PDB250A, PDB250A2, PDB250C

Switchable Gain Free-Space Balanced Detector

User Guide



2024

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Chapter 1 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 PDB250x photodiodes must not be operated in explosion endangered environments!

Do not obstruct the air ventilation slots in the housing!

Do not remove covers! There are no user-serviceable parts inside!

This precision device is only serviceable if returned and properly packed into the complete original packaging including the cardboard inserts. If necessary, ask for replacement packaging.

Refer servicing to qualified personnel!

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

Attention

Prior to applying power to the LDS12B power supply of the PDB250x photodetectors, make sure that the protective conductor of the 3 conductor mains power cord is correctly connected to the protective earth ground contact of the socket outlet! Improper grounding can cause electric shock resulting in damage to your health or even death!

Before connecting the power supply to the mains, make sure that the line voltage range marked on the power supply agrees with your local supply.

Ensure that the line voltage setting of the LDS12B at the rear panel agrees with your local supply. If not, please change the line voltage setting (see section Setting the LDS12 AC Line Voltage).

All modules must only be operated with duly shielded connection cables.

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).

Attention

Do not stick anything into the aperture! You may damage the protective window and/or the sensor behind.

Chapter 2 Intended Use

The PDB250A, PDB250A2 and PDB250C devices are free-space balanced amplified photodiodes which detect signal from two input light sources and act as balanced receivers by subtracting the two optical input signals from each other, resulting in the cancellation of common mode noise. They are used in photonics research and development applications.

The PDB250A, PDB250A2, and PDB250C balanced photodiodes are designed for laboratory use only. The PDB250A, PDB250A2, and PDB250C devices may not be used or integrated into equipment that is applied in pharmaceutical, medical or military applications.

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.

Chapter 3 Introduction

The Thorlabs PDB250x Series Switchable Gain Balanced Amplified Photodetectors consist of two well-matched, photodiodes and generate an output voltage (RF OUTPUT) proportional to the difference between the photo currents in the two photodiodes, i.e. the two optical input signals. The gain of the amplifiers can be adjusted in 8 steps over about 2 optical decades.

Additionally, the unit has two fast monitor outputs (Monitor + and Monitor -) to measure the individual optical input power level as well as low frequency modulated signals on each photodetector separately.

The PDB250x slim line housing has two tapped holes with combination threads of 8-32 and M4 x 0.7 for convenient mounting to the optical setup with imperial or metric posts.

The input apertures for free space beams have both external SM1 and internal SM05 threads that are compatible with Thorlabs' SM1- and SM05-threaded accessories. The included SM1T1 lens tube coupler allows mounting of external SM1-threaded accessories (e.g. external optics, filters, apertures, or fiber adapters).

The PDB250x are shipped with an external linear power supply LDS12B. For more information on this device, please refer to the operating instructions available on the website.

The PDB250A, PDB250A2 and PDB250C operate from DC up to 1 MHz and feature photodiodes with a large active area. AC-coupling is available upon request. These photodiodes show excellent Noise Equivalent Power (NEP) and Common-Mode Rejection Ratio (CMRR).

Attention

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

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3.1 Ordering Codes and Accessories

PDB250A Switchable Gain Free-Space Balanced Photodetector, Si, Active Area Diameter 5 mm, Wavelength Range 320 - 1060 nm, Bandwidth Range DC - 1 MHz, Combi-Thread Mounting Holes Compatible with 8-32 and M4 Threads

PDB250A2 Switchable Gain Free-Space Balanced Photodetector, UV-Enhanced Si, Active Area Diameter 4.1 mm, Wavelength Range 190 - 1100 nm, Bandwidth Range DC - 1 MHz, Combi-Thread Mounting Holes Compatible with 8-32 and M4 Threads

PDB250C Switchable Gain Free-Space Balanced Photodetector, InGaAs, Active Area Diameter 3 mm, Wavelength Range 800 - 1700 nm, Bandwidth Range DC - 1 MHz, Combi-Thread Mounting Holes Compatible with 8-32 and M4 Threads

According to Thorlabs' general detector part numbering system, the suffix "A" indicates Si photodiodes while the suffix "C" indicates InGaAs photodiodes.

AC-coupled versions as well as special versions with an open photodetector (cover glass removed) are available upon request. Please contact Thorlabs for details.

Chapter 4 Getting Started

4.1 Parts List

Please inspect the shipping container for damage. Please do not cut through the cardboard, as the box might be needed for storage or returns.

If the shipping container appears to be damaged, keep it until you have inspected the contents for completeness and tested the PDB250x device mechanically and electrically.

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

PDB250A

1. PDB250A Balanced Amplified Photodetector
2. Two SM1T1 Adapter (SM1 Internal Thread)
3. Two SM1EC2B Snap-On Plastic Dust Caps for Input Aperture
4. Power Supply LDS12B (±12 V, 250 mA), Switchable to 100 V, 120 V, or 230 V Line Voltage
5. Quick Reference

PDB250A2

1. PDB250A2 Balanced Amplified Photodetector
2. Two SM1T1 Adapter (SM1 Internal Thread)
3. Two SM1EC2B Snap-On Plastic Dust Caps for Input Aperture
4. Power Supply LDS12B (±12 V, 250 mA), Switchable to 100 V, 120 V, or 230 V Line Voltage
5. Quick Reference

PDB250C

1. PDB250C Balanced Amplified Photodetector
2. Two SM1T1 Adapter (SM1 Internal Thread)
3. Two SM1EC2B Snap-On Plastic Dust Caps for Input Aperture
4. Power Supply LDS12B (±12 V, 250 mA), Switchable to 100 V, 120 V, or 230 V Line Voltage
5. Quick Reference

4.2 Basic Setup

Note

Prior to operation, please check if the indicated line voltage range on the power supply matches with your local mains voltage! For alternative power supplies, Thorlabs offers appropriate power connector cables.

1. Carefully unpack the unit and accessories. If any damage is noticed, do not use the unit. Contact Thorlabs and have us replace the defective unit.
2. If required, mount the unit on an optical table or application. The unit has two tapped mounting holes on the side and bottom of the device. The mounting holes are compatible with metric and imperial threads.
3. Remove the metal cover caps on the optical inputs to detect your optical signal.
4. If required, mount external optics, filters, apertures or fiber adapters.
5. Set the LDS12B power supply to your local mains voltage (100 VAC, 120 VAC, or 230 VAC) as described in the chapter Setting the LDS12B AC Line Voltage.
6. Connect the included DC output cable of the power supply to the POWER IN jack.
7. Connect the power supply to the AC outlet; turn power supply on.
8. Connect RF OUTPUT with coaxial cable to the data acquisition device.
9. If necessary, connect monitor outputs (MONITOR +, MONITOR -) to measure the optical input power for each channel individually.

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4.3 Setting the LDS12B AC Line Voltage

Your LDS12B, ±12 VDC Regulated Power Supply has been shipped from Thorlabs configured for 120 VAC operation. If you plan to operate this unit at 100 VAC or 230 VAC, please refer to steps below and heed the safety warnings mentioned above.

WARNING

The unit must be powered off, unplugged from the AC input power source, and disconnected from all external devices before changing the line voltage. Failure to do so may cause serious injury to the user due to high voltages within the unit.

Line Voltage Selection

To change the line voltage, locate the voltage selector switch below the power input connector. Select the appropriate line voltage by adjusting the voltage selector switch to either 100, 120, or 230 VAC.



Voltage Selector Switch of the LDS12B

1. Remove the AC line cord from the LDS12B.
2. Using a flat head screwdriver, slide the voltage selector switch to the desired setting.
3. Verify the correct voltage is shown on the switch. If not, please repeat above steps.

Attention

This particular unit does not give access to change the fuse. Listed below are common causes of fuse failure:

- Output Short Circuit
- Output Overload

There are two elements utilized to provide safety protection:

- Short-Circuit Current Limit: Uses a Low Dropout Regulator with internal current limit circuit to protect against high-load current faults or shorting events.
- Thermal Fuse: Uses a thermally sensitive element, which melts and opens the circuit when high temperature is present.

WARNING

The power switch must be in the OFF position while making connections to the output.

Please contact your local Thorlabs Technical Support office with any questions.

Chapter 5 Operating Instructions

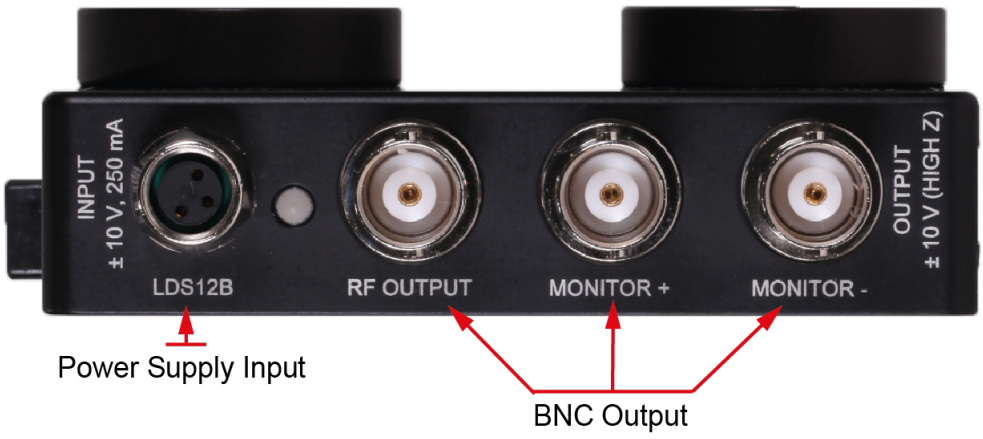
5.1 Operating Elements

NOTE

The photodetector operating elements are identical in all products of the PDB250x Series.

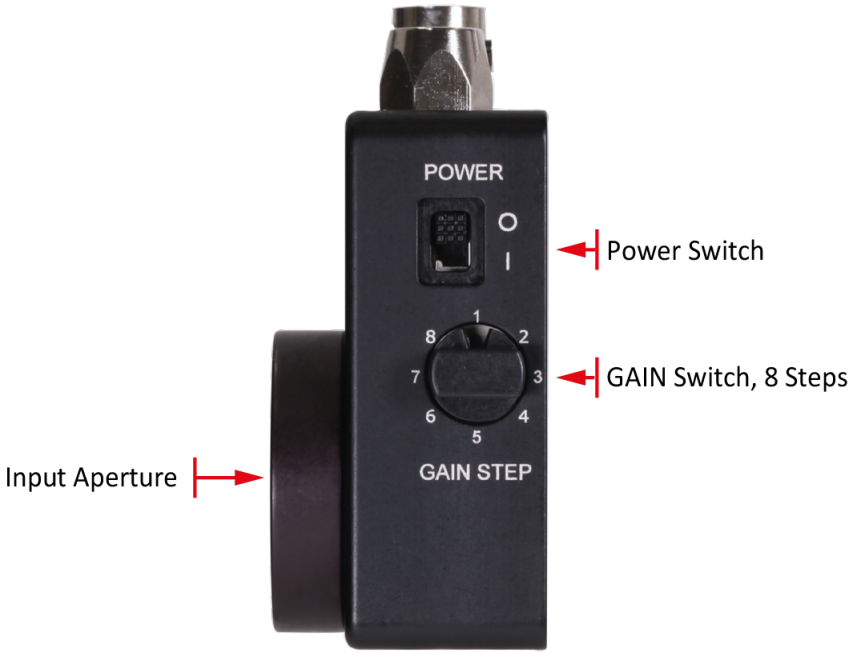


Components of the PDB250C Photodetector



Top View of the Power Supply Input and BNC Output of the PDB250x Series

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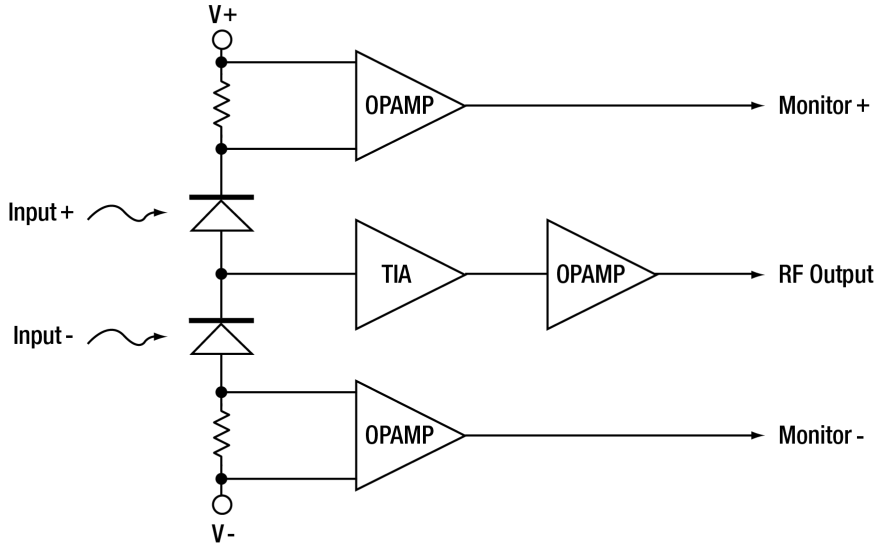
8-Step Gain Switch and Power ON/OFF of the PDB250A Photodetector

5.2 Operating Principle

Thorlabs' PDB250x Series of Switchable Gain, Free-Space Balanced Amplified Photodetectors consist of two well-matched photodiodes and an ultra-low noise, high-speed transimpedance amplifier that generates an output voltage (RF OUTPUT) proportional to the difference between the photo currents of the two photodiodes, i.e. the difference between the two optical input signals. The gain of the amplifiers can be adjusted in 8 steps.

Additionally, the unit has two monitor outputs (Monitor + and Monitor -) to observe the optical input power level on each photodiode separately. Due to the increased cut-off frequency, the output from Monitor + and Monitor - can also be used to measure low frequency modulated signals on each photodetector separately.

The PDB250x Series is powered by the LDS12B, ±12 V, 250 mA external linear power supply via a PICO M8 power connector.



Functional Block Diagram of the PDB250x Series

5.3 Optical Input

The PDB250x Series Photodetectors have two free-space optical input ports. Open beams should be carefully aligned to both photodetectors. This is particularly critical for the PDB250A2 and the PDB250C, which have a smaller photodiode active area. When working with large beam diameters, additional focusing lenses can be placed in front of the optical inputs to avoid overfilling the active photodetector area. For this, Thorlabs offers a large variety of lenses and mounting accessories. The housing is compatible with any number of Thorlabs SM1- and SM05-threaded accessories, allowing for easy integration with external optics, filters, apertures, or fibers adapters as well as Thorlabs cage assembly accessories.

For fiber coupled applications, the S120-XX Series Fiber Adapters can be easily mounted to the optical input ports. Thorlabs offers such adapters for single-mode fibers (connector styles FC, SC, ST and LC) and for multi-mode fibers (connector SMA).

The RF OUTPUT will saturate at an optical input power greater than the CW Saturation Power listed in Specifications. If necessary, use external neutral density filters or attenuators to reduce the input light level. Please note that the PDB250x Balanced Amplified Photodetectors are very sensitive to unwanted stray light. It is important to carefully shield the input apertures from any unwanted light sources. Common techniques include the use of baffling or other opaque barriers, such as black cloth or lens tubes,

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and placing appropriate bandpass filters in front of the photodetector to minimize the influence of stray light.

Note

Do not exceed a maximum power density of 4 W/cm^2 for maximum linearity performance when measuring focused or small diameter beams. Always try to illuminate the whole detector active area to prevent nonlinearities. Equal power densities on both photodetectors are important for maximum CMRR.

The PDB250x can be used in balanced mode (both inputs are illuminated) as well as in single detector mode. In single detector mode, the RF OUTPUT swing depends on which INPUT is used: it is positive for INPUT+ and negative for INPUT-.

In single detector mode, the optical input power should be below the specified CW Saturation Power (see the chapter Specifications) to avoid saturation of the RF OUTPUT amplifier.

In balanced mode the power difference between the optical inputs should be less than the CW Saturation Power. If necessary, use external neutral density filters or attenuators to reduce the input light level.

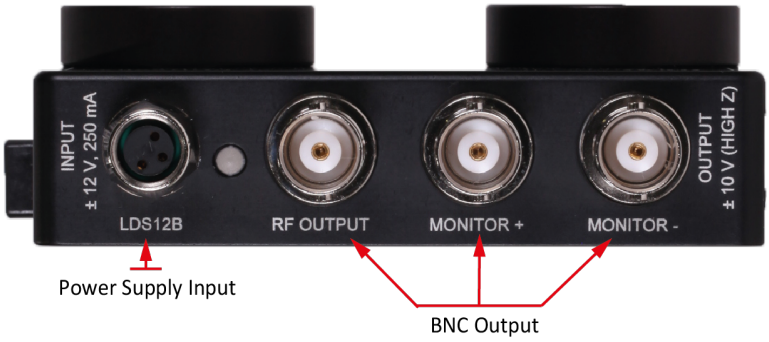
Attention 

The optical damage threshold is 20 mW.
Exceeding this value will permanently damage the photodiodes!

5.4 Electrical Output Ports

The PDB250x Series has the following 3 BNC output connectors:

- MONITOR +
- MONITOR -
- RF OUTPUT



Power Supply Input and BNC Output of the PDB250x Series

5.4.1 RF OUTPUT Port

The **RF OUTPUT** delivers an output voltage proportional to the difference between the photo currents of the two photodiodes. This voltage can be calculated by:

$$U_{RF,OUT} = (P_{opt,1} - P_{opt,2}) \; x \; \Re(\lambda) \; x \; G$$

$\Re(\lambda)$	Responsivity of the Photodiode at Given Wavelength λ
$P_{opt,1}$ $P_{opt,2}$	Optical Input Power as Measured at the 2 Photodetector Ports
G	Transimpedance Gain of the RF Output

The responsivity $\Re(\lambda)$ for a given wavelength can be read from the individual curves in the Performance Plots section to estimate the **RF OUTPUT** voltage. Please note that the given responsivity curves represent typical values and individual responsivity may deviate. The maximum output voltage swing of the **RF OUTPUT** can be found in the chapter Specifications.

The optical input saturation power of the balanced detector is the minimum value, as it is given for the wavelength with the highest detector responsivity. At other wavelengths, saturation will be reached at higher input power levels. The output signal should not exceed the maximum output voltage to avoid saturation. Therefore the optical input power (or the power difference between the optical input ports 1 and 2) should not exceed CW Saturation Power listed in the Specifications.

5.4.2 RF Monitor Ports

The signal monitor output ports (Monitor + and Monitor -) allow measurements of the input power level of the two input ports separately. Monitor + and Monitor - can therefore be used to assess low frequency modulated signals at the individual detectors. The maximum output voltage swing of the MONITOR output is +10 V for high impedance loads (+1.5 V into 50 Ω). Saturation of MONITOR output will occur at optical input power level greater than 1 mW, depending on the detector wavelength response.

MONITOR output can be used to roughly adjust equal input power levels on each detector for balanced operation. MONITOR outputs of the unit are also convenient to use for free-space beam alignment.

The amplifier offset voltage is factory set to zero at 23 °C ambient temperature. A small drift during a short warm-up period (~5 min) may occur. For exact DC light level measurements a constant temperature environment is recommended.

5.5 Mounting

As shown in the chapter Operating Elements, the PDB250x is housed in a rugged, shielded aluminum enclosure. This slimline housing has two tapped holes for convenient mounting to the optical setup. The PDB250A, PDB250A2, and PDB250C photodetectors feature tapped holes which are compatible for both imperial and metric threads (8-32 and M4 x 0.7).

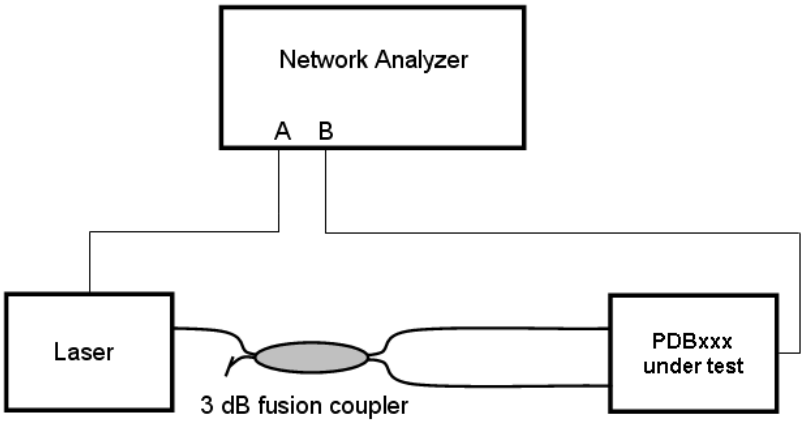
The input aperture is fitted with both an external SM1 and an internal SM05 thread that is compatible with any number of Thorlabs' SM1- and SM05-threaded accessories. The included SM1T1 allows externally SM1-threaded accessories (e.g. external optics, filters, apertures, or fiber adapters) to be mounted to the input aperture.

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5.6 CMRR and Frequency Response

An important specification for balanced amplifiers is the Common Mode Rejection Ratio (CMRR) that reflects the ability to suppress common mode noise.

In the setup described below, the Device under Test (DuT) - here a PDB250x - is tested for CMRR. A common mode signal is generated, which is canceled out when the amplifier is in balanced mode.



Device under Test Setup

A network analyzer is used as signal generator (output A) and receiver (input B). The receiver is synchronized with the signal generator and measures selectively at the same frequency. A laser light source is modulated by the signal generator (port A) and acts as a transmitter. A 3 dB fusion coupler is connected to the laser output, splitting the modulated light signal into two paths. Depending on the measurement task, one or both coupler outputs are connected to the input ports of the DuT. One of the DuT output ports is connected to the network analyzer Port B.

Frequency Response Measurements

The frequency response of each signal path can be measured by connecting only one coupler output to the appropriate input. In this way, the frequency response curves of the RF OUTPUT from INPUT+ and INPUT- can be measured, as well as the frequency responses of the MONITOR output ports, as shown in the individual technical data.

CMRR Measurement

For Common Mode Rejection Ratio measurement, both output ports of the fusion coupler are connected to both input ports of the DuT. The optical power level at both inputs must be well matched ("balanced") in order to achieve the optimal common mode suppression. Now the common mode rejection can be measured as a function of the frequency. The frequency response of the RF OUTPUT must be considered when calculating the CMRR - it is the difference between the RF OUTPUT signal at a given frequency and the measured common mode or balanced output signal - at the same frequency.
Typical measurement curves can be found in the respective Performance Plots.

5.7 Recommendations

Thorlabs PDB250x balanced amplified photodetectors can eliminate noise sources to allow precise measurements. The PDB250x are designed for use in a dual beam setup: one optical path for measurement and one invariant reference path. If set up properly, the PDB250x can reduce common mode noise for more than 35 dB over the specified frequency range. Please find recommendations to achieve an optimal common mode suppression below:

- Equal power levels on each photodetector are essential. Any power imbalance will be amplified and hence decrease the possible noise reduction.
- Equal power densities on both detectors is important to obtain maximum possible common mode rejection. Always try to illuminate the whole active area of the detectors to prevent nonlinearities. Focused high power beams may lead to frequency response degradation, resulting in dramatically reduced common mode rejection.
- Equal optical path lengths are critical for common mode noise suppression especially at higher frequencies. Any path length difference will introduce a phase difference between the two signals, which will decrease the noise reduction capability of the balanced detector. The figure below shows the maximum allowed path length difference in air to obtain a desired CMRR. For fiber-based applications the maximum path length difference must divided by 1.5.

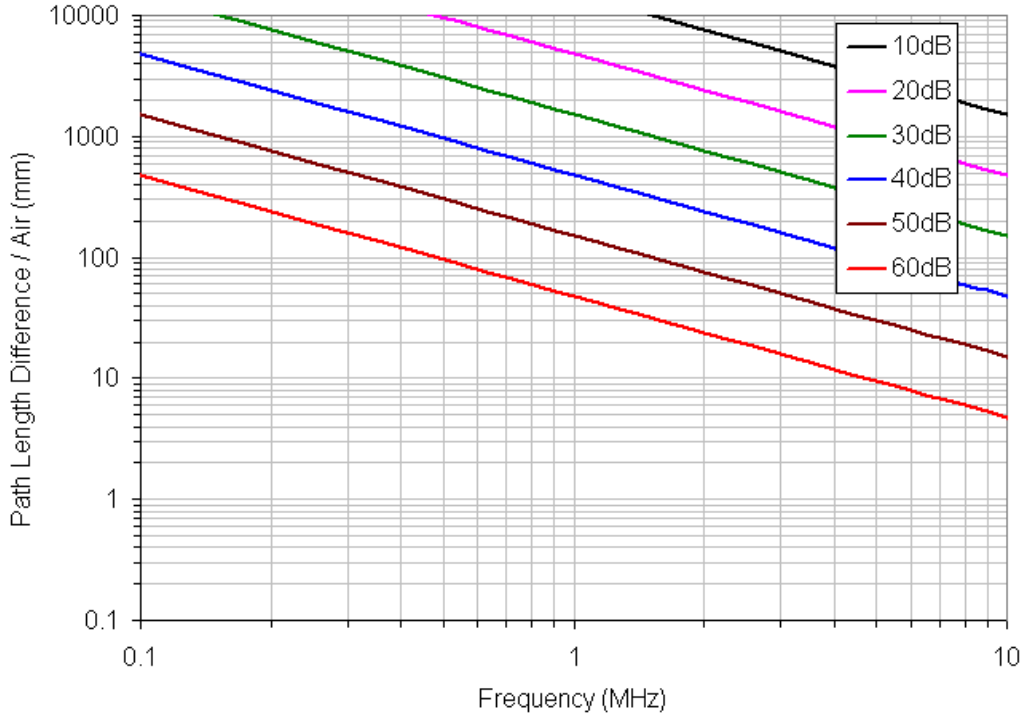


Diagram of the Maximum Permissible Path Length Difference in Air to Achieve a Desired CMRR

- Avoid etalon effects (interference fringes caused between two optical surfaces) in optical paths. Using angle polished optical connectors will greatly reduce etalon effects in a fiber based setup. Effects like residual frequency modulation, polarization noise, polarization wiggle or spatial modulation can also degrade common mode noise suppression. For further details contact Thorlabs. In general, reducing sources of differential losses in the optical paths (other than the measurement itself) will improve the common mode noise reduction.

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- Please note, that the PDB250x balanced amplified photodetectors are very sensitive to unwanted stray light. Carefully shielding of the PDB250x photodetectors from any unwanted light sources is essential.
- Electrostatic coupling of electrical noise associated with ground loops will introduce electrical noise. In most cases an electrically isolated post (see Thorlabs parts TRE or TRE/M) will suppress electrical noise coupling. Always try to identify the electrical noise sources and increase the distance to the PDB250x balanced detector. Different common ground points can also be tested.

Chapter 6 Specifications

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

Item #	PDB250A2	PDB250A	PDB250C
Detector			
Detector Type	UV Enhanced Si/PIN	Si/PIN	InGaAs/PIN
Optical Inputs	Free-Space		
Wavelength Range	190 to 1100 nm	320 to 1060 nm	800 to 1700 nm
Max. Responsivity, Typ., @ λ_{Peak}	0.5 A/W @ 960 nm	0.6 A/W @ 920 nm	1.0 A/W @ 1550 nm
Photodiode Damage Threshold	20 mW		
Diameter of Active Detector Area	4.1 mm	5 mm	3 mm
RF Output			
RF Electrical Output	BNC, 100 Ω		
Bandwidth (3dB)[1]	DC to 1 MHz		
Common Mode Rejection Ratio (Typ.)	35 dB	35 dB	30 dB
Gain Adjustment Range	42 dB		
Gain Steps	8		
Transimpedance Gain **High Z Load** **50 Ω Load**	 750 V/A - 500 x 10^3 V/A 263 V/A - 175 x 10^3 V/A	 3750 V/A - 500 x 10^3 V/A 263 V/A - 175 x 10^3 V/A	 750 V/A - 500 x 10^3 V/A 263 V/A - 175 x 10^3 V/A
Conversion Gain @Gain = 8, λ_{Peak} **High Z Load** **50 Ω Load**	 250 x 10^3 V/W 87.5 x 10^3 V/W	 300 x 10^3 V/W 105 x 10^3 V/W	 500 x 10^3 V/W 175 x 10^3 V/W
Conversion Gain @Gain = 1, λ_{Peak} **High Z Load** **50 Ω Load**	 1.87 x 10^3 V/W 0.65 x 10^3 V/W	 2.25 x 10^3 V/W 0.78 x 10^3 V/W	 3.75 x 10^3 V/W 1.3 x 10^3 V/W
CW Saturation Power @Gain = 1	5.3 mW @ 960 nm	4.4 mW @ 920 nm	2 mW @ 1550 nm
Minimum NEP (DC to 1 MHz) @Gain = 8	6.5 pW/√Hz	5 pW/√Hz	17 pW/√Hz
Voltage Swing **High Z Load** **50 Ω Load**	 ±10 V ±2.5 V		
MONITOR Output			
Electrical Monitor Outputs	BNC, 200 Ω		
Outputs Bandwidth (3 dB)	DC - 10 kHz	DC - 10 kHz	DC - 2 kHz
Output Conversion Gain **High Z Load** **50 Ω Load**	@ 960 nm 10 V/mW 2.5 V/mW	@ 920 nm 10 V/mW 1.5 V/mW	@ 1550 nm 10 V/mW 1.5 V/mW
Output Voltage Swing **High Z Load** **50 Ω Load**	 Max. 10 V Max. 1.5 V		

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Item #	PDB250A2	PDB250A	PDB250C
Overall Output Voltage Noise	<0.65 mV		
DC Offset	< ±5 mV		
General			
Operating Temperature Range	5 °C to 40 °C		
Storage Temperature Range	-40 °C to 70 °C		
Dimensions (W x H x D)[2]	88.2 mm x 65.3 mm x 21.1 mm (3.47" x 2.57" x 0.83")		
Weight[3]	0.2 kg (w/o Power Supply)		
Included Power Supply	±12 V @ 250 mA (100/120/230 VAC, 50 - 60 Hz, Switchable)		

[1)] Bandwidth for Gain 1 - 6: 1 MHz, Gain 7: 800 kHz; Gain 8: 500 kHz. AC-Coupled PDB250x versions are available upon request.

[2)] Minimum depth with removed SM1T1 adapters.

[3)] Weight of the PDB250A, PDB250A2 or PDB250C, excluding all shipped accessories.

6.1 Technical Data Explained

Details about the individual specifications:

- **Typical Max. Responsivity** is the peak responsivity $\mathcal{R}(\lambda)_{MAX}$ of the photodiode.
- **Transimpedance Gain [V/A]** is the ratio of the output voltage to the photo current:

$$G_{TI} = \frac{U_{RF,OUT}}{I_{PD}}$$

  While the photo current depends on the wavelength, the transimpedance gain is wavelength-independent. The transimpedance gain values are always given for a high impedance load at the RF Output; for 50 Ω loads these values need to be divided by 2.85.

- **Conversion Gain [V/W]** is the ratio of output voltage to input optical power:

$$G_{CONV} = \frac{U_{RF,OUT}}{P_{IN}} = G_{TI} \; x \; \Re(\lambda)$$

  This formula shows that the conversion gain is dependent on the actual wavelength as well. In the specifications, the conversion gain is given only for the peak responsivity wavelength of the photodiode. The conversion gain values are always given for a high impedance load at the RF Output; for 50 Ω loads these values need to be divided by 2.85.

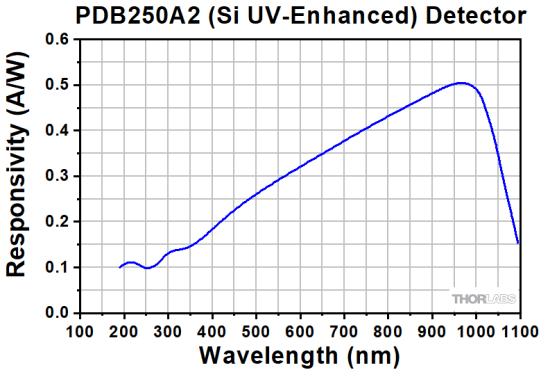
- **NEP** (Noise Equivalent Power) is the minimum input optical power to generate a photo current, equal to the RMS noise current in a 1 Hz bandwidth. NEP is essentially the minimum detectable power. It is stated for the PDB250x balanced detectors from DC to the RF Output cut frequency.
- **Maximum Input Power** is the damage threshold of the photodiode.
- **Typical Noise Spectra** (Performance Plots): These spectra were measured using an electrical spectrum analyzer (resolution bandwidth 10 kHz, video bandwidth 1 kHz unless otherwise noted). The INPUTs of the balanced detectors under test were blocked. The lower curve in the diagram was measured with the same setup and the balanced detectors switched off, i.e., it represents the measurement system's noise floor.
- **Monitor Outputs** are designed for use with high impedance loads (e.g., high-Z scope input etc.), but can also drive 50 Ω loads. Monitor outputs conversion gain is 10 V/mW, given at the detectors peak responsivity and high impedance load.
- **Typical Frequency Response Curves** are measured using the setup described in section CMRR and Frequency Response.

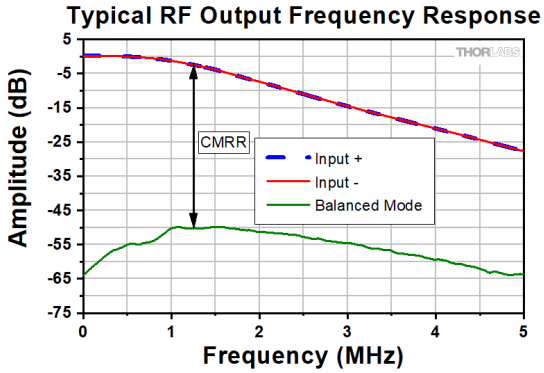
 © 2024 Thorlabs

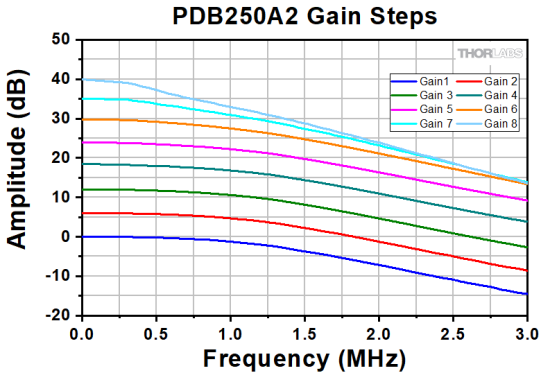
6.2 Performance Plots

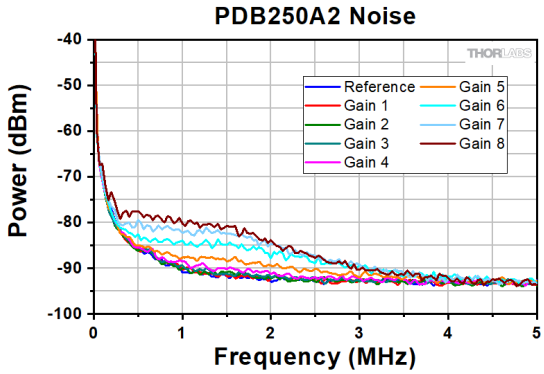
The following graphs show the typical performance of the PDB250x Series. Though frequencies higher than 1 MHz are shown, this series' bandwidth and performance are specified up to 1 MHz.

6.2.1 PDB250A2

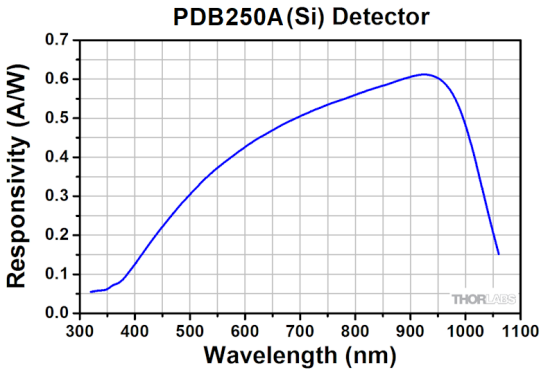


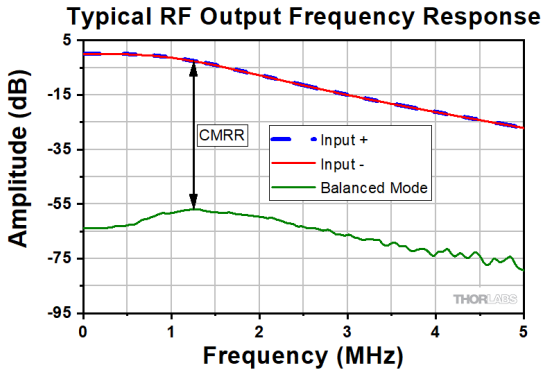


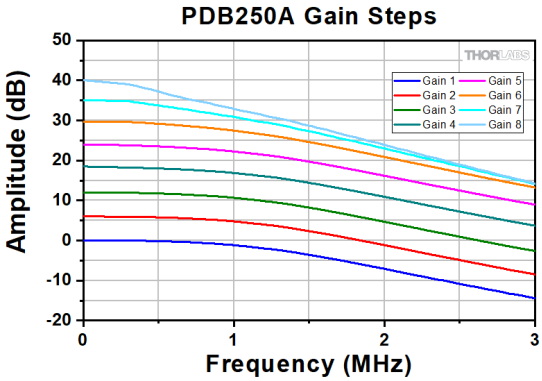


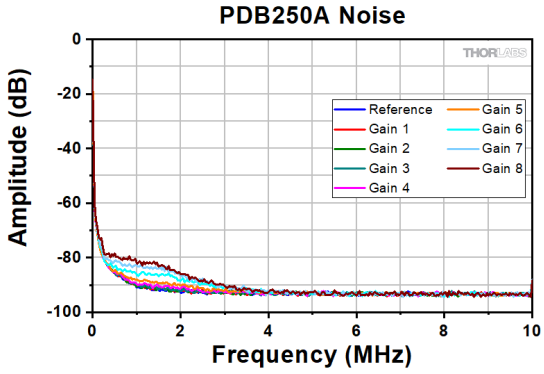


6.2.2 PDB250A

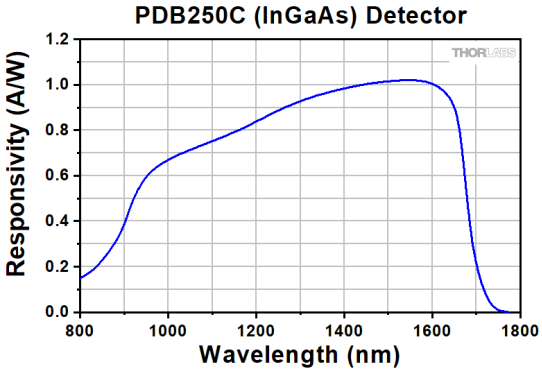


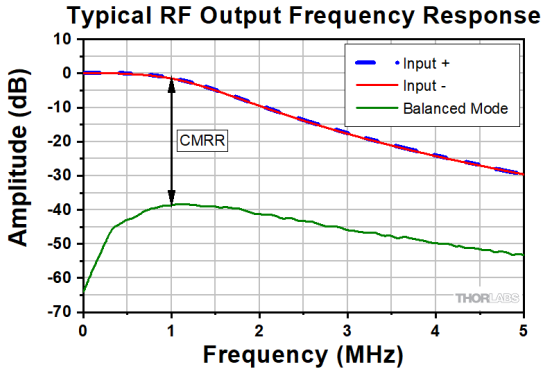


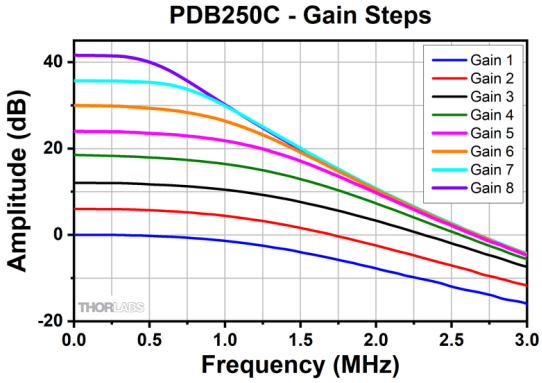


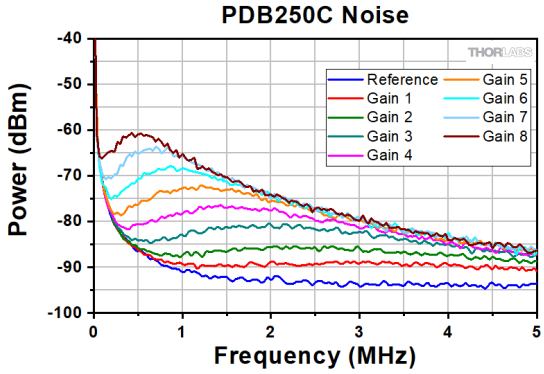


6.2.3 PDB250C









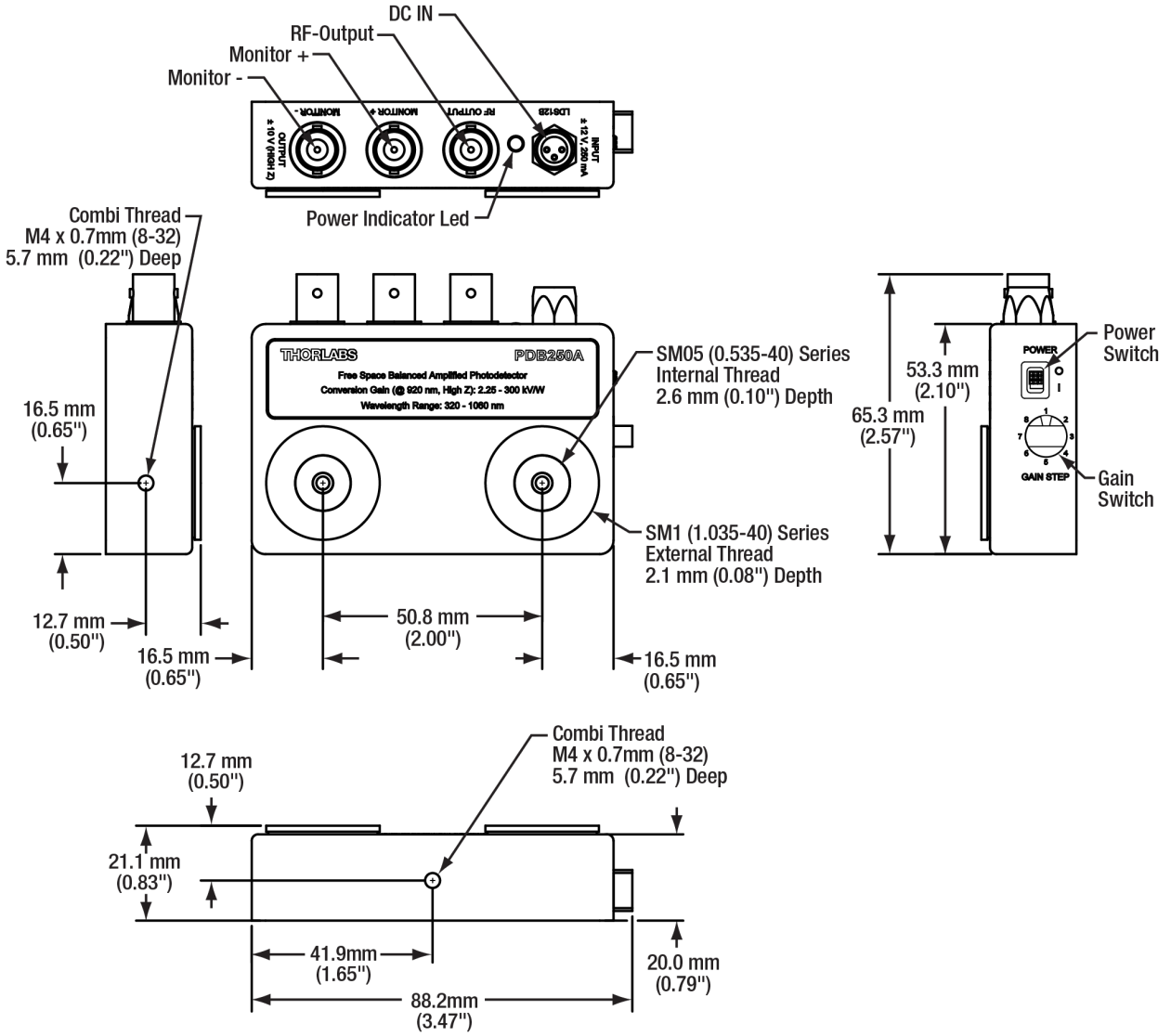
6.3 Dimensions

Depicted is PDB250A photodetector, representing all other models of the PDB250x Series.

The threads for post mounting are universal (M4 x 0.7 and 8-32).

Outer dimensions may vary slightly. Please view the respective technical drawings on the website.

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Item #	Threads for Post Mounting
PDB250A	Universal 8-32 x 0.22 / M4 x 0.7 Tap, 0.22" (5.7 mm) Depth (Imperial and Metric)
PDB250A2	Universal 8-32 x 0.22 / M4 x 0.7 Tap, 0.22" (5.7 mm) Depth (Imperial and Metric)
PDB250C	Universal 8-32 x 0.22 / M4 x 0.7 Tap, 0.22" (5.7 mm) Depth (Imperial and Metric)

6.4 Maintenance and Service

Protect the PDB250x photodetector from adverse weather conditions. The PDB250x Series is not water resistant.

Attention

Be very careful when connecting the fibers to the optical input ports! The photodiodes are mounted such that the gap between the protective diode glass and the fiber tip is as small as possible. For this reason, be careful when tightening the fiber connector in order to avoid damage to the glass window that protects the photodiode.

Attention

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

The unit does not need 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 see the section Return of Devices and contact Thorlabs for return instructions.

Do not remove covers!

To clean the PDB250x series housing, use a mild detergent and damp cloth. Do not soak the unit in water or use solvent based cleaners.

When cleaning the windows of the photodetectors, please remember that it is a sensitive optical device. Gently blow off any dust using compressed air and wipe gently with an optic tissue moistened with isopropanol or alcohol.

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Chapter 7 Certifications and Compliances

EU Declaration of Conformity

in accordance with EN ISO 17050-1:2010

We: Thorlabs GmbH

Of: Münchner Weg 1, 85232 Bergkirchen, 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: ***PDB2*, PDB4*, PDB5*, PDB8****

Equipment: ***Fixed and switchable gain balanced amplifiers***

is/are 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 + A1:2019 + AC:2019.
EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements	2013

and which, issued under the sole responsibility of Thorlabs, is/are 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:

contains no 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 November 2022

Name: Dr. Bruno Gross

Position: General Manager

EDC - PDB2, PDB4*, PDB5*, PDB8'*

CE

Chapter 8 Warranty and RMA Information

Thorlabs warrants material and production of the PDB250x for a period of 24 months starting with the date of shipment in accordance with and subject to the terms and conditions set forth in Thorlabs' General Terms and Conditions of Sale which can be found at:

General Terms and Conditions:

https://www.thorlabs.com/Images/PDF/LG-PO-001_Thorlabs_terms_and_%20agreements.pdf

and

https://www.thorlabs.com/images/PDF/Terms%20and%20Conditions%20of%20Sales_Thorlabs-GmbH_English.pdf

Chapter 9 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.

Chapter 10 WEEE Policy

Thorlabs 'End of Life' Policy (WEEE)



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 users responsibility to delete all private data stored on the device prior to disposal.

Chapter 11 Manufacturer Address

Manufacturer Address Europe	EU-Importer Address	UK-Importer Address
Thorlabs GmbH	Thorlabs GmbH	Thorlabs, LTD.
Münchner Weg 1	Münchner Weg 1	204 Lancaster Way Business Park
D-85232 Bergkirchen	D-85232 Bergkirchen	Ely, CB6 3NX
Germany	Germany	UK
Tel: +49-8131-5956-0	Tel: +49-8131-5956-0	Tel: +44-1353-654440
Fax: +49-8131-5956-99	Fax: +49-8131-5956-99	Fax: +44 (0)1353-654444
www.thorlabs.de	www.thorlabs.de	www.thorlabs.com
Email: europe@thorlabs.com	Email: europe@thorlabs.com	Email: techsupport.uk@thorlabs.com

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Chapter 12 Copyright and Exclusion of Liability

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Please refer to the general terms and conditions linked under Warranty.

Chapter 13 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.



USA, Canada, and South America
Thorlabs, Inc.
sales@thorlabs.com
techsupport@thorlabs.com

UK and Ireland
Thorlabs Ltd.
sales.uk@thorlabs.com
techsupport.uk@thorlabs.com

Europe
Thorlabs GmbH
europe@thorlabs.com

Scandinavia
Thorlabs Sweden AB
scandinavia@thorlabs.com

France
Thorlabs SAS
sales.fr@thorlabs.com

Brazil
Thorlabs Vendas de Fotônicos Ltda.
brasil@thorlabs.com

Japan
Thorlabs Japan, Inc.
sales@thorlabs.jp

China
Thorlabs China
chinasales@thorlabs.com

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