

## Integrating Sphere USB Power Meter with Silicon Photodiode Detector



### Description

**PM16-144**

The PM16 remotely controlled power meters have USB interfaces and are offered with a selection of photodiode and thermal power sensors. Other sensors are available upon request; please contact Tech Support with inquiries. Each sensor is connected to the USB interface by a standard 1.5 m connection cable and can be operated using any of the software and driver packages that are compatible with Thorlabs' other power meters. The PM16-144, with its Integrating-Sphere-based design, can measure optical power independent of the divergence angle and beam shape of the incoming beam. The optical power meter head will detect light over the power range from 1  $\mu$ W up to 500 mW.

This optical power meter can be used for both fiber-coupled and free-space applications. An SM1 (1.035"-40) thread adapter and an FC fiber adapter are supplied with the unit, while other fiber adapters for SMA, LC, ST and SC connectors are separately.

8-32- and M4-threaded mounting holes are provided to accommodate posts.

The meter holds the sensor's individual NIST- and PTB-traceable spectral calibration data in a non-volatile memory.

### Software Installation

System Requirements: Windows XP and Later

The PM16 requires a National Instruments VISA installation, that can be downloaded from the National Instruments website (<https://www.ni.com/visa/>), to allow the correct USB installation as a "Test and Measurement Device (IVI)". Please install NI VISA first and then plug the PM16 into a free USB port. Wait until USB installation has finished, after which the device is ready to operate.

Software, drivers, command reference and examples can be downloaded from [www.thorlabs.com](http://www.thorlabs.com)

### Cleaning and Maintenance

There are no serviceable parts in the PM16-144 head. The housing may be cleaned by wiping with a soft damp cloth. When cleaning the aperture filter, treat it as any other fine optic. Gently blow off any debris using compressed air and wipe gently with an optic tissue wetted with propanol. If you suspect a problem with your PM16-144 please call Thorlabs and an engineer will be happy to assist you.

As long as the sensor has not been exposed to excessive optical power (please pay attention to the maximum ratings in the technical specifications), the calibration should be very stable over long periods of time (well over a year). To keep the accuracy and performance of the PM16-144, Thorlabs recommends a yearly recalibration, starting one year after purchase.

## Specifications

PM16-144 Specifications	
<b>Sensor Properties</b>	
Detector Type	InGaAs Photodiode
Wavelength Range	800 - 1700 nm
Optical Power Working Range	1 $\mu$ W - 500 mW
Max Average Power Density	1 kW/cm <sup>2</sup>
Linearity	$\pm 0.5\%$
Active Area Uniformity <sup>a</sup>	$\pm 1\%$
Resolution	<1 nW
Calibration Uncertainty <sup>a</sup>	$\pm 5\%$
Typical Application	Fiber Lasers / Low- and Mid-Power Lasers
Laser Types	Diode, Ti-Sapphire, He-Cd, Arlo, Krlo, Dye, LED
Integrating Sphere Material (Diameter)	Zenith® PTFE Integrating Sphere (Ø1")
Response Time	<1 $\mu$ s
Sensor Head Dimensions	Ø45 x 30.5 mm
Active Detector Area	Ø2 mm
Input Aperture	Ø5 mm
Post Mounting	8-32 & M4 Threads
Aperture Thread	Externally SM1-Threaded (1.035"-40) Removable Adapter
Fiber Adapters (Optional)	FC (Included) SC, LC, SMA, ST (Not Included)
Cable Length	1.5 m
<b>Power Meter Electronics Properties</b>	
Analog Measurement Ranges <sup>b</sup>	500 nA, 50 $\mu$ A, 5 mA
Measurement Units	W, dBm, A
AD Converter	24 Bit
Analog Amplifier Bandwidth	10 Hz
Update Rate	10/s
Remote Interface	USB 2.0
Power Supply	External: 5 V DC via USB
Connector	USB
Electronics Dimensions	65 mm x 20 mm x 10 mm
Total Weight	0.2 kg

a. Beam diameter > 1 mm

b. The appropriate range is chosen internally by the power meter to achieve the best accuracy; the auto-ranging function can be deactivated.

## Precautions, Warranty and Conformity Information

These products are ESD (electro static discharge) sensitive and as a result are not covered under warranty. In order to ensure the proper functioning of a photodiode care must be given to maintain the highest standards of compliance to the maximum electrical specifications when handling such devices. The photodiodes are particularly sensitive to any value that exceeds the absolute maximum ratings of the product. Any applied voltage in excess of the maximum specification will cause damage and possible complete failure to the product. The user must use handling procedures that prevent any electro static discharges or other voltage surges when handling or using these devices.

Thorlabs, Inc. Life Support and Military Use Application Policy is stated below:

THORLABS' PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS OR IN ANY MILITARY APPLICATION WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF THORLABS, INC. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.
3. The Thorlabs products described in this document are not intended nor warranted for usage in Military Applications.

Category	Standards or description	
EC Declaration of Conformity - EMC	Meets intent of Directive 2004/108/EC <sup>1</sup> for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:	
	EN 61326-1:2006	EMC requirements for Class A electrical equipment for measurement, control and laboratory use, including Class A Radiated and Conducted Emissions <sup>2,3,4</sup> ) and Immunity. <sup>2,3,4</sup> )
	IEC 61000-4-2	Electrostatic Discharge Immunity (Performance Criterion B)
	IEC 61000-4-3	Radiated RF Electromagnetic Field Immunity (Performance Criterion A)
	IEC 61000-4-4	Electrical Fast Transient / Burst Immunity (Performance Criterion B)
	IEC 61000-4-6	Conducted RF Immunity (Performance Criterion A)
FCC EMC Compliance	Emissions comply with the Class A Limits of FCC Code of Federal Regulations 47, Part 15, Subpart B <sup>2,3,4</sup> .	
EC Declaration of Conformity - Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 2006/95/EC <sup>5</sup>	
	EN 61010-1:2010	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements
U.S. Nationally Recognized Testing Laboratory Listing	UL 61010-1 2 <sup>nd</sup> ed.	
Canadian Certification	CAN/CSA C22.2 No. 61010-1 3 <sup>rd</sup> ed.	
Additional Compliance	IEC 61010-1:2010	
Equipment Type	Test and Measuring	
Safety Class	Class I equipment (as defined in IEC 60950-1:2001)	

<sup>1</sup> Replaces 89/336/EEC.

<sup>2</sup> Compliance demonstrated using high-quality shielded interface cables shorter than or equal to 3 meters.

<sup>3</sup> Emissions, which exceed the levels required by these standards, may occur when this equipment is connected to a test object.

<sup>4</sup> Minimum Immunity Test requirement

<sup>5</sup> Replaces 73/23/EEC, amended by 93/68/EEC

