Calibrated Integrating Sphere Sensors

mks | Newport

Newport 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Note that the system calibration is no longer valid if any component is changed from the original calibrated configuration.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

Specifications

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.

Sphere-Based Fiber Optic Detectors

No.	Model	Spectral Range	Sphere Size	Power Range	Maximum Measurable Power	Input Port Size	Linearity with Power	Detector Type	Calibration Uncertainty Filter Out	Calibration Uncertainty Filter In
1	918D-IS-1	400-1650 nm	1 inch	10nW to 0.35W	350mW	3mm/0.118 Inch	±1 %	InGaAs and Silicon	400 to 430nm 1.65%	N/A
									430 to 700nm 1.1%	
									700 to 1430nm 2.4%	
									1430 to 1600nm 2.6%	
2	918D-IS-IG	800-1650 nm	1 inch	10nW to 0.1W	100mW	3mm/0.118 Inch	±1 %	InGaAs	900 to 1430nm 2.4%	N/A
									1430 to 1600nm 2.6%	
3	918D-IS-SL	400-1100 nm	1 inch	10nW to 0.3W	300mW	3mm/0.118 Inch	±1 %	Silicon	400 to 430nm 1.65%	N/A
									430 to 1000nm 1.1%	
									1035 to 1065nm 4.3%	

Sphere-Based Fiber Optic Detectors (continuation #1)

No.	Model	Max. Power (W) vs Wavelength (nm) Responsivity (Ma/w) with Attenuator 1938/2938	Max. Power (W) vs Wavelength (nm) Responsivity (Ma/w) with Attenuator 1936/2936	Max. Power (W) vs Wavelength (nm) Responsivity (Ma/w) with Attenuator 1919-R/843-R/844-PE-USB	Max. Power (W) vs Wavelength (nm) Responsivity (Ma/w) with Attenuator 845-PE-RS	Max. Power (W) vs Wavelength (nm) Responsivity (Ma/w) without Attenuator 1938/2938	Max. Power (W) vs Wavelength (nm) Responsivity (Ma/w) without Attenuator 1936/2936	Max. Power (W) vs Wavelength (nm) Responsivity (Ma/w) without Attenuator 1919-R/843-R/844-PE-USB	Max. Power (W) vs Wavelength (nm) Responsivity (Ma/w) without Attenuator 845-PE-RS
1	918D-IS-1	NA	NA	NA	NA	400-849 300mW	400-849 300mW	400-850 100mW	400-849 300mW
						850-1399 350mW	850-1399 350mW	851-1400 150mW	850-1399 350mW
						1400-1650 300mW	1400-1650 300mW	1401-1650 100mW	1400-1650 300mW
2	918D-IS-IG	NA	NA	NA	NA	900-1650 30mW	900-1650 30mW	900-1650 30mW	900-1650 30mW
3	918D-IS-SL	NA	NA	NA	NA	400-900 0.15W	400-900 0.15W	400-900 0.13W	400-900 0.15W
						901-1100 0.3W	901-1100 0.3W	901-1100 0.25W	901-1100 0.3W

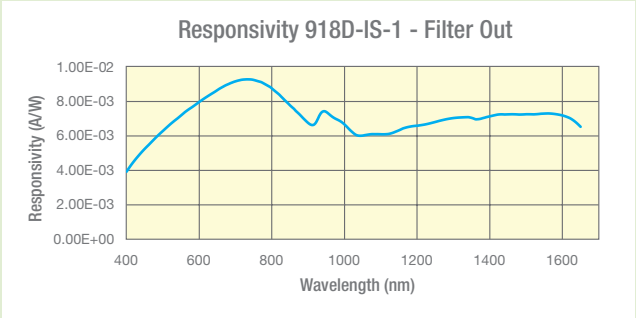
Sphere-Based Fiber Optic Detectors (continuation#2)

No.	Model	Power Range 1938/2938	Power Range 1936/2936	Power Range 1919-R/843-R/844-PE-USB	Power Range 845-PE-RS	Max. Beam Divergence deg°	Sensitivity to Beam Divergence ±%	Power Noise Level 1938/2938	Power Noise Level 1936/2936	Max. Pulse Energy mJ	Accuracy vs Wavelength	Compliance
1	918D-IS-1	10nW - 0.35W	10nW - 0.35W	10nW - 0.15W	10nW - 0.35W	NA	NA	0.5nW	0.5nW	100µJ	400-1650 ±5%	CE, UKCA, China RoHS
2	918D-IS-IG	10nW - 0.1W	10nW - 0.1W	10nW to 0.1W	10nW - 0.1W	NA	NA	0.5nW	0.5nW	100µJ	900-1650 ±5%	CE, UKCA, China RoHS
3	918D-IS-SL	10nW - 0.3W	10nW-0.3W	10nW to 0.3W	10nW-0.25W	NA	NA	0.5nW	0.5nW	100µJ	400 - 1000 ±5%	CE, UKCA, China RoHS
											1001 - 1100 ±7%	

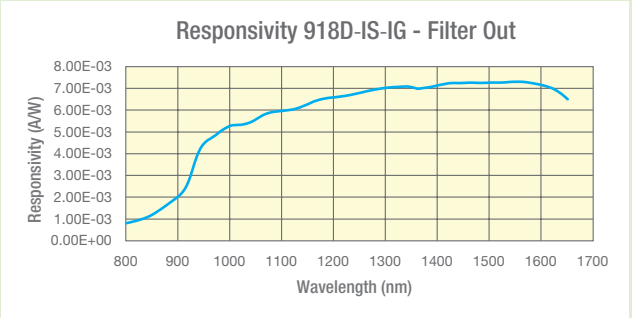
Maximum Power Calculation

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 µA, 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.

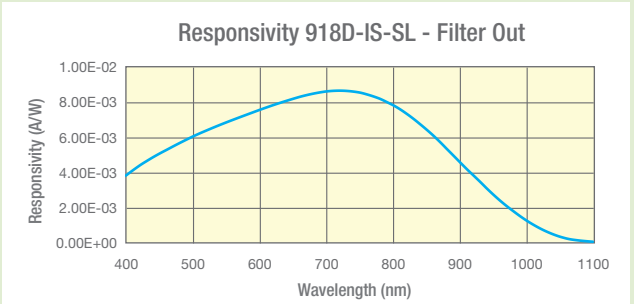
918D-IS-1



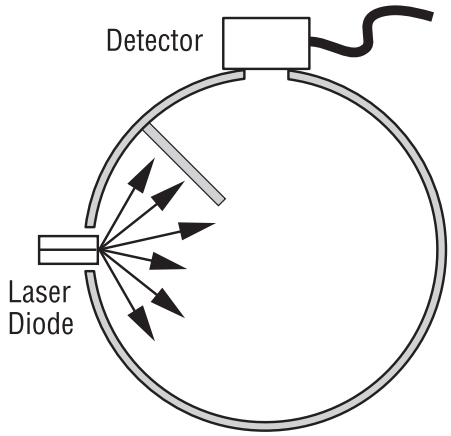
918D-IS-IG



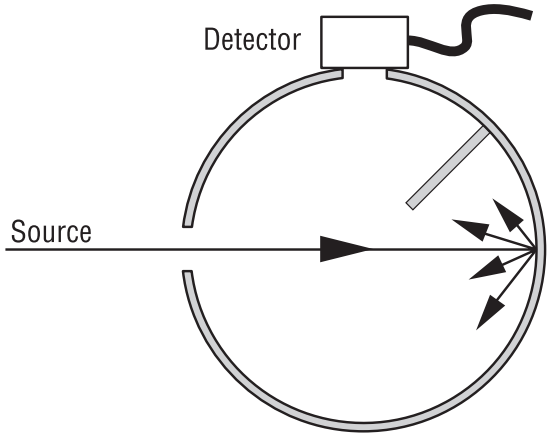
918D-IS-SL



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

Sphere-Based Fiber Optic Detectors

NO.	Model	Description
1	918D-IS-1	Fiber Optic Detector, Universal, 400-1650 nm, DB15 Connector
2	918D-IS-IG	Fiber Optic Detector, Universal, 800-1650 nm, DB15 Connector
3	918D-IS-SL	Fiber Optic Detector, Universal, 400-1100 nm, DB15 Connector

DS-062403 Fiber Optic Detector Sphere Datasheet_08/24