LabSpion

Patent pending

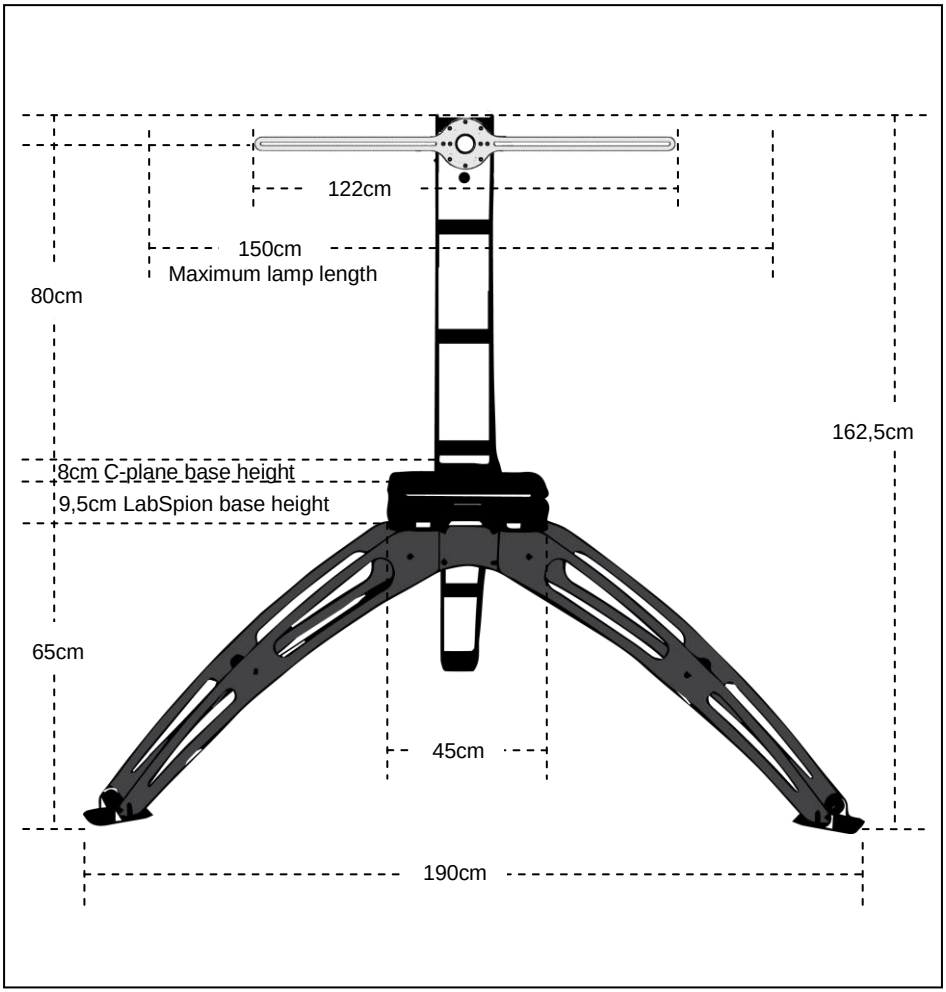
User guide

Preliminary edition

Last edited: 2015-01-12

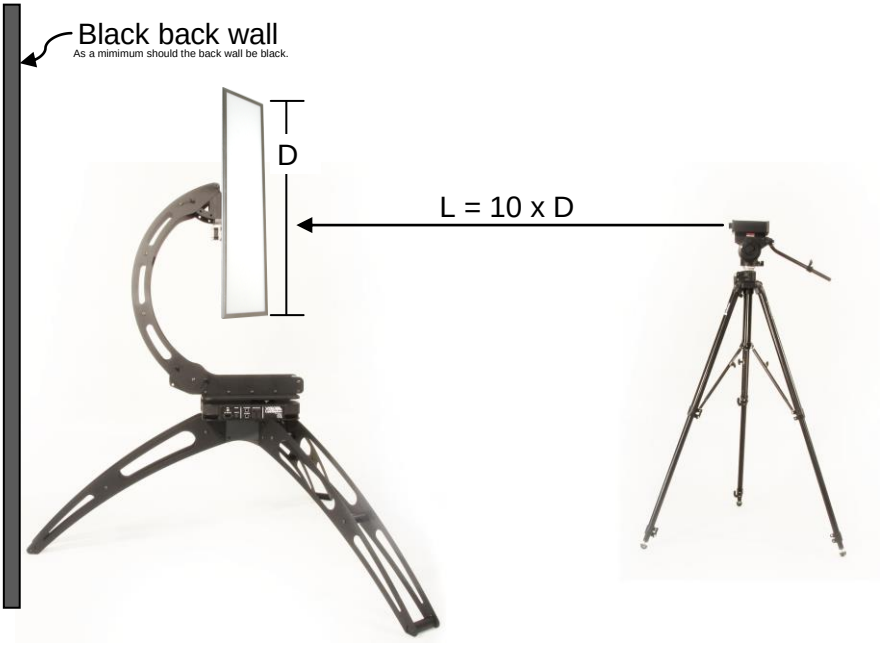
VISO SYSTEMS

Dimensions



Sensor distance L

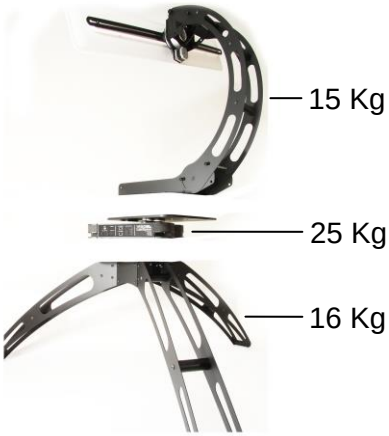
Measurement method: Far Field



Please note that the sensor-lamp distance must be at least 10 times larger than the diameter of the lamp.

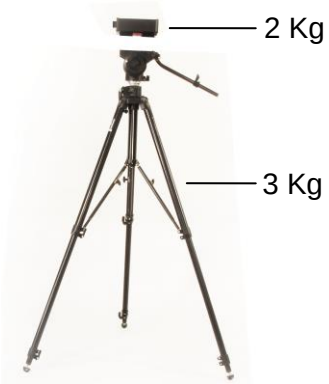
This condifiton is required by the standards of the ”Far Field” method for accurate results.

Weight



LabSpion weight

56 Kg



LabSensor weight

5 Kg

Total weight: 63 Kg

	Shipping packages	***Shipping dimensions***	***Shipping weight***
1.	**C-Plane goniometer**	**40x30x25cm**	**6Kg**
2.	**Lab base + tripod**	**133x47x17cm**	**27Kg**
3.	**Base gonio table**	**50x50x35cm**	**26Kg**
4.	**Sensor**	**45x35x17cm**	**1Kg**
5.	**Screws + cables**	**40x30x25cm**	**11Kg**

Total shipping weight: 71 Kg

Packages: 5 pcs

Contents

Safety Information

Warning! This product is not for household use.

Read this manual before installing and operating the controller, follow the safety warnings listed below, and study all the cautions in the manual.

Preventing electric shocks

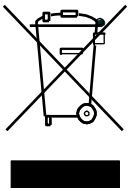
Make sure the power supply is always grounded.

Use a source of AC power that complies with the local building and electrical codes, that has both overload and ground-fault protection.

If the controller or the power supply are in any way damaged, defective, wet, or show signs of overheating, disconnect the power supply from the AC power and contact Viso Service for assistance.

Do not install or use the device outdoors. Do not spray with or immerse in water or any other liquid.

Do not remove any covers or attempt to repair the controller or the power supply. Refer any service to Viso.



Disposing of this product

Viso products are supplied in compliance with Directive 2002/96/EC of the European Parliament and of the Council of the European Union on WEEE (Waste Electrical and Electronic Equipment), as amended by Directive 2003/108/EC, where applicable.

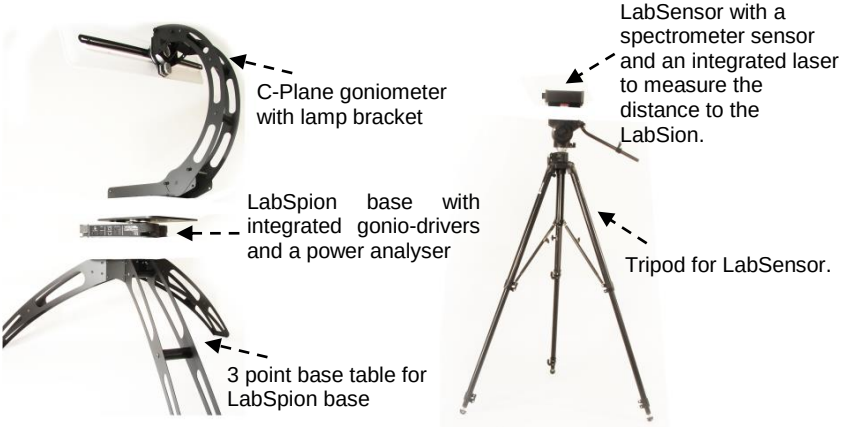
Help preserve the environment! Ensure that this product is recycled at the end of its lifetime. Your supplier can give details of local arrangements for the disposal of Viso products.

Introduction

About the LabSpion

The LabSpion is a revolutionary new far field goniometer system with a spectrometer sensor that makes it possible to measure all photometric measurements quickly and efficiently. The Light Inspector software enables to quickly measure, save and export the newly obtained data.

System content



The LabSpion package contains the following items:

- LabSpion goniomtere base
- C-plane goiniometer with a lamp bracket
- 3 points base table
- LabSensor
- Tripod for the LabSensor
- Light Inspector USB stick (Windows)
- 5 m IEC power cord

- 5 m USB cable
- 20m RJ45 cat 5 for connection between LabSpion and LabSensor

About this document

These guidelines describe the installation process of the LabSpion controller followed by the typical measurements of various light sources.

Installation

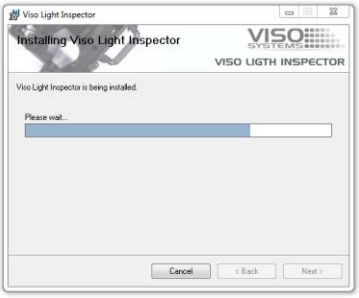
Software installation

Before you can start using the LabSpion, the “Viso Light Inspector” software must be installed. It is supported on all windows platforms.

Use the following link to download the latest version: http://www.lightdataserver.com/software/Viso%20Systems/LightInspector.htm

Please make sure the LabSpion is not connected to the computer during software installation.

Run the msi file and follow the installation instruction.



USB drivers are automatically installed.

Your measurements are not lost when installing newer versions or uninstalling. All measurements will always remain in your document folder.

Connecting power

The LabSpion comes with a standard IEC power-in connector and with a standard euro power cable, but any power cable can be used as the LightSpion supports any outlet voltage from 90-260VAC.

The power-in connector supplies power both to the goniometer motor and to the power analyser and then subsequently to the measuring light source. It means that the power is identical to the one of the measuring light source.

AC power supply cable plug

Warning: Risk of an electric shock! Plug installation shall be performed by a qualified electrician.

A grounding-type (earthed) power plug that fits the local power outlet must be used. You can acquire an IEC power cable with a suitable grounding-type plug from most of consumer electronics stores.

When installing the plug connect pins as follows:

yellow and green wire to grounding (earth)

blue wire to neutral

brown wire to live

Connecting USB

The LabSpion is connected to the computer using a USB connector type B. A 2m USB cable type A to B is included with the LabSpion, however any USB cable supporting USB2.0 can be used.

The USB provides communication and power to the LabSpion's main board processor, power analyser and photo spectrometer, meaning that the photo spectrometer can be used only with the connected USB.

Start the "Viso Light Inspector" software after having connected the USB; the connection to the LightSpion will be established automatically. A successful connection is shown with a green "Connected" icon in the upper right corner of the "Viso Light Inspector" software.

You can connect and disconnect the USB without restarting the "Viso Light Inspector" software, as the connection is always established automatically as soon as the USB connector is plugged in and vice versa.

Connecting LabSensor

The LabSpion is connected to the LabSensor with a RJ45 cable, which is supporting the transfer of data and power between the two parts.

Warning

Do not connect the LabSensor to the C-plane motor connector, this could damage the LabSensor.

Connecting the C-plane goniometer

The C-plane goniometer is connect to the LabSpion base through a RJ45 cable. The LabSpion will automatically detect the C-plane goniometer.

Warning

Do not connect the C-plane motor to the LabSensor connector, this could damage the LabSpion.

Connecting a lamp power

The LabSpion has a built-in power analyser and a power switch. The power switch is used to switch off the lamp before every measurement, so that the values of the ambient light are obtained and subsequently subtracted from final measurements.

The maximum supported lamp current is 3A, which is 660W at 220VAC and 330 at 110VAC.

AC power supply cable plug

Warning: Risk of electric shock! Plug installation shall be performed by a qualified electrician.

A grounding-type (earthed) power plug that fits the local power outlet must be used. You can acquire an IEC power cable with a suitable grounding-type plug from most of consumer electronics stores.

When installing the plug connect pins as follows:

yellow and green wire to grounding (earth)

blue wire to neutral

brown wire to live

Connecting diagram

Below is a connection diagram showing the different connections needed to make the system operational.

Making measurements

Alignment of the sensor

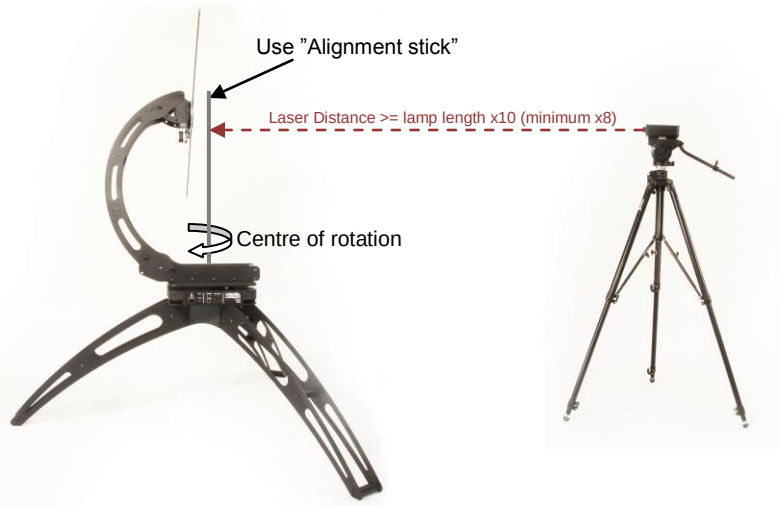
Before making any measurements it is important to place the sensor at the correct distance and to align it accordingly.

The LabSpion is a “Far Field” goniometer system, which means that the distance between the sensor and the lamp is determined by a lamp size.

The recommended distance between the sensor and the goniometer is 10 times larger than the lamp length/diameter.

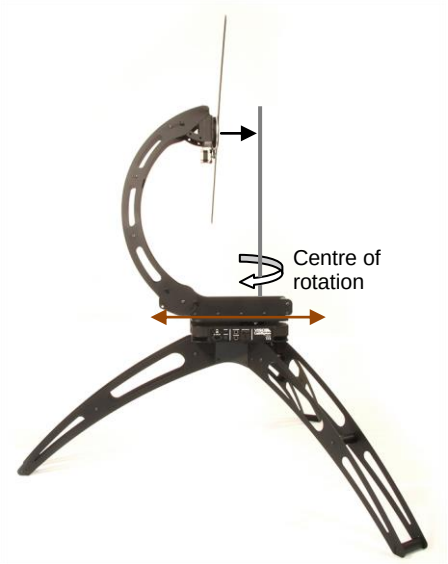
The distance can easily be configured using the built-in laser in the LabSensor.

IMPORTANT!! The distance should be measured to the centre of rotation of LabSpion base goniometer, use the centre stick as the laser target.



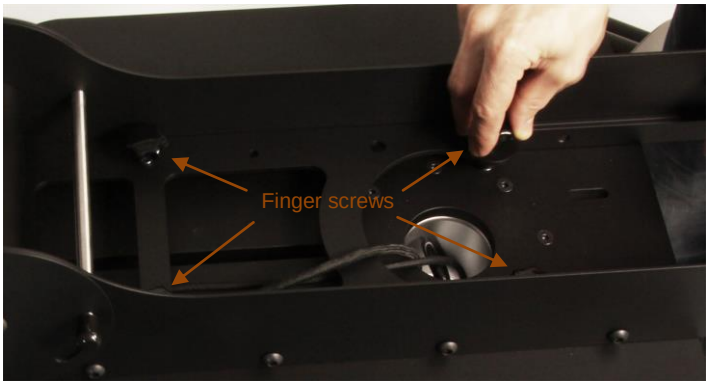
Alignment of lamp

Before making a measurement is it necessary to align the lamp to the centre of rotation.



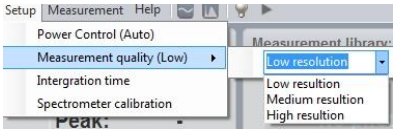
Loosen the 4 screws on the C-Plane goniometer to slide and adjust the lamp to the centre position.

The 4 finger screws are placed in pairs on each side of the C-Plane goniometer as shown below.



Quality selection

It is possible to manually select the measurement quality beforehand in Setup -> Measurement quality.



The “Viso Light Inspector” uses the low resolution by default. Yet, there are three levels of complexity: low, medium and high. Each quality level increases the number of measurements made during the goniometer operation, it also increases the photo spectrometer integration time whilst lowering the noise level of the photo spectrometer measurements.

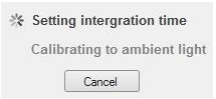
Increasing the quality results in substantial measuring time extension.

Fully automatic

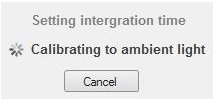
The “Viso Light Inspector” software makes fully automatic measurements by default. It adjusts the photo spectrometer to the background light environment by firstly turning off the light source and secondly measuring the background light level, which is subsequently subtracted from the following measurements. Therefore the measurements can be done even in a lit room. The adjustment of the exposure time of the photo spectrometer (also known as the integration time) is also done automatically.

A measurement is simply started by clicking on the play icon.

Then the integration time is set automatically.

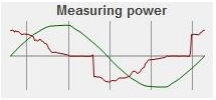


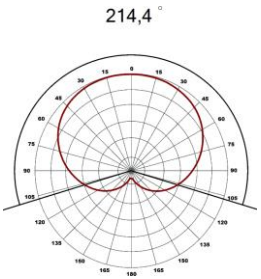
The ambient light level is automatically measured by turning off the light source.



The light source is then rotated at 180 degrees to prepare for measurement.

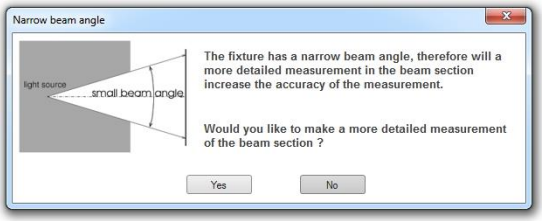
The power is then measured and stored.



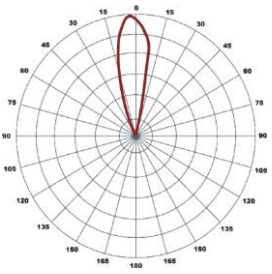


The complete 360 degrees angular light field is then measured and the beam angle is calculated.

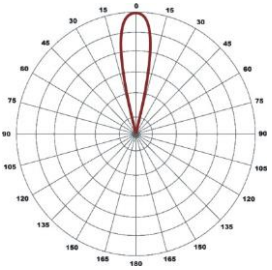
Light sources with narrow beam angles can have insufficient number of measurements in order to generate an accurate result. In such a case the “Viso Light Inspector” software will ask you automatically, whether you would like to have a more detailed scan of the beam section.



The increase in measurement quality after a detailed re-scan of the narrow beam section can be seen below.

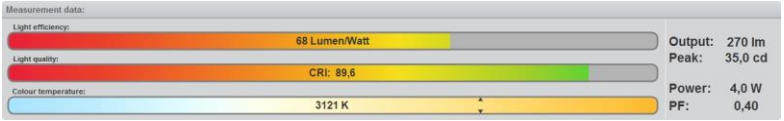


Before a detailed auto re-scan



After a detailed auto re-scan

Upon completion the main characteristics are calculated and displayed: the total luminous flux in lumen, the colour rendering index CRI, the efficiency in lumen/watt, the peak light intensity in candela, the power and power factor.



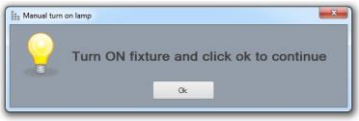
Further details about the measurement data can be found in the chapter “Measurement data”.

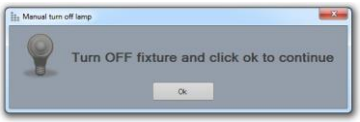
Manual power control

In some cases it is necessary to control the power of the light source manually. For example, when measuring flash light on batteries, as the LabSpion's power analyser won't be able to turn on and off the light source automatically. Another example could be a low voltage light source such as LED chips. The external power supply of such chips has low response time when turned on and off, therefore it would lead to an inaccurate result of the ambient light level.

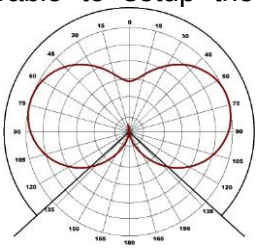
To enable the manual power control select Setup -> Power control and select manual power control.

When the manual power control has been selected the "Viso Light Inspector" will ask you to manually turn on and off the light source when necessary, as shown below.



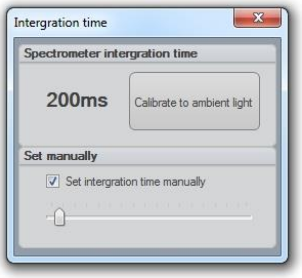


Manual integration time setup



In some rare cases it could be desirable to setup the integration time of the photo spectrometer manually. One case could be when measuring a light source emitting most of the light to the sides instead of in the central direction. As the automatic setup of the integration time is done in the centre at 0 degrees, the integration time would be too high, resulting in saturation of the photo spectrometer and leading to an inaccurate measurement.

The integration time of the photo spectrometer can be set manually by selecting Setup -> Integration time.



Independently running spectrometer

The photo spectrometer can also be used to run independently to test different light sources that might be too large for a complete goniometer measurement or to have a real-time update on how the light source behaves over time.

To start the photo spectrometer independent operation click on the spectrum scan icon. 

During the independent run mode the light intensity output in candela, CRI, and colour temperature are being continuously updated.

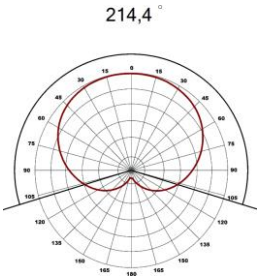
The integration time can be changed during the free run scan, as explained in the previous chapter to ensure a correct resolution.

NOTE: After changing the photo spectrometer integration time the spectrum should be “Calibrated to ambient light”.

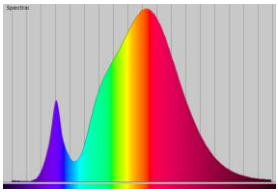
Measurement data

After the goniometer measurement is complete the following results are displayed.

1. The angular light distribution shows the amount of light from the non-rotational symmetrical part of the light source. This field distribution is used to calculate the beam angle.



2. The complete integrated spherical spectrum is shown in the spectral window. Integrated spherical spectrum signifies a spectrum that is mathematically integrated from all of the individual spectra in the spatial distribution. Thus it represents the equivalent of a spectrum obtained from an integrating sphere.



3. The complete integrated spherical spectrum calculated in the previous step is utilised to calculate the luminous flux in lumens.

The peak intensity output in candela is also displayed, which accords to the highest level of the light output during goniometer measurement.

4. The power is measured by sampling a voltage and a current at a rate of 50.000 samples per second to ensure high resolution and thus high power precision.

The power factor (PF) indicates the quality of power consumption, where 1.0 being the best (it is generally achieved with a pure resistive load such as a tungsten lamp) and 0.0 being the worst. For a satisfactory level, the PF value should be located between 0.5 – 1.0. You can refer to the quality chapter in order to figure out the power standards for different countries and regions.

5. The efficiency in lumens per watt is calculated by dividing the luminous flux in lumens to the power consumption. The result is displayed in the efficiency bar with a corresponding colour, where 100 lumen/watt it shown as the outmost green. The standard maximum value of 100% efficiency is 683 lumen/watt.

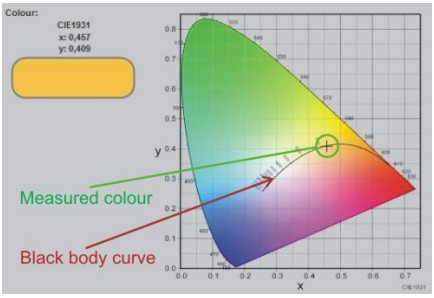
6. The CRI is calculated using the standard 8 reflectance colours in order to figure out the ability of the light source to transmit colours, thus indicating the quality of the radiated light. 0 being the worst quality and 100 being the best quality equal to that of the Sun.

The CRI can only be used for white light. If the CRI is not indicated that means that either the radiated light does not meet the criteria for white light or that light levels are too low to be measured.

7. The photometric colour temperature indicates the colour of the white light and is displayed in kelvin. Where 6000K is considered as cold and 2500K as warm. The kelvin scale was initially derived from the temperature of the tungsten filament. Therefore the high temperature of the filament is considered

as cold light and vice versa. If the colour temperature is not displayed, it means that either the radiated light does not meet the criteria for white light or that light levels are too low to be measured.

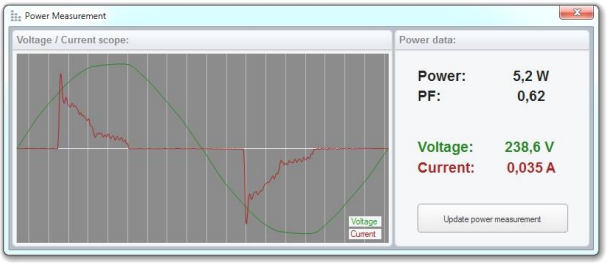
8. At a closer look, the radiated colour is shown with x and y coordinates in the CIE1931 diagram. The diagram illustrates all visible to the human eye colours. It is based on an experiment conducted in 1931 with a number of participants aiming at figuring out the eye's perception of colour.



The black line in diagram is called the black body curve. It illustrates all colours that are defined as white colours from warm to cold. The point corresponding to the measured colour is shown with a black cross. It can be used to check the whiteness of a colour, by checking how close it is to the black body curve: the closer it is to the black body curve the more accurate is the white colour.

Power details

A detailed voltage and current data can be viewed by clicking on the scope button or selecting “View->Power details”



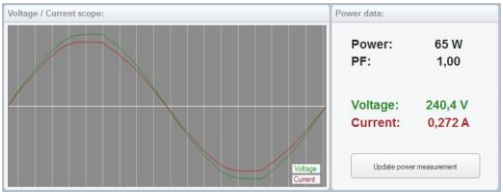
The real-time data of the voltage and current is shown in the power details window: the green line illustrates voltage (it should have a sinus curve). The upper part of the sinus curve can sometimes have a flat top, which is explained by the power grid distortions. The current is presented with a red line, it is displaying how the current is consumed by the light source.

The power factor is an indication of how well the current is consumed through a voltage period. The power factor is calculated according to the following principle: the value of the actually consumed power is divided by the product of the voltage and the current. PF = Power / (Voltage x Current) = 5,2 / (238,6 x 0,035) = 5,2 / 8,35 = 0,62.

When the transformation of the current by the light source is not efficient, the source will consume more current than necessary.

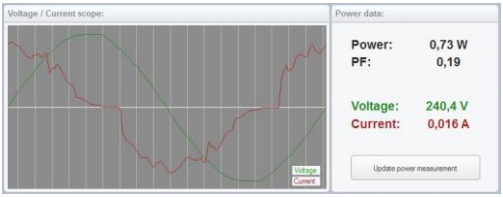
When the current is not consumed by the light source efficiently, the cabling during installation should be adjusted accordingly. The excess current will result in power loss due to cables’ heating, etc. A general rule is the following: a 10W light source with a PF 0.5 must be connected to an installation capable of supplying 20W. The corresponding formula reads installation W = Power/PF.

Example 1



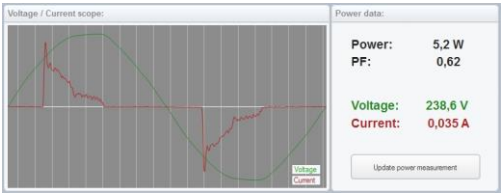
Shows a standard 60W tungsten bulb with an ideal PF of 1.0 and a current curve that is identical to the voltage.

Example 2



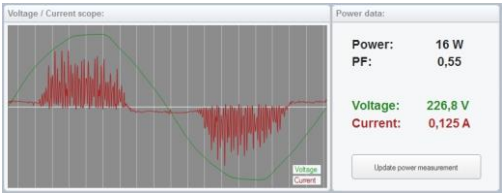
Shows a LED bulb that has a passive capacitor power supply, which results in a high phase shift between current and voltage, thus resulting in a very low power factor of 0.19.

Example 3



Shows a LED bulb of a medium quality switch-mode driver with a high capacity peak load, thus a medium quality power factor of 0.62.

Example 4



Shows a LED bulb having a switch-mode driver with a particularly bad filtering. It results in a high noise level of the current. Therefore this level of noise would probably not be able to pass the EMC noise level requirements.

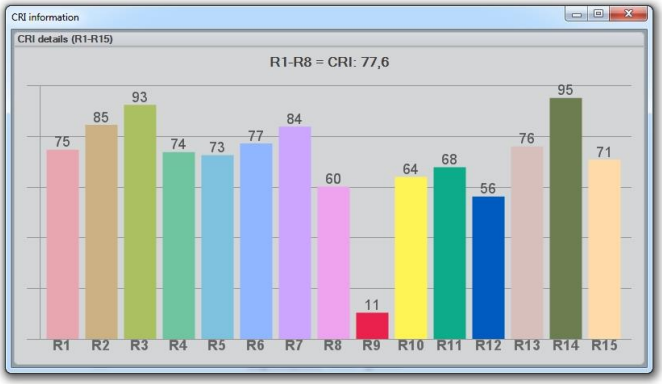
CRI details

The CRI defines the quality of white light, it is also known as the Colour Rendering Index or Ra. The value of CRI shows how much the spectrum of a light source resembles that of the Sun, thus the ability of the light source to reproduce the colours of an object as if it were illuminated by the Sun.

The CRI is calculated with the help of the standard test colours, which examine the chromatic adaptation of light.

The standard set consists of 15 test colours, but only the first 8 of them (known as R1-R8) are used to calculated the CRI, whereas the remaining R9-R15 are typically not used. However, sometimes LED lights do not have a red light component (which is considered in the R9 measurement), that is why it is becoming more common to include the R9 measurement as well.

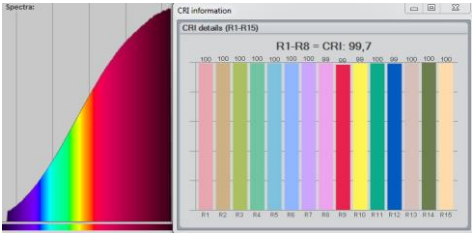
R9-R15 values can be view in the CRI details window, which is opened by clicking on the CRI bar or selecting View->CRI details.



According to the colours table above, we can see that the red light of R9 is rather low compared to the rest of the values. In some cases R9 can even be negative due to particularly low levels of the red light.

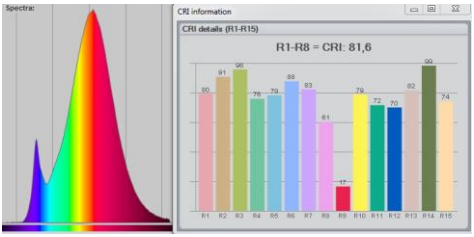
Example 1

Shows a standard tungsten lamp. Its continuous spectrum has the closest resemblance to the Sun, therefore the CRI values are the highest.



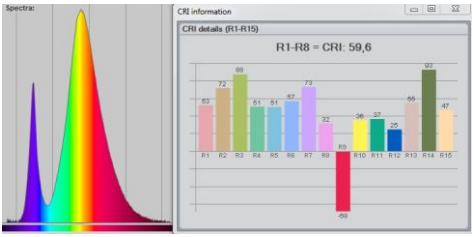
Example 2

Shows a Philips LED bulb with a low red R9 value.



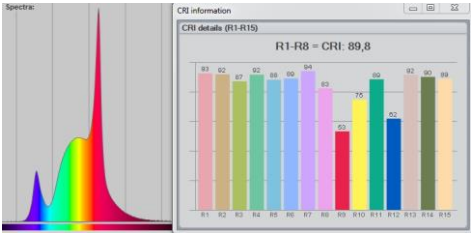
Example 3

Shows a standard LED bulb with a negative red R9 value due to the lack of red light in the spectrum.



Example 4

Shows a LED bulb with an additional red colour boost, so that the LED's R9 value is increased.



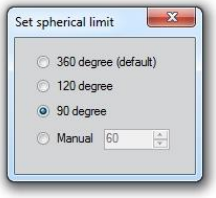
Spherical limit

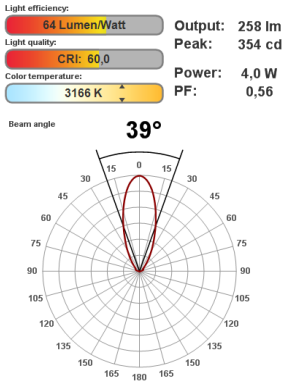
Spherical limit allows the user to constrain the area of the luminous flux integration. It is also known as measuring luminous flux in a Φ cone.

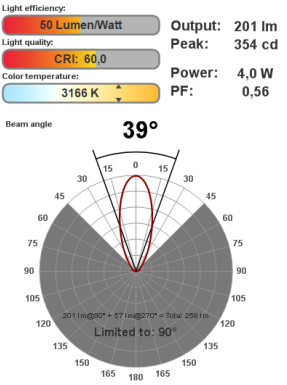
Luminous flux measurement is generally done in a full sphere of 360°. The new EU regulations (EU No 1194/2012), however, require the measurement of the directional lamps in a 90° or 120° cone, meaning that light illuminated only inside of that cone is considered for the calculation of the efficient luminous flux.

The spherical limitation can be set by clicking Edit -> Spherical limit.

Spherical limitation does not need to be set before a measurement, although it can be set afterwards, also for the previously made full-on 360° measurements. Below is an example of the differences in the flux at 90° cone, where 57 lm is considered as a waste outside the 90° cone.

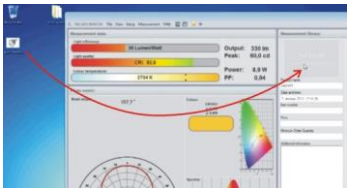






Attaching pictures

You can easily attach pictures to your measurements via dragging and dropping them towards the area of the picture frame.

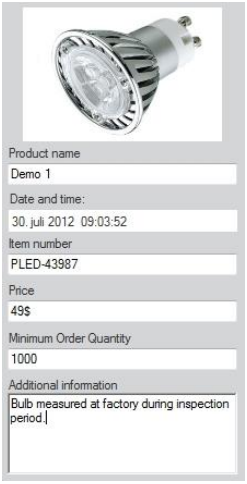


It is also possible to use a webcam to snap pictures of the measured light sources for quick references. To use the webcam click on the picture frame to open a picture editor.

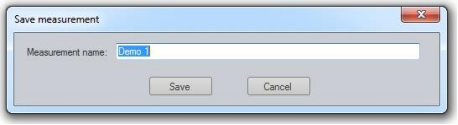
Afterwards click on the start webcam button for the webcam to start and add as many pictures as you like. The first picture in the picture editor will be used as the primary one, which accompanying the measurement by default. Pictures can be moved or deleted by right clicking on each pictures.

Saving measurement

Fill in and store all the necessary information about each measurement in the appropriate section, as shown in the picture.



To save the measurement simply click on the save icon or select File -> Save as.



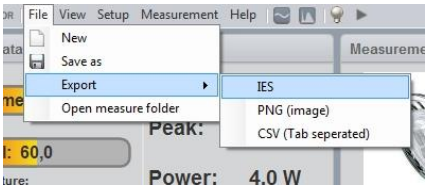
Measurements are stored in the Measurement library in an alphabetic order.

Measurements are physically stored in “My documents\Viso Systems\Light Inspector\” as .fixture files.

The folder can also be opened through selecting File -> Open measure folder. When some files are added or removed, it is then necessary to restart the program, so the library can be updated.

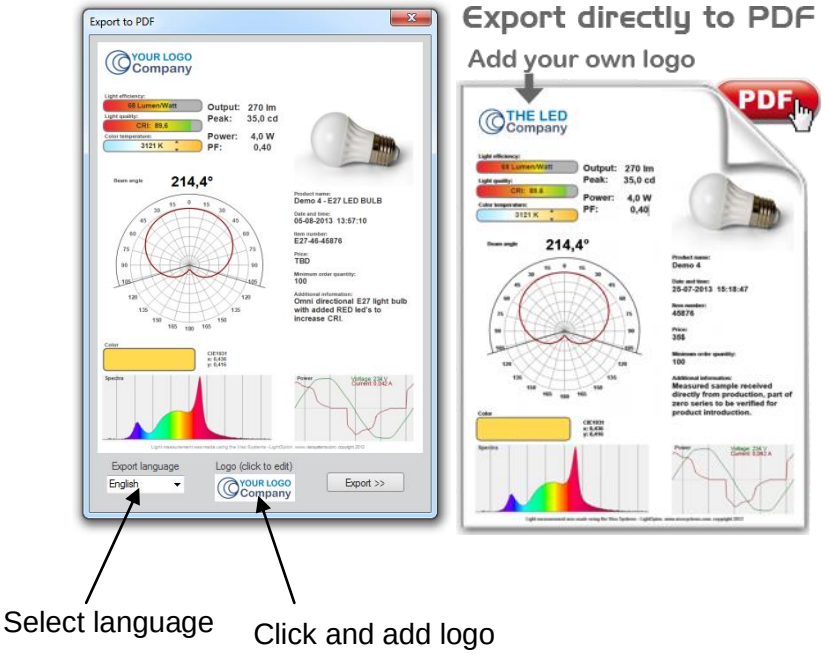
Exporting to IES/LDT

It is possible to export the measurements to IES or LDT formats to be further used in Dialux or other 3D lighting design software. To export to IES simply select File -> Export -> IES or LDT.



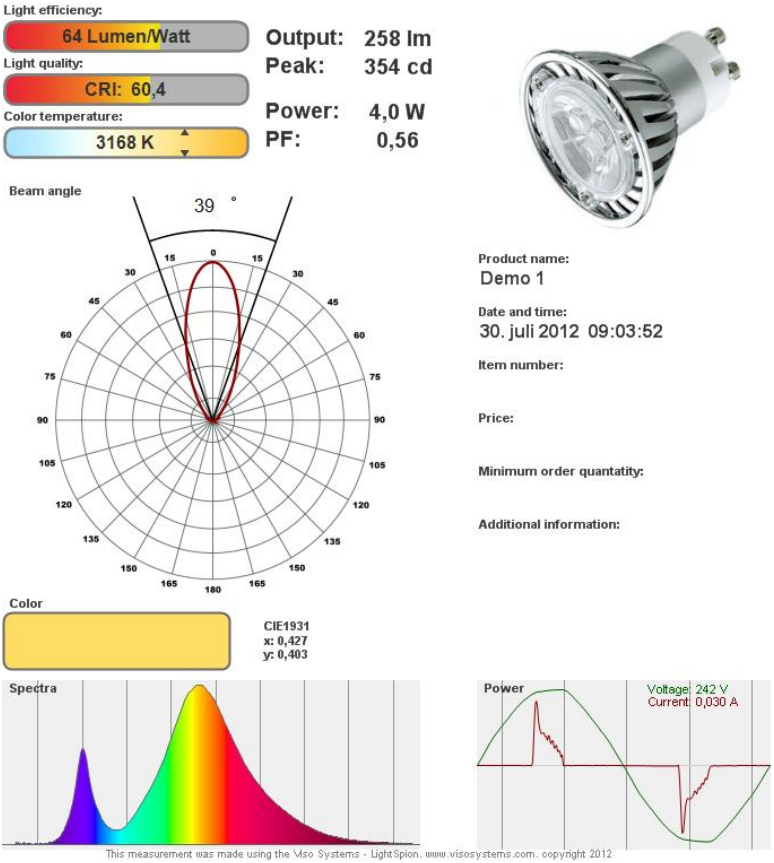
Exporting to PDF

All measurements can be exported directly to a PDF document. Firstly select the measurement and then click File -> Export -> PDF. It is also possible to implement your own logo in the PDF, and export to different languages like English, German and Chinese. A typical export procedure is shown below.



Exporting to PNG

All measurements can be exported to a PNG picture file to be used in reports, sales and marketing materials. To export pick a measurement in your measurement library and then select File -> Export -> PNG (Image). A typical export is shown below.



Exporting to CSV

Measurements can be exported to a CSV tab separated file, so that the measurement data can be imported into Excel or other calculation software for further manipulation. To export to CVS click File -> Export -> CSV (Tab separated)

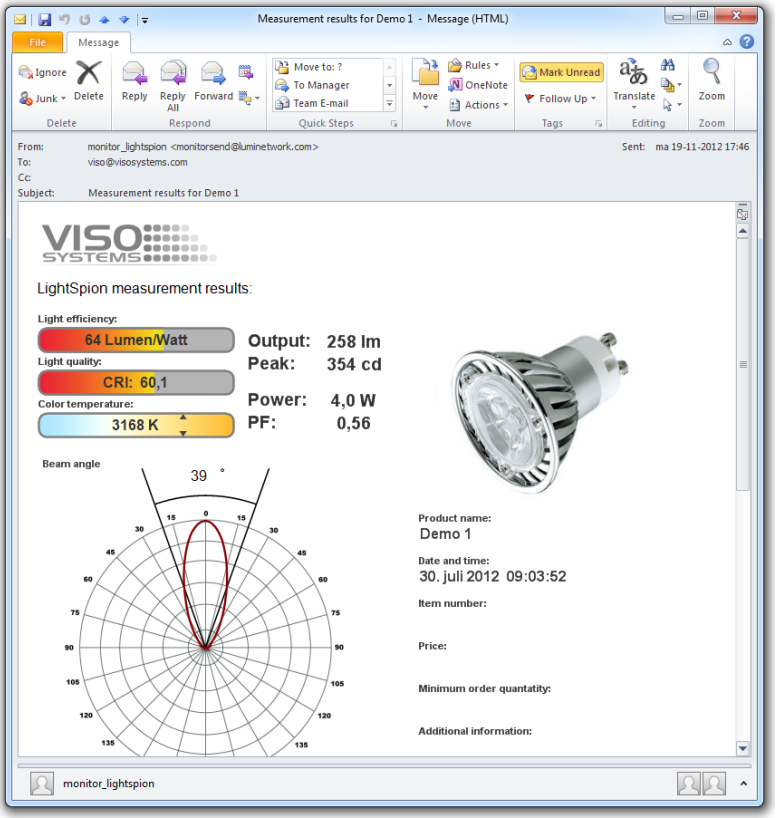
The contents of the CVS file can be seen below:

Product name	**Demo 1**
Date and time	**30. juli 2012 09:03:52**
Item number	
Efficiency	**64**
CRI	**60**
CCT	**3166**
Lumens	**257,9**
Peak cd	**353,75**
Power	**4,01**
PF	**0,56**
CIE x	**0,427**
CIE y	**0,403**
Angle	**Candela**
-179,55	**0,46**
-178,65	**0,43**
-177,66	**0,48**
-176,67	**0,47**

Etc…

Emailing measurement

The “Viso Light Inspector” software is capable of directly emailing measurements by clicking on the email icon.



Specifications

Measurement method ..... Far Field

Physical dimensions

Shipping dimensions (L x W x H) ..... (See shipping dimensions)

Shipping weight ..... 69 Kg

Dimensions (L x W x H) ..... (See dimensions)

Weight ..... 63 Kg

Sensor distance ..... 50m to 0.5m

..... Sensor distance >= lamp length x10

Sensor distance setup ..... Laser range finder (build into sensor)

Lamp diameter range ..... 0 – 1,5m at 2 axis (1 axis upto 6m)

Lamp maximum weight 25Kg

Electrical

Power supply input ..... 90 to 260 VAC, 50/60 Hz

Power consumption ..... 60W (Idle 15 W)

USB current consumption ..... 200 mA

Power analyser voltage range ..... 30VAC-400VAC <+/- 0.2V

Power analyser current range ..... 0A-3A (Avg: +/- 0.1mA)

Power analyser power range..... 0W-300W (Avg: +/- 0.001W)

Power analyser sample rate ..... 70.000 samples/sec

Photometric

Flux, lumen ..... 1 – 1.000.000 +/- 4.00%

Intensity, candela ..... 0,3 - 500.000 <+/- 2,5%

Colour temperature ..... 1.000K-10.000K <+/- 35K

Colour rendering index ..... 0-100 <+/- 0,7

Angular resolution LOW MODE ..... 3.6 degree step

..... (About 20 sec measurement time per C-plane)

Angular resolution HIGH MODE..... 1 degree step

..... (About 1 min measurement time per C-plane)

Spectrometer type ..... Ibsen Photonics FREEDOM

..... Custom viso (high sensitive transmission grating)

Spectrometer range..... 360-830nm (1024 pixels)

Spectrometer detector..... SONY ILX511B

Calibration .....Fully calibrated plug and play solution

Re-calibration ..... Every 1 year (Maximum 2 years)

Control and interface

Control interface .....USB 2.0

Control connector ..... USB-B

Connections

AC power in (power supply) ..... IEC 3-pin

AC power out lamp.....Universal socket

Light source adaptors..... E27, E14, B22, GU10

PC..... USB B

Approvals

Power supply..... cUL/UL, CE, CCC, TUV, FCC

Power analyzer - LabSensor ..... CE

Ordering information

LabSpion ..... P/N LABSP001