GL OPTIC

Light quality control

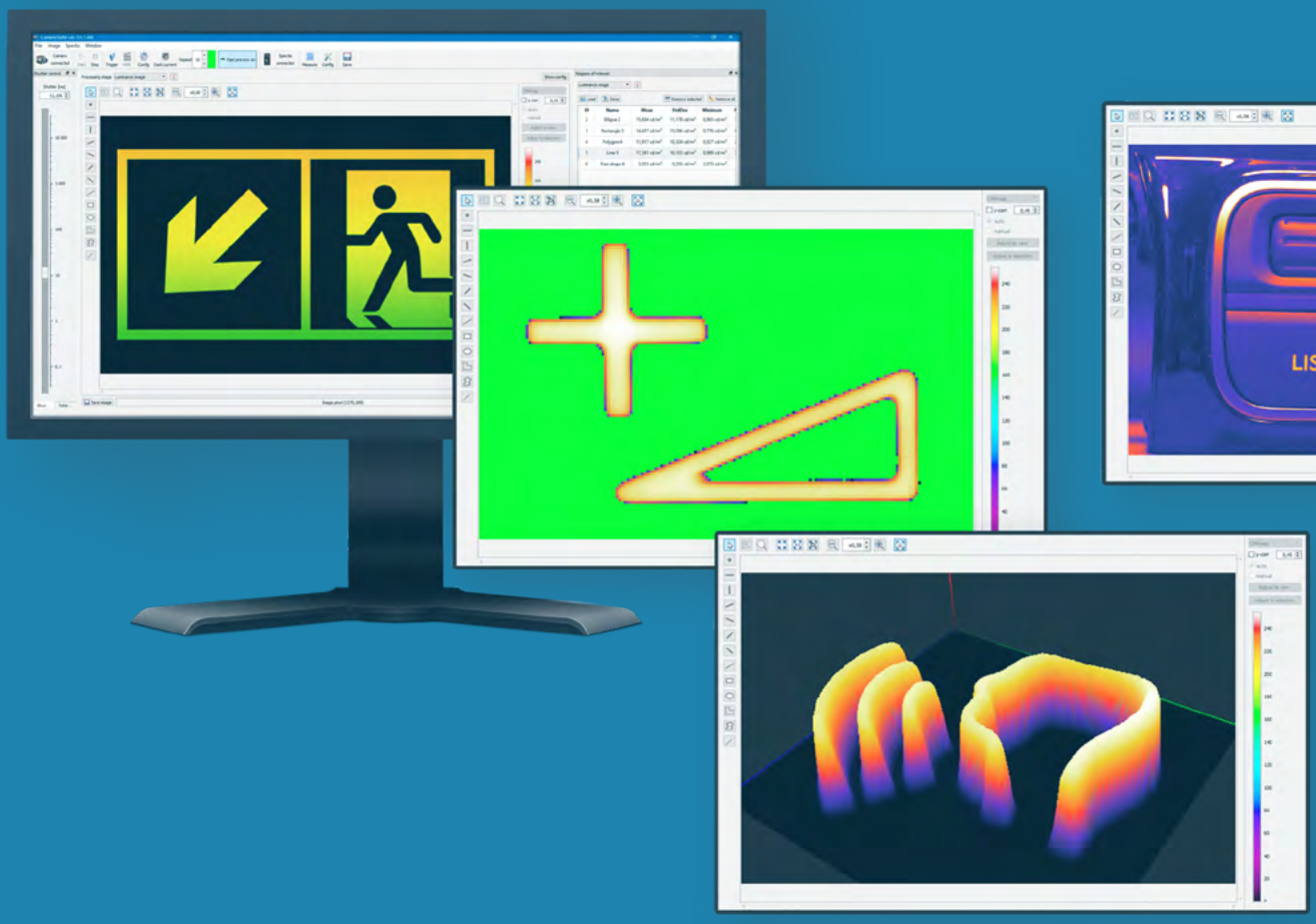
GL OPTICAM SYSTEMS

Luminance under control

Imaging Luminance Measuring Devices designed to verify compliance and check performance of lighting components to support faster introduction of modern LED, OLED lighting devices.

Introducing world's first ILMD optimised for on-site measurements of lumimance distribution in street and area lighting quality control.

GL OPTICAM SYSTEMS


LIST


GL OPTICAM 2.0

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GL OPTICAM SYSTEMS

GL OPTIC

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 the potential customers to choose quality instruments for their lighting product quality control.

There are many light meters available on the market today. However, we know what matters for fast developing lighting manufacturers the most: engineering, precision, performance and, equally important, independence from external quality testing labs. For many manufacturers, the possibility of optimising 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 accurate and dependable results in order to make the right product quality decisions.

GL Optic instruments feature automatic dark current compensation combined with a temperature monitoring system that 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 get the calibration files for each available accessory automatically and allow 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"

Who trusted us:

BOE Display Technology
CHINA

B/S/H Hausgeräte GmbH
GERMANY

Sagecom
FRANCE

Samsung Electronics
KOREA

Nexus Industries Ltd
UNITED KINGDOM

LG Electronics
KOREA

Nvidia Corp.
USA

WHIRLPOOL Company
USA

Gruppo Antolin
FRANCE

LEAR Corporation GmbH
GERMANY

Guangzhou Antolin Lighting Co.,Ltd
CHINA

British Standards Institution
UNITED KINGDOM

Varroc Lighting Systems, s.r.o.
CZECH REPUBLIC

MAGNA STEYR Fahrzeugtechnik
AUSTRIA

DELPHI Deutschland GmbH
GERMANY

10 YEARS 2009 – 2019

Origins

GL Optic was established in 2009 to develop and bring innovative solutions in the 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 are built in every light measurement instrument we provide. With the use of our instruments and software, lighting companies get control over quality from the moment of the components purchase through the research and development stage up to the final product testing.

GL OPTIC 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

COO of GL Optic
a partner, light quality enthusiast and head of GL business development and operations.

Light quality blog

Jan Lalek

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

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Introduction to luminance measuring devices

by Miko Przybyła

Latest technology supporting luminance distribution measurement for quality control of lighting systems.

Luminance is the most important quantity in lighting design and the most important measure in road lighting and architectural illumination. It is also the measure that is probably the easiest to understand and notice by the user, because it determines the "brightness" of the observed objects and surfaces.

The 21st century, revolutionised by the widely available, increasingly cheaper to buy and maintain LED sources, contributed to a huge increase in the number of all the lighting investments - using luminescent diodes.

LED is a source of high intensity, which is characterised by high luminous efficacy too. Unfortunately, a specific side - effect of LED construction is the high luminance and irritating glare effect. The assessment of glare is dependent on the luminance value in relation to the background luminance level.

Designers and lighting companies often use design software and the available visualisation functions for lighting installations where luminance plays the key role. However, there is a big discrepancy between the assumptions of the designer and the design – the actual implementation of the lighting system.

As the technological possibilities of LED luminaire construction and lighting control increase, the need for more reliable verification of lighting quality at the stage of construction works completion increases. The client, the customer or the ordering party more and more often demands a lighting audit report and a declaration of conformity of the installation with the design and the order.

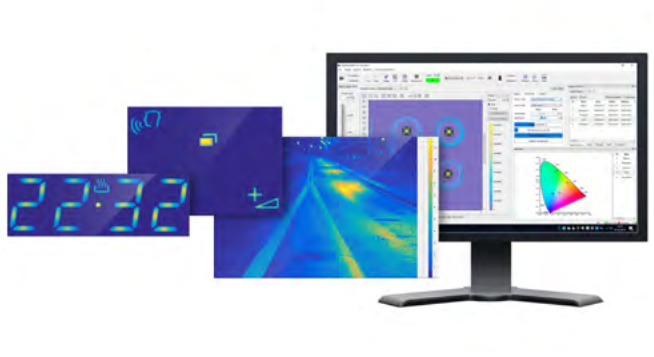

Fig. 1. Software for ILMD solutions.

Fig. 2. Luminance distribution in the interior with LED luminaires.

Tradition vs. modernity

Traditional luminance meters, using a single lens optical system and appropriately adjusted photodiode – the so-called spot luminance meters, allowed for precise targetting and precise focusing at a small point. Despite the fact that they are fast and reliable, they have two main disadvantages due to their technical characteristics. Firstly, they usually have a very narrow viewing angle, i.e. from a given distance we can measure an area (point) with relatively small dimensions. In the case of luminance distribution measurements, it forces the user to make multiple measurements and calculate the luminance distribution of a given area manually. Secondly, the matching class of a photodiode with a V(λ) filter may cause measurement errors depending on the type of light source's spectral power distribution or the colour temperature. These meters were perfect for measurements of broad band light sources i.e. light sources with a wide range of radiation. On the other hand, in the case of some white LED sources, especially RGB systems, the errors can be up to 20% even for a good class meter.

New solutions available on the market, using CMOS or CCD sensor technology, commonly used in digital cameras, offer far greater possibilities to use this technology both for measuring and testing the luminance of illuminated surfaces, as well as backlit elements and the luminaires and light sources. With the use of a camera luminance measurement system, the so-called Imaging Luminance Measuring Device (ILMD), it is possible to perform measurements and compare luminance values on the basis of the so-called image analysis.

These meters are equipped with a high-resolution sensor and optical system consisting of a lens and a V(λ) filter adjusting the sensitivity of the sensor to the sensitivity of the human eye. In this way, the image recorded by the sensor is subject to a computer analysis, and the recorded luminance (brightness) level corresponds to the impression received by the human eye, i.e. it is the level of absolute luminance value. Unlike an ordinary camera, where the level of brightness in different points of the image is a relative value, in the case of an imaging luminance meter there is an image showing the distribution of luminance. On its basis, the level, uniformity, changes in values, etc., for each point individually or for a given area of the image can be analysed, compared and measured.

More about the luminance camera (ILMD) from GL Optic here:
gloptic.com/products/gl-opticam-2-0-4k-tec

Thanks to this technology, with the use of a 2D image sensor in several million pixels, the entire image of a given surface, a lighting component or the entire interior of a building can be recorded. The recorded images can

be analysed in detail with the supplied software. Not only the connections between different measurement areas can be assessed both visually and metrologically, but also the areas, or points of interest can be marked quickly owing to the image analysis tools. Dedicated software for such systems allows for additional presentation of luminance levels in pseudo-colours, isocandels, 3D charts, in the form of histograms. Furthermore, it contains many other useful functions facilitiating the report creation.

When it is necessary to determine luminance distribution uniformity throughout the scene, a traditional, spot meter seems to be an uncomfortable solution.

Fig. 3. Sample of display and controls (automotive industry).

Point by point measurements, a very time-consuming solution not applicable in practice, would have to be made. Similarly, the measurement of small objects like indicating LEDs or backlit icons cannot be carried out with such a luminance meter because the measuring angle is constant and usually not small enough.

The measurements made with ILMD meter, compared to a spot meter, allow to capture an entire image of the scene. All the luminance information in the frame can be stored in a single image, so this method takes much less time. Repeatability is also an important advantage compared to a point by point measurement of luminance. It is due to the fact that the measured image can be recorded and re-assessed at a later date.

Using V(λ) filters in the measuring devices may cause problems with accuracy of the readings for different types of light sources or colour temperature. To overcome this, a mismatch correction can be applied by combining an ILMD system with a spectroradiometer. This configuration increases the accuracy of the luminance measurement and additionally allows for colorimetric analysis, e.g. of colour temperature, colour rendering index and other colour measuring functions. In advanced systems, this is a part of an integrated measuring instrument. It is also possible to use a two-stage measurement procedure for this purpose. Firstly, luminance is measured with an ILMD meter, and then spectral distribution of distribution of light is measured with a spectroradiometer. By means of a dedicated software platform, it is possible to combine the resulting measurement data and present consistent reports including both luminance and colour assessment.

Advanced technology

Moreover, technologically advanced meters are already available on the market. Some allow the luminance distribution to be measured with a single frame in the field of a view, and the number of spots collected is equivalent to 1,000,000 or more synchronously measured with a traditional meter.

Imaging meters are characterised with a very high accuracy. They are usually equipped with a high Class A optical system correction (DIN 5032-7) for V (λ) function. These can be very high-resolution measurements thanks to CMOS or CCD sensors that can have up to 8 million pixels. A wide range of measured values enables accurate measurement of objects with large variations in luminance. The dynamic range of imaging meters starts from 0.001 cd/m^2 to 200 kcd/m^2, using appropriate neutral density filters or high dynamic range images techniques. The most advanced models use special cooling technology of the measuring system for superior stability and repeatability.

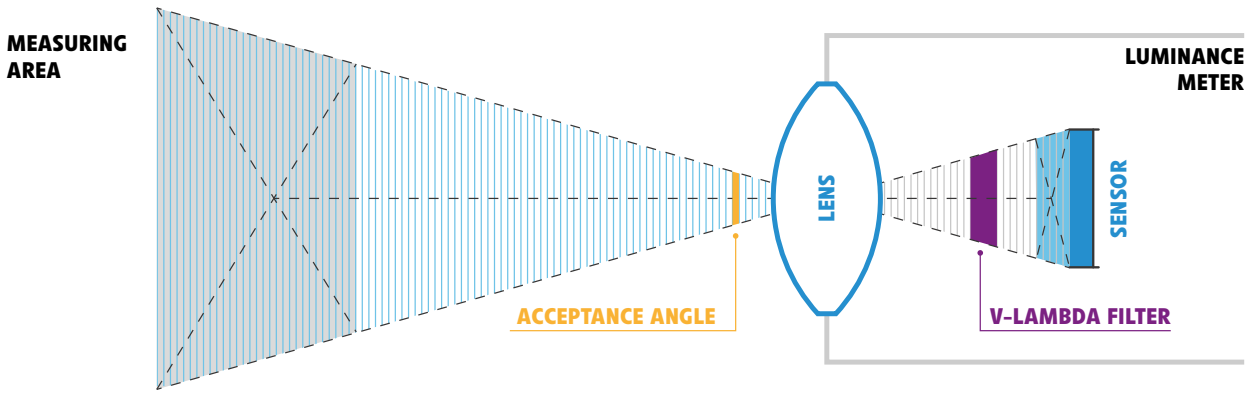

Fig. 4. Luminance meter scheme.

Fig. 5. Sample of a luminaire with a LED light source.

Excellent image quality is achieved with a high-quality lens. Some measuring systems allow the lens to be changed. However, it is recommended to buy one from the manufacturer to ensure that it has been included in the calibration procedure.

The use of imaging meters is very wide as they are used to measure the luminance of widely interpreted LED products; from individual lamps, chips, modules, luminaires, car lamps, LED screens, through displays, various illuminated signs, indicators, signalling, up to the measurement of all kinds of installations: in road lighting, in architecture, etc.

Inside and outside

Luminance measurements can be useful during the acceptance of lighting installations both indoors, where the luminance image can be used to assess the uniformity of lighting, and outdoors, where luminance distribution can be measured, e.g. on the facade of a building to check whether the levels and distribution of luminance are in line with the design or the expectations of the investor. It is particularly useful to use ILMDs for road lighting measurements where the luminance levels of illuminated road fragments are described in detail in EN 13201-2:2016-03 standard.

Light sources and luminaires

With this technology, luminaire manufacturers and installation companies can verify the quality of their products quickly and reliably. The high-resolution imaging meter can measure both the luminance of a single diode and the luminance distribution of low luminance large areas.

Displays, screens and icons

The automotive and electronics industries make widespread use of illuminated signs, controls, switches and entire displays to provide users with convenient access to information and control options. Most household appliances are also equipped with displays and lights today. All such luminous elements can be easily measured and checked for quality and luminance levels.

The availability and the accessible price of the ILMD Imaging Luminance Measuring Devices give hope that reliable measurements of lighting products and installations will improve the quality of lighting while reducing the energy consumption. In qualitative terms, we should provide light where it is necessary, as much as it is necessary and whenever it is needed.

7 things making GL **OPTICAM** systems a unique solution

1. **Multi-step factory calibration process guarantees the highest accuracy and traceability**
2. **Optical filters are made for individually selected sensors**
3. **High class optical lenses are offered to limit the effects of stray light**
4. **Temperature monitoring/ stabilization TEC**
5. **Unique RFID system for lens and filter recognition**
6. **Most versatile software with easy-to-use tools and Add-Ons**
7. **Unique and easy integration with a spectroradiometer**

WHAT IS INCLUDED IN THE FACTORY CALIBRATION SERVICE?

Typical calibration service of the camera system takes 8 working hours and includes the following stages:

- Faulty pixels identification and compensation
- Dark current compensation with respect to integration time and system temperature
- Sensor non-linearity correction
- Integration time non-linearity correction
- Focusing distance correction
- Lens stray light correction
- Lens vignetting correction
- Absolute calibration factor for sensor/ lens combination
- Optional mismatch correction for light source spectral characteristic (requires a spectroradiometer)

GL OPTICAM 2.0 TEC 4K

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Optimized for each application

FOR LABORATORY USAGE
GL **OPTICAM 2.0** TEC 4K
SYSTEM CONFIGURATION

GL OPTI PROBE 1.0.11 LUMINANCE
Pen type probe for precise point measurement of colorimetric values.

SPECTIS 1.0 TOUCH + FLICKER
for colorimetric values like CCT and CRI. Additionally, it will also provide an automatic filter miss match correction procedure.

SYSTEM CORE

GL OPTICAM 2.0 TEC 4K

LENS
High quality 50 mm lens covers the majority of applications.

GL OPTICAM SOFT
User-friendly analytical software supporting data downloads and fast reporting.

WINDOWS LAPTOP
With powerful processor for fast luminance data processing.

GL SPECTROSOFT
This software allows „to add" colorimetric measurements data to luminance analytical software GL OPTICAM SOFT.

SELECTION of OPTIONAL LENSES and NEUTRAL DENSITY FILTERS available on demand

FOR OUTDOOR USAGE
GL **OPTICAM 3.0** TEC 4K
SYSTEM CONFIGURATION

BATTERY PACK
ensuring nearly 9 hours
of continuous working time.

OPTIONAL LENSES and ND FILTERS available on demand

POWER INVERTER
(on demand)
Provides 220V from car cigarette lighter.

SYSTEM CORE

GL OPTICAM 3.0 TEC 4K

LENS
High quality 50 mm lens covers majority of road widths.

GL OPTICAM SOFT
Analytical software including dedicated EN 13201 Add-on for street lighting evaluation.

WINDOWS LAPTOP
With powerful processor for fast luminance data processing.

TRANSPORTATION CASE
All packed in 2 cases with integrated wheels and handles for easy transport.

Working space for laptop at a comfortable height.

PROFESSIONAL TRIPOD
Heavy-duty construction designed for theodolites & geared photographic head for precise direction control.

MEASURING WHEEL
for precise measurement of the distance, road width and length.

DEDICATED MARKERS
simplify the identification of a measurement field.

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GL OPTICAM 2.0 TEC 4K

The optical performance of displays, backlit buttons and instrument clusters requires a dependable luminance testing solution. Developers, designers and quality engineers need to verify luminance uniformity, contrasts, luminance distribution and light leakage.

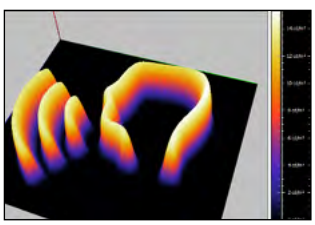
With this new optical instrument all the touch screen control panels, backlit buttons, displays, keyboards and indicating lights can be easily and precisely verified during the R&D and production stage.

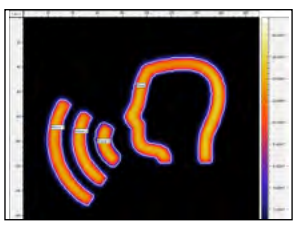
GL OPTICAM SOFT

SELECT AND MEASURE

When working with specific products GL Optic dedicated software tools will help to mark and select the Point-Of-Interest. Now, selected areas of the image can be analysed in no time.

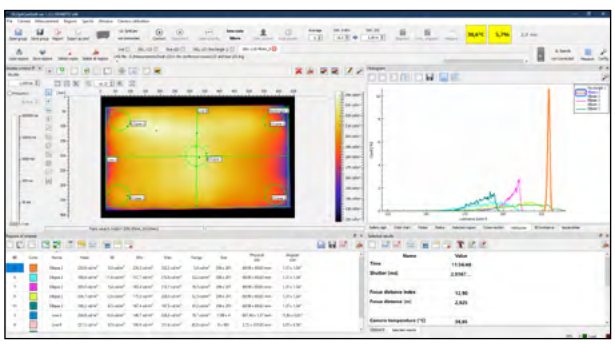
The software automatically recognizes specific shapes and backlit symbols.





FASTER IMAGE ANALYSIS

Performance and luminance distribution verification can be obtained with such helpful tools as: **ISO lines, Histogram and Results comparison table and statistical analysis tools.**

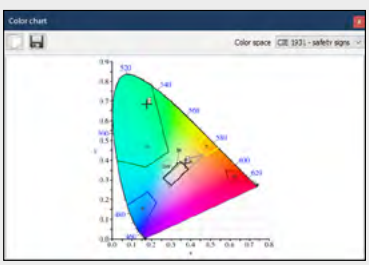


APPLICATIONS

VEHICLES CONTROLS, INDICATORS AND TELL-TALES

ISO 2575:2010 standard specifies symbols (i.e. conventional signs) for use on controls, indicators and tell-tales applying to passenger cars, light and heavy commercial vehicles and buses, to ensure identification and facilitate use.

Luminance uniformity of backlit symbols and keyboards can be quickly verified using GL OPTICAM 2.0 TEC 4K. Chromatic coordinates and CCT of an individual element, can be evaluated by means of a combination of the ILMD and GL SPECTIS 1.0 Touch along with a pen type luminance probe. With just a click of a button, the analytical software can "add" colour characteristics to the software luminance layer and provide a report.



Owing to the software, a colorimetric analysis of the indicators and tell tales can be obtained. The colour characterisation is of importance as the tell tales' changing colours inform the driver whether related devices operate correctly or not.

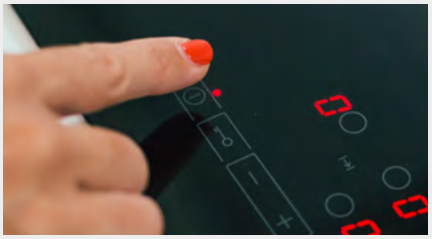
SELECTION of OPTIONAL LENSES and NEUTRAL DENSITY FILTERS available on demand

DO YOU NEED TO MEASURE COLOR?

When the lighting fixture or electronic board uses different colour LEDs and OLEDs, OPTICAM 2.0 4K TEC luminance meter can be combined with our GL SPECTIS 1.0 Touch spectral device to support luminance and colour test and evaluation.

Our GL SPECTROSOFT features an option to combine the measurements from the luminance camera with the spectroradiometric measurement. As a result, we are able to provide the mismatch correction for luminance values to get the highest accuracy and provide all colorimetric and spectral data for the product under test.

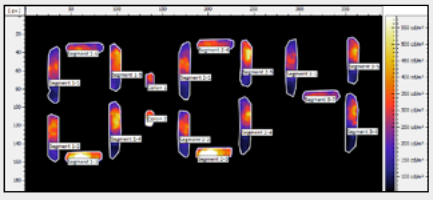
GL OPTICAM 2.0 TEC 4K + GL SPECTIS 1.0 Touch

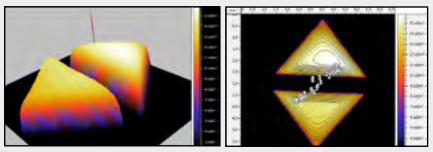


TESTING DISPLAYS AND USER INTERFACE

GL OPTICAM 2.0 TEC 4K high resolution and sensitivity camera system is preconfigured for immediate luminance measurements of all kind of electronic displays. Its purpose is to quantify the displays' characteristics and qualities.

GL OPTICAM systems enable compliance with: EN ISO 9241-305:2009 Ergonomics of human - system interaction - Part 305: Optical laboratory test methods for electronic visual displays.

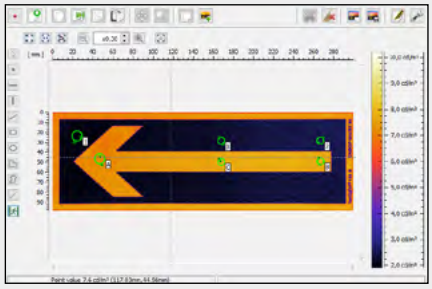




SIGNAGE AND EMERGENCY LIGHTING VERIFICATION

The verification of emergency lighting products compliance with the ISO 3864-2: 2016, the standard for Graphical Symbols - Safety Colours and Safety Signs Part 4: Colourimetric and Photometric Properties of Safety Sign Materials, can be greatly simplified with the GL Optic ILMD.

Internally illuminated emergency exit signs validation, in terms of IEC/EN 60598 series standard, takes the luminance distribution and contrast measurements as of key importance.



LED MODULES, LAMPS, LUMINAIRES QUALITY CONTROL

GL Optic solution speeds up and simplifies headlamps' testing with accordance to Luminance Measurement, Contrast Sensitivity, Homogeneity: New Approaches of Defining the Quality of Headlamps SAE Technical Paper 980324, 199.8

Since LED traffic signs that display road graphic signs and text messages must comply with the requirements EN 12966 – Road vertical signs – Variable message Traffic signs and EN 12368 Traffic control equipment – Signal heads, GL Optic Opticam solution helps to deliver safe and reliable systems conforming to the latest standards.

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www.gloptic.com

GL OPTICAM 3.0 TEC 4K

GL OPTICAM 3.0 TEC 4K Street luminance, pedestrian crossing zones, tunnel lighting and airfield lighting all can be measured in no time. This high resolution and sensitivity camera system is preconfigured for immediate luminance distribution measurements in any field application.

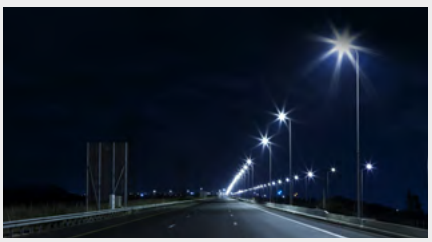
Unlike current laboratory meters, GL OPTICAM 3.0 TEC 4K is the world's first solution fully adapted to field measurements. Owing to the thermal stabilisation of the image sensor, measurement errors that result from the changing temperature conditions can be minimised. It is hermetic and ready to work in different weather conditions without fear of camera damage – even in the rain. In addition, it is equipped with a battery power source, thanks to which the operator is relieved in terms of power generators or portable power supplies. Moreover, a set of accessories makes it easy to determine the measurement field.

GL OPTICAM SOFT

The system consists of a computer and software that enables the results analysis immediately after the measurement – also on site. The analysis software is intuitive and immediately presents the results, including the compliance or non-compliance of the installation with the assumptions and requirements for the road lighting class according to EN 13201. Moreover, the software allows to generate a report at the touch of a button – a function that has not been available in any system on the market so far. A laptop and a set of transport cases help to create a fully functional measuring station in the field. **Dedicated Software Add-on for street lighting evaluation according to EN 13201.**

STANDARD COMPLIANCE TEST IN 3 SIMPLE STEPS »

APPLICATIONS



STREET LIGHTING

GL OPTICAM 3.0 TEC 4K is the first fully adapted system for road measurements according to the road lighting standard EN 13201: 2016.

Measurement of road luminance is a demanding task. This system, however, is fully prepared for on-site measurements on the road. The camera's hermetic housing is built to protect both the system and the lens from mechanical damages.

The sensor is thermally stabilized and, thus, ready to work in different temperatures. This professional field measurement system is additionally supported by delivered battery pack and peripheral devices. The System can be used in different places while maintaining laboratory accuracy performance.

PARKING LIGHTING

The proposed system also meets requirements of the ANSI/IES RP-8-18, Recommended Practice for Design and Maintenance of Roadway and Parking Facilities.

DEDICATED MARKERS
simplify the identification of the measurement field.

TRANSPORTATION CASE
All packed in 2 cases with integrated wheels and handles for easy transport. Working space for laptop at a comfortable height.

TUNNEL LIGHTING

The GL OPTICAM system can be applied in order to measure the correct lighting levels of tunel lighting. Improved visibility and proper luminance ratios enable drivers to avoid the dangerous black-hole effect at the tunnel entrance. Compliance to the CIE 88: 2004 standard – Guide for the lighting of road tunnels and underpasses can be achieved.

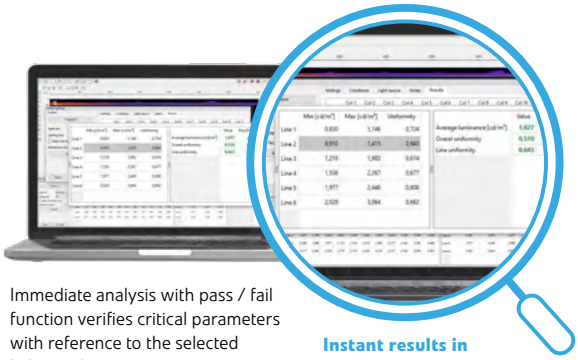
MEASURING WHEEL
for a precise measurement of the distance, road width and length.

Project with Poznan University of Technology

The GL OPTICAM imaging luminance instrument development was completed in cooperation with Poznan University of Technology. It was implemented within the framework of the National Centre for Research and Development Programme. The aim of the project was to bring to the market a measuring system which supports on-site luminance distribution measurements. There are many luminance meters available on the market but they are all laboratory devices and none of them is actually designed and prepared for road luminance measurements.

1. Once the photo of the selected road section is taken, the software recognizes active area markers and applies measurement field automatically.

2. Transformation of the image to a bird's-eye view is made by the software.
The measurement points grid is applied in accordance to the standard requirements.



3. Immediate analysis with pass / fail function verifies critical parameters with reference to the selected lighting classes.

Instant results in just a few minutes.

AIRFIELD LIGHTING

Airport lighting systems must be fully compliant with the required standards and regulations including ICAO, EASA, FAA, MOS139. Luminance levels and uniformity can be easily verified by using the world's first solution fully adapted to field measurements – GL OPTICAM 3.0.

OUTDOOR LIGHTING

Nowadays, new outdoor lighting installations must not only provide users with a comfortable and safe well-lit environment but also guarantee low energy consumption.

The analytical software, delivered with GL Opticam 3.0 system, will help to evaluate the installation with multiple universal analysis tools such as: marking spots of interest, levels presentation in false-color scales, statistical parameters, histograms, linear cross-sections, and 3D luminance imaging.

INDOOR LIGHTING

The right lighting at the workplace opens up ways for healthier, more pleasant and sustainable work with the best light quality and maximum light output.

The use of latest GL Optic ILMDs allows for quick inspection of the new indoor lighting installation.

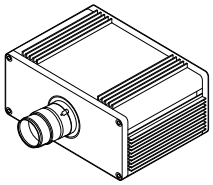
office@gloptic.com
www.gloptic.com

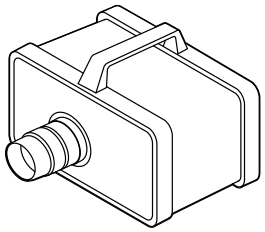
learn about the differences

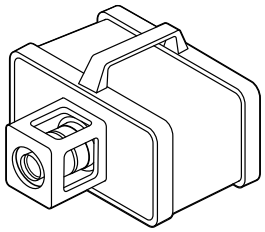
A NEW RANGE OF INSTRUMENTS FOR VARIOUS MEASUREMENT TASKS

	GL OPTICAM 1.0	GL OPTICAM 2.0 TEC 4K	GL OPTICAM 3.0 TEC 4K
APPLICATION	**Entry level device for precise luminance tests and measurements**	**Advanced laboratory high resolution TEC imaging system**	**Dedicated street and area lighting compilance testing TEC imagining system**
SENSOR	CMOS 2.3Mpix	CMOS 4K 9Mpix	CMOS 4K 9Mpix
TEMPERATURE	Passive/monitoring	Active TEC with Peltier	Active TEC with Peltier
HOUSING	60 mm x 111 mm x 58 mm	149 mm x 229 mm x 265 mm	149 mm x 306 mm x 265 mm Waterproof IP 54
CONNECTION	USB 3.0	USB 3.0	USB 3.0
POWER	Powered by USB 3.0 cable	15V DC power adapter (optional battery pack)	including battery pack + 15V DC power adapter + power inverter (on demand)
RFID	N/A	Yes	Yes
ACCESSORIES	▪ Transportation case	▪ Transportation case	▪ Transportation case ▪ Professional tripod ▪ Measuring wheel ▪ Dedicated markers that simplify identification of measurement field
SOFTWARE	**OPTIONAL** GL OPTICAM SOFT DLL on request	**OPTIONAL** GL OPTICAM SOFT DLL on request	**COMPLIMENTARY** EN 13201 software add-on Requires OPTIONAL GL OPTICAM SOFT licence DLL on request

technical data







GL OPTICAM 1.0

APPLICATION	
Light sources, displays, luminous and illuminated surfaces	
MEASUREMENTS	
Imaging resolution	1920x1200 (Full HD, 2.3 MPix)
A/D conversion	12 bit
Measurement range	0.01 cd/m² ...200 kcd/m² (range depends on lens aperture) (ND filter for higher range available on request)
Resolution	0.01 cd/m²
Dynamic range	1:20000000
Focus distance	440 mm to infinity (depends on lens type)
Minimum working area	100 mm x 63 mm (at 440 mm distance) (will vary depending on lens type)
Uncertainty of spectral response	Class A (f1') < 3 %
Integration time	50 µs ... 30 s
PROPERTIES	
Measuring sensor type	CMOS monochromatic matrix with a spectral response V(λ) filter
Optical system	50 mm f/2.8 lens (different available on request)
Dimensions [H x W x D]	60 mm x 111 mm x 58 mm
Weight	570 g
PC Connectivity	USB 3.0
Power source	Powered by USB connection
Tripod adapter	BSW ¼"
ORDERING INFORMATION	
Case	✓
USB cable	✓
Part number	201952

GL OPTICAM 2.0 4K TEC

APPLICATION	
Light sources, displays, luminous and illuminated surfaces	
MEASUREMENTS	
Imaging resolution	4096x2168 (4K, 9 MPix)
A/D conversion	12 bit
Measurement range	0.01 cd/m² … 150000 cd/m² (range depends on lens aperture) (ND filter for higher range available on request)
Resolution	0.01 cd/m²
Dynamic range	1:20000000
Focus distance	200 mm to infinity (depends on lens type)
Minimum working area	56 mm x 30 mm (at 200 mm distance) (will vary depending on lens type)
Uncertainty of spectral response	Class A (f1') < 3 %
Integration time	50 µs … 10 s
PROPERTIES	
Measuring sensor type	CMOS monochromatic matrix with a spectral response V(λ) filter
Optical system	50 mm f/1.8 lens (different available on request)
Dimensions [H x W x D]	149 mm x 229 mm x 265 mm
Weight	5.0 kg
PC Connectivity	USB 3.0
Power source	15V DC power adapter (optional battery pack)
Tripod adapter	BSW ¼"
ORDERING INFORMATION	
Case	✓
USB cable	✓
Part number	202601

GL OPTICAM 3.0 4K TEC

APPLICATION	
Road lighting and other light sources, displays, luminous and illuminated surfaces	
MEASUREMENTS	
Imaging resolution	4096x2168 (4K, 9 MPix)
A/D conversion	12 bit
Measurement range	0.01 cd/m² … 150000 cd/m² (range depends on lens aperture) (ND filter for higher range available on request)
Resolution	0.01 cd/m²
Dynamic range	1:20000000
Focus distance	200 mm to infinity (depends on lens type)
Minimum working area	56 mm x 30 mm (at 200 mm distance) (will vary depending on lens type)
Uncertainty of spectral response	Class A (f1') < 3 %
Integration time	50 µs … 10 s
PROPERTIES	
Measuring sensor type	CMOS monochromatic matrix with a spectral response V(λ) filter
Optical system	50 mm f/1.8 lens (different available on request)
Dimensions [H x W x D]	149 mm x 306 mm x 265 mm
Weight	5.7 kg
PC Connectivity	USB 3.0
Power source	Battery pack + 15V DC power adapter + power inverter (on demand)
Tripod adapter	BSW ¼"
IP Rating	54
ORDERING INFORMATION	
Case	✓
USB cable	✓
Part number	202599

Note: Instrument, firmware and software specification are subject to change without prior notice. All the information included in GL OPTIC datasheets and product information available in any form are carefully prepared. Included information is 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.

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GL OPTIC

Light quality control

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