/s.
3. Instrument Control using SCPI commands (RS232 [12] Serial Communication). Please see the document PM101x-WYOA for details.
4. Power Meter Control and Output via USB

3.2.5 PM101U

Sensor Input
Pin Assignment

USB Fixture

USB Connector

PM101U Special Features

- Power Meter Control and Output via USB

3.2.6 USB Operation

All PM101x models can be run via the USB port.
The USB interface on all PM101x models also serves to connect the power meter to a power supply and to update firmware of the PM101x.
The PM101U uses the USB interface as the only port for control and output.

> **Note**
>
> In case a USB communication is established in addition to the DA-15/DE-9 connection, PM101 and PM101R switch to USB-Mode and the DA-15/DE-9 serial interface becomes inactive. Only after actively closing the USB connection, the serial communication is reestablished.
>
> When switching the PM101 or PM101R from USB to RS232 operation or, in the case of PM101, to UART operation, PM101R and PM101 use the DA-15 or DE-9 interface for control and output.

3.2.7 RS232 Operation

The power meters PM101 and PM101R can be operated with serial communication via RS232.

Please use a RS232 standard protocol for RS232 communications. For questions, please contact our engineers at Thorlabs [25].

Please set up the port as follows:

Parameter	Setting
Baud Rate	115.200 Bit/s (default)
	Supported range of Baud Rate: 9.600 and 230400 Bit/s
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None
Termination Character	LF (x0A; \n). The termination character needs to be enabled.

> **Note**

PM101:

To operate the PM101 via RS232, RxD, TxD, and GND need to be wired from the DA-15 connector to a 9 Pin female connector to perform the connections.

PM101 DA-15 Pin	Male DE-9 Pin	Female DE-9 Pin (PC)
Pin7: TxD	Pin2	Pin2: RxD
Pin8: RxD	Pin3	Pin3: TxD
Pin15: GND	Pin5	Pin5: GND

3.2.8 UART Operation

The PM101 is delivered in RS232 operation but can be switched to UART operation.

UART dependent PM101 functions:

The PM101 may need to be switched from RS232 to UART operation when using an external micro controller for PM101 control. In RS232 operation the PM101 uses voltage levels of +/-5 V, while in UART mode the voltage level is shifted to 0/5 V. The PM101 can also be adjusted to accommodate micro-controllers using 3.3 V. When switched to 3.3 V, UART operation is tolerant for 5 V input signal.

For instructions on how to change the voltage level for UART operation, please refer to the document Write-Your-Own-Applications (WYOA) for PM101x.

For UART operation, please use standard protocols for UART communication and the SCPI commands listed in WYOA for PM101x.

3.2.9 Reset Button

This button reboots the internal micro controller of the PM101x. To press the button, please use a small device that will not break inside the instrument. All settings are saved due to the internal non-volatile memory.

3.2.10 Baud Rate

For PM101 and PM101R, the Baud rate can be adjusted from 9600 to 230400 Bit/s. This can be done either via the USB interface or via the serial interface using SCPI commands or driver functions. Please see the document Write-Your-Own-Applications (WYOA) for PM101x. The default baud Rate is 115200.

Note

After adjusting the Baud Rate via RS232 or UART, close the RS232 or UART connection and reconnect with the desired Baud Rate in order for the Baud Rate to communicate it via RS232/UART. This is not required for operation via USB.

3.2.11 Non-Volatile Memory

All PM101x models have an internal non-volatile memory for all settings (i.e. wavelength setting, ranging, analog output configuration). The PM101x will start in the same configuration as prior to shut-down.

3.2.12 Auxiliary I/O Ports

PM101 with its DA-15 connector gives access to two configurable general purpose input/output (I/O) Pins (DA-15 Pins 2 and 3). Please see the Pin assignment [20] in the appendix. These auxiliary I/O ports use 3 V logic for output and are tolerant for 5 V input signal.

The I/O port can be controlled or monitored via the instrument driver or through SCPI commands in custom made software.

3.2.13 Analog Output

PM101A

The PM101A has an analog output port with a SMA output connector.

This analog output, similar to the AO2 port of the PM101, delivers a range independent voltage which is DAC controlled. The output voltage is proportional to a configured value in V/W. This constant can be adjusted via the OPM software or the SCPI/driver commands for custom made software. The constant can be set in the OPM software under the Settings tab: AO Responsivity. The analog signal is generated with a 16-bit DAC with an update rate of 1 kHz. The analog output voltage can range from -0 V to +2.5 V.

The analog signal following the DAC is of advantage when large signal dynamics are expected because the DAC range changes and the output signal stays largely the same. Additionally, the output signal is wavelength corrected and corrected regarding the sensor calibration data.

PM101

The PM101 has two analog outputs, AO1 and AO2.

The Analog Output ports provide the amplified photo-diode current or the amplified thermal sensor voltage, depending on the sensor. The signals from the analog output AO1 are not wavelength- or zero- corrected.

The signal is measurement range dependent and can be calculated to:

$$U_{out} = 2.5 \text{ V} \frac{\text{Measured Scale}}{\text{Full Scale Value}}$$

AO1: The AO1 (DA-15 Pin 4) delivers the amplified direct **real analog signal** without a Digital-Analog-Converter (DAC). Therefore, the AO1 delivers a proportional voltage for each measurement range. The analog output voltage can range from -0.25 V to +2.5 V. The bandwidth is according the setting of the meter. The advantage of this real analog signal is its speed (up to 100kHz). The Analog Output Port is not wavelength- or zero- corrected.

AO2: The AO2 (DA-15 Pin 5) delivers a range independent voltage which is **DAC controlled**. The output voltage is proportional to a configured value in V/W. This constant can be adjusted via the OPM software or the SCPI/driver commands for custom made software. The constant can be set in the Thorlabs software OPM under the Settings tab: AO2 Responsivity. The signal of the AO2 is generated with a 16-bit DAC with an update rate of 1 kHz. The analog output voltage can range from -0 V to +2.5 V.

The analog signal following the DAC is of advantage when large signal dynamics are expected because the DAC range changes and the output signal stays largely the same.

3.2.14 Autonomous Operation to Analog Output

Power meters PM101 and PM101A can be run autonomously by only connecting a power supply and using analog output. In that case, no control device is required. For the PM101, both analog output ports can be used for autonomous operation.

3.2.15 NTC Input

To monitor the temperature in a test environment, the PM101 has an NTC Input (DA-15 Pin 14) which allows connection of an NTC thermistor. The measurement range is 0.1 – 100 kΩ. The set range R0 and the bandwidth B for the NTC thermistor can be adjusted in the OPM software or through SCPI commands. The default settings are 10 kΩ and 3988 K to directly access the TSP-TH 15 temperature probe. The measurement range with the PM101 is then -10 °C to 80 °C with the TSP-TH.

Note

Connection of the NTC to the DE-9 Pin 7 of the Sensor Connector requires a resistance of 0.2 kΩ to 40 kΩ.

3.2.16 Power Supply

All PM101x models use the USB port for power supply. Please provide an appropriate connection to a PC or power bank.

Note

When operating the PM101 via the RS232 interface or completely autonomously via an analog output, the unit can either be powered with 5 V via the USB connector or with any supply in the range from +5 V to +36 V via the DA-15 connector (Pin 1 and Pin 9 (GND)). As an external power supply, we recommend the DS5 5 VDC regulated power supply.

3.3 Software

The PM101x is operated remotely from a PC, laptop or tablet.

Thorlabs OPM Software

The Thorlabs Optical Power Monitor (OPM) software provides a Graphical User Interface to view, log, and analyze measurement data. Download the OPM software package from the Thorlabs website, via this link, through the software tab on the product website, or through searching for the product name within the Thorlabs software website.

All information on software installation, device control and data management software can be found in the software manual directly downloaded here.

Note

Do not connect the PM101x prior to software installation!

Attention

Exit all running applications on your PC as the installer may require a reboot of your PC during installation!

Custom Made Software

The PM101x can also be run using custom made software. For this, please refer to the document Write-Your-Own-Application (WYOA) for PM101x.

3.3.1 Software Requirements

All models of the PM101x can be run with the Thorlabs' OPM software.

Please find the requirements for the PC intended to be used for operation of the PM101x on the OPM website.

3.3.2 PM101x Specific Software Functions

When using a PM101 power meter interface, the latest version of the OPM software shows several power meter specific functions. To see details, please also visit the OPM manual.

3.3.2.1 PM101 Specific Software Functions

1. When a PM101x power meter is connected, the OPM software recognizes NTCs in the devices section. The OPM now allows users to adjust settings, view measurement results and to integrate the NTC measurements results in long-time monitoring experiments. For more information, please see the OPM manual.

2. When a PM101 is connected, it is possible to configure the analog AO2 port and display the output voltage.

3.3.2.2 PM101A Specific Software Functions

When a PM101A is connected, it is possible to configure the analog SMA port and display the output voltage.

3.4 Maintenance and Service

Protect the PM101x from adverse weather conditions. The PM101x is not water resistant.

Attention

To avoid damage to the instrument, do not expose it to spray, liquids or solvents!

The unit does not need a regular maintenance by the user. It does not contain any modules and/or components that could be repaired by the user himself. If a malfunction occurs, please contact Thorlabs 25 for return instructions.

4 Appendix

4.1 Technical Data

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

	PM101	PM101A	PM101R	PM101U
Interfaces				
Input/Output Interface	Mini USB, DA-15	Mini USB, Analog SMA	Mini USB, RS232 DE-9	Mini USB
Operation Protocol	USB, RS232, UART Autonomous Operation	USB, Analog, Autonomous Operation	USB, RS232	USB
Current Input (Photodiode Sensor)				
Connector	DE-9 (left housing side)			
Units	W, dBm, W/cm², A			
Measurement Range	6 Decades; 50 nA - 5 mA Range Selectable [W], Sensor Dependent			
Display Resolution	1 pA / Responsivity Value (A/W)			
Measurement Uncertainty	±0.2% Full Scale (5 µA - 5 mA) ±0.5% Full Scale (50 nA)			
Analog Bandwidth	DC - 100 kHz, Dependent on Sensor and Settings			
Wavelength Correction	nm (A/W)			
Beam Area Setting	Diameter 1/e² or Rectangular x,y			
AD Converter	16 bit			
Voltage Input (Thermopile Sensors)				
Connector	DE-9 (left housing side)			
Units	W, dBm, W/cm², V			
Measurement Range	9 Ranges; 2, 4, 10, 20, 40, 100, 200, 400, 1000 mV Ranges Selectable in W, Sensor Dependent			
Display Resolution	1 µV / Responsivity Value (V/W)			
Measurement Uncertainty	±0.5% Full Scale (10 mV - 1 V) ±1% Full Scale (2mV, 4mV)			
Analog Bandwidth	DC - 10 Hz, Dependent on Sensor and Settings			
Time Constant Correction Range	1 s - 30 s			
Wavelength Correction	Sensor Dependent; nm, (V/W)			
Beam Area Setting	Diameter 1/e² or Rectangular x,y			
Sensor Temperature Control				
Supported Temperature Sensor	Thermistor			
Temperature Measurement Range	-10° C to 120° C			
Sensor Power Supply				
Connector	DE-9 Pin 1			
Voltage	5V			
Maximum Current	100 mA			

	PM101	PM101A	PM101R	PM101U
Remote Interfaces				
Remote Interface Type 1	USB 2.0			
Connector	Mini-B USB			
Measurement Speed	Up to 1000/s			
Remote Interface Type 2	RS232		RS232	
Connector	DA-15 Pin 7/8	NA	DE-9 Pin 2/3	NA
Baud Rate	9600 - 230400 Bit/s Default: 115200 Bit/s	NA	9600 - 230400 Bit/s Default: 115200 Bit/s	NA
Settings	N1S	NA	N1S	NA
Measurement Speed	Up to 200/s	NA	Up to 200/s	NA
Analog Output, Configurable				
Connector	DA-15 Pin 5	SMA	NA	NA
Signal	Gain Signal Configurable	Gain Signal Configurable	NA	NA
Voltage Range	0 to 2.5 V	0 to 2.5 V	NA	NA
Accuracy	±1%	±1%	NA	NA
Bandwidth	1 kHz	1 kHz	NA	NA
Analog Input, Not Corrected				
Connector	DA-15 Pin 4	NA	NA	NA
Signal	Amplified Input Signal - Not Corrected	NA	NA	NA
Voltage Range	0 to 2.5 V	NA	NA	NA
Accuracy	±3%	NA	NA	NA
Bandwidth	up to 100 kHz, Dependent on Sensor and Settings	NA	NA	NA
Auxiliary Temperature Control				
Connector	DA-15 Pin 14	NA	NA	NA
Supported Temperature Sensor	Thermistor NTC 0.1 - 100 k , B-Value: 1000 - 9999 K	NA	NA	NA
Temperature Measurement Range	-40 °C to +200 °C (NTC dependent)	NA	NA	NA
Digital Control Pins I/O				
Connector	DA-15 Pins 2/3	NA	NA	NA
Function	2 x GPIO	NA	NA	NA
Power Management				
DC Input 1 / Connector	+5 VDC to +36 VDC / DA-15	NA	NA	NA
DC Input 2 / Connector	5 V / USB			
Power Consumption	1 W			
Display				
Display Type	None; External PC - Windows Application or Driver Set			

	PM101	PM101A	PM101R	PM101U
Display Screens	Windows Application Software Provided			
GUI Refresh Rate	1000 Hz (Dependent on PC and Settings)			
General				
Detectors Compatibility	Photodiode Sensors S100C Series Thermal Sensors S400C (S300C) Series Photodiodes (Max 5 mA) Thermopiles (Max 1 V)			
Operating Temperature	- 20 °C to +50 °C			
Storage Temperature	-40 to 70 °C			
Dimensions (L x W x H)	3.80" x 2.25" x 1.00" (96.5 x 57.2 x 25.4 mm^3)	3.94" x 2.25" x 1.00" (100.0 x 57.2 x 25.4 mm^3)	3.78" x 2.25" x 1.00" (95.9 x 57.2 x 25.4 mm^3)	3.68" x 2.25" x 1.00" (93.6 x 57.2 x 25.4 mm^3)
Weight	0.16 kg (0.35 lb)			

4.2   Pin Assignment Output Connector

PM101R: PM101R has a serial DE-9 connector. The Pins are assigned as follows:

Pin	Function	Description
1	N.C.	Not Connected
2	TxD	RS232: Connect to PC Terminal RxD (PC DE-9 Pin2)
3	RxD	RS232: Connect to PC Terminal TxD (PC DE-9 Pin3)
4	N.C.	Not Connected
5	GND	RS232 Signal Ground: Connect to PC Terminal Ground (PC DE-9 Pin5)
6	N.C.	Not Connected
7	N.C.	Not Connected
8	N.C.	Not Connected
9	N.C.	Not Connected

PM101: PM101 has a universal DA-15 connector. The Pins are assigned as follows:

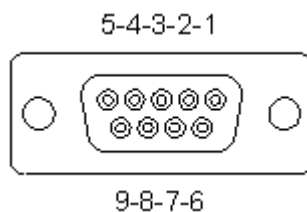| Pin	Function	Description
1	Power Supply	Pin for Alternative Power Supply with 5 VDC to 36 VDC
2	I/O 1	General Digital Input / Output port; 3 V logic (Output), 5 V tolerant for Input
3	I/O 2	General Digital Input / Output port; 3 V logic (Output), 5 V tolerant for Input
4	AO1	Analog Output; -0.25 V to +2.5 V per Measurement Range
5	AO2	Software Configurable Analog Output; 0 V to 2.5 V
6	N.C.	Not Connected
7	TxD	RS232; Connect to PC terminal RxD (PC DE-9 Pin2)
8	RxD	RS232; Connect to PC terminal TxD (PC DE-9 Pin3)
9	GND	Power Supply Ground
10	GND	Ground
11	GND	Ground
12	GND	Ground
13	GND	Ground
14	N.C.	NTC Thermistor Input; Measurement Range 0.1 kΩ to 100 kΩ
15	GND	RS232 Signal Ground; Connect to PC Terminal Ground (PC DE-9 Pin5)

4.3 Pin Assignment of the Sensor Connector

The sensor connector allows the access of all Thorlabs "C-type" photodiode and thermal power sensors. The power meter intrface uses the sensor calibration data, stored in the sensor connector, to calculate the corresponding actual power levels.

Additionally, the PM101x is capable to support custom made detectors. Please read the following instruction prior to connecting a self made sensor.

Warning

Pin 2 is uniquely used for the EEPROM Digital I/O (memory in Thorlabs sensor heads) and MUST NOT be used. Connecting this Pin may cause malfunction of the PM101x.

Pin-out of the DE-9 female connector (female)

Pin	Function	Description
1	Power Supply	+5 V; Max Current 100 mA from this Pin
2	EEPROM	Sensor Memory for the Calibration Data
3	AGND	Analog Ground for Photodiode Anode, Thermal Sensor , NTC
4	PD -	Photodiode Cathode Input
5	N.C.	Not Connected
6	DGND	Digital Ground for EEPROM and 5V Output
7	PRESENT	Connect via a 1kΩ – 10kΩ Resistor to Pin 3 (AGND) to Enable a Custom Sensor
8	TH+	Thermal Sensor Input
9	N.C.	Not Connected

4.4 Safety

Attention

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.

The PM101x must not be operated in explosion endangered environments!

Only with written consent from Thorlabs may changes to single components be made or components not supplied by Thorlabs be used.

All modules including control inputs / outputs and the sensor must be connected with duly shielded connection cables.

Attention

The following statement applies to the products covered in this manual, unless otherwise specified herein. The statement for other products will appear in the 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 and meets all requirements of the Canadian Interference-Causing Equipment Standard ICES-003 for digital apparatus. 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.
- Consult the dealer or an experienced radio/T.V. technician for help.

Thorlabs GmbH 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 GmbH. 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 any and all optional peripheral or host devices. Failure to do so may violate FCC and ICES rules.

Attention

Mobile telephones, cellular phones or other radio transmitters are not to be used within the range of three meters of this unit since the electromagnetic field intensity may then exceed the maximum allowed disturbance values according to IEC 61326-1.

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).

4.5   Return of Devices

This precision device is 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.

4.6 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):

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

hereby declare that:

Model: **PM101x**

Equipment: **Power Meter for Photodiode and Thermal Sensors**

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

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: 29 May 2019

Name: Bruno Gross

Position: General Manager

EDC - PM101 -2019-05-29

CE

4.7 Warranty

Thorlabs warrants material and production of the PM101x 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 entitled to warranty.

For warranty repairs or service the unit must be sent back to Thorlabs. The customer will carry the shipping costs 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 also has to carry the costs for back shipment.

In case of shipment from outside EU duties, taxes etc. which should arise have to be carried by the customer.

Thorlabs warrants the hard- and/or software determined by Thorlabs for this unit to operate fault-free provided that they are handled according to our requirements. However, Thorlabs does not warrant a fault free and uninterrupted operation of the unit, of the software or firmware for special applications nor this instruction manual to be error free. Thorlabs is not liable for consequential damages.

Restriction of Warranty

The warranty mentioned before does not cover errors and defects being the result of improper treatment, software or interface not supplied by us, modification, misuse or operation outside the defined ambient 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 instruction manual or the technical data of the described unit at any time.

4.8 Copyright and Exclusion of Reliability

Thorlabs has taken every possible care in preparing this document. We however assume no liability for the content, completeness or quality of the information contained therein. The content of this document is regularly updated and adapted to reflect the current status of the hardware and/or 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 document is neither part of any previous or existing agreement, promise, representation or legal relationship, nor an alteration or amendment thereof. All obligations of *Thorlabs* 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 document. Should you require further information on this product, or encounter specific problems that are not discussed in sufficient detail in the document, please contact your local *Thorlabs* dealer or system installer.

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4.9 Thorlabs Worldwide Contacts - WEEE Policy

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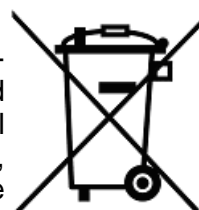www.thorlabs.com
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Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return "end of life" Annex 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.