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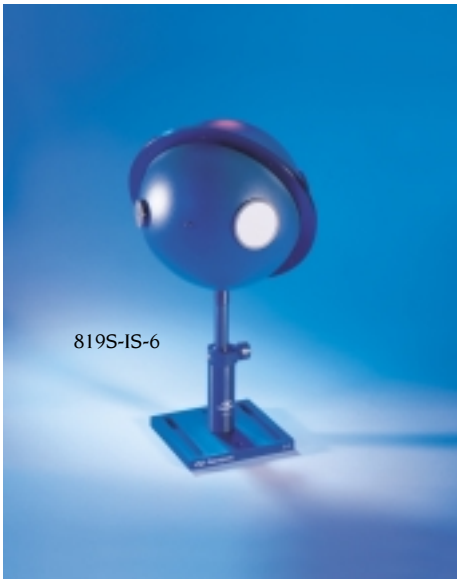
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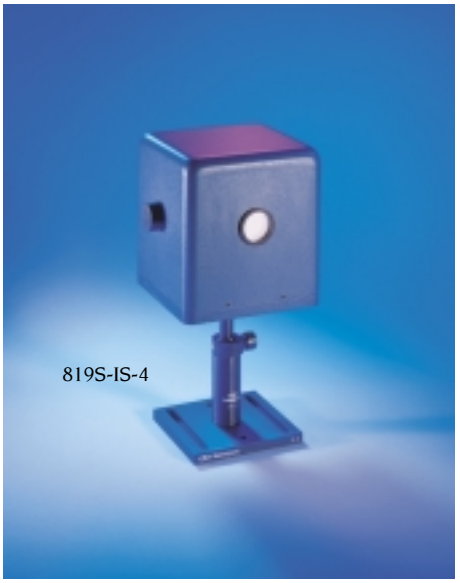
Integrating Spheres

Key Features

- *Total collection of light and spatial integration. Useful for divergent and non-symmetrical beams*
- *Measurements insensitive to exact detector positioning*
- *Signal attenuation, advantageous in measurement of high-power beams*
- *High reflectance coating avoids direct damage from the first strike of the beam*
- *Thermally stable*
- *High* UV-VIS-NIR *reflectance*

For Applications and Tutorials for integrating spheres, see page 163.





819S *and* 819 *Integrating Spheres (stands sold separately)*

819S Integrating Spheres are useful for measurement of divergent light from laser diode sources. Their thin walls, only a few millimeters thick, make it possible to position the laser diode very close to the internal cavity of the sphere and thus collect 100 percent of the light emitted from the front facet of the device. A baffle, positioned between the input port and the detector port prevents the detector from directly viewing the emitting aperture of the laser or the direct area of illumination.

In an integrating sphere the detected flux is always a small fraction of the incident flux. This attenuation, caused by light reflecting many times before reaching the detector, makes the integrating sphere ideal for measurement of output light power of high-power lasers.

The 819S Integrating Sphere coating has an effective range from 300 nm to 2400 nm, with reflectivity of >97% at 600 nm. Each sphere is designed with four equally-spaced ports located on the equator of the sphere.

The unmatched environmental stability and high performance of Newport's **Model 819** Integrating Spheres are derived from their rugged monolithic thermoplastic material and are superior to coated integrating spheres. In addition, their high damage threshold surface can be cleaned with distilled water.

Hydrophobic, chemically inert and thermally stable to 350°C, Model 819 spheres can be used in demanding environments, including underwater, high or low temperature processes and high vacuum applications. At the same time, reflectance exceeding 95% from 250 to 2500 nm, 98% from 310 to 2100 nm, and 99% from 400 to 1500 nm make them ideal for even the most demanding measurements from the ultraviolet to the near infrared.

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Specifications

Sphere Surface Reflectance (8° Hemispherical)

Wavelength (mm)	Reflectance (819S)	Reflectance (819)
250		0.958
300	0.963	0.980
400	0.976	0.991
500	0.979	0.990
600	0.977	0.990
700	0.973	0.991
800	0.968	0.990
900	0.967	0.992
1000	0.965	0.991
1100	0.959	0.989
1200	0.953	0.988
1300	0.948	0.987
1400	0.932	0.991
1500	0.917	0.991
1600	0.920	0.991
1700	0.922	0.988
1800	0.912	0.989
1900	0.910	0.981
2000	0.852	0.976
2100	0.858	0.953
2200	0.866	0.973
2300	0.837	0.972
2400	0.819	0.955
2500		0.950

Ordering Information

819S Integrating Spheres are available in 4 and 6 in. diameters and are fabricated from spun aluminum. 819S spheres include a baffle located between the input and detector port. The port frame at 90° position (relative to the input port) is 0.5 in. in diameter and is designed to accept a variety of detector assemblies and detector holders. Each sphere comes with a detector mask, port reducers and two port plugs.

819 Integrating Spheres are available in 2 and 4 in. inner diameters with a cube-shaped outer housing made of drawn aluminum. Each sphere comes with a detector mask, port reducers, and two port plugs. See Sphere Accessories on the next page for detector adapters, sample holders and additional sphere components.

The 2 and 4 in. diameter spheres come with a 8-32 tapped hole in the base for post mounting. The 6 in. spheres come with a 1/4-20 tapped hole.

Model	Description
819-IS-2	2 in. Integrating Sphere
819-IS-4	4 in. Integrating Sphere
819S-IS-4	4 in. Integrating Sphere
819S-IS-6	6 in. Integrating Sphere

Damage Threshold

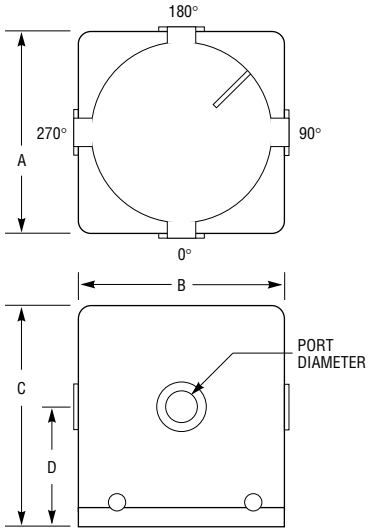
Damage to integrating spheres will typically occur on the first surface where the optical beam hits before it starts reflecting inside the sphere. A typical damage phenomenon is ellowing of the material which decreases the reflectivity, consequently compromising the calibration of the sphere.
If your source is divergent, use the diameter of the sphere as the distance the light must travel when calculating the area of the beam on the first surface. For Gaussian sources, multiply your calculated energy or power density by a factor of two to account for the higher densities in the center of the beam.

	Model 819S	Model 819
Damage Threshold	1.7 J/cm²	8 J/cm²

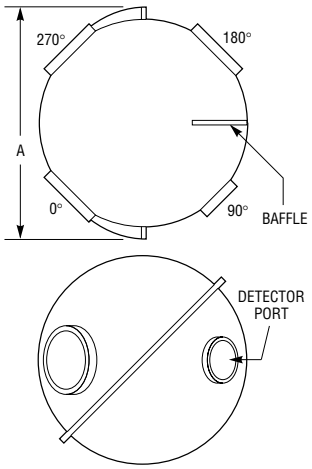
Call one of Newport's Application Sales Engineers to help you select the integrating sphere and accessories that best serve your measurement needs.

Dimensions

819



819S



	DIMENSION (IN.)			
MODEL	A	B	C	D
819-IS-2	3.00	3.00	3.38	1.88
819-IS-4	5.00	5.00	5.38	2.88
819S-IS-4	4.75			
819S-IS-6	7.25			

	PORT DIAMETERS		
MODEL	0.5 IN.	1.0 IN.	1.5 IN.
819-IS-2	4	0	0
819-IS-4	1	3	0
819S-IS-4	1	3	0
819S-IS-6	1	0	3

Integrating Sphere Optional Accessories

819-DA Detector Adaptors allow you to mount 818 Low-Power Cylindrical Detectors to a 1.0 in. (25.4 mm) port.

The 819-PC-0.5 and 819-PC-1.5 Port Converters convert 0.5 in. (12.7 mm) and 1.5 in. (38.1 mm) ports respectively into 1.0 in. (25.4 mm) ports to allow mounting of accessories.

819-PA Port Apertures reduce the clear aperture of a port. Port apertures do not alter port size or restrict the mounting of other accessories. Each set contains three different port apertures.

819-PP and 819S-PP Port Plugs seal off unused ports and are made of the same high reflectance material as the sphere.

819-SH Sample Holders are used for transmission and reflectance measurements and mount to 1.0 in. (25.4 mm) ports. The clear aperture of the 0° sample holder is 0.875 in. (22.2 mm) while the 8° sample holder has a clear diameter of 0.687 in. (17.4 mm). Each sample holder can be disassembled to facilitate the mounting of large samples.

819-LTP and 819-LTP-0.5 Light Traps mount on 1.0 in. (25.4 mm) and 0.5 in. (12.7 mm) ports respectively and deliver 99% absorptance from 250 to 2500 nm. The **819-LTSH** mounts on either 0° or 8° sample holders and delivers 98.5% absorptance from 250 to 2500 nm. The 819-LTSH is recommended when measuring the reflectance of translucent samples.

The 819-FH Filter Holder is designed to hold 2-inch-square optical filters up to 0.375 in. (9.5 mm) thick. You can use it with Newport's line of neutral-density filters and colored glass filters. The 819-FH mounts to 1.0 in. (25.4 mm) port frames.

Port Adaptors configured for SMA, ST *and* FC *terminated optical fiber are also available upon request. Call Newport's Application Sales Engineers for details.*

Optional Accessories Ordering Information

Model	Description	Compatible with 819 or 819S Sphere Model
819S-PP-1.0	Port Plug for 1.0 in. Port	819S
819S-PP-1.5	Port Plug for 1.5 in. Port	819S
819-PP-0.5	Port Plug for 0.5 in. Port	819
819-PP-1.0	Port Plug for 1.0 in. Port	819
819-PP-1.5	Port Plug for 1.5 in. Port	819
819-SH-0	0 deg. Sample Holder	819 and 819S
819-SH-8	8 deg. Sample Holder	819 and 819S
819-DA	Detector Adaptor	819 and 819S
819-PC-0.5	0.5 to 1.0 in. Port Converter	819 and 819S
819-PC-1.5	1.5 to 1.0 in. Port Converter	819 and 819S
819-LTP-0.5	Light Trap for 0.5 in. Port	819 and 819S
819-LTP	Light Trap for 1.0 in. Port	819 and 819S
819-LTSH	Light Trap for Sample	819 and 819S
819-FH	Filter Holder for 1.0 in. Port	819 and 819S
819-PA-0.5	0.5 in. Port Aperture Set	819 and 819S
819-PA-1.0	1.0 in. Port Aperture Set	819 and 819S
819-PA-1.5	1.5 in. Port Aperture Set	819 and 819S

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Integrating Sphere Optical Power Measurement Systems

Newport's Integrating Spheres and Low Power Detectors can be configured as a system to measure either diverging or collimated light inputs. The assembly could include either an 819 or 819S Integrating Sphere with one of the 818 Series low-power detectors, and is calibrated to NIST traceable standards containing the calibration data for the wavelength range of 400 nm to 1100 nm. To attach any of these detectors to an 819S or 819 Integrating Sphere, you need to use an 819-DA Detector Adaptor and an 819-PC-0.5 Port Converter (included with system).

This setup consisting of a combination of integrating sphere and calibrated detector is suitable for accurate, absolute value light power measurement of light sources with divergent beams. Such light sources include LEDs, laser diodes, and laser diode bars. In such applications, using the integrating sphere assembly ensures that your measurements are completely insensitive to errors caused by detector positioning or problems associated with overfilling, or saturation of the active area of the detector. This system can be used to perform optical power measurements of laser diodes operating under both CW and pulse modes. For details on how this can be accomplished please refer to the tutorial on pages see page 160 and Newport's Application Notes.

The integrating sphere shown in the photo is equipped with an optional fiber optic port (available on a semi-custom basis), enabling the simultaneous measurement of optical power and spectrum of lasers. For this purpose, the multi-mode optical fiber shown in the photo would be connected to an optical spectrum analyzer.

Ordering Instructions

819-OPT-□□-□□-□□-□□

- 819-IS-2 02
- 819-IS-4 04
- UV 818-UV
- SL 818-SL
- IG 818-IG
- IR 818-IR
- NN BNC Connector
- CM Calibration Module
- DV Diverging Input
- CO Collimated Input

819S-OPT-□□-□□-□□-□□

- 819S-IS-4 04
- 819S-IS-6 06
- UV 818-UV
- SL 818-SL
- IG 818-IG*
- IR 818-IR*
- NN BNC Connector
- CM Calibration Module
- DV Diverging Input
- CO Collimated Input

* *Call for 6 in. availability.*

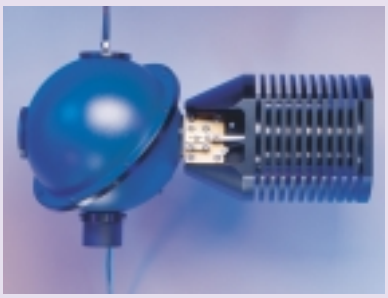
Example: 819S-OPT-04-IG-CM-DV

819S-IS-4 integrating sphere with 818-IG/CM detector, configured for diverging input beam.

Note: Optical power meter, stand and fiber optic port adaptor sold separately.



A 6 in. diameter 819S integrating sphere, equipped with an 818 Series detector and fiber optic connector port, shown with a Model 1835-C Optical Power Meter.



A 6 in. diameter 819S integrating sphere equipped with an 818-SL detector used for light power measurements of a CW high-power laser diode bar. The laser is mounted on Newport's 762 high-power laser diode mount.

Call Newport for price information.

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