THORLABS

Adjustable Gain Avalanche Photodetectors

APD410x Operation Manual

2020

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Contents

We aim to develop and produce the best solution for your application in the field of optical measurement technique. To help us to live up to your expectations and constantly improve our products permanently we need your ideas and suggestions. Therefore, please let us know about possible criticism or ideas. 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 Thorlabs APD410x series of temperature-compensated Avalanche Photodetectors combine a high sensitivity Si or InGaAs Avalanche Photodiode with a specially designed ultra-low noise transimpedance amplifier for detection of optical signals from DC to 10 MHz.

APD410x series Avalanche Photodetectors have an exceptionally low NEP, making them ideal for fast low-level light detection applications, such as spectroscopy, fluorescence measurements, laser radar and optical rangefinders. Due to their very high sensitivity, the APD410x series Avalanche Photodetectors can replace Photomultiplier Tubes (PMT) in many applications. The Avalanche Photodetectors cannot be damaged by unwanted ambient light, which is an advantage over many photomultiplier tubes.

The APD410x feature a continuously adjustable Gain that is based on the adjustment of the APD's M (multiplication) factor. They also incorporate a special electronic circuit to compensate for the temperature dependency of the M factor.

The slim line housing includes a removable threaded coupler that is compatible with any of Thorlabs 1" and ½" threaded accessories. This allows convenient mounting of external optics, filters, apertures or fiber adapters. The APD410x has three tapped mounting holes.

The APD410x series is powered by the included external power supply LDS12B (±12 VDC, 250 mA) via a PICO M8 power connector. The appropriate input voltage (100 VAC, 120 VAC, 230 VAC) can be selected with a switch on the power supply 5.

1.1 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 APD410x must not be operated in explosion endangered environments!

Do not obstruct the air ventilation slots in the housing!

Do not remove covers!

Do not open the cabinet.There are no parts serviceable by the operator inside!

This precision device is only serviceable if properly packed into the complete original packaging including the plastic foam sleeves. If necessary, ask for replacement packaging. Refer servicing to qualified personnel!

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

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).

1.2 Ordering Codes and Accessories

APD410A2	Temperature Compensated, Adjustable Gain Avalanche Photodetector, UV-enhanced Silicon APD, 200 - 1000 nm, 8-32 mounting holes
APD410A2/M	Temperature Compensated, Adjustable Gain Avalanche Photodetector, UV-enhanced Silicon APD, 200 - 1000 nm, M4 mounting holes
APD410A	Temperature Compensated, Adjustable Gain Avalanche Photodetector, Silicon APD, 400 - 1000 nm, 8-32 mounting holes
APD410A/M	Temperature Compensated, Adjustable Gain Avalanche Photodetector, Silicon APD, 400 - 1000 nm, M4 mounting holes
APD410C	Temperature Compensated, Adjustable Gain Avalanche Photodetector, InGaAs APD, 900 - 1700 nm, 8-32 mounting holes
APD410C/M	Temperature Compensated, Adjustable Gain Avalanche Photodetector, InGaAs APD, 900 - 1700 nm, M4 mounting holes

AC-coupled versions as well as open detector versions (detector cover glass removed) of each model can be ordered on request.

2 Getting Started

2.1 Parts List

Inspect the shipping container for damage.

If the shipping container seems to be damaged, keep it until you have inspected the contents and you have inspected the APD410x mechanically and electrically.

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

1. **APD410x** Temperature-Compensated Variable Gain Avalanche Photodetector
2. SM1CP1 Metal cover cap
3. LDS12B Power Supply (±12V, 250 mA), 100 VAC, 120 VAC or 230 VAC line voltage
4. Operation manual

2.2 Preparation

Note

Prior to operation, please check if the indicated line voltage range on the power supply matches with your local mains voltage!

Note

If you want to use your own power supply, you can ask Thorlabs for an appropriate power connector cable.

- Carefully unpack the unit and accessories. If any damage is noticed, do not use the unit. Call Thorlabs and have us replace the defective unit.
- If necessary, mount the unit on your optical table or application. The unit has three tapped mounting holes (see section Mounting 8 for details).
- Remove the metal cover cap that protects the optical input.
- If necessary, mount external optics, filters, apertures or fiber adapters.
- Adjust the power supply to accommodate your local mains voltage (100 VAC, 120 VAC or 230 VAC).

- Plug the power connector cable into the POWER IN.
- Plug the power supply into a outlet.
- Switch on the power supply
- Connect OUTPUT to your data acquisition device with a coaxial cable. Please note that a 50 Ω impedance device should be used for best RF performance.

3 Operating Instruction

3.1 Operating Principle

The Thorlabs APD410x series of temperature-compensated, variable gain Avalanche Photodetectors combine a high sensitivity Si or InGaAs Avalanche Photodiode with a specially designed ultra-low noise transimpedance amplifier for detection of optical signals from DC to 10 MHz. The buffered output stage can deliver up to 2.0 V into a 50 Ω impedance load. No external high voltage power supply is required for operation.

APD410x series Avalanche Photodetectors have an exceptionally low NEP, making them ideal for fast low-level light detection applications, such as spectroscopy, fluorescence measurements, laser radar and optical rangefinders. Due to their very high sensitivity the APD410x series Avalanche Photodetectors can replace Photomultiplier Tubes (PMT) in many applications. The Avalanche Photodetectors cannot be damaged by unwanted ambient light, which is critical for many Photomultiplier Tubes.

Avalanche Photodiodes use an internal gain mechanism to increase the sensitivity. Incident photons generate electron-hole pairs, like in a normal photo diode. By applying a high reverse voltage, a strong electric field appears that accelerates these electrons and produces secondary electrons by impact ionization. This leads to an electron avalanche producing gain factors of up to several hundreds. The amplification depends on the reverse bias voltage and is described by the M (multiplication) factor. Due to internal processes, the M factor is temperature dependent. At a fixed reverse bias voltage the M factor will change with temperature: in general, with lower temperatures the M factor will increase, with higher temperatures - decrease.

The APD410x series Avalanche Photodetectors are temperature-compensated. A thermistor senses the temperature inside the APD410x enclosure, and a special electronic circuit controls the applied to the APD reverse voltage in accordance with the temperature change. As the M (multiplication) factor depends on the applied reverse voltage, the temperature dependency of the M factor can reduced drastically.

These detectors have a rotary **GAIN** knob that allows the reverse bias voltage of the avalanche photodiode to be adjusted within a certain range, resulting in a variation of the M (multiplication) factor that is equivalent to a gain variation.

The APD410x Series is powered by the included external power supply (±12 V, 250 mA) via a PICO M8 power connector.

3.1.1 Optical Input

The APD410C uses an InGaAs Avalanche Photodiode with a detector active area diameter of 0.2 mm, operating from 900 to 1700 nm nm.

The APD410A uses a Silicon Avalanche Photodiode with a detector active area diameter of 1 mm, operating from 400 to 1000 nm.

The APD410A2 uses an UV-enhanced Silicon Avalanche Photodiode with a detector active area diameter of 0.5 mm, operating from 200 to 1000 nm.

The typical responsivity curves can be found in the appendix 13.

An open beam should be carefully aligned to the detector. Additional focusing lenses can be easily attached to the Avalanche Photodetectors. The housing is compatible with any number of Thorlabs 1” and ½” threaded accessories. This allows convenient mounting of external optics, filters, apertures or fiber adapters.

For fiber coupled applications, in order to meet specifications, it is recommended to focus the optical signal out of the fiber onto the detector. Details please see in the appendix 22.

Please note, that coupling losses may occur due to small detector size, which will result in a reduced output signal. If angled connectors are used the fiber adapter can be rotated from its original position to check for an improved alignment. For this process use an optical input power below the saturation power while observing OUTPUT voltage on a digital voltmeter or other low-frequency measurement device.

The maximum OUTPUT voltage swing is 4.1 V at High-Z termination. Saturation of the OUTPUT will occur at optical input power greater than CW Saturation Power listed in specifications 12. If necessary, use external neutral density filters or attenuators to reduce the input light level. Please note that the Avalanche Photodetectors are extremely sensitive to unwanted stray light. Carefully shielding of the Avalanche Photodetectors from any unwanted light sources is essential. Common techniques to minimize the influence of stray light include baffling or other opaque barriers like black cloths, beam tubes or using appropriate band pass filters in front of the detector.

Attention
The optical damage threshold is 1 mW. Exceeding this value will permanently destroy the Avalanche Photodetector!

3.1.2 Electrical Output

Thorlabs APD410x Avalanche Photodetectors deliver an OUTPUT voltage, which is a function of incident light power P_{opt}, detector's responsivity $\Re_M(\lambda)$ at a given wavelength and M factor (see Typical Detector Responsivity Curves 13), and transimpedance gain G:

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

- $\Re_M(\lambda)$ for a given wavelength can be read from the spectral responsivity curves (see Technical Data 13) to estimate the OUTPUT voltage.The M factor (gain) settings range is 10 to 100 (APD410A), 5 to 50 (APD410A2) and 4 to 20 for APD410C at 23°C ambient temperature.
- The amplifier's transimpedance gain G is 500 kV/A. Please note that OUTPUT voltage is reduced by a factor of 0.5 if connected to a 50 Ω load.

The maximum output voltage swing of OUTPUT is 4.1 V for high impedance loads (2.0 V into 50 Ω). Depending on the wavelength responsivity $\Re(\lambda)$ of the detector and the M factor, the amplifier will reach saturation at optical input power greater than CW Saturation Power listed in specifications. To avoid saturation, keep the output signal below the specified maximum output voltage.

The output of the APD410x Avalanche Photodetectors is a BNC connector.

The amplifier offset voltage is factory set to zero at 23°C ambient temperature. Due to the very high transimpedance gain, small temperature changes may affect offset voltage. Therefore it is recommended to use the Avalanche Photodetectors in a constant temperature environment after a short warm up period (~5 min) for exact DC light level measurements.

In the appendix, typical curves for Output Frequency Response 15 and Spectral Noise Distribution 17 can be found.

3.2 Mounting

The APD410x series is housed in a rugged 2 x 2.5 x 1 inch shielded aluminum enclosure. The slim line housing comes with a removable threaded coupler that is compatible with any number of Thorlabs 1" and ½" threaded accessories. This allows convenient mounting of external optics, filters, apertures or fiber adapters, as well as providing an easy mounting mechanism using the Thorlabs cage assembly accessories. The electrical connectors, the optical gain adjustment knob and the ON/OFF switch are conveniently located on the side walls of the housing for easy access and to minimize the thickness of the Avalanche Photodetector so it can fit into tight spaces. For maximum flexibility the APD410x has three 8-32 (M4 for metric version) tapped mounting holes to mount the unit to a post or pedestal.

3.3 Operation

- Turn the power switch to **I**. The green LED on the APD410x indicates correct power supply.
- Set the **Gain** knob to its MIN position.
- Adjust the optical source to the optical input. The maximum OUTPUT voltage swing is 4.1 V for high impedance loads (2.0 V into 50 Ω loads). The output signal must not exceed this maximum output voltage to avoid saturation. External neutral density filters or attenuators are recommended to reduce the input light level in critical cases.
- The **Gain** adjustment can be used for setting the output voltage to an appropriate value.

  Note

  APDs generate noise due to the multiplication process, so excess noise increases as the gain is increased. Similarly, the photocurrent generated by signal light is also amplified by the gain. These facts mean that the best S/N exists at a certain gain. [1] 26
- Turn the power switch to **O** when you are finished the measurements.

Note

Avoid saturating the amplifier! Therefore, make sure that the optical input power does not exceed the saturation power level listed in specifications 12.

Attention

Exceeding the optical damage threshold input power will permanently destroy the detector!

3.4 Recommendations

Please always remember that the Avalanche Photodetectors are extremely sensitive devices. Carefully shielding the Avalanche Photodetectors from any unwanted light sources is essential. Common techniques include baffling or other opaque barriers like black cloths or lens tubes.

It is highly recommended to use appropriate band pass filters in front of the detector to minimize the influence of stray light.

Since stray light has its strongest frequencies at DC and line frequency or harmonics, optical chopping and Lock-In detection can further improve measurement sensitivity.

It is not necessary to switch off the Avalanche Photodetectors when it is exposed to ambient light. The amplifier will saturate but unlike Photomultiplier Tubes it will not be damaged or saturated for a long period of time.

Another critical point can be electrostatic coupling of electrical noise associated with ground loops. In most cases an electrically isolated post (see Thorlabs parts TRE or TRE/M) will suppress electrical noise coupling. You should always try to identify the electrical noise sources and increase the distance to the Avalanche Photodetector. If possible, you can also rotate the Avalanche Photodetector input away from the noise source. Different common ground points can also be tested.

The **amplifier offset voltage** is factory set to zero at 23°C ambient temperature. Due to the very high transimpedance gain, even small temperature changes may affect offset voltage. Therefore it is recommended to use the Avalanche Photodetector in a constant temperature environment after a short warm up period (~5min) for exact DC light level measurements. The output offset voltage is dependent on the M factor. As the intrinsic noise of InGaAs APD is significant higher than Si APDs, it causes a higher impact on the output offset voltage.

The **M factor** is factory set at 23°C ambient temperature. The APD410x are operated at an internal reverse bias voltage that is temperature-compensated, and their actual M factor will remain nearly constant within the specified ambient temperature range of (23±5) °C.

It is recommended to set the **GAIN** to minimum before applying the optical signal to the APD410x. This is the condition when the APD410x is most insensitve and can tolerate its highest optical input level.

For any level of the optical input signal there is an optimal M factor that provides the best SNR (Signal-to-Noise Ratio). To change the M factor, turn the **GAIN** knob on the side panel.

A non-linearity caused by intrinsic effects of the APD may appear at a too high power, as well as at a too high power density (too small beam diameter) on the APD chip.

4 Maintenance and Service

Protect the APD410x from adverse weather conditions. The APD410x 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 for return instructions.

Do not remove covers! High voltage!

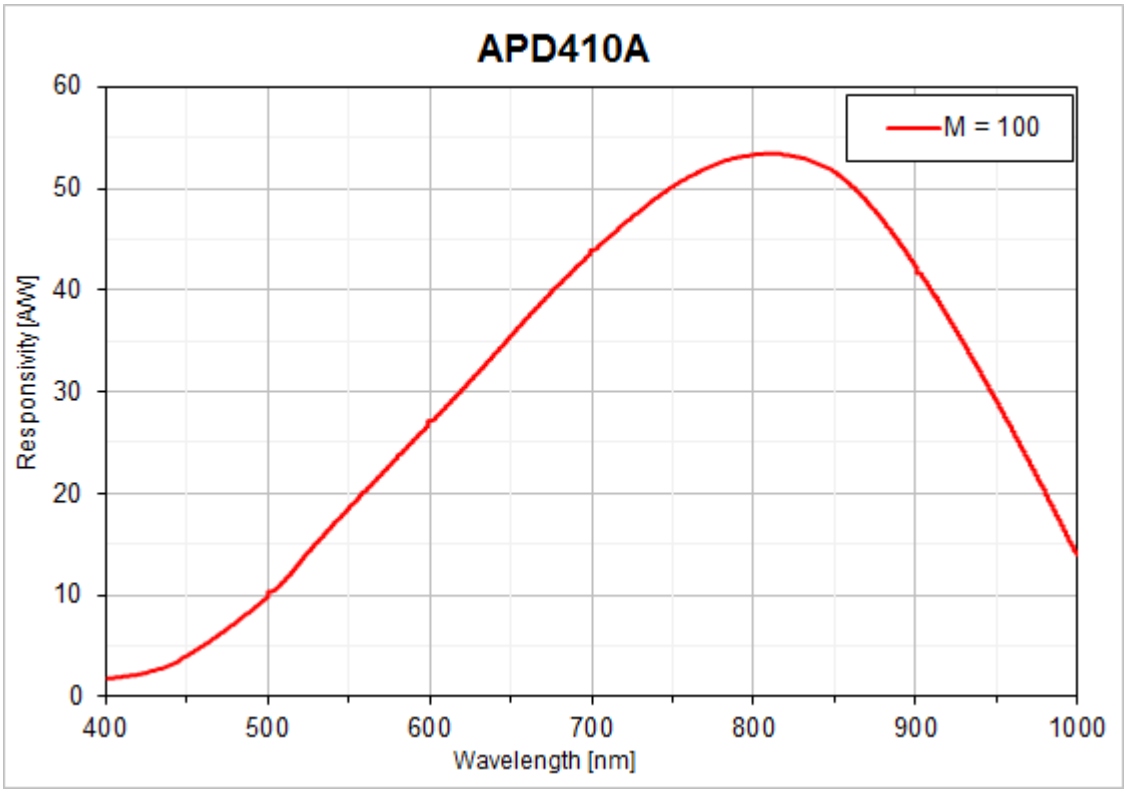
5 Appendix

5.1 Technical Data

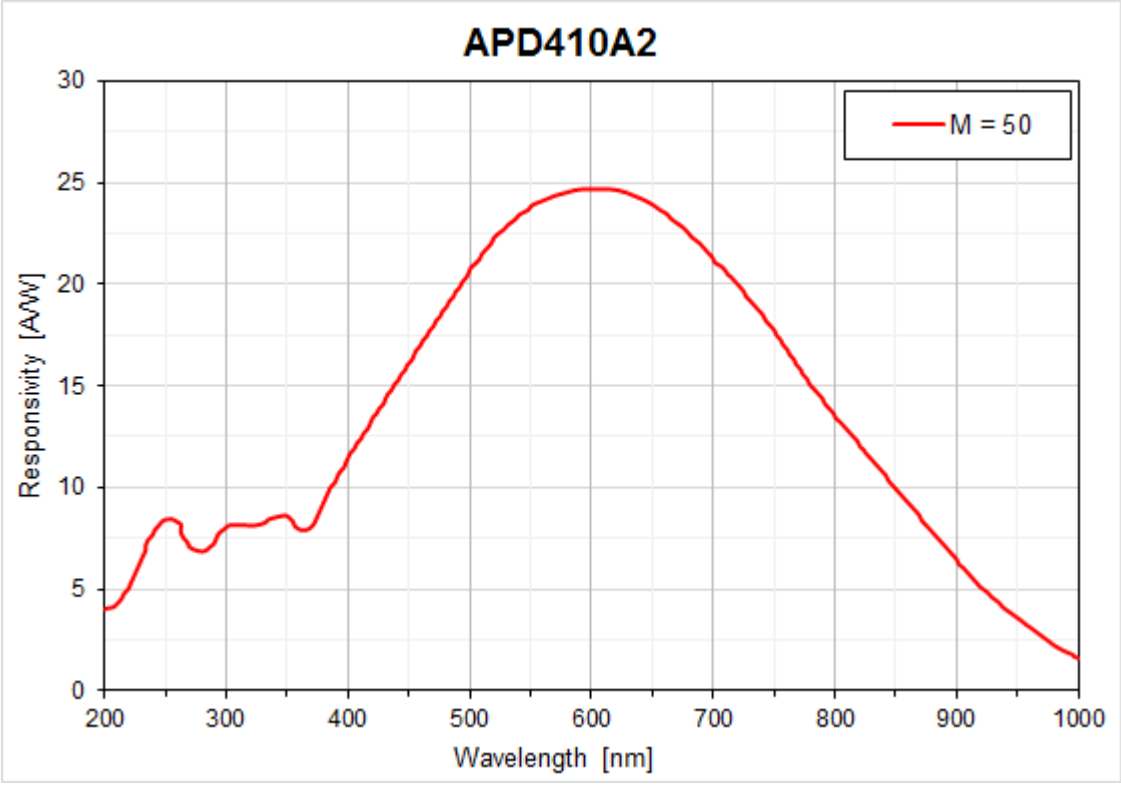
	APD410A	APD410A2	APD410C
Parameter			
Detector Material/Type	Silicon APD	UV-enhanced Silicon APD	InGaAs APD
Wavelength Range	400 to 1000 nm	200 to 1000 nm	900 to 1700 nm
Maximum APD Responsivity	53 A/W @ 800 nm, M = 100	25 A/W @ 600 nm, M = 50	18 A/W @ 1550 nm, M=20
M Factor Temperature Stability [1])	typ. ± 2 %; max. ± 3 %		
Detector Active Area Diameter	1.0 mm	0.5 mm	0.2 mm
Transimpedance Gain	500 kV/A 250 kV/A with 50 Ω Termination		
Maximum Conversion Gain	26.5 x 10^6 V/W	12.5 x 10^6 V/W	9.0 x 10^6 V/W
OUTPUT Bandwidth (3 dB) [2])	DC to 10 MHz		
CW Saturation Power	0.15 µW @ 800 nm (M = 100) 1.5 µW @ 800 nm (M = 10)	0.32 µW @ 600 nm (M = 50) 3.2 µW @ 600 nm (M = 5)	0.45 µW @ 1550 nm (M = 20) 2.25 µW @ 1550 nm (M = 4)
Maximum Input Power (Photodiode Damage Threshold)	1 mW		
M Factor Adjustment Range	10 to 100	5 to 50	4 to 20
Minimum NEP (DC - 10 MHz)	0.04 pW / √ Hz	0.09 pW / √ Hz	0.12 pW / √ Hz
Integrated Noise (DC - 10 MHz)	0.13 nW (RMS)	0.28 nW (RMS)	0.38 nW (RMS)
Electrical Output, Impedance	BNC, 50 Ω		
Maximum Output Voltage	4.1 V (High Z load) 2.0 V (50 Ω)		
DC-Offset Electrical Output	< ±3 mV		< ±25 mV
Power Supply	±12 V, 250 mA (100 V,120 V,230 V switchable)		
General			
Operating Temperature Range [3])	0 to 40 °C		
Storage Temperature Range	-40 to 70 °C		
Dimensions (W x H x D)	2 x 2.5 x 1" (50.8 x 63.5 x 25.4 mm^3)		
Weight	< 0.1 kg		

[1]) Ambient temperature within (23 ± 5)°C
[2]) At maximum gain setting.
[3]) Non-condensing
All technical data are valid at (23 ± 5) °C and (45 ± 15) % rel. humidity (non condensing)

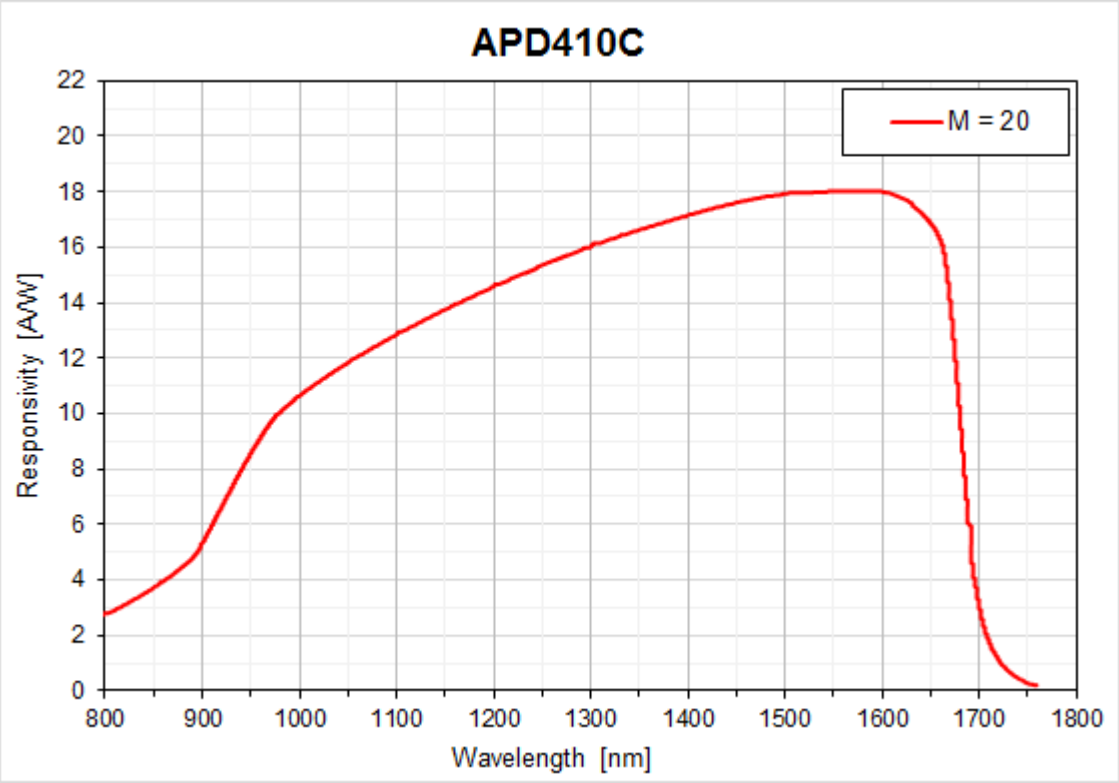
5.2 Typical Detector Responsivity Curves



Typical Detector Responsivity APD410A; M = 100



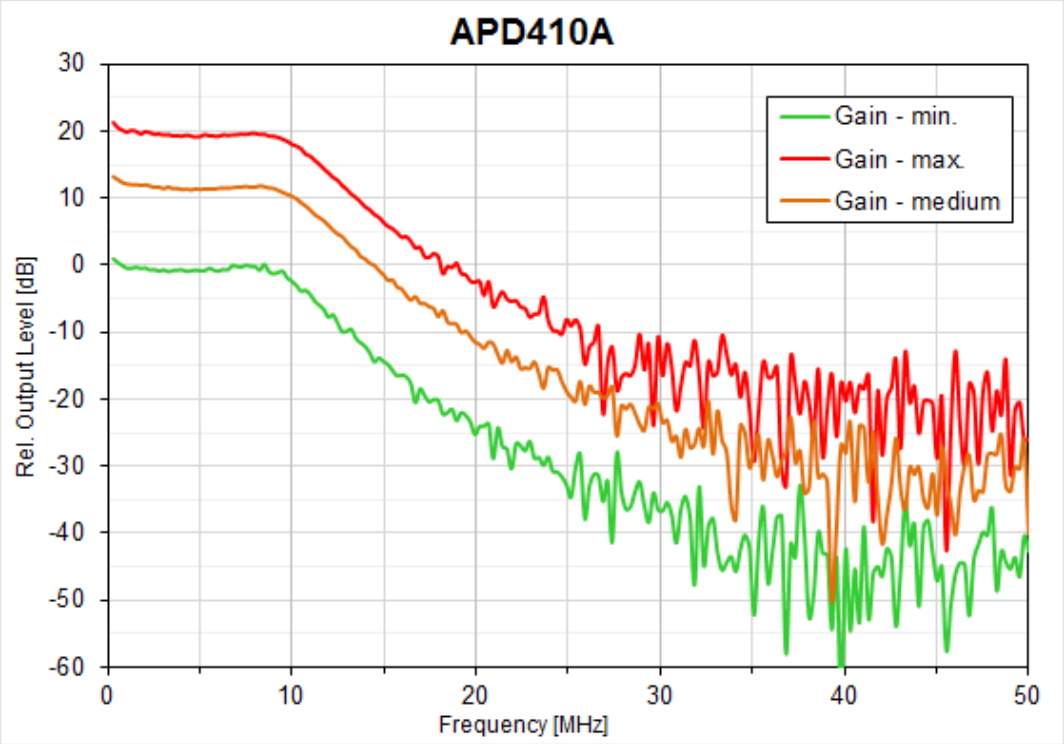
Typical Detector Responsivity APD410A2; M = 50



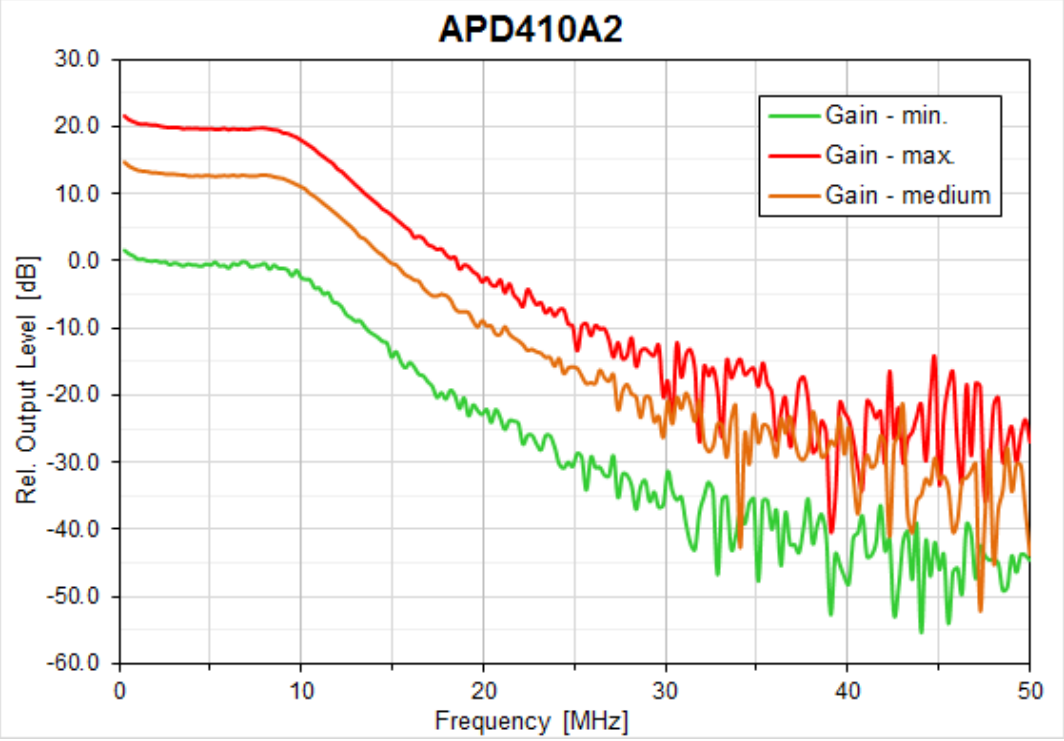
Typical Detector Responsivity APD410C; M = 20

5.3 Typical Output Frequency Response

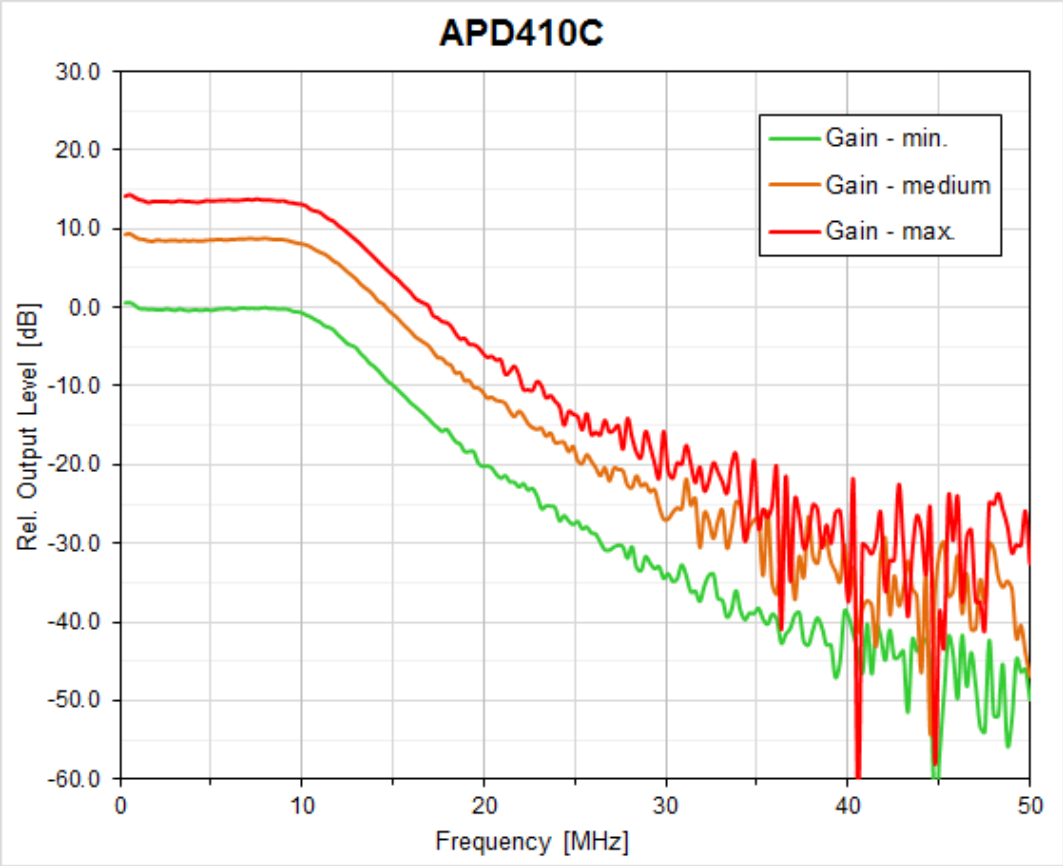
For this measurement a test signal, generated by an optical transmitter, was fiber-coupled to the Avalanche Photodetector. The OUTPUT frequency response was measured using a optical network analyzer.



Typical Output Frequency Response APD410A



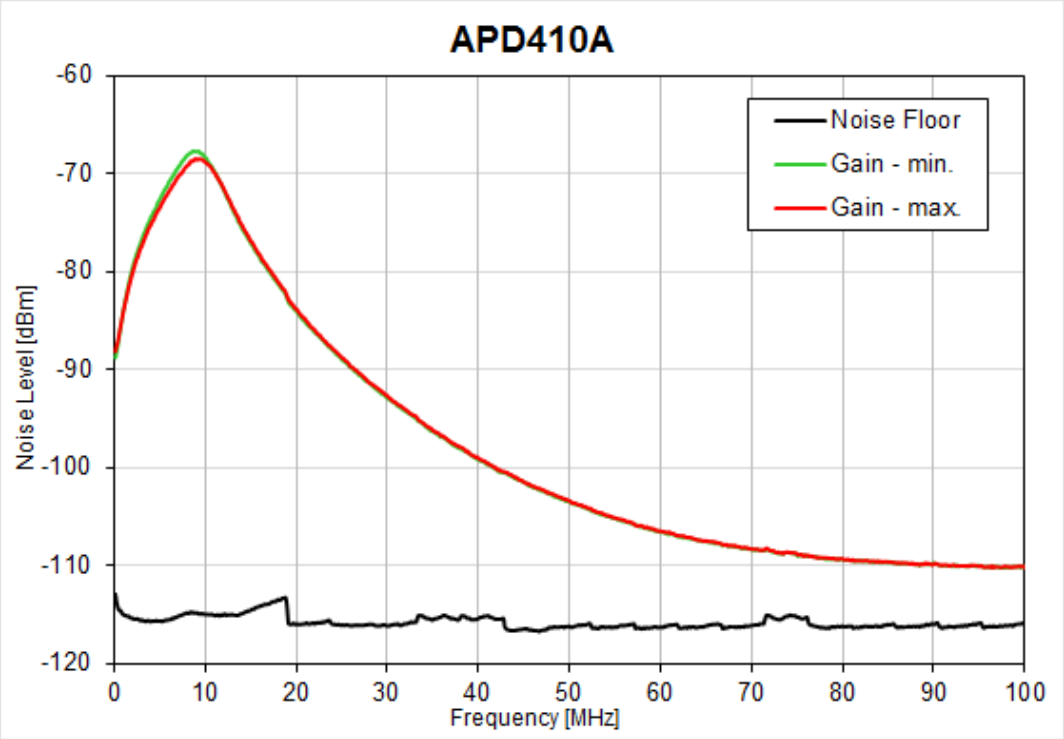
Typical Output Frequency Response APD410A2



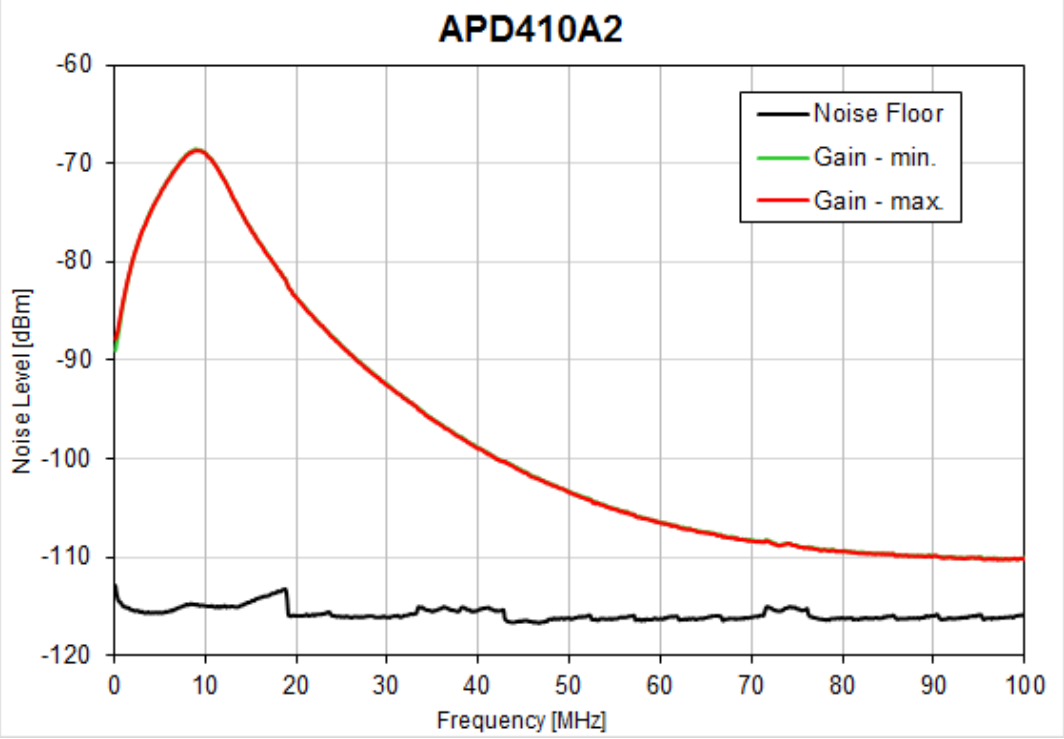
Typical Output Frequency Response APD410C

5.4 Typical Spectral Noise

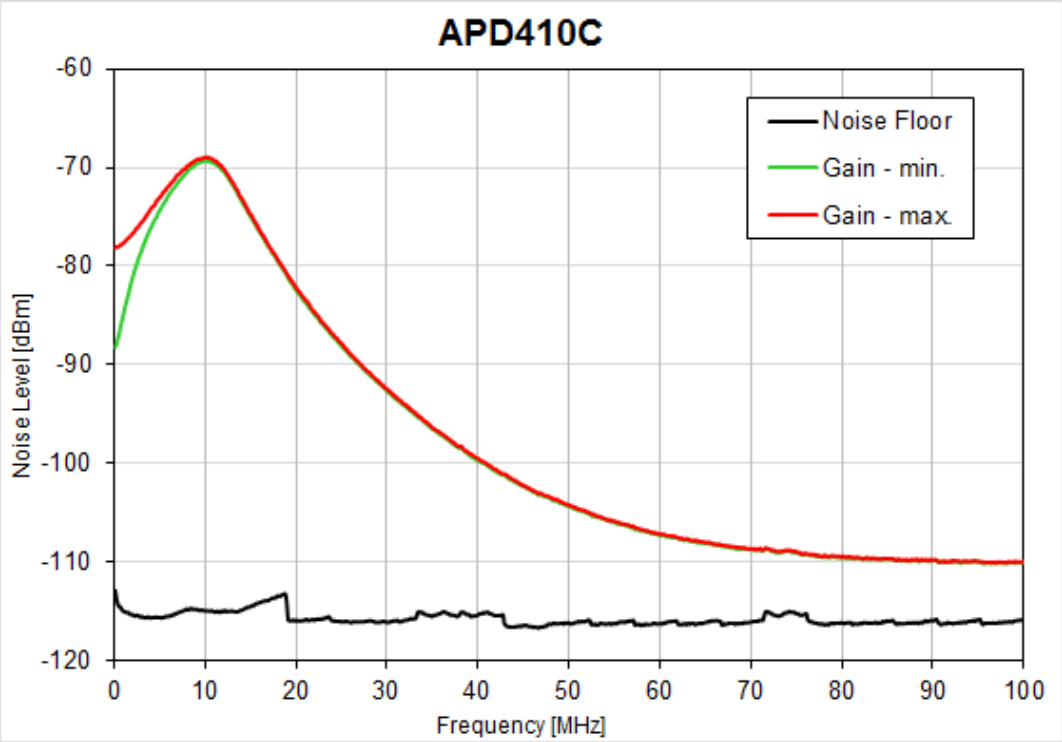
The typical noise spectrum was measured using an electrical spectrum analyzer (resolution bandwidth 10 kHz, video bandwidth 10 kHz). The optical input of the detector was blocked. The black curve ("Reference") was measured with the same setup and the detector switched off , i.e., it represents the measurement system's noise floor.



Typical Spectral Noise APD410A



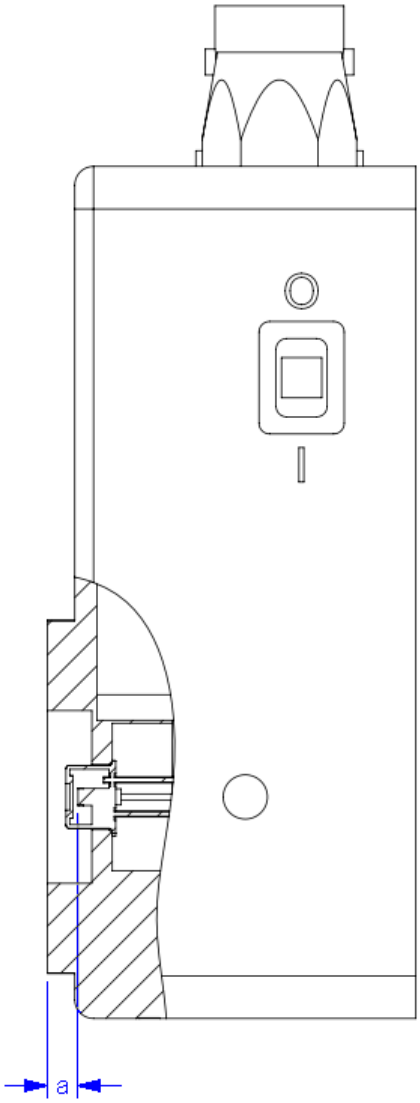
Typical Spectral Noise APD410A2



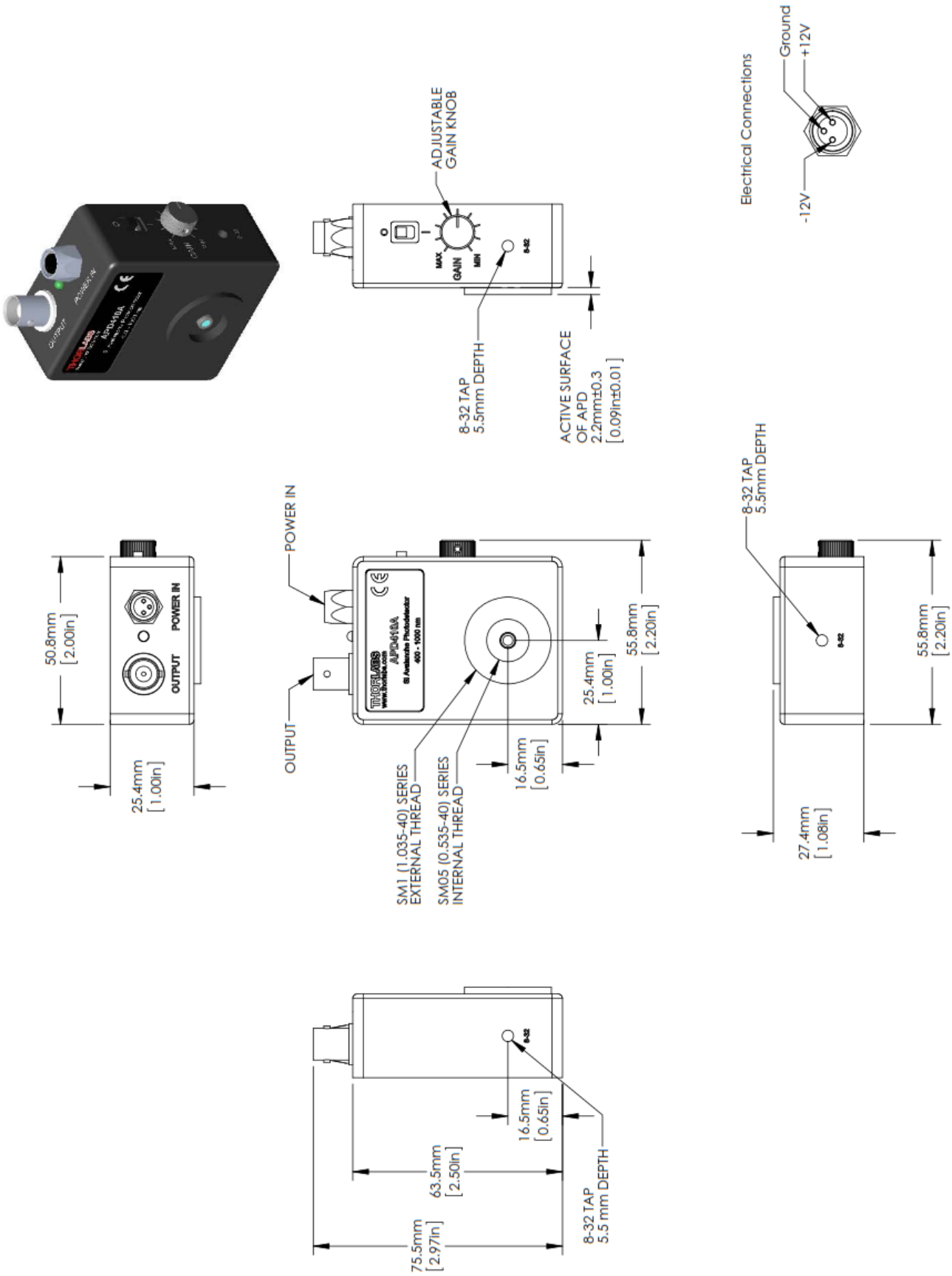
Typical Spectral Noise APD410C

5.5 Drawings

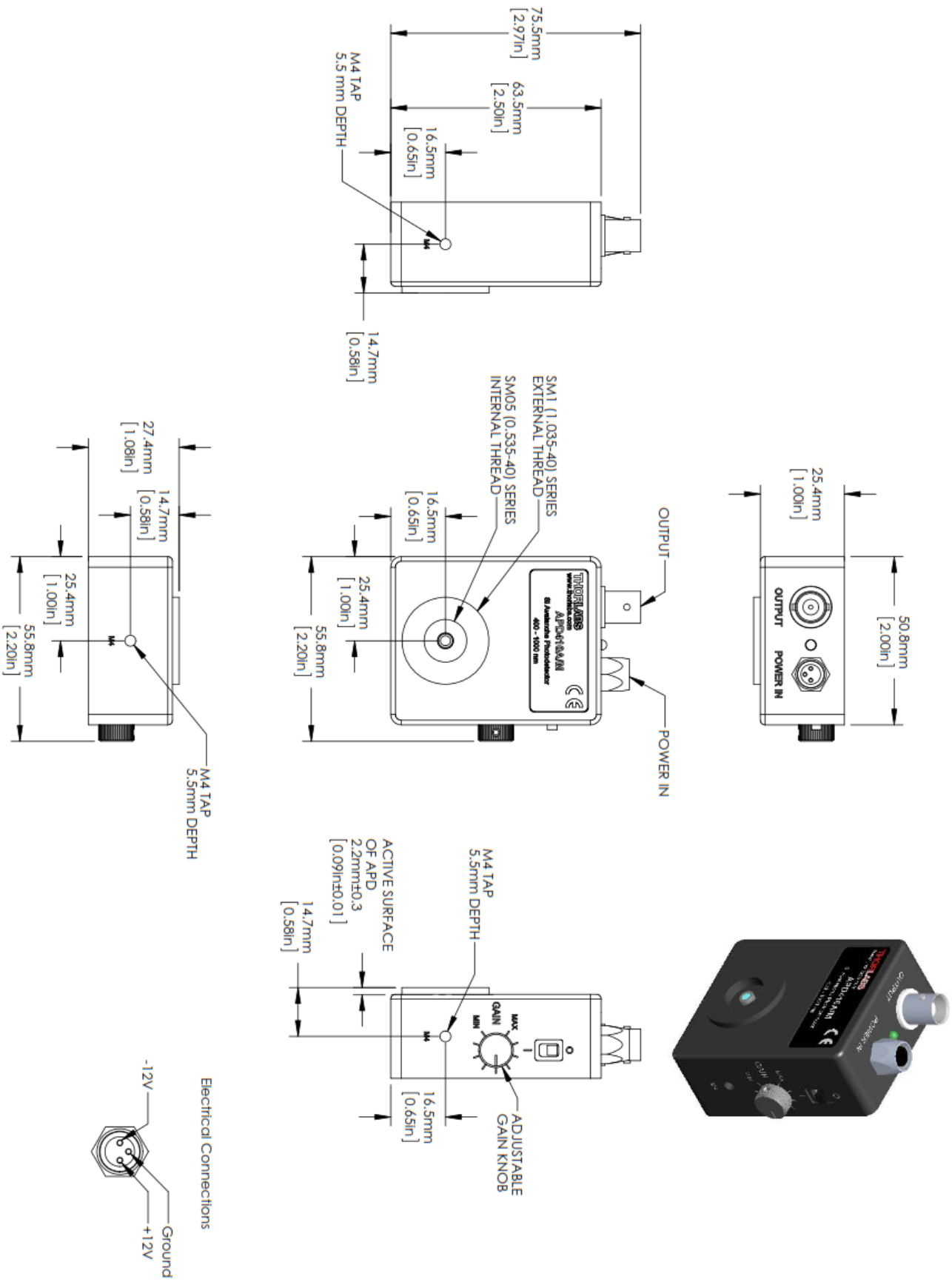
Distance between the surface of the active detector area and the front of the flange



Distance	A Type	A2 Type	C Type
a=	(2.2 ± 0.3) mm	(2.2 ± 0.3) mm	(2.1 ± 0.3) mm



Dimensions APD410X Series (Imperial)



Dimensions APD410X/M Series (Metric)

5.6 Fiber Coupling onto Small Detector Area

When coupling an optical fiber into the APD410x, please consider the beam divergence out of the fiber tip and the active detector area.

For detectors with an active area smaller than 1 mm, the beam divergence out of the fiber needs to be compensated by using a collimator and a focusing lens. Below is a possible arrangement:

The assembly in front of the APD410x comprises of a fiber collimator (dependent on fiber), a lens tube collimator adapter (AD11F or AD12F, dependent on collimator), a SM1L1 lens tube with aspheric lens inside (not visible above) and a LM1XY X-Y translation mount.

The beam out of the fiber is collimated (transferred into a nearly parallel beam) and afterwards focused by the aspheric lens onto the detector. The X-Y translation mount allows the focused beam to be aligned with the center of the sensor.

5.7 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: ***APD410x***

Equipment: ***Avalanche Photodetector***

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:* 15 November 2019

Name: Bruno Gross

Position: General Manager

EDC - APDxxxx -2019-11-15

CE

5.8 Manufacturer Address

Manufacturer Address Europe
Thorlabs GmbH
Münchner Weg 1
D-85232 Bergkirchen
Germany
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Fax: +49-8131-5956-99
www.thorlabs.de
Email: europe@thorlabs.com

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D-85232 Bergkirchen
Germany
Tel: +49-8131-5956-0
Fax: +49-8131-5956-99
www.thorlabs.de
Email: europe@thorlabs.com

5.9 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.

5.10 Warranty

Thorlabs warrants material and production of the APD410x 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.

5.11 Copyright and Exclusion of Liability

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.

5.12 List of Acronyms and References

Acronyms

AC	Alternating Current
APD	Avalanche Photo Diode
CW	Continuous Wave
DC	Direct Current
LED	Light Emitting Diode
NEP	Noise Equivalent Power
RF	Radio Frequencies
Si	Silicon
SNR	Signal-to-Noise Ratio
UV	Ultraviolet

References

[1] Hamamatsu - Technical Information SD-28

5.13 Thorlabs Worldwide Contacts and WEEE policy

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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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.

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