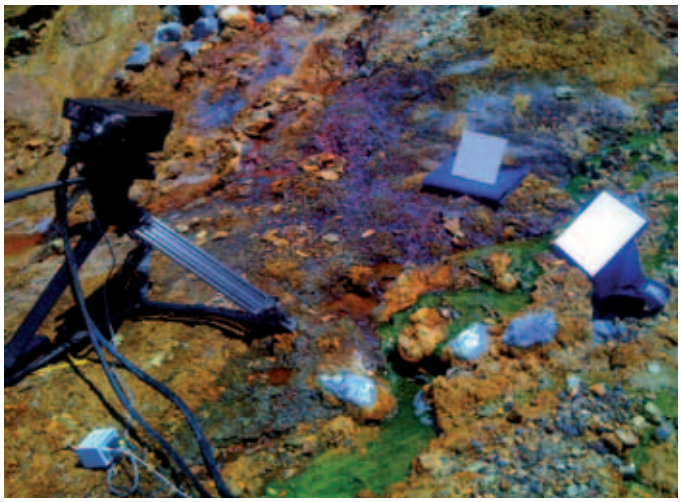


Zenith Polymer® Diffuse Reflectance Standards, Targets and Materials

FOR USE OVER THE UV, VIS AND NIR SPECTRAL REGIONS

SphereOptics

... your Partner in Lighting Technology!

Properties of Zenith Polymer® – optical PTFE

All SphereOptics GmbH Zenith Polymer products are made from our proprietary Zenith Polymer reflectance material. This highly reflecting, PTFE-based material is resistant to harsh environments and exposures and its unique optical properties, when produced under strict clean conditions, makes it the ideal reflectance material for standard or targets. Our products are all produced using the highest purity PTFE powder material available in Germany und throughout the production process, including pressing and sintering, the highest level of cleanness is maintained. All machines used to obtain the final product are reserved exclusively for PTFE use to keep the high level of purity.
Manufactured in Germany under ISO/TS 16949 conditions, we act as a reliable and qualified partner in the European industry.

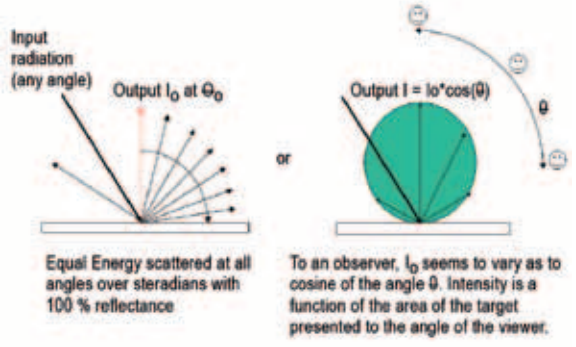
MECHANICAL/CHEMICAL PROPERTIES:

- After sintering, material is easy to machine
- Usable temperature range: - 50 °C to 250 °C
- Usable humidity range: 5 % to 95 %, but water absorption bands will be visible
- Standard pore sizes 1 - 20 µm, average 6 µm
- Surface roughness: 3 - 25 µm
- Density: 1.3 g/cm^3 to 1.5 g/cm^3 (depending on the product)
- non-polar, insulator
- Hydrophobic
- Chemically inert, exception: reacts with organic Lithium and Sodium compounds

OPTICAL PROPERTIES:

- Effective spectral range: 260 – 2500 nm
  Reflectance: > 99 % from 350 -1500 nm
  > 95 % from 1500 – 2500 nm
  Absorbance: < 20% above 2700 nm
- Atmospheric UV resistance
- Nearly ideal lambertian, diffuse reflectance
- Nearly ideal diffuse transmittance
- Uniform BRDF over all angles
- No absorption bands in the range of 250 – 2500 nm
- Laser damage threshold: 7 J/cm^2
- Vacuum compatible to 10^{-6} Torr

Temperature Range (°C)		*Thermal Linear Coefficient α 10^{-5} (1/K)*
from	*to*	
-100	-50	7.8
-50	10	9.1
10	30	23.7
30	100	10.8
100	200	14.0
200	260	22.9
260	300	39.3
30	200	12.7
30	260	15.4
30	300	18.4



All our products can be purchased with a NIST or PTB traceable certificate over the range of 250 – 2500 nm.

Zenith Polymer® Diffuse Reflectance Standards

SphereOptics Diffuse Reflectance Standards are made from our proprietary Zenith Polymer reflectance material. This highly reflecting, PTFE-based material is resistant to heat, humidity and exposure to high levels of radiation, making it ideal for use as reflectance standards and calibration targets.

Our range of gray scale standards are generally used to determine the linearity of optical detector systems used in colorimeters, spectrophotometers and densitometers. Our diffuse 99% standard is used industry-wide for calibration of sphere systems, photometers, optical equipment, and spectrophotometers.

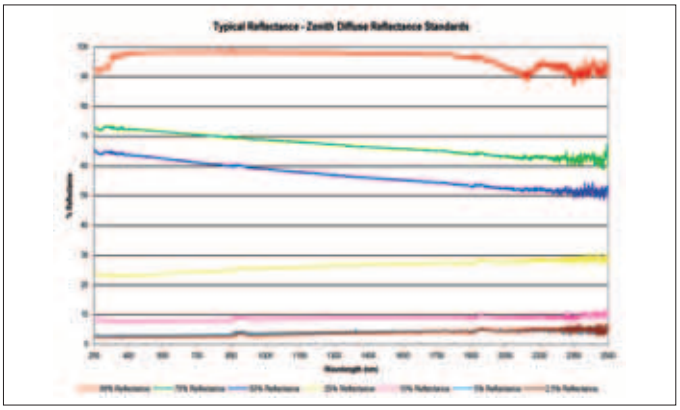
Standards are available in two sizes of 50 mm and 30 mm diameter with reflectance values ranging from 99 % (white) to a 2.5 % grey standard. Reflectance values include 99 %, 60 %, 50 %, 25 %, 10 %, 5 % and 2.5 %. Standards are sold individually or in sets of two, four or eight standards with a free choice of reflectance values. Each standard is packaged in a durable holder with a protective cover and comes in a storage box.

SphereOptics maintains a calibration laboratory in Germany and uses standards traceable to both the National Institute of Standards and Technology (NIST) and the Physikalisch Technische Bundesanstalt (PTB). All standards come with a printed and signed certificate and measurement data in electronic form.

Art.-No.	Reflectivity	Diameter
SG 3051	≈ 99 %	50 mm
SG 3052	≈ 99 %	30 mm
SG 3069	≈ 60 %	50 mm
SG 3070	≈ 60 %	30 mm
SG 3071	≈ 50 %	50 mm
SG 3072	≈ 50 %	30 mm
SG 3073	≈ 25 %	50 mm
SG 3074	≈ 25 %	30 mm
SG 3082	≈ 10 %	50 mm
SG 3083	≈ 10 %	30 mm
SG 3075	≈ 5 %	50 mm
SG 3076	≈ 5 %	30 mm
SG 3046	≈ 2.5 %	50 mm
SG 3045	≈ 2.5 %	30 mm
SG 3086	Set of 2 [2]	50 mm
SG 3087	Set of 2 [2]	30 mm
SG 3088	Set of 4 [2]	50 mm
SG 3089	Set of 4 [2]	30 mm
SG 3044	Set of 8 [2]	50 mm
SG 3043	Set of 8 [2]	30 mm

Calibration will be performed on a Perkin Elmer Lambda 19, data will be supplied electronically in 1 nm steps, 50 nm step printed documentation with NIST/PTB traceability with certificate for the range from 250 nm-2500 nm.

[2] Within the sets, reflectivities are selectable.



APPLICATIONS

» Calibration of: Sphere Systems • Photometers, Radiometers & Spectrophotometers • Densitometers & Optical Equipment

» Test Linearity of: Detector Systems • Colorimeters, Densitometers & Spectrophotometers

Zenith Lite® Diffuse Targets

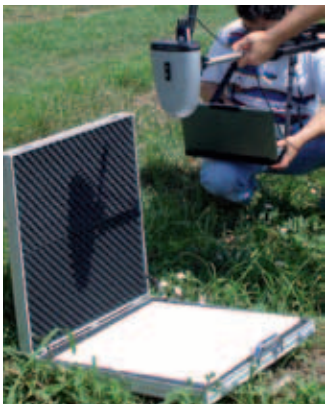
Zenith Lite Diffuse Targets are made from our Zenith Polymer diffuse reflectance material, which provides nearly ideal diffuse lambertian reflectance over the wavelength range from 250 to 2500 nm. Zenith Lite targets are constructed using a 1 mm or 2 mm thick Zenith Polymer panel laminated with a special adhesive to a 10 mm thick aluminium honeycomb structured plate that serves as a solid, but lightweight backing. They are the ideal choice for both laboratory and field applications since they are lightweight and can withstand harsh environments for long exposure periods. Due to their design, very flexible mounting solutions are possible.

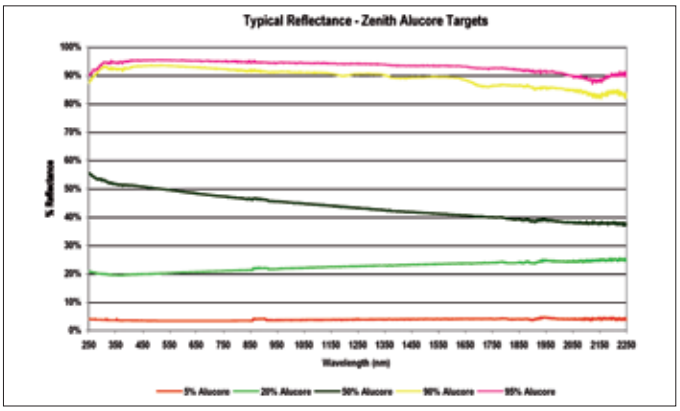
The laminating technique used with Zenith Lite Diffuse Targets allows for multiple reflectance values in one target with almost no visible seams. Targets can be made to any size and combination of white or greyscale reflectance. The aluminium backing can be drilled to allow for attachment to a variety of mounting devices. Even with a 1 mm or 2 mm Zenith film, the diffuse optical properties are maintained.

All targets can be provided with the National Institute of Standards and Technology (NIST) or the Physikalisch Technische Bundesanstalt (PTB) traceable calibration certificates from 250 nm to 2500 nm. For the targets bigger than 200 x 200 mm a smaller reference target (witness sample) is provided and the calibration is performed on the reference.

Art.-No.	Reflectivity	Dimensions
SG 3151	≈ 95 %	200x200x12 mm (approx. 8x8 inch)
SG 3152	≈ 90 %	200x200x11 mm (approx. 8x8 inch)
SG 3153	≈ 50 %	200x200x11 mm (approx. 8x8 inch)
SG 3154	≈ 20 %	200x200x11 mm (approx. 8x8 inch)
SG 3155	≈ 5 %	200x200x11 mm (approx. 8x8 inch)
SG 3156	≈ 95 %	500x500x12 mm (approx. 20x20 inch)
SG 3157	≈ 90 %	500x500x11 mm (approx. 20x20 inch)
SG 3158	≈ 50 %	500x500x11 mm (approx. 20x20 inch)
SG 3159	≈ 20 %	500x500x11 mm (approx. 20x20 inch)
SG 3160	≈ 5 %	500x500x11 mm (approx. 20x20 inch)
SG 3161	≈ 95 %	1000x1000x12 mm (approx. 40x40 inch)
SG 3162	≈ 90 %	1000x1000x11 mm (approx. 40x40 inch)
SG 3163	≈ 50 %	1000x1000x11 mm (approx. 40x40 inch)
SG 3164	≈ 20 %	1000x1000x11 mm (approx. 40x40 inch)
SG 3165	≈ 5 %	1000x1000x11 mm (approx. 40x40 inch)

Calibration will be performed on a Perkin Elmer Lambda 19, data will be supplied electronically in 1 nm steps, 50 nm step printed documentation with NIST/PTB traceability with certificate for the range from 250 nm-2500 nm.





Zenith Polymer® Full Material Targets

Although the Zenith Lite Diffuse Targets cover a wide range of applications, in some cases, the purity of the material and volume reflection (bulk scattering) is required. For vacuum applications or use under space conditions, only pure optical PTFE can be used. There is also the option to vacuum bake the raw PTFE material before production. We offer a restricted choice of standard sizes, so for custom, sizes please contact us directly.

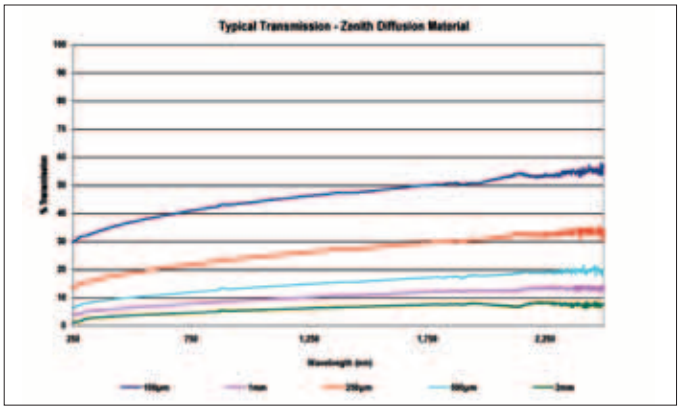
Art.-No.	Reflectivity	Dimensions
SG 3105	≈ 99 %	50x50x10 mm (approx. 2x2 inch)
SG 3110	≈ 99 %	100x100x10 mm (approx. 4x4 inch)
SG 3120	≈ 99 %	200x200x10 mm (approx. 8x8 inch)
SG 3150	≈ 99 %	500x500x10 mm (approx. 20x20 inch)

Calibration will be performed on a Perkin Elmer Lambda 19, data will be supplied electronically in 1 nm steps, 50 nm step printed documentation with NIST/PTB traceability with certificate for the range from 250 nm-2500 nm.

APPLICATIONS: Remote Sensing Calibration • Field Testing of Imaging Systems • Environmental Test Targets • Optical Reflectors • Contrast Measurement for Camera Applications • Illuminator Panels for QC of Projectors and Projector Lamps • Reflectance Standard for Illumination Measurements and Calibration

Zenith Polymer® White Diffuser
Lambertian transmission sheets

Our Zenith Polymer diffusers are made of the same material as our reflectance standards with its unique, highly lambertian optical properties. Thin section Zenith Polymer sheets are used as cosine diffusers minimise angular dependency of the light reaching a photodetector or to create more even illumination from a light source. With a constant, lambertian throughput over the entire wavelength range of 250 nm to 2500 nm, the Zenith Polymer diffuser finds application in a variety of light scattering measurements and calibration set ups.



Art.-No.	Transmission	Description
SG 3201	≈ 50 %	Diffuser 100 µm thickness 200x200 mm (approx. 8x8 inch)
SG 3202	≈ 50 %	Diffuser 100 µm thickness 500x500 mm (approx. 20x20 inch)
SG 3203	≈ 25 %	Diffuser 250 µm thickness 200x200 mm (approx. 8x8 inch)
SG 3204	≈ 25 %	Diffuser 250 µm thickness 500x500 mm (approx. 20x20 inch)
SG 3205	≈ 16 %	Diffuser 500 µm thickness 200x200 mm (approx. 8x8 inch)
SG 3206	≈ 16 %	Diffuser 500 µm thickness 500x500 mm (approx. 20x20 inch)
SG 3210	≈ 8 %	Diffuser 1mm thickness 200x200 mm (approx. 8x8 inch)
SG 3211	≈ 8 %	Diffuser 1mm thickness 500x500 mm (approx. 20x20 inch)
SG 3212	≈ 8 %	Diffuser 1mm thickness 1000x1000 mm (approx. 40x40 inch)
SG 3213	≈ 4 %	Diffuser, 2 mm thickness 200x200 mm (approx. 8x8 inch)
SG 3214	≈ 4 %	Diffuser, 2 mm thickness 500x500 mm (approx. 20x20 inch)
SG 3215	≈ 4 %	Diffuser, 2 mm thickness 1000x1000 mm (approx. 40x40 inch)

Only general transmission data available!

Zenith Polymer® Greyscale Diffuser
Lambertian reflectance sheets

For some applications in quality control or production processes, the flat surface of the reflectance targets and standards are not usable and custom curvature or shape is required. To realise optical and process stability, often Zenith Polymer greyscale diffuser sheets are used as an optical baseline reference. To enable the customer to adapt the optical standard to his or her needs, we offer the greyscale Zenith Polymer as 1 mm thick sheets, optionally with the proper gluing agent applied, so engineers and quality control personnel can fit the standard to their needs.

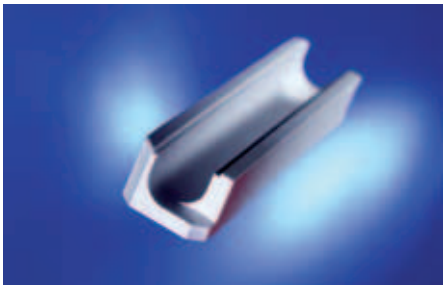
Art.-No.	Reflectivity	Description
SG 3224	≈ 50 %	Diffuser, 1 mm thickness 1000x1000 mm (approx. 40x40 inch)
SG 3223	≈ 50 %	Diffuser, 1 mm thickness 500x500 mm (approx. 20x20 inch)
SG 3222	≈ 50 %	Diffuser, 1 mm thickness 200x200 mm (approx. 8x8 inch)
SG 3221	≈ 20 %	Diffuser, 1 mm thickness 1000x1000 mm (approx. 40x40 inch)
SG 3200	≈ 20 %	Diffuser, 1 mm thickness 500x500 mm (approx. 20x20 inch)
SG 3219	≈ 20 %	Diffuser, 1 mm thickness 200x200 mm (approx. 8x8 inch)
SG 3218	≈ 5 %	Diffuser 1mm thickness 1000x1000 mm (approx. 40x40 inch)
SG 3217	≈ 5 %	Diffuser 1mm thickness 500x500 mm (approx. 20x20 inch)
SG 3216	≈ 5 %	Diffuser 1mm thickness 200x200 mm (approx. 8x8 inch)

APPLICATIONS: Industry Quality Control • Refinement of Detectors • Custom Research Applications • Remote Sensing Calibration

Custom and OEM parts made out of Zenith Polymer®

We welcome enquiries for the custom fabrication of Zenith Polymer parts such as small OEM integrating spheres, laser cavities, lamp housings, illumination or diffuser panels and custom calibration targets. Our engineers can work directly from your print or drawing.

With Zenith Polymer 99 % reflectance standards or Zenith Polymer optical greyscale standards, you obtain an optical standard which withstands harsh environments, is chemically inert, stable against most acids, resists temperatures up to 250 °C and offers you a constant, high diffuse reflectivity over the broad range of UV-VIS and NIR.



Zenith Polymer® Space Grade Material

Zenith Polymer Space grade is the material of choice for vacuum applications and space based platforms or satellites. Our customers are the main European space agencies.

Our space qualified material is produced using highly advanced manufacturing processes that virtually eliminate potential contamination that can lead to UV degradation under space conditions. Zenith Polymer material and manufacturing processes have been qualified by ESA contractors for several satellite space projects.

The material exhibits reflectance values of more than 98 % over the wavelength range of 300 to 1800 nm. It is resistant to heat, humidity and exposure to high levels of radiation, making it the optimal material for use in space.

APPLICATIONS: Satelite Calibration Targets • Space Based Platforms • Radiance Calibration Standards • Uniform Light Source Spheres

About us

SphereOptics GmbH was founded in 2003, together with its sister company SphereOptics LLC in the USA. In 2010, SphereOptics LLC was bought by Labsphere Inc. and SphereOptics GmbH in Germany now serves as Labsphere's sales channel for Germany and Eastern Europe. In addition to Zenith diffuse reflectance materials, standards and targets, SphereOptics also supplies a wide range of measurement equipment from Labsphere, Radiant Imaging, ASD and NEO.

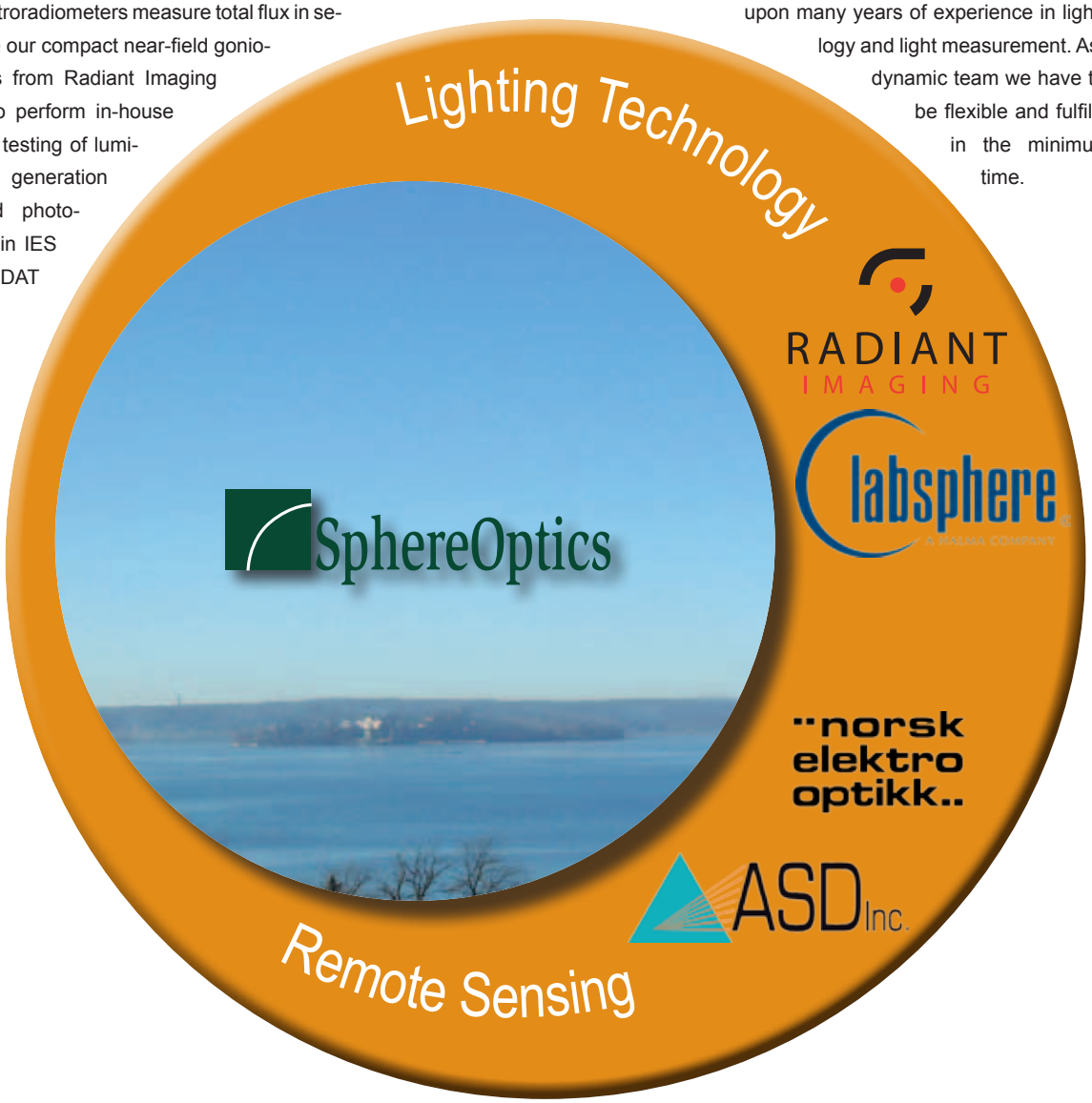
From Labsphere, we offer both standard and custom integrating sphere systems for measuring light sources and for measuring the optical properties of materials. Integrating sphere based laser power meters provide a convenient way of measuring the output of high power or divergent laser beams. Integrating sphere uniform light source systems provide a spatially uniform field of luminance for flat-fielding and pixel gain normalisation of cameras and imaging sensors, and are also used to calibrate remote sensing and space-based multi-spectral radiometers.

For those developing the next generation of energy efficient lighting, you will know how important fast, accurate and affordable test equipment is when it comes to being able to bring new products to market quickly. SphereOptics can help you to save time and money with our innovative photometric and goniophotometric test equipment for luminaires, solid state lighting, lamps and LEDs. Labsphere's high speed integrating sphere spectroradiometers measure total flux in seconds, while our compact near-field goniophotometers from Radiant Imaging allow you to perform in-house photometric testing of luminaires and generation of standard photometric data in IES and EULUMDAT formats.

ProMetric imaging photometers and colorimeters from Radiant Imaging are powerful, CCD-based instruments that provide for increased productivity compared with traditional 'spot' photometers. A ProMetric photometer can measure the illuminance, luminance, luminous intensity or colour of literally millions of points simultaneously. Moreover, localised luminance and colour differences can be easily detected. Applications for ProMetric imaging photometers are extremely varied, but the more popular include the characterisation of light sources, displays, LEDs and solid state lighting, vehicle lighting, road traffic and emergency signs and automotive and avionic instrument panels.

SphereOptics GmbH is also active in the field of remote sensing and hyper-spectral imaging. In addition to the supply of Zenith diffuse reflectance targets, SphereOptics is now partnered with ASD for the supply of portable NIR field spectrometers which are widely used in agricultural as well as defence applications. SphereOptics also supplies specialised hyper-spectral imaging equipment from NEO which is capable of performing spatially-resolved spectral analysis.

SphereOptics connects all of these different fields of applications with our optical materials and our knowledge, understanding of customer needs and desire to be much more than just a supplier of state-of-the-art equipment. SphereOptics supports you with practical advice based upon many years of experience in lighting technology and light measurement. As a small but dynamic team we have the power to be flexible and fulfil your needs in the minimum possible time.



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