THORLABS

Large Area InGaAs Amplified Photodetector

PDA20C2 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 PDA20C2 is a wideband, fixed-gain-amplified, large-area InGaAs detector designed for detection of light signals from DC to 5 MHz. A buffered output drives up to 3.5 V into 50 Ω loads. The PDA20C2 is sensitive to light within the wavelength range of 800 nm to 1700 nm.

The PDA20C2 detector housing can be integrated in optical setups using convenient 8-32 and M4 combi-thread mounting holes that are compatible with both imperial and metric threading. Please see the chapter Mounting 3 for details.

The housing accommodates Thorlabs' SM05 (0.535"-40) and SM1 (1.035"-40) threaded adapters and accessories. This allows convenient mounting of external optics, light filters, and apertures. The product includes a SM1T1 SM1 Coupler Body which adapts the external thread to an internal thread and holds the SM1RR Retaining Ring and a reusable protective plastic cover cap. For accessories, please visit our website or contact Thorlabs 13.

A ±12 VDC power supply is included with each amplified photodetector. The appropriate input voltage (100 VAC, 120 VAC, 230 VAC) can be selected with a switch on the power supply 2.

Attention

Please find all safety information and warnings concerning this product in the chapter Safety 10 in the Appendix.

1.1 Ordering Codes and Accessories

PDA20C2: InGaAs Amplified Photodetector, 800 - 1700 nm, Bandwidth Range DC-5MHz, Active Area 3.14 mm^2, Combi-Thread Mounting Holes Compatible with 8-32 and M4 Threads

Included Accessories

- LDS12B Power Supply (±12V, 0.2A), 100 VAC, 120 VAC or 230 VAC Line Voltage
- Plastic Cover Cap on an included SM1T1-SM1 Coupler with a SM1RR-SM1 Retaining Ring.

Optional Accessories

- PDA-C-72 DC power supply cable to PDA20C2: This cable has a connector on one end and open wires at the other. The pin-out of the PDA20C2 DC power jack is shown in the appendix 9.

Please visit our homepage http://www.thorlabs.com for various accessories like fiber adapters, posts and post holders, data sheets and further information.

2 Getting Started

2.1 Parts List

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, keep it until you have inspected the contents and you have inspected the PDA20C2 mechanically and electrically.

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

1. PDA20C2 Amplified Photodetector
2. Plastic Cover Cap (Item # SM1EC2B) on SM1T1-SM1 Coupler with an SM1RR-SM1 Retaining Ring
3. LDS12B Power Supply (±12V, 0.2A), 100 VAC, 120 VAC or 230 VAC Line Voltage
4. Quick Reference

2.2 Preparation

Note

Prior to operation, please check if the selected line voltage range on the power supply matches your local mains voltage.

Please follow these steps for preparation:

- Carefully unpack the unit and accessories. If any damage is evident, do not use the unit and contact Thorlabs 13.
- Mount 3 the unit on your optical table or application.
- Remove the metal cover cap that protects the optical input.
- If necessary, mount external optics, filters, or apertures.
- Adjust the power supply to accommodate your local mains voltage (100 VAC, 120 VAC or 230 VAC).

Voltage Selector Switch

- Connect the power supply 3-pin plug into the mating receptacle on the PDA20C2.
- Plug the power supply into a outlet.
- Switch on the power supply.
- Attach a 50 Ω coaxial cable (i.e. RG-58U) to the output of the PDA20C2. When running cable lengths longer than 12” we recommend terminating the opposite end of the coax with a 50 Ω resistor (Thorlabs p/n T4119) for maximum performance.
- Connect the remaining end to a measurement device.

3 Operating Instruction

3.1 Mounting

The PDA20C2 is housed in a rugged, shielded, 70.9 mm x 49.9 mm x 20.3 mm aluminum enclosure.

For mounting flexibility, the PDA20C2 has two tapped mounting holes on the side and bottom to mount the unit on either an imperial or metric optical post. The combi-thread tapped holes accept both 8-32 and M4 threads, so using either imperial or metric TR posts is possible.

The PDA20C2 housing accommodates Thorlabs' SM05-threaded (0.535"-40) series and SM1 threaded (1.035"-40) series adapters and accessories. This also allows convenient mounting of lens tubes or cage systems.

The PDA20C2 comes with an SM1T1 SM1 coupler that adapts the external thread to an SM1 internal thread. A retaining ring in the coupler holds the protective cover cap. Please unscrew the coupler if needed.

For accessories, please visit our website or contact Thorlabs 13.

The electrical connectors and the ON/OFF slider are located on the side walls of the housing for easy access and to minimize the thickness of the PDA20C2 so it can fit into tight spaces.

3.2 Operation

- Mount 3 the detector using the combi-thread mounting holes on the side and bottom of the device.
- Connect the detector to the power supply and data acquisition device following the steps in section Preparation 2.

  Attention

  Ensure that the correct mains voltage is selected on the power supply prior to connecting the power supply to the mains power. Wrong settings for the mains voltage may damage the power supply.
- Move the power slider to I. The green LED on the PDA20C2 indicates the correct power supply.
- Align the light source with the optical input. The max V_{out} is 10.0 V for high impedance loads (3.5 V for 50 Ω loads). To avoid electrical saturation, keep the output voltage below this maximum listed in the Technical Data 7. External neutral density filters or attenuators are recommended to reduce the input light level in critical cases.
- Move the power slider to O after finishing the measurements.

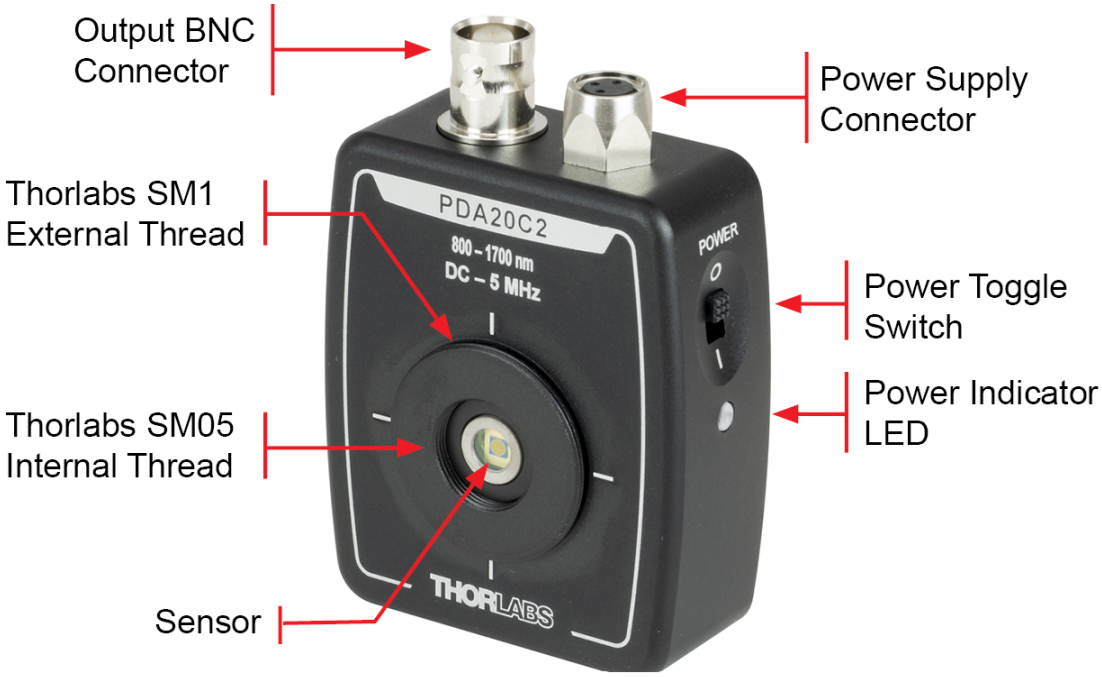
3.3 Operating Principle

In principle, the photodiode generates a current in response to the optical input. The TIA then converts the current to a voltage and amplifies the signal, reaching a frequency response from true DC to the cutoff frequency. The fixed gain amplifies the signal to 3.5 V at 50 Ω.

The output is passed through a 50 Ω series resistor before reaching the output connector. The user can apply either a 50 Ω or high-impedance external load depending on the situation.

The PDA20C2 is powered by an external power supply (±12 V, 200 mA) with switchable 100 V, 120 V or 230 V line voltage. The power supply is connected to the PDA20C2 via a 250 mA, LUMBERG RSMV3 connector.

3.3.1 Operating Elements



The PDA20C2 comes with a SM1T1 SM1 coupler which holds a SM1RR retaining ring and a protective plastic cover cap.

3.3.2 Optical Input

For maximum linearity performance when measuring focused beams, fiber outputs, or small diameter beams, do not exceed a maximum intensity of 10 mW/cm^2.

Note

For optical alignment, use an optical input power below the saturation power while observing the output voltage on a low-frequency measurement device such as a digital voltmeter.

Note

The maximum output of the PDA20C2 is 10 V for high-impedance loads and 3.5 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.

The PDA20C2 housing features internal SM05 and external SM1 threads for convenient mounting of lens tubes or cage systems.

3.3.3 Electrical Output

Thorlabs PDA20C2 photodetectors deliver an OUTPUT voltage that is a function of incident light power P_{opt}, the detector's responsivity $\Re(\lambda)$ at a given wavelength, and the transimpedance gain G:

$$V_{out} = P_{opt} \times \Re(\lambda) \times G$$

The detector's responsivity $\Re(\lambda)$ for a given wavelength can be read from the spectral responsivity curve (see Appendix 8).

The maximum output of the PDA20C2 is 10 V for high-impedance loads and 3.5 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.

4 Maintenance and Service

Protect the PDA20C2 from adverse weather conditions. The PDA20C2 is not water resistant. The unit does not require regular maintenance by the user. There are no serviceable parts in the PDA20C2 optical head or power supply. The housing may be cleaned by wiping with a soft, damp cloth. Do not remove covers!

If you suspect a problem with your PDA20C2, please read the section Safety 10 and contact Thorlabs 13 tech support and an engineer will be happy to assist you.

Attention

The window of the detector should only be cleaned using optical grade wipes.

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

5 Appendix

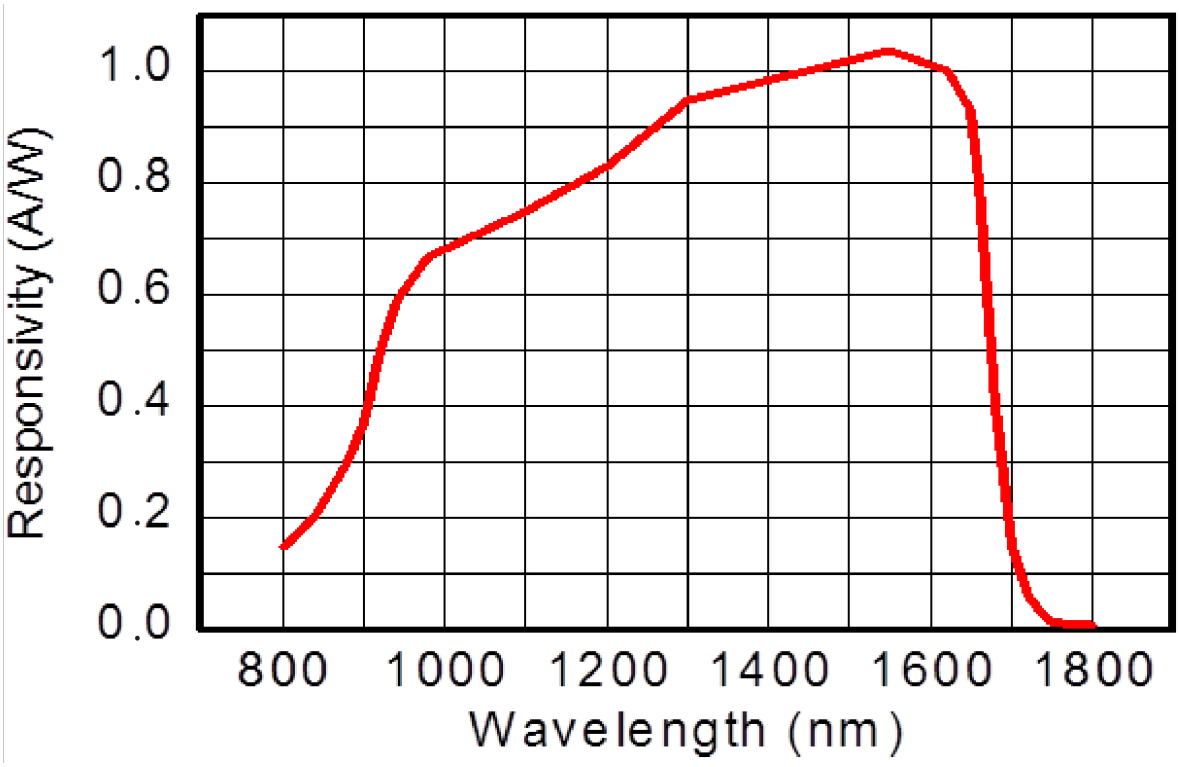
5.1 Technical Data

Electrical Specification	
Detector	InGaAs
Active Area	Ø2.0mm
Wavelength Range	800 - 1700 nm
Peak Responsivity	1 A/W @ 1550 nm
Bandwidth	DC to 5.0 (± 0.2) MHz
NEP	22 pW / √Hz
Noise (RMS)	11 mV
Dark Offset (max.)	±25 mV
Output Voltage Hi-Z 50 Ω	 0 to 10.0 V 0 to 3.5 V
Transimpedance Gain Hi-Z 50 Ω	 500 kV/A 175 kV/A
General	
On / Off Switch	Slide
Output	BNC
Dimensions of Housing	70.9 mm x 49.9 mm x 20.3 mm (2.79” x 1.96” x 0.80”)
Weight (detector w/o power supply)	0.06 kg
Operating Temperature Range	10°C to 50°C
Storage Temperature Range	-25°C to 70°C [1])
Power Supply Input Output	 100 VAC, 120 VAC, 230 VAC, switchable 50-60 Hz, 5 VA, + 12 / -12 VDC

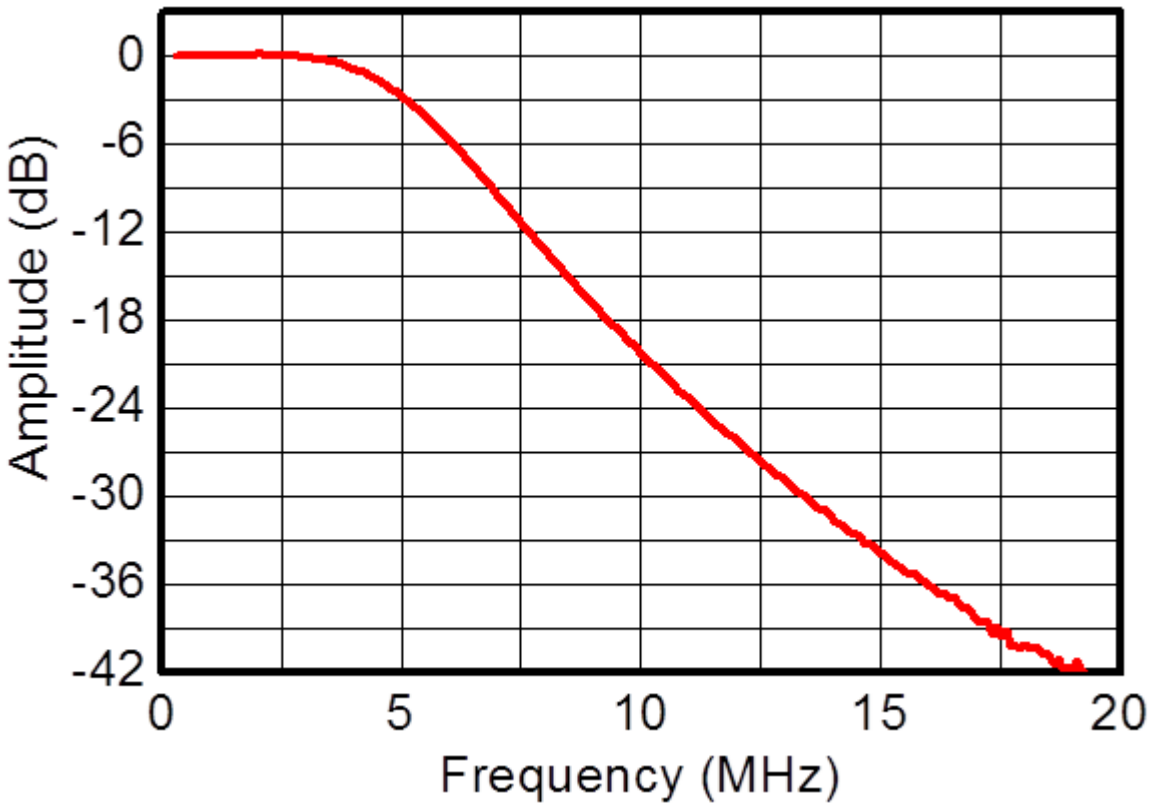
[1]) non-condensing

All technical data are valid at 23 ± 5°C and 45 ± 15% rel. humidity (non condensing).
All measurements performed with 50 Ω load unless stated otherwise.

5.2 Typical Resonsivity and Detectivity

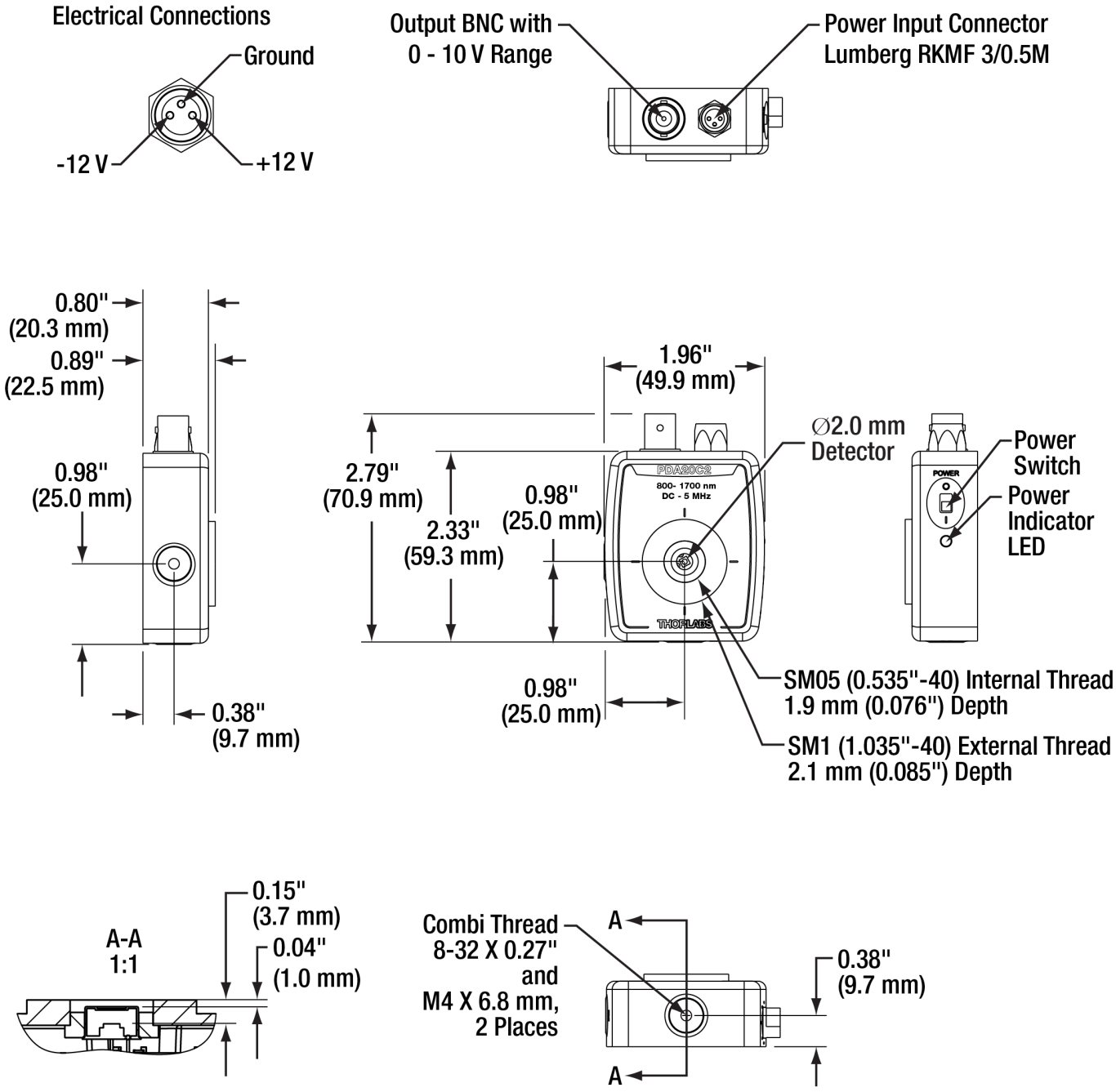


Spectral Resposivity



Frequency Response

5.3 Drawings


Electrical Connections
Ground
-12 V
+12 V
Output BNC with
0 - 10 V Range
Power Input Connector
Lumberg RKMF 3/0.5M
0.80"
(20.3 mm)
0.89"
(22.5 mm)
0.98"
(25.0 mm)
0.38"
(9.7 mm)
1.96"
(49.9 mm)
2.79"
(70.9 mm)
2.33"
(59.3 mm)
0.98"
(25.0 mm)
0.98"
(25.0 mm)
PDA20C2
800- 1700 nm
DC - 5 MHz
THORLABS
∅2.0 mm
Detector
POWER
Power
Switch
Power
Indicator
LED
SM05 (0.535"-40) Internal Thread
1.9 mm (0.076") Depth
SM1 (1.035"-40) External Thread
2.1 mm (0.085") Depth
A-A
1:1
0.15"
(3.7 mm)
0.04"
(1.0 mm)
Combi Thread
8-32 X 0.27"
and
M4 X 6.8 mm,
2 Places
A
A
0.38"
(9.7 mm)

5.4 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 PDA20C2 must not be operated in explosion endangered environments.

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 insert that holds the enclosed devices. 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 GmbH be used without written consent from Thorlabs GmbH.

Attention

Prior to applying power to the PDA20C2, 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!

Ensure that the line voltage setting of the fuse holder at the rear panel agrees with your local supply and that the corresponding fuses are inserted. If not, please change the line voltage setting (see section Preparation 2).

To avoid risk of fire, only the appropriate fuses for the corresponding line voltage must be used.

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

Users that change or modify the product described in this manual in a way not expressly approved by Thorlabs GmbH (party responsible for compliance) could void the user's authority to operate the equipment.

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.

5.5 Certifications and Compliances

EU Declaration of Conformity

in accordance with EN ISO 17050-1:2010

We: Thorlabs GmbH

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

in accordance with the following Directive(s):

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

hereby declare that:

Model: ***PDAVJ5/8/10, PDA20C2, PDA8A2, PDF10A2, PDF10C2***

Equipment: ***Variable-/ Fixed Gain Amplified Detector***

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

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

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

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

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

Signed:  *On:* 12 November 2018

Name: Bruno Gross

Position: General Manager

EDC - PDAVJ5/8/10, PDA20C2, PDA8A2, P...

CE

5.6 Warranty

Thorlabs GmbH warrants material and production of the PDA20C2 for a period of 24 months starting with the date of shipment. During this warranty period Thorlabs GmbH 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 GmbH. The customer will carry the shipping costs to Thorlabs GmbH, in case of warranty repairs Thorlabs GmbH 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 GmbH warrants the hard- and/or software determined by Thorlabs GmbH for this unit to operate fault-free provided that they are handled according to our requirements. However, Thorlabs GmbH 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 GmbH 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 GmbH does explicitly not warrant the usability or the economical use for certain cases of application.

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

5.7 Copyright and Exclusion of Reliability

Thorlabs GmbH 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 GmbH* result from the respective contract of sale, which also includes the complete and exclusively applicable warranty regulations. These contractual warranty regulations are neither extended nor limited by the information contained in this 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 GmbH* dealer or system installer.

5.8 Thorlabs Worldwide Contacts and WEEE policy

US

A, Canada, and South America

Thorlabs, Inc.
56 Sparta Avenue
Newton, NJ 07860
USA
Tel: 973-300-3000
Fax: 973-300-3600
www.thorlabs.com
www.thorlabs.us (West Coast)
Email: sales@thorlabs.com
Support: techsupport@thorlabs.com

UK and Ireland

Thorlabs Ltd.
1 Saint Thomas Place, Ely
Cambridgeshire CB7 4EX
United Kingdom
Tel: +44-1353-654440
Fax: +44-1353-654444
www.thorlabs.com
Email: sales.uk@thorlabs.com
Support: techsupport.uk@thorlabs.com

Europe

Thorlabs GmbH
Hans-Böckler-Str. 6
85221 Dachau
Germany
Tel: +49-8131-5956-0
Fax: +49-8131-5956-99
www.thorlabs.de
Email: europe@thorlabs.com

Scandinavia

Thorlabs Sweden AB
Bergfotsgatan 7
431 35 Mölndal
Sweden
Tel: +46-31-733-30-00
Fax: +46-31-703-40-45
www.thorlabs.com
Email: scandinavia@thorlabs.com

France

Thorlabs SAS
109, rue des Côtes
78600 Maisons-Laffitte
France
Tel: +33-970 444 844
Fax: +33-825 744 800
www.thorlabs.com
Email: sales.fr@thorlabs.com

Brazil

Thorlabs Vendas de Fotônicos Ltda.
Rua Riachuelo, 171
São Carlos, SP 13560-110
Brazil
Tel: +55-16-3413 7062
Fax: +55-16-3413 7064
www.thorlabs.com
Email: brasil@thorlabs.com

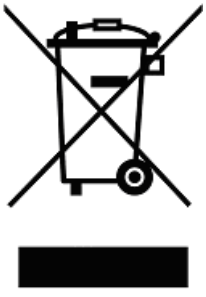
Japan

Thorlabs Japan, Inc.
3-6-3 Kitamachi
Nerima-ku, Tokyo 179-0081
Japan
Tel: +81-3-6915-7701
Fax: +81-3-6915-7716
www.thorlabs.co.jp
Email: sales@thorlabs.jp

China

Thorlabs China
Room A101, No. 100
Lane 2891, South Qilianshan Road
Putuo District
Shanghai 200331
China
Tel: +86-21-60561122
Fax: +86-21-32513480
www.thorlabs.com
Email: chinasales@thorlabs.com

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.



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