

T6 Goniophotometer with Moving Photometer Head

The T6 Goniophotometer with moving photometer head is a photometer of high accuracy and reliability for the measurement of the distribution of luminous intensity and spectrum of conventional and LED lamps and luminaires.

The T6 Goniophotometer is manufactured in accordance with the following Standards and Recommendations:

- ▶ CIE n. 70 Chap. 6 Type 1
- ▶ EN 13032 Type 2
- ▶ IESNA LM-75 Type C (complying IESNA LM-79)

and allows measurement according to the following systems:

- ▶ C- γ .

Characteristics

Mechanical Parts

The mechanical part consists of:

- machine and corresponding platform to hold it to the laboratory ceiling or to an adequately prearranged, inverted U-shaped support bracket
- luminaire support system that allows rotation around the vertical axis and its positioning along the C- plane to be measured. The luminaire is mounted with the luminous area face downwards, and perfect positioning is achieved through a vertical lifting system for fine adjustment
- photometer head support arm rotating around a horizontal axis around the luminaire under measurement; the rotation is managed by a step-by-step motor retroactivated by an absolute encoder. The maximum γ angular rotation is 150° from the vertical axis
- upper block which houses the control system of the motor cards assisted by computer. It also holds any measurement instruments.

Synthesis of mechanical characteristics



| | |
|---|--|
| ▪ max dimensions (AxBxH) - Inverted U-shaped Type | 3000x2500x300 mm + 2,5 m rotating arm |
| ▪ max. total weight | 100 kg approx |
| ▪ max. rotation axis speed | 1 rpm |
| ▪ max. horizontal axis rotation angle | + - 150° |
| ▪ max. vertical axis rotation angle | + - 360° |

| | |
|--|---|
| ▪ Luminaire or Lamp Characteristics | |
| ▪ luminous area max diagonal of luminaire for measurements with T6 Goniophotometer and 2,5 m arm | To be defined in accordance with Standard EN 13032-4:2015 - paragraph 4.5.4.1 |
| ▪ max height | 300 mm |
| ▪ max weight | 50 kg |

Electromechanical Actuators / Motors

The system is operated by 2 step-by-step motors with absolute encoders, controlled by a robotic system whose circuit boards are situated on the side of the machine.

The motors can be operated separately and move along special acceleration and deceleration ramps designed to restrict vibrations, or directly from the computer.

The system can measure in continuous movement or by stopping the machine in each measurement position: in the latter case the program proceeds to acquire at least 3 values whose difference must not exceed a pre-established range.

If this is not the case, a further three values are taken and then compared until measurement stability is achieved. Measurement with machine stop in each measurement position is generally more precise than continuous measurement but slower.

The control panel must be fed with 3 separate lines having the following characteristics:

- ▶ Machine Feed Line: Voltage 230 V - Frequency 50 Hz - Max. power 2000 W - Peak Current 7 A (other feeds on request)
- ▶ Lamp/Source Feed Line: Voltage 230 V - Frequency 50 Hz - Max. Power 2000 W - Peak Current: depends on feeder
- ▶ Computer and Devices Feed Line: Voltage 230 V - Frequency 50 Hz - Max. power 300 W (it is preferable to have a dedicated line).

Angle Measurement

Angle measurement is carried out directly on the horizontal and vertical axes by 2 absolute encoders to determine the position corresponding to the C- plane and the γ angle

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The angular resolution of the encoders is equal to $4/100^\circ$ (13 bit) and the angular positions are shown on screen during measurement along with indication of the state of progress of measurement and the polar diagram of the plane under examination.

Photocell and Luxmeter

The photocell consists of a silicon photovoltaic cell whose response corresponds to the relative visibility curve CIE $V(\lambda)$ using the full-filtering method.



The photocell, which is supplied mounted on the rotating arm, is connected to the luxmeter by a shielded cable of a maximum length of 70 m: should it be necessary to increase this distance, a suitable signal amplifier will have to be taken into consideration.

Photocell – Luxmeter System Characteristics (In accordance with EN 13032 - CIE 69 - DIN 5032/6))

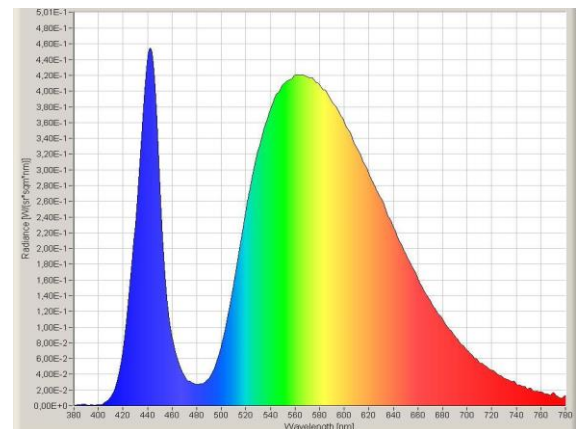
| | |
|--|-----------------------|
| Acquisition Area Diameter | 8 mm |
| Calibration Error u_{kal} | < 1% |
| Correspondence to $V(\lambda)$ f_1 Curve | < 1,5% |
| Directional Response Error f_2 | < 1% |
| Linearity Error f_3 | < 0,1% |
| Display Unit Error f_4 | < 0,1% |
| Fatigue f_5 (measured at 1 klx) | < 0,1% |
| Modulated Light f_7 | < 0,1% |
| Polarization f_8 | < 1% |
| Scale Change Error f_{11} | < 0,1% |
| Temperature Coefficient α_{25} | 0,1%/K (L)-0,2%/K (A) |
| Sensitivity to UV (u) | < 0,01% |
| Sensitivity to IR (r) | < 0,01% |
| Overall Characteristic f_{ges} | < 3% |
| Integration Period at 50 Hz | 20-200 ms |
| Calibration Period | 2 years |

Spectroradiometer (Optional)

The system can be equipped with a spectroradiometer fitted on an appropriate support.



It is therefore possible to make measurements as prescribed by the Standards IESNA LM-79 and EN 13032-4 by using the module Gonwin SP in Gonwin and defining a number n of C-semiplanes in which to make the measurements.



Spectroradiometer Characteristics

| | |
|--------------------------|---|
| Spectral Range | 380-780 nm |
| Optical Bandwidth | 5 nm FWHM |
| Wavelengths Resolution | 1 nm |
| Digital Resolution | 15 bit ADC |
| Dispersive Element | Imaging grating |
| Sensor Type | Photodiode array |
| Measuring Ranges | Luminance 2 ... 70 kcd/m ² Illuminance 20 ... 500 klx |
| Photometric Accuracy | 5 % (@ 2856 K) |
| Chromaticity Accuracy | 0.002 x, y (@ 2856 K) |
| Color Repeatability | 0.0005 x, y |
| CCT Repeatability | 20 K (@ 2856 K) |
| Wavelengths Accuracy | ± 0.5 nm |
| Calibration Traceability | NIST |

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Control and Data Acquisition System

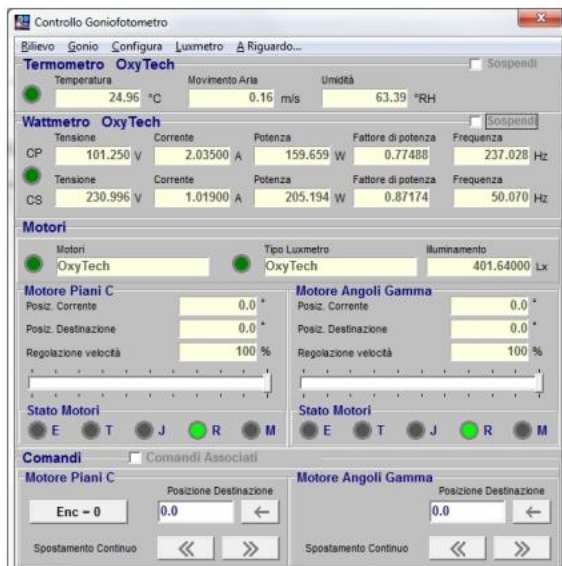
The control unit organizes and manages the measurement and is connected to the computer by means of a TCP/IP interface.

The system manages all the measurement procedures, from reading angular positions to that of the signal from the photocell; it allows the angles to be fixed for a defined position and to carry out the whole measurement according to C- γ system.

Machine Management Software - Gonwin

The machine is supplied with management software LITESTAR 4D Gonwin in MS Windows® environment that allows you to:

- ▶ carry out a complete measurement in accordance with:
 - standards (CIE Recommendations, EN Norm 13032 and Norm LM79)
 - matrices freely set by the user



- ▶ save the measured values in matrices in GF format (goniophotometer format) convertible into formats Eulumdat, IES, Cibse TM14, LTLI and OXL OxyTech with LITESTAR 4D Photoview.
- ▶ perform point measurements defined by the operator
- ▶ define the type of measurement whether continuous or with stops in every measurement position
- ▶ regulate the automatic start of measurement by evaluation of the full performance of the lamp
- ▶ regulate the length of the stops between one plane and the other
- ▶ regulate the speed of rotation around the axes during measurement
- ▶ measure and save in Excel files:
 - measure the electrical parameters before and after the feeders (optional module)
 - measure the parameters of temperature, humidity and air speed (optional module)

- ▶ manage all functions of control and acquisition of measured and calculated values
- ▶ assess the lamp/source stability during measurement with immediate stop to the latter should the differences be greater than a predefined delta
- ▶ assess the stability of the electrical parameters during measurement with immediate stop of the latter should the differences be greater than a predefined delta
- ▶ assess the flux decay for emergency lighting devices in accordance with EN 1838 (optional module)
- ▶ visualize the stability graph of the electrical parameters throughout measurement
- ▶ visualize the polar diagram of the plane under examination throughout measurement
- ▶ automatically turn off lamp and machine at the end of measurement (useful function for long term measurements that can also be performed during the night - optional)
- ▶ measure the temperatures of luminaires and lamps using the thermocouple system (optional module).

The software works on PC in MS Windows® environment and is available in more than 20 languages.

Optional Accessory Elements

The following optional accessory elements are available:

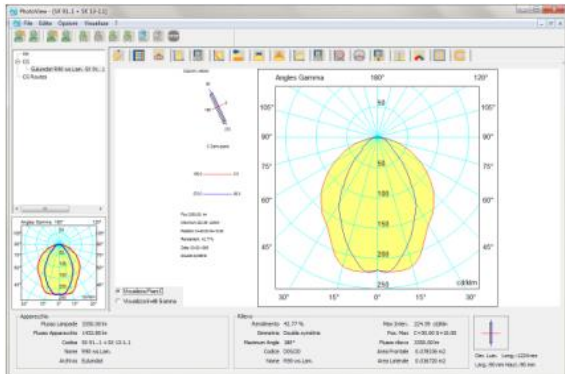
- ▶ Standard calibrated lamp for calibrating the goniophotometer inclusive of lampholder (4 wire technique), CC feeder and certificate
- ▶ Wave generator (power source)
- ▶ High precision multimeter with 1, 2 or 3 channels
- ▶ Special brackets for fixing luminaires and lamps.

LITESTAR 4D Photoview Software

Processing and visualization of measurement results in tables and graphs are carried out with the LITESTAR 4D Photoview Plus module that allows you to:

- ▶ import the measurement data saving them in files defined by the operator
- ▶ convert a C- γ measurement into V-H and viceversa
- ▶ import and export the measurements in the standard formats Eulumdat, IES (86, 91 and 95), TM14, LTLI and OXL
- ▶ process graphs:
 - polar, Cartesian and of beam aperture

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- of the glare
- of the isolux and isocandela curves
- of the yield for the interior and road luminaires
- of the photometric classification of road luminaires according to IES TM-15 standard
- of the decay in emergency
- ▶ process tables:
 - of the utilances and utilization factors
 - of UGR and luminance values
 - of the international classifications.

The software works on PC in MS Windows® environment and is available in more than 20 languages.

Computer

The computer supplied with the machine complies with the following minimum requirements:

- ▶ PC with 1 Gb RAM or greater, 2 Gb hard disk
- ▶ 1 LAN and 2 USB interfaces
- ▶ color monitor
- ▶ MS Windows® 8 Operating system or higher.

Room Dimensions and Characteristics

Dimensions

The dimensions of the room in which to install the goniophotometer depend on the type of luminaire to be measured, on the maximum dimension of the luminous area and the maximum luminous intensity.

The distance photocell/luminous center of luminaire is determined according to the prescriptions given, for example, in standard EN 13201-4:2015 paragraph 4.5.4.1.

Example: LED luminaire with a 400 mm (L) diameter luminous area therefore the distance between the luminaire and the photocell must not be less than 2 m (5 x L) if the beam is uniformly distributed in space. It is normally preferable to consider a distance of no less than 2 m even with luminaires of smaller dimensions.

It is also important to consider the type of beam emitted by the luminaire and the lamp power; in fact, when this is highly concentrated, it is advisable to consider a distance photocell/luminous center of luminaire of approximate 2/3 times greater than 5L.

The dimensions of the room in which to install the machine are:

| | Arm |
|--------------|--|
| | 2,5 m |
| ▪ length[m] | 3.5 |
| ▪ width [m] | 3.5 |
| ▪ height [m] | 3.5 ⁽¹⁾ or 5.5 ⁽²⁾ |

⁽¹⁾ for measurement of luminaires with emissions up to γ 90°

⁽²⁾ for measurement of luminaires with emissions up to γ 150°

Nota Bene: for dimensions different to those reported above please contact our customer service.

Characteristics

Wall Colour - The laboratory walls should be painted in matt black and it's suggestable to cover the laboratory wall, ceiling and floor surfaces with black velvet type DC-Fix

Air conditioning system - The room must be equipped with an air conditioning system capable of maintaining the temperature of the area around to the appliance to be measured to the value of 25 °C +/- 1 °C

Further details may be provided in case of acquisition of the machine.

Nota Bene

- ▶ Machine installation is carried out by OxyTech technicians.
- ▶ OxyTech reserves the right to make improvements to the machine at any time without obligation to inform the customer.