Calibrated Integrating Sphere Sensors

Newport's NIST traceable, calibrated integrating sphere detectors consist of the 819C and 819D series spheres, configured to measure diverging or collimated light sources, respectively. A Si, UV-enhanced Si or an InGaAs sensor are used. The available sphere sizes are between 2" and 5.3" sphere sizes.

CAL2 models feature a built-in temperature sensor and OD1 attenuator sensor. When connected to power meter models 1830-R, 1919-R, 844-PE-USB, 1938-R, or 2938-R, they will automatically recognize the attenuator On/Off position and the detector head temperature.

The spheres with a silicon photodiode are suitable for measurements ranging from 400 – 1100 nm, while the models with an InGaAs detector are suitable for approximately 800 – 1650 nm range. The UV version is optimized for wavelengths between approximately 200 - 400 nm, even though it is calibrated up to 1100 nm. All the spheres come with an SMA fiber optic connector on the North pole as a standard feature, allowing a small amount of light pickoff for wavelength measurement or any further analysis without affecting the overall system calibration.

Note that the system calibration is no longer valid if any component is changed from the original calibrated configuration. For a very high power level, elevated temperature of the integrating sphere system can affect the measurement accuracy, so the sphere must be properly cooled. Check with Newport for the complete list of integrating sphere detectors.

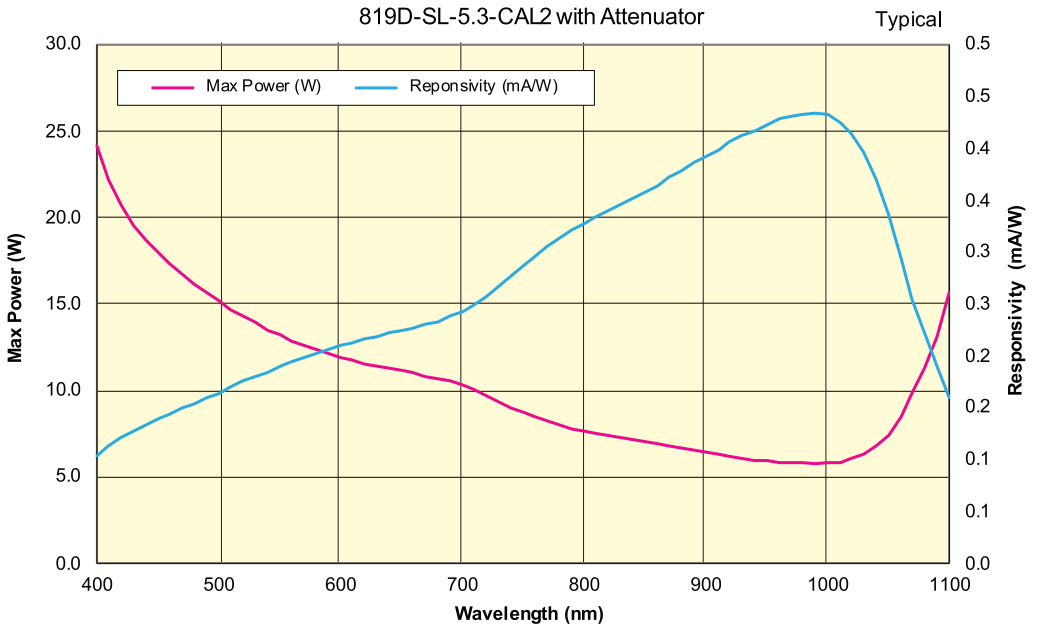
Features and Benefits

- Calibrated and traceable to NIST standards
- Smallest calibration uncertainty specification in market
- Maximum power measurement up to 10 watts and higher
- Wavelengths covered 200 - 1650 nm

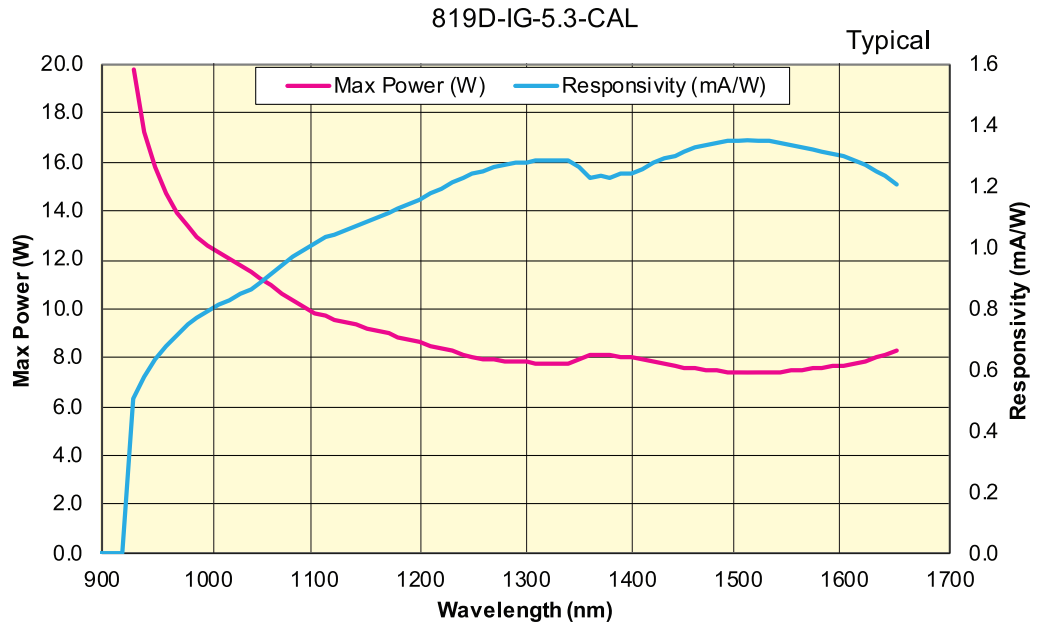
Model	Spectral Range	Calibration Uncertainty Filter Out	Calibration Uncertainty Filter In	Power Range 2936-R	Power Range StarBright	Linearity with Power	Sphere Size	Input Port Size	Detector Type
819C-UV-2-CALv2 (P/N: 7N6328)	200 to 1100 nm	10% @ 200 - 270nm 5% @ 271 - 980nm 7% @ 981 - 1100nm	–	10 nW – 100mW	10 nW – 75mW	+/- 1 %	2 in.	0.5 in.	UV-enhanced Silicon
819C-SL-2-CAL2v2 (P/N: 7N6327A)	400 to 1100 nm	3% @ 400 - 1000nm 7%@ 1001 - 1100 nm	3% @ 400 - 1000nm 7%@ 1001 - 1100 nm	10 nW - 2.0 W	10 nW - 75 mW	+/- 1 %	2 in.	0.5 in.	Silicon
819C-IG-2-CAL2 (P/N: 7N6326A)	800 to 1650 nm	5% @ 800-950 nm 4% @ 951-1600 nm 7% @ 1601-1650 nm	5% @ 800-950 nm 4% @ 951-1600 nm 7% @ 1601-1650 nm	100 nW - 15 W	100 nW - 5W	+/- 1 %	2 in.	0.5 in.	InGaAs
819C-SL-3.3-CAL2 (P/N: 7N6318A)	400 to 1100 nm	3% @ 400 - 1000nm 7% @ 1001 - 1100nm	3% @ 400 - 1000nm 7% @ 1001 - 1100nm	10 nW – 1.5W	50 nW – 150mW	+/- 1 %	3.3 in.	0.5 in.	Silicon
819C-IG-3.3-CAL2 (P/N: 7N6317A)	800 to 1650 nm	5% @ 800-950 nm 4% @ 951-1600 nm 7% @ 1601-1650 nm	5% @ 800-950 nm 4% @ 951-1600 nm 7% @ 1601-1650 nm	10 nW - 15 W	50 nW – 2.5 W	+/- 1 %	3.3 in.	0.5 in.	InGaAs
819C-UV-5.3-CAL	220 to 1100 nm	±3% @ 220-829 nm ±3.5% @ 830-959 nm ±3% @ 960-1100 nm	–	100 nW – 850 nm	100 nW – 850 nm	+/- 1 %	5.3 in.	1.0 in.	UV-enhanced Silicon
819C-SL-5.3-CAL2	400 to 1100 nm	±2.5% @ 400-1000 nm ±3% @ 1001-1100 nm	±2.5% @ 400-1000 nm ±3% @ 1001-1100 nm	100 nW – 4.0 W	100 nW – 2.0 W	+/- 1 %	5.3 in.	1.0 in.	Silicon
819C-IG-5.3-CAL	860 to 1650 nm	±5% @ 860-920 nm ±2% @ 921-1650 nm	–	100 nW – 5.0 W	100 nW – 0.65 W	+/- 1 %	5.3 in.	1.0 in.	InGaAs
819D-UV-2-CALv2 (P/N: 7N6331A)	200 to 1100 nm	10% @ 200 - 270nm 5% @ 271 - 980nm 7% @ 981 - 1100nm	–	1 nW –0.2W	50nW –0.2W	+/- 1 %	2 in.	0.5 in.	UV-enhanced Silicon
819D-SL-2-CAL2v2 (P/N: 7N6330A)	400 to 1100 nm	3% @ 400 - 1000nm 7%@ 1001 - 1100 nm	4% @ 400 - 1000nm 7%@ 1001 - 1100 nm	10 nW - 4.5 W	500 nW - 950 mW	+/- 1 %	2 in.	0.5 in.	Silicon
819D-IG-2-CAL2 (P/N: 7N6329A)	800 to 1650 nm	5% @ 800-950 nm 4% @ 951-1600 nm 7% @ 1601-1650 nm	5% @ 800-950 nm 4% @ 951-1600 nm 7% @ 1601-1650 nm	200 nW – 8W	200 nW – 3W	+/- 1 %	2 in.	0.5 in.	InGaAs
819D-SL-3.3-CAL2 (P/N: 7N6320A)	400 to 1100 nm	3% @ 400 - 1000nm 7% @ 1001 - 1100nm	3% @ 400 - 1000nm 7% @ 1001 - 1100nm	10 nW – 1.65W	50 nW – 1.5W	+/- 1 %	3.3 in.	0.5 in.	Silicon
819D-IG-3.3-CAL2 (P/N: 7N6319A)	800 to 1650 nm	5% @ 800-950 nm 3% @ 951-1600 nm 7% @ 1601-1650 nm	5% @ 800-950 nm 3% @ 951-1600 nm 7% @ 1601-1650 nm	10 nW – 5 W	50 nW – 5 W	+/- 1 %	3.3 in.	0.5 in.	InGaAs
819D-UV-5.3-CAL	220 to 1100 nm	±3% @ 220-829 nm ±3.5% @ 830-959 nm ±3% @ 960-1100 nm	–	100 nW - 700 mW	100 nW - 500 mW	+/- 1 %	5.3 in.	0.5 in.	UV-enhanced Silicon
819D-SL-5.3-CAL2	400 to 1100 nm	±2.5% @ 400-1000 nm ±3% @ 1001-1100 nm	±2.5% @ 400-1000 nm ±3% @ 1001-1100 nm	100 nW – 6.5 W	100 nW – 3.5 W	+/- 1 %	5.3 in.	0.5 in.	Silicon
819D-IG-5.3-CAL	930 - 1650 nm	±5% @ 930-950 nm ±2% @ 951-1650 nm	–	100 nW – 6.0 W	100 nm – 0.75 W	+/- 1 %	5.3 in.	0.5 in.	InGaAs

Maximum Power Calculation

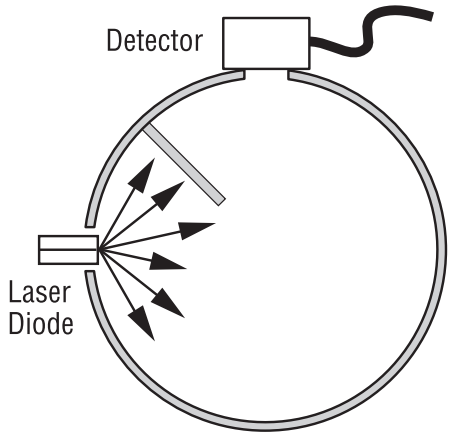
One key specification in calculating the maximum power handling capability is the detector saturation current. Typical values of a UV silicon, a Si, and a InGaAs photodiode are approximately 100 uA, 2.5 mA, and 10 mA, respectively. Dividing the detector responsivity, R, by the saturation current density will result in the saturation power. Since the detector responsivity is wavelength dependent, so is the saturation power level, as shown in the plot. When the responsivity is the maximum, the maximum power before saturation is the lowest. Also make sure to have a proper heat sink to the sphere for the most accurate measurement, when working with a high power light source.



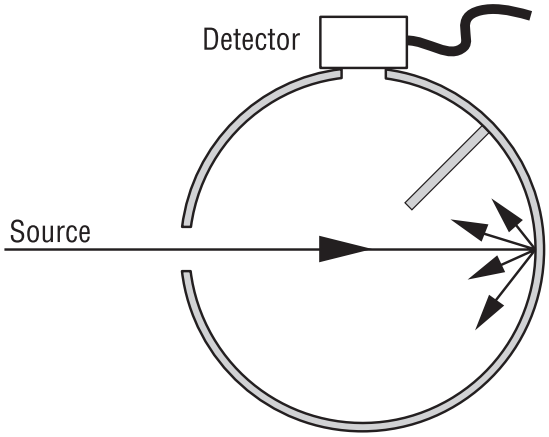
Plot of the maximum power (red) and the typical responsivity (blue), as a function of wavelength, of Model 819C-UV-2-CAL.



One of the major advantages of using an integrating sphere is to diffuse the input beam so that the detector readings are insensitive to errors caused by detector positioning or problems associated with overfilling, or saturation of the active area of the detector. The detector should see a completely diffused input field. Then, a key technical consideration, when deciding which configuration one has to choose, is whether the input beam will directly hit the detector, influencing the optical power at the detector. For this purpose, each integrating sphere includes a baffle.



819D integrating sphere configuration is ideal for divergent beam source such as an output beam from a laser diode.



819C integrating sphere configuration is ideal for a collimated beam source such as a collimated laser beam.

Ordering Information

819D Divergent Light Sphere Sensors

Model	Description
819D-UV-2-CALv2 (P/N: 7N6331A)	Integrating sphere detector , diverging beam, 2", 200-1100 nm
819D-UV-5.3-CAL	Integrating sphere detector, diverging beam, 5.3", 220-1100 nm
819D-SL-2-CAL2v2 (P/N: 7N6330A)	Integrating sphere detector for diverging beam, 2" sphere , 400-1100 nm
819D-SL-3.3-CAL2 (P/N: 7N6320A	Integrating sphere detector, diverging beam, 3.3", 400-1100 nm
819D-SL-5.3-CAL2	Integrating sphere detector, diverging beam, 5.3", 400-1100 nm
819D-IG-2-CAL2 (P/N: 7N6326A)	Integrating sphere detector, diverging beam, 2", 800-1650 nm
819D-IG-3.3-CAL2 (P/N: 7N6319A)	Integrating sphere detector, diverging beam, 3.3", 800-1650 nm
819D-IG-5.3-CAL	Integrating sphere detector, diverging beam, 5.3", 930-1650 nm

819C Collimated Light Sphere Sensors

Model	Description
819C-UV-2-CALv2 (P/N: 7N6328)	Integrating sphere detector , diverging beam, 2", 200-1100 nm
819C-UV-5.3-CAL	Integrating sphere detector, collimated beam, 5.3", 220-1100 nm
819C-SL-2-CAL2v2 (P/N: 7N6327A)	Integrating sphere detector for diverging beam, 2" sphere , 400-1100 nm
819C-SL-3.3-CAL2 (P/N: 7N6318A)	Integrating sphere detector, collimated beam, 3.3", 400-1100 nm
819C-SL-5.3-CAL2	Integrating sphere detector, collimated beam, 5.3", 400-1100 nm
819C-IG-2-CAL2 (P/N: 7N6329A)	Integrating sphere detector, collimated beam, 2", 800-1650 nm
819C-IG-3.3-CAL2 (P/N: 7N6317A)	Integrating sphere detector, collimated beam, 3.3", 800-1650 nm
819C-IG-5.3-CAL	Integrating sphere detector, collimated beam, 5.3" sphere , 860-1650 nm

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