
THORLABS

PMM01 Amplified Photomultiplier

User Guide



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Chapter 1 Description

The PMM01 is an amplified photomultiplier tube designed for detection of light signals from DC to 20 kHz. A buffered output drives a 50 Ω impedance up to 5 V. The PMM01 housing includes SM1 (1.035" x 40) threads that are compatible with any number of Thorlabs' SM1-threaded accessories. The housing also includes tapped holes that are compatible with Thorlabs' 30 mm cage system. These features allow convenient mounting of external optics, light filters, and apertures, as well as provide an easy mounting mechanism using the Thorlabs cage assembly accessories.

The PMM01 has three 8-32 tapped mounting holes with a 0.2" mounting depth and includes a switchable line voltage power supply.



CAUTION



Avoid exposing the tube to strong light sources (especially UV) because they can temporarily increase noise.

Chapter 2 Setup

1. Unpack the optical head, attach a TR-series post to one of the three 8-32 tapped holes located on the top and sides of the sensor, and use a PH-series post holder.
2. Connect the power supply 3-pin plug into the mating receptacle on the Y cable.
3. Connect the Y cable to the optical head.
4. Apply the desired tube control voltage (0 to +1.8 V max, subject to not exceeding the rated gain of the PMT) to the 2.5 mm connector on the Y cable with the tip ground. An external user provided supply is necessary for the control voltage. **Do not exceed an anode current of 100 μ A.**

Note: The anode current is dependent on both the sensitivity of the PMT at a given wavelength and the applied voltage.

$$\text{Tube Voltage} = -1000 \times \text{HV control (V)}$$

5. Set the line switch to the appropriate line voltage and plug the power supply into a 50 - 60 Hz outlet.
6. Attach a 50 Ω coax cable (i.e. RG316U) to the output of the PMM01. When running cable lengths longer than 12", we recommend terminating the opposite end of the coax with a 50 Ω resistor (Thorlabs Item # T4119) for maximum performance.

Chapter 3 Operation

CAUTION

The PMM01 was designed to allow maximum accessibility to the photomultiplier tube. When using fiber adapters, make sure that the fiber ferrule does not touch the detector. Failure to do so may cause damage to the diode and/or the fiber. To prevent this, install the SM1RR retaining ring included with the PMM01 inside the Ø1" threaded coupler before installing the fiber adapter.

- The light to voltage conversion can be estimated by factoring the wavelength-dependent responsivity of the photomultiplier tube with the transimpedance gain, i.e., $\text{output (V/W)} = \text{transimpedance gain (V/A)} \times \text{sensitivity (A/W)} \times \text{tube gain}$. The tube gain can be estimated from Figure 2 and the supplied calibration. The label attached to the part will include the max voltage of 500 A.
- The maximum output of the PMM01 is 10 V for high impedance loads (5 V for 50 Ω loads). The output signal should be below the maximum output voltage to avoid saturation. If necessary, use external neutral density filters to reduce the input light level.

Note: Because of the finite gain-bandwidth performance common to all amplifier circuits, the bandwidth of the PMM01 goes down with increased output signal levels.

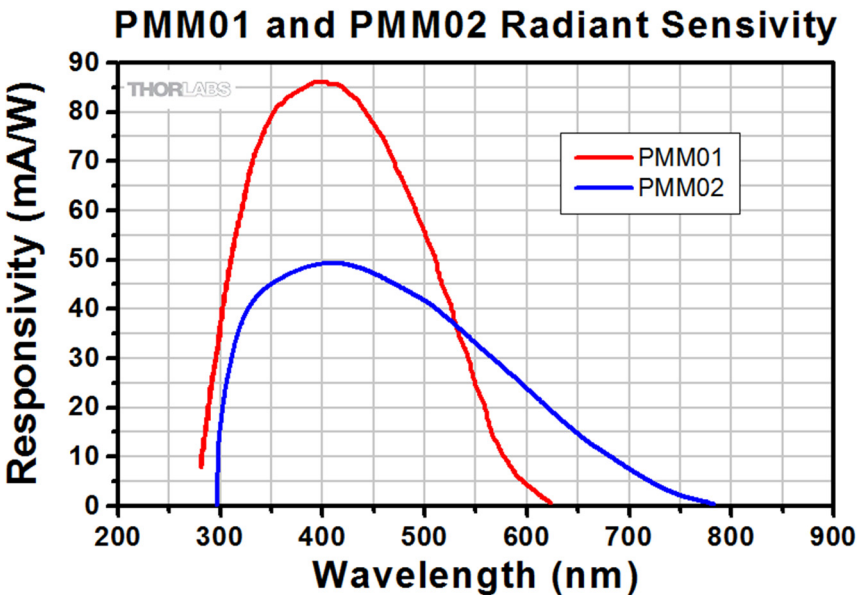


Figure 1 Typical Spectral Response Curve

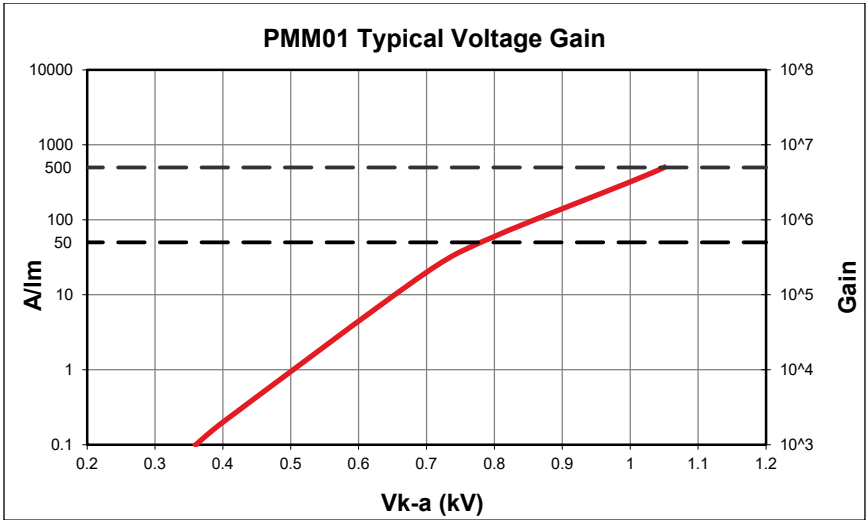


Figure 2 PMM01 Typical Voltage Gain Curve

Chapter 4 Fiber Adapters & Other Accessories

Thorlabs sells a number of accessories that are compatible with the $\varnothing 1$ " threads on the PMM01 housing, including FC, SMA, and ST fiber adapters, stackable lens tubes for mounting optics, and cage assemblies that allow the PMM01 to be incorporated into elaborate 3D optical assemblies.



CAUTION



The PMM01 was designed to allow maximum accessibility to the photomultiplier tube. When using fiber adapters, make sure that the fiber ferrule does not touch the detector. Failure to do so may cause damage to the diode and/or the fiber. To prevent this, install the SM1RR retaining ring included with the PMM01 inside the $\varnothing 1$ " threaded coupler before installing the fiber adapter.

Chapter 5 Maintaining the PMM01

There are no serviceable parts in the PMM01 optical head of power supply. The housing may be cleaned by wiping with a soft, damp cloth. The window of the tube should only be cleaned using optical grade wipes. If you suspect a problem with your PMM01, please contact techsupport@thorlabs.

Chapter 6 Specifications

6.1. General Specifications

Specification	Value
Module Dimensions	3.65" x 1.60" x 2.46" (92.8 x 40.6 x 62.5 mm)
Operating Temperature	5 to 55 °C
Storage Temperature	-40 to 55 °C
Mounting Holes	8-32
Weight (Module)	200 g (0.44 lbs)
Weight (Total)	1.2 kg (2.67 lbs)

6.2. Window Specifications

Specification	Value
Material	Borosilicate
Type	Plano-Concave
Refractive Index	1.49
Potassium (K)	300 ppm
Thorium (Th)	250 ppm
Uranium (U)	100 ppm

6.3. Electrical Specifications

Specification	Value
Photocathode Type	Bialkali
Photocathode Geometry	Head-On
Dynode Chain Orientation	Circular
Photocathode Active Diameter	22 mm
Wavelength Range	280 - 630 nm
Wavelength of Maximum Response	400 nm
Tube Gain (Max)	7.1×10^6
Peak Responsivity @ 400 nm (Typ.)	80 mA/W
Quantum Efficiency at Peak (Typ.) ¹	25%
Transimpedance Gain	Hi-Z: 1×10^6 V/A 50 Ω : 5×10^5 V/A
Dark Current (@ 20 °C)	0.3 - 3 nA
Dark Count Rate (@ 20 °C)	100 s ⁻¹
Bandwidth (6 dB) ²	0 - 20 kHz
Amplifier Noise (Typ.)	2 mV (RMS)
Amplifier Offset (Typ.)	1 mV
Output Rise and Fall Times	15 μ s
Output Impedance	50 Ω
Output Signal ³	0 - 10 V (Unterminated) 0 - 5 V (Term. into 50 Ω)
Power Input	+12 V (+12 to +15): 40 mA -12 V (-12 to -15): 10 mA
Anode Current (Max)	100 μ A
Tube Voltage	0 to -1800 V
HV Voltage Control (Max ⁴)	+1.8 V
HV Control Connector	2.5 mm Mono Jack
HV Control Sensitivity	-1000 V/V
Warm Up Time	<10 s
Output Connector	SMA

¹ Calculated from Radiant Sensitivity

² The bandwidth decreases with increased output signal levels.

³ The output signal should be below the maximum output voltage to avoid saturation. Use ND filters if necessary.

⁴ Subject to not exceeding the rated gain of the PMT.

6.4. Mechanical Drawings

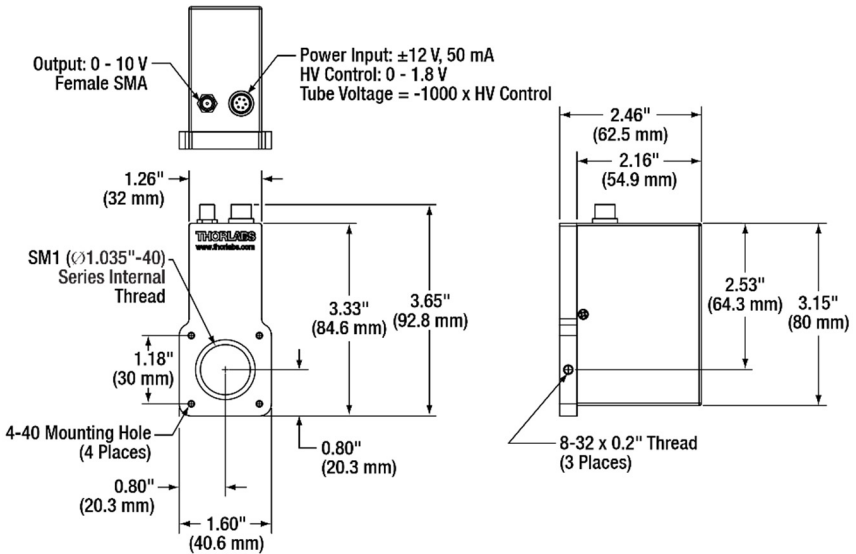


Figure 3 Mechanical Drawing of the Housing

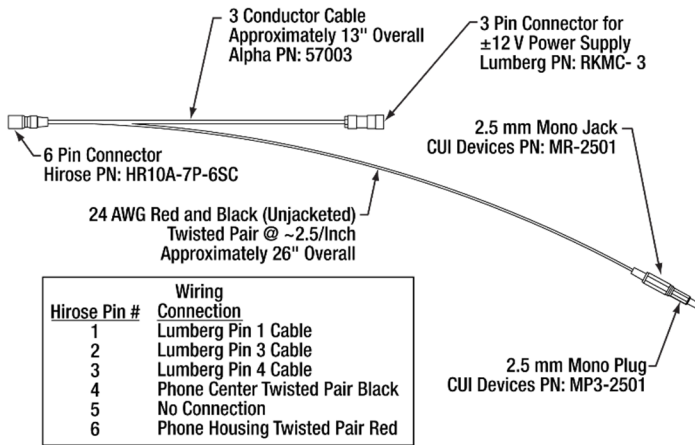


Figure 4 Interface Connector Drawing

Chapter 7 Regulatory

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 13, 2005
- Marked correspondingly with the crossed out “wheelie bin” logo (see right)
- 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



Wheelie Bin Logo

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 is 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 life products will thereby avoid negative impacts on the environment.

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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