

# T2+ Goniophoto-spectroradiometer

The Goniophoto-radiometer T2+ is a high precision and reliability photometer for measuring the distribution of the luminous intensity of conventional and LED lamps and lighting devices.

The T2+ is manufactured in accordance with EN Norm 13.032 types 1.1, 1.2 and 1.3, corresponding to CIE Recommendation n.70 Types 1 and 2 (Luminaire Revolving Goniophotometer).

The T2+ allows measurements according to the following systems:

- ▶ C-Gamma
- ▶ V-H (B-Beta)
- ▶ for conical surfaces.

## Characteristics

### Mechanical Part

The mechanical part allows measurement of luminaires and lamps according to the C-Gamma system generally used for lamps, interior and road luminaires and the V-H (B-Beta) system generally used for lamps and floodlights.

With the C-Gamma system, the luminaire rotates around a horizontal plane and the luminaire's rotation axis generally coincides with its luminous axis.

Due to this characteristic it is not suitable for measuring lamps or luminaires whose flux varies according to the relative position in space.

The V-H system solves this problem because the rotation axis generally coincides with or is parallel to the lamp axis and therefore this rotates around its own axis and remains on the horizontal plane.

The lower mechanical block houses the motors, encoders and reducers in addition to the machine control system assisted by computer. It also holds any measurement instruments and the shaft that supports the upper part.

The upper mechanical part consists of an L-shaped arm that rotates around the vertical axis and supports the step-by-step motor for the movement of the luminaires along the C- or V- semi-planes.

The vertical part of the arm is semi-mobile and can be moved linearly forwards or backwards on a slide with a wheel and endless screw for precise positioning of the luminaire so that its luminous center coincides with the intersection of the 2 rotation axes.

### Synthesis of mechanical characteristics

Machine	
max. dimensions (AxBxH)	1800x800x2000 mm
max. volume (AxBxH)	2800x3000x2800 mm
total max. weight	350 kg approx.
max. rotation axis height	1800 mm +- 50 mm
max. axis rotation speed	1 turn/min
horizontal axis max. rot. angle	+ 360°
vertical axis max. rot. angle	+ 180°



Goniophotometer T2



### Luminaire or lamp characteristics

max. diagonal	2000 mm
max. depth	800 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 being its circuit boards situated on the side of the machine.

The motors can be operated separately by means of the manual control system and move along special acceleration and deceleration ramps designed to restrict vibrations. They can be manoevered independently or simultaneously with a touch-pad manual control system, equipped with emergency switch, 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, 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.

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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 Feed Line: Voltage 230 V or 380 V - Frequency 50 Hz - Max. power 5000 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 in order to determine the position corresponding to the C- and V- (B-) planes and the Gamma or H- (Beta) angle.

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 is thermostated at  $35^\circ\text{C}$  and is supplied along with a support to be fixed to the floor or ceiling. The support is equipped with all fine regulating systems for the various alignments and lasers to verify the centering of the luminaire/lamp.

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

Acquisition Area Diameter	8 mm
Calibration error ukal	< 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 $\alpha_{25}$	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

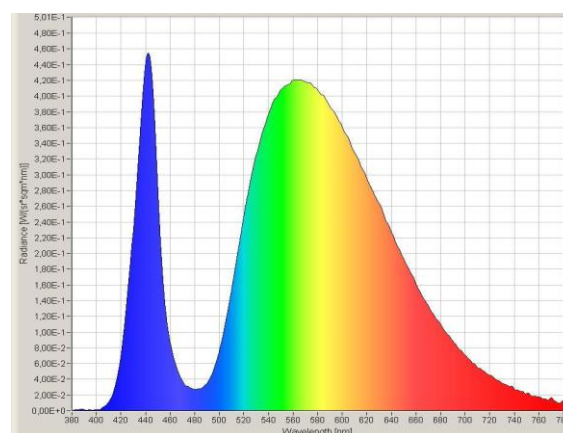
The photocell is connected to the luxmeter by a shielded cable of a maximum length of 70 m: should it be necessary to increase this distance, a suitable signal amplifier will have to be taken into consideration.

### Spectroradiometer (Optional)

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



It is therefore possible to make measurements as prescribed by the EN 13032-4 Standard 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	4,5 nm FWHM
Wavelengths Resolution	1 nm
Digital Resolution	16 bit ADC
Dispersive element	Imaging grating
Sensor Type	Photodiode array
Measuring ranges	Luminance 1 ... 150.000 cd/m2
	Illuminance 1 ... 250 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.

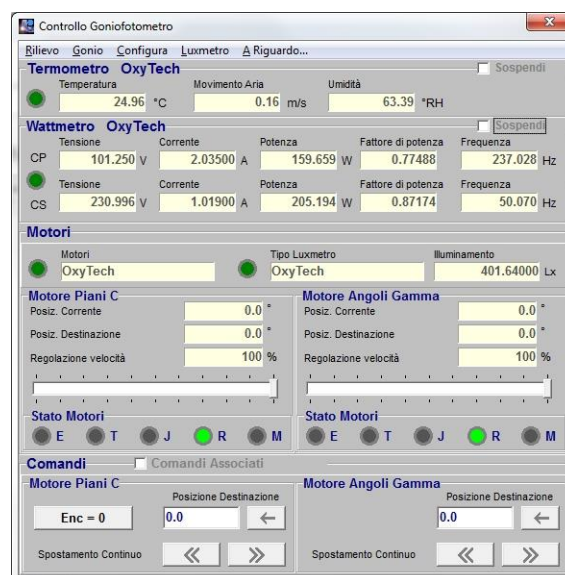
The system manages all the measurement procedures, from reading angular positions to acquiring the signal from the photocell; it allows the angles to be fixed for a defined position and to carry out the whole measurement according to the C-Gamma system and V-H system for conical surfaces.

## 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 and EN Norm 13032)
  - matrices freely set by the user.
- ▶ save the measured values in matrices in GF format (goniophotometer format) convertible into formats Eulumat, 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 file:
  - the electrical parameters before and after the feeders (optional module)
  - the parameters of temperature, humidity and speed of the air (optional module)
- ▶ manage all functions of control and acquisition of measured and calculated values
- ▶ assess the lamp flux 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 measurements that can also be performed during the night - optional module)
- ▶ 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

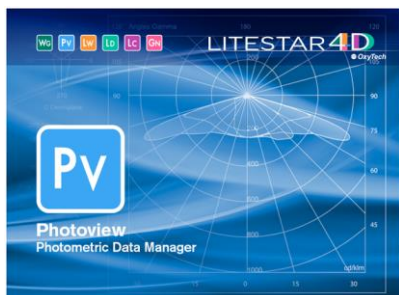
The following optional accessory elements are available:

- ▶ 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.

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## 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 and save 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 beam aperture
  - of the glare
  - of the isolux and isocandela curves
  - of the yield for interior and road luminaires
  - of the photometric classification of road luminaires according to IES TM-15 standard
  - of the decay in emergency
  - of the spectrum following CIE, CRI and TM-30-18



- ▶ 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 and 2 Gb hard disk
- ▶ 2 USB and 1 LAN interfaces
- ▶ color monitor
- ▶ MS Windows® 8 or greater operating system

## 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.

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

**Example:** luminaire for linear 58W fluorescent lamps – dimension of luminous area approx. 1500 mm therefore the distance must not be less than 7.5 m (in such case the rule of 5 times the greater dimension of the luminous area can be applied).

It is normally preferable to consider a distance of no less than 5 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 and the lamp exceeds the power of 400W, it is advisable to consider a distance photocell/luminous center of luminaire of approx. 15/20 m.

The room dimensions (Laboratory) are (consider that the length must be between 5 and 20 m + 2 m for arm movement):

- ▶ length > 7 m
- ▶ width 4 m
- ▶ height 3 m

### Characteristics

**Wall Colour** - The laboratory walls should be painted in matt black and it's recommended 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 at 25 °C +/- 1 °C

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

### N.B.

- ▶ 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.