GL OPTI SPHERES

Standards compliance in a flash

Integrating spheres are important instrumentation of laboratory systems and product testing. When you introduce many lighting products to the market or you need to organize a photometric laboratory GL Optic can supply quality instrumentation and provide professional technical support. Modern lighting quality standards require full characterization of LED modules, lamps and luminaires. Tests include photometric and colorimetric measurements along with temperature and electrical power measurements.
Table of contents:

4 First get to know us better

6 How to organize a modern photometric laboratory?


12 GL SPECTROSOFT
   The brains behind our systems

14 GL System
   Integrating sphere systems

16 5 steps to high quality integrating spheres

18 Single LEDs and COBs

20 Lamps and Modules

22 Lamps and Luminaires

24 GL TEC CONTROL System
   Thermal controlled measurement system

26 3 levels of configurations available

28 Technical data
First get to know us better.

At GL we believe that the true quality innovation is about the best technology and not about gadget functionality. This is why we encourage all potential customers to choose quality instruments for their lighting product quality control.

There are many light meters available on the market today but we know what matters most for fast developing lighting manufacturers: engineering, precision, performance and, equally important, independence from external quality testing labs. For many manufacturers the possibility of optimizing product quality and faster prototyping are advantage factors helping them to win the market share.

Unlike mass produced devices, GL instruments are individually calibrated for the end user allowing for accurate and dependable results and helping to make the right product quality decisions.

Our instruments feature automatic dark current compensation combined with a temperature monitoring system which allows everyone to use the system whenever and wherever they need dependable data.

The unique plug-and-measure concept by GL features the RFID codes helping to automatically get the calibration files for each available accessory and allowing quick, easy and precise measurements of different lighting quantities. Changing from lux to lumen and even luminance values is as easy as changing the available accessories. Leave it to the system to take care of the rest.

“The ultimate light quality control systems available only for best lighting quality product manufacturers”

GL Optic is a full-line manufacturer of complete instrumentation for professional spectral light measurement

At GL we design, manufacture and support light quality control systems that help modern lighting companies develop their products faster and better by using the knowledge, technology and expertise which is built in every light measurement instrument we provide. With the use of our instruments and software users can get command of the quality from the moment of components purchase through the research and development stage up to the final product testing.

Our Leadership Team

Michael Gall
CEO of Just Normlicht
co-founder of GL Optic and an open-minded entrepreneur with many years of experience in lighting/technology for visual colour assessment.

Miko Przybyla
CFO of GL Optic
a partner, light quality enthusiast and head of GL business development and operations.

Jan Lalek
CTO of GL Optic
co-founder of GL Optic – physicist and optical engineering expert, passionate about colorimetry, optics and modern technology.

GL Optic was established in 2009 to develop and bring innovative solutions in light measurement. Since its establishment GL Optic has been growing, developing products, setting industry standards and expanding sales all over the world.

Nowadays GL Optic is at the stage of developing R&D centre and expanding its services. The company is finalizing the construction of a new photometric laboratory equipped with Poland’s first black body (BB) model, the first primary standard radiation source in Central Europe.

GL OPTIC IS A FULL-LINE MANUFACTURER OF COMPLETE INSTRUMENTATION FOR PROFESSIONAL SPECTRAL LIGHT MEASUREMENT

10 YEARS

Origins
2009 – 2019

GL SPHERE SYSTEMS

office@gloptic.com
www.gloptic.com
Standards compliance in a flash


Selection of an integrating sphere system

An integrating sphere, also known as a spherical lumen meter, is one of the basic instruments for measuring light sources, lamps and luminaires. Traditionally, an integrating sphere is also called an Ulbricht sphere, and its name comes from the name of German engineer Richard Ulbricht, who during the preparation of electrification and lighting of a railway station dealt with photometric measurements in order to find the best illumination method [1]. He proved that the light intensity measured on the wall of the sphere in which the light source is placed is proportional to the total luminous flux of the light source.

Today, integrating spheres, commonly used in photometry and radiometry, enable a reliable comparison of the luminous flux of different light sources, lamps and luminaires. This part of the article on the organization of a photometric laboratory will focus on the types of integrating spheres and address technical issues that are important for the measurement and evaluation of lighting products. Issues related to the conditions that should prevail in the laboratory will be discussed and practical tips will be given, especially useful in the selection and operation of measuring systems.

Why should an integrating sphere be used and what values can be measured in it?

The properties of the integrating sphere allow for a relatively simple and quick comparison of photometric parameters of different lighting products. An object placed in the sphere can be measured within a few seconds (apart from the time needed for stabilisation – see below). This is the fastest way to measure the luminaire’s total luminous flux [lm] and determine the luminaire’s luminous efficacy [lm/W] at a known power supply. The measurement in the integrating sphere is straightforward and allows for direct comparison of the readings with the reference standard. Contrary to goniometer measurements, which consist of long-term partial measurements integrated to calculate the total luminous flux, the measurement in the sphere is immediate and much easier. A well-described and accepted measuring procedure allows almost every operator to obtain reliable and reproducible measurement results. This is important when comparing many lighting products and measuring different sources, lamps and luminaires. Traditionally, an integrating sphere is one of the basic instruments for measuring light sources, lamps and luminaires. An integrating sphere, also known as a spherical lumen meter, is one of the basic instruments for measuring light sources, lamps and luminaires. This part of the article on the organization of a photometric laboratory will focus on the types of integrating spheres and address technical issues that are important for the measurement and evaluation of lighting products. Issues related to the conditions that should prevail in the laboratory will be discussed and practical tips will be given, especially useful in the selection and operation of measuring systems.

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In addition, the Ulbricht sphere system also enables measurements outside the visible spectral range. In the case of products for illumination of plants, it is possible to measure quantities such as the PPF photon flux or the spectrally expanded PAR photon flux. Integrating spheres are also used for infrared radiation measurements in vision systems and industrial equipment - in this case an integrating sphere appropriately calibrated and equipped with high-quality measuring equipment can be used for rapid verification of the energy efficiency of solar radiation from different spectral ranges.

Also according to the recommendations of the recently published new standard CIE S026:2018, the effective lighting influence on the human day / night cycle (circadian rhythm) can also be evaluated on the basis of data from the measurement of the luminaire’s radiant flux, and then calculated by the aPSCI’s efficiency curves.

Another practical advantage of the integrating sphere is its essential property, namely the lighttight structure. Thanks to this, the integrating sphere can be placed in normal office conditions and illuminated rooms without the risk of the general lighting affecting the measurement result.

What size and type of sphere should be chosen?

Golden principles of photometry described, among others, in the CIE S026/E:2015 standard and the EN 13032-4:2015 also included in IESNA LM 79 specify that the sphere size must be 10 times greater than the luminaire’s source [2] [3]. This does not refer to linear luminaries with a small total area of the housing. On the other hand, the practical principles applied in many in-house measurement laboratories allow for the measurement of luminaires whose size is up to 30% of the sphere diameter, which is described in more detail in the article. Practical tips for LED measurements in the integrating sphere and on the goniometer according to CIE025 [4]. Let us remember that each element introduced into the integrating sphere interferes with the measurement and therefore limits the possibility of multiple reflections and absorbs a part of the light flux. This effect is compensated for by an additional light source placed in the sphere, allowing for the determination with the recommendations of the standards defining minimum functional requirements and ecosdesign requirements for energy-related products defined in Directive 2009/125/EC in Europe or the relevant standards for Energy Star rating in the Americas.
of the absorption coefficient. If we are building a laboratory that is to be accredited in the future, we must take into account the recommendations of the applicable standards. For factory quality control we can adopt our own procedures, but we have to take into account the error, which is caused by the size of the luminaire placed inside the sphere.

When selecting the sphere size for our laboratory, it is necessary to suggest the maximum size of luminaires to be measured in it. In the case of luminaires with a diameter of 1 m or more, large integrating spheres with a diameter of 1.5 m or 2 m are the most frequently selected. Laboratories that measure LED modules, components or small illuminators (e.g. evacuation lighting) usually buy a sphere with a diameter of 1 m. In the R&D departments the most popular are integrating spheres with a diameter of 0.2 and 0.5 m, which make it possible to measure both individual COB diodes and most commonly used LED modules.

On the market there are integrating spheres combined with a photometer, i.e. typical photometric spheres, as well as spheres which use the spectroradiometry as a measuring device - i.e. spectrally-radiometric spheres. The advantage of the latter is the ability to measure the luminous flux, including the calculation of additional data such as colour temperature, any effective curves for human centric lighting or lighting for plants, as well as other effective curves for special applications. Moreover, the integrating spheres with the spectroradiometer are not burdened with the so-called spectral mismatch error, which results from a simple photometer measurement system and is dependent on the class of the applied optical correction filter for matching to V(λ) (Fig. 1-2). The better the photometer class, the smaller the mismatch error. Spectroradiometers used in integrating spheres mathematically calculate the V(λ) and more accurately measure light emitting diodes with different spectral power distributions. (Fig. 2).

Modern measuring systems are fully computer controlled. Both the measuring system with additional components, as well as an additional light source to compensate the absorption coefficient with the power supply system, are controlled via a single user interface. At present, for LED measurements, photometric measurement is automatically combined with colorimetric measurement and power and temperature measurement. All these elements can influence the results and repeatability, so when selecting the equipment, attention should be paid to the details of the additional measurement functions. An important element is the ability to integrate the optical measurement system with programmable and stabilized power sources, power meters or electrical parameter analyzers. Good quality solutions allow for optimal configuration of the measuring system adjusted to the requirements of standards and laboratory needs.

Laboratory conditions and luminaire stabilization

Before measurement

In accordance with the recommendations of the standard, suitable conditions should be provided in the photometric laboratory that do not interfere with the measurement results. The optimum ambient temperature is 25°C. The room should be free of dust and vibrations and the humidity should be kept constant. The air movement should not exceed 0.5 m/s to avoid disturbance by possible reflections in the sphere, so that more repeatable measurement results can be obtained. And the impact of the so-called aperture error on the distribution and incident light output is considered. In this context, the most commonly used optical system, the barium sulphate (BSO) are used to coat the integrating spheres. A poor quality coating does not have the appropriate reflective properties over the entire spectral range, which may result in larger or smaller errors depending on the type of light source to be measured. In addition, the low-quality coating change by more than 5% within 15 minutes. If the luminaire does not stabilize during this time, it should be heated for a longer time. There is also a case of technical luminaires, which due to their design are not subject to stabilization – in such case measurements should be started and the conditions and changes in the flux at initial moments should be noted in the measurement report.

Stabilization and measurement of the luminaire should be carried out in the final working position of the luminaire. It is worth noting that in order for this requirement to be met, the integrating sphere should be equipped with brackets or mounting table enabling proper installation of the luminaire in the sphere. In addition, it is necessary to remember about the appropriate power cables connected directly to the luminaire, so that the light can be transported in its entirety. This applies to the entire transport route, including gates, entrances, staircases, etc. In some cases it is necessary to partially disassemble the walls or enlarge the door. The sphere itself, placed in the laboratory, does not take up much space – an area of about 10 m² is enough.

Integrating sphere systems are subject to regular calibrations. Standards require stabilization of the system between calibrations at the level of 0.5%. To be able to check the conformity of a working reference standard, the sphere should be calibrated. Calibration of a sphere spectroradiometer system should be made with a use of a Total Spectral Radiant Flux (TSR) standards traceable to National Metrology Institutes (NMIs). Laboratory staff may obtain TSR standards and perform such calibration on their own or request an onsite service from a supplier or accredited organisation. Laboratory "best practices" suggest that annual calibrations are recommended however it is up to the laboratory manager to decide.

Measurement of luminaires - even if the luminaire is equipped with a power supply unit, must be powered from a stabilized source. Under laboratory measurement conditions, a stabilized power supply system should be provided to protect against fluctuations in power supply from the mains. In addition, it is necessary to remember about the appropriate power cables connected directly to the luminaire, so that the light can be transported in its entirety. This applies to the entire transport route, including gates, entrances, staircases, etc. In some cases it is necessary to partially disassemble the walls or enlarge the door. The sphere itself, placed in the laboratory, does not take up much space – an area of about 10 m² is enough.
MEASURE. LAUNCH. GROW.

With more and more companies manufacturing commercial lighting fixtures, there is increasing demand for a reasonably priced, accurate and easy to use solution to test & measure large luminaires during development and as a QC measure in production.

The Opti Spheres were developed to meet this need and offer a completely turnkey solution for all your light measurement needs, big or small.

A LABORATORY OF YOUR OWN

These instruments are equally suited to accredited laboratory environments, production labs or in R&D for quick quality control. When using external labs becomes too expensive or time-consuming, the Opti Spheres are an excellent choice for laboratory light measurement applications.

INSTANT CUSTOMIZED REPORTS

Install, measure and prepare customized reports directly from our GL Spectrosoft suite. This analytical software will control the measurement instrument and an auxiliary light source and will optionally manage peripheral devices like programmable and stabilized power supplies or TEC controllers. All the data can be included in one complete measurement report.

ACCESSIBLE LUMINOUS FLUX AND RADIANT POWER MEASUREMENT SYSTEMS

GL OPTI SPHERES are as default equipped with a spectroradiometer. This allows the user to combine photometric measurements with spectral measurements to provide colorimetric data.

Additionally, all spheres deliver spectroradiometric data necessary for calculations of specific values in extended spectral range. UV and IR range measurements outside the visual spectrum are possible.

A new GL PHOTOMETER 3.0 + Flicker can now be connected to extend measurement capacity to allow for characterization of flicker.

1. Quality no-aging coating with high reflectance
2. Smart mechanics and durability
3. Optimized baffles size and measurement geometry
4. Universal configuration
5. Customizable
Our systems

Don’t forget to verify the software interface when comparing competitive integrating sphere systems.

At GL we believe that it is of key importance to check before you buy.

Make sure how you will get the control of the instrumentation during your measurements.

It is the user friendly interface that will make your life easier and you will be able to appreciate the high quality instrumentation.

SPECTORADIOMETRIC DATA
Default system uses a calibrated spectroradiometer for full photometric and colorimetric characterization of DUT*. Total Luminous Flux is measured along with many colorimetric and radiometric values. UV and IR optical radiation measurements available with GL SPECTIS 5.0 touch or GL SPECTIS 6.0 rack mount system.

NEW FAST PHOTOMETER + FLICKER
This new optional instrument can be used for fast measurements combined with optical flicker characterization of DUT*. The software includes all latest flicker metrics according to EU and US standards.

EASY TO NAVIGATE
If you are looking for more advanced product testing and measurements in accordance with international lighting standards you will find everything you need for a professional laboratory work. Unlimited data capture options and peripheral devices integration are available.

POWER SUPPLIES
Programmable and stabilized power supply can be controlled using single user interface simplifying measurement procedure and saving time.

ADVANCED TOOLS
If you need technical assistance, please complete the form available on gloptic.com/support and we will get back to you as soon as possible.

POWER MEASUREMENTS
Extended measurement of electrical power is available with the use of additional connections to include full electrical testing into measurement report compliant with Energy Star and Eco Label Design requirements. This can include optional harmonics and high resolution electrical measurement data.

FLEXIBLE AND CUSTOMIZABLE REPORTS
Our RTF reporting system allows the user to create custom report templates and save them as defaults for future use. Simply open the document in any editor and prepare the layout of your company’s reports by including your company logo, fonts and colours in line with your company identification system. You can even upload photos of your lighting products and include selected measurement data.

TEMPERATURE CONSIDERATIONS
Temperature measurements close to DUT* are available with USB controlled measurement unit or optional TEC stabilized mounts for LED modules paired with programmable controllers.

LIFETIME LICENCE POLICY
All GL customers are provided with a lifetime software license and can be sure to get continuous access to the latest software versions available for download online. Simply download the latest version of the software from the link and enjoy using our tools.

TEMPERATURE MEASUREMENTS
Large spheres are equipped with USB controlled temperature measuring device featuring temperature probes placed outside the sphere, on the wall of the sphere and additionally inside the sphere close to DUT mount. This allows for temperature monitoring during tests and measurements.

MULTIPLE LANGUAGES
Being a European manufacturer, GL Optic offers GL SPECTROSOFT in many languages, e.g. English, German, French, Italian, Polish, Russian, Chinese, and more. Please contact us to make sure your native language is available.

AUTOMATIC DARK CURRENT COMPENSATION
During the entire measurement process the software monitors the sensors temperature. This allows even for non-cooled instrument to provide very accurate measurements in different conditions. A temperature sensor installed on the electronic board monitors changes in temperature and automatically compensates for any change in dark current level providing excellent measurement stability.

DIFFERENT SOFTWARE LICENCE LEVELS
GL SPECTROSOFT is available in different software licence levels to meet the demand of the end user. Starting with entry level BASIC configuration through the professional software licence up to the laboratory licence level. You can also pick and choose from the available Add-Ons and tools. Please see the table for details.

ONLINE SUPPORT
We offer ongoing technical support when you are online. Just contact us at info@gloptic.com for details.

SOFTWARE LICENCE POLICY
GL SPECTROSOFT is available in different software licence levels to meet the demand of the end user. Starting with entry level BASIC configuration through the professional software licence up to the laboratory licence level. You can also pick and choose from the available Add-Ons and tools. Please see the table for details.

COMPLIANCE & UPDATES
We are always up-to-date with the latest international, European and American lighting industry standards and market requirements. We follow up CIE, IEC and IES standardization committees to include the latest metrics in our software. We are also open to suggestions from our end users to make our software a useful analytical tool for specific applications.

GL SPECTROSOFT
The brains behind our systems

www.gloptic.com
office@gloptic.com
GL SYSTEM

Integrating sphere systems

MOUNT AND MEASURE

By default, an integrating sphere system comes equipped with a mechanical stand that can be adapted to mount many different fixtures and LED module types. An optional lamp post installed in the center of the sphere makes it easy to install different A type products. Any of our high-performance spectrometers can be connected to the sphere and is automatically detected by the software. Load the lamp, and let the software do the rest.

ADAPTABLE TO YOUR NEEDS

With a wide range of spectrometers and accessories available for the Opti Spheres, you can select the best spectral range and features to fit your budget and technical requirements. Combine it with our powerful Spectrosoft Analysis suite software and automation add-on, to have a completely turnkey test station that anyone can use to obtain accurate and repeatable results.

ACCELERATE PRODUCT DEVELOPMENT

This integrating sphere system is still small enough to be installed in an office or production floor space allowing R&D departments and engineers to quickly and accurately measure lighting components onsite. Sending lamps and components for testing in the lab means long lead times and ultimately slows down the development cycle. Now, when new fixtures are delivered or a new board is fabricated the results are available immediately.

DUT – Device Under Test

SPECTIS 1.0
Our popular spectroradiometer optimized for fast photometric & colorimetric measurements

SPECTIS 5.0
For optical radiation measurements in an extended spectral range from UV to NIR in a variety of applications.

TEC CONTROL
TEC controllers and mounts for LED modules thermal stabilization and measurements during goniometric tests are available.

POWER SUPPLIES & METERS
Choose from available power supplies and current sources for a full electrical characterization of DUT*. Advanced power meters and fast current sources from leading suppliers available on demand.

SOFTWARE + PC
GL offers preconfigured, turn-key system including all instruments with software and a dedicated PC which is tested prior to shipment to customer.

SUPPORT & INSTALLATION
Online and On-site extensive know-how support for end-users to help them manage their complex measurements.

14
NO-AGING HIGH REFLECTANCE COATING

High quality coating is the essence of integrating spheres. Unfortunately there is no way to tell the difference between good and bad quality coating just by visual inspection. The devil is in the compound and process. For this reason GL uses only premium quality coating from proven and tested suppliers. We have been supplying our sphere systems since 2010 to Europe and America and never had a single claim from end users regarding the coating. Our products maintain superb optical performance for years and our coating is resistant to yellowing, flaking off or fluorescence.

MECHANICS AND DURABILITY

A sphere is just a sphere they say. Many suppliers can offer you a hollow structure and claim that it can be used for photometry. We believe that careful design of instrument is the best guarantee for accurate measurements. Durable construction and light weight differentiate GL spheres from competitors. Easy handling and best mechanical repeatability supports many people in photometry labs worldwide.

BAFFLES AND GEOMETRY

Optimization of baffles size and positioning in the GL spheres is the best solution to avoid annoying differences of readings depending on how the Device Under Test (DUT) is positioned in the sphere. Competitive spheres are sensitive to DUT orientation and the difference between 2PI and 4PI measurements are significant. GL Optic sphere design is optimized for international measurement standards for measurements and higher level of accuracy.

UNIVERSAL CONFIGURATION

Each sphere is ready for a bottom-up and upside-down position of DUT in the center of the sphere. All spheres are available with external measurement support for emission lighting systems measurements in 2PI geometry. As default an auxiliary light source for self absorption compensation is also available in each sphere. Larger spheres are equipped with the USB controlled temperature sensor complying with the latest standards for LEDs requiring temperature measurements near DUT to monitor the influence of temperature on readings accuracy and repeatability. Universal mechanical mounts and typical lamp sockets are available together with reference Total Luminous Flux Standards.

CUSTOMIZABLE

GL systems offer unmatched customization possibilities. Where competitive products require expensive product modifications or cannot be changed to customer needs GL system of ports and adapters is suitable for quick and easy adaptation to specific application. If you want to order the measurement system and will need to modify it in the future the GL Opti Spheres are the best choice among European, American and Asian suppliers. If you need to connect to a specific instrument system just send us your technical details and we will be happy to provide dedicated connections and additional components in short time and at reasonable pricing.

“Integrating spheres from GL can be used for various applications and are the basic equipment for a quick and reliable optical characterization of lighting products and components. GL OPTI SPHERES including selection of peripheral devices are available in 3 standard configurations.”

BASE

Budget configuration for total luminous flux and colour testing entry level configuration for quick and easy quality lighting products testing. The set is available with GL Spectis 1.0 VIS spectroradiometer to measure luminous flux and colour of the light.

The accompanying software package supports photometric and radiometric analysis of the light output.

PROFESSIONAL

Turn key setup for complete products and components tests and measurements. This configuration level includes all basic items + most popular AC and DC power supplies for stability and electric parameters measurements. Companies working with integrated lighting systems (lamps including driver) will need AC power supply only. Those working with LED modules or DC drivers will need DC current unit.

Optional power meters for advanced system characterization are often requested. There is a selection of diverse models for electrical evaluations available.

LABORATORY

Advanced instrumentation for demanding accredited laboratory applications for advanced tests and measurements and for accredited laboratory environments GL OPTI SPHERE system is available in the top end configuration. This setup uses laboratory level measuring instrument GL Spectis 5.0 or rack mounted GL Spectis 6.0 which not only offers highest optical resolution in the extended spectral range but also provides increased sensitivity which will support demanding optical measurements of technical lighting or scientific research beyond the visible spectrum.

NOTE: More information on available components and configurations on page 24.
LUMINOUS FLUX MEASUREMENTS AT YOUR HAND

Did you know that electric current, electronic drivers and even heat may negatively affect lighting properties of LEDs? These are some of the reasons why you would need an integrating sphere to measure the performance of single LEDs once they are installed on PCB.

It takes only 10 seconds to connect this plug ‘n’ measure set to a computer and precise GL SPECTIS 1.0 and intuitive GL SPECTROSOFT delivers accurate results quickly.

- Monitoring of spectra, colour or luminous flux
- Quality control of incoming LEDs
- Binning i.e. selection of colour and brightness groups

GL OPTI SPHERE 48
Luminous flux and radiant power measurement of single LEDs and other small light sources. Mounts directly on spectrometer.
Use this for luminous flux, radiant power, colour temperature CCT, colour coordinates and colour rendering properties (CIE CR, IES TIA-SQ) of LEDs.
For everyday work of electronics engineers and LED modules developers, helpful for purchasing managers or purchasing agents to select the proper components.

TECHNICAL DATA
- Spectral range: 340 – 1700 nm
- Sphere inner diameter: 48 mm
- Sphere material: Aluminium
- Inner coating: Barium Sulfit (BaSO4) high-reflectance material (R98)
- Standards compliance: CIE

GL OPTI SPHERE 205
For COBs and UV sources total output measurements
This GL Opti Sphere offers an automated, easy to use alternative for measuring luminous flux and radiant power of COBs and other small light sources. All measurements are compliant with CIE 127:2007 Technical Report and CIE TS025: 2015.
The intelligent design of the sphere enables different adapters to be installed and allows measurement of a wide number of light sources. Front emitting sources can be measured at the wall entrance in 2π geometry. Other types of LEDs should be measured at the center of the sphere in 4π geometry. Configure the system as required by your application.

TECHNICAL DATA
- Spectral range: 340 – 1700 nm
- Sphere inner diameter: 205 mm
- Sphere material: Aluminium
- Inner coating: Barium Sulfit (BaSO4) high-reflectance material (R98)

ADAPTABLE TO YOUR NEEDS
There are customized sizes of apertures available on demand for GLS 48 depending on the size of LEDs.
High signal spheres are available on demand to extend the dynamic range of the system for high power LEDs.

DIFFERENT APERTURES
- MOUNTS & ADAPTERS
- MODIFIED GEOMETRIES

POSSIBLE CUSTOMIZATIONS
- Custom-made spheres can be offered for special applications such as UV sources or fluorescence measurements of OLEDs.
PRECONFIGURED SETUP
FOR MODULES, LAMPS AND FIXTURES

Whether you import or develop retrofit or new LED fixtures you can quickly check the performance of lighting product, verify standard compliance and control the quality of drivers and components. This solution, thanks to its compactness and precision, will turn your desktop into a professional measurement lab. Included set of typical lamp sockets and adjustable sample post make it a simple solution for various measurements.

- Quality control of different lamps
- Measurement of luminous flux and colour
- Energy efficiency measurement

GL OPTI SPHERE 500
Table top system for measurement of LED modules and retrofit lamps.
This sphere offers an excellent entry into the laboratory test & measurement space for LED modules, lamps and components that you use in lamp manufacturing. The sphere can be combined with any of our spectrometers for accurate flux and colour testing. Now you will be able to check components, diffusers, control the influence of new electronic drivers and produce reports immediately and frequently. Get photometric results for prototypes, verify the LEDs and components from your suppliers and get your light quality under control!

TECHNICAL DATA
Spectral range: 340 – 1700 nm
Sphere inner diameter: 500 mm
Sphere material: Composite
Inner coating: Barium Sulfate (BaSO4) high-reflectance material (R98)

GL OPTI SPHERE 1000
Compact measurement of large LED modules and luminaires.
This integrating sphere system is equally suited to accredited laboratory environments, production labs or in R&D for quick quality control. By default, this integrating sphere system comes equipped with a mechanical stand that can be adapted to mount many different fixtures and LED module types. An optional lamp post installed in the center of the sphere makes it easy to install different A-type products.

TECHNICAL DATA
Spectral range: 340 – 1700 nm
Sphere inner diameter: 1100 mm
Sphere material: Composite
Inner coating: Barium Sulfate (BaSO4) high-reflectance material (R98)

“Own an older sphere? Third-party sphere integration with our measurement instrumentation is available on demand.”

GL AUTOMATION
This powerful tool which is part of the GL Spectrosoft software package is used to operate all of the attached instrumentation to plan, conduct and monitor automated test scenarios. The turnkey system includes the lab-grade GL SPECTIS 6.0 spectrometer and TEC-Mount with Peltier element for cooling or heating connected to a cutting-edge TEC controller. Both in turn are connected to a GL OPTI SPHERE 500 integrating sphere and a programmable power supply and controlled in Spectrosoft.

OPTICAL MEASUREMENTS
A high resolution and wider spectral range instrument. Industrial rack housing for simplified connection of complex measurement systems.

THERMAL CONTROL & MEASUREMENTS
Different TEC mounts for stabilization of LED modules temperature during test and measurements. Programmable temperature controllers managed by AUTOMATION to set, measure and simulate different test and measurements conditions.

ELECTRICAL POWER SUPPLY & MEASUREMENTS
Stabilized and programmable power supplies are available to provide adequate electrical conditions. Measurement function allows for reliable characterization of electrical parameters. Laboratory grade DC sources current controlled LED chips and modules tests & measurements.
This is the professional grade setup, powerful enough to work as a real on-site lab so you will not need to send your lamps to any external laboratories for evaluation any more. Compliant with the latest light measurement standards this system features universal mounts and external measurement port for 2Pi and 4 Pi configurations. Direct connection to Spectroradiometer and optional fast Photometer for optical and flicker measurements in one.

Easily-operated and flexible – featuring adjustable universal sample post for light sources of various size.

**GL OPTI SPHERE 1500 / 2000**

Luminous flux and radiant power measurement of large LED modules and large luminaires. GL Opti Sphere 2000 and 3000 were designed for the measurement of large-LED luminaires and modules. These systems enable STANDARD compliant testing to CIE S025/E: 2015 standard and EN 13032-4:2015 and IESNA LM-79. The size of the sphere and the side-opening system facilitate the easy installation of a variety of light sources using additional adapters or holders, allowing full measurement flexibility. As with all our integrating sphere systems, this system can be equipped with any of our high-performance spectrometers and powerful automation and analysis software to produce a completely turnkey system that anyone can operate.

**TECHNICAL DATA**

- **Spectral range**: 340 – 1700 nm
- **Sphere inner diameter**: 1500 mm / 2000 mm
- **Sphere material**: Carbon steel
- **Inner coating**: Barium Sulfate (BaSO4) high-reflectance material (R98)
- **Standards compliance**: CIE S025/E:2015

**GL OPTI SPHERE 3000**

Build an on-site largest integrating sphere system. CIE S025/E:2015, EN 13032-4:2015 and IESNA LM-79-08 compliant systems including 2 pi external measurement aperture diameter 500 mm; an auxiliary LED and halogen light sources; for self-absorption compensation with USB controlled power supply; 3-point temperature measurement; universal DUT fixing table (breadboard) for measurement in 4 Pi geometry; set of adapters and baffles; 3 reference lamps with holder.

**NOTE:**
This product ships in parts in 6 transportation crates and requires 7 days assembly and installation on-site.

**TECHNICAL DATA**

- **Spectral range**: 340 – 1700 nm
- **Sphere inner diameter**: 1500 mm / 2000 mm
- **Sphere material**: Carbon steel
- **Inner coating**: Barium Sulfate (BaSO4) high-reflectance material (R98)
- **Standards compliance**: CIE S025/E:2015

**Quality & Price**

GL Optic uses only top quality sensors from a recognized Japanese supplier HAMAMATSU Photonics. Coating and diffusing materials together with profiles and housing parts come from trusted German suppliers. Our electronic boards and software interface are designed, manufactured and programmed in Poland.

Our own Calibration Standards are based on Russian VNIOFI Institute of Physical Measurements which is the world’s leading provider of Black Body reference standards used by NIST, NPL, PTB, and other top National Metrology Institutes.

The production facility and calibration laboratory of GL Optic is located in Western Poland, in the region of Poznan, which abounds in well-educated and trained human capital.

**Support**

Our roots are in the lighting industry and we understand light measurement from the lighting manufacturers’ perspective.

GL Optic does not simply manufacture high quality instruments but it offers an extensive know-how support for its end-users to help them manage their complex measurement challenges.

We have a world wide experience in simplifying professional light measurements to improve the quality of light products.

GL Optic provides consultations, modifies or customizes solutions and supports customers in developing their light related business.

Online and onsite support, training and consultations are available.
Reliable and Stable Surface Temperature Control

New industry standards require reliable, stable conditions for surface temperatures of LED modules and stabilized power supplies. This creates the need to regulate and stabilize the temperature of high-power LEDs during the measurements or to simulate various LED operating temperatures. New test standards such as CIE 5 025/E.2015 force lighting manufacturers and developers to place greater emphasis on heat control.

The GL TEC Control System is a new solution which guarantees a complete temperature regulation and control solution for LED modules measurements. It includes a spectrometer, integrating sphere, programmable power supply and sophisticated software in a well-harmonised set.

INTEGRATED SOLUTION

The turnkey system includes the lab-grade GL SPECTIS 6.0 spectrometer and TEC Mount with Peltier element for cooling or heating connected to a cutting-edge TEC controller. Both in turn are connected to a GL OPTISPHERE 500 integrating sphere and a programmable power supply and controlled in Spectrosoft.

HIGH-PRECISION MONITORING AND CONTROL

The module creates stable measurement conditions and can simulate nearly any operating temperature. Heat control is managed by GL AUTOMATION, a powerful tool which is part of the GL SPECTROSOFT software package.

A WIDE RANGE OF LUMIANAIREs

With a max load of over 20 kg and 1800mm diameter max dimension, this sphere will cover most of the demand for testing. Have a range of small and large fixtures? No problem. The system can accurately characterize big and small fixtures without any mechanical changes.

GL SPECTROSOFT AUTOMATION ADD-ON

Instead of the need for setting up parameters in each plugged in device separately, this smart additional software cooperates with and runs all of them. Thanks to this, in one program on your computer, you can set sequences of operations such as: cooling temperature, current and voltage before a measurement. GL SPECTROSOFT AUTOMATION can collect data from external devices and link them together with measurement results.

GL SPECTIS 6.0
Spectral measurement.

LED MOUNT
Stabilize LED module temperature.

GL TEC CONTROLLER UNIT
Programmable thermal control device.

GL POWER SUPPLY
Programmable stabilized current source.

GL OPTISPHERE 2000
The best solution for luminous flux and radiant power measurements of LED lamps and luminaires.

A WIDE RANGE OF LUMIANAIREs

With a max load of over 20 kg and 1800mm diameter max dimension, this sphere will cover most of the demand for testing. Have a range of small and large fixtures? No problem. The system can accurately characterize big and small fixtures without any mechanical changes.
### GL SPECTROMETERS

#### BASIC

<table>
<thead>
<tr>
<th>Product No.</th>
<th>Product Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>073272</td>
<td>GL OPTI SPHERE 3000</td>
</tr>
<tr>
<td>173906</td>
<td>GL SPECTOMETERS</td>
</tr>
<tr>
<td>173906</td>
<td>GL PHOTOMETER 3.0 + FLICKER</td>
</tr>
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</table>

#### PROFESSIONAL

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#### LABORATORY

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</tbody>
</table>

### GL PHOTOMETER 3.0 + FLICKER

- **APPLICATION**
  - High precision illuminance measurements, including long-term sampling, integrating sphere photometer, high-speed, high-precision measurements.

- **TECHNICAL DATA SHEET**
  - Measurement range: 0.001 lx - 50,000 lx
  - Spectral range: 340 – 780 nm
  - Integration time: 10 ms – 10 s
  - Number of pixels: 256
  - Physical resolution: ~1.7 nm / ~1.8 nm
  - Measurement uncertainty: 0.0015
  - Cosine correction: Class B – DIN 5032-7
  - Signal to noise ratio: Class A < 3 %
  - Output: 4 % within range 500 – 1050 nm
  - Sampling frequency: 100 kHz
  - Input: AC 100-240V 50/60Hz 0.15A
  - Power consumption: < 640 mA
  - Power supply: 5V-1A
  - Weight: 1580 g
  - Connectivity: USB A & B
  - Tripod adapter: 1/4" in

- **PRODUCT NO.**
  - 202295

### GL SPECTOMETERS

- **APPLICATION**
  - High speed measurement of SSL products (IESNA LM-79-08), extended by customization

- **TECHNICAL DATA SHEET**
  - Spectral range: 340 – 850 nm (VIS) – 380 – 1050 nm (VIS-NIR)
  - Measurement uncertainty: 4 % within range 500 – 780 nm
  - Cosine correction: Class AA – JIS C 1609-1:2006
  - Signal to noise ratio: Class A on demand
  - Output: 4 % within range 500 – 1050 nm
  - Sampling frequency: 100 kHz
  - Input: AC 100-240V 50/60Hz 0.15A
  - Power consumption: < 640 mA
  - Power supply: 5V-1A
  - Weight: 1580 g
  - Connectivity: USB A & B
  - Tripod adapter: 1/4"

- **PRODUCT NO.**
  - 202295

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**GL SPECTOMETERS**

**GL PHOTOMETER**
**GL OPTI SPHERES**

**APPLICATION**
- Luminous flux and radiant power measurement of single LEDs and other small light sources.
- Measurement of LEDs and other light sources. Measures directly on spectrometers.

**TECHNICAL DATA SHEET**

<table>
<thead>
<tr>
<th>Sphere frame</th>
<th>Outer coating</th>
<th>Reflectance properties</th>
<th>Auxiliary light source</th>
<th>Mechanical breadboard with post</th>
<th>Standards compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Black textured finish</td>
<td>97%</td>
<td>White LED or halogen</td>
<td>No post for 4π measurement</td>
<td>CE, LM 79, CIE 127:2007</td>
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**Maximum DUT dimensions in accordance with CIE S 025/E:2015**
- GL OPTI SPHERE 48: 50 mm (diameter or diagonal)
- GL OPTI SPHERE 205: 150 mm (diameter or diagonal)
- GL OPTI SPHERE 500: 200 mm (diameter or diagonal)
- GL OPTI SPHERE 1100: 300 mm (diameter or diagonal)
- GL OPTI SPHERE 1500: 500 mm (diameter or diagonal)
- GL OPTI SPHERE 2000: 665 mm (diameter or diagonal)
- GL OPTI SPHERE 3000: 1000 mm (diameter or diagonal)

**Weight**
- GL OPTI SPHERE 48: 520 g
- GL OPTI SPHERE 205: 500 g
- GL OPTI SPHERE 500: 500 g
- GL OPTI SPHERE 1100: 1000 g
- GL OPTI SPHERE 1500: 2000 g
- GL OPTI SPHERE 2000: 4200 g
- GL OPTI SPHERE 3000: 1100 g

**Spectral range**
- 340 – 1700 nm

**Barium Sulfate (BaSO4)**

**Technical data**

- Maximum DUT weight: N/A 250 g 3 kg 3 kg 25 kg 25 kg 25 kg
- Maximum dimension for optimal measurement: CIE S 025/E:2015
- Outer coating: Black textured finish Black textured finish Black finish Black finish Black textured finish Black textured finish Black textured finish
- Sphere material: Aluminium Aluminium Composite Composite Carbon steel Carbon steel Carbon steel
- Sphere inner diameter: 48 mm 205 mm 500 mm 1100 mm 1500 mm 2000 mm 3000 mm
- Reflectance properties: 97% 97% 97% 97% 97% 97% 98%
- Sphere center positioning: N/A N/A N/A N/A Cross laser mechanism Cross laser mechanism Cross laser mechanism
- Auxiliary light source: N/A White LED White LED White LED White LED or halogen Halogen
- Sphere frame: N/A N/A Hinged Hinged Hinged Hinged with electric powered opening mechanism
- Mechanical breadboard with post: N/A For 4π measurement For 4π measurement For 4π measurement For 4π measurement For 4π measurement For 4π measurement
- Spectrometer port: Direct connection Direct connection Direct connection Direct connection Direct connection Direct connection Direct connection
- USB source controller for auxiliary light source: N/A With current source and relay With current source and relay With current source and relay With current source and relay With current source and relay With current source and relay
- Universal post with standard lamp sockets: N/A N/A E14, E27, GU10 and G4
- Universal DUT fixing table (breadboard): N/A N/A N/A N/A N/A N/A N/A

**Note:** Instrument, firmware and software specification are subject to change without prior notice. All information included in GL OPTIC datasheets and product information available in any form are carefully prepared and include information believed to be true. Please note that discrepancies may occur due to test and/or other errors or changes in the available technology. We advise to contact GL Optic before the use of the product to obtain the latest product specification.