

# 818 Series Calibrated Photodiode Sensors

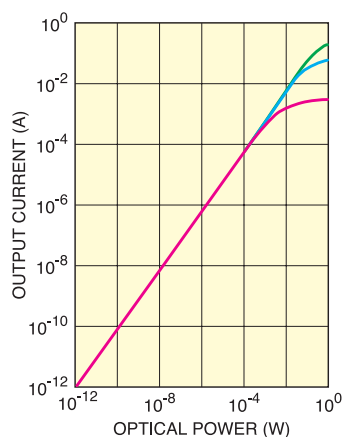


818 Series advanced free space photodiode sensors are calibrated for use with Newport power meters. They feature a removable, threaded OD3 attenuator. The sensors are ISO 17025 accredited, ensuring compliance with the highest standards of calibration and measurement accuracy. Utilizing NIST-traceable standards and calibrated with high-precision equipment these optical power detectors offer the lowest calibration uncertainty in industry.

- NIST traceable calibration with lowest uncertainty available
- Removable OD3 attenuation filter
- Detachable DB15 calibration module
- Optional screw in fiber-optic adapters for fiber power measurement

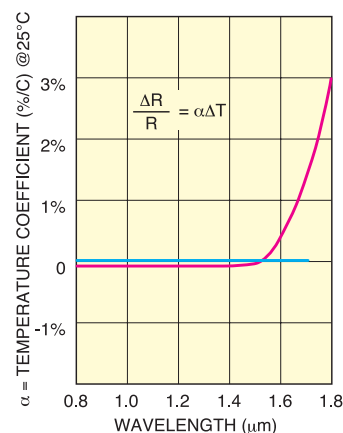


## Product Features



Linearity of photodiode response

— 818-UV, 918D-UV  
— 818-SL, 818-ST2, 918D-IS  
— 818-IR, 818-IG, 918D-IR, 918D-IG



Temperature variation of response vs. wavelength

— 818-IG, 918D-IG  
— 818-IR, 918D-IR

These photodiodes show excellent linearity over a large dynamic range. This is ideal for use in applications that require high accuracy measurements down to the pW level, especially when combined with a high sensitivity power meter that can accommodate the large dynamic range of the optical signal.

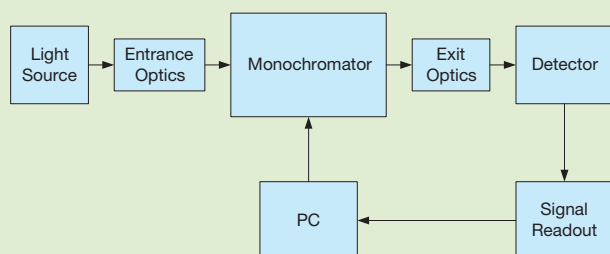
A natural characteristic of a photodiode is for its optical response to change as the temperature changes near the bandgap of semiconductor materials. Newport's 918D series sensors feature a thermocouple near the photodiode, which allows certain Newport meters to read the temperature and automatically adjust the responsivity, ensuring the most accurate measurements.

## Factors that Affect Maximum Measurable Power

The maximum measurable power of photodiode sensors is dependent on several factors such as the wavelength of incoming light, photodiode current output saturation, temperature, use of an attenuator and a power meter's maximum current input value. Newport provides maximum power specifications based on the power meter models, with and without an attenuator, and wavelength-dependent maximum power level. With these factors affecting measurable power in mind, choosing the proper detector for your application is critical.

## NIST-traceable Sensor Calibration

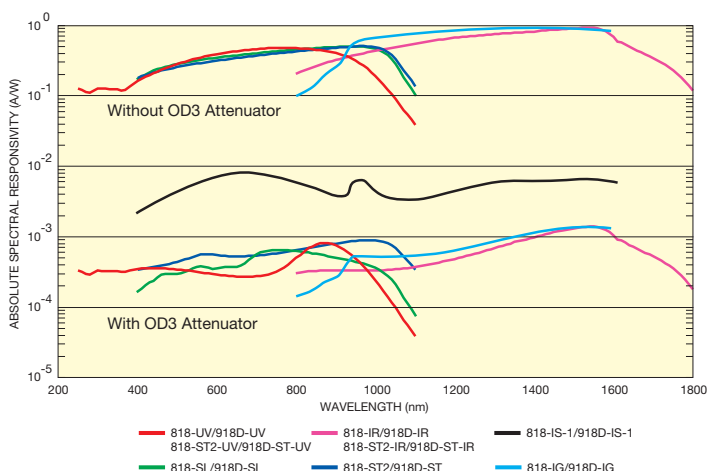
Our calibrated photodiode sensors include a full spectral response calibration utilizing NIST-traceable standards calibrated with high-precision equipment maintained in Newport's optical detector calibration facility. Tight calibration facility and process control allows the tightest calibration uncertainty in industry. Each detector is shipped with the calibration data, which is electronically stored inside the detector's EEPROM. A certificate of calibration as well as the actual calibration curves and data are shipped with each detector for attenuator and no attenuator models. To maintain accuracy and guarantee performance, Newport recommends annual photodiode detector calibration.



Detector calibration system block diagram

## Wide Dynamic Range with OD3 Attenuator

The 884 Series OD3 attenuators extend the calibrated optical dynamic range of our detectors by three decades. Both the attenuator and detector have their serial number scribed on the part which, to maintain calibration, must match. Our attenuator design provides high damage threshold and spectral flatness. With the low noise equivalent power (NEP) associated with the photodiodes being used, a wider dynamic range is achieved. The clear aperture of the 884 Series attenuators is 10.3 mm.



## Removable OD3 Attenuator

For less than 1 mW input power (or 0.1 mW for 818-UV/DB between 200-400 nm), removing the OD3 attenuator by unscrewing it from the detector head is recommended to maximize the signal-to-noise ratio.



## Removable Calibration Module

The 818 series detectors include a BNC connector with a removable calibration module. The /DB suffix indicates a DB15-style calibration module that is directly compatible with Newport's current power meters. Please order the 818-SCAL when a new calibration module is needed for the 818 Series photodiode detectors, without the need to recalibrate the detector.



DB15 Cal Module



No Cal Module  
(BNC)

## Additional Functionality with BNC Connector

The BNC connector extends the functionality of the 818 Series photodiode sensors. It enables direct connection to an ammeter or lock-in amplifier. It also allows the detector output to be viewed on an oscilloscope after first connecting it to a current-to-voltage preamplifier, such as Newport's model 70710. Furthermore, the cable length can be extended by connecting another BNC cable.



## Adapters for Fiber-Optic Applications

These photodiode sensors can be converted to measure optical power from connectorized or bare optical fibers. Newport offers a comprehensive set of screw-in fiber-optic adapters to match a variety of connector types. Our bare fiber holder and adapter mount are designed together to hold 250- $\mu$ m bare fibers without damaging the fiber.



## 818 Series Specifications

| Models                                                  | 818-UV/DB                                                                           | 818-SL/DB                                                      | 818-IR/DB                                | 818-IG/DB                                |
|---------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------|------------------------------------------|------------------------------------------|
| Sensor Size                                             | Ø10 mm                                                                              | Ø11.3 mm                                                       | Ø3 mm                                    | Ø3 mm                                    |
| Spectral Range                                          | 200 - 1100 nm                                                                       | 400 - 1100 nm                                                  | 780 - 1800 nm                            | 800 - 1650 nm                            |
| Max Measurable Power w/ Attenuator (W) <sup>(1)</sup>   | 40 mW                                                                               | 2W                                                             | 3W                                       | 3W                                       |
| Max Measurable Power w/o Attenuator (mW) <sup>(1)</sup> | 0.1 mW                                                                              | 4 mW                                                           | 10 mW                                    | 4 mW                                     |
| Maximum Power Density                                   | 30 W/cm <sup>2</sup>                                                                | 30 W/cm <sup>2</sup>                                           | 30 W/cm <sup>2</sup>                     | 30 W/cm <sup>2</sup>                     |
| Maximum Power Density without Attenuator                | 0.2 W/cm <sup>2</sup>                                                               | 3 W/cm <sup>2</sup>                                            | 3 W/cm <sup>2</sup>                      | 3 W/cm <sup>2</sup>                      |
| Maximum Pulse Energy Without Attenuator                 | 0.4 µJ                                                                              | 60 nJ                                                          | 60 nJ                                    | 60 nJ                                    |
| Calibration Uncertainty With Attenuator                 | 3.4% @ 220-300nm,<br>1.65% @ 300-430nm,<br>1.1% @ 430-1000nm<br>4.3% @ 1035-1065nm  | 1.65% @ 400-430nm,<br>1.1% @ 430-1000nm,<br>4.3% @ 1035-1065nm | 2.4% @ 780-1430nm,<br>2.6% @ 1430-1600nm | 2.4% @ 900-1430nm,<br>2.6% @ 1430-1600nm |
| Calibration Uncertainty without Attenuator              | 3.4% @ 220-300nm,<br>1.65% @ 300-430nm,<br>1.1% @ 430-1000nm,<br>4.3% @ 1035-1065nm | 1.65% @ 400-430nm,<br>1.1% @ 430-1000nm,<br>4.3% @ 1035-1065nm | 2.4% @ 780-1430nm,<br>2.6% @ 1430-1600nm | 2.4% @ 900-1430nm,<br>2.6% @ 1430-1600nm |
| Attenuator                                              | OD3, Threaded                                                                       | OD3, Threaded                                                  | OD3, Threaded                            | OD3, Threaded                            |
| Linearity                                               | ±1 %                                                                                | ±1 %                                                           | ±1 %                                     | ±1 %                                     |
| Uniformity                                              | ±2 % over Ø2 mm with<br>attenuator, ±2 % over Ø4 mm<br>without attenuator           | ±2 %                                                           | ±2 %                                     | ±2 % @ 1550 nm                           |
| Rise Time                                               | 3 µs                                                                                | ≤2 µs                                                          | ≤2 µs                                    | ≤2 µs                                    |
| Connector Type                                          | DB15                                                                                | DB15                                                           | DB15                                     | DB15                                     |
| Clear Aperture                                          | 10.3 mm                                                                             | 10.3 mm                                                        | 10.3 mm                                  | 10.3 mm                                  |
| Detector Material                                       | UV Enhanced Silicon                                                                 | Silicon                                                        | Germanium                                | Indium Gallium Arsenide                  |
| Detector Input                                          | Free Space                                                                          | Free Space                                                     | Free Space                               | Free Space                               |
| Calibration Module                                      | DB15 removable                                                                      | DB15 removable                                                 | DB15 removable                           | DB15 removable                           |
| Minimum Measurable Power                                | 20 pW                                                                               | 20 pW                                                          | 5 nW                                     | 20 pW                                    |
| Cable Length                                            | 1.5 m                                                                               | 1.5 m                                                          | 1.5 m                                    | 1.5 m                                    |
| Maximum Pulse Energy                                    | 400 µJ                                                                              | 60 µJ                                                          | 60 µJ                                    | 60 µJ                                    |
| Detector Type                                           | Post Mounted                                                                        | Post Mounted                                                   | Post Mounted                             | Post Mounted                             |
| ISO 17025                                               | Compliant                                                                           |                                                                |                                          |                                          |

1) Max power meter dependence table below.

## 818 Series Specifications (continuation #1)

| Models                                                                                             | 818-UV/DB                                        | 818-SL/DB                     | 818-IR/DB                                        | 818-IG/DB                         |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------|--------------------------------------------------|-----------------------------------|
| Max. Power (W) vs Wavelength (nm) – Responsivity (Ma/w) with Attenuator 1938/2938                  | 200-400 40mW<br>401-1050 15mW<br>1051-1100 30mW  | 400-750 2W<br>751-1100 1.5W   | 780-1800 3W                                      | 800-1000 3W<br>1001-1650 1.5W     |
| Max. Power (W) vs Wavelength (nm) – Responsivity (Ma/w) with Attenuator 1936/2936                  | 200-400 30mW<br>401-1050 10mW<br>1051-1100 30mW  | 400-750 2W<br>751-1100 1.5W   | 780-1800 3W                                      | 800-1000 3W<br>1001-1650 1.5W     |
| Max. Power (W) vs Wavelength (nm) – Responsivity (Ma/w) with Attenuator 1919-R/843-R/844-PE-USB    | 200-400 30mW<br>401-1050 10mW<br>1051-1100 30mW  | 400-750 1.5W<br>751-1100 1W   | 780-1000 1W<br>1001-1650 0.5W<br>1651-1800 1.5W  | 800-1000 1W<br>1001-1650 0.5W     |
| Max. Power (W) vs Wavelength (nm) – Responsivity (Ma/w) with Attenuator 845-PE-RS                  | 200-400 30mW<br>401-1050 10mW<br>1051-1100 30mW  | 400-750 2W<br>751-1100 1.5W   | 780-1000 2W<br>1001-1650 1W<br>1651-1800 2W      | 800-1000 2W<br>1001-1650 1W       |
| Max. Power (W) vs Wavelength (nm) – Responsivity (Ma/w) without Attenuator 1938/2938               | 200-400 100μW<br>401-1050 30μW<br>1051-1100 40μW | 400-750 4mW<br>751-1100 3mW   | 780-1000 10mW<br>1001-1650 6mW<br>1651-1800 15mW | 800-1000 4mW<br>1001-1650 2mW     |
| Max. Power (W) vs Wavelength (nm) – Responsivity (Ma/w) without Attenuator 1936/2936               | 200-400 100μW<br>401-1050 30μW<br>1051-1100 40μW | 400-750 4mW<br>751-1100 3mW   | 780-1000 10mW<br>1001-1650 6mW<br>1651-1800 15mW | 800-1000 4mW<br>1001-1650 2mW     |
| Max. Power (W) vs Wavelength (nm) – Responsivity (Ma/w) without Attenuator 1919-R/843-R/844-PE-USB | 200-400 100μW<br>401-1050 30μW<br>1051-1100 40μW | 400-750 2.5mW<br>751-1100 2mW | 780-1000 2mW<br>1001-1650 1mW<br>1651-1800 2mW   | 800-1000 1mW<br>1001-1650 0.7mW   |
| Max. Power (W) vs Wavelength (nm) – Responsivity (Ma/w) without Attenuator 845-PE-RS               | 200-400 100μW<br>401-1050 30μW<br>1051-1100 40μW | 400-750 4mW<br>751-1100 3mW   | 780-1000 3mW<br>1001-1650 1.5mW<br>1651-1800 4mW | 800-1000 2.5mW<br>1001-1650 1.5mW |

