GL OPTIC

Light quality control

GL SPHERE SYSTEMS

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.


GL
OPTIC

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GL SPHERE SYSTEMS

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Light quality control

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"

10 YEARS

Origins

2009 – 2019

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

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-fouder of GL Optic and an open-minded entrepreneur with many years of experience in lighting technology for visual colour assessment.

Jan Lalek

CEO of GL Optic

co-fouder of GL Optic - physicist and optical engineering expert, passionate about colorimetry, optics and modern technology.

office@gloptic.com
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GL OPTIC

Light quality control

Standards compliance in a flash

GL Optic provides comprehensive solutions for measurements of LED lighting according to the global standard CIE 025/E:2015, European standard EN 13032-4:2015 and US standard IES LM79.

HOW TO ORGANIZE A MODERN PHOTOMETRIC LABORATORY?

first published by Miko Przybyła in LED Lighting Magazine

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.

Fig. 1. Sculpture of an integrating sphere, located on the campus of the Technical University of Dresden. The German inscription reads: "Ulbricht sphere 1990 for checking filament lamps".

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 straight forward 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. Let's assume that we have a ready, measured and accepted prototype luminaire. If the power supply unit is replaced by another type or if it is necessary to replace the type of the light-emitting diode or optical elements, when we want to quickly verify the overall flux - the integrating sphere becomes an indispensable tool for everyday work with lighting products.

In addition to the total luminous flux in the integrating sphere combined with the spectroradiometer, we will also measure the correlated color temperature CCT for white light [K], colour rendering index CRI and Rf, the Duv parameter determining the position in relation to the Planck curve, chromatic coordinates x, y and many other parameters that characterize the lighting product. Measurement in the sphere will provide all the necessary data for the assessment of the energy class in accordance with the recommendations of the standards defining minimum functional requirements and ecodesign requirements for energy-related products defined inDirective 2009/125/EC in Europe or the relevant standards for Energy Star rating in the Americas.

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 PBAR 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 optical 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 ipRGC'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 S025/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 size[2] [3].

This does not apply to linear luminaires 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

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 for general lighting purposes, large integrating spheres with a diameter of 1.5 m or 2.0 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 1m. 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 spectroradiometer as a measuring device - i.e. spectro-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 missmatch 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 (lambda) curve [5]. The better the photometer class, the smaller the mismatch error. Spectroradiometers used in integrating spheres mathematically calculate the V curve (lambda) and more accurately measure light-emitting diodes with different spectral power distributions. **(Fig. 2).**

Fig. 2. Example of a complete measuring system consisting of a 50 cm diameter integrating sphere, with a Peltier module, a computer with analysis and reporting software and a spectrometer, power supply and programmable temperature controller (placed in a rack cabinet).

The quality of the diffusing coating, which covers the inner part of the sphere and guarantees proper, repeated reflection of the signal, is very important. In the 1970s there was a standard in force indicating the use of a coating with a reflection coefficient of ρ 80. The current CIE standard from 2015, after many years of various tests and publications, introduced the requirement to use a reflection coating above ρ 90. The higher the reflection coefficient, the higher the number of 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 smaller. Various types of paint and barium sulphate mixture ($BaSO_4$) 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 material will "yellow" over time, which means that the signal from the blue wavelength range is gradually attenuated, and then causes serious measurement errors and difficulties in calibration of the system.
As is known, white LED light uses a blue diode and the latest designs use a near UV diodes, so reflection of this part of the radiation when measuring in the sphere is very important in order to obtain accurate results.
A good quality coating is sensitive to mechanical damage (so it should be taken care of), but in return it maintains its excellent optical properties for many years. The manufacturer of integrating spheres should instruct the customer on how to maintain the sphere during the system maintenance training. **(Fig. 3).**

Fig. 3. GL Opti Sphere 500 integrating sphere with a universal lamp holder.

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 measuring 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 0.25 m/s so as not to cause cooling of the luminaire during measurements. Traditionally, in a photometric laboratory, the walls of the room are black. This has no direct effect on the integrating spheres in the case of measurements made with the sphere completely enclosed. When measuring projecting light and other luminaires introduced into the sphere through the external measuring port, special attention should be paid to the stray light (ambient

light in lab) that may affect the measurement results. In other cases the integrating sphere can be placed in any room, even a bright one. **(Fig. 4).**

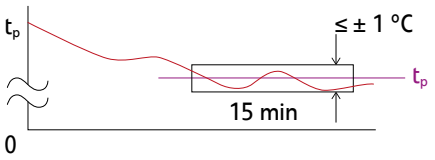


Fig. 4. Principle of stabilization of LED modules prior to measurement, where tp is the board temperature at the measuring point.

(Fig. 5).

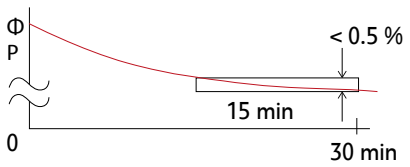


Fig. 5. Principle of stabilization before measurement of the the luminaire, where Ø is the luminaire flux and P is the power supply.

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, because voltage drops in the cables may affect the parameters of the power supply. The issue of power supply during the measurements has been presented in more detail in the previous issue of "LED lighting".

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 inside the sphere in different working positions [Fig. 3]. Professional systems are also equipped with power supply cables and additional circuits allowing to measure power directly near the luminaire.

(Fig. 6).

Fig. 6. Painting of integrating spheres with barium sulphate.

The luminaire should be stabilised (heated-up) for a minimum of 30 minutes and is considered to be stable if the light output and power supply do not change by more than 0.5% 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 full stabilization –in such case measurements should be started and the conditions and changes in the flux at individual moments should be noted in the measurement report.
In the case of measurement of LED modules, the stabilisation also lasts a minimum of 30 minutes until the temperature changes are below 1°C. Attention should be paid to the stabilization of the temperature at the point Tp measured at a specific point on the board. In practice, the measurement of LED modules takes place in an integrating sphere on a radiator after the module's operating temperature has been stabilized. Alternatively, TEC temperature stabilization systems with Peltier system can be used, where the module is placed, and then the temperature is stabilized at a preset level, e.g. 25°C or 85°C (it can be similar to the operating temperature of the module placed in the luminaire). In modern measuring systems the process of temperature adjustment and stabilization of the LED module can be integrated with a programmable system. This enables efficient and comprehensive evaluation and measurement of LED modules.

Special requirements for LED measurement

When planning the organisation of the laboratory, attention should be paid to the dimensions of the integrating sphere and
the possibility of bringing it into the building and placing it in the target room of the laboratory. In the case of an integrating sphere with a diameter of 2 m appropriate entrance (2.3 m by 2.3 m) must be provided so that the sphere 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 dismantle the walls or enlarge the door. The sphere itself, placed in the laboratory, does not take up much space - an area of about 10 m is enough.

Integrating sphere systems are subject to regular calibrations. Standards require stabilisation of the system between calibrations at the level of 0,5%. To be able to check the conformance a working reference standards may be used. Calibration of a sphere spectroradiometer system should be made with a use of a Total Spectral Radiant Flux (TSRF) standards traceable to National Metrology Institutes (NMIs). Laboratory staff may obtainTSRF 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.

Summary

A decision to buy an integrating sphere is an investment decision, so it is worth considering the choice of equipment and supplier. As in the case of other measuring devices - it is also necessary to properly train the personnel. If we build a laboratory from scratch and we do not have experience in performing measurements on our own, at the beginning many questions and doubts will arise. Additional training and technical support from the measuring instrument supplier are helpful.

References

[1] J.M. Palmer, B.G. Grant, The Art of Radiometry, SPIE Press 2010, ISBN 978-0-8194-7245-8, p. 5.
[2] CIE International Standard, Test Method for LED Lamps, LED Luminaires and LED Modules, CIE S025/E: 2015, 2015.
[3] Light and lighting. Measurement and presentation of photometric data of lamps and luminaires. Part 4: LED lamps, modules and luminaire], PN-EN 13032-4:2015.
[4] LED lighting.Practical tips for LED measurements in the integrating sphere and on goniometer according to CIE025.], 3, 2016.
[5] O. Yoshi, Luminous Flux and Spectral Radiant Flux Measurements. NIST Photometry Short Course, 2011.

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

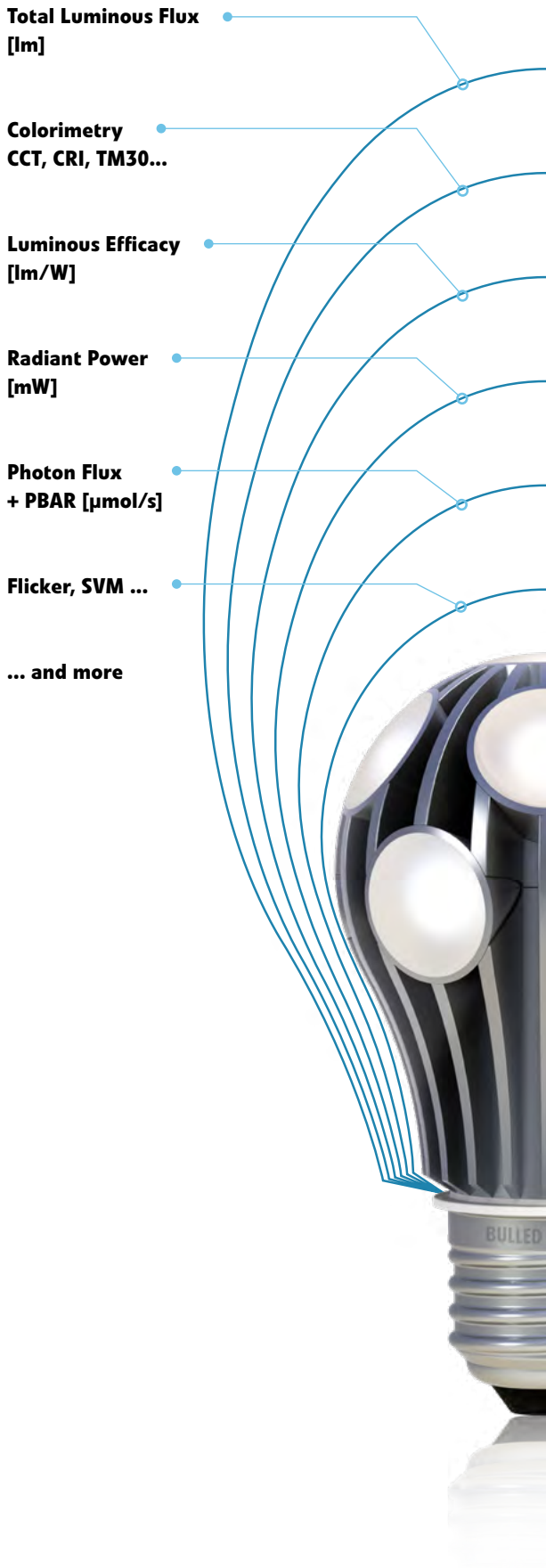
Install, measure and prepare customized reports directly from our GL Spectrosoft suite. This analytical software will control the measurement instrument and an auxiliary light source and will optionally manage peripheral devices like programmable and stabilized power supplies or TEC controllers. All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



5 steps to high quality spheres

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**

GL OPTIC
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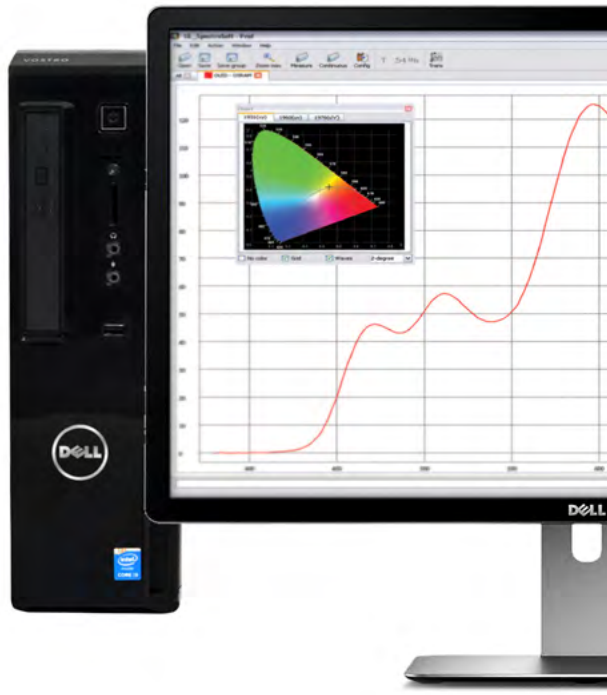
www.gloptic.com

GL SPECTROSOFT

The brains behind our systems



Dont't forget to veryfy 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.

SPECTRORADIOMETRIC 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.

AUXILIARY LIGHT SOURCE CONTROL

The software automatically controls the auxiliary light source with the use of a dedicated power supply. Software interface guides the operator through the self-absorption calibration process. The correction factor is automatically applied to the measured values. As standard GL OPTI SPHERES use LED auxiliary light source. Larger spheres feature additional halogen auxiliary light source to comply with photometric laboratory standards.

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.

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.

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.

POWER SUPPLIES

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

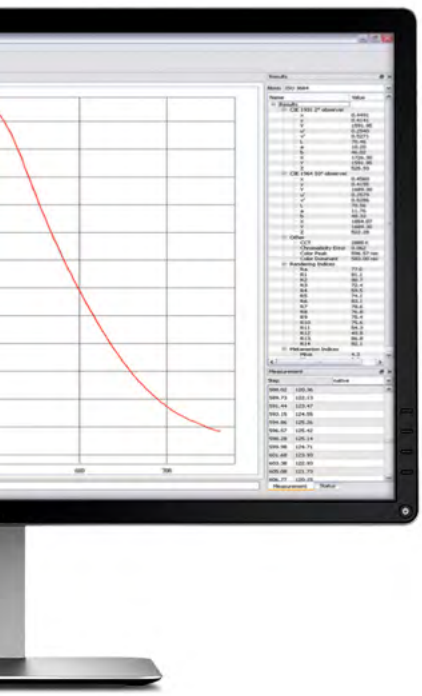
POWER MEASUREMENTS

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.

TEMPERATURE CONSIDERATIONS

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

*DUT – Device Under Test



Intuitive, clear and easy

One software interface to program, monitor and manage a complete measurement system. Starting from power supply through the stabilization process up to the final results and reporting.

EASY TO NAVIGATE	Our software is built for the operator and it will take short time to get the measurement process done if all you want is photometric files . With flexible import and export functions you can get the files in any available format IES, LDT, IEC ...
ADVANCED TOOLS	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.
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.
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 form the link and enjoy using our tools.
ONLINE SUPPORT	We offer continuous online support for end users worldwide. 95% of support calls can be resolved quickly by remote support sessions provided by our highly educated and experienced support engineers. 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.
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.
DIFFERENT SOFTWARE LICENCE LEVELS	GL SPECTROSOFT is available in different software license levels to meet the demand of the end user. Starting with entry level BASIC configuration through the professional software license up to the laboratory license 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.

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Integrating sphere systems

MOUNT AND MEASURE

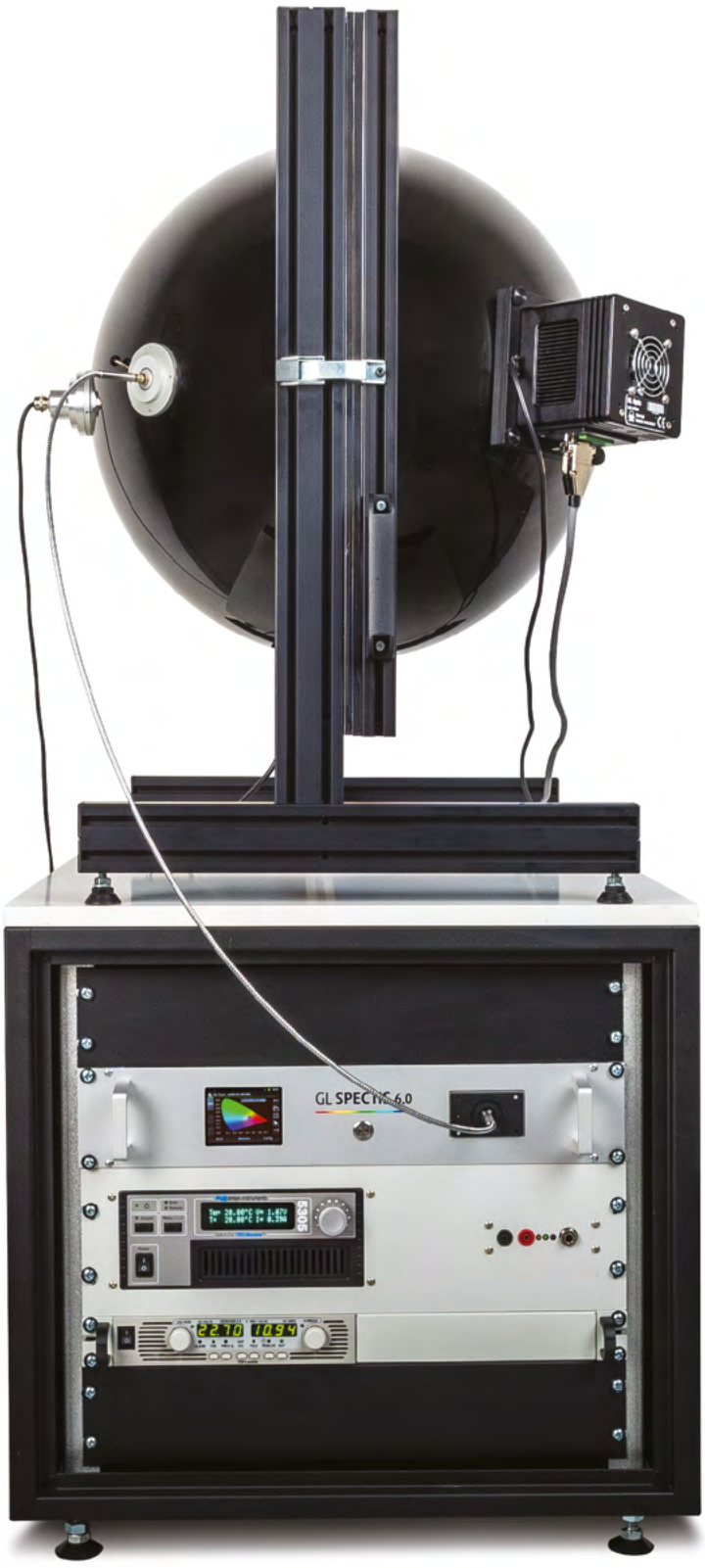
By default, an integrating sphere system comes equipped with a mechanical stand that can be adapted to mount many different fixtures and LED module types.
An optional lamp post installed in the center of the sphere makes it easy to install different A type products. Any of our high-performance spectrometers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



PERIPHERALS

AUTOMATION

SYSTEM CORE

POWER SUPPLIES & METERS
Choose form 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.

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

INTEGRATING SPHERE
for measuring luminous flux and radiant power

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

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

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

FAST PHOTOMETER + FLICKER
New optional instrument combined with optical flicker characterization of DUT*.

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

*DUT – Device Under Test

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www.gloptic.com

5 steps to high quality integrating spheres

1 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 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.

2 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.

3 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.

4 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.

5 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."

BASIC

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

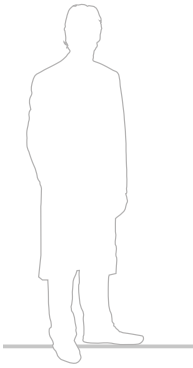
Turn key setup for complete products and components tests and measurements. This configuration level includes all basic items + most popular AC and DC power supplies for stability and electric parameters measurements. Companies working with integrated lighting systems (lamps including drivers) will need 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 compoments and configurations on page 24.

Single LEDs and COBs



LUMINOUS FLUX MEASUREMENTS AT YOUR HAND

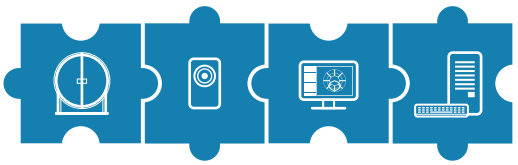
Did you know that electric current, electronic drivers and even heat may negatively affect lighting properties of LEDs? These are some of the reasons why you would need an integrating sphere to measure the performance of single LEDs once they are installed on PCB.
It takes only 10 seconds to connect this plug 'n' measure set to a computer and precise GL SPECTIS 1.0 and intuitive GL SPECTROSOFT delivers accurate results quickly.

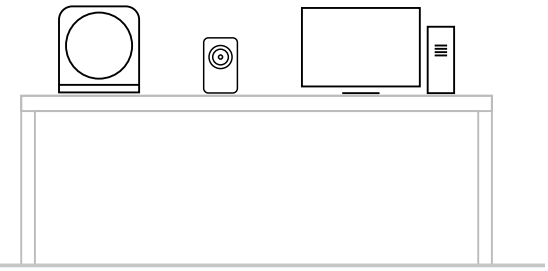
- Monitoring of spectra, colour or luminous flux
- Quality control of incoming LEDs
- Binning i.e. selection of colour and brightness groups

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 CRI; IES TM-30) 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 Sulfate ($BaSO_4$) high-reflectance material (R98)
Standards compliance	N/A





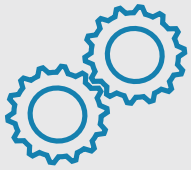
GL OPTI SPHERE 205

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 S025: 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 Sulfate ($BaSO_4$) high-reflectance material (R98)
Standards compliance	CE, LM 79, CIE 127:2007 CIE S 025/E:2015



ADAPTABLE TO YOUR NEEDS

POSSIBLE CUSTOMIZATIONS

DIFFERENT APERTURES

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.

MOUNTS & ADAPTERS

MODIFIED GEOMETRIES

Custom-made spheres can be offered for special applications such as UV sources or fluorescence measurements of OLEDs

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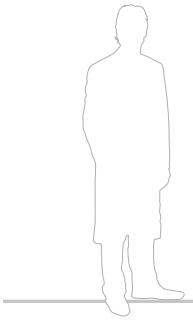
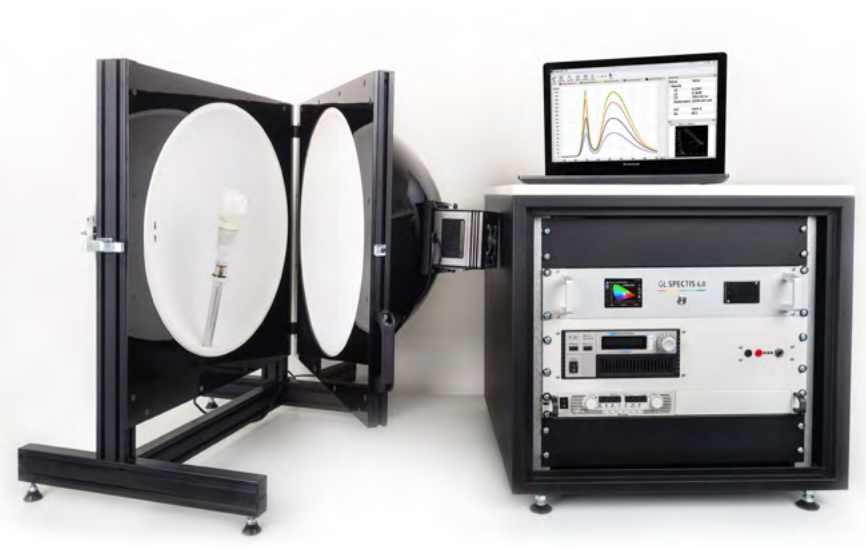
Lamps and Modules



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.

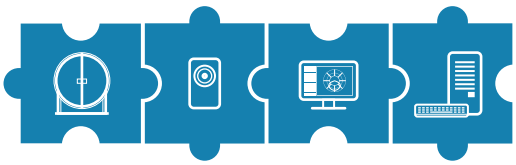
- Quality control of different lamps
- Measurement of luminous flux and colour
- Energy efficiency measurement

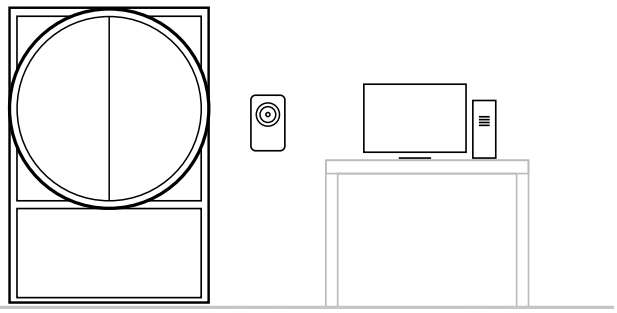


GL OPTI SPHERE 500

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 ($BaSO_4$) high-reflectance material (R98)
Standards compliance	CE, LM 79, CIE 127:2007 CIE S 025/E:2015





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 ($BaSO_4$) high-reflectance material (R98)
Standards compliance	CE, LM 79, CIE 127:2007 CIE S 025/E:2015

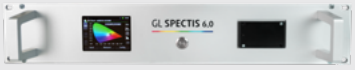
Extensive selection of optional and peripheral devices are available to complete the integrating sphere system designed to your needs. Choose from available AC, DC power supplies, mounts and adapters or order customized sphere solution.

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

GL AUTOMATION

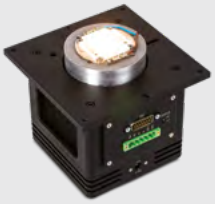
This powerful tool which is part of the GL Spectrosoft software package is used to operate all of the attached instrumentation or to plan, conduct and monitor automated test scenarios. The turnkey system includes the lab-grade GL SPECTIS 6.0 spectrometer and TEC Mount with Peltier element for cooling 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.

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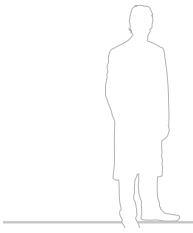
Luminaires



COMPLETE AND AFFORDABLE SYSTEM FOR LED MODULES AND LUMINAIRES TESTING

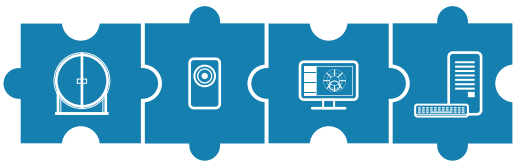
This is the professional grade setup, powerful enough to work as a real on-site lab so you will not need to send your lamps to any external laboratories for evaluation any more. Compliant with the latests light measurement standards this system features universal mounts and external measurement port for 2PI and 4 Pi configurations. Direct connection to Spectroradiometer and optional fast Photometer for optical and flicker measurements in one.

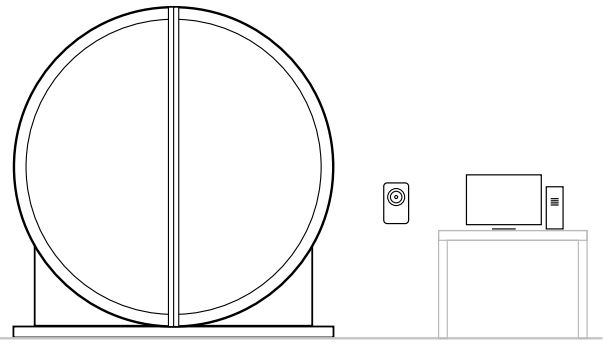
Easily-operated and flexible – featuring adjustable universal sample post for light sources of various size.

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 ($BaSO_4$) high-reflectance material (R98)
Standards compliance	CE, LM 79, CIE 127:2007 CIE S 025/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	3000 mm
Sphere material	Carbon steel
Inner coating	Barium Sulfate ($BaSO_4$) high-reflectance material (R98)
Standards compliance	CE, LM 79, CIE 127:2007 CIE S 025/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 VNIOFII 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.

MADE IN EUROPE

We are an European manufacturer with best price/quality ratio.

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.

GL OPTIC
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GL TEC CONTROL SYSTEM

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 S 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.

GL OPTISPHERE 2000

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

INTEGRATED SOLUTION

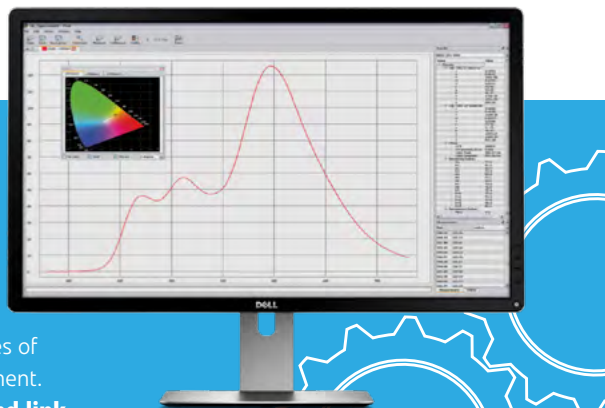
The turnkey system includes the lab-grade GL SPECTIS 6.0 spectrometer and TEC Mount with Peltier element for cooling or heating connected to a cutting-edge TEC controller. Both in turn are connected to a GL OPTI SPHERE 500 integrating sphere and a programmable power supply and controlled in Spectrosoft.

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.**

LED MOUNT

Stabilize LED module temperature.

GL SPECTIS 6.0

Spectral measurement.

GL TEC CONTROLLER UNIT

Programmable thermal control device.

GL POWER SUPPLY

Programmable stabilized current source.

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3 LEVELS OF CONFIGURATIONS AVAILABLE, DEPENDING ON THE BUDGET AND REQUIREMENTS

	BASIC		PROFESSIONAL		LABORATORY	
	APPLICATION		**APPLICATION**		**APPLICATION**	
	industrial grade system		factory laboratory level		accredited laboratory grade system	
	Product no.	**Product name**	**Product no.**	**Product name**	**Product no.**	**Product name**
GLS 48						
	93021	GL OPTI SPHERE 48	93021	GL OPTI SPHERE 48		This size of the sphere is not recommended by the standard
	67827	GL SPECTIS 1.0	106260	GL SPECTIS 1.0 Touch*		
	174276	GL Spectrosoft Basic	173724	GL Spectrosoft PRO		
GLS 205						
	102053	GL OPTI SPHERE 205		_	102053	GL OPTI SPHERE 205
	67827	GL SPECTIS 1.0		_	106989	GL SPECTIS 5.0 Touch
	173724	GL Spectrosoft PRO		_	174292	GL Spectrosoft LAB
GLS 500						
	105429	GL OPTI SPHERE 500	105429	GL OPTI SPHERE 500	105429	GL OPTI SPHERE 500
	67827	GL SPECTIS 1.0	67827	GL SPECTIS 1.0	106989	GL SPECTIS 5.0 Touch
	173724	GL Spectrosoft PRO	173724	GL Spectrosoft PRO	174292	GL Spectrosoft LAB
			202295	GL PHOTOMETER 3.0 + FLICKER	202295	GL PHOTOMETER 3.0 + FLICKER
			201425	Windows desktop PC for GL Optic System	201425	Windows desktop PC for GL Optic System
			200974	AC-POWER SUPPLY IT 7321 300 VA	200974	AC-POWER SUPPLY IT 7321 300 VA
			200975	DC-POWERSUPPLY IT 6333B	200975	DC-POWERSUPPLY IT 6333B
			200211	GL SPECTROSOFT AUTOMATION	200211	GL SPECTROSOFT AUTOMATION
GLS 1100						
	103804	GL OPTI SPHERE 1100	103804	GL OPTI SPHERE 1100	103804	GL OPTI SPHERE 1100
	67827	GL SPECTIS 1.0**	67827	GL SPECTIS 1.0	106989	GL SPECTIS 5.0 Touch
	173724	GL Spectrosoft PRO	173724	GL Spectrosoft PRO	174292	GL Spectrosoft LAB
			202295	GL PHOTOMETER 3.0 + FLICKER	202295	GL PHOTOMETER 3.0 + FLICKER
			201425	Windows desktop PC for GL Optic System	201425	Windows desktop PC for GL Optic System
			200974	AC-POWER SUPPLY IT 7321 300 VA	200974	AC-POWER SUPPLY IT 7321 300 VA
			200975	DC-POWERSUPPLY IT 6333B	200975	DC-POWERSUPPLY IT 6333B
			200211	GL SPECTROSOFT AUTOMATION	200211	GL SPECTROSOFT AUTOMATION
GLS 1500/2000						
	107060	GL OPTI SPHERE 1500 / 2000	107060	GL OPTI SPHERE 1500 / 2000	107060	GL OPTI SPHERE 1500 / 2000
	67827	GL SPECTIS 1.0	67827	GL SPECTIS 1.0	106989	GL SPECTIS 5.0 Touch
	173724	GL Spectrosoft PRO	173724	GL Spectrosoft PRO	174292	GL Spectrosoft LAB
			202295	GL PHOTOMETER 3.0 + FLICKER	202295	GL PHOTOMETER 3.0 + FLICKER
			201425	Windows desktop PC for GL Optic System	201425	Windows desktop PC for GL Optic System
			200974	AC-POWER SUPPLY IT 7321 300 VA	200974	AC-POWER SUPPLY IT 7321 300 VA
			200975	DC-POWERSUPPLY IT 6333B	200975	DC-POWERSUPPLY IT 6333B
			200211	GL SPECTROSOFT AUTOMATION	200211	GL SPECTROSOFT AUTOMATION
GLS 3000						
		GL OPTI SPHERE 3000		GL OPTI SPHERE 3000		GL OPTI SPHERE 3000
	67827	GL SPECTIS 1.0	67827	GL SPECTIS 1.0	106989	GL SPECTIS 5.0 Touch
	173724	GL Spectrosoft PRO	173724	GL Spectrosoft PRO	174292	GL Spectrosoft LAB
			202295	GL PHOTOMETER 3.0 + FLICKER	202295	GL PHOTOMETER 3.0 + FLICKER
			201425	Windows desktop PC for GL Optic System	201425	Windows desktop PC for GL Optic System
			200974	AC-POWER SUPPLY IT 7321 300 VA	200974	AC-POWER SUPPLY IT 7321 300 VA
			200975	DC-POWERSUPPLY IT 6333B	200975	DC-POWERSUPPLY IT 6333B
			200211	GL SPECTROSOFT AUTOMATION	200211	GL SPECTROSOFT AUTOMATION

GL SPECTROMETERS

	GL SPECTIS 1.0 VIS	GL SPECTIS 5.0 Touch VIS	GL SPECTIS 6.0
APPLICATION			
	Luminous flux and radiant power measurement of large LED modules and luminaires.	Luminous flux and radiant power measurement of large LED modules and large luminaires.	High speed measurement of SSL products (IESNA LM-79-08), LED wafers, large street lamps and luminaries
TECHNICAL DATA SHEET			
Spectral range	340 – 780 nm	340 – 850 nm (VIS) 200 – 800 nm (UV-VIS) 380 – 1050 nm (VIS-NIR) 200 – 1050 nm (UV-VIS-NIR)	340 – 850 nm (VIS) 200 – 800 nm (UV-VIS) 380 – 1050 nm (VIS-NIR) 200 – 1050 nm (UV-VIS-NIR)
Detector	CMOS image sensor	CCD Backed thinned image sensor	CCD Backed thinned image sensor
Number of pixels	256	2048	2048
Physical resolution	~ 1.7 nm / ~ 1.8 nm	~ 0.5 nm	~ 0.5 nm
Optical FWHM	~ 10 nm	2.5 nm	2.5 nm
Measurement range	10 – 100 000 lx [Illuminant A]	5 – 150 000 lx [Illuminant A]	1 – 200 000 lx [Illuminant A]
Wavelength reproducibility	0.5 nm	0.5 nm	0.5 nm
Integration time	10 ms – 10 s in automatic mode (100 s in manual mode)	10 ms – 10 s in automatic mode (100 s in manual mode)	10 ms – 10 s in automatic mode (100 s in manual mode)
A/D conversion	16 bits	16 bits	16 bits
Signal to noise ratio	1000:1	1000:1	1000:1
Cosine correction	Class B – DIN 5032-7 Class AA – JIS C 1609-1:2006	Class B - DIN 5032-7; Class A on demand Class AA - JIS C 1609-1:2006	Class B – DIN 5032-7; Class A on demand Class AA – JIS C 1609-1:2006
Stray light	2*10 E-3	3*10 E-4	2*10 E-4
Spectroradiometric accuracy	5 % within range 340 – 500 nm 4 % within range 500 – 780 nm	6 % within range 200 – 220 nm 5 % within range 220 – 500 nm 4 % within range 500 – 1050 nm	6 % within range 200 – 220 nm 5 % within range 220 – 500 nm 4 % within range 500 – 1050 nm
Measurement uncertainty of colour coordinates (x.y)	0.0015	0.0015	0.0015
PC interface	–	USB 2.0 standard	USB 2.0 standard
Display full colour	–	240 x 320 px	240 x 320 px
WiFi	–	802.11b/g	802.11b/g
Micro SD card	–	4GB	4GB
Power	Power USB	lithium-ion battery 4000mAh	Power USB
Power consumption	< 640 mA	~ 700 mA	~ 700 mA
Power supply	–	Input: AC 100-240V 50/60Hz 0.15A Output: 5V-1A	Input: AC 100-240V 50/60Hz 0.15A Output: 5V-1A
Ambient temperature	5 – 35°C	5 – 35°C	5 – 35°C
Dimensions	72 mm x 115 mm x 19 mm	111 mm x 210 mm x 58 mm	480 mm x 262 mm x 88.9 mm 2U 19"
Weight	120 g	1500 g	2500 g
Product no.	67827	106989	173906

GL PHOTOMETER

GL PHOTOMETER 3.0 + FLICKER

APPLICATION	
	High quality flicker measurements including long term sampling, integrating sphere photometer, high precision illuminance measurements
TECHNICAL DATA SHEET	
Measurement range	0.001 – 10 000 000 lx*
Resolution	0.001 lx
Uncertainty of spectral response (f1')	Class A < 3 %
Uncertainty of cosine correction (f2')	Class A < 3 %
Sampling frequency	100 kHz
A/D conversion	18 bit
Software	GL Spectrosoft or API for external software developers
Dimensions [H x W x D]	115 mm x 66 mm x 51 mm
Weight	350g
Connectivity	USB A-B
Power	USB, 5V <200 mA
Tripod adapter	¼"
Product no.	202295

* standard measuring range can be extended by customization

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technical data

GL OPTI SPHERES

	GL OPTI SPHERE 48	GL OPTI SPHERE 205	GL OPTI SPHERE 500
APPLICATION			
	Luminous flux and radiant power measurement of single LEDs and other small light sources. Mounts directly on spectrometer.	Luminous flux and radiant power measurement of LEDs and other light sources.	Luminous flux and radiant power measurement of LED modules and retrofit lamps.
TECHNICAL DATA SHEET			
Spectral range	340 – 1700 nm	340 – 1700 nm	340 – 1700 nm
Sphere inner diameter	48 mm	205 mm	500 mm
Sphere material	Aluminium	Aluminium	Composite
Inner coating	Barium Sulfate ($BaSO_4$) high-reflectance material (R98)	Barium Sulfate ($BaSO_4$) high-reflectance material (R98)	Barium Sulfate ($BaSO_4$) high-reflectance material (R98)
Outer coating	Black textured finish	Black textured finish	Black finish
Reflectance properties	97%	97%	97%
Auxiliary light source	N/A	White LED	White LED
Spectrometer port	Direct connection	Direct connection or SMA fiber-optic	Direct connection or SMA fiber-optic
Standards compliance	N/A	CE, LM 79, CIE 127:2007 CIE S 025/E:2015	CE, LM 79, CIE 127:2007 CIE S 025/E:2015
Maximum DUT dimensions in accordance with CIE S 025/E:2015	N/A	20 mm (diameter or diagonal)	50 mm (diameter or diagonal)
Maximum dimension for optimal measurement (1/3 x sphere diameter)	N/A	65 mm (diameter or diagonal)	165 mm (diameter or diagonal)
Maximum DUT weight	N/A	250 g	3 kg
Sphere frame	N/A	N/A	Hinged
Sphere center positioning	N/A	N/A	N/A
Mechanical breadboard with post	N/A	For 4 π measurement	For 4 π measurement
USB source controller for auxiliary light source	N/A	With current source and relay switch for external power supply	With current source and relay switch for external power supply
Universal post with standard lamp sockets	N/A	N/A	E14, E27, GU10 and G4 for QTH lamp spectral flux source
External dimensions [W x H x D]	52 x 88 x 51 mm	265 x 270 x 225 mm	620 x 760 x 590 mm
Weight	0.126 kg	3.3 kg	17.5 kg

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 text 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.

GL OPTI SPHERE 1100

Luminous flux and radiant power measurement of large LED modules and luminaires.

340 – 1700 nm
1100 mm
Composite
Barium Sulfate ($BaSO_4$) high-reflectance material (R98)
Black finish
97%
White LED
Direct connection or SMA fiber-optic
CE, LM 79, CIE 127:2007 CIE S 025/E:2015
100 mm (diameter or diagonal)
330 mm (diameter or diagonal)
3 kg
Hinged
N/A
For 4 π measurement
With current source and relay switch for external power supply
Universal DUT fixing table (breadboard) for measurement in 4 π geometry
1260 x 1800 x 1220 mm
60 kg

GL OPTI SPHERE 1500

Luminous flux and radiant power measurement of large LED modules and large luminaires.

340 – 1700 nm
1500 mm
Carbon steel
Barium Sulfate ($BaSO_4$) high-reflectance material (R98)
Black textured finish
97%
White LED or halogen
Direct connection or SMA fiber-optic
CE, LM 79, CIE 127:2007 CIE S 025/E:2015
150 mm (diameter or diagonal)
500 mm (diameter or diagonal)
25 kg
Hinged
Cross laser mechanism
For 4 π measurement
With current source and relay switch for external power supply
Universal DUT fixing table (breadboard) for measurement in 4 π geometry
1800 x 1800 x 1800
218 kg

GL OPTI SPHERE 2000

Luminous flux and radiant power measurement of large LED modules and large luminaires.

340 – 1700 nm
2000 mm
Carbon steel
Barium Sulfate ($BaSO_4$) high-reflectance material (R98)
Black textured finish
97%
White LED or halogen
Direct connection or SMA fiber-optic
CE, LM 79, CIE 127:2007 CIE S 025/E:2015
200 mm (diameter or diagonal)
665 mm (diameter or diagonal)
25 kg
Hinged
Cross laser mechanism
For 4 π measurement
With current source and relay switch for external power supply
Universal DUT fixing table (breadboard) for measurement in 4 π geometry
2200 x 2200 x 2300 mm
420 kg

GL OPTI SPHERE 3000

Radiant power and luminous flux measurements.

340 – 1700 nm
3000 mm
Carbon steel
Barium Sulfate ($BaSO_4$) high-reflectance material (R98)
Black textured finish
98%
Halogen
Direct connection or SMA fiber-optic
CE, LM 79, CIE 127:2007 CIE S 025/E:2015
300 mm (diameter or diagonal)
1000 mm (diameter or diagonal)
25 kg
Hinged with electric powered opening mechanism
Cross laser mechanism
For 4 π measurement
With current source and relay switch for external power supply
Universal Device Under Test fixing table (breadboard) for measurement in 4 π geometry
4200 x 3500 x 3300 mm
1100 kg

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GL OPTIC

Light quality control

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