VISO SYSTEMS
Light Inspector

User Manual

Revision: 2025MAY

Congratulations on purchasing your new Viso Systems product. Before using this product, please read the Safety Information.

This manual contains descriptions and troubleshooting necessary to install and operate your new Viso Systems product. Please review this manual thoroughly to ensure proper installation and operation.

For news, Q&A and support at Viso Systems, visit our website at www.visosystems.com

Other manuals in this series (the latest version can be downloaded from www.visosystem.com):

- Guidelines - building a lighting laboratory
- Guidelines - Practical measurement setup

System manuals

- LabSpion Assembly Manual
- LabSpion User Manual
- LabRail User Manual

- BaseSpion Assembly Manual
- BaseSpion User Manual

- LightSpion User Manual
- LightSpion Extender User Manual

Accessories

- LabFlicker User Manual
- LabPower User Manual
- LabAnalyzer User Manual
- Labarazzi User Manual
- LabTemp User Manual
- LightInterface User Manual
- LabTarget User Manual
- LabDisc User Manual

Reference lamps

- CALI-T50 User guide (calibration light source)
- CALI-DT300 User guide (calibration light source)
- REF-800 User Manual

Other Guidelines

- Guidelines – dimensions of lighting fixtures and IES/LDT file formats
- Guidelines – working with UV in DIALux

Contents

1. Introduction

About This Document

This guide shows you how to get started using the Light Inspector and takes you through an in-depth introduction of all the features in the software.

About the Light Inspector Software

The Light Inspector is light measurement software that is used with all Viso Systems measurement systems. It enables you to quickly measure, evaluate, save and export the newly obtained data.

The Light Inspector software is made with an intuitive interface and shows the data being measured in real-time. The photometric results are graphically represented to give you a fast overview of all measurements.

Caution

Viso light measurement equipment is not for home use. Action must be taken to protect personnel working in lighting measurement laboratories from damage to skin (UV light) or eyes (UV, powerful light sources, blue light sources).

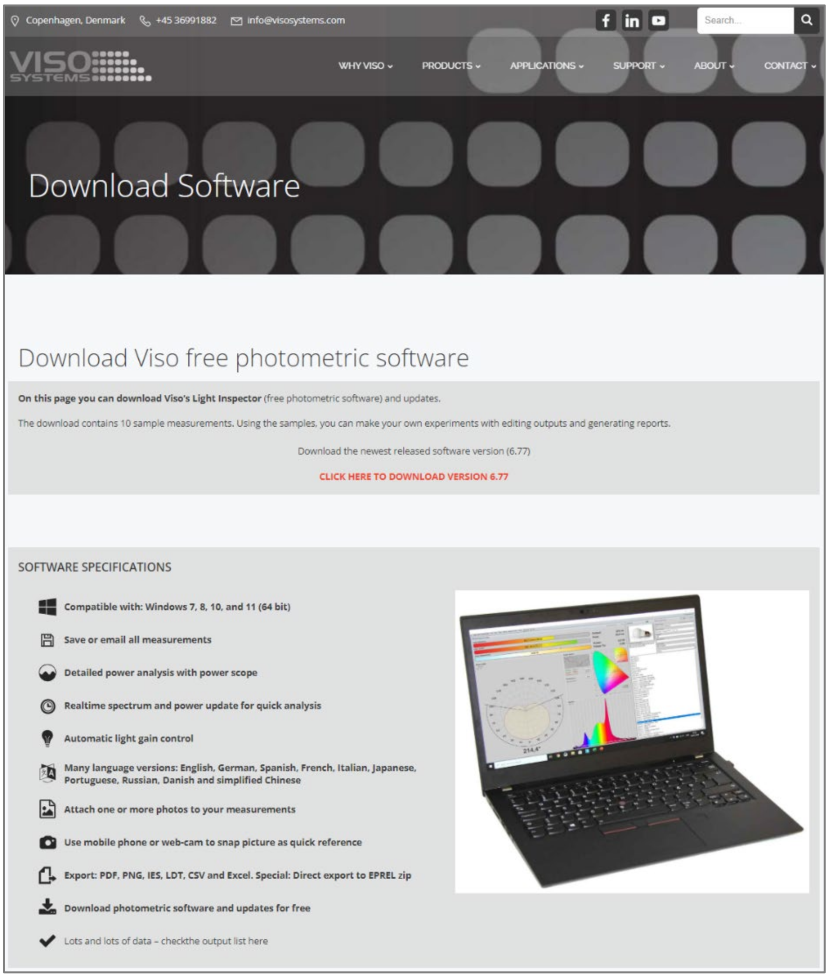
Viso light measurement equipment contains heavy parts and moving parts.

2. Light Inspector Installation

To install the Viso Light Inspector software you must follow the link below to download the latest version:

https://www.visosystems.com/download-light-inspector/

Activating this link opens the download page.



!

Note: Please make sure no measurement devices are connected to the computer during software installation.

Top of page and first download tab

Under the first tab in the bottom of the page you can download the newest beta releases. Please be aware these releases can be unstable, and we recommend you use the latest final version available.

However, new beta versions come often as it is a way to make newly developed features available as soon as possible to Viso clients.

If you scroll further down, you can find and install all earlier releases of Light Inspector.

Second download tab

Find the latest released version in the top of the page or under the second tab. Expect new releases to come quarterly.

Third download tab

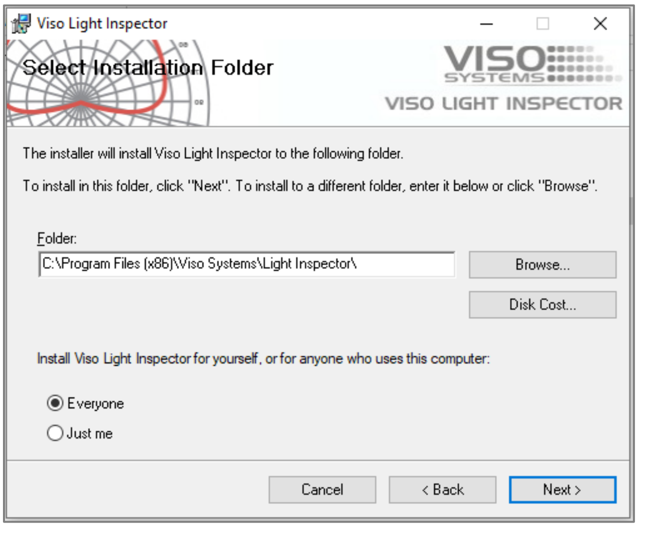
Under the third tab you will find firmware versions.

PC Requirements

- The software is compatible with: Windows 7, 8, 10, and 11 (64 bit)
- System requirements minimum 8 GB RAM
- Internet connection is needed to make software updates, tracking options, automatic language updates etc., Viso news etc.
- Microsoft Word (or after version 7.16: Open Office) is needed to customize PDF reports

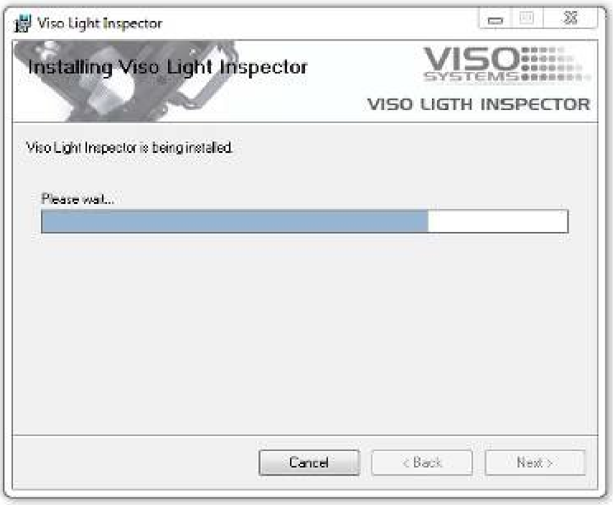
Installation

To install, run the .msi file from the file that you have downloaded to your "Downloads" folder and follow the installation instructions.



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 (default C:\Users\"Your Name"\Documents\Viso Systems\Light Inspector).



Click “Finish” and run the software from the link on your desktop

Important

Don’t run any high resource demanding applications doing a measurement!

It is very important that the computer used with any of Viso Systems goniometers is not used for any high demanding tasks while measuring. This can lead to parts of the measurement being lost and will result in inaccurate measurements.

Radio waves precautions

It is recommended not to have a transmitter of radio waves or other EMC powerful sources close to a working LabSpion/LightSpion/BaseSpion. Hence, it is advisable to keep your smartphones and other electronic devices away from the system as they can interfere with the spectrometer and disturb the final results.

Measuring conditions

Adhere to the physical measuring conditions detailed in Viso manual “Guidelines - building a lighting laboratory”

3. Getting Started

3.1. Measurement Fundamentals

All Viso light measurement systems LightSpion, BaseSpion and LabSpion are:

CIE goniometer far-field Type C, source-rotating with horizontal optical axis (C, γ-coordinate system, horizontal DUT – detector axis, with spectroradiometer detector.

Far field systems

A far-field system produces what is commonly referred to as "far-field data". At relatively long distances the dimensions of the light source (assumed point-shaped) no longer have an influence of the light distribution (beam angle, etc.).

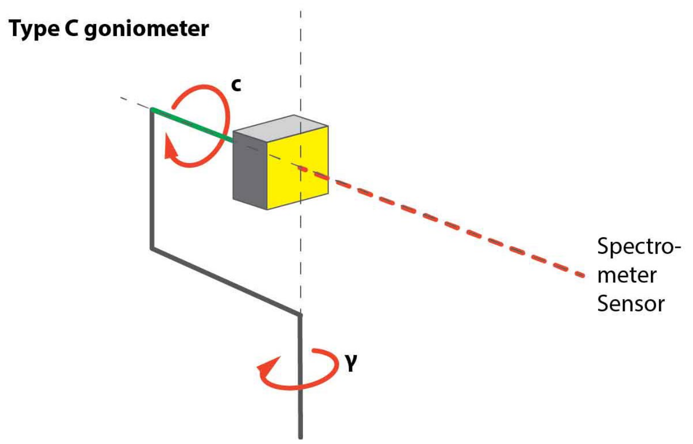
All measurement standards require that the measurement is done using a far-field system (or near-field measurement corrected to far-field) (Standardized in ANSI/IESNA LM-63-02 and CIE S025).

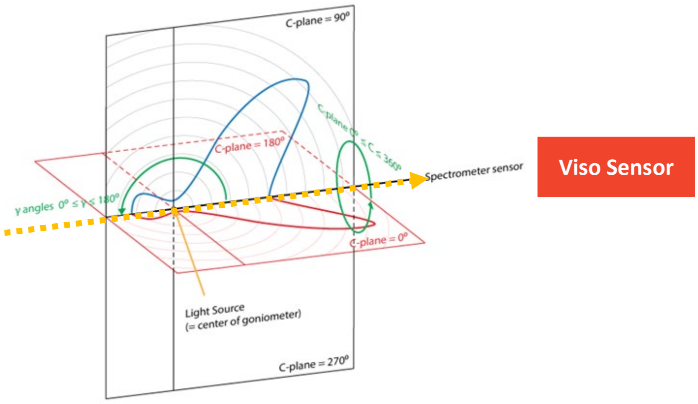
"Far-field" means measuring in principle at an infinite distance when the light source can be considered to be a point (having no physical dimensions). In practice, measurements are performed at a distance that is a compromise between

- Getting close enough to have a good signal-to-noise ratio (small and weak light sources),
- Getting far enough away to limit the influence of the luminaire size – normally around 8-15 times the max. size of the luminous area. See more details in "Guidelines - Building a Lighting Laboratory"
- For powerful, narrow beam light sources: Getting far enough away to avoid oversaturating the sensor.

Type C systems

Type refers to the way that measurement planes and their corresponding coordinate systems are organized. All Viso light measurement systems LightSpion, BaseSpion and LabSpion are Type-C Systems (C, γ) coordinate system) with a horizontal DUT – detector axis:





Read more about this in section 3.3 Aligning the light source.

Spectroradiometer sensor

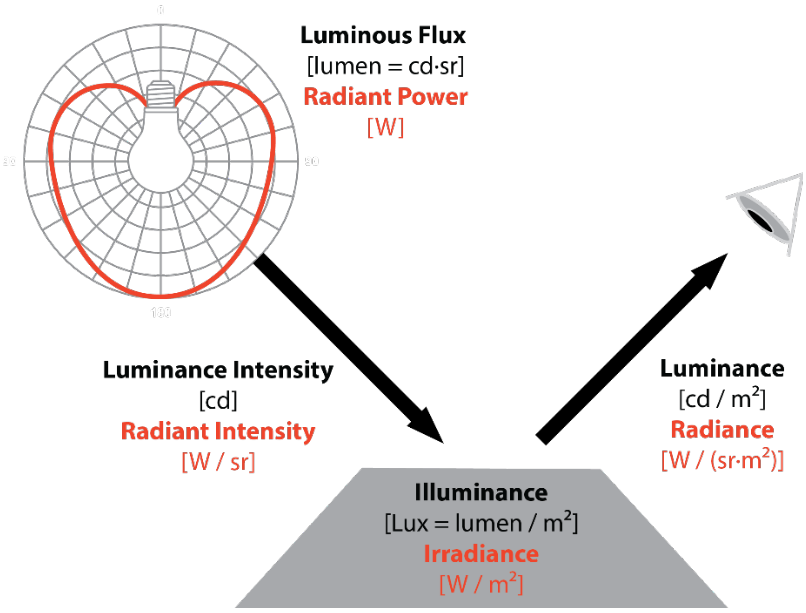
Viso light measurement systems all contain spectroradiometers, which means that data collected in each measurement point are fundamentally spectral distributed irradiances.

A spectroradiometer is a device that measures radiometric quantities in narrow wavelength intervals over a given spectral region.

The radiant intensities are spectrally distributed – meaning that a full spectral intensity distribution can be retrieved for each measurement point.

This data can be calculated into all other formats – obviously radiometry units, but also photometrical units (human vision, v-lambda interpretation) and horticultural units.

The relationship between radiometry and photometrical units are these:



Photometry

A the spectroradiometers cover the full visible wavelength range it can be used as an absolute photometer for measurement of illuminance according to:

$$E_v = K_m \int_0^{\infty} E_{e,\lambda}(\lambda) V(\lambda) d\lambda$$

where

- E_v is the calculated illuminance,
- K_m is the maximum luminous efficacy for photopic vision,
- $E_{e,\lambda}(\lambda)$ is the spectral irradiance (measurement data of the spectroradiometer), and
- $V(\lambda)$ the spectral luminous efficiency for photopic vision (defined in CIE 018:2019 The Basis of Physical Photometry, 3rd Edition)

V(λ) is defined over the range from 360 nm to 830 nm these wavelength limits effectively set the summation limits.

Characterization methods for the array spectroradiometer as described in CIE 233:2019 (CIE, 2019b) is applied.

Given that the sensor-DUT distance is known, these illuminances can be recalculated to luminous intensities (cd) data for each measurement point.

3.2. Units and terminology

Viso Systems use SI-units.

Only few exceptions are possible to this principle, e.g., within illuminance units where fc (footcandle) and ft (feet) are possible.

Custom reports can be made in any sort of unit through inserted excel objects, see section, see *page 134*)

Full stop "." is 1000 separator
Comma "," is European style decimal separator.

In general, the term "**light source**", means the "device under test" (DUT), which can be both a lamp, a lighting fixture, a luminaire, and an LED component.

3.3. Aligning the light source

For in-depth practical advice, please read Guidelines - Practical measurement setup.

The goniometer does not "know" how it is rotated/oriented, so the directions that you turn lamp bracket and the base manually will be the start position. Every automatic measurement starts with the lamp being turned 90 degrees just to make it possible to detect any mechanical fixation problem before the measurement actually starts (except LightSpion).

!

It is recommended to lock the base (LabSpion/BaseSpion) while aligning the sensor and fixing the lamp, and if necessary to keep a level nearby to align the lamp vertically on the lamp bracket. Then unlock the base before starting the measurement.

As the software does not “know” how the lighting fixture is actually positioned on the goniometer, it is very important that the fixture is aligned in a way that the “length” will actually be interpreted as “length” in posterior outputs.

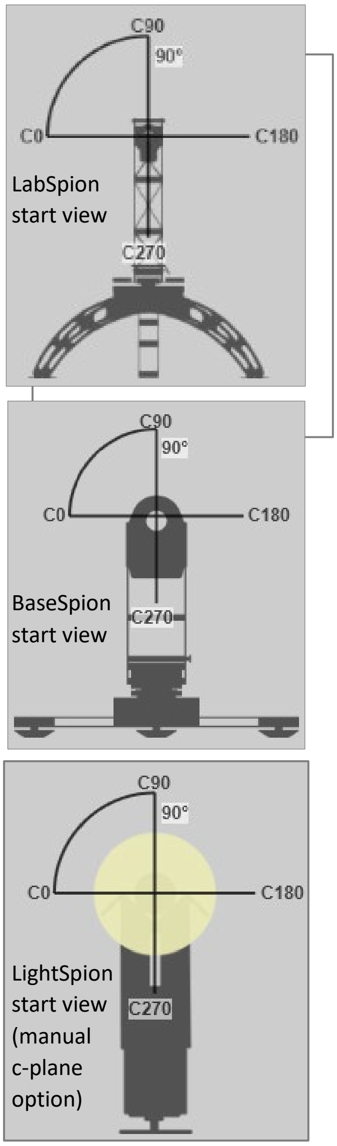
Orientation during measurement

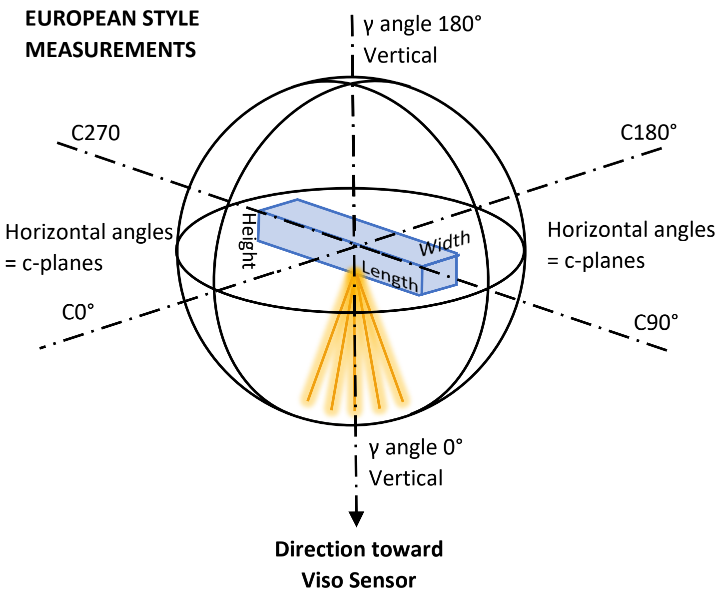
As there are two prevailing standards that work with different orientations there is you need to decide whether you want to work **“European style”** or “**US Style”**:

European style (CIE 121)

Choose European Style if your primary output is LDT files. Make sure that the measurement starts with the fixture having the *length being parallel to c9-c270* on the goniometer[1].

The image to the left shows the C-plane orientations of the LabSpion. BaseSpion and LightSpion work the same way).





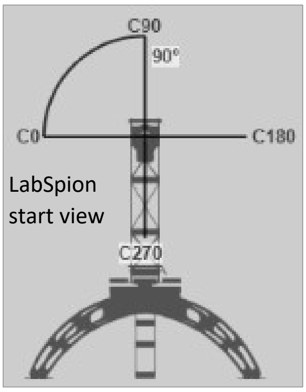
Road lighting: Turn “street side” toward c0 and “house side” toward c180.

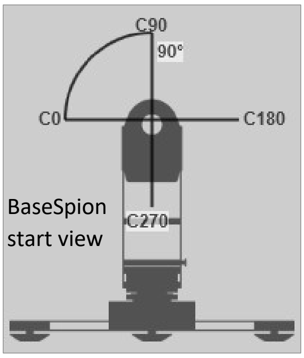
Please note that in advance of exporting European style measurements to IES the light distribution must be rotated 90 degrees.

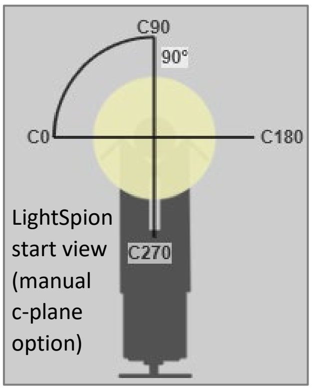
Alternative: Make a custom IES file format that swaps {LENGTH_M} and {WIDTH_M}, see *page 35, Tab: Export*.

[1] Standardized in CIE 121-1996, section 2.8.

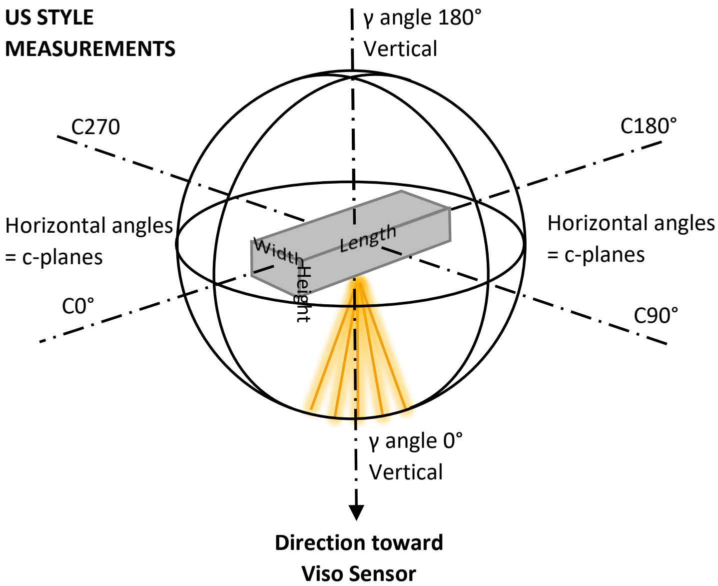
US style (LM63-02)







Choose US Style if your primary output is IES files. Make sure that the measurement starts with the fixture having the *length being parallel to c0-c180* on the goniometer[2].



Road lighting: Turn “street side” toward c0 and “house side” toward c180.

Please note that in advance of exporting US style measurements to LDT the light distribution must be rotated 90 degrees. Also please note that software UGR calculation assumes European style orientation.

Alternative: Make a custom LDT file format that swaps {LENGTH_LMP_MM} with {WIDTH_LMP_MM} and {LENGTH_MM} with {WIDTH_MM}, see *page 35, Tab: Export.*

Planes and resolution

The system measures the total flux from the light source in all directions with a resolution that can be set by the user. The orientation is standardized in CIE 121-1996, section 2.8. Please note that in the parallel North American standard IESNA LM63-02, this is defined differently. In LM63-02, the length axis is parallel with C0-180. Consequently, Viso export to .IES formats interchanges length and width luminaire dimension indications as off software version 6.44.

- C-planes all rotate around the vertical axis of a light source (by definition, the primary light direction being vertical in real life, thus horizontal on the measurement system). There are no standards that indicate the necessary quantity of c-planes.
  There are two C-planes per measuring plane (the goniometer measures the full 360° in every sweep). The number of planes can be set from 1 to 36 by the user (equaling 2 to 72 C-planes), or a suitable number can be detected automatically (see *page 56, Choice of C-plane Quantity*). LightSpion measures one full plane (equaling two C-planes).

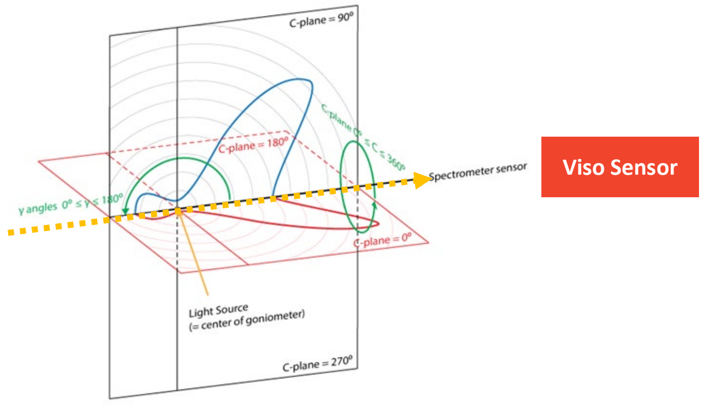
[2] Standardized in LM63-02

Report keywords
{H_ANG_NUM} and **{H_PLANES}** indicate the qty of gamma angles measured
{GAMMA_RES} indicates gamma resolution (degrees between each)

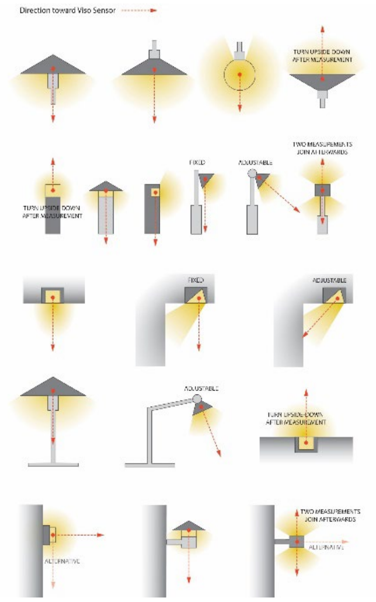
Report keywords
{PLANES} return the number of full planes that were measured

{C_ANG_NUM} and **{C_PLANES}** indicate the qty of c-planes measured
{C_PLANE_RES} indicates c-plane resolution (degrees between each) resolution (degrees between each)

- In each C-plane, light is measured for a set of γ-angles (standard every 5° = 36 γ-angles per C-plane). This γ ("gamma") resolution can be set down to 0.1° by the user. Further, the LightInspector may suggest a finer resolution automatically if large variations are detected (see page 60, Increasing the Measurement Resolution). In LightSpion, the standard resolution γ-resolution is 7.5°.
- In Viso Systems goniometers, light sources are placed with their normal vertical burning direction (usually **vertically down**) pointing **horizontally** toward the sensor. Compensation for output changes due to burning directions can be made in the software – see section 8.12, Window: Light source Orientation (S 025).

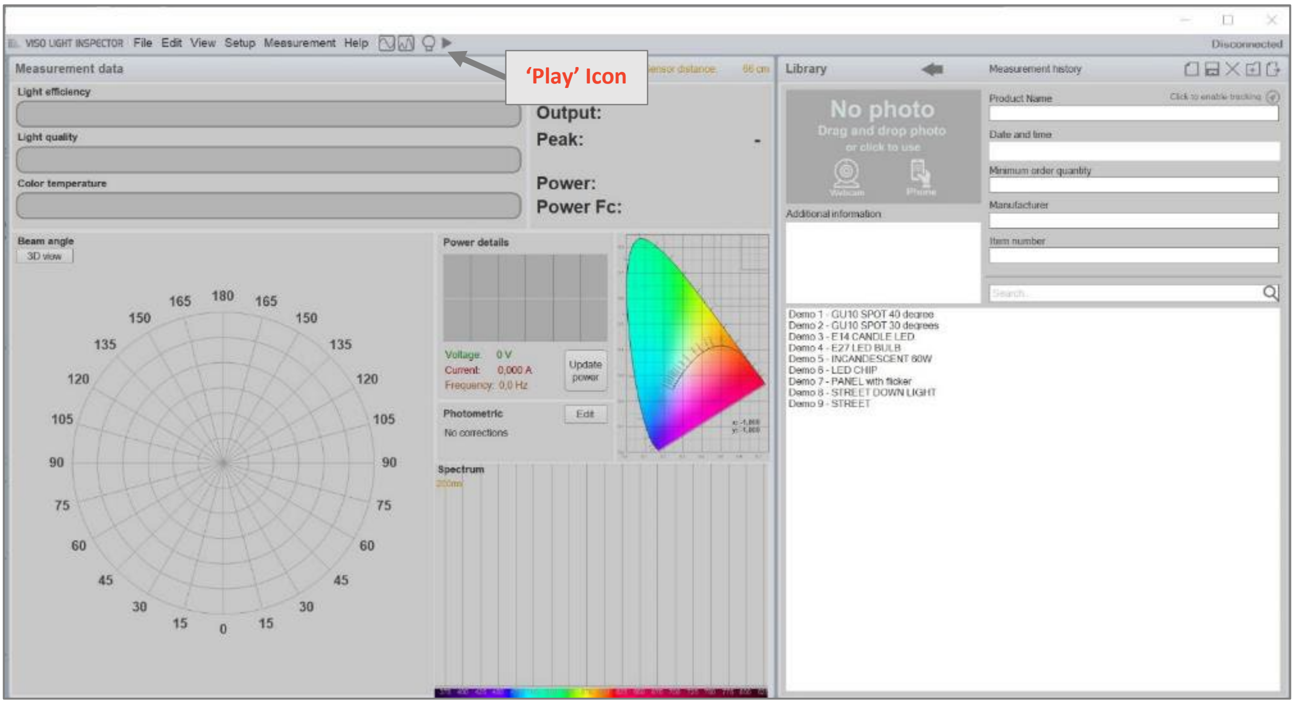


- As the goniometer is fitted with a fast-speed spectrometer sensor, the system measures radiometric properties in all chosen directions. Hence, the raw data are light intensities expressed in W/nm/sr, and all other properties are calculated from this.
- For more explanations about orientation during measurements, please refer to page 165, Appendix 2 – Orientation of Luminaires During Measurements.



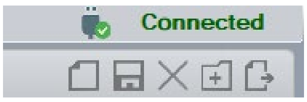
3.4. The Viso dashboard

With the Light Inspector started for the first time you will be presented with an empty sheet like below and some pre-saved demo-measurements in the Viso library.



With no device connected, the Light Inspector software runs in demo mode. Pressing the 'Play' icon will start a demo measurement showing a little video of the LightSpion goniometer making a measurement while the software simulates a measurement with live graphics and ends up showing the results.

3.5. Connecting the Device



When Viso equipment is connected via USB, a "connecting" symbol will be shown in the top-right corner. After about 10 seconds, the device(s) will be connected, and this will be displayed in the top right corner as well.

3.6. The Menu Line and Shortcut Buttons

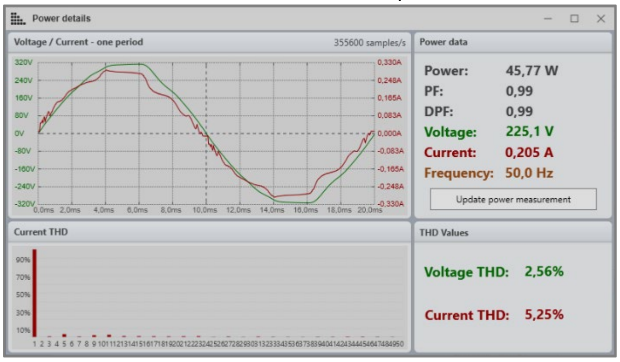
The Menu Line: Left Hand Side

On the left-hand side, you will find the menu indicators. All menu contents are detailed in this manual.

Further you will find 4 short-cut buttons:

The power button

Short-cuts *to Set* → *Power* Control and open this window:



The spectrum button

To start the independent spectrometer operation, click on the spectrum scan icon. In this stage, the software shows live readings.
In the independent run mode, the light intensity output in candela, CRI, and color temperature are being continuously updated.
The integration time can be changed during the free run scan, as explained in *section 4.3, Window: Resolution (Basic 5° Step)* to ensure a correct resolution.
The 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.
You may even save the spectral distribution in this mode. Just click the "Save" button or type Ctrl+S.

The light source button

Manually turn the light source on/off

The start/stop button

Manually starts/stops a measurement

The Menu Line: Right Hand Side

On the right-hand side of the menu line, you will find:

- a short text indicating whether ambient light correction is on. This is a function that automatically removes most of the influence from ambient light (e.g. office lighting) in the lab. The function requires the system to shortly turn off the light source when initiating a new measurement. During the interval, the ambient light is measured and deducted from all subsequent measurements. This function works well if the ambient light is steady and not too powerful (not for daylight).
This function does not remove straylight so lab surfaces still need to be blackened to reduce straylight to a minimum.
- a short text describing the status of the current process (in the example above "Measure ambient light")

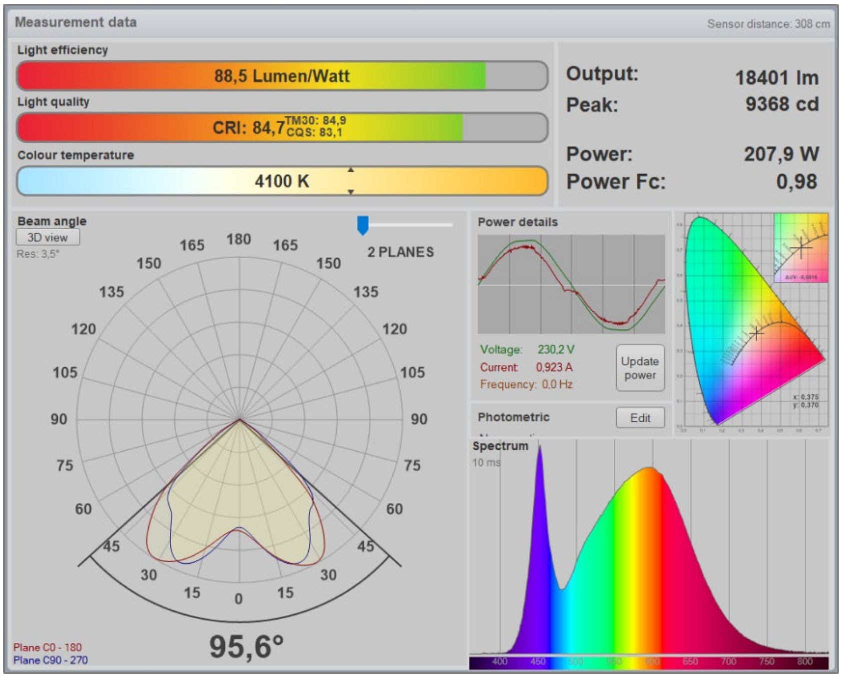
- an indicator showing the hardware connection status.

The Main Measurement Data Window. The dashboard

The following description covers the appearance of the dashboard in default mode. Some changes to the appearance occur in special measurement modes such as Radiometry Mode or Dose Mode (*see page 88, Tab: Measurement*)

The dashboard includes the most important measurement results, but much more information and output are available in the menus.

The dashboard number, curves and spectral data are updated in real-time while you do the measurement. This means that if you have made an error (e.g., wrong measurement settings or inaccurate alignment), you will see this right away. You may then immediately stop the measurement, correct and restart.

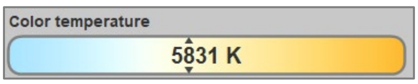


The dashboard will provide all major measurement results updated in real-time.

Light efficiency
Light efficiency is indicated in lumen/watt. The color scale goes from 0-100 lumen/watt. Clicking the color bar opens a window with more details, also see *page 75, Power Details*

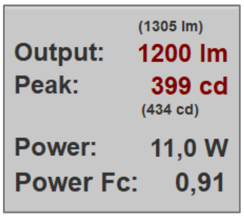
Light Quality
Color rendering index, TM30-18 R_f and CQS values are indicated. The color scale goes from CRI 0-100. Clicking the color bar opens a window with more details, also see *page 94, Window: CRI/UGR/BUG/ISO LUX - Color Quality Information.*

Color Temperature
Color temperature is indicated in Kelvin. The color scale goes from 2,000-12,000 K.



Clicking the color bar opens a window with more details, also see page 106, Window: Color Details.
If corrections have been made to this value, the original value is shown in brackets.

Right-hand side
In the top right-hand corner, the following key figures are shown:

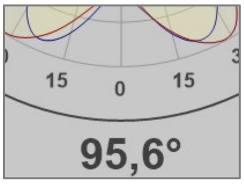


- Output in lumen (min. four significant digits). The total luminous flux measured. If corrections have been made to this value, the original value is shown in brackets.
- Peak luminous intensity in candela (4 significant digits/3 digits behind comma). The maximum candela value found in all directions. If corrections have been made to the total lumen package, the peak value will be recalculated too, and the original peak value is shown in brackets.
- Power in watt. The total power consumption of the system under stable conditions as measured by the built-in power analyzer. Also see page 75, Power Details
  If you own a Viso LabPower, Viso LabAnalyzer, or another connected external power analyzer, this field shows the results from this unit.
- Power factor (no unit). The ratio of the actual electrical power dissipated by an AC circuit to the product of the RMS values of current and voltage. The difference between the two is caused by reactance in the circuit and represents power that does no useful work. Also see page 76, Power Factor.
- In Radiometry Mode or Dose Mode this field looks differently, see page 88, Tab: Measurement

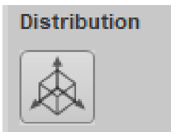
Report keywords
Beam angle **{B_ANG#}**

Beam angle
This window displays the measurement result in a polar diagram with each C-plane overlaid in different colors. By pushing the blue slider back and forth you will be able to toggle between the measured C-planes.

If you just measured one plane (=two opposite C-planes) you will not have this option, and you will not see the slider. A total average beam angle (cut-off at 50% of peak candela) is shown. 50% Beam angles in all measured planes can be shown by activating the slider.



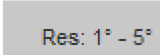
3D view and
In the top left-hand corner, you can activate a 3D-representation of the light output. Also see page 110, Window: 3D View.



γ-resolution	Same resolution all over

You can quickly see the measurement resolution. This is a single value if the resolution is the same all over. An interval is shown to indicate a smaller resolution in the beam section.

Finer resolution in the beam section:

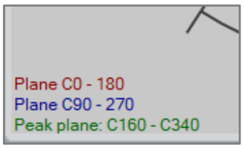


Legend
In the lower left-hand corner you will find color indicators for primary measurement planes.

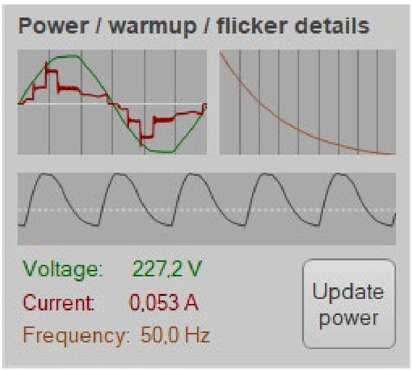
- In red: C0 - C180
- In blue: C90 - C270

If choosing *View → Show Peak Plane* also:

- In green: The c-plane that contains the peak intensity (and the opposite c-plane)



Power (/ Warmup) (/ Flicker) details
This area displays one cycle of AC power voltage and current graphically and in numbers as well as the power supply frequency. A button allows you quickly to update the power measurement manually. Click on the graphics and a window with more power details opens – see *page 75, Power Details*.
If a full warm-up cycle has been concluded, a small representation of the warm-up curve will be shown graphically. Click on the graphics and a window with more warm-up details opens.
Further, if a flicker measurement has been included, the modulation pattern will be shown graphically. Click on the graphics and a window with more flicker details opens – also see *page 112, Window: Flicker*.



Report keywords

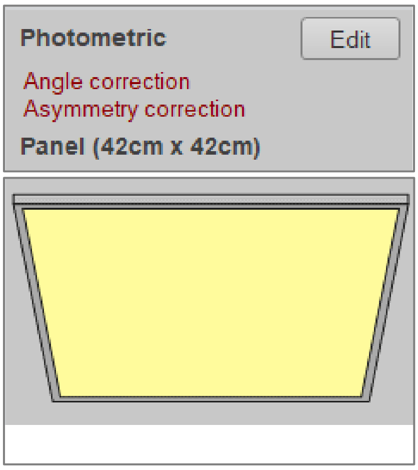
{VOL} Voltage

{CUR} Current

{FREQ} Frequency

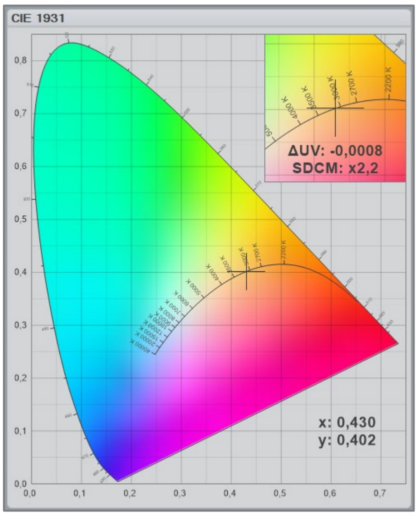
{VOLAMP} VoltAmpere or apparent power = RMS-voltage * RMA-current

Photometric
In this field photometric changes are listed – corrections and information about light sources sizing.
Clicking the Edit button opens a new window where all corrections are listed.
If light source sizing has been entered, a generic image of the light source will appear.
There are many possible corrections – see *section 7, Menu: Edit*



Color space

To the right, the x,y-coordinates of the summarized color data are listed and displayed in a CIE 1931 diagram. In the upper right-hand corner, the graph is zoomed to the x,y-position in detail. Further, the equivalent Δu,v-value is listed (distance to the Planckian Locus in u,v-space). If the color temperature target value/expected value is set, the software will also calculate MacAdam steps (SDCM, see *page 75*).



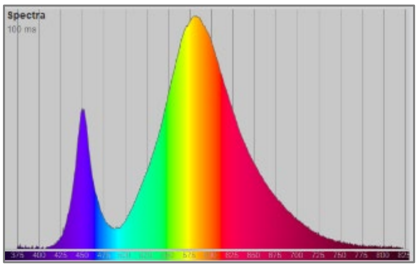
Spectrum

In this window the summarized spectrum for all directions is displayed graphically. In the top left corner, you will find the spectrometer integration time in milliseconds.

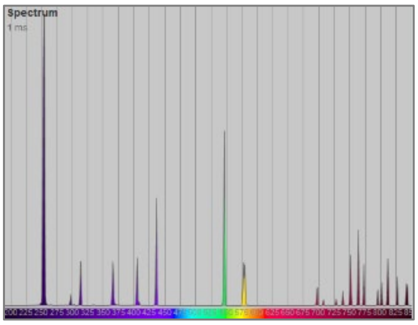
Depending on your sensor version, the spectrum will cover either
[360;830] nm (VIS-versions),
[200;850] nm (UV-VIS versions), or
[200;1100] nm (UV-VIS-NIR versions).

If you have chosen to smoothen the spectrum (just cosmetically) you will also see the original spectrum indicated with a fine line in this window.

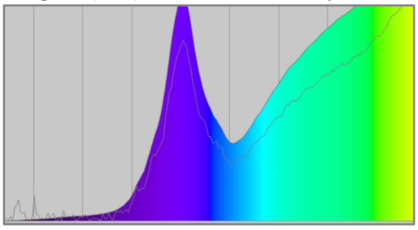
VIS versions:



UV-VIS versions:



Original (line) and smoothened spectrum:



Report keywords

{PNM#] returns the power for each wavelength in nm. {PNM550} gives the power at 550 nm. If no wavelength is specified {PNM} returns the total output power.

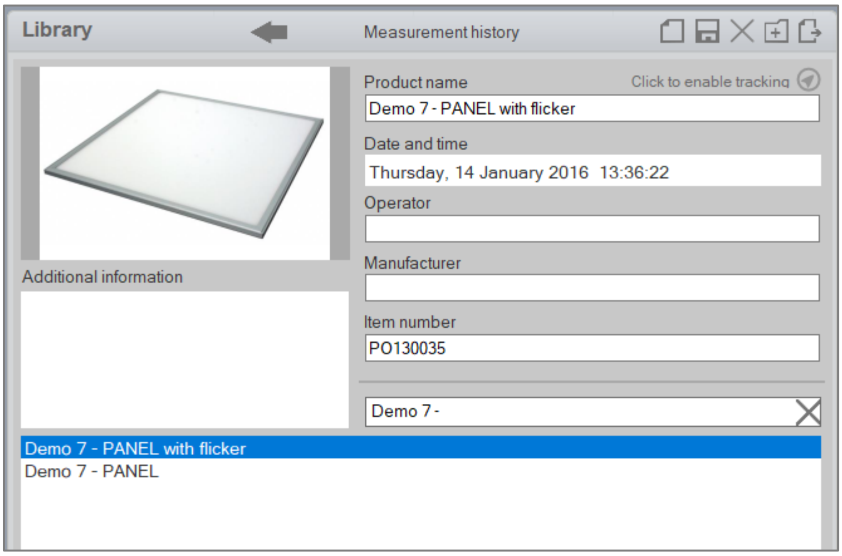
{DNM] returns the dominant wavelength in nm (calculated in relation to the white point of the D65 standard illuminant)

{PEAKNM#} returns the wavelength with the highest intensity. Use {PEAKNM1} to get the first peak and {PEAKNM2} for the second

{PERNM#} returns the percentage of light in a given range compared to the total amount of light. Example {PERNM400-499}.

The Library Window

In the top part, you may add your own specifications that allow you to identify the tested light source and measurement. You may also add a photo, see *page 61, Add a Photo to your Measurement File*.



The measurements listed in the bottom part are measurement saved in the chosen folder. The default folder is C:\Users\'UserName'\Documents\Viso Systems\Light Inspector. Read more in [page 33, Tab: Basic]. Measurements are stored in the Measurement library in an alphabetic order as *.fixture* files (the .fixture file format is a special Viso format).

The demo measurements are just for illustrating how measurements could look. If you don't want them in your list, they can be removed by right-clicking and selecting 'delete'. Alternatively, move them to another folder via a standard file browser or change the default output folder ([page 33, Tab: Basic).]

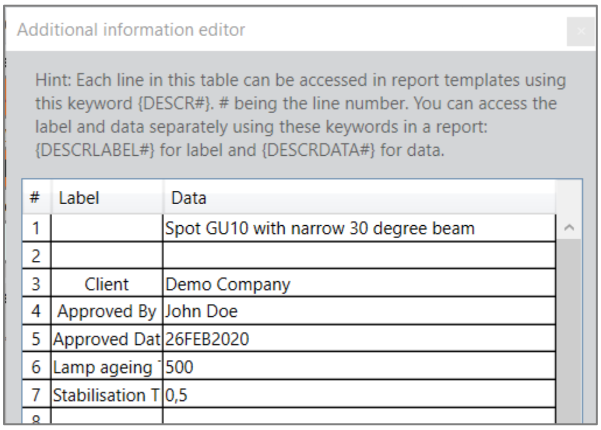
Fill in and store all the necessary information about each measurement in the appropriate section, as shown in the picture. It is highly recommended to fill in fields consistently and devise names that makes browsing through your measurement library easy.

- The "Date and Time" field is mandatory and will be filled in automatically.
- "Product Name", "Manufacturer", "Item Number", "Operator" and "Additional Information" are all labels that can be customized to your needs. Simply click on the label and overwrite. The new label will stay in your version of the software, also after updating.
  Please note that PDF report keywords will not change accordingly. Hence, the contents of the field labelled "Manufacturer", will still have keyword {MANUFAC_NAME} even if you replace the software label with e.g., "Supplier".
- The information can be part of your own report templates as well, see [page 134, Creating Custom PDF Report.]
- Add lots of custom fields in the "Additional information area": When double-clicking this area, a new window opens. A table allows you to define your own labels and information:

Report keywords
{DATE} = date of measurement
{DATE_NOW} = current date
{DATE_TIME} = date and time of measurement

Report keywords
{PROD_NAME}, **{MANUFAC_NAME}**, and **{ITEM_NUM}** return the contents of the "Product Name", "Manufacturer", "Item Number" fields. **{MIN_ORDER}** returns the content of the "Operator" field (default).

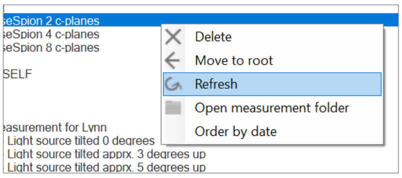
Report keywords
Keyword {DESCRIB} returns the first line (until manual line shift)
Keyword {DESCR1} returns line 1



Report keywords
Keyword **{DESCRLABEL3}** returns the Label of row 3
Keyword **{DESCRDATA3}** returns the Data of row 3

- Note: In older software versions, the "Additional Information field" was merely a text field with no columns. "Hard line shifts" (Enter = ¶) marked line shifts in report {DESCR#} text. It is important not to use "space" to separate lines.

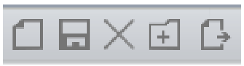
To save the measurement simply click on the save icon or select: *File → Save as* or by clicking the 'save' icon. If you forget to save, you can browse through recent measurements with the **library history arrows**, find the right measurement and save it later.



The folder can also be opened through selecting *File → Fixture Files→ Open*.

When files are added or removed the overview can be updated by right-clicking in the white space to the right of your measurements and choosing "refresh". Here, you will also find the possibility to delete measurements, move them to the root or order them by date/alphabet.

Your own saved measurements will be listed here.



The **five short-cut buttons** in the top right corner will allow you to

1) Create a new measurement.
2) Save a measurement.
3) Delete a measurement.
4) Add a folder to the library. A folder can be created by clicking on the folder icon with a plus inside or right click and click 'New folder' and fixture files can be dragged and dropped to it.
5) Export a measurement.

3.7. A Normal Measurement Cycle

The following section outlines the steps in a normal measurement cycle:

- Measuring
- Specifying details, editing and settings
- Working with outputs

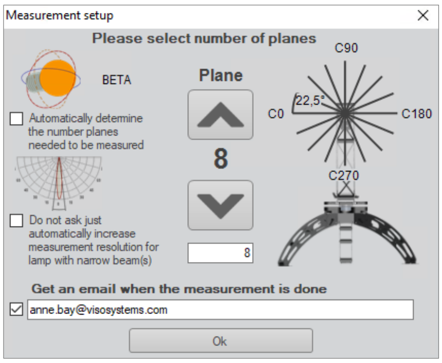
The section specifies basic steps. In the right-hand column, you will find references to where you may find additional information on the topics.

A practical checklist (before/after measurement) is available in *page 164, Appendix 1: Laboratory Checklist*.

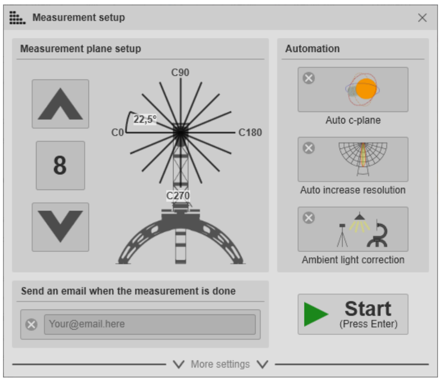
Warning – if you are measuring light sources that have the potential to damage human eyes or skin (lasers, UV-light sources, blue light), take measures to prevent any contact or exposure (screens, eyeglasses, warning signs etc.)

The Measurement Steps

Step	Action - basic	More information
1	**Mount, connect and align** the hardware and the light source/device under test as described in the hardware manuals. Note: Good alignment and proper measuring distance is very important. Please also read these guidelines carefully *https://data.visosystems.com/content/manuals/guidelines_practical_measurement_setup*	
2	**Set the physical distance** between the light source and the sensor appropriately to light source proportions – correct distance will be at least 8 times the diameter of the lamp, and sometimes more. Assistance on how to locate the photometric center of a light source, go to *Help* → *Photometric* center guide in the Light Inspector Software.	See *page 53, Sensor Distance*
3	**Set the light source in the start position** (light source pointed directly a sensor, luminaire length axis as specified in section 3.2). The goniometer lamp bracket can be in any start position – what counts is the light source orientation. LabSpion/BaseSpion: Make sure that the base is not mechanically locked on the rear side.	See *page 13, Aligning the light source*
4	**Open the Light Inspector Software** Pick a clean sheet with *File* → *New* or	
5	**Measuring distance.** On LightSpion and BaseSpion, the distance is detected automatically and should not be measured). On LabSpion: Measure the distance, using the laser: Caution: Do not stare directly into the laser beam or mirrored reflections of it. Simply long-press the laser button on the rear side of the sensor, and a window will pop up in the software indicating the measured distance. This step is redundant for LabRail owners.	See *page 52 , Correct Sensor* Distance
6	**Start a new measurement** Click *Measurement* → *Start Measurement* or click the 'Play' button	See *page 56, Command: Start/Stop* Measurement



As off version 7.16:



7 **Choose measurement resolution**

A dialog box asks how many measurement planes you would like to run.

Until you have sufficient experience, it is recommended to pick the "Auto c-plane" option.

With more experience:
Enter the desired amount (each represents two c-planes, for example plane 0 and the opposite plane 180). More planes increase accuracy but add to the total measuring time.
For diffuse light sources, 2 planes may be enough
More complex light sources as streetlights e.g., 18 or 36 planes are suitable numbers.
Keeping arrow buttons depressed scrolls fast through all plane options.

For γ-resolution (steps in each c-plane) the system always starts out in a basic 5°-resolution (LightSpion = 7,5°). The system automatically detects if the beam section needs an increased resolution.

It is recommended to use the "Auto-increase resolution" option picked at all times. This ensures that the system picks the necessary γ-resolution, and only applies the fine resolution in the beam section to save time.

See page 56, Choice of C-plane Quantity

8 **Important: Stabilizing the light source.**

A new window opens: "Waiting for stable lamp output". The system waits for the temperature and the power to stabilize.

- The red curve is the light intensity variation of the lamp (for example from cold to warm),
- The yellow curve is the power consumption variation,
- The green curve is the voltage variation – how stable is the mains that are connected to the lamp.

Wait for completion of the chosen stabilization and automatic start of measurement.
If the light source is already stabilized, click 'Skip' to continue.

See page 59, Stabilizing the Light Source

9 **Real time measurement output**

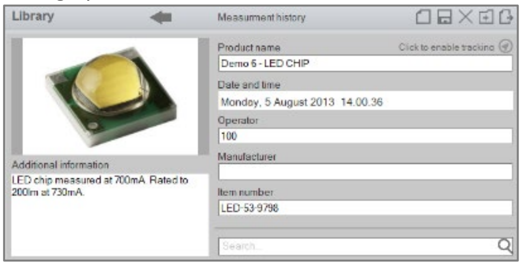
Now, you can see the light measurement happening, all on one screen, in real-time. Each c-plane takes about 20 seconds (dependent on resolution), so a standard, 2-plane measurement takes less than one minute.

What you see is:

- Light Efficiency, in lumen per watt
- Light Quality, in CRI
- Color Temp, in K
- Beam Angle
- Other photometric data and power data

See page 72, Main Window Output
See page 92, Window: Power Details
See page 93, Window: Efficiency Details
See page 94, Window: CRI/UGR/BUG/ISO LUX - Color Quality Information

10	**When the measurement is done: Enter Library information** in the library section of the main view. Good and consistent library information will make it much easier to browse through your measurements.	See *page 22, The Library Window*



11	**Save your measurement file** (optional) Click *File* → *Save As* and specify a file name.	See *page 78,* and *page 33, Tab: Basic*
12	**Track your measurement file** (optional) If your PC is connected to the internet, you have the option of saving your measurement file to Viso Systems' server in Copenhagen.	See *page 78, Measurement Tracking (Optional)*

Specifying Details, Editing Photometric Files and Settings

Step	Action - basic	More information
1	**Option: Add a photo** From the main screen, you can take a photo of e.g., the light source using a mobile phone or a webcam. Click on the photo box and follow instructions. Once you have added a picture, it will pop up in the photo box. You may also just drag-and-drop any photo from a folder and into the photo box.	See *page 61, Add a Photo to your Measurement File*
2	**Option: Enter dimensions** of the lighting fixture and the light emitting surface here. This is necessary if you need UGR calculations (part of the advanced report output)	See *page 82, Tab: Dimensions*
3	**Option: Make corrections** – each item is self-explanatory, and can be used to correct small mounting and alignment errors by rotating orientation, etc.	See *page 82, Tab: Corrections*
4	**Option - make modifications** • Change e.g., lumen output results, for example, to round-out numbers. • Spectral smoothing: Remove "noise" by checking the Auto smooth box. • The "Combine" function can join uplight and downlight measurements into one. • Set a target CCT to indicate the data sheet value of the color temperature combined with a SDCM value.	See *page 85, Tab: Modify*

Report keywords (horticulture)

{PPF#} returns the flux in µmol/s, and {PPF420 returns flux µmol/s at 420 nm, and {PPF400-490 returns the flux in µmol/s from 400 to 490 nm.

{PPFD} Power Photon Flux Density – Light output peak in µmol/(m^2·s)

{PPFW} returns the Photon Efficiency in µmol/J

{PPFD_F#}/{PPFD_M#} returns the PPFD in feet/m from center of lamp. Example {PPFD_F10} /{PPFD_M10} returns the PPFD 10 ft/m in front of the lamp.

{DLI} returns the Daily light integral (µmole/(m^2*d).

{PFLUX} returns the photon flux (photons/s) for the integrated spectrum. {PFLUX450} returns the flux for a specific wavelength, and {PFLUX450-500} returns the flux for a wavelength range

	These modifications will show as normal in the exported report but will be denoted in red in the software-version of the tracked report	
5	**Option: Change measurement type** In this section, you can choose the measurement setup as well as spectral region. After only one single measurement, you can decide between standard photometrics or to generate the Horticultural report in PPFD format within the PAR region. Horticultural Light, or Grow Light, changes lumen to PPF (Power Photon Flux) and PPFD (Power Photon Flux Density). Owners of UV-VIS sensors: You may also choose to work with UV light and doses.	See *page 88, Tab: Measurement*
6	**Option: Edit power settings**	See *page 38, Window: Power Control (Auto)*
7	**Option: Edit cone limits.** Click *Edit* → *Spherical limit cone* – you can change the limiting degrees of the beam angle (and remove stray light from measurements)	See *page 91, Window: Spherical Limit*
8	**Save your measurement file** after making changes.	See *page 81*

!

Note: You can experiment with modifications as much as you want. They will not be saved to your measurement file before you actively choose "Save" or press the "Save" icon. When shifting between measurements, your modifications will be lost unless you have actively saved them.

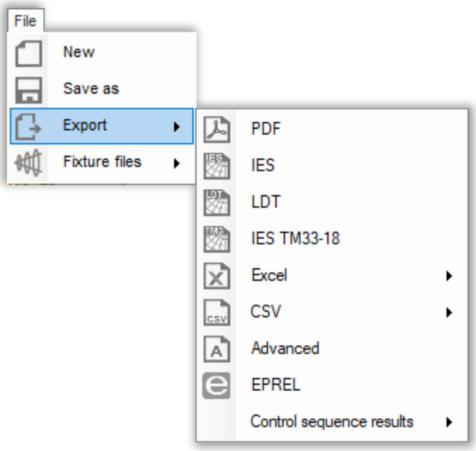
No matter what you do, the original measurement data stays in the file. All posterior modifications can be reversed.

Tip: Work out your own laboratory checklist – see example in *Appendix 1: Laboratory Checklist*

Working with Outputs and Reports

Step	Action - basic	More information
1	Pick a stored measurement (or work with the present measurement) from the measurement menu	

2	Click *File* → *Export* or click short-cut button in the top right-hand corner	*See page 123,* Exports and Reports



2	Choose output format and save

3.8. Software shortcut keys

Keyboard action	Shortcut to
CTRL+D	Delete
CTRL+E	Make a PDF report
CTRL+I	Save as an IES-file
CTRL+L	Save as an LDT-file
CTRL+N	Make new measurement (clear window)
CTRL+O	Open a .fixture file
CTRL+S	Save a .fixture file
CTRL+T	Run new test
ALT	Use menu without mouse (+arrow +Enter keys)

3.9. Common mistakes

- **The lumen package is too low.**
  Possible reason: The measurement distance is too short, and the sensor cannot see the whole light source.
  Solution: Use Help → Sensor Distance Guide to calculate the minimum distance.
- **The lumen package is too low or too high.**
  Possible reason: LabSpion - The distance has not been measured after moving the sensor tripod.
  Solution: Use the built-in laser to measure the distance.

- **The beam shape is wrong, and the lumen package is too low.**
  Possible reason: The narrow beam light source has not been aligned properly with sensor, and the sensor can't see the peak intensity.
  Solution: Carefully align the light source with the sensor and use many measurement planes (18 or 36, *see page 15, Alternative: Make* a custom LDT file format that swaps {LENGTH_LMP_MM} with {WIDTH_LMP_MM} and {LENGTH_MM} with {WIDTH_MM}, see *page 35, Tab: Export.*

- Planes and resolution*) to make sure that the whole beam shape is captured. Small misalignments can be corrected in posterior software processes (see 82, Tab: Corrections)*

- **The beam is too wide and maybe the lumen package is too small.**
  Possible reason: The light source has not been centered correctly when fixing it to the lamp bracket on the gonio.
  Solution: The center of the light source must be right where the vertical rotation axis meets the horizontal rotation axis. Solution: Push back or forth the gonio tower until the light source is centered. More information: Page 122, Checking the Calibration Status

- **The lumen package is too high, and the light distribution is wrong.**
  Possible reason: There is daylight in the lab or the general light was not turned off before measurement:
  Solution: Turn off lights before measurement or use the Ambient light functionality. Read more here: Page 17, The Menu Line: Left Hand Side.

- **The UGR table is empty in the software and in the PDF reports**
  Possible reason: The system does not calculate UGR figures.
  Solution: Add the right symmetry setting to the light distribution (marked with an asterisk, and make sure you have inserted shape and dimensions of the luminous surface. Read more in page 98, Tab: UGR.

- **The curves in the polar plot do not all meet in 0 degrees. The lumen package is too high. The 3D plot looks strange.**
  Possible reason: The 0-degree intensity values are not the same in all measurement planes:
  Solution: Make sure that the luminaire does not move mechanically during measurement. Or make sure that full stabilization has been performed (not skipped) so that the output doesn't drop during measurement. Read more in page 59, Stabilizing the Light Source.

- **The spectral intensity diagram looks bumpy and noisy. Measurement results are not correct.**
  Possible reason: Calibration is needed.
  Renew your calibration with Cali-T50, Cali-DT300 or let Viso help.

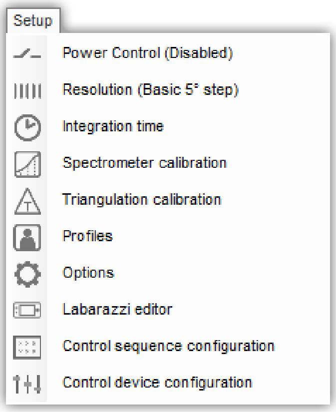
- **The spectrum is noisy and the gonio moves slowly.** Possible reason: The measurement distance is too long.
  Solution: Move your sensor closer to the light source – but not shorter than the minimum. Use Help → Sensor Distance Guide to calculate the minimum distance.

- **One of the curves in the polar diagram “sticks out” – thus being more 100%.**
  Possible reason: The measurement resolution (γ) is too low.
  Solution: Make sure that the resolution is not set manually: Check Setup → resolution and set to “Basic”. Also check that no measurement profile is activated: Check Setup → Profiles and click “Deactivate” if necessary. Then run the measurement again and this time click ‘yes’ when the system suggests you increase the resolution.

- **The curves in the polar diagrams do not meet I 0 degrees.**
  Possible reason 1***:*** **(**Optical parts of) the luminaire were not fixed properly mechanically during the measurement.
  Possible reason 2: The luminaire was not stabilized correctly during measurement. Consequently, the 0-degree output dropped in the cause of the measurement.

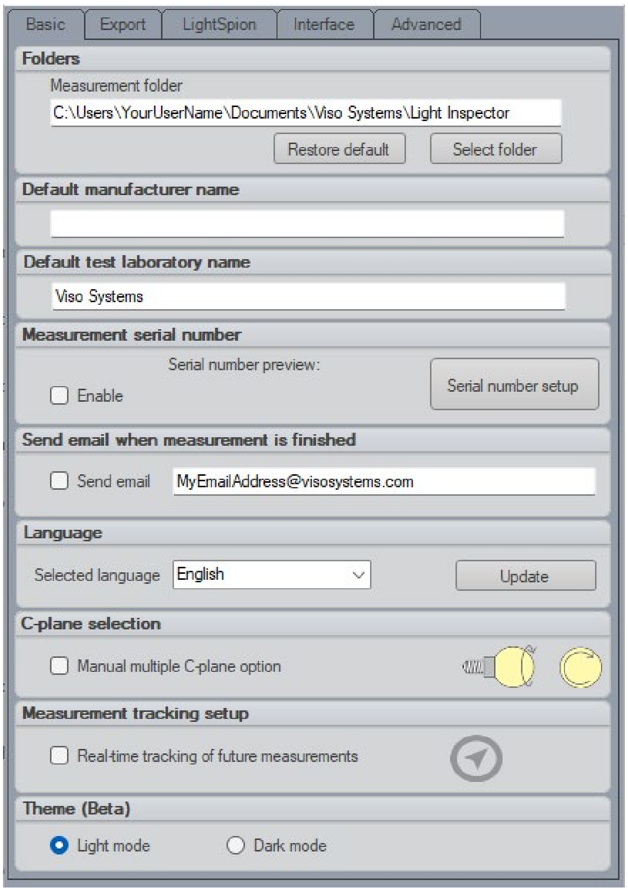
4. Menu: Setup

In this menu you can access the following windows and sub-menus:



4.1. Window: Options

Under *Setup* → *Options*, there is a collection of settings you want to consider before making any measurements.



Tab: Basic

Folders
Here, you have the option to select a default folder for your original measurements (format **".fixture"),** which includes server folders, thus enabling access to the folder on several computers. You can always choose to restore it to the default folder.

Especially the **.fixture files** are important, since they contain all original measurements, as well as system, firmware and software information. Make sure to back-up these files regularly. Also, when involving Viso Systems for support, please always supply a recent ".fixture" file to us, so that we get all of this important information. This is easy to with Help → Support → Share Measurement.

Your templates will be saved in the same folder:

- PDF report templates (format ".rft")
- Profile measurement templates (format "MEAS_PROFILE")
- Custom table measurement templates (format: "CUSTOM_TABLE")
- Custom IES/LDT templates (format: "IES_TEMPLATE"/ "LDT_TEMPLATE")
- Templates related to UV exposure calculations: (Format "DOSESETTING" and "RESPONSECURVE")
- Templates relating to control device definitions and control sequences (Format ".DmxDeviceSetup" and ".ControlSequence").

You may share these templates with other simply by saving the template in the correct folder on another PC.

Report keywords
{MANUFAC_NAME} returns the default manufacturer name

{TEST_LAB} returns the default manufacturer name

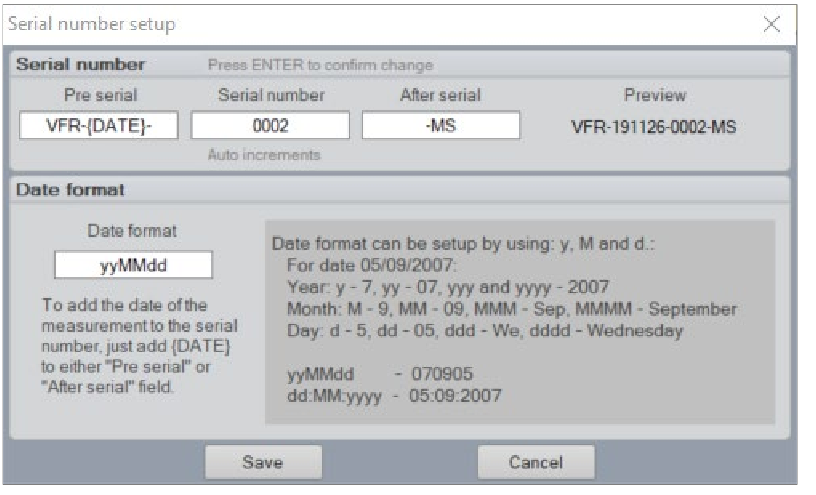
{SERIAL_NUM} returns the specific serial number

Default manufacturer name
In this field you can set a default manufacturer name which will be shown in all your measurements as well as in PDF reports.

Default test laboratory name

In this field you can set a default manufacturer name which will be shown in all your measurements as well as in PDF reports

Measurement Serial Number
When 'Serial number' is enabled, it gives you the option to add a serial number to all of your measurements. Press setup to open the 'Set Serial number' window. Here you can customize your own serial number by choosing the following:



- Pre-serial: Add in the first part of the serial number, e.g., your company name. If you keep {DATE} the date will automatically be added here.
- Serial number: Choose how many digits the serial number should consist of.
- After serial: Add in any number or characters to be added at the end.
- Date format setup: Choose how you want the date to be shown, yyMMdd, yyyyMMdd, ddMMyy etc.
- Press the “enter” key after each change to confirm changes

Send email when measurement is finished
Specify a standard email address in this field and the system will send an email to you when a measurement is terminated. This will save you some time checking in on the equipment for progress.

Language
This field allows you to choose between German, Simplified Chinese, Japanese or English.

- To shift language, pick an alternative language from the list and click “OK”. The software needs to restart to make this change.
- Languages are automatically updated when new translations are available. To check for changes/updates press the “Update” button. If there no updates, the software will not change anything and let you continue. If there are updates the software needs to restart. When opening the software again, changes have been implemented.

C-Plane Selection
C-Plane selection is a function primarily for LightSpion and will give you a manual 4 pcs C-Plane option. Read more in the *LightSpion user manual*.

Measurement tracking set-up
By checking the box, you will enable all measurements to be tracked to Viso Systems’ online database. If the box is unchecked, you will be asked whether you want to choose the tracking option manually for every measurement. Checking the box is

also useful if you are going to run a series of trackable measurements. Read more in *page 78, Measurement Tracking (Optional)*.

Theme
Choose Light or Dark mode with the radio buttons. Dark mode is an advantage if you have your Light Inspector screen running in your dark room.

Tab: Export

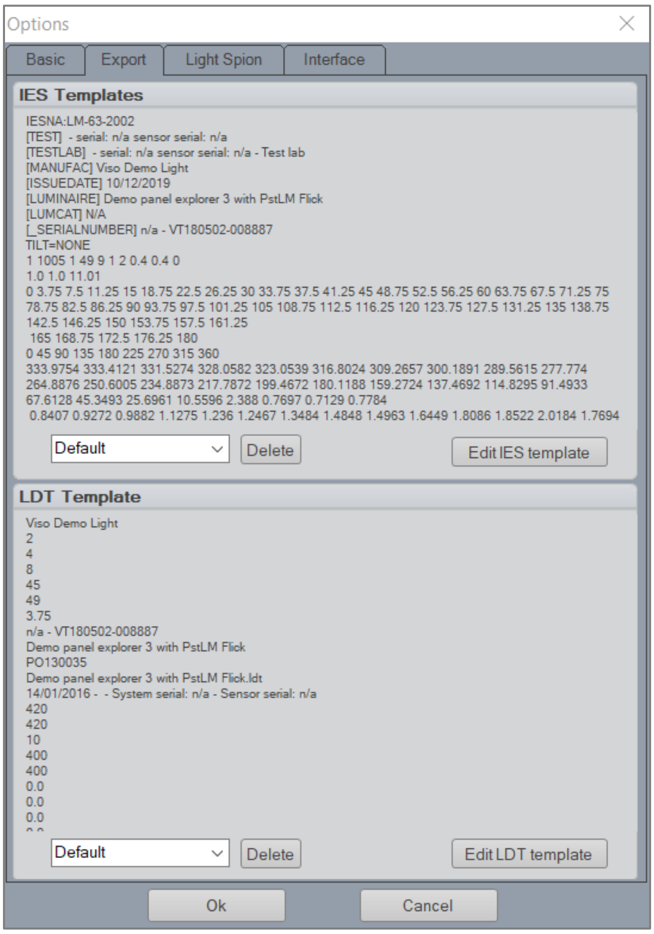
The Light Inspector allows you to export photometrical data in the two standard formats: .IES and .LDT (EULUMDAT) – read more in *page 127, IES and LDT Export*. Both are text file formats that contain very similar information but arranged differently. Both are primary outputs for software intended for light planning in spaces.

You can choose either default IES[3] and LDT[4] templates or design your own. Designing your own templates will be stored and can be reused and shared. The templates will typically be stored in measurement folder. Remember to abide by standards when building your own .IES/.LDT output formats.

Before saving, you also have the option of resampling your measurement to alternative resolution or number of C-planes.

[3] Standardized in ANSI/IESNA LM-63-02

[4] Also called EULUMDAT. Not standardized, but proposed by Axel Stockmar (Light Consult Inc., Berlin) in 1990



Important: The results will be exported to .IES and .LDT formats based on the chosen spectrum. The default spectrum is “Full”, i.e., all light detected with the sensor measurement range (VIS-versions: around 380-830 nm, UV-VIS versions: 200-850 nm). If you have limited the spectral region (*Edit → Photometric → Measurement → Spectral region*) the .IES and .LDT will also reflect this.

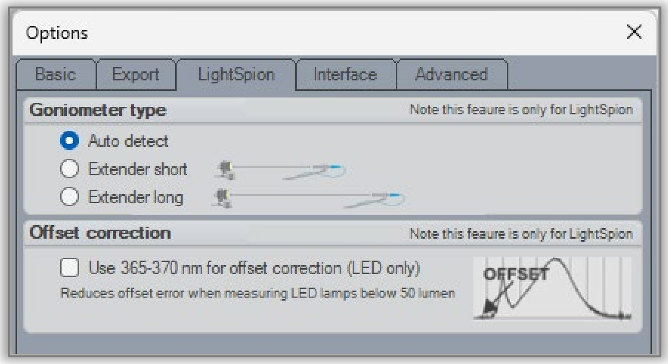
The numbers in the .IES/.LDT file reflect the chosen setup (e.g.. Candela, Watt/sr or mMole/m2/s) see *Edit → Photometric → Measurement → Measurement Setup)*

This also means that it is possible to export radiometrical or horticultural data to .IES/.LDT. If so, please note, that as these formats that intended for photometrical data, all numbers will be right, but units will be wrong. Read more in these guidelines.

Tab: LightSpion

The contents under this tab only apply to users of LightSpion goniometers.

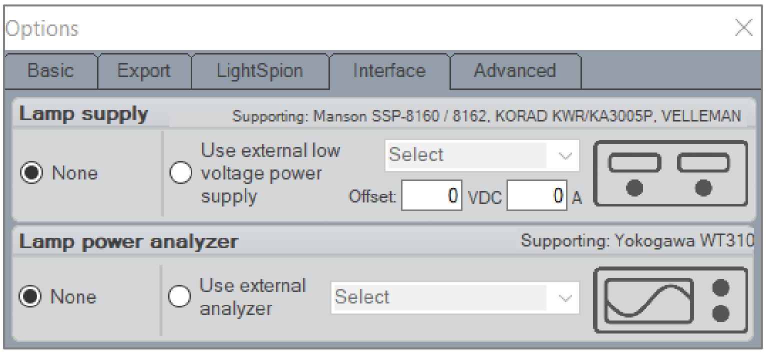
“Goniometer type” specifies whether a long or short extender is connected to the system or not.



Offset correction will use some of the pixels in the spectrometer sensor as dark/black pixels and will limit the wavelength range a bit but will give a better noise to signal ratio on low output LED's.

Tab: Interface

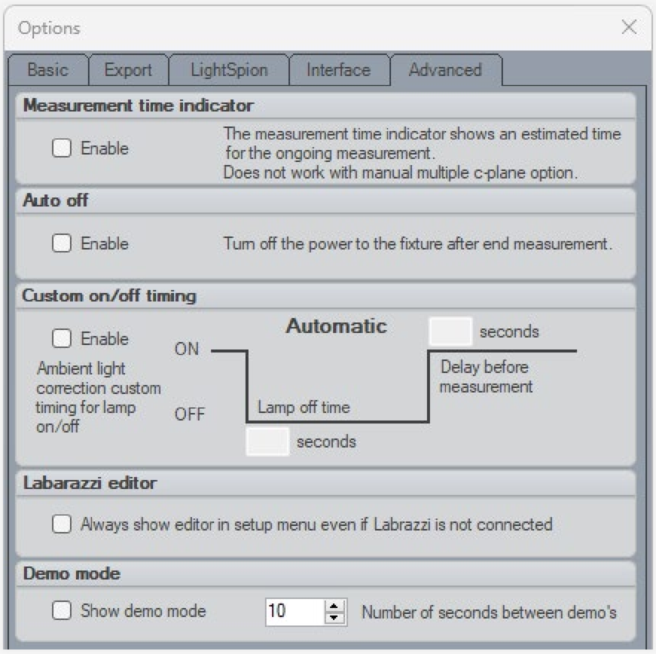
The interface sections allow the user to select and use an external power supply and or external power analyzer.



The offset of the external power supply to adjust what the software reads from the device. If there is a difference from what the software reads to what the device displays.

Read more in *page 148, Using external power supplies and power analyzers.*

Tab: Advanced



In this window, you have the option of **activating a time indicator** that shows the estimated time for the ongoing measurement.

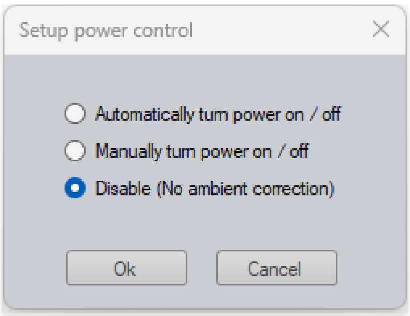
You may also choose whether the device under test should be **powered off automatically** when the measurement is completed.

You have the option of **customizing the on/off cycle** for ambient light correction. Some lamp types do not turn off immediately, some do not turn on immediately. By customizing/increasing the built-in delays you may compensate under such conditions.

If you own a Viso Labarazzi TLA generator, you can force **the Labarazzi Editor** menu point always to be visible.

Demo mode: Tick off this box if you want the system to loop the same measurement for demonstration purposes.

4.2. Window: Power Control (Auto)



When a computer with the Light Inspector software installed is connected to any of the goniometers from Viso Systems, the software automatically detects which of the goniometer systems it is connected to and changes the setup for that specific system.

- When connected to the LightSpion system the “Viso Light Inspector” software is default set to ‘Ambient Light Correction’ for measurements in rooms with some ambient light.
- When connected to the LabSpion or the BaseSpion system the “Viso Light Inspector” software is default set to ‘No Ambient Correction’ for dark room measurements.

These default behaviors can be changed by going to *Setup* → *Power Control*, where you change between

- Automatically (Ambient light correction)
- Disable (No ambient correction)

Automatically Turn Power On/Off

When 'Automatically turn power on/off' is chosen, the Viso Light Inspector software makes fully automatic measurements.

If "Ambient light correction" is green it adjusts the spectrometer to the background light environment by initially turning off the light source and measuring the background light level, and this light is subsequently subtracted from the following measurements.

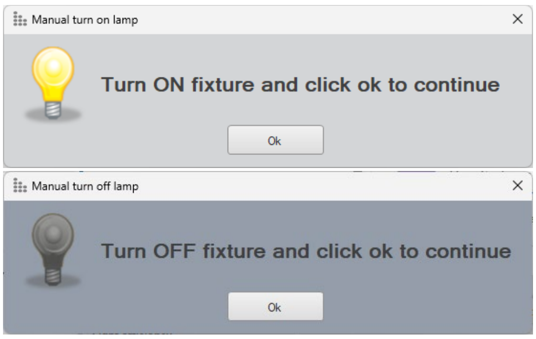
If an external power supply source with a UBS interface is connected, the system will also run on/off automatically with these units.

Manually Turn Power On/Off

In some situations, it is necessary to control the power to the light source manually. For example, when measuring a flashlight on batteries, the LightSpion's power analyzer will not 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 a 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 Manually turn power on/off.

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



Disable (No Ambient Correction)

When "Disable" is chosen the Light Inspector is configured for dark room measurements and the light source will not be turning on and off before measurement. The integration time is still being set and the power measured. For this setup it is important to have a completely dark room.

4.3. Window: Resolution (Basic 5° Step)

The “Viso Light Inspector” uses the Basic 5° resolution by default (LightSpion default value is 7,5°). It is recommended to leave the resolution the default setting. In any case, the system will automatically detect if a finer resolution is needed. If so, the system will prompt you during measurement to allow for increasing resolution in the beam section only. In this way the fine resolution will be used only where needed, which optimized your total measurement time.

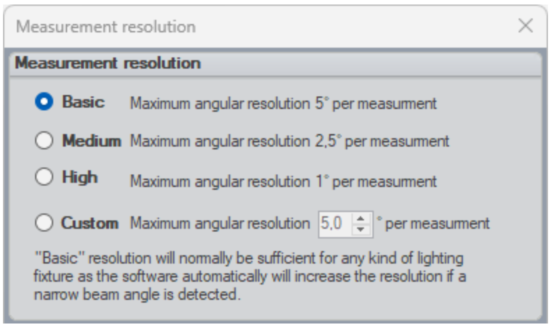
It is possible to manually select the measurement quality beforehand in Setup - Measurement quality:

- Medium
- High
- Custom.

Each quality level increases the number of measurements made during the goniometer operation. It also increases the spectrometer integration time whilst lowering the noise level of the sensor measurements. Increasing the measurement resolution results in substantial measurement time extensions.

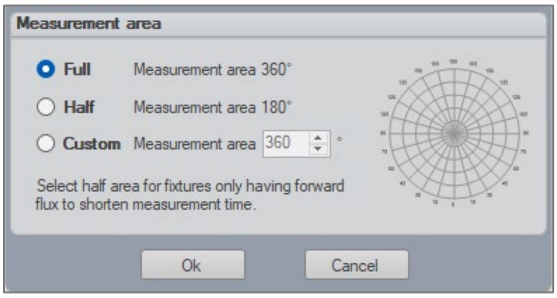
It is recommended to use the default basic 5°-resolution for all measurements and let the system detect the need for increased resolution in dedicated areas only.

With this setting the system will only use a fine resolution where it is necessary, and the total measurement time will be optimized.



In Measurement Area, you can also choose the gamma angle range – typically to reduce measurement time or to eliminate straylight coming from the back wall behind the goniometer. The setting will apply to all c-planes. Measuring only the lower 180 degrees is allowed if you are sure that the light source does not emit light in the upper hemisphere.

Report keywords
{H_ANG_NUM} and {H_PLANES} indicate the qty of gamma angles measured
{GAMMA_RES} indicates gamma resolution (degrees between each).



4.4. Window: Integration Time

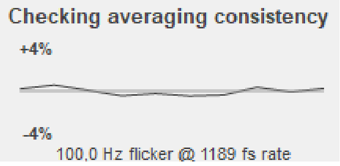
The integration time is the time spent by the spectrometer sensor to accumulate light in every step of the measurement. A long integration time will provide more accurate results by optimizing the signal-to-noise-ratio. An integration time that is too short will be less accurate and the spectrum may be jagged. Too long integration times will cause the sensor to over-saturate.

To optimize the signal-to-noise ratio, the system will auto-set an integration time that is adapted to the light source in case. Hence, high-intensity light source will need short integration times and vice-versa.

Compensating for flicker

The integration time is set automatically according to the intensity of the light source and any flicker signal periods – *see 59, Auto-Setting the Integration Time*.

The integration will also be adapted to any flicker in the light source so that the final integrations in a multiple of flicker periods.



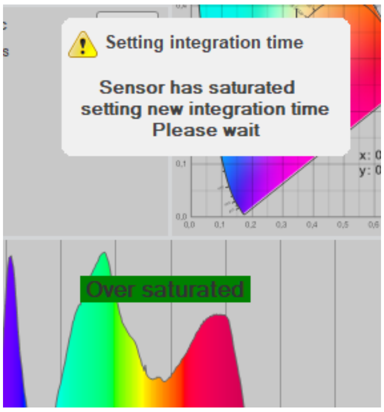
The system sets the integration time automatically while looking at a primitive flicker measurement from just one pixel on the spectrometer. The purpose is to get an integration time which is a multiple of the fundamental flicker frequency, thus making sure that the output in each measurement is (almost) not influenced by flicker. It is an iterative process where the system sets a particular integration time, and then runs 10 subsequent measurements and tests how close those results are to one another. I believe that the integration time is deemed to be ok, if those 10 measurement are within +/- 0.5% or so. If not, the system will try another integration time. This also explains, why this important test sometimes take time, and sometime is really fast: It simply depends on the number of iterations.

It works the same way for PWM modulation.

When using LightInterface, we also recommend allowing the sensor to autoset the integration time again before each point measurement to compensate for effects like that.

Integration Time During measurement

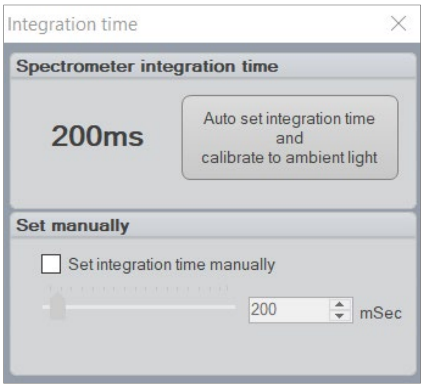
Per default, the system will set the integration time based on the amount of light in 0 degrees. If there is very little light in this direction (e.g., a side emitting LED or lighting fixture), then the integration time will be set too high. When during measurement the system encounters more light than the sensor is set for (over-saturation), a warning will pop up:



The system will then go to the point of oversaturation and spend a little time setting the integration time correctly, checking consistency and automatically rescan the measurement plane where the over-saturation occurred. Another option is to pre-set the integration time manually (see below).

Manual setting of integration time

In some rare cases it could be desirable to set the integration time of the 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 center at 0 degrees, the integration time would be too high, resulting in over-saturation of the photo spectrometer and leading to an inaccurate measurement. Systems with a Sony sensor can work with integration times down to 0,1 ms (milliseconds). Systems with a Hamamatsu sensor can go down to 0,011 ms.



The integration time of the spectrometer can be set manually by selecting *Setup → Integration time*.

In manual mode and if ambient light correction is turned on, you can do an ambient light correction by clicking the “Calibration to ambient” button, otherwise it does nothing.

In case you are seeing an oversaturated status on the spectrum graph after setting the integration time manually, you either have to adjust the timer further down or move the sensor further away.

In parallel, if your sensor is very far away from the light source, the integration time increases automatically, but the signal-to-noise ratio gets bad. Further. the system moves slower if the integration time exceeds about 0,5 s. Hence, always optimize the sensor distance to the light source in case. See *page 52, Light Source Alignment.*

4.5. Window: Spectrometer Calibration

All Viso products have two memory areas where calibration data can be stored. The first memory area contains the factory calibration and can only be edited by Viso Systems. The second area contains a custom calibration and can be changed by the user as many times as desired.

Viso Systems goniometers can be calibrated using Viso Systems own reference light sources, the CALI-T50/CALI-DT300 irradiance reference lamps, or you can choose to use a calibration lamp of your choice.

Calibration information is stored within the sensor and not in the software. This also means that you may use different Viso sensors in the same laboratories. For renewing factory calibrations, Viso System just needs you to ship the sensor (and all original reference lamps).

If you are using Viso Systems CALI-T50 or CALI-DT300, please follow the guide in the dedicated manuals.

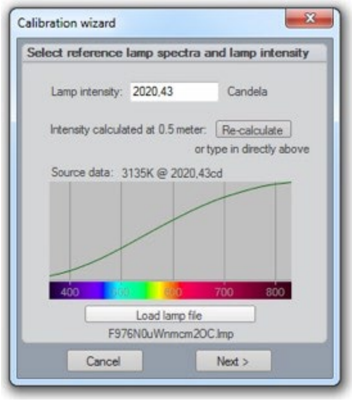
Calibrations steps	
Step 1	First you must locate the lamp file (.lmp) for the calibration lamp of your choice

Step 2

Then the calibration lamp must be aligned as described in the manual, the distance measured, and the light source warmed up as the manufacturer describes

Step 3

Connect the Viso Systems goniometer via USB and open the Viso Light Inspector software. Select: *Setup* → *Spectrometer calibration*, select custom calibration and click 'New'.
Note: The primary factory calibration will not be lost, and you can always return to it



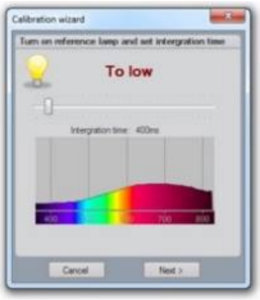
Step 4

Select "Load lamp file" and locate the lamp file, to load the calibration source spectrum.
At the top you can put in the intensity value in candela

Make sure the calibration source is stable and has been turned on for the time stated by the manufacturer

Step 5

Click next and set the integration time to a maximum possible value to ensure the highest resolution and thereby the best calibration quality.
Use the keyboard arrow keys to fine-tune.
Click next



Step 6

To make a dark measurement cover the sensor or turn off the calibration source so the dark reference spectrum can be measured. Click next and the calibration is finished.

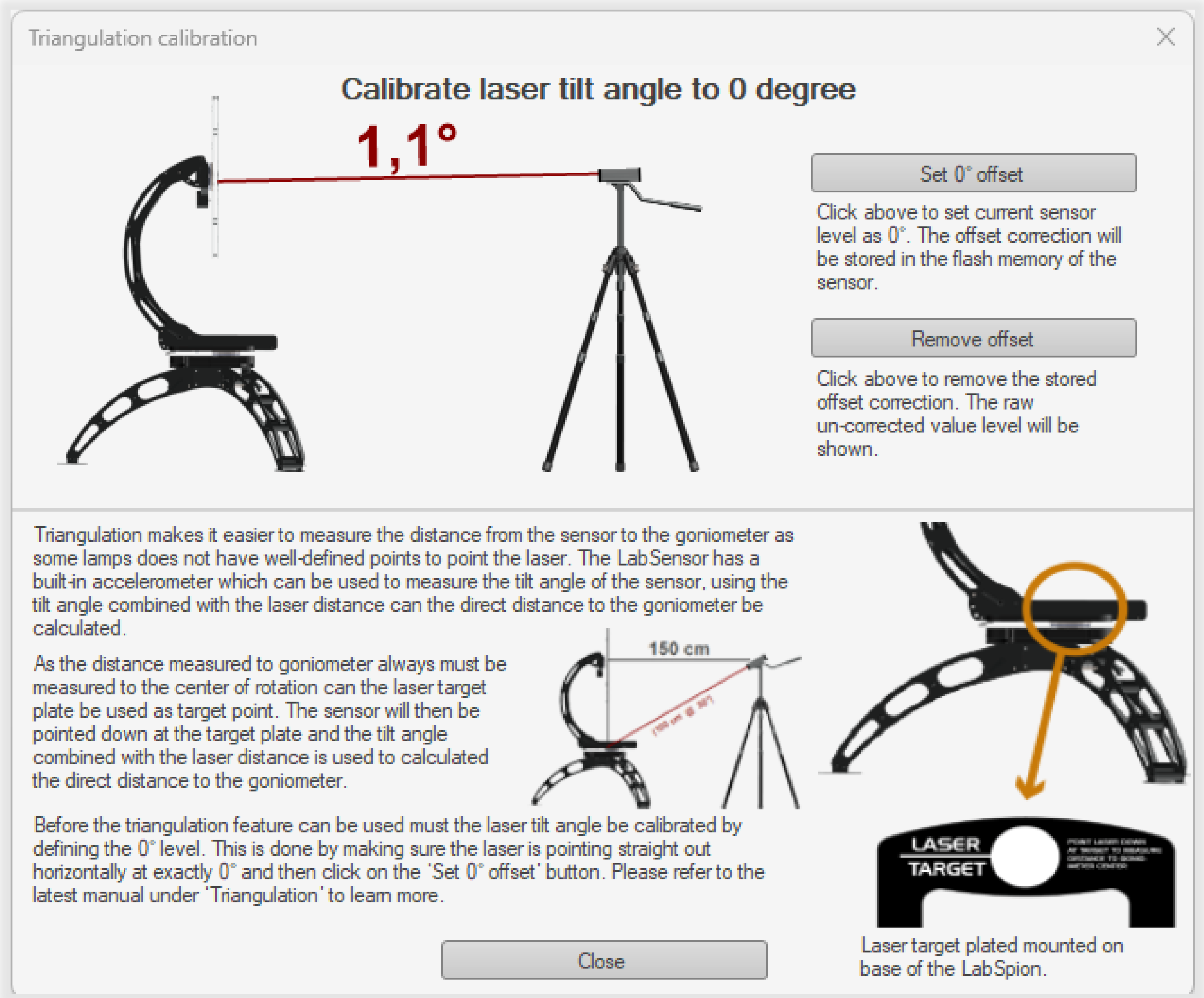
Step 7

When you close the calibration dialog box you will be asked if you want to save the calibration to the device. When selecting 'yes' the custom calibration will be saved inside the device. You can switch back to the factory calibration at any time.

Step 8

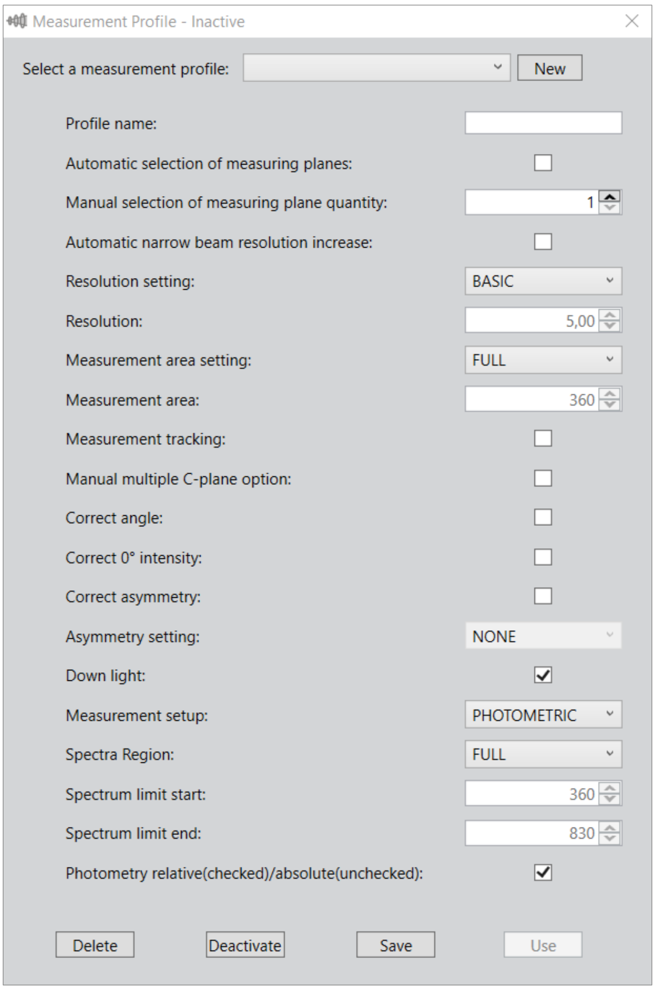
Restart the Viso Light Inspector software and check the new calibration is stored correctly by going into Setup - Calibration.

4.6. Window: Triangulation calibration (LabSpion only)



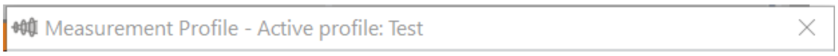
4.7. Window: Profiles

The measurement profile window allows users to create different reusable measurement setups. This is handy when you want to measure many different fixture types in the same way and can save you some time making changes or settings before and after you do a measurement.



Set your preferences, choose a profile name and press "Save". For use with the next measurement, press "Use" (only runs with saved profiles).

If the title says "Inactive", no saved measurement profile is active when starting a new measurement.



If the window title says 'Active profile: "YourProfileName"' then all subsequent measurements will be based on this profile until you choose another profile or deactivate the Profiles feature.

4.8. Window: Labarazzi Editor

If you own a Viso Labarazzi (TLA generator) and connect it to your PC, the menu point "Labarazzi Editor" will appear in your Setup menu.

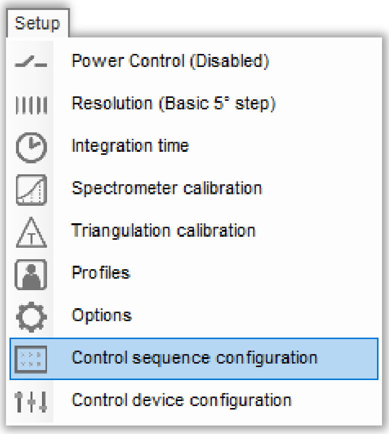
You can force the menu point to be listed even if a Labarazzi is not connected by going to *Setup* → *Options* → *Advanced* and ticking off the box "Always show Editor....". By doing so you may explore the Labarazzi capabilities before owning one.

Using the Labarazzi Editor software is described in detail in the Labarazzi User Manual here
https://data.visosystems.com/content/manuals/labarazzi_user_manual.pdf

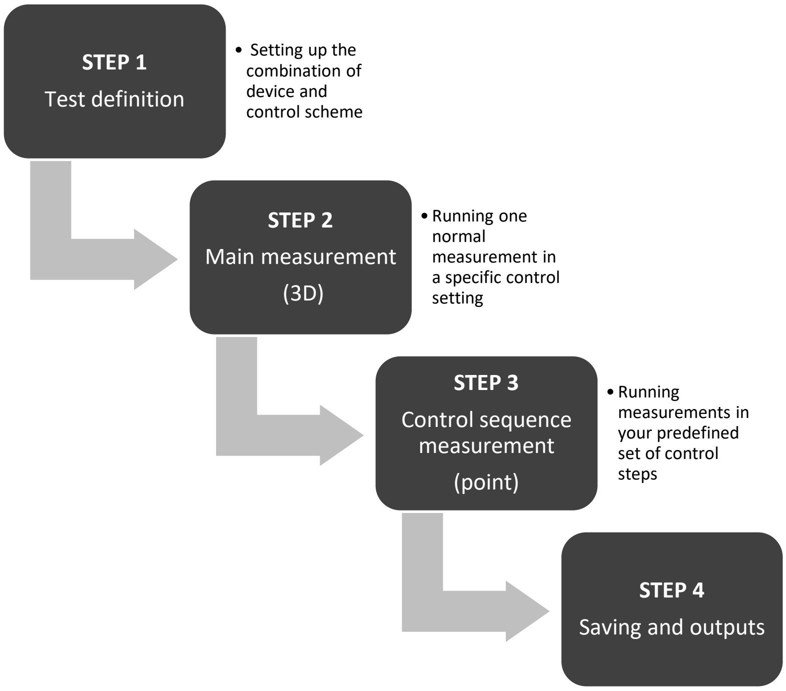
4.9. Window: Control sequence configuration

As off version 7.16:

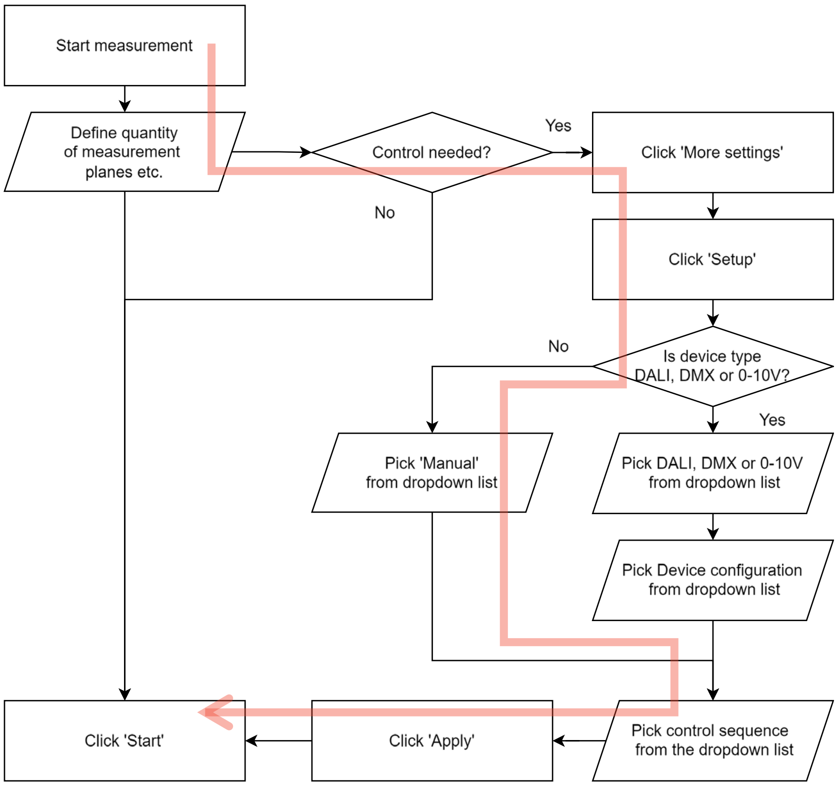
In the standard version, this window allows you to set up a post-measurement that steps the light source through a series of control steps. The steps will take manual setting unless you own Viso LightInterface, that enables automatic post-measurement (DALI, DMX/RMD, 0-10V).



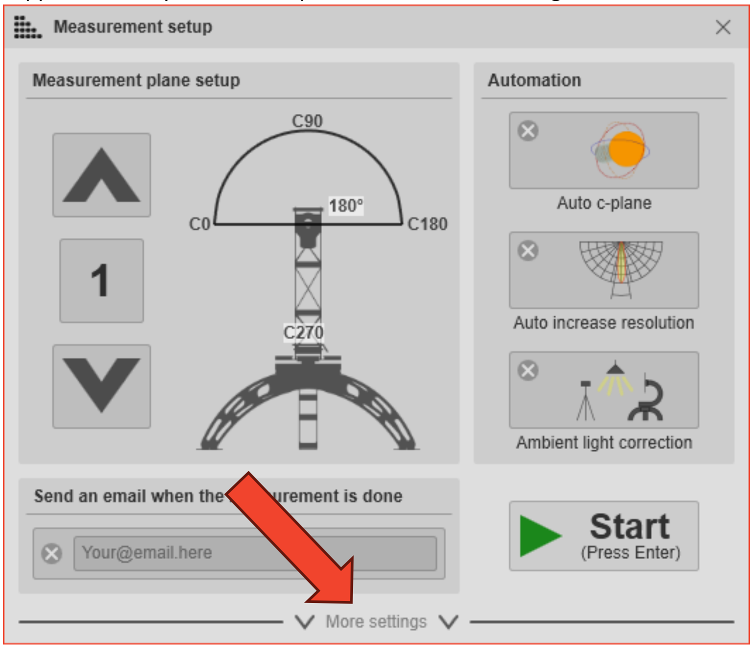
Use control sequence configuration if you would like to measure, for example, smart light sources or wirelessly dimmable light sources and fixtures.



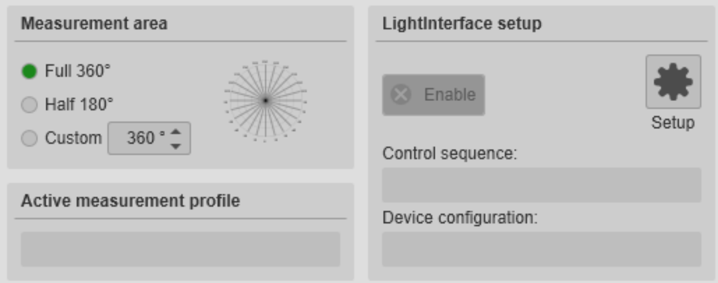
The procedure is described in detail in the LightInterface user manual, where everything applies except cannot set up a device, but you need to go with "manual":



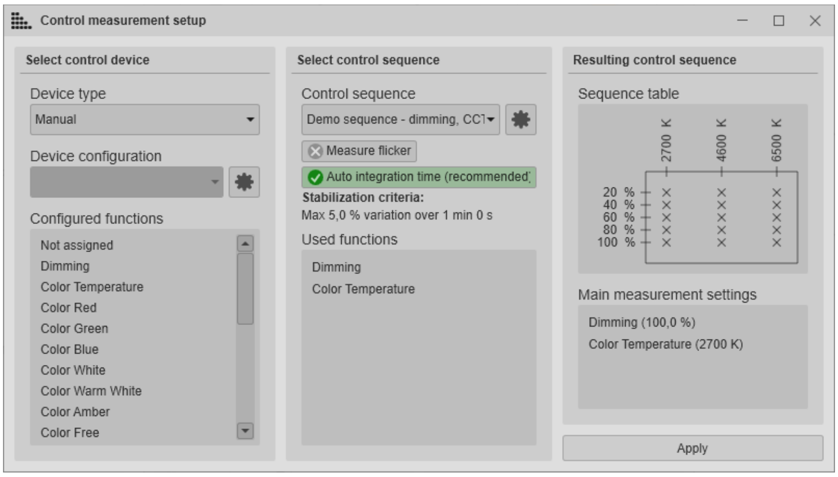
Use the expanded Measurement setup window to start a new measurement supplemented by a control sequence. Click "More settings" in the bottom:



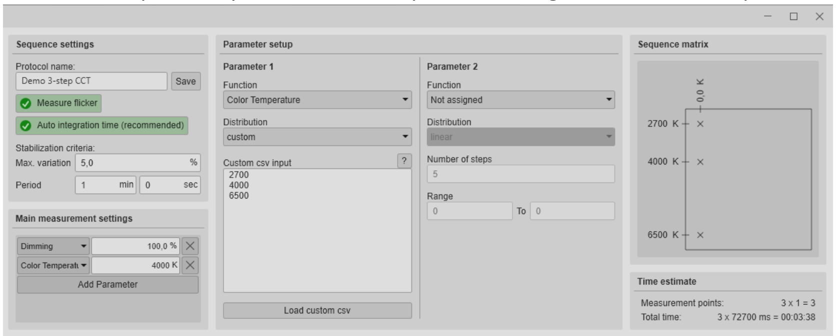
Click the ‘Setup’ button:



Pick ‘Device type’ = manual from the dropdown list:

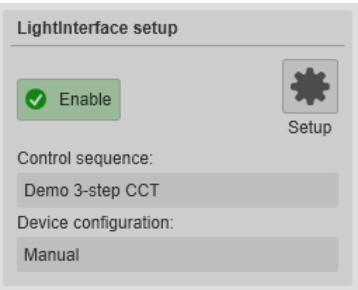


Pick a control previously saved control sequence or design a new one. Example:

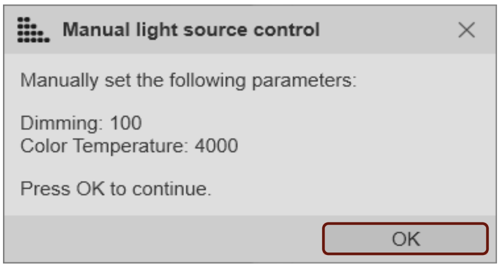


Close the window, and then click the ‘Apply’ Button.

Click ‘Enable’:

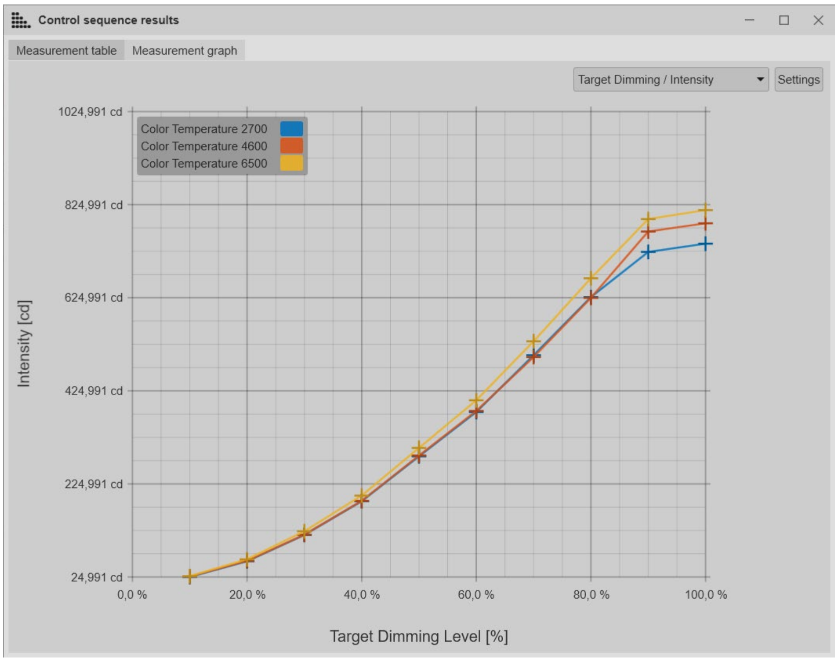


Finally click the Start button (or hit enter). The system will then perform a normal measurement followed by a control sequence where the user is prompted to make regulations with pop-up windows like this:



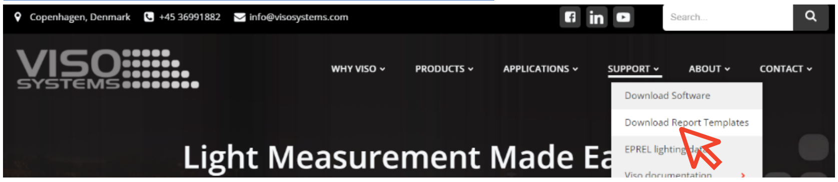
Reporting

You will be able to make report etc. based upon your results:



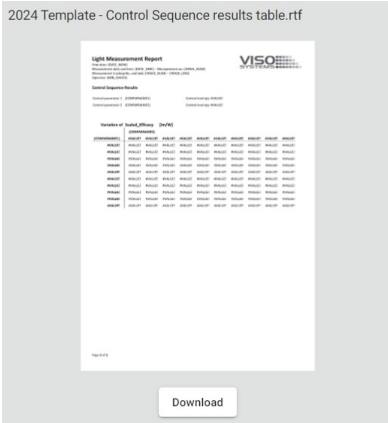
The procedure is described in detail in the LightInterface user manual.

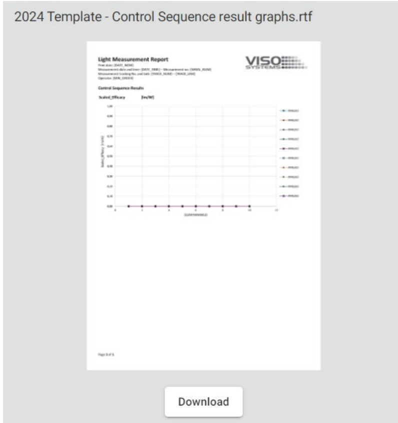
You may find PDF templates that you can work with in https://www.visosystems.com/download-plugins/



These templates self-install: Download the plugin, and double-click on the plugin file in your file browser, and the plugin self-installs to become available as a standard PDF report in Light Inspector:

There are two templates available:





Adding Control Sequence Results to LDT Files

LDT files can contain more than one lamp. This is because LDT files were deviced when most indoor fixtures could contain more than one lamp type with different outputs and wattages.

This feature can be used to convey your control sequence results to users of LDT files, the lighting designers.

Go to Setup -> Optional -> Tab:Export.

Click 'Edit LDT template'.

Number of lamps:	{NUMBER_OF_LAMPS}
Type of lamps:	
Total luminous flux:	{LUM}
CCT of lamps:	{CCT}
CRI:	{CRI}
Wattage:	{PWR}

These are the six lines that can be repeated to contain all of your control sequence results – provided that you design a special LDT template containing the right number of repetitions.

Pull the information that you need with lines like this (/0 means no decimals):

```
1
{CONPAR1-1} %
{CONRES-Scaled_Lumen-1-1/0}
{CONRES-Color_temperature-1-1/0}
{CONRES-CRI-1-1/0}
{CONRES-Power-1-1}
1
{CONPAR1-2} %
{CONRES-Scaled_Lumen-2-1/0}
{CONRES-Color_temperature-2-1/0}
{CONRES-CRI-2-1/0}
{CONRES-Power-2-1}
1
 {CONPAR1-3} %
{CONRES-Scaled_Lumen-3-1/0}
{CONRES-Color_temperature-3-1/0}
{CONRES-CRI-3-1/0}
{CONRES-Power-3-1}
```

Continue repetitions until you have covered of all the combinations in your measurement matrix.

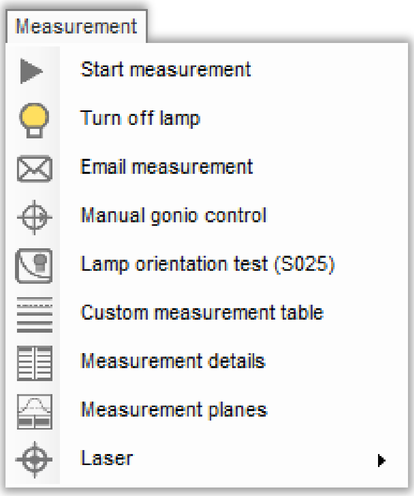
Click 'Save' and pick a new name if needed. Read more about the LDT format in page 127.

4.10. Window: Control Device Configuration

This feature is only relevant if you are a Viso LightInterface owner. See more here: https://visosystems.com/lightinterface.

5. Menu: Measurement

In this menu you can access the following windows, commands and sub-menus:



5.1. Important measurement prerequisites

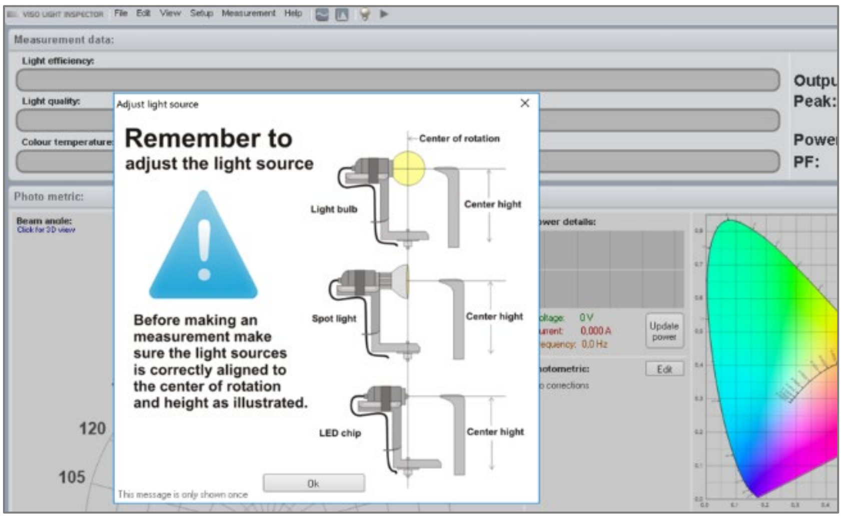
Light Source Alignment

Correct sensor distance and perfect sensor and rotational center alignment is extremely important in providing accurate results!

When the device is connected and the light source is correctly aligned with the goniometer and sensor, you are ready to make the first measurement (for alignment of the light source please go to the LabSpion/BaseSpion/LightSpion manual).

Find more information about light source alignment in the specific hardware manuals for LightSpion, BaseSpion and LabSpion.

A pop-up window will appear at the first measurement each time the software has been restarted to remind you of this. Simply hit 'enter' or click 'Ok' to bypass this. Below is an example from LightSpion.



Correct Sensor Distance

On BaseSpion/LabSpion and LightSpion with extender, setting the correct distance is very important:

- If the **sensor distance is too short**, the narrow field-of-view sensor will not be able to "see" the whole lamp. The result will be losing some lumen and wrong light distribution shape.
- If the **sensor distance is too long**, the signal-to-noise ratio deteriorates. The irradiance on the sensor drops with the distance squared. This means that for a small light source of e.g. 25 cm in diameter (that can be measured at 2 m), if you measure it at 12 m, the signal-to-ratio will be $2^2/12^2 = 1/36$ of what it could be. The system will try compensating by increasing the integration time. The result will be an overly noisy signal, a long measurement time, higher sensitivity toward straylight.

Always adapt the sensor distance to the light source in case, and keep the distance to the minimum or slightly above.

Report keywords

{ MEASDIST} returns the sensor distance in m.

{MEASDISTCM} returns the sensor distance in cm.

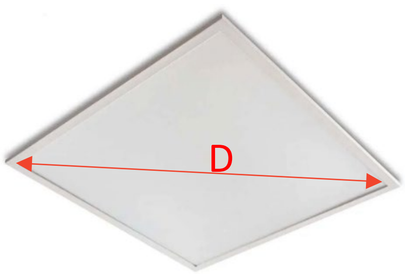
Sensor Distance according to CIE standards

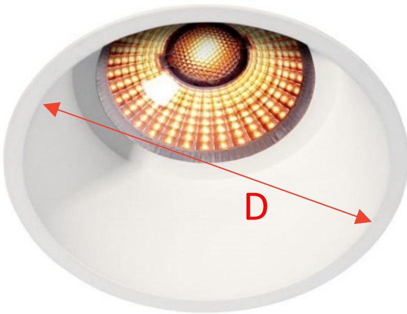
According to CIE S 025/E:2015, minimum measuring distances should be (D is the largest dimension of the luminous area):

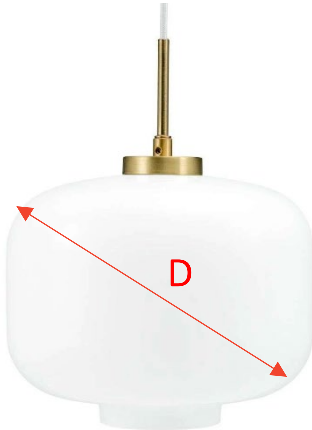
- Beam angle ≥90°: ≥5xD (Viso Systems ≥8xD)
- Beam angle ≥60°: ≥10xD
- Narrow angular distribution / steep gradients: ≥15xD
- Large non-luminous areas with maximum distance S: ≥15x(D+S)

Examples

The luminous surface should be interpreted as **all surfaces that emit light** including reflected light (reflectors regardless of color) or transmitted light (diffusers etc.). The biggest dimension of the luminous surface could be a diagonal or a diameter:





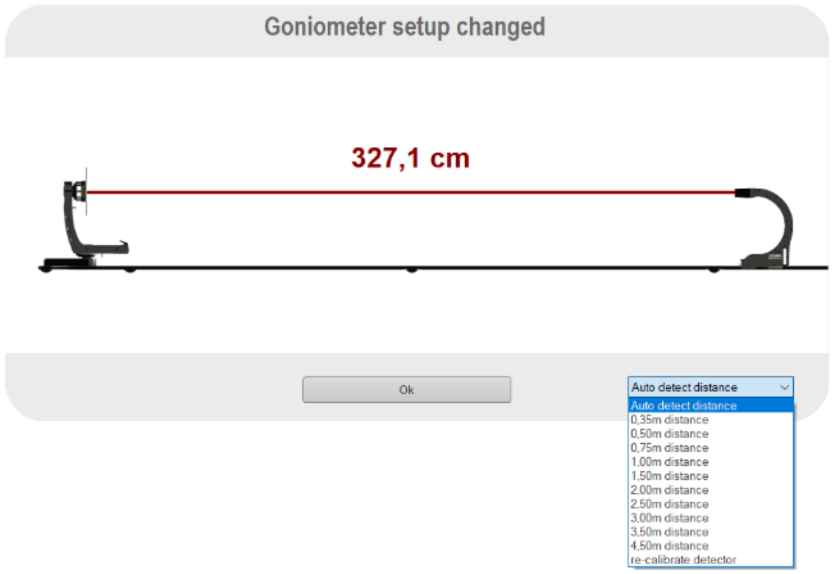


Get the software to calculate the correct minimum sensor distance with the Sensor Distance Guide in the Help menu. Read more in *page 123, Window: Photometric Center Guide.*

Setting the correct distance on LightSpion/BaseSpion/LabSpion

On the **LightSpion** (without extender) this distance is fixed. On the other systems, the sensor must be placed in a suitable distance from the photometric center of the light source (see *page 123, Window: Photometric Center Guide*).

On **BaseSpion**, there are a limited set of distances to choose. The system will register the chosen distance automatically.



Tip: If you experience that the automatic distance detection on the BaseSpion does not go as smoothly as it used to do, you may re-calibrate the detector. Just go to the re-calibrate menu point to do this.

On **LabSpion** (unless you own a LabRail system), simply press the "Measure Distance" on the rear side of the sensor head and the laser will measure the distance to the light source. The distance (in centimeters) is displayed immediately on the Light Inspector and can be checked manually if desired.

Caution: Do not stare directly into the laser beam or mirrored reflection of it.

LabSensor Model 1

LabSensor Model 2

Sometimes the laser beam will hit optics that spread the light and prevent the distance measurement. If so, place an adhesive label on the optics where the laser beam hits, make the measurement, and remove the label again.

- To turn on the laser, push the “laser on” button shortly
- To measure the distance, push and hold the “laser on” button until an audible sound is heard, and the software window indicates that a new distance is set.
- The laser turns off automatically after about 60 seconds. To force turn off, push the “laser on” button shortly again.
- Note: Remember to measure the distance every time the tripod is LabSensor moved

LabRail

With the LabRail accessory combined with a LabSpion goniometer you will have a system that

- Allows for very easy adjustments for the sensor distance – keeping the sensor in the optical axis at all times
- detects the measurement distance automatically every time
- Keeps the floor free of cables

Internal Photometric Centers

If the photometric center is internal/is not on the very front of the light source (see *page 123, Window: Photometric Center Guide*).

The measuring procedure includes the following steps:

- Place the front of the lighting fixture in the centerline of goniometer.

- Measure the distance with the laser
- Move the lighting fixture forwards and align the internal photometric center with the centerline of the goniometer.
- Start measuring

Alignment of LabSpion sensor and laser

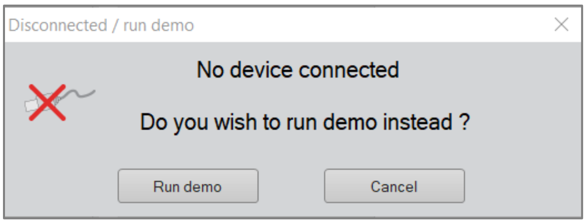
The laser and the sensor directions are carefully aligned during production. The laser direction (and thus also the sensor direction) is not necessarily aligned with the top of the sensor housing. Because of the small physical distance between the sensor and the laser within the LabSensor housing, this alignment is most accurate at 2 m distance.

5.2. Command: Start/Stop Measurement

The PLAY button.

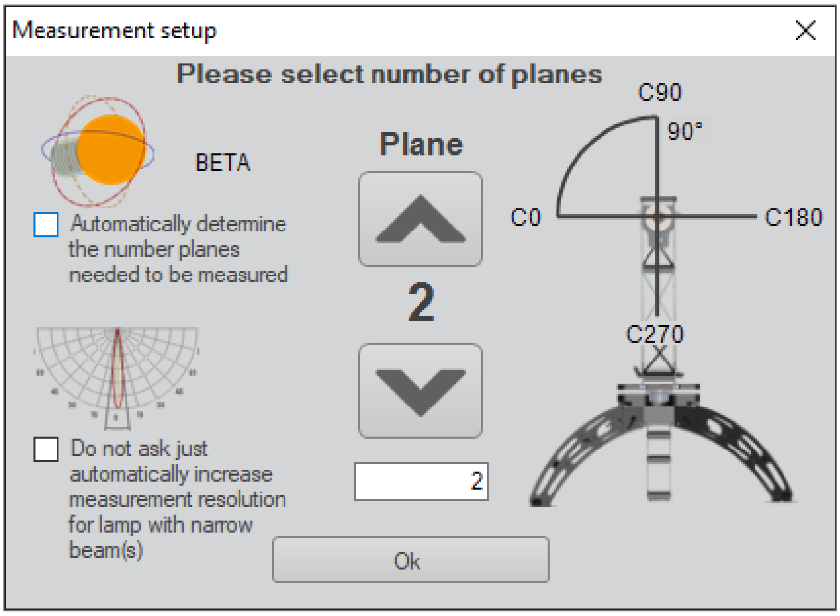
Click the “Play” button in the top line or click *Measurement →Start measurement*.

If no measurement instruments are connected, the following window will be displayed:

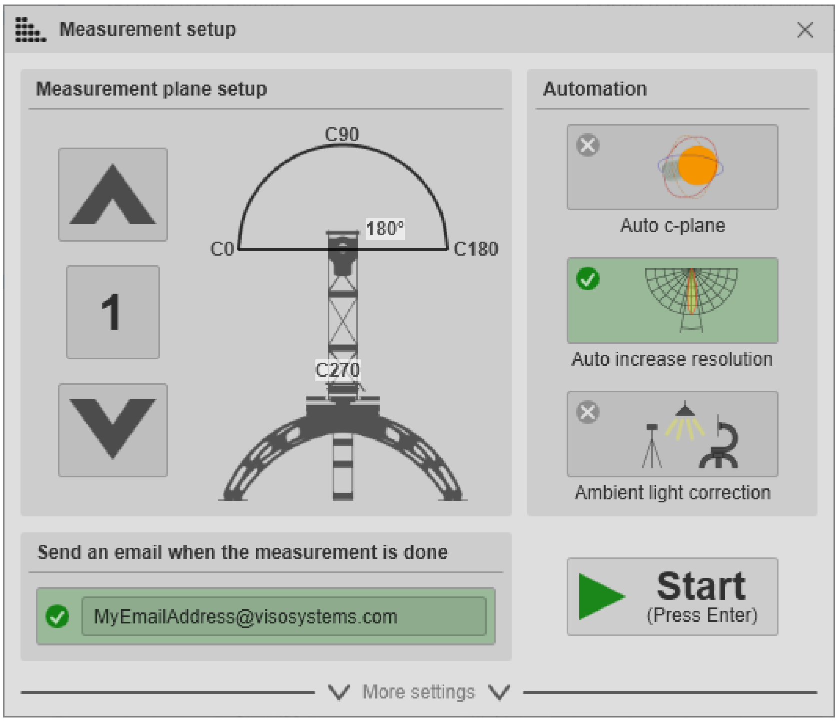


The measurement can be stopped anytime by clicking the short-cut “stop” button (appears when measurement is running) in the top line, or by clicking *Measurement →Stop measurement.*

Choice of C-plane Quantity



As off version 7.16, the start window looks like this:



The graphics showing the goniometer depends on the actual system connected: LabSpion, BaseSpion or LightSpion (if manual c-plane option is picked Setup -> Options).

The LabSpion and BaseSpion both have the option of measuring multiple C-Planes, so pressing the "play" button to start a measurement, a window will appear where the number of planes for this measurement can be set. Default is a full sweep in a single plane (equals two opposite C-planes). Up to 36 full planes (equaling 72 C-planes, and a 5° resolution) are possible.

LightSpion measures a single plane (=2 c-planes). More planes are possible with manual C-Plane rotation is possible, see the LightSpion manual.

Read more about 3D measurement resolution (C-planes and γ-steps) in section 3.1, Measurement Fundamentals.

Pressing and holding the arrow buttons allows you to scroll quickly through the number of planes. Typing the desired number is also possible in the field below.

Point measurements

As off version 7.16, you can also pick 0 (zero) measurement planes, in which case the system will perform a standard light source stabilization as per your requirements and then a point measurement (spectral power, CRI, CTT etc. distribution and intensity [cd] – but no flux [lm]).

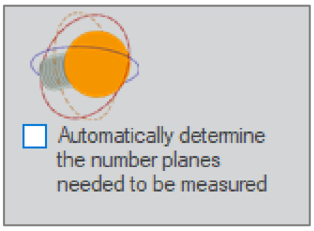
Correct no. of measurement planes

There is no standard that specifies the correct number of c-planes, but general advice can be given:

- Accurate alignment is essential – for symmetrical light sources, the more accurate, the less planes are needed.
- Diffuse light sources with wide beam angles do need many measuring planes. If aligned very accurately then 1 plane (= 2 planes) is in principle enough (as on LightSpion). Viso recommends using minimum 2-4 measuring planes to make sure any misalignment can be detected.
- For asymmetrical light sources, more measuring planes are needed. Viso recommends using 12-36 planes.
- For narrow beam (less 15-20° beam angles) Viso recommends minimum 12 planes. This is because narrow beam light sources are harder to align, so chances are that the plane containing the peak intensity will be missed. Viso recommends using 12-36 planes.
- When in doubt, run the autodetection mode described below.

Autodetection Mode

Version 5.87 or later will allow you select a feature that detects a recommended number of measuring planes. When ticking this box, the measurement will start with a pre-measurement that detects light distribution asymmetry/spikiness and bases the recommended number of planes on this analysis.



Auto-Increase Resolution Mode

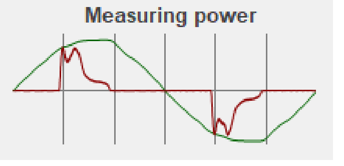
Beside the number of C-planes ("horizontal resolution") the system also needs an adequate vertical resolution, γ (Greek letter *gamma*). Per default, the system is set up to run with a basic 5° γ-resolution. It is also set up to detect during measurement whether this needs to be increased. When the system finds that increasing the resolution should be considered, a dialog box will open. If you want the system to increase measurement γ-resolution automatically without asking you should tick off the box "Do not ask...etc."

Read more about 3D measurement resolution (C-planes and γ-steps) in *section 3.1, Measurement Fundamentals.*

! **It is recommended to leave the gamma (vertical) resolution in the basic 5-degree setting and tick the box in the start window that allows the system to pick the optimal resolution automatically. This is the best way to ascertain a good characterization while also keeping the total measurement time down.**

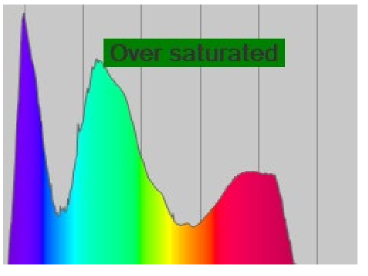
Auto-Setting the Integration Time

Next, the system will automatically scan the power draw:



Then, the correct integration time for the light source is set. The integration time is the time that the sensor spends picking up the signal in each measurement point. To optimize the signal-to-noise ratio, the system will auto-set an integration time that is adapted to the light source in case. Hence, high-intensity light source will need short integration times and vice-versa.

If the integration time starts out at a high level, you may encounter a label like this, while optimization starts:



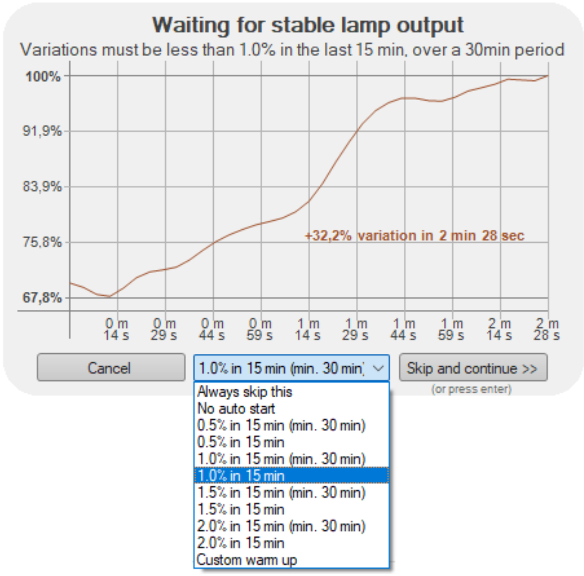
Read more about integration time in *page 40, Window: Integration Time.*

Integration Time During measurement

The system will then go to the point of oversaturation and spend a little time setting the integration time correctly, checking consistency and automatically restart the measurement. Another option is to pre-set the integration time manually.

Stabilizing the Light Source

To make an accurate measurement, the light source must be stable with regards to power consumption, light output and temperature – the time needed depends on the light source. A graphical 'stabilization' window will appear while the light source warms up and stabilizes. The default is set so the intensity variation from the light source must be less than 2% over 15 minutes before the measurement automatically starts. By clicking the dropdown, you may choose from several other options.



Report keywords

Stabilization criteria:

{WUC_CHNG_MAX} Stabilization max change in %, **{WUC_STBL_PER}** stabilization period in minutes, and **{WUC_MIN_TIME}** stabilization period minimum in minutes

Stabilization results:

{WU_TIME} stabilization time. Formatted as '23 min 12 sec'

{WU_VARI} stabilization variation in %

{WU_START_CCT} Stabilization CCT at start, and CTT change **{WU_CHNG_CCT}**

{WU_START_OUT} Stabilization Output in lumen at start, and output change **{WU_CHNG_OUT}**

{WU_END_SEC} returns the warm-up end time in seconds. Can be used when reading out intensity values using **{WU_INT#}** to get the maximum curve time which can be read out

{WU_MAX_INT} Warm-up period maximum intensity

See more details in section 11.12

Proper stabilization is necessary to conform with measurement standards such as CIE S025 and IES LM79.

CIE S025: "The DUT shall be operated for **at least 30 minutes,** and it is considered as stable if the relative difference of maximum and minimum readings of light output and electrical power observed over **the last 15 minutes is less than 0,5 %** of the minimum reading (etc.)"

IES LM79-19: "Stability shall be achieved when the variation (maximum to minimum) of at least three readings of the light output and electrical power consumption, taken at a maximum of 10-minute intervals over **a period of 20 minutes** and divided by the last of these measurements chronologically, **is less than 0.5%** (etc.)"

If the light source is already stable the warm-up can be skipped by hitting 'enter' or clicking 'Skip to continue'.
Note: When skipping, the stabilization will not be logged and recorded in the measurement file.

Clicking 'Cancel' will stop the measurement.

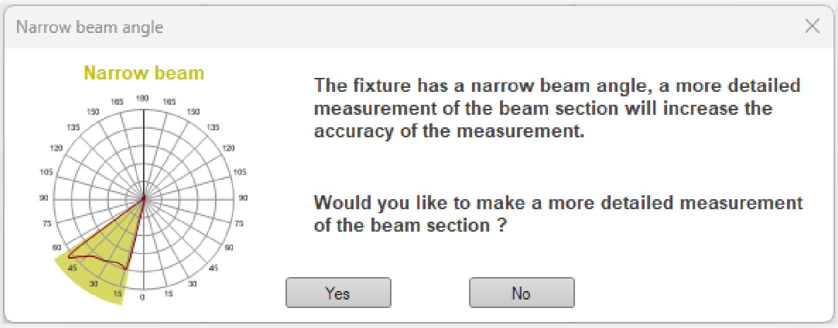
Auto-Start of Measurement

When the warm-up time is completed (or skipped), the goniometer will then go to start position by turning 180° counterclockwise, then do a complete 360° clockwise measurement sweep and go back to the start position. If multiple measuring planes has been selected, the C-Plane goniometer motor head will turn one plane for each 360° measurement.

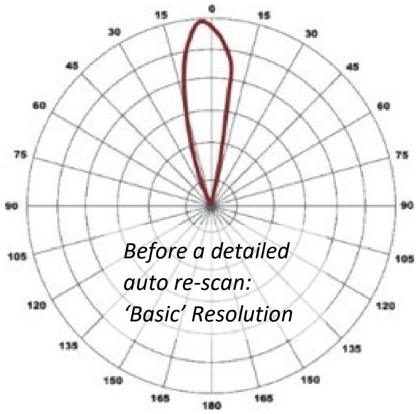
Increasing the Measurement Resolution

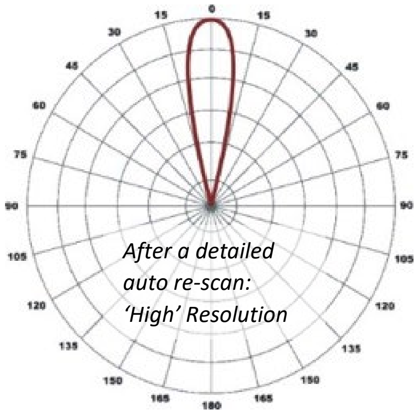
The default 'Basic' resolution can be insufficient for light sources with narrow beam angles. So, to generate accurate results, the "Viso Light Inspector" software will automatically ask you if you want a more detailed scan of the beam section. If 'Yes', the goniometer will rotate back and redo the measurement within the beam section at ‘High’ resolution.

The basic/default resolution is 5 degrees in LabSpion and BaseSpion.



The example below illustrates the result of an increased in measurement quality after a detailed re-scan of the narrow beam section.





The individual measurement points are not connected with straight lines but with Bezier curves. This means that light distribution curves will always make a smooth impression. Sometimes connection Bezier curves will “stick out” from the outer circle (>100%). This is a sign that the measurement resolution was too low.

Add a Photo to your Measurement File

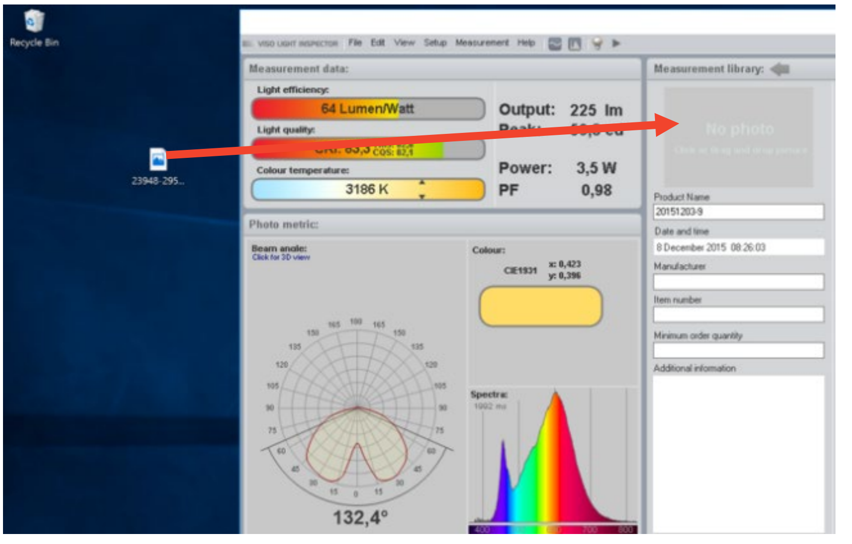
Adding photos and other bitmaps to your measurement file eases browsing through previous results and is a straight-forward way of e.g., distinguishing different optical variants in R&D. You may also add bitmaps illustrating product drawings, sketches, your own QR codes etc.

The photos will be added to the measurement file and can be included in the pdf-outputs.

From the main screen, you can take photos of e.g., the light source using a mobile phone. Click on the picture frame, choose mobile phone, then scan the QR code on the screen. Once you have taken the photo and approved it, it will pop up in the photo box in the main screen.

You may also easily attach pictures to your measurements by dragging and dropping them towards the area of the picture frame. You can add as many picture files as you wish – also e.g., bitmap drawings.

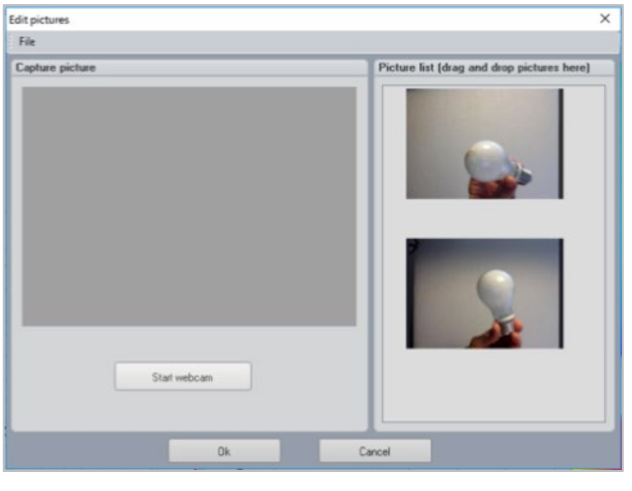
All images can be added to PDF reports with graphical Product Photo drag and drop functionality. By adding keywords ({PIC1}, {PIC2}, {PIC3}, ...) to the Image Alt Text in Word, you can specify which particular image to show.

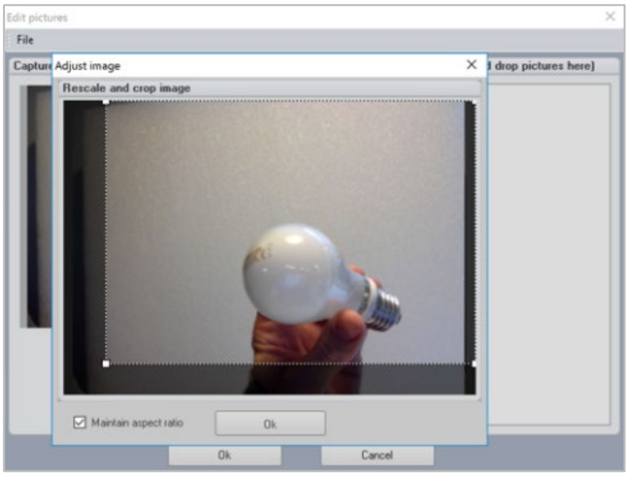


It is also possible to use a webcam to snap pictures of the measured light sources for quick references. To use the webcam, click on the picture frame to open a picture editor.

Click on the ‘Start webcam’ button to take as many pictures as you like. The first picture in the picture editor will be used as the primary one, which accompanies the measurement by default. Pictures can be moved or deleted by right-clicking on each picture.

Each time a picture is added, you get the option of turning and/or cropping it.





5.3. Window: Turn On/Off Light Source

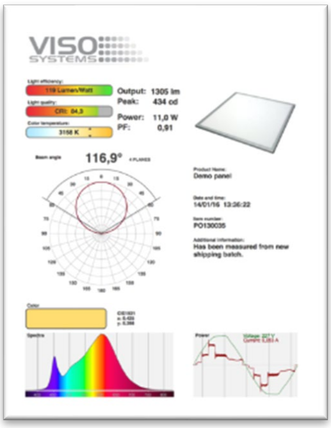
Choosing this option directly turns on/off the light source.

5.4. Window: Email Measurement

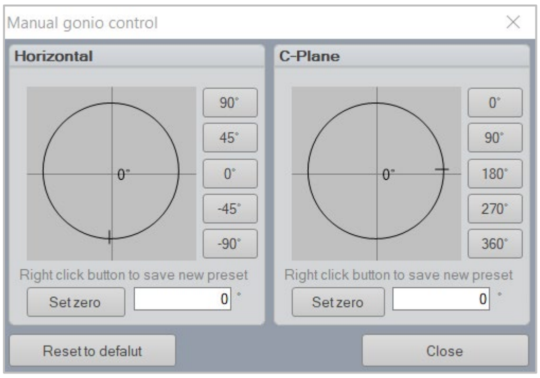
The Light Inspector software is capable of directly emailing measurements by clicking on the email icon.

- Click *Measurement → Email measurement*
- Type in the email address
- An email with an attached .pdf report will arrive

The report in the email will be the Standard PDF report, like below.



5.5. Window: Manual Gonio Control



Manual gonio control can be used to turn the Gonio Base or C-Plane to a desired position to read the candela or see the spectrum. In principle, you can change both horizontal and c-plane positions with your hands on the gonio with the same result. However, by using the software, you are in perfect control of the angles, which might be an advantage if you are searching for e.g., intensities or CCT's in specific directions.

In the right-hand side, there are five presets which all can be changed individually and saved as new presets.

When one of the planes is turned to a new position and 'Set zero' is pressed and a new measurement is started, this will be used as the new starting position.

5.6. Window: Lamp Orientation Test (S 025)

Introduction

For all modern, rotating-source type goniometers, compensations must be made to adjust for influence of measuring the light source in another position than the normal burning position.

Viso Systems has a standard software feature that handles this.

Such a compensation is explicitly allowed in CIE S 025 and EN13032-4, and although not being mentioned in LM79 Viso clients in the US use this feature for compliance with LM79.

Keeping the light source in the normal burnings position during measurement used to be extremely important, since fluorescent light sources can vary 20-25% in output just based on the way they are turned. With LEDs, this problem is eliminated or at least at very low deviations, which was recently demonstrated in the impressive inter-laboratory comparison IC2017 – you may read more here (Viso is anonymized to "G46") and here.

EN 13032-4:2014 as well as CIE S 025/E:2015 "Test Method for LED Lamps, LED Luminaire and LED Modules" state the following:

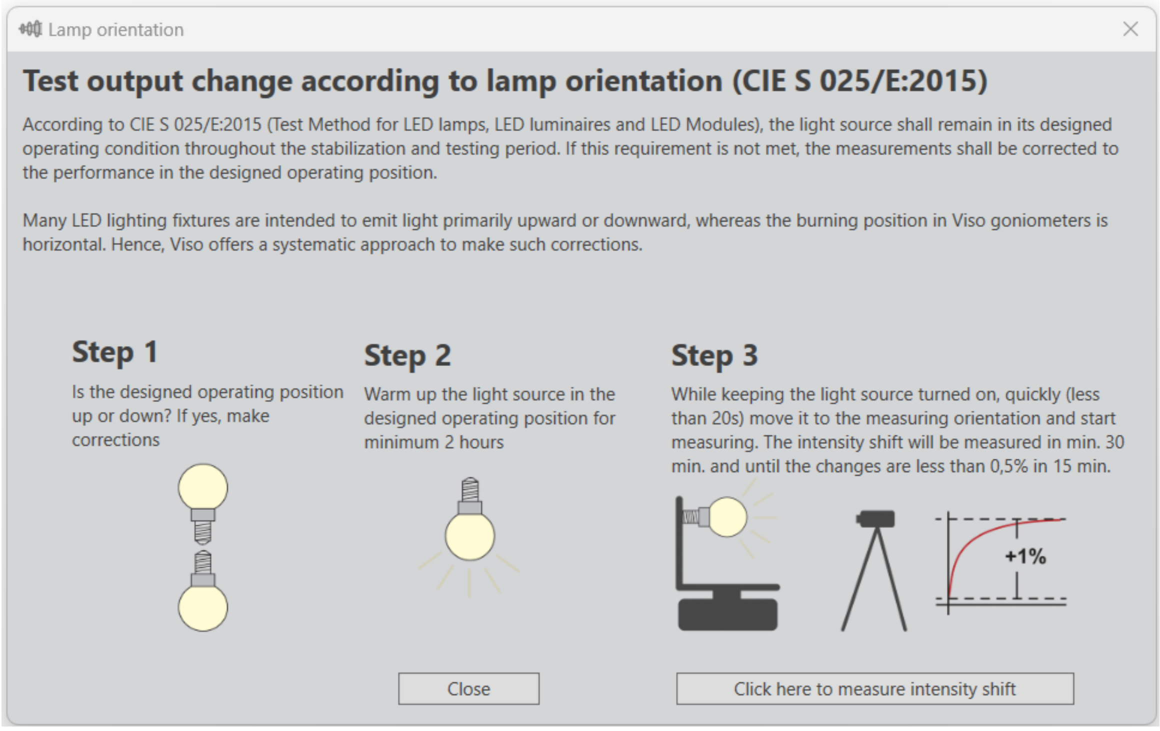
> **4.2.5 Operating Position**
>
> *Specific requirement: The DUT shall remain in its designed operating condition throughout the stabilization and testing period.*
>
> NOTE This requirement is not applicable to LED modules whose temperature is set and maintained to performance temperature. (See 5.3.1)"
>
> If this requirement is not met, the measurements shall be corrected to the performance in the designed operating position.

Hence, if corrected, also measurements performed in source-rotating type-c measurement systems (as Viso systems) can be said to conform with CIE S 025 and EN 13032-4.

Viso Light Inspector software supported correction procedure.

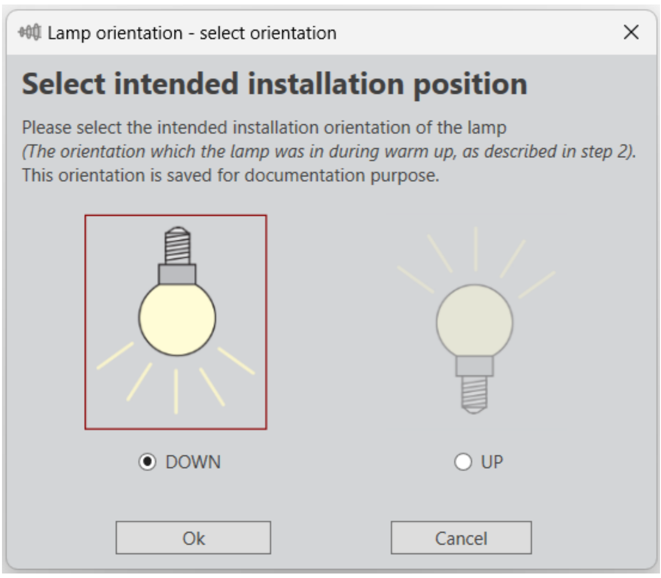
In the software, the correction process is supported by the step-by-step procedure described below.

This first window describes the whole process.

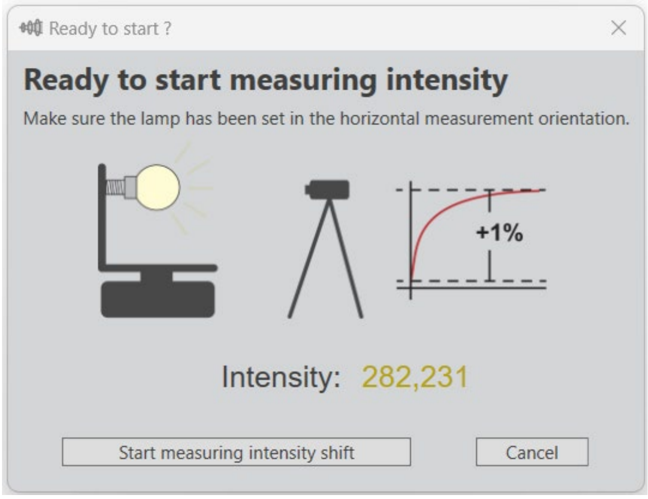


Before continuing from here, the operator must perform “step 2” (while placing the DUT close to the gonio in the position, that it would normally installed in). Mechanically, the operator must prepare the DUT to be fixed very quickly to the gonio arm, e.g. with the quick grips).

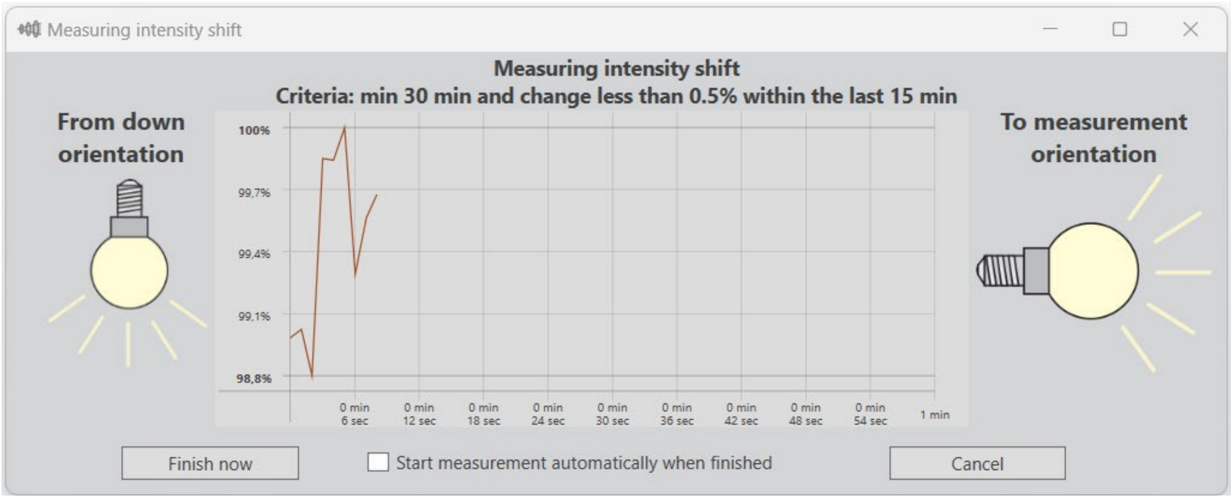
The operator clicks the lower right-hand button to continue to the following window. This window allows the operator to choose whether the DUT is normally facing down or up in the “designed operating condition”:



Then the operator must move the DUT fast as he can (to make sure that the internal temperature does not change). Then click “Start measuring intensity shift”:



Then, this window opens:



The operator ticks the box “Start measurement automatically” to continue with a normal measurement cycle afterwards (a window opens where you can choose the appropriate qty of measurement planes).

After either clicking the “Finish now” button or ticking the “Start measurement...” box, the operator must actively save the result with the whole light measurement.

Once this comparison has been completed, the system will not automatically apply this to the measurement result as we regard it as the operator’s decision.

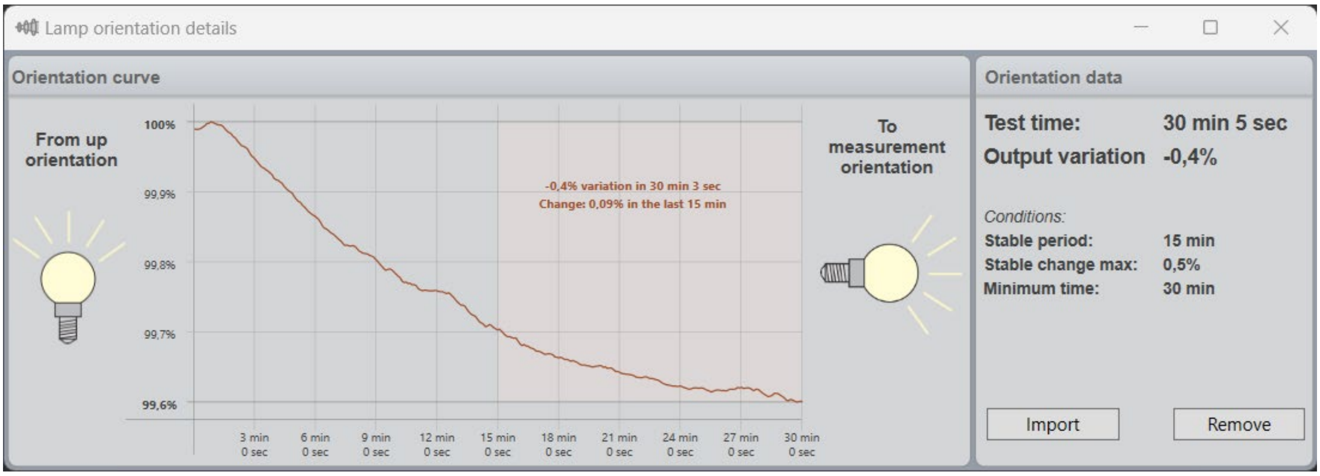
If a very small difference was measured, e.g. +/- 0,25% which is well within the measurement tolerance, then the operator may prefer to leave your result be.

After this procedure, you can see the result in View -> Lamp Orientation (S 025):

If a bigger difference has been detected a correction must be applied by the operator:

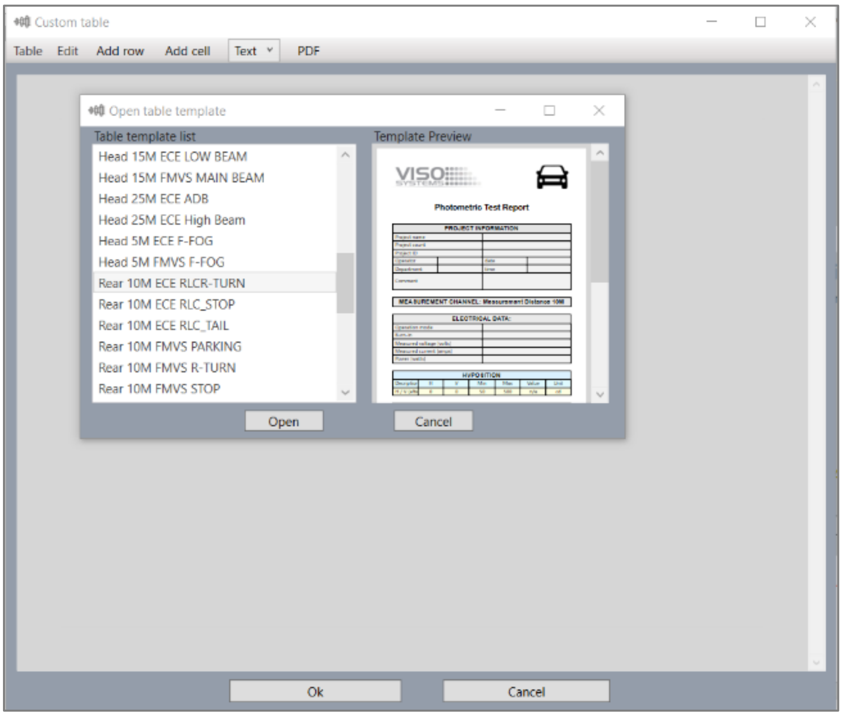
- Modifying the lumen package accordingly (in Edit -> Photometric -> Modify)

- Noting that a correction has been applied in the “Additional information” field.



As for the measuring standard IES LM-79, it requires that the lamp be measured in their install position (usually pointing up or down). This is because the intensity of metal halide lamps and fluorescent lamps can change quite a bit if the lamp rotated. As Viso measurement systems rotate the lamp during measurement, the measurement is not compliant with LM-79 standards for measuring these conventional light source types. As a general rule, however, the LED lamps do not vary significantly. CIE S:025 is on course to replace the old north American LM-79 standard. All Source-rotating goniometers have this fundamental situation.

5.7. Window: Custom Measurement table

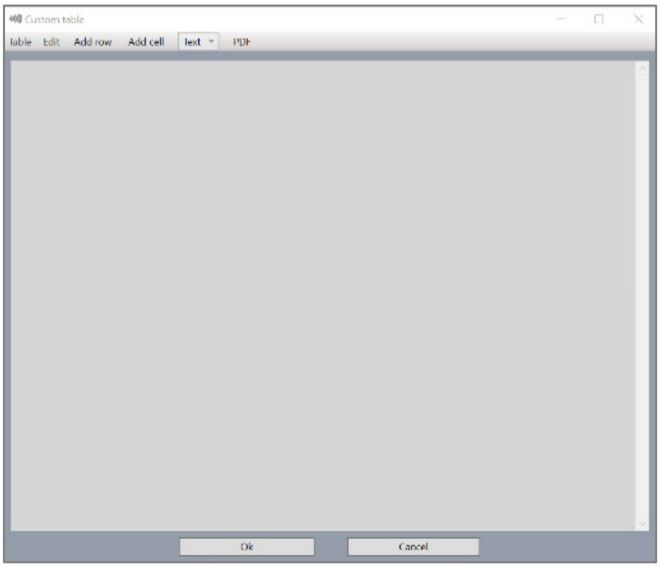


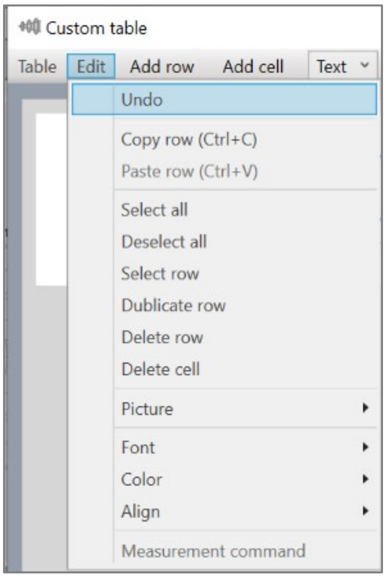
Specific photometric tests and measurements are required by automotive and transportation lighting standards including Rail, Aviation and Marine lighting. Viso

Systems offers instruments and special dedicated software for a full characterization of light intensity distribution, flicker and colorimetry.

No matter which fundamental goniometer movement setup that is used (Type A, type B, type C), the test result consists of discrete measurement points in specific light directions. Viso BaseSpion and LabSpion can be programmed to measure in any global direction just like a robot and fulfil e.g., type B requirements.

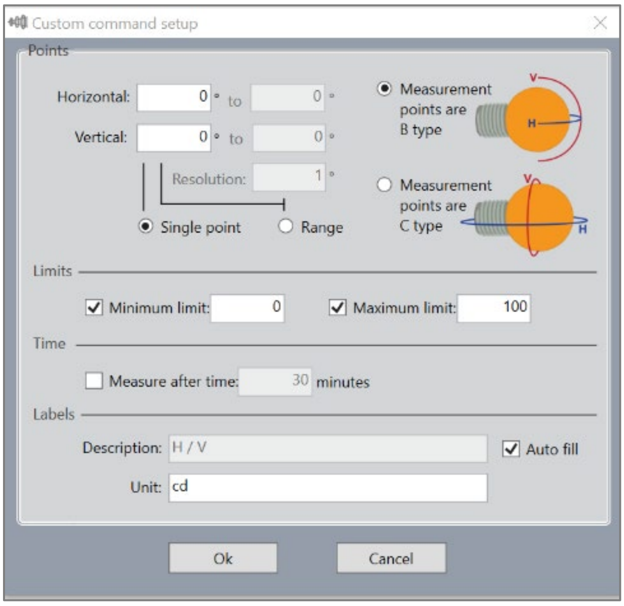
This special “table measurement” feature allows you to set up your own measurement protocols and reports. Click *Measurement→ Custom Measurement Table* to start a new table. A window showing a blank table opens:





- You can now add row and each row you may add cells (adds another cell to a row every time you click ‘Add cell’.
- Drag cell borders to change sizing,
- Edit cell layout and cell content with
- Add images and logos

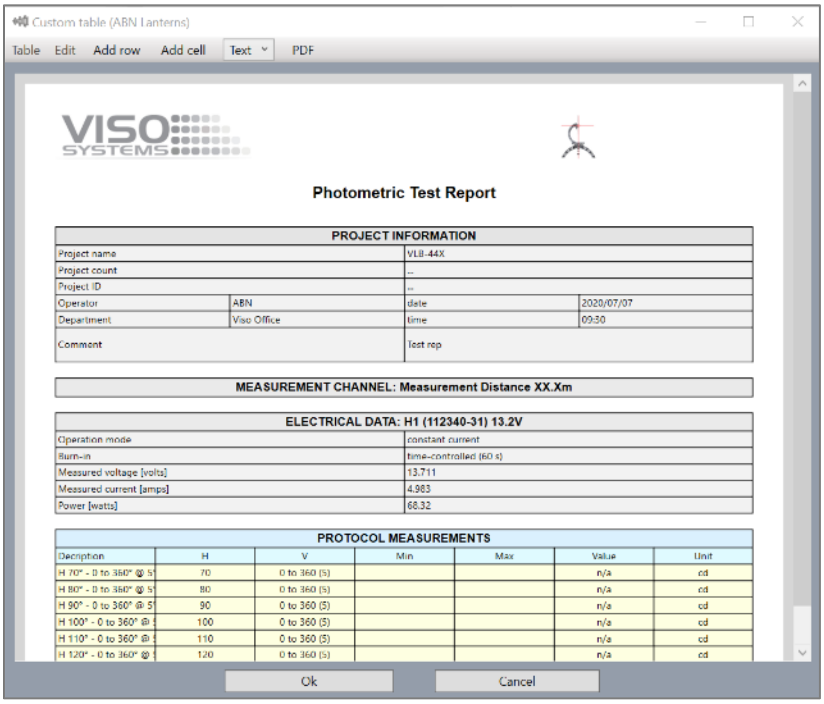
- Add measurement points. Click Change → Measurement Command:



Add single point or ranges and choose range resolution.

- Set minimum and maximum limits for output result and allow the table to check that values are within limits.
- Delay measurement start e.g., to allow for stabilization.
- Save your template to use it again.
- Export directly to pdf – click PDF button.

Example table measurement protocol



Photometric Test Report

PROJECT INFORMATION			
Project name		VLB-44X	
Project count		--	
Project ID		--	
Operator	ABN	date	2020/07/07
Department	Viso Office	time	09:30
Comment		Test rep	

MEASUREMENT CHANNEL: Measurement Distance XX.Xm

ELECTRICAL DATA: H1 (112340-31) 13.2V	
Operation mode	constant current
Burn-in	time-controlled (60 s)
Measured voltage [volts]	13.711
Measured current [amps]	4.983
Power [watts]	68.32

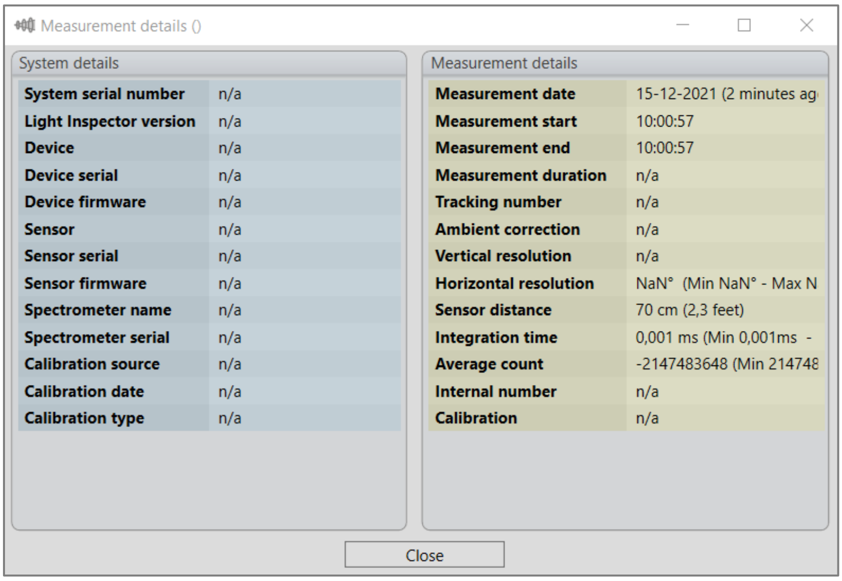
PROTOCOL MEASUREMENTS

Decription	H	V	Min	Max	Value	Unit
H 70° - 0 to 360° @ 5	70	0 to 360 (5)			n/a	cd
H 80° - 0 to 360° @ 5	80	0 to 360 (5)			n/a	cd
H 90° - 0 to 360° @ 5	90	0 to 360 (5)			n/a	cd
H 100° - 0 to 360° @	100	0 to 360 (5)			n/a	cd
H 110° - 0 to 360° @	110	0 to 360 (5)			n/a	cd
H 120° - 0 to 360° @	120	0 to 360 (5)			n/a	cd

5.8. Window: Measurement details

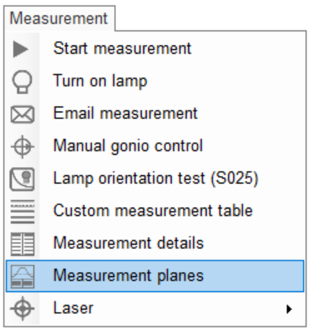
Choose this menu point to get the full overview of your system and measurement setup.

Tip: If you contact Viso Systems or a local Viso distributor for support, a screen shot of this window is a valuable starting point. Also, sending an original measurement file in .fixture format provides a lot more information to the supporter than pdf reports.

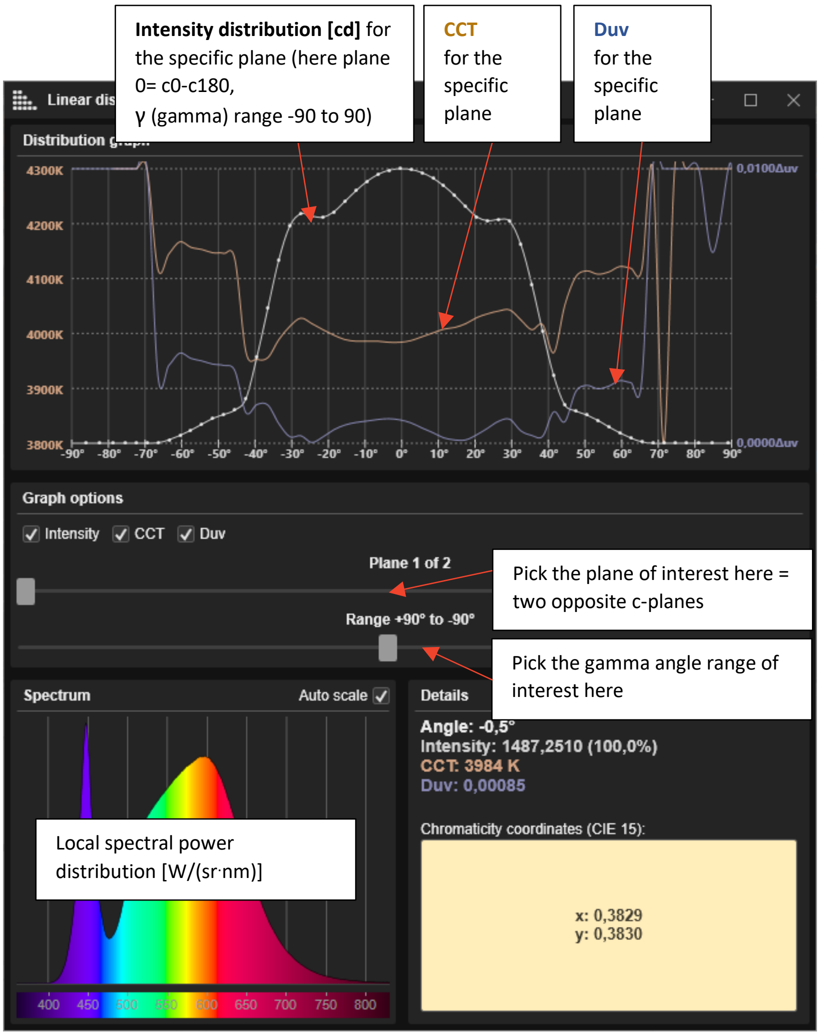


5.9. Window: Measurement planes

Perform a detailed analysis of the light source spectrum and intensity distribution with the “measurement planes” feature:

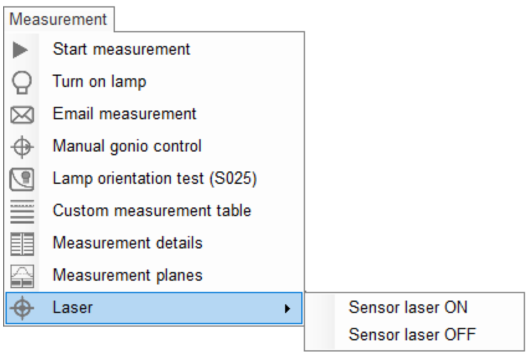


Click Measurement → Measurement planes to get a detailed view of your data:



Click directly in the upper diagram and move the line curser back and forth to get more local results.r

When a LabSpion sensor is connected to the software, it is possible to turn the built laser on and off via the software. Click Measurement → Laser → Sensor on/off.

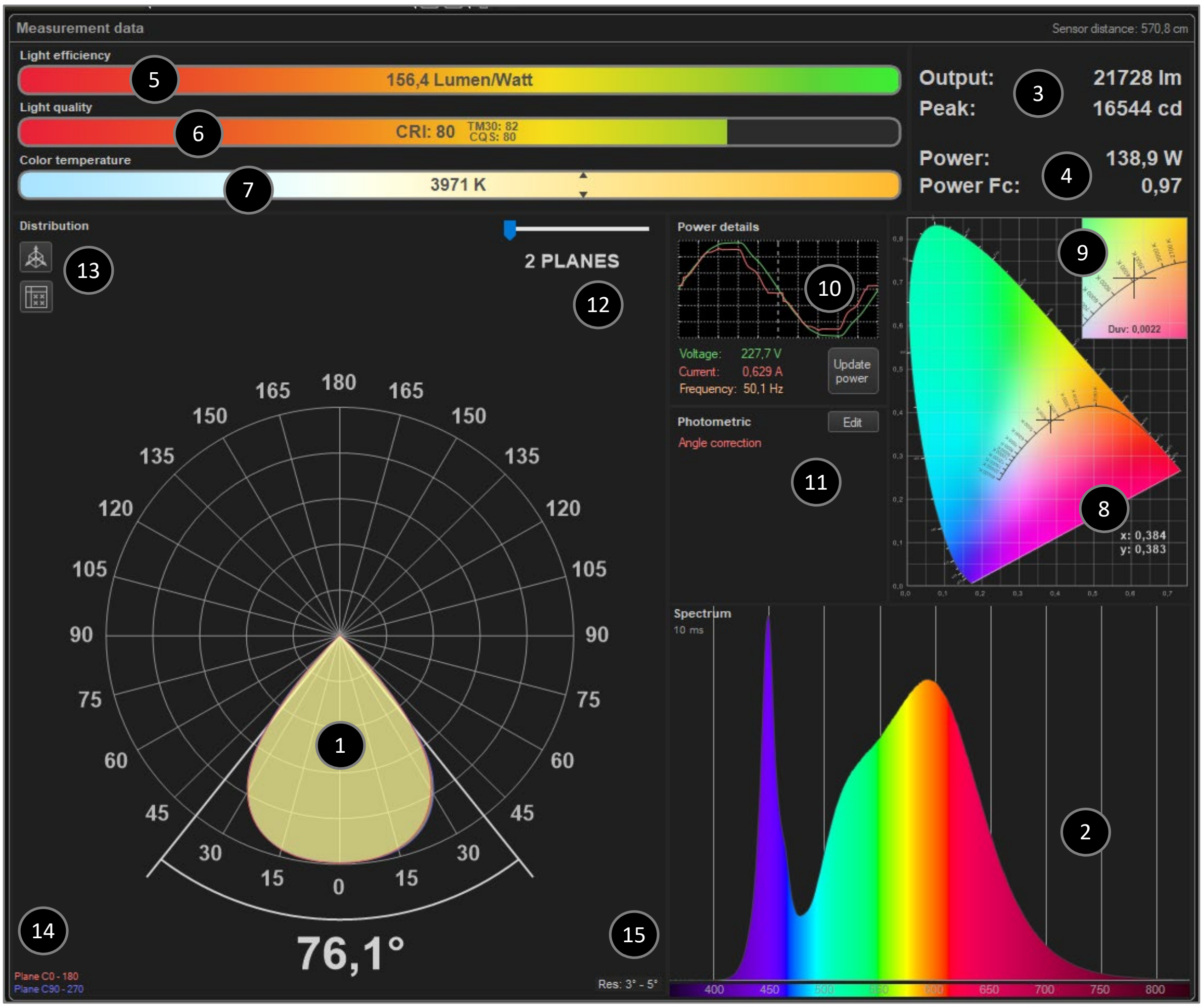


If you forget to turn off the laser, it will turn off automatically after about 10 minutes.

5.10. Measurement results

Note: Marked with green are **{KEYWORDS}** that can be used to extract data in various kinds of reports.

Main Window Output



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

1. The angular light intensity distribution – red curve is C-planes 0-180, blue curve is C-planes 90-270.

   The distribution (from all C-planes) is used to calculate the average beam angle (crosses at 50% of peak value).

   {HALFILLUMANG} returns the angle where the illuminance (average at the given angle for all planes) is half of the illuminance on a plane perpendicular to the gamma 0 direction.
   {HALFILLUMANGC0} returns the angle where the illuminance for C-plane 0-180 is half of the illuminance on a plane perpendicular to the gamma 0 direction.
   {HALFILLUMANGC90} returns the angle where the illuminance for C-plane 90-270 is half of the illuminance on a plane perpendicular to the gamma 0 direction.

Report keywords
Keyword **{INTTIME}** returns the integration for the measurement. If more than one was used, use **{INTTIME_MAX}** and **{INTTIME_MIN}** return max and minimum values of the integration time.

Keyword **{LUM#},** where **{LUM}** returns the overall lumen package, {LUM90} returns the lumen in 90 deg. cone, and {LUM45-90} returns in a 45-90 degree zone.
{LUM_DOWN} and **{LUM_UP}** returns the lumen packages in the lower and upper hemispheres.
{LORL} returns the Light Output Ratio of the DUT
{MSCP} returns the mean spherical candlepower

Keyword **{PEAK}** returns the value of this field (depending on measurement setup in cd, in W/sr or in µmol/(s·m²). To get specifically the W/sr value, use **{PEAK_WSR}**.

{PEAK45} returns the value in C-plane 45. **{PEAK_ANG}** returns the angle (format like “315H 0V” = C315° and gamma 0°). To get just C-plane, write **{PEAK_ANG1}**. To get just gamma angle, write **{PEAK_ANG0}**.
Keywords {PEAK_INT_80TO90}. {PEAK_INT_ABOVE90}, {PEAK_INT_ANG_ABOVE90}, {PEAK_INT_ANG_BELOW90}, {PEAK_INT_AT90}, and {PEAK_INT_BELOW90} return peak values in specific angular areas (dark sky).

Keyword **{INT#}** renders intensity (in cd or W/sr) per measurement angle, e.g., {INT80-45} returns the intensity in C-plane 80 deg, at gamma angle 45 deg.

{RINT} returns the real measured intensity where intensities at 0 and 180 deg were not averaged, e.g. {RINT45} and {RINT90-45] – real intensity in c-plane 90 and gamma 45 deg.

Keyword **{B_ANG}.** To get beam angles for separate planes, type {B_ANG#}, e.g. {B_ANG45} to get the beam angle in c-planes 45-225.

Other angles: {F_ANG} returns the field angles (10%) and {C_ANG} returns the cut-off angles (2,5%). Write e.g. {F_ANG45} and {C_ANG45} angle in c-planes 45-225.

2. The complete integrated spherical spectrum is shown in the spectral window. Integrated spherical spectrum is 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.

   In the corner, the spectrometer **integration time** is indicated (the “pick-up” time in spent in every measurement point).

3. The radiated output – default is luminous flux in lumens.

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

   Depending on the measurement setup (read more here: *Section 7.1, Window: Set photometric*), different values and unit appear in this area.

   - **Photometrical Units**: Standard output in lumen (lm) and candela (cd)
   - **Horticultural Units**: PAR region (400-700 nm) output in PPF (µmol/s) and PPFD (µmol/(s·m²) @1m)
   - **Radiometrical Units**: Radiated power output in W and W/sr
   - **Dose Units**: Radiated power output in W and W/sr and specific dose time (hh:mm)

4. The total power to the light source is indicated. 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 measurement 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 light source) and 0.0 being the worst. For a satisfactory level, the PF value should be located between 0.5 – 1.0.

5. The efficiency in lumen per watt is calculated by dividing the luminous flux in lumen by power consumption. The result is displayed in the efficiency bar with a corresponding color, where 100 lumen/watt it shown as the outmost green. The theoretical maximum value of 100% efficiency is 683 lumen/watt (green light at 555 nm). For broad-spectrum white light a theoretical maximum would be around 360 lumen/watt.
   In Dose Unit mode, this area looks different:

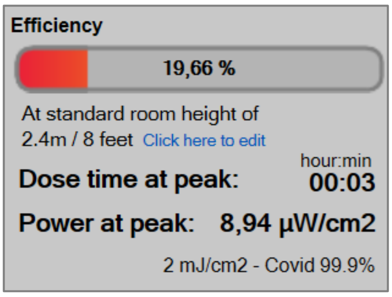
{PWR} return the power in W. **{PF}** returns the power factor, and **{DPF} returns the** power displacement factor. **{LPW}** returns the efficiency in lumen/W. **{RADPWREFF}** returns the efficiency in W/W (radiated/input).

{RCCT} returns the measured CCT of the overall integrated spectrum.
{CCT} returns the manually modified value of CCT (= {RCCT} if not modified).
{CCT#} returns the CCT of a specific c-plane and a specific gamma-angles, e.g. {CCT60-45}.

{CIEx} and **{CIEy}** returns CIE x,y coordinates for the integrated spectrum.
{CIEu} and **{CIEv}** returns CIE u,v coordinates for the integrated spectrum.
{CIEuMark} and **{CIEvMark}** returns CIE u',v' coordinates for the integrated spectrum.
{CIEx#} returns the CIE x coordinate of a specific c-plane and a specific gamma-angles, e.g. {CIEx60-45}, and similar for the other 5 keywords.
If CCT has been manually modified, use {RCIEx}, {RCIEy}, {RCIEu}, {RCIEv}, {RCIEuMark}, and {RCIEvMark} to get the original data.

{SDCM} returns the MacAdam step value.

{Duv} returns the Duv value
{DuvMarkLinDist} returns the delta (u',v') linear distance to the weigted average point in the CIE 1976 (u',v') diagram.
{DuvMarkLinDist90-150} returns Delta (u',v') in C-plane 90, gamma angle 150.

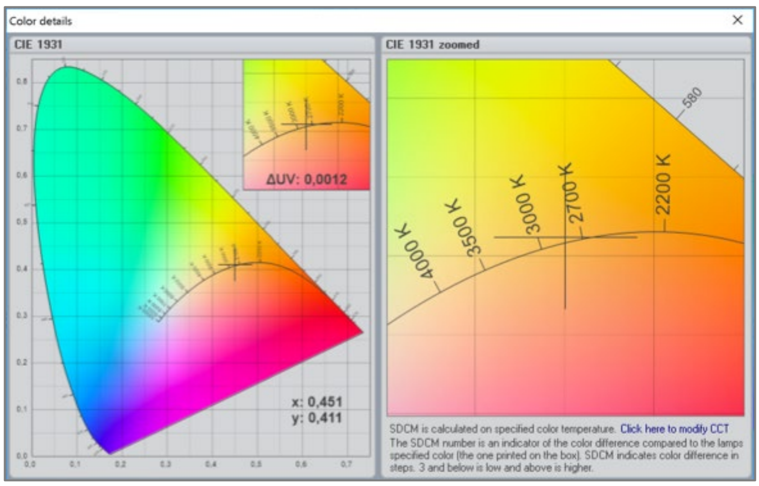


Read more in section 11.10, Working with doses of light / radiant exposure.

6. The CIE color renderings index, R_a or CRI is calculated using the standard 8 color samples. Although theoretically this value can be negative, in the graphics 0 indicates the worst quality and 100 indicates the best quality. The CRI can only be used for white light, so if the CRI is not shown 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. See more on page 94 about CRI.

7. The correlated color temperature indicates the integrated color of white light and is displayed in Kelvin. The graphics indicate 6,000 K as cold and 2,500 K as warm. The Kelvin scale was initially derived from the temperature of an ideal black body radiator. Therefore, a low color temperature is considered as warm light and vice versa. If the color 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. The radiated color is also shown with x,y-coordinates in the CIE1931 diagram/color space. The diagram illustrates all colors visible to the human eye. It is based on an experiment conducted in 1931 with a number of participants aiming at determining the eye's perception of color.
The black line in the diagram is called the black body locus [BBL] (or the Planckian Locus or black body curve). The BBL illustrates all colors that are perceived as white from warm to cold. The point corresponding to the measured color is shown with a black cross. It can be used to check the whiteness of a color by checking how close it is to the BBL: the closer it is to the BBL, the more accurate the white color is. Light sources above the BBL will have green tint, whereas they will have a red tint if the cross is below the curve.



When the color space is clicked, a larger, more detailed view is presented. MacAdam step values (noticeable color differences SDCM) can also be presented – see page 106, Window: Color Details. x,y-coordinates in x,y color space indicated.

9. Zoomed in version of color space. Crosshairs indicate measured value. Duv value (distance from point to BBL in u,v color space) indicated (+ = above BBL/- = below BBL).

10. Power details thumbnail. Click on the graph to open power details window.

11. Photometric overview – indicating activated changes. Click "Edit" to change details.

12. Plane slider (2 c-planes per plane). Slide to quickly compare measurement results in the captured measurement planes. Not active if there is only one measurement plane (= 2 c-planes, 000 and 180).

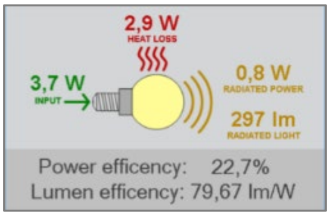
13. 3D-view button. Opens the measurement result in a 3D viewer window. Control sequence results button (only present when the present measurement result – see page 46, Window: Control sequence configuration).

14. Colors of main c-planes in light distribution image. A third set of planes can be added (containing peak plane). See section 8.13, Show Peak Plane

15. Measurement gamma resolution. If there are two numbers, the first indicates the gamma resolution in the beam section and the second number indicates the coarser gamma resolution outside the beam angle. Click grey text to get more details.

Report keywords
{GAMMA_RES} returns the gamma resolution in degrees
{V_ANG_NUM} returns the number of gamma angles (vertical angles) that was measured

Efficiency Details



For more detailed information, the three bars 'lumen/watt', 'CRI' and 'Color Temperature' can each be clicked, and a window will appear.

If the 'lumen/watt' bar is clicked, it shows how much of the consumed energy is actually radiated as light and what turns into heat, which gives an actual Power efficiency in %. Alternatively click on *View → Efficiency.*

Power Details

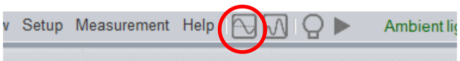
A standard Viso system contains a power analyzer. This means that the system will automatically analyze the feed to your light source if plugged into the built-in AC mains outlet.

In other words, your light source will be tested using your building mains feed (no stabilization or regulation).

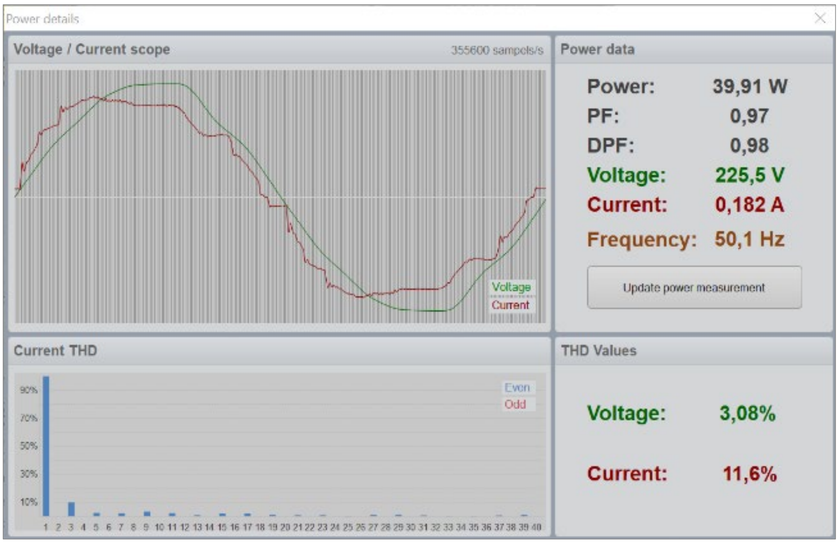
If you want to control or regulate the feed to your light source (AC and DC) you will need to connect a dedicated power supply.

The results in the power window are provided by the built-in power analyzer, unless you own a Viso LabPower, Viso LabAnalyzer, or another USB connected external power analyzer, in which case this field shows the results from this unit. Read more about connecting external power supplies and power analyzers in page 148, *Using external power supplies and power analyzers.*

A click on the "Power details" (or going to *View → Power details)*, brings up an enlarged view of the voltage and current curves.



Power measurements are taken just after stabilization and before the measurement starts. You may overrule this subsequently by clicking the "Update power measurement" button, and re-save your measurement, in which case the original power measurement is lost.



The green line illustrates voltage (often a sine curve). The upper part of the sine curve can sometimes have a flat top, which is explained by power grid distortions. The measured current is presented with a red line and displays how the current is consumed by the light source.

Report keywords

{PWR} returns the power in W. **{PF}** returns the power factor, and **{DPF} returns the** power displacement factor. **{LPW}** returns the efficiency in lumen/W. **{RADPWREFF}** returns the efficiency in W/W (radiated/input).

{VOL} Voltage

{CUR} Current

{FREQ} Frequency

Power Factor, PF

The power factor is an indication of how well the current is consumed through an AC voltage period. The power factor is calculated according to the following principle: the value of the consumed power is divided by the product of the voltage and the current.

$$PF = \frac{\text{Power}}{\text{Voltage} \cdot \text{Current}} = \frac{26{,}97\ \text{W}}{230\ \text{V} \cdot 0{,}120\ \text{A}} = 0{,}98$$

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

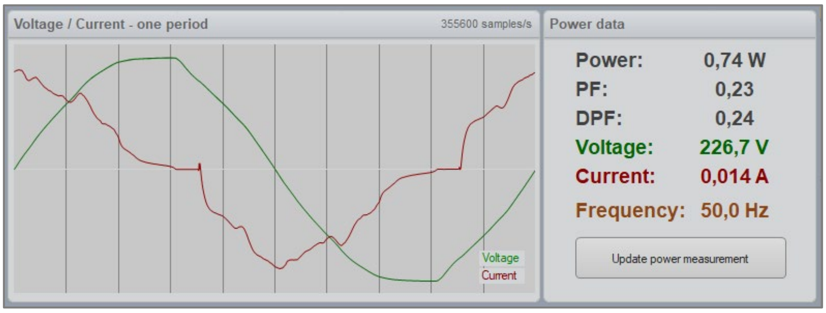
When the current is not consumed by the light source efficiently, the cabling during installation should be adjusted accordingly. The excess current will result in power loss due to cable heating, etc. A general rule is the following: a 10 W light source with a PF 0,5 must be connected to an installation capable of supplying 20 W. The corresponding formula reads installation W = Power/PF.

Displacement factor, PF

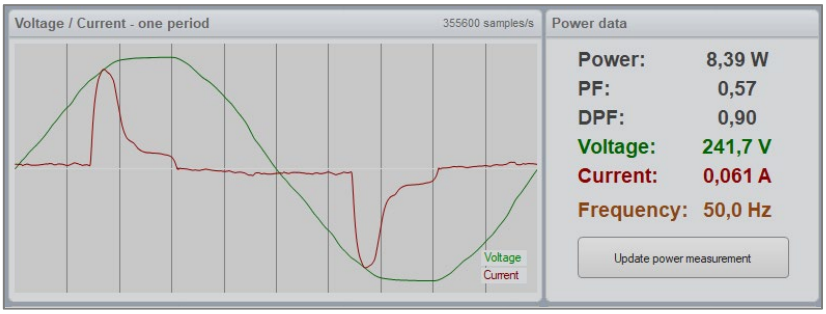
DPF is another measure of the "efficiency" of power delivery, or a ratio between the useful energy delivered and the burden on the electrical system/mains. The DPF is the "power factor" of just the 50/60 Hz portion of the waveform for voltage and current. DPF is computed as the sine of the phase angle between the current and voltage fundamental sine waves.

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.

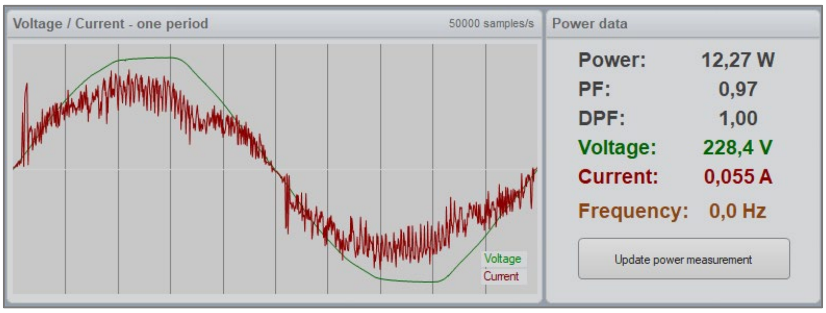
Example 2
Shows an LED bulb that has a passive capacitor power supply, which results in a high phase shift between current and voltage, thus resulting in a very low power factor of 0,23 and displace factor 0,24.



Example 3
Shows an LED bulb of a medium quality switch-mode driver with a high-capacity peak load, thus a medium quality power factor of 0.57. The displacement factor is as high as 0,9 because the fundament signal is in phase.



Example 4
Shows an LED bulb having a switch-mode driver with 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 – but PF and DPF both look nice.



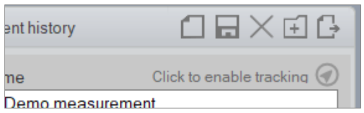
5.11. Measurement Tracking (Optional)

In a world in which thousands of new lighting products are released into the market each month it is difficult to keep track of the quantity of measurement data that accompanies each new product.

With current measurement technology, it is impossible to know when and where an IES file or PDF report was generated because it is easily altered. Also, it is not always possible to track information about modifications made to the IES file, and other information is also not available like symmetry, angle, and intensity corrections.

The Light Inspector software has a unique feature called “Measurement Tracking”:

- You have the option of storing measurements on Viso’s tracking server, including the date, time, and location of the measurement.
- Measurement tracking gives each measurement a tracking number verified by the Viso tracking server.
- External partners may access the complete measurement file (or parts of it) and posterior changes with just the tracking number available.
- You may track measurement in real-time or in a posterior process. Press “Click to enable tracking” in the upper right-hand corner to enable tracking of a single measurement.



- You may set tracking as a default option – see *page 33*

Report keywords

{TRACK_NUM} returns the tracking number

{TRACK_LINK} returns the link to the tracked measurement

Another powerful use for organizations is to keep track of measurements for internal use by, for example, the development team, in order to track the impact of design revisions on the light measurement. In addition, organizations can use measurement tracking to verify that the measurement data they receive from their LED supplier has indeed been done at a particular date and time and use the tracking number to retrieve the measurement data from the Viso server. This is a particularly beneficial in the quality control process.

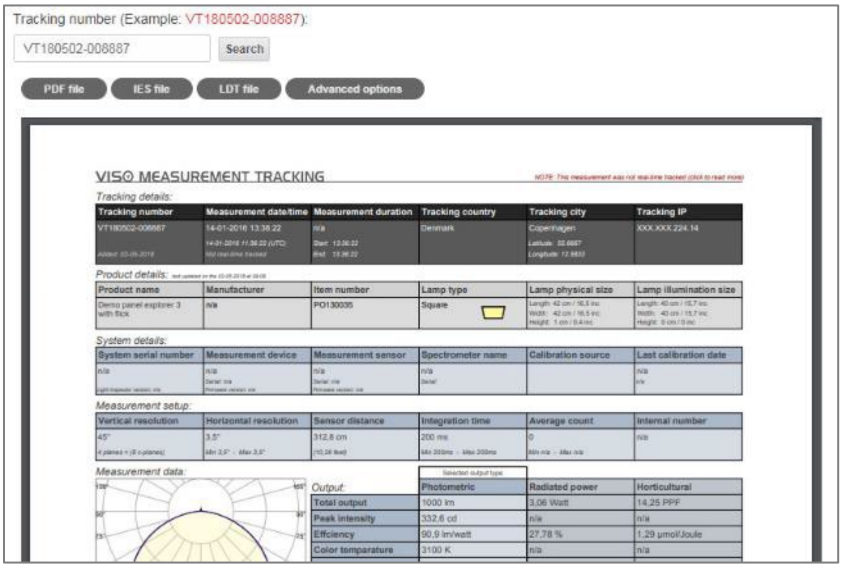
Further, the external storage will also be a safe place to recover your data if they are lost locally.

The tracking number has the following format “VT180502-008887”. The first 6 digits are the date of the measurement YEAR/MONTH/DAY where 180502 is the 2 of May 2018. The following 6 digits is a unique random generated measurement number.

With the tracking number, it is possible to track the measurement on the Viso tracking server by using the following link: https://www.visosystems.com/tracking

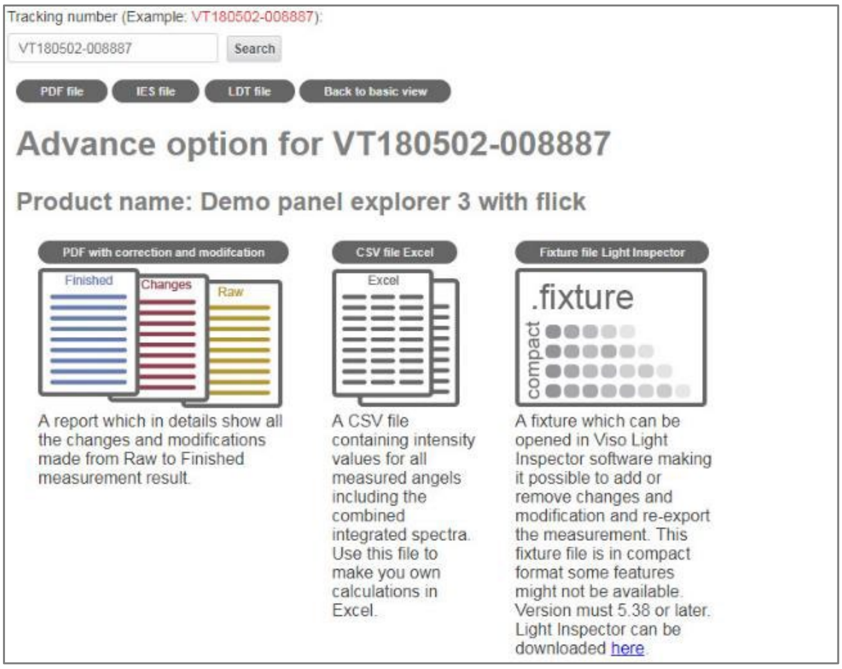
It is also possible to make a direct tracking link to a specific measurement using the following format https://www.visosystems.com/tracking/?id=VT180502-008887

On the tracking site (as shown below) the finished measurement data can be seen, and it is also possible to download the measurement as IES and LDT files.



The tracking number is also embedded in the IES and LDT files which makes measurements fully traceable by time and date allowing for full transparency between supplier and buyer as well as internal departments.

Advanced details can be accessed by clicking on the “Advanced option” button as shown below.



The advanced options include the option to export a 3-page report showing the raw measurement, changes made (such symmetry correction, etc.), and the finished measurement.

The measurement can also be exported into CSV for MS Excel making it possible to make custom calculations.

Finally, the measurement can also be exported into a fixture file for the Light Inspector software making it possible to add or remove modification as well as export it to your own designed PDF layout.

What is Real-Time Tracking?

Real-time tracking means a measurement was tracked at the exact moment the measurement took place. During a real-time tracked measurement, the Viso tracking server communicates with the measurement system in order to accurately verify and register the place and time of the measurement.

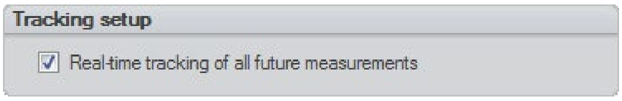
Real-time and non-real time tracked measurements are marked as shown below.

This measurement was real-time tracked
and
NOTE: This measurement was not real-time tracked

A measurement that was not real-time tracked, is typically a measurement which has been manually added to the tracking server after the measurement took place.

When a measurement is added to the tracking server afterwards, the measurement time will be stored locally in the measurement file and be used as the reference of the measurement time. The measurement location is then recorded as the location where the measurement was manually added to the tracking server thus giving less precise tracking data.

To ensure all measurements are real-time tracked, “Real-time tracking of all future measurements” must be enabled as shown below. (*Setup* → *Options* → *Basic*)



Tracking data does not contain any personal/confidential information such as name or computer name. It only contains the measurement including date, time and location.

A tracked measurement can only be located on the Viso Site using the tracking number and is not made available in any way to the general public.

Tracked measurements can always be deleted by the user.

Direct link without using the Viso website can be used for embedding data into your website. Direct link examples are shown below.

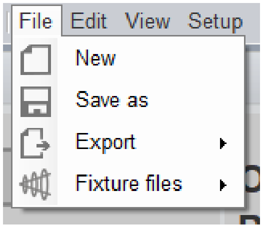
Tracking result: http://www.luminetwork1.com/tracking/?id=VT180502-008887

PDF report only: http://www.luminetwork1.com/tracking/VT180502-008887.pdf

IES file only: http://www.luminetwork1.com/tracking/VT180502-008887.ies

LDT file only: http://www.luminetwork1.com/tracking/VT180502-008887.ldt

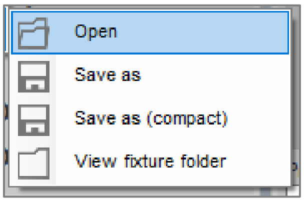
6. Menu: File



The File menu contains:

- New – Creates a new empty measurement
- Save as – Save the current measurement
- Export – See *page 123*

6.1. Files



The Fixture files submenu, allows the user to (format *.fixture* is a Viso Systems format):

- *Open* – Open a specific *.fixture* file
- *Save as* – Save the current measurement to a destination measurement folder on your PC
- *Save as (compact)* – Save to current measurement as a compact *.fixture* file. This is a much smaller version with limited spectral data
- *View fixture folder* – Opens the measurement folder

The measurement will now be filed locally on your PC or in another chosen location.

The 20 last measurements will be held automatically – so you can also go back and store them later.

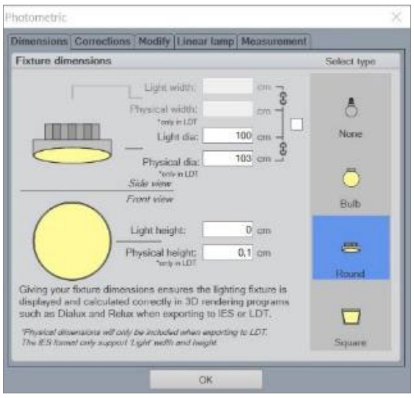
Fixture files contain all measurement basics, measurement results and all of the information you choose to attach or enter manually, such as flicker measurements, image files or various typed-in data.

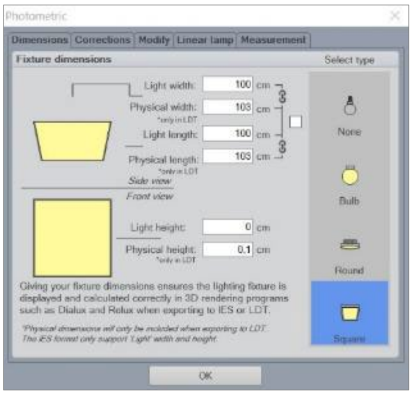
7. Menu: Edit

7.1. Window: Set photometric

Important: No correction or modification will change the original, measured data. All modifications can be removed again.

Tab: Dimensions





To calculate the correct light outputs for further visualization, it is necessary to insert the dimensions of the measured lighting fixtures (bulbs, spots and panels) in the table as shown in the figures. The table is found under:

Edit → Photometric → Dimensions.

This feature enables the data files to reflect the luminous and physical dimensions for a more accurate visualization in 3D lighting software, such as DIALux and Relux.

Report keywords:

{HEIGHT_FT}, **{LENGTH_FT}**, and **{WIDTH_FT}** return luminous surface dimensions in feet.

{HEIGHT_M}, **{LENGTH_M}**, and **{WIDTH_M}** return luminous surface dimensions in meter.

{HEIGHT_MM}, **{LENGTH_MM}**, and **{WIDTH_MM}** return luminous surface dimensions in millimeter.

{HEIGHT_LMP_M}, **{LENGTH_LMP_M}**, and **{WIDTH_LMP_M}** return housing dimensions in meter.

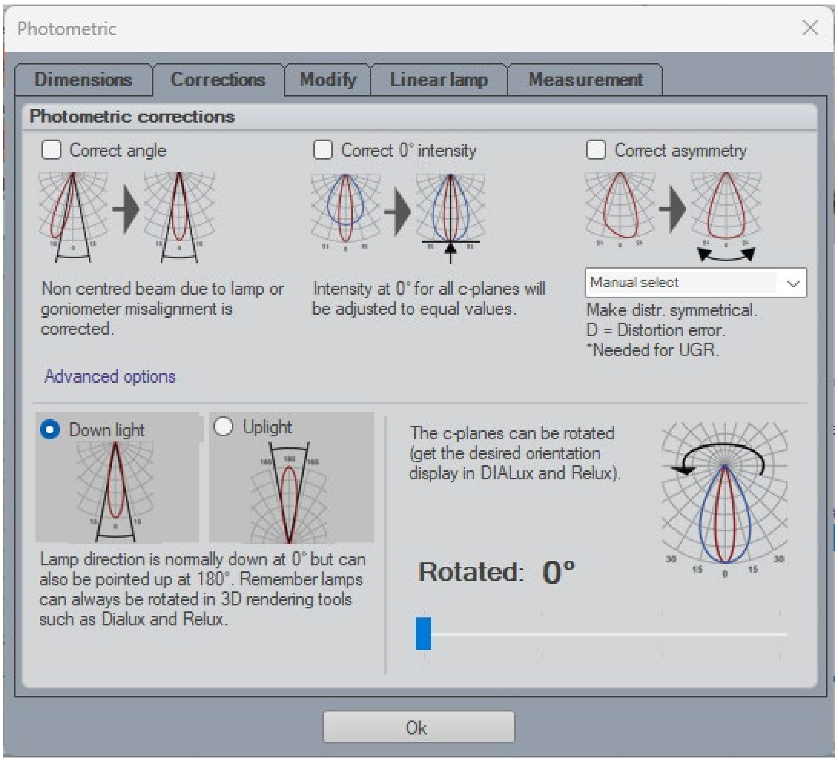
{HEIGHT_LMP_MM}, **{LENGTH_LMP_MM}**, and **{WIDTH_LMP_MM}** return housing dimensions in millimeter.

{LUMINOUS_SHAPE} returns the shape of the luminous surface such as spherical, panel or spot.

Tab: Corrections

Options can be selected under the Photometric tab to let the light source software autocorrect an off-centered beam, for either one or several planes or correct for asymmetry. These options can be useful when measuring light sources with asymmetric or tilted intensity distribution curves; for example, outdoor or automotive lighting fixtures can yield slight tilts, which can be corrected by the software.

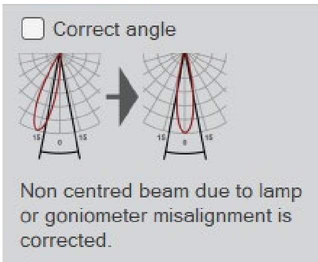
Edit → Photometric → Corrections



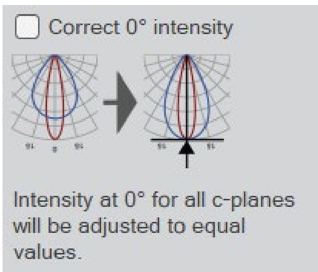
Ideally, corrections should be avoided. If measurements turn more asymmetrical than expected, alignment has probably not been correct, and the measurement should be corrected and repeated. Good alignment is especially important for narrow beam light distributions as the peak direction is easily missed. Choosing 8 measuring planes or more to some extent compensates for small alignment errors.

If you choose to make posterior correction, the result of corrections in terms of altering the peak intensity or lumen package is displayed for information.

Correct angle adjusts the off-centered intensity distribution relative to the 0° axis, so that it becomes symmetrical.



Correct 0° intensity equates the intensities at the 0° axis for all of the C-planes during a measurement, as sometimes the intensity values for different C-planes can vary due to goniometer misalignment or wobbly fixation to the goniometer.
Note: Mismatch of 0° intensity in different c-planes may also result from inadequate stabilization! *(See Stabilizing the Light Source, pg. 59)*. Discard the measurement, stabilize and measure again.

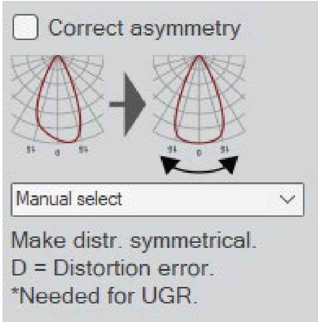


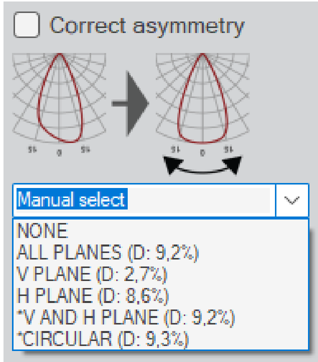
Correct asymmetry modifies the profile of the distribution to be vertically symmetric.

The systems allows the user to choose between various symmetrizing options and will prompt the most probable build on the actual light distribution.

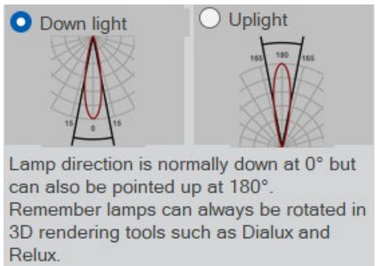
Symmetrizing is necessary if you require calculation of UGR (unified glare rating). For this purpose, only the options “V AND H PLANE” and “CIRCULAR” (both marked with an asterisk) are allowed.

This modification should not be applied for light sources with off-centered beams, like street lighting systems.

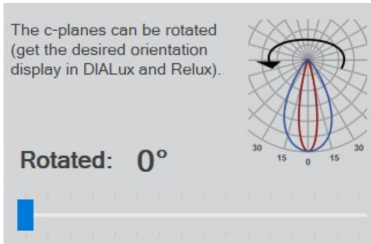




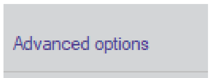
Downlight/Uplight. Reverses the light output 180 degrees. Uplights need to be measured as if they were downlight – and then the direction is shifted in this posterior process.

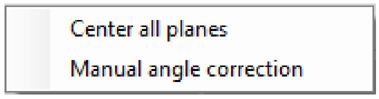


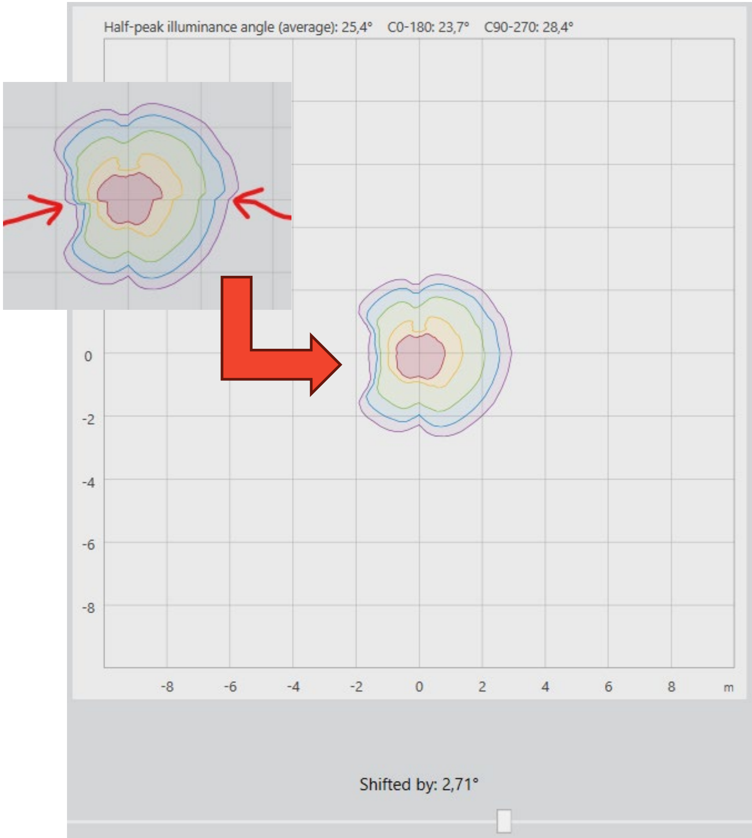
Rotate distribution – c-planes. Use the slider to rotate the whole light distribution around the vertical axis. Only actually measured planes can be chosen. By definition, it is not possible to rotate around other axes than 0 (vertical).



Advanced options – click this text and get the option of centering all planes or making advanced adjustments.
With manual angle correction it is possible to correct small start position misalignment of the gonio base. For narrow beam light sources, misalignments are extremely hard to avoid, so corrections are allowed as long as the overall result is not manipulated.
Use the slider in the bottom to correct your output.



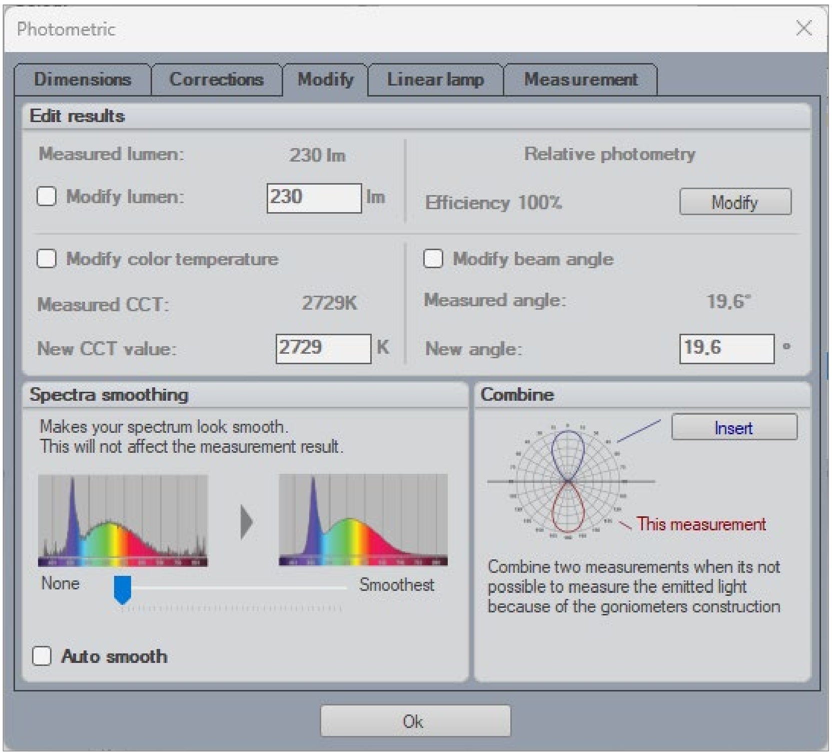




Tab: Modify

Edit → Photometric → Modify /**Edit Results**

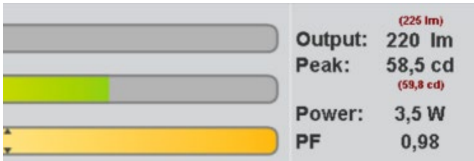
Under *Edit Results* the lumen, color temperature and beam angle can be edited so the exported PDF report shows the desired values in accordance with the customer's expectations (e.g., 3200 lm in the report versus 3219 lm from the measurement). This would usually be rounded numbers, or numbers that reflect the average of several measurements. **These corrections do NOT affect the fundamental measurement results and can always be reversed.**



It is important to keep in mind that a corrected lumen value also affects the calculated intensity in candela.

Adding a new CCT value also serves a reference point for SDCM calculations. Read more in *section 8.5 Window: Color Details on page 106.*

In the original data file, the measured values will always be displayed in parenthesis above the overwritten numbers, like in the example below.



Relative photometry efficiency can be used to show the difference between the measured light source lumen and the lumen of the naked light source used in the lighting fixture.

Spectral Smoothing

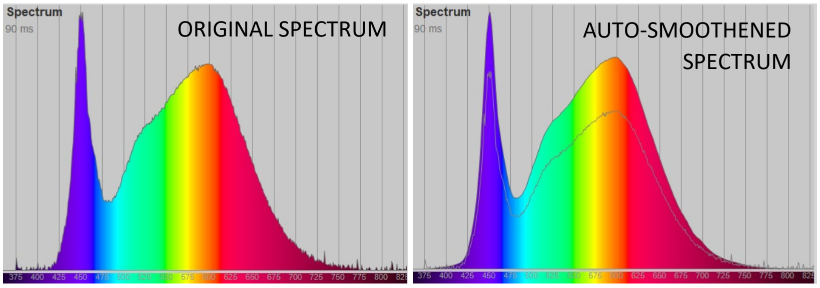
Spectrum smoothing can be used make the spectrum look smoother for use in PDF reporting, web sites etc. The smoothing will not affect the original measurement

Report keywords

{REL_EFF} returns the relative photometry efficiency, η (Greek eta)

{SOURCE_LUM} returns the lumen value of the light source when using relative photometry.

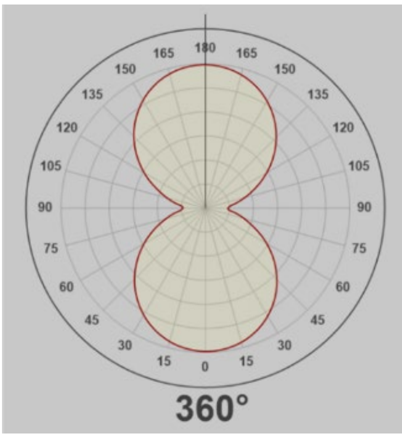
result. In the dashboard, after smoothing, you will see the original spectrum as a fine line scaled to roughly 75% of the smoothened spectrum.



NOTE: A non-smooth spectrum may also be a sign of need for calibration or for other interferences.

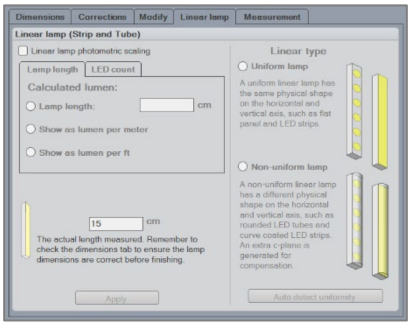
Combine

For all light measurements systems, it is challenging to measure a lighting fixture, which emits light in 4π (all directions), as the goniometer structure can block the light. To overcome this, the front and back of the lighting fixture are measured separately. The two intensity distributions are then merged to represent the fully spherical radiation. Thus, the "insert measurement" button will open a dialog for the additional data file, and then the two curves will be combined. Also see *page 145, Omni-directional Light Sources*. Remember to save under a new name.



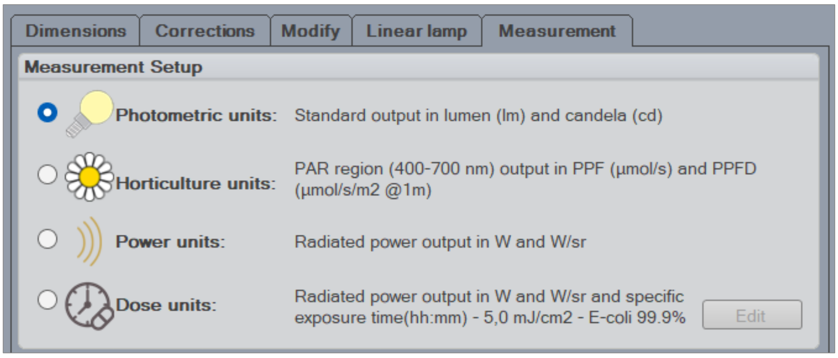
Tab: Linear Lamp

Linear Lamp is a LightSpion only feature, making the system capable of measuring linear light sources by masking of the fixture, so only a specific portion of the light is measured. After the measuring process is finished, the actual length of the light source is typed into the software and the complete light output of the linear light sources is then calculated. For linear light sources of flexible lengths such as LED strips it is possible to get the light output information specified in lumen per meter or foot.
See more about this in the LightSpion User Manual.
The Linear Lamp feature assumes that the measured portion of the light source is representative of the entire length. As this is not always the case, care should be taken that extrapolation of measurement



results increases the inaccuracy of the results. Thus, it is recommended not to extrapolate more than 500%. This means that a LightSpion without Extender will be able to measure linear light sources with a length up to 8 cm * 5 = 40 cm, and a LightSpion with Extender will be able to measure up to 22 cm * 5 = 110 cm with an acceptable accuracy.

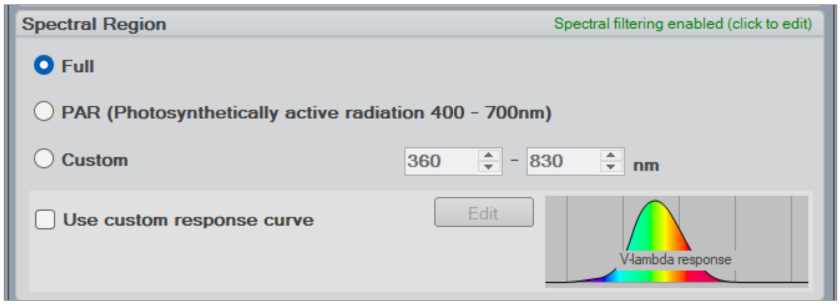
Tab: Measurement



Under the **Measurement Setup** you can change measurement output to fit your own purposes. In any case, all output are calculated from raw measurement data in radiometric units (W and W/sr).

- **Photometrical Units**: Standard output in lumen (lm) and candela (cd). Standard Viso output is adjusted to human eye photopic sensitivity (CIE photopic luminosity function V(λ) is a function may be used to convert radiant energy into luminous (i.e., visible) energy. Viso uses CIE 018:2019 conversion).
- **Horticultural Units**: PAR region (400-700 nm) output in PPF (µmol/s) and PPFD (µmol/s/m^2 @1m). PAR is photosynthetic active radiation. PAR light is the wavelengths of light within the visible range of 400 to 700 nanometers (nm) which drive photosynthesis.
- **Radiometric Units**: Radiated power output in radiant flux W=J/s and radiant intensity W/sr. Summarizes the raw radiated output per wavelength.
- **Dose Units**: Radiated power output in W and W/sr and specific dose time (hh:mm). This setting is particularly interesting for UV lighting – germicidal UV light sources and for other purposes such as curing of glue and plastics. Read more in section 11.10, Working with doses of light.

Under the **Measurement Setup** you can also change the Spectral Region:



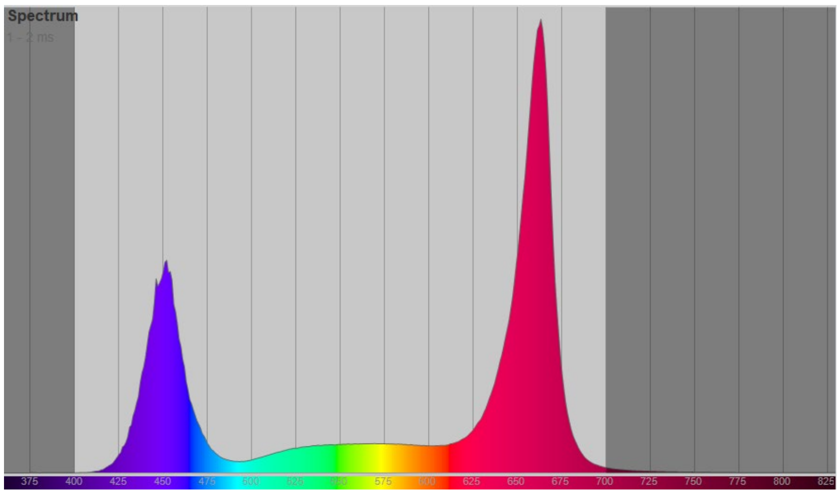
Full Will include the full spectral range for the specific system.

- Most LightSpions: 350-800 nm
- BaseSensor and LabSensor VIS: 360 - 830 nm
- BaseSensor and LabSensor UV-VIS: 200 - 850 nm
- BaseSensor and LabSensor VIS-NIR: 360 - 1100 nm
- BaseSensor and LabSensor UV-VIS-NIR: 200 - 1100 nm

PAR PAR light is the wavelengths of light within the visible range of 400 to 700 nanometers (nm) which drive photosynthesis.

Custom Set your own range. E.g., from 250-260 nm.

The dashboard spectrum plot will change to reflect any changes in the spectral region. Omitted regions are now in dark grey as shown in the PAR example below, but fundamental measurement results are not altered.



The spectral region can be changed back to “full” at any time.

Finally, the response curve can be changed. Default response curve is the human eye photopic sensitivity - CIE photopic luminosity function V(λ).

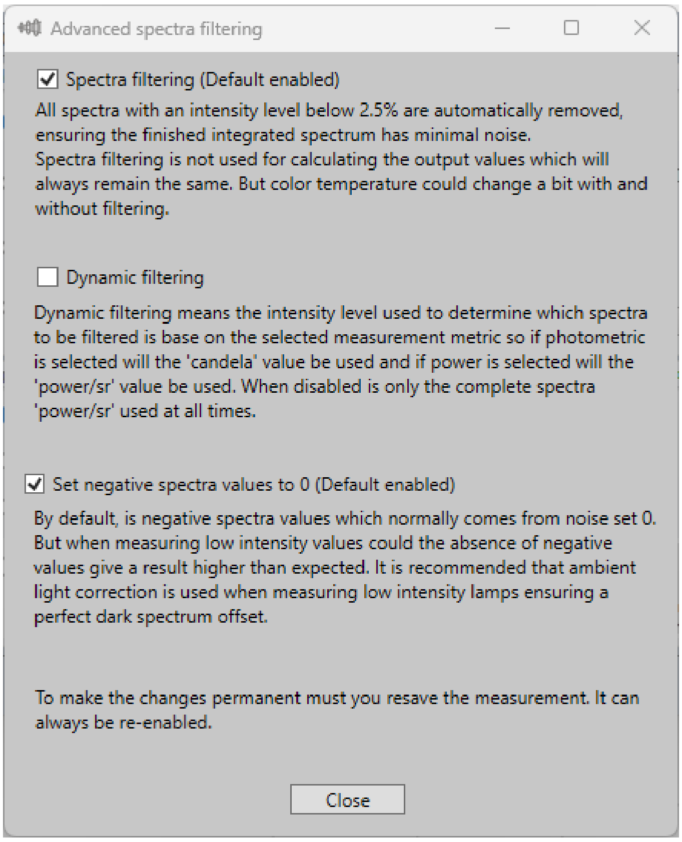
Other response/sensitivity curves can be entered:

- Curves that indicate other human eye sensitivity scenarios: Scotopic and mesopic light conditions are interesting in outdoor lighting
- Blue light hazard sensitivity curves
- Melanopic, α-opic curves etc. are interesting in photobiology

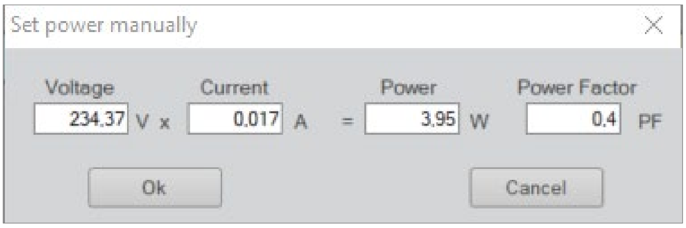
- Photosynthesis action spectra are interesting in horticultural lighting
- Curves that indicate specific virus/bacteria sensitivity to wavelengths also called “action spectra”.

Read more about this feature in *section 11.11, Working with Special Response/Sensitivity Curves.*

Advanced settings: Spectral filtering

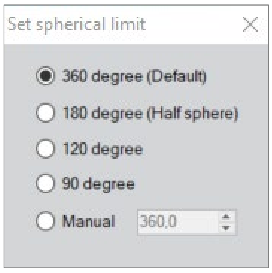


7.2. Window: Power - Set Power Manually



This window allows you to input the power readings manually. It is useful if you use an external DC power supply. By typing your values, you will have them saved with the rest of the measurement data. Further, the system will also be able to calculate efficacy.

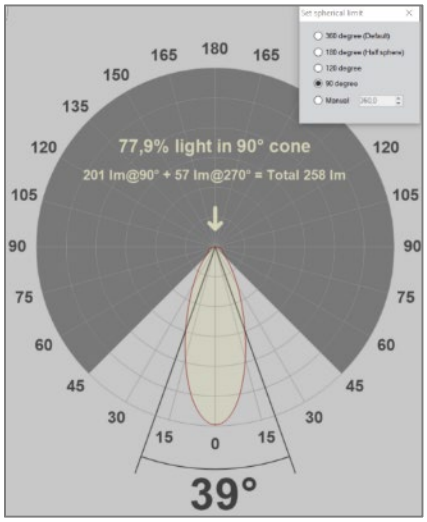
7.3. Window: Spherical Limit Cone



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 measurements are generally done in a full sphere of 360°. EU Ecodesign requires measurement of the directional light sources 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. It can be set afterwards and can also be used for previously made 360° measurements. To the right is an example of the differences in the flux at 90° cone, where 57 lm is considered as a waste outside the 90° cone.

Press the "save" icon to preserve this setting.

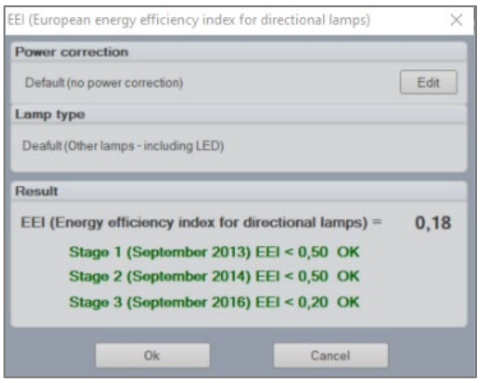
This function can also be an effective way of reducing errors due to stray light from the wall behind the goniometer.

7.4. Window: EEI (European Energy Efficiency Index)

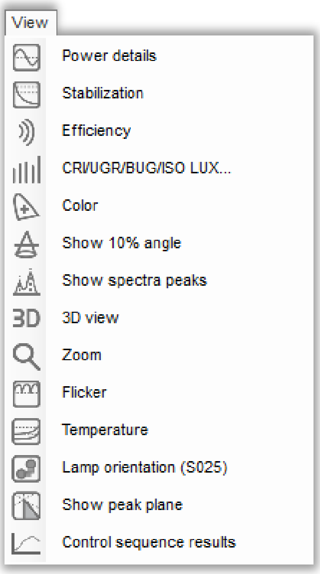
Note: Omitted in the latest software versions

This feature enables you to investigate whether your light source is compliant with the energy consumption requirement set by the EEI (European Energy Efficiency Index for Directional Light sources).

By pressing the "Edit" button you will be able to enter category information about your specific light source. From this information, the software will calculate the EEI index for comparison with the require-ments (in green).



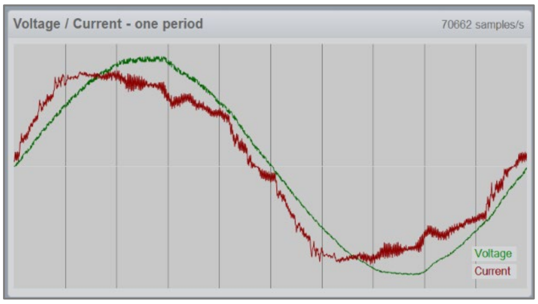
8. Menu: View



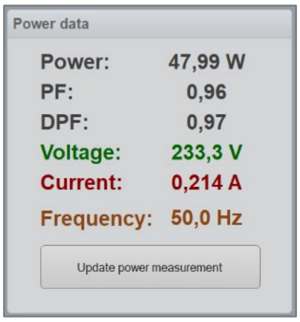
Under this menu point, you can access the in-software measurement data presentation options and views.

8.1. Window: Power Details

Voltage / Current Scope
This shows the voltage and power curve as measured by the power analyzer and it also shows the sample rate.



Power Data
This shows the different power information



Report keywords

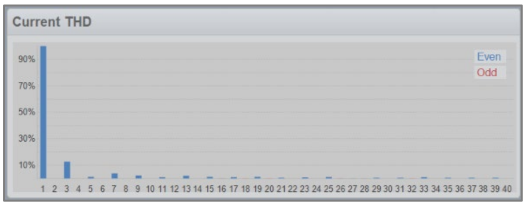
{PWR} returns the power in W. {PF} returns the power factor, and {DPF} **returns the** power displacement factor. {LPW} returns the efficiency in lumen/W. {RADPWREFF} returns the efficiency in W/W (radiated/input).

{VOL} Voltage

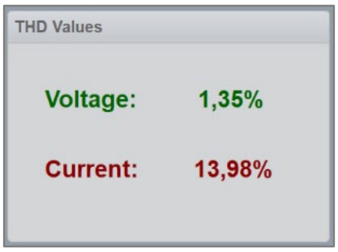
{CUR} Current

{FREQ} Frequency

Current THD
This shows the total harmonic distortion graph for the current.



THD Values
This shows the total harmonic distortion values for both voltage and current.



Report keywords

{THDC} returns the total harmonic distortion of the current

{THDV} returns the total harmonic distortion of the voltage

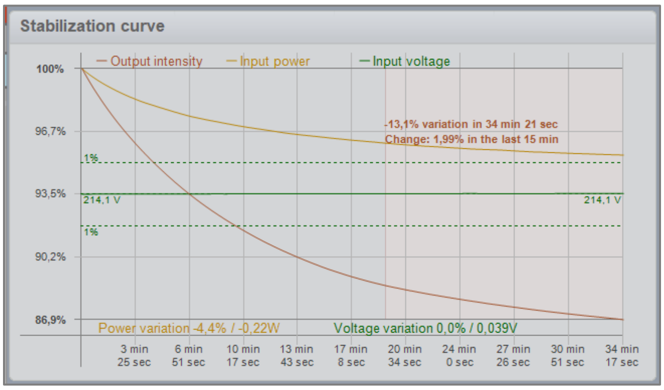
{VOL_HARM#} Voltage harmonics percentage #1-40

{CUR_HARM#} Current harmonics percentage #1-40

8.2. Window: Stabilization Details

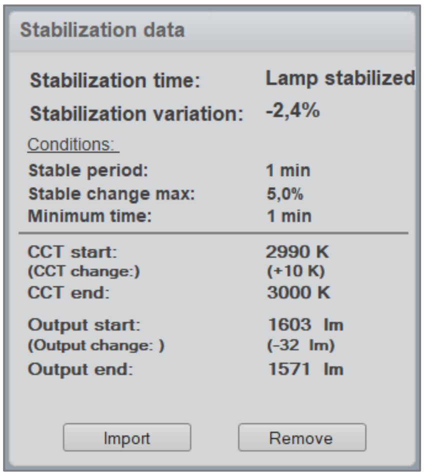
Stabilization Curve

This shows the graph generated during warm-up.



Stabilization Data

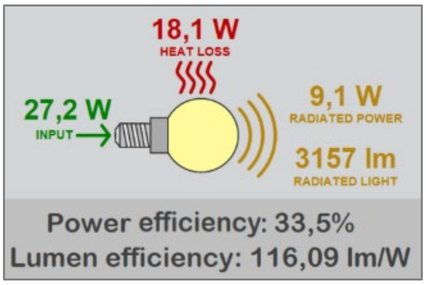
This shows some details about the stabilization variations



8.3. Window: Efficiency Details

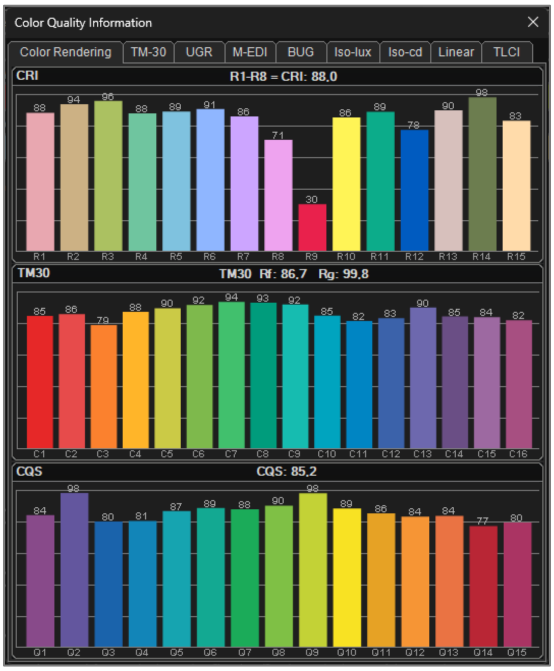
In this window the total energy conversion details are illustrated.

Most LED solutions convert about 1/3 of the power input to visible light. For incandescent lamps, power efficiency is around 5-10%.



8.4. Window: CRI/UGR/BUG/ISO LUX - Color Quality Information

To open this window, click View → CRI/UGR/BUG/….



Tab: Color Rendering

CRI (Color Rendering Index)

The CRI (Color Rendering Index) is calculated based on the standard test colors, which examine the chromatic adaptation of light. The higher the CRI value of a light source, the more accurate the color appearance of an object is.

Report keywords

{CRI} returns the over CRI of the integrated spectrum. Report keyword **{R#}** returns the single values of R, # indicating which, e.g., {R9}

The standard set consists of 15 test colors, but only the first 8 of them (R1-R8) are used to calculate the CRI, whereas the remaining R9-R15 are typically not used. Sometimes, however, LED light sources do not have much output in the deep red end of the spectrum (which affects the R9 value), which is why it is becoming more common to specify the R9 value as well.

R1-R15 values can be viewed in the CRI details window, which is opened by clicking on the CRI bar or selecting View → CRI details.

At the color tables above, we can see that the red bar (R9) is rather low compared to the rest of the values. In some situations, R9 can even be negative due to particularly low levels of the red light.

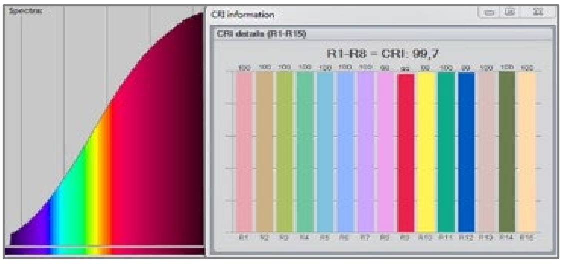
CRI, CQS and TM30 are indexes used to determine how well colors are rendered by light sources as compared to the sun. CRI is the industry standard and is the only internationally recognized color rendering index. TM30 is presented overleaf.

CRI’s test color samples have long been problematic, firstly because there are so few reference colors, and secondly, they are not fully representing the colors in our environment. Furthermore, the CRI just indicates the size of an error, but not the implication in terms of saturation or color shifts. The index is made by combining only a few pigments whose spectral features are not uniformly distributed across visible wavelengths, making them more sensitive to certain wavelengths than others. This allows CRI to be easily "tricked" by selectively optimizing spectral power distribution in ways that boost CRI without actually improving average color fidelity.

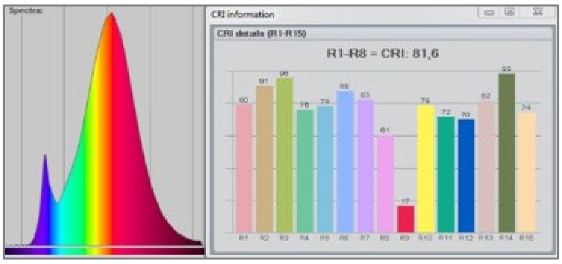
For example, an LED can be classified with a CRI over 80 and yet render red very poorly. A poor red reproduction may not matter much in a general lighting setting although it will cause people to look pale, but it could cause LEDs to be insufficient for use in food stores, art galleries, hospitals etc.

Below, there is a few examples of CRI on different light sources.

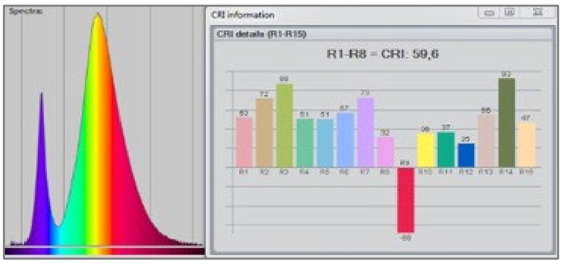
Example 1
Shows a standard tungsten light source. Its continuous spectrum has the closest resemblance to the Sun; therefore, the CRI values are the highest.



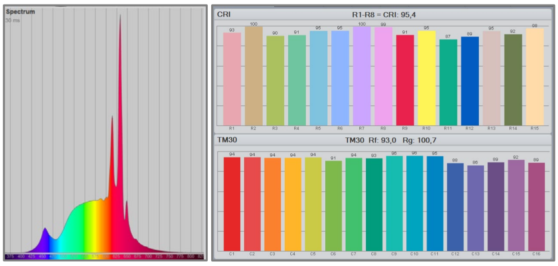
Example 2
Shows a household LED bulb with a low red R9 value.



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 color boost, so that the LED's R9 value is increased.



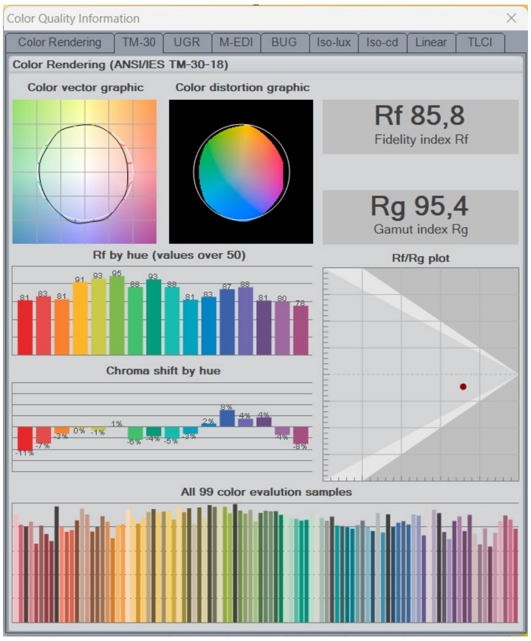
CQS (Color Quality Scale)

The CQS (Color Quality Scale) is an alternative scale developed at NIST and is mainly used in the U.S. lighting industry. It is an updated scale that was designed to address some of the shortcomings of CRI. The CQS method seeks to improve on CRI by using a larger set of test samples including the saturated colors as well as earth colors and skin tones. Also, the CQS calculations are intended to prevent development of light sources that score a high overall index through manipulation of distinct colors. Still, CQS only tests fidelity. Its ability to describe color rendition accuracy is limited while its strength is being a measure for color preferences.

Report keywords

{CQS} returns the over CQS of the integrated spectrum. Report keyword **{Q#}** returns the single values of Q 1-15, # indicating which, e.g., {Q9}.

Tab: TM30



IES TM-30-18 is the most recently developed method of evaluating color rendition and is set to replace CRI.

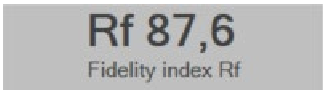
The Illumination Engineering Society of America (IES) has suggested the TM-30 test method, which has been designed to overcome the limitations of fidelity-based metrics such as CRI and CQS. The TM-30 addresses some of the apparent shortcomings associated with the color space, test samples, and characteristics of the reference illumination, and generates more detailed metrics that describe not only fidelity but also gamut and a color-vector graphic that helps the end user anticipate the light source's performance in their intended application.

TM-30 uses a much larger set of color samples than both the CRI and CQS test methods. 99 Color Evaluation Samples (CES) have been selected, with spectral properties representative of real objects such as paints, textiles, skin tones and inks.

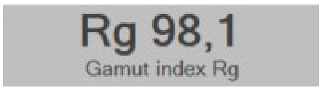
The TM-30 uses 99 colors, whereas the CRI uses only uses eight colors. A lighting manufacturer could ‘trick’ the CRI system by ensuring that certain peaks of the light source spectrum matched one or more of the CRI’s eight color samples and thereby achieve a falsely high CRI value. TM-30 has 99 color samples and is almost impossible to ‘trick’.

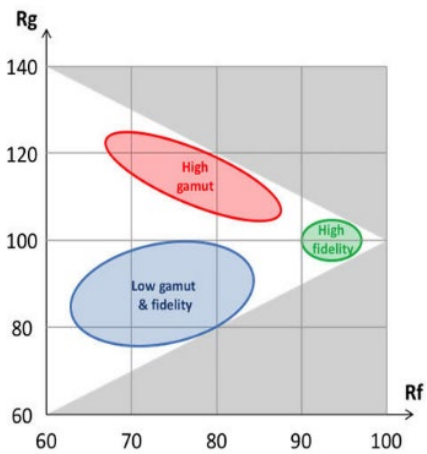
The TM-30 uses a Fidelity Index, Gamut index and Color Vector Graphic to represent the light source’s color rendition properties. The Light Inspector (v5.85 and later) calculates the TM30-18 values.

TM30-18 Fidelity Index (R_f)
R_f which is a similar metric to the CRI (Ra) standard that measures color rendering based on comparison to a color palette of 99 colors (CRI only had 8)
IES Rf (ANSI/IES TM-30-18) ad CIE Rf (CIE 224:2017) are equivalent measures



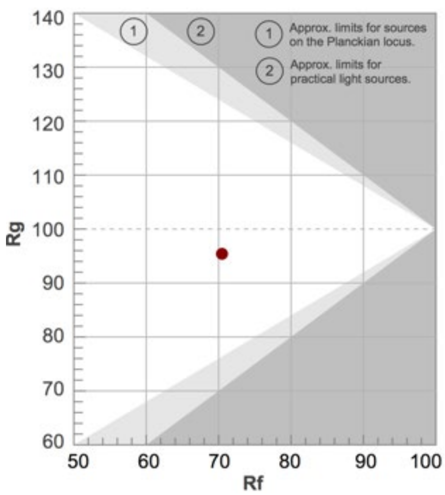
TM30-18 Gamut Index (R_g)
R_g represents the average saturation shift of the source compared to the reference illuminant. A neutral score is a 100, higher scores than 100 represent higher levels of saturation and values less than 100 represent a decrease.





TM30-18 R_f/R_g plot
Light source R_f/R_g’s should be plotted within the white area.

In general, the plot has three interes-ting zones:
a) The low fidelity/low gamut zone, indicates low quality but allows manufacturer to provide sources thar are perhaps more efficient in terms of lumen/watt.
b) the high-fidelity zone, which corresponds to high-CRI products, has a clear appeal but comes at a price on efficiency.
c) the intriguing high-gamut zone, which “enhances” colors and can be desirable in some applications.



Report keywords

{TM3} returns the TM30-Rf (fidelity) value

{TM3g} returns the TM30-Rg (gamut) value

{C#} = TM30 values 1-16

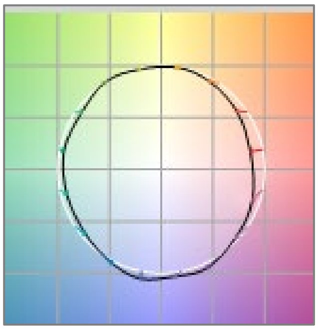
TM30 Design intents

{TM3F} returns the TM30 design Fidelity value

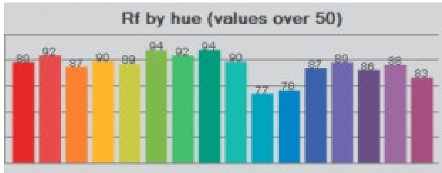
{TM3P} returns the TM30 design Preference value, and **{TM3csh1}** returns the TM30-Rcs, h1 value

{TM3V} returns the TM30 design Vividness value, and **{TM3fh1}** returns the TM30-Rf, h1 value

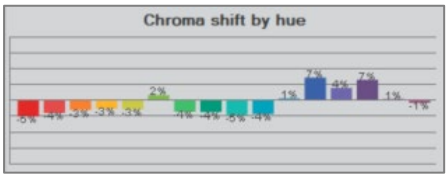
TM30-18 Color Vector Graphic
Color Vector Graphics are used to visually highlight gamut and hue distortions. The reference illuminant is represented by the black circle, deviation outside of this region shows an increase in saturation for the given color, where a shift within, shows a saturation decrease for the given hue. The arrows between the reference and the source show the gamut vector shift. The circle is referenced to the color temperature of the light source measured.



TM30-18 R_f by hue (values over 50)
Shows the 99 colors binned into 16 at the values above 50. This makes it easy to get a quick overview of what is within the Rf value.



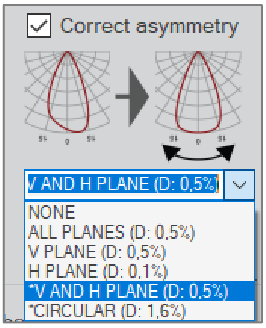
TM30-18 Chroma shift by hue
Shows the 99 colors binned into 16 and refers to the vectors on the Color Vector Graphics. Negative is under-saturated and inside the circle and positive is over-saturated and outside the circle.



Tab: UGR

The UGR values are calculated according to CIE 117-1995 and CIE 190:2010 (corrected).

The table allows you to evaluate the glare properties of a given light source through tabularized glare calculations based on standard spaces, reflectivity, viewing direction. Hence, the glare limits set forth in e.g. standard *EN 12464-1 Light And Lighting – Lighting of Work Places – Part 1: Indoor Work Places* and standard *ISO 8995-1:2002(E)/CIE S 008/E:2001 "Lighting of Workplaces – Part 1: Indoor* can be evaluated during lighting design and planning.



The LightInspector will calculate the UGR table automatically provided that:

- the dimensions of the luminous area are manually entered as described in *page 82, Tab: Dimensions,* and
- either circular symmetry or V and H symmetry is used (Click *Edit → Photometric → Corrections*. Check box "Correct asymmetry", Choose "V and H plane" or "Circular" depending on luminaire type (double symmetrical or round symmetrical). As a consequence of CIE 117, you must choose one of the two last symmetry options (marked with a very small asterisk).

The UGR table is part of the advanced pdf-report and can be added to any other report if needed.

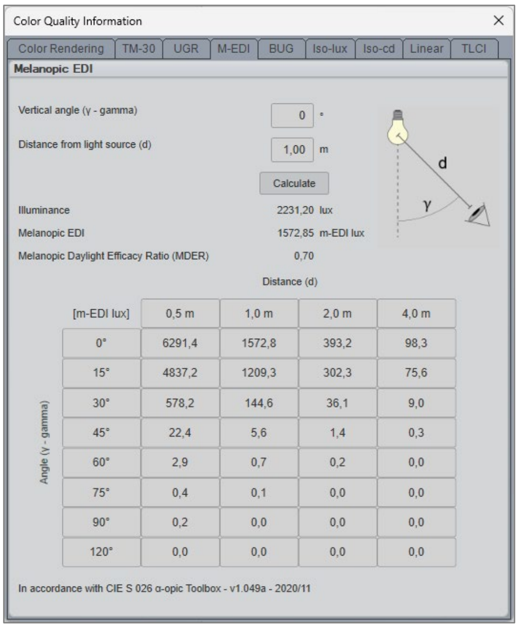
Color Quality Information

Color Rendering | TM-30 | UGR | M-EDI | BUG | Iso-lux | Iso-cd | Linear | TLCI

Corrected, comprehensive UGR table (CIE 117-1995) 5)

Ceiling		70	70	50	50	30	70	70	50	50	30
Walls		50	30	50	30	30	50	30	50	30	30
Floor		20	20	20	20	20	20	20	20	20	20
Room size X	Y	Lamp viewed crosswise					Lamp viewed endwise				
2H	2H	20,5	21,6	21,1	22,3	23,1	20,5	21,6	21,1	22,3	23,1
	3H	22,5	23,6	23,2	24,3	25,0	22,5	23,6	23,2	24,3	25,0
	4H	23,5	24,5	24,2	25,2	26,0	23,5	24,5	24,2	25,2	26,0
	6H	24,5	25,4	25,2	26,1	27,0	24,5	25,4	25,2	26,1	27,0
	8H	25,0	25,9	25,7	26,6	27,4	25,0	25,9	25,7	26,6	27,4
	12H	25,4	26,4	26,1	27,0	27,9	25,4	26,4	26,1	27,0	27,9
4H	2H	21,2	22,2	21,9	22,9	23,7	21,2	22,2	21,9	22,9	23,7
	3H	23,5	24,5	24,2	25,1	26,0	23,5	24,5	24,2	25,1	26,0
	4H	24,6	25,7	25,3	26,2	27,1	24,6	25,7	25,3	26,2	27,1
	6H	25,7	26,5	26,5	27,2	28,1	25,7	26,5	26,5	27,2	28,1
	8H	26,2	26,9	27,0	27,7	28,5	26,2	26,9	27,0	27,7	28,5
	12H	26,8	27,3	27,5	28,1	29,0	26,8	27,3	27,5	28,1	29,0
8H	4H	25,0	25,7	25,8	26,5	27,3	25,0	25,7	25,8	26,5	27,3
	6H	26,4	26,9	27,2	27,8	28,7	26,4	26,9	27,2	27,8	28,7
	8H	27,1	27,5	27,9	28,4	29,4	27,1	27,5	27,9	28,4	29,4
	12H	27,7	28,1	28,6	29,0	30,0	27,7	28,1	28,6	29,0	30,0
12H	4H	25,1	25,7	25,9	26,5	27,4	25,1	25,7	25,9	26,5	27,4
	6H	26,5	27,0	27,4	27,9	28,9	26,5	27,0	27,4	27,9	28,9
	8H	27,3	27,7	28,2	28,6	29,5	27,3	27,7	28,2	28,6	29,5
S = 1.0H		0,1 / 0,0					0,1 / 0,0				
S = 1.5H		0,1 / -0,1					0,1 / -0,1				
S = 2.0H		0,2 / -0,2					0,2 / -0,2				

Tab: M-EDI



Report keywords

{MEDILX} returns the Melanopic EDI lux for a given viewing angle and distance. Formatted so that angle 45 deg and distance 1.5 , the keyword shall be [MEDILX45-1.5)

{MELA_ACTION_FACTOR} returns the Melanopic Daylight Efficacy Ratio (MDER).

Melanopic Equivalent Daylight Illuminance (m-EDI lux).

This page calculates quantities related to illuminance and melanopic EDI lux from a given light source.

All default quantities are in accordance with the definitions of International Commission on Illumination (CIE).

The calculations are in accordance with the CIE S 026 α-opic Toolbox - v1.049 - 2020/11/16.

For a given light source, m-EDI lux is a quantity that depends on the viewing angle and distance of the spectator. Hence, results are given in a matrix of different combinations of distances and viewing angles. The spectrum in the viewing angle is the average SPD in all c-planes in this angle.

Tab: BUG

Report keywords

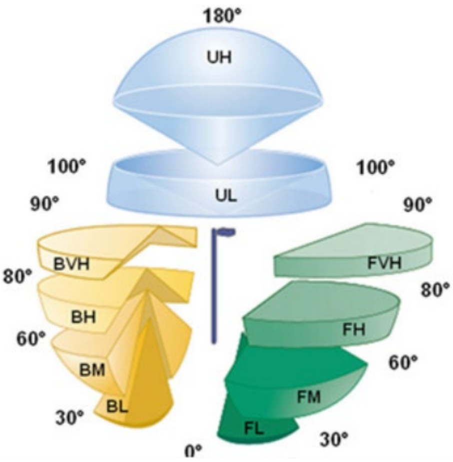
{C_ANG} Cutoff angle (2,5% level). **{C_ANG#}** use # to indicate a specific c-plane.

For many years, the Illuminating Engineering Society of North America (IESNA) used the so-called "cutoff" classification system.

But in 2005, IESNA began its efforts to replace the cutoff rating system with the new TM-15-07 methods used for rating outdoor fixtures. The resulting BUG (Backlight, Uplight, Glare) rating method constitutes a comprehensive system that limits luminaire lumen output to values appropriate for the lighting zones.

In summary, the outdated "cutoff" classification can be used for products with traditional light sources, while the BUG ratings system and TM-15-07 was introduced to evaluate LED luminaires (as well as traditional luminaires). This is because the cutoff classification is based on percentages of the light source flux that cannot be determined in LED solutions.

To determine the BUG rating, the total lumen output of luminaires must be divided into several spatial angles / zones:



B: Rear-facing lighting that creates light on adjacent areas. The B-rating is divided into the amount of light in BL, BM, BH and BVH zones, which is in the direction opposite to the area intended to be illuminated.

Backlight Rating

	Secondary Solid Angle	B0	B1	B2	B3	B4	B5
Backlight / Trespass	BH	110	500	1000	2500	5000	>5000
	BM	220	1000	2500	5000	8500	>8500
	BL	110	500	1000	2500	5000	>5000

U: Light directed upward causes light pollution. The U-rating is divided into UL, which causes more light pollution and adverse effects academic and academic astronomy, and UH, which is mostly a waste of energy.

Uplight Rating

	Secondary Solid Angle	U0	U1	U2	U3	U4	U5
Uplight / Skyglow	UH	0	10	50	500	1000	>1000
	UL	0	10	50	500	1000	>1000

G: Glare that can be irritating or visually disabling. The G-rating is divided into the amount of light in the Frontlight zones FH and FVH zones as well as BH and BVH zones.

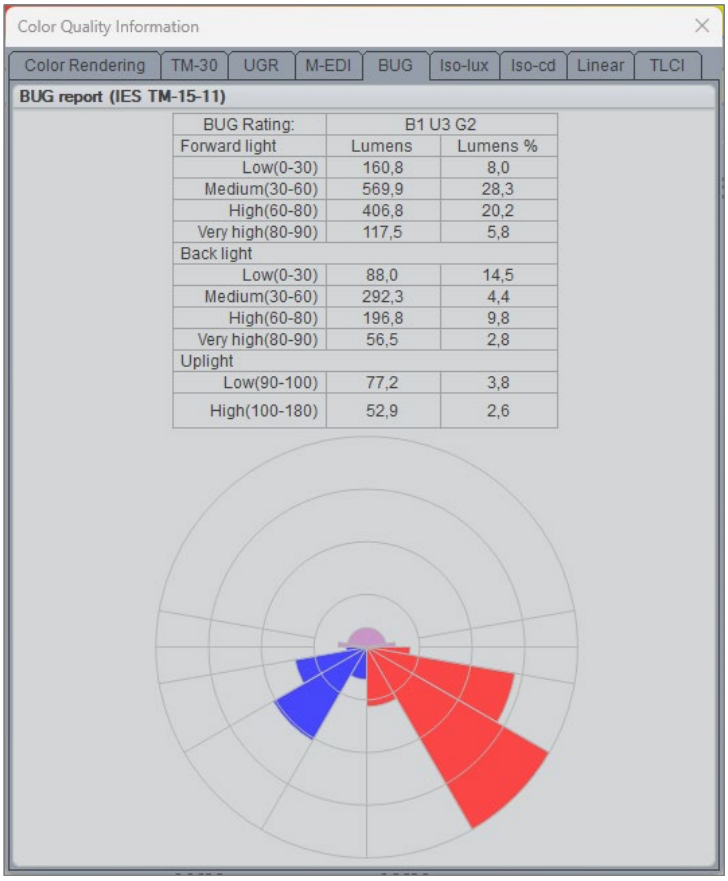
Glare Rating for Asymmetrical Luminaire Types (Type I, Type II, Type III, Type IV)

	Secondary Solid Angle	G0	G1	G2	G3	G4	G5
Glare / Offensive Light	FVH	10	100	225	500	750	>750
	BVH	10	100	225	500	750	>750
	FH	660	1800	5000	7500	12000	>12000
	BH	110	500	1000	2500	5000	>5000

Glare Rating for Quadrilateral Symmetrical Luminaire Types (Type V, Type V Square)

	Secondary Solid Angle	G0	G1	G2	G3	G4	G5
Glare / Offensive Light	FVH	10	100	225	500	750	>750
	BVH	10	100	225	500	750	>750
	FH	660	1800	5000	7500	12000	>12000
	BH	660	1800	5000	7500	12000	>12000

The LightInspector Software automatically outputs the full BUG-rating (e.g., B2 U1 G1):



Report keywords

Use keyword **{BUG}** to get the overall rating text.

Other US road lighting keywords:

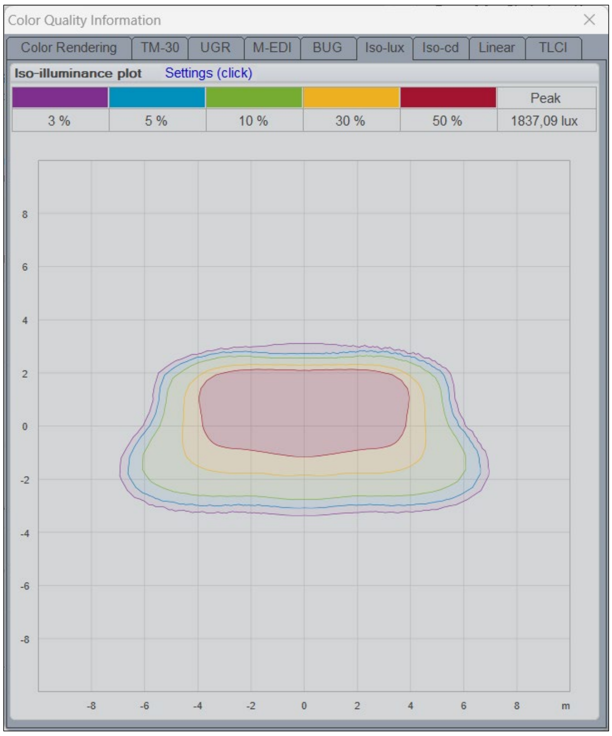
{IES_ROAD_LONGCLASS} IES Roadway Longitudinal Classification. Describes the vertical light distribution of the luminaire along the transverse roadway lines. I.e., how far along the road does the maximum candela point fall-

{IES_ROAD_LUMCLASS} returns the IES Roadway Luminaire classification. Describes the lateral distribution of the luminaire along the longitudinal roadway lines. I.e., how far away from the side of the road where the luminaire is placed does the half-maximum candela iso-line fall. Will only be type V (circular) if circular symmetrization is applied.

{IESNA_CUTOFFCLASS} IESNA cutoff classification

Tab: Iso-illuminance

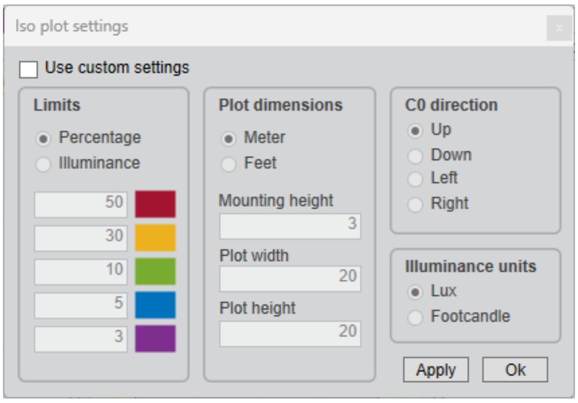
Isolux diagrams specify the distribution of the illuminance on a visible surface. Points with the same illuminance are connected to each other by means of curves (isolux lines). The luminaire is located vertically above the drawing layer at the mounting height (MH) above the coordinate origin.



The standard setting is mounting height 2 meter above ground/floor and drawing layer 20 m x 20 m. When clicking the blue text “Settings (edit)” this window opens:

By ticking the box “Custom settings” all Limits and dimensions can be changed to fit your needs.

Click “Apply” to see the result of your changes one by one before clicking “ok” to close and save your settings.



Please note that your dashboard settings will not influence settings of diagrams in PDF reports and will not be saved with your fixture file. Please see page 138.

Keywords:

{F_LUX#} Distance from center lamp at specified lux value. Example {F_LUX10} returns the distance in ft where the illuminance level is 10 lux.

{M_LUX#} Distance from center lamp at specified lux value. Example {M_LUX10} returns the distance in m where the illuminance level is 10 lux.

{FCD_1M}, **{FCD_2M}**, **{FCD_3M}**, **{FCD_4M}**, **{FCD_5M}** Illuminance in footcandles in 1/2/3/4/5 meter distance in front of the lamp

{LUX_1M#}, **{LUX_2M}**, **{LUX_3M}**, **{LUX_4M}**, **{LUX_5M}** Illuminance in lux in 1/2/3/4/5 meter distance in front of the lamp

{FCD_F#}/**{FCD_M#}** footcandles in feet/m from the center of the lamp. Examples {FCD_F10}/{FCD_M10} returns the footcandles 10 feet/m in front of the lamp. {FCDF10_50}/{FCD_M10_50} will return the 50% of the footcandle value at 10 feet/m.

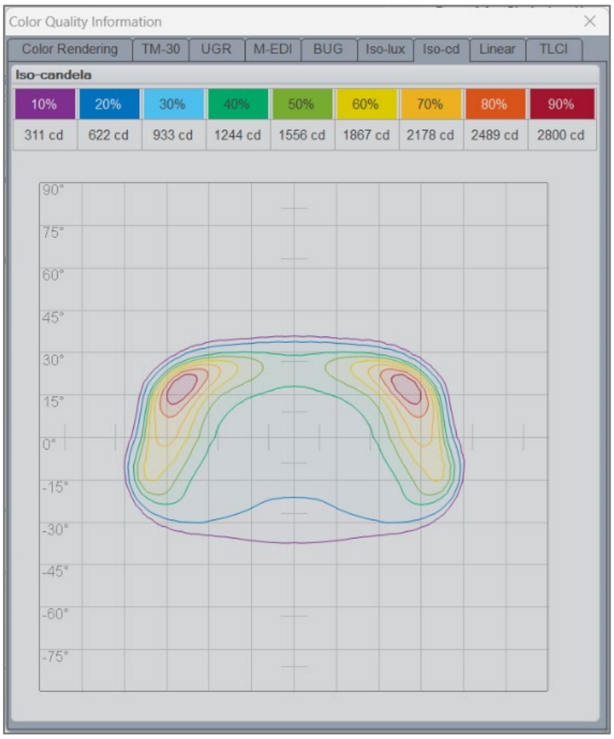
{LUX_F#}/**{LUX_M#}** lux in feet/m from the center of the lamp. Examples {FCD_F10}/{FCD_M10} returns the lux 10 feet/m in front of the lamp. {FCDF10_50}/{FCD_M10_50} will return the 50% of the lux value at 10 feet/m.

{LUX_10M#} Illuminance in lux in 10 meter distance in front of the lamp. {LUX_10M50} return 50% lux at 10 m distance in front of the lamp.

{PHOLX#} returns the photopic lux for a given angle and distance. Formatted so that for angle 45 deg and distance 1.5 m, the keyword shall be {PHOLX45-1.5}

Tab: Iso-candela

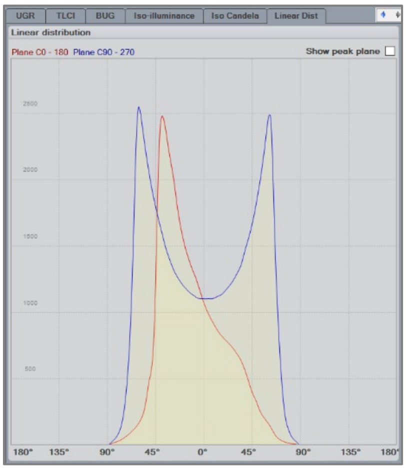
A set of curves traced on an imaginary sphere with the source at its center and joining all the points corresponding to those directions in which the luminous intensity is the same. The LightInspector displays a plane projection of these curves.

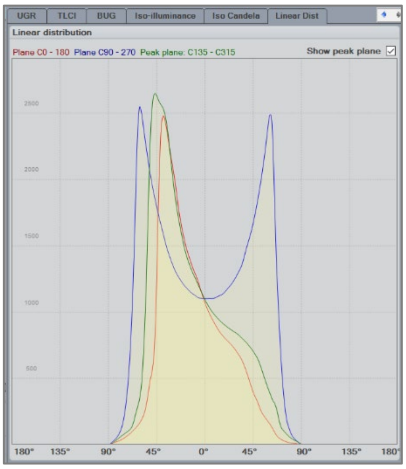


Tab: Linear Dist

The linear light distribution plot contains the same information as the polar diagram (page 16,

The Viso). Only C-planes 0-180 and 90-270 are shown. The abscissa axis corresponds to the circular axis in the polar diagram. Check the box in the upper right-hand corner to add a third peak-plane distribution (green).





Tab: TLCI

Report keywords

{TLCI} return the Television Lighting Consistency Index

{TLCIQ#} returns the Qa values for each reference color . Example: {TLCIQ6} is Qa for Bluish Green.

The TLCI (Television Lighting Consistency Index, EBU Tech 3355) is an assessment of the colorimetric quality of lighting when used in television production. While similar to the CRI in overall intent and method, it is tailored for Television reproduction by mimicking a complete television camera and display, while using a larger set of test colors, using a modern color difference metric (CIEDE2000), and weighting the quality metric and overall averaging so as to not dilute the influence of the worst reproduced colors.

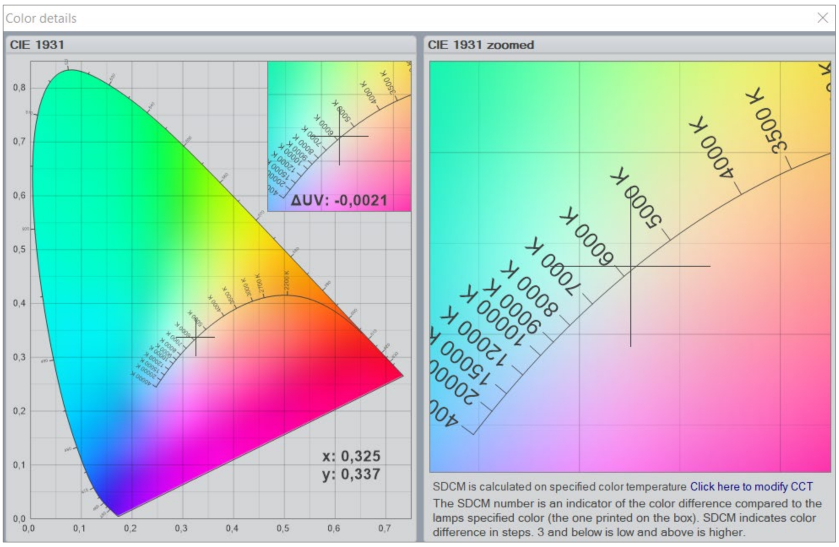
The meaning of the resulting Qa can be interpreted using this table:

TLCI Qa	Quality Scale	Colorist Opinion
90-100	Perfect	Can get all color right
70-95	Good	Easy to get most colors right
55-80	Fair	Can get some colors right
40-60	Poor-Fair	Hard to get much right
25-50	Poor	Hard to get anything right.
0-35	Bad	Too hard, not worth trying

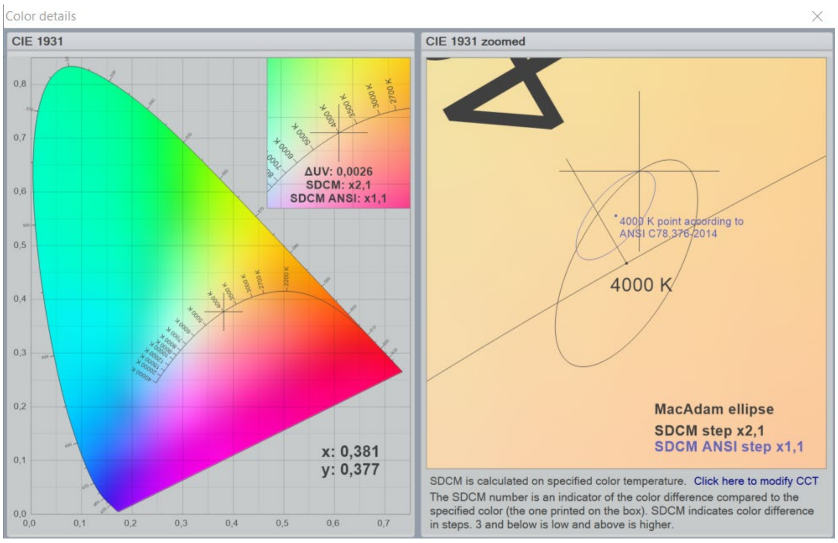
The LightInspector calculates the TLCI-value based on the test color set below.

8.5. Window: Color Details

This window opens the overview of the integrated color specs plotted in the CIE 1931 x,y-diagram. The right-hand side is zoomed in to show more details.



If a target value for the color temperature has been entered manually, the right-hand side will show the corresponding MacAdam Ellipse(s) and indicate the SDCM steps:

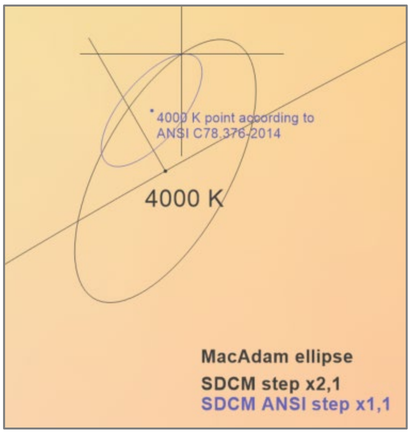


A target value for the color temperature can be entered by clicking the blue text under the diagram ('Click here to modify CCT') – or click *Menu* → *Edit* → *Photometric* → *Modify* - tick off "modify color temperature" and entering a value (typically as specified by the light source supplier). This will not change the original, measured CCT value, but constitutes a reference point for calculation the color deviation, i.e., number SDCM steps.

Three types of MacAdam Ellipses

The original MacAdam ellipses were defined by Davis L. MacAdam in his paper "Specification of Small Chromaticity Differences" printed in Journal of the Optical Society of America, Vo. 33, No. 1, January 1943, pp. 18-26. SDCM is an acronym which stands for Standard Deviation Color Matching. SDCM has the same meaning as a "MacAdam ellipse". The original 25 MacAdam ellipse sets are spread all over the color space and some are close to the BBL.

The ellipses define color differences between two colors – two points in color space. However, in light measurement practice you often need to specify SDCM deviance for a single point.



There is no standardized way of establishing a reference point/ellipse center point for this calculation. Hence, Viso has two ways of doing this – "Viso SDCM Ellipses" and "ANSI C78-376 Ellipses". You may read about the differences in the next two sections.

Viso standard SDCM Ellipses

The standard Viso way of specifying SCDM values places the MacAdam ellipse centers on the Black Body Locus (BBL). In this way, the SDCM value can be used to specify how "white" the light source is.

To get the SDCM value, go to *Menu* → *Edit* → *Photometric* → *Modify* - tick off "modify color temperature" and enter a value, which constitutes an expected color temperature or a target value for the SDCM. This could be the CCT mentioned in the LED datasheet.

The SDCM value will now be shown in the detailed diagram as the matching black MacAdam ellipse and the size of that ellipse indicated below with black text.

The Light Inspector interpolates between the original 25 ellipses to generate ellipses that are indeed centered on the BBL.

This approach is consistent with the coming EU Ecodesign Directive (revision dated 1/10-2019, incl. amends of May 2021) after which the manufacturer or importer declares the chromaticity center point (*"The determined number of (MacAdam) steps shall not exceed the declared number of steps. The center of the MacAdam Ellipse shall be the center declared by the supplier with a tolerance of 0,005 units"*).

Please note that the SDCM value is indicated for this device only, and catalogue values of maximum SDCM values may involve measuring more than one device. Color consistency may also change over time.

Report keywords

{SDCM} returns the standard Macadam steps value (ellipse center on BBL or "special").

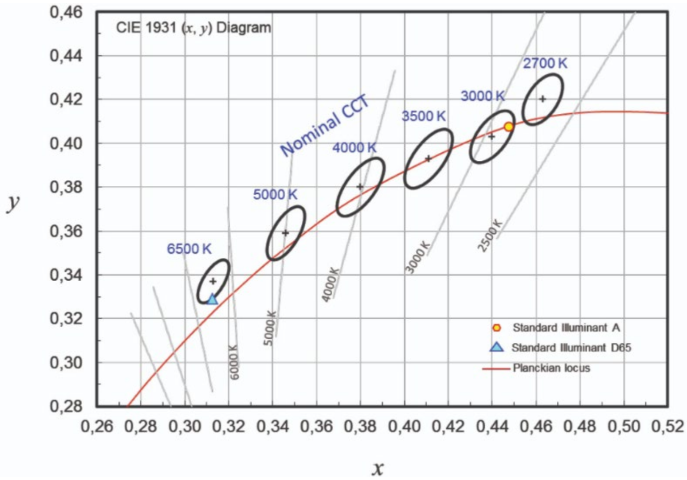
{SDCM_ANSI} returns MacAdam steps value corresponding to ANSI C78.376-2014.

{SDCM_ADAM_X} returns the CIEx coordinate for the MacAdam ellipse

{SDCM_ADAM_Y} returns the CIEy coordinate for the MacAdam ellipse

ANSI C78-376 Ellipses

Further, a MacAdam ellipse value corresponding to ANSI C78.376-2014 (Specifications for the Chromaticity of Fluorescent Lamps) is intended for fluorescent light sources is shown.



Viso Systems has chosen to specify ANSI SCDM values for ellipses as an alternative. <u>The ANSI SDCM value will now be shown the detailed diagram as the matching blue MacAdam ellipse and the size of that ellipse indicated below with blue text.</u>

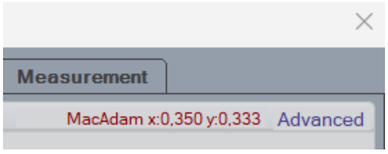
ANSI C78.376 specifies a set of 7 ellipses, that fit into the quadrilateral ANSI bins (2700, 3000, 3500, 4000, 5000, 6000 and 7000 K). However, but these ellipses are only centered close to the BBL for warm CCTs. As a consequence of working with the ANSI C78.376 ellipses, a light source measurement, that hits the BBL perfectly on 5000 K, will have a SDCM-value of about 2.4.

As ANSI C78.376 is intended for evaluation of color consistency for fluorescent lamps, **it is not recommended for use with LEDs.**

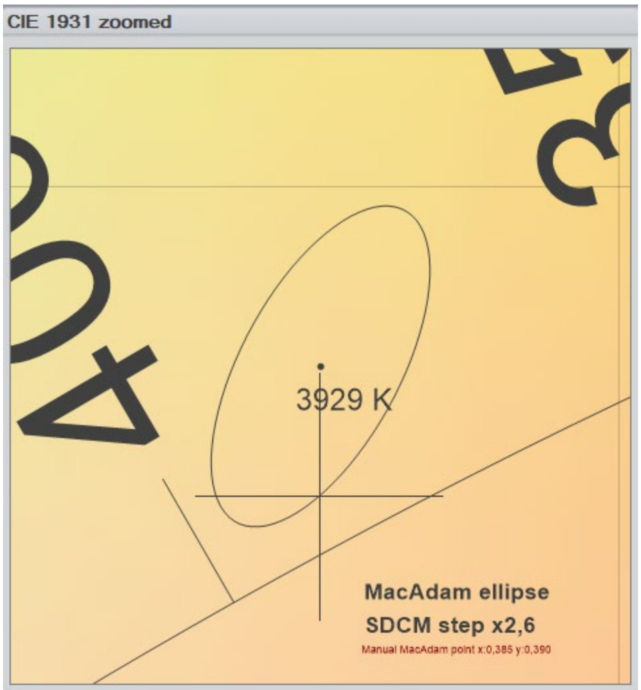
Special MacAdam ellipses

It is also possible to specify a target value (MacAdam Ellipse center) that is NOT on the Black Body Locus. This is necessary for evaluating consistency of for instance colored light sources or white light sources that are deliberately NOT on the BBL:

Go to *Menu → Edit→ Photometric → Modify. Click the Blue "Advanced" text in the upper right-hand corner. In the pop-up window, specify the your target color expressed in x,y coordinates. Your custom target is specified in the "Photometric" window:*

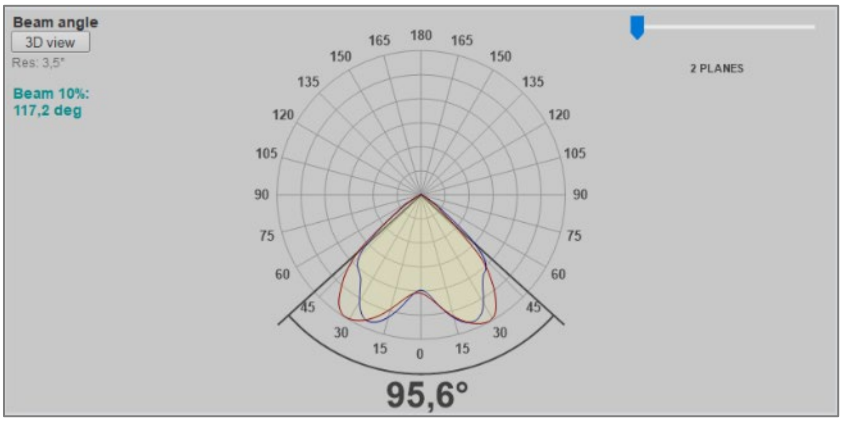


The CIE 1937 window will also change to show that the new ellipse:



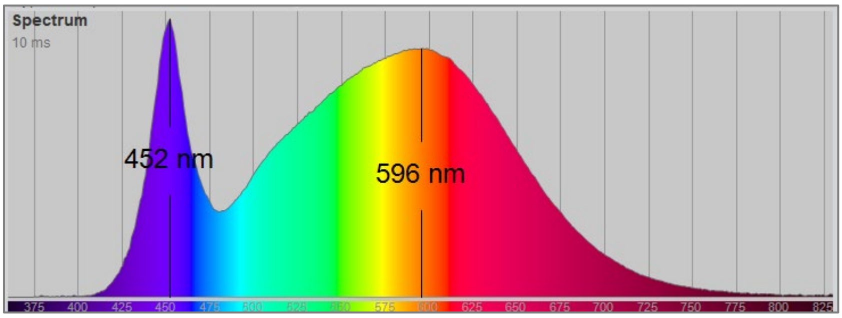
The small text in red indicates that a custom x,y-target has been set.

8.6. Show 10% Angle



The 50% beam angle is shown per default below the light distribution curve. By choosing "Show 10% angle" the beam angle containing 90% of the light output will be shown in green in the left-hand top corner. This text can be removed by choosing the menu point again (Click-on – click off).

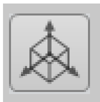
8.7. Show Spectrum Peaks

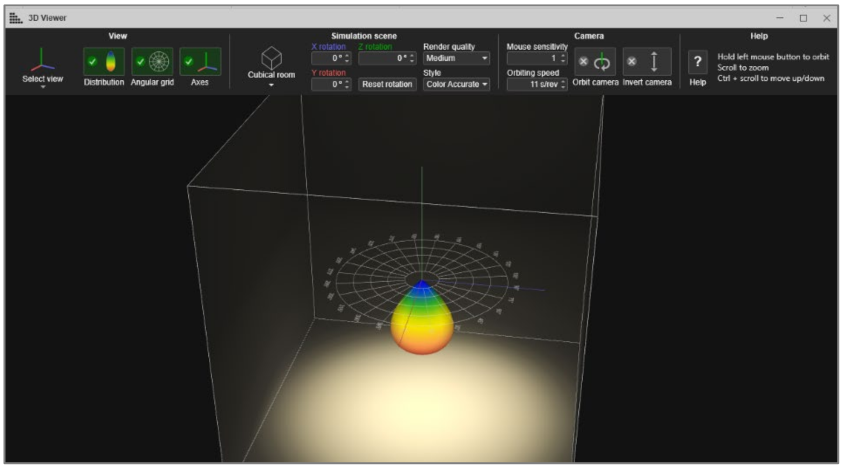


Choosing this menu point adds wavelength information about the two predominant peaks in the spectrum. This text can be removed by choosing the menu point again (Click-on – click-off).

8.8. Window: 3D View

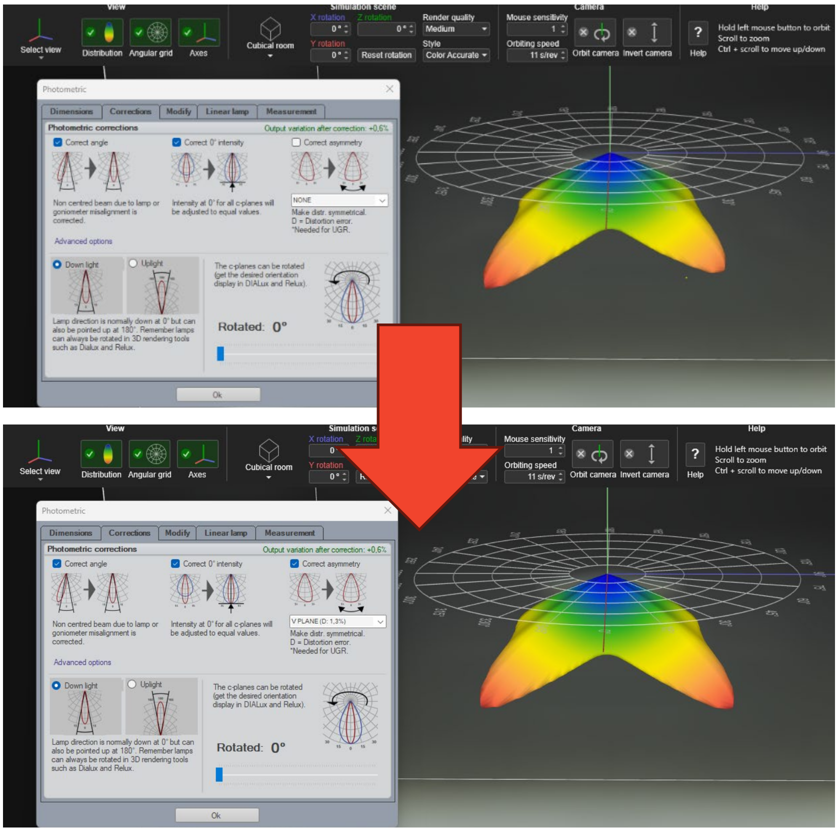
In the left corner of the dashboard there is a button that opens the 3D viewer:



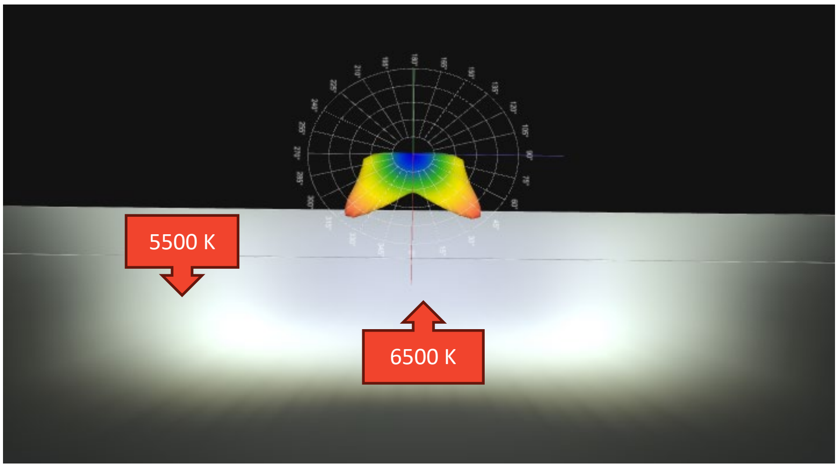


A 3D-view is a very powerful tool to analyze you results in terms of inaccuracies and systematic errors such as insufficient warm-up or misalignment.

You can also keep the 3D viewer open while apply corrections to see the changes dynamically, e.g. adding symmetrization:

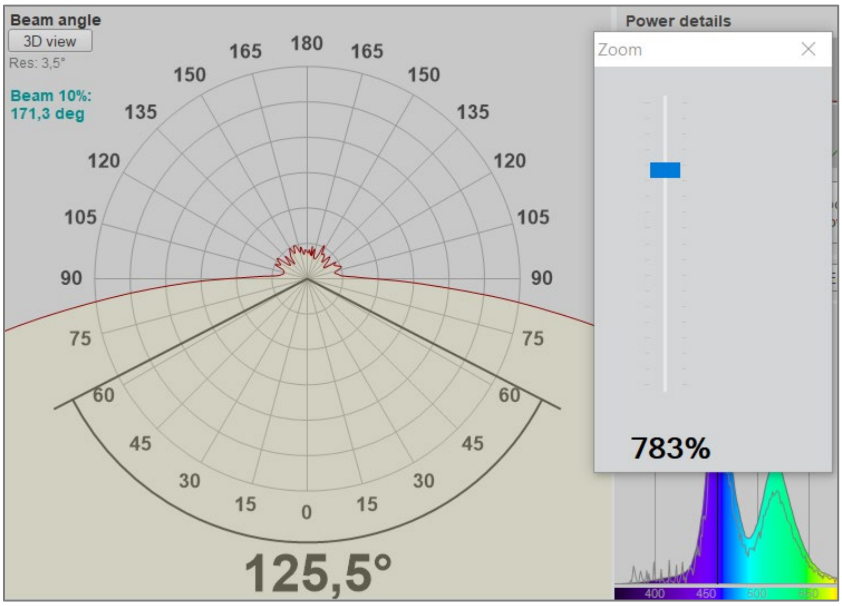


The light color is rendered in true color, so you will be able to see discoloration e.g. at the edges:



8.9. Zoom

The zoom feature allows you to look at the light distribution curve in more detail if necessary.

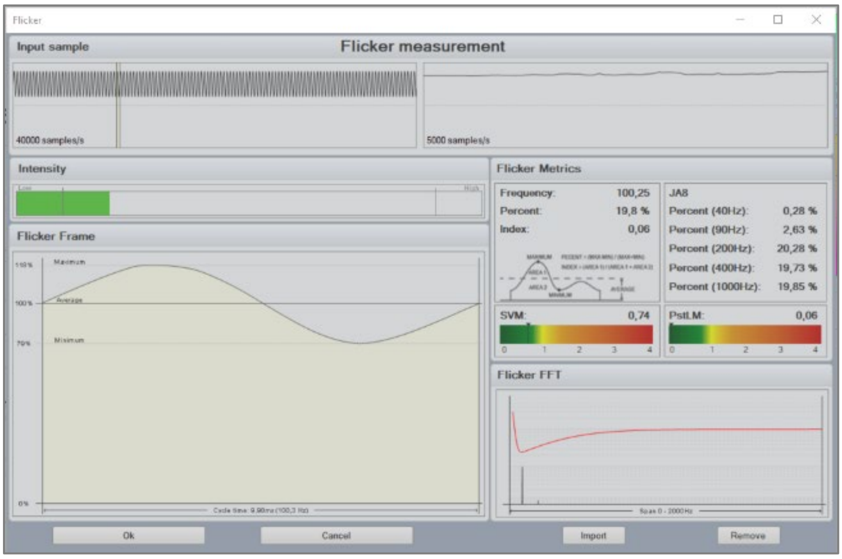


8.10. Window: Flicker

If you have combined your goniometer with a LabFlicker instrument you will be able to include flicker measurements in your files:

- Frequency
- Flicker Percent
- Flicker Index
- PstLM
- SVM

More details to be found in the LabFlicker manual.



Report keywords

{FLPSTLM} returns the PstLM value (F < 80 Hz) TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

{FLS} returns the SVM value (80 < F < 2000 Hz) TLA indices (re IEC TR 61547-1, IEC 61000-3-3 and IEC 61000-4-15)

{FLF} returns the Flicker frequency in Hz according to Illuminating Engineering Society (IES)

{FLP} % returns the Percent Flicker according to Illuminating Engineering Society (IES)

{FLI} returns the Flicker index according to Illuminating Engineering Society (IES)

{FL_CO1000}, **{FL_CO200}**, **{FL_CO40}**, **{FL_CO400}**, **{FL_CO90}** returns Flicker indices according to California Energy Commission (CEC) 2016b

{FL_SAMPLE_RATE} returns the Flicker/TLA sample rate in samples/s

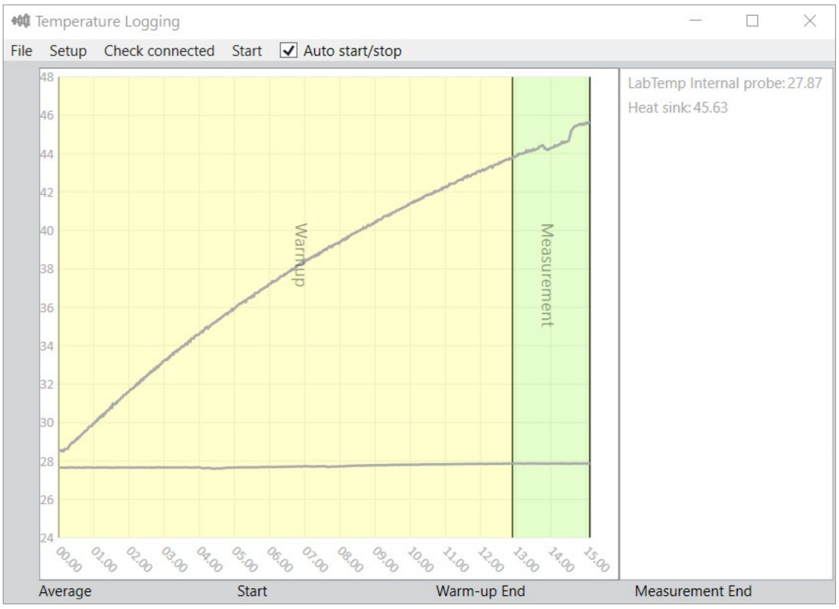
{FLMP} Perception metric, Assist Mp Flicker index according to Lighting Research Center (2015)

8.11. Window: Temperature

If you have combined your goniometer with a LabTemp instrument you will be able to include temperature measurements in your files:

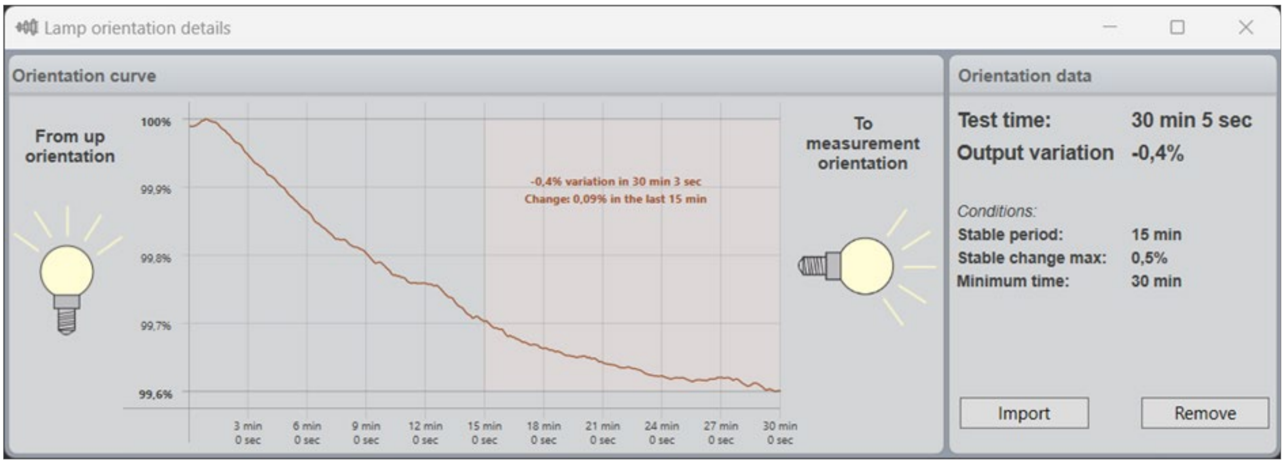
- Internal temperature probe = lab/ambient temperature
- 3 external probes = for temperature of heat sink, driver Tc etc.

More details to be found in the LabTemp manual.



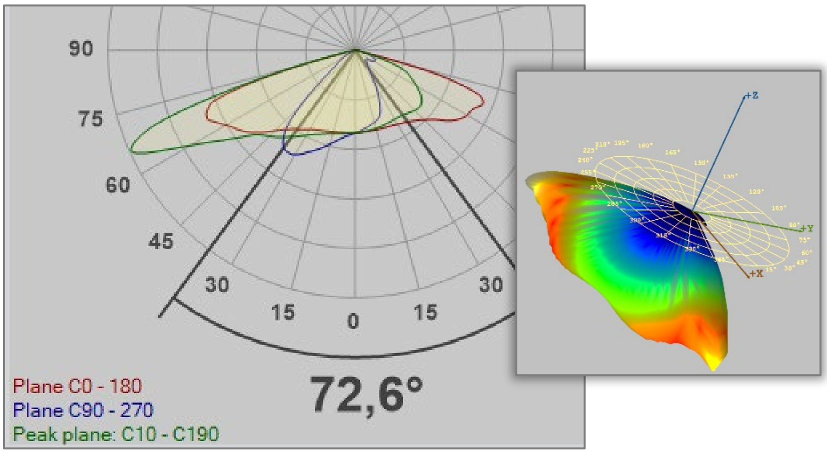
8.12. Window: Light source Orientation (S 025)

In this window you will be able to see the result of the S 025 test as detailed in *page 64, Window: Lamp Orientation Test (S 025)*.



8.13. Show Peak Plane

Angular distribution plots normally just show two sets of curves: Plane C0-C180 in red and Plane C90-C270 in blue. Click menu point "Show Peak Planes" to add a third, green curve to the plot in the dashboard: The plane including the peak intensity. This is especially applicable in streetlighting.



Report keywords

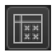
In parallel, a third Peak plane can be added to the polar plot graphics in PDF outputs by adding **{SHOWPEAKPLANE}** to the Alt_Text. Keyword **{PEAKPLANETEXT}** returns the green text above, e.g., “Peak plane: C10 - C190”.

The actual c-plane that contains the peak intensity is indicated in green in the lower left-hand corner. The opposite c-plane is also shown (the two planes are half-planes that constitute a full plane together).

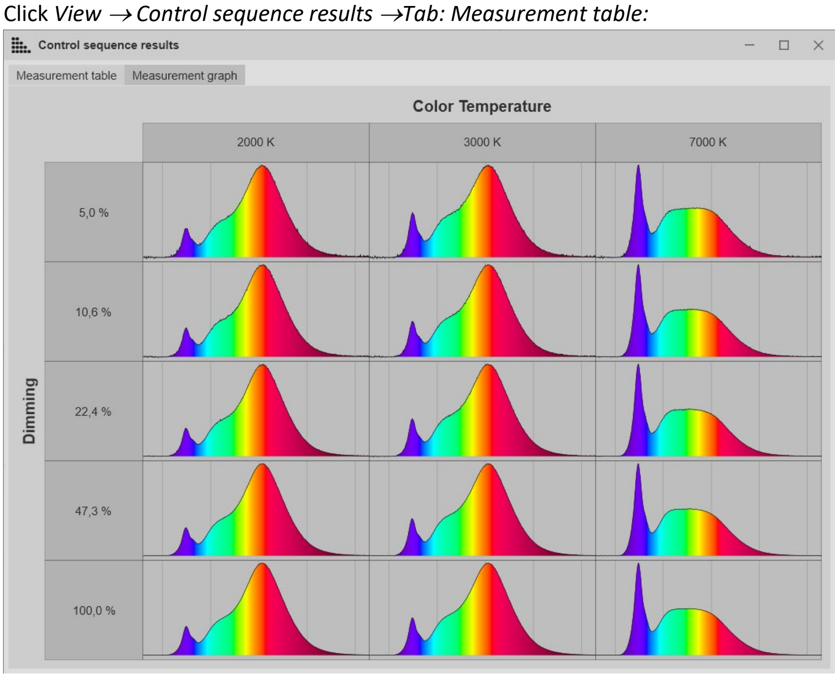
8.14. Control sequence results

This window allows you to check and analyze the result of a control sequence measurement. Read more in *page 46, Window: Control sequence configuration.*

The results in the examples below were obtained using the accessory Viso LabInterface. Read more about measuring controllable light sources in the separate LightInterface user manual.

Click the button in the left-hand side of the screen to access results: 

Click *View* → *Control sequence results* →*Tab: Measurement table:*



This window displays the number of control steps that were performed as a matrix (2 dimensional or single). In this view, you will just see a small spectrum image that represents each control step.

Report keywords:

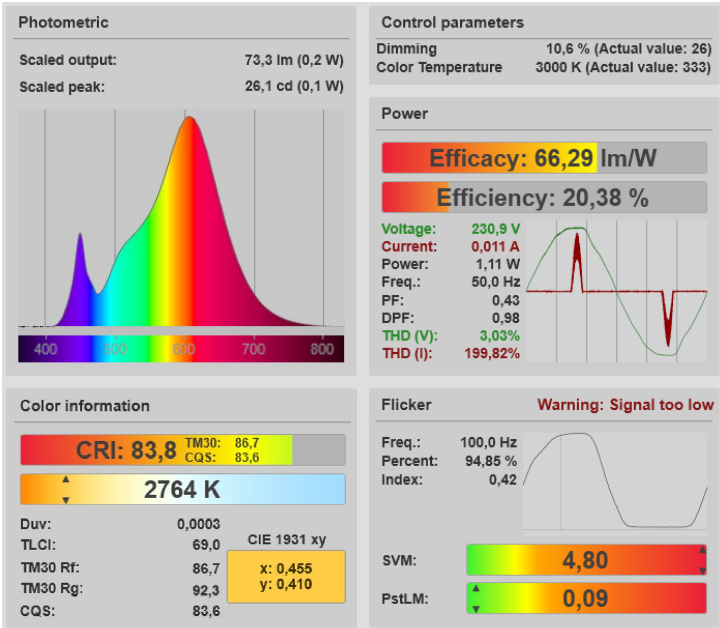
{CONPAR#} Control sequence parameter value. To get the third values of parameter 1, write {CONPAR1-3}.

{CONPARCOUNT#} Number of steps for each parameter in the control sequence measurement. To get the number of steps for parameter 1, write {CONPARCOUNT1].

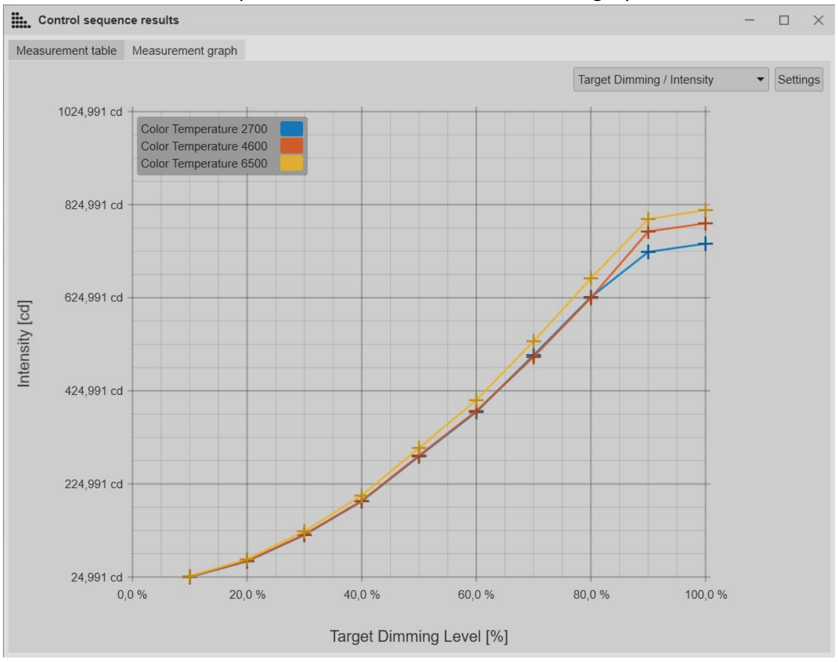
{CONPARNAME#} Control sequence parameter name. To get the name of parameter 1, write {CONPARNAME1}. If the function of parameter was e.g. CCT, this will return “Color temperature [K]”.

{CONRES#} Control sequence result. Formatted so that one can get fx the light intensity in position 2,4 in the measurement matrix by writing {CONRES-Intensity-2-4}.

As during the live measurements, you can see more detailed results by hovering over the cells in the matrix:



Click *View → Control sequence results -> Tab: Measurement graph:*

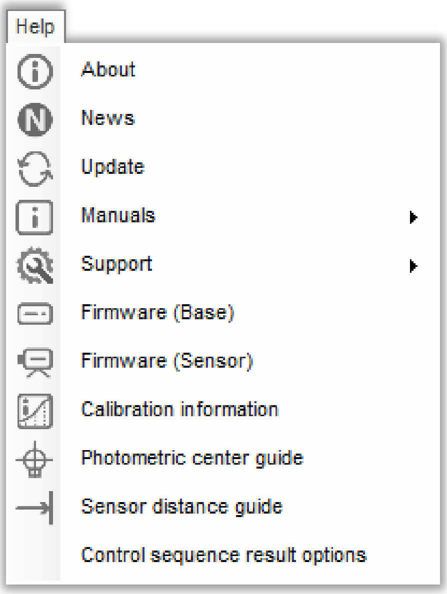


In this view you can see graphical representations of the control sequence data. The default graph shows the measured intensity versus the target dimming level.

Hover-over effect: Try mouse hovering over the “+” data markers and you will find more results.

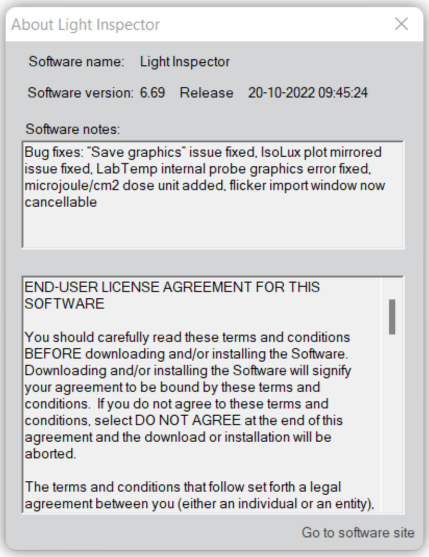
Other standard options can be found in the drop-down list.

9. Menu: Help



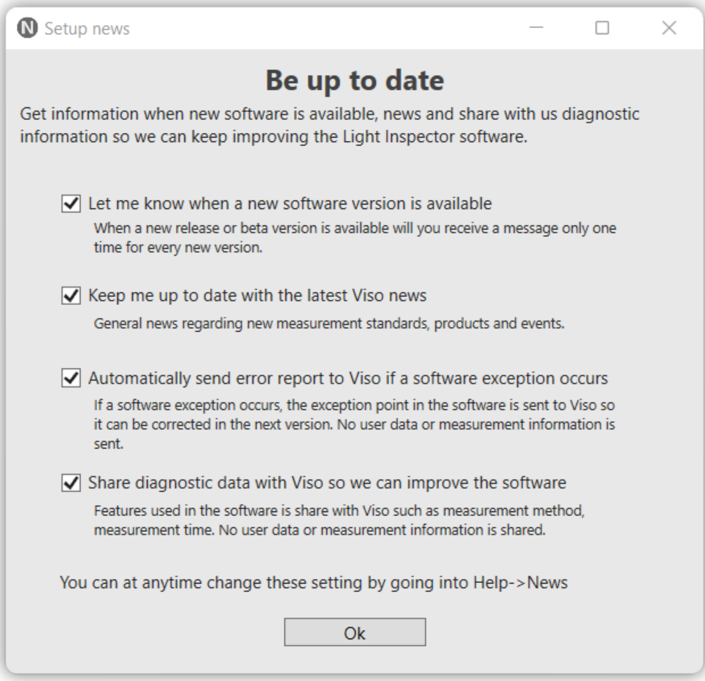
9.1. Window: About

This menu point allows you to read the end-user license agreement and check the current software version.



9.2. Window: News

In this window you can sign up for light measurement information:



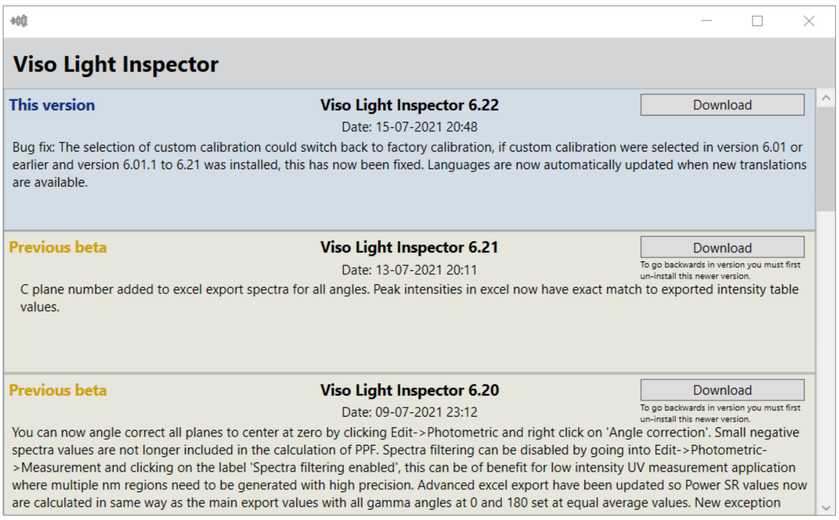
The system can let you know when new software versions are available. You still need to go to *Help* → *Update* to start updating.

The system can send you important news. This news is typically new software features or new products. News is issued every 1-2 months, and a news window will pop up automatically when you open the software, but only once. If you missed out on some news or want to read them again, all news is available in https://www.visosystems.com/blog/ too.

Finally, you can allow the system to send error reports to Viso Systems and diagnostics to help us improve the Light Inspector software.

9.3. Window: Update

This menu point allows you to check for updates to your current software version.



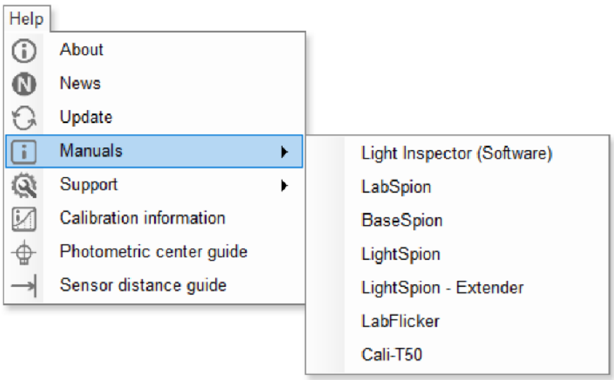
Often, you will be able to download beta-version that contain the latest trial up-dates – check https://www.visosystems.com/download-light-inspector/.

Also read *page 8, Light Inspector Installation.*

All upgrades are backward compatible. Please note that if you choose to downgrade your software version, you will not be able to open measurements made in newer versions.

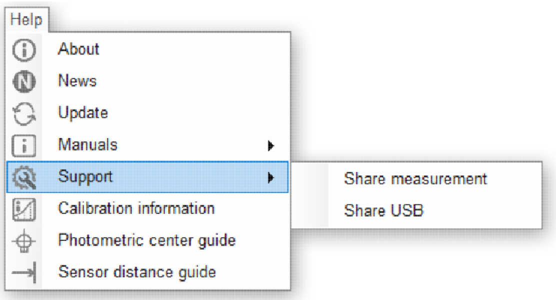
9.4. Window: Manuals

With this menu you will find direct links to the most popular product manuals (provided that your measurement PC is online):



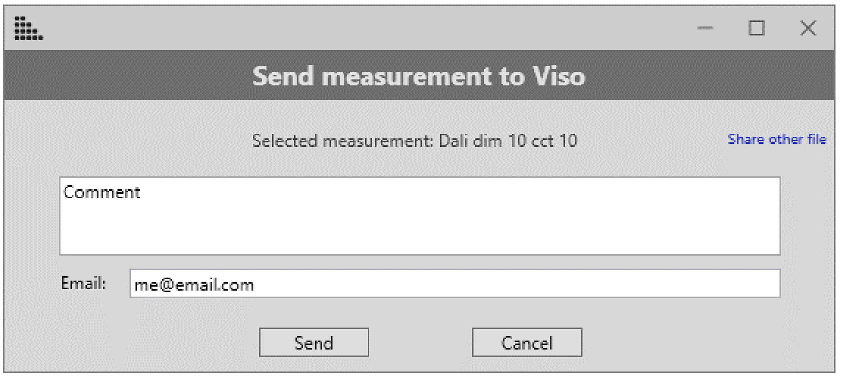
Find more manuals and guideline here: https://www.visosystems.com/user-manuals/

9.5. Support



Share measurement

Chose "Share measurement" if you want to send the current measurement directly to Viso Systems for support:



You may also send other files (regardless of size and format) by picking "Other file" in the upper right-hand corner. This could e.g., a photo, a video, or a data sheet.

You may put e.g., your company name in the Comment field.

Please remember to put your email address in the email field. Otherwise, Viso support will not know who you are, and who to contact with answers.

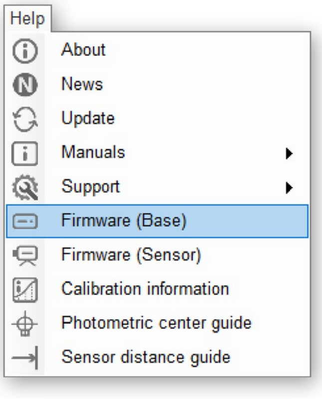
Share USB

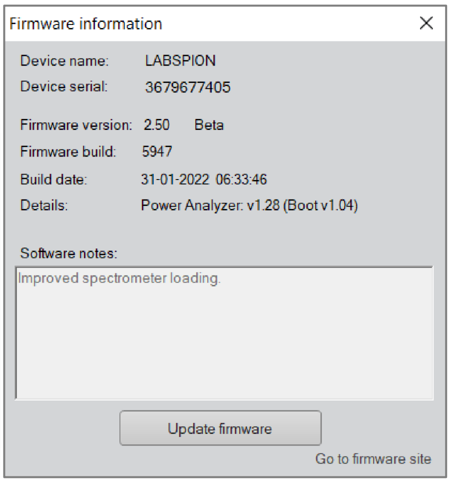
With this command you allow Viso Systems support to connect directly to Viso products, that are connected to your PC USB port(s) including power supplies that have a Light Inspector interface.

9.6. Window: Firmware (Base)

If you have Viso equipment connected with USB, they will show in the Help menu, and you will be able to check the firmware status and run an update if you wish.

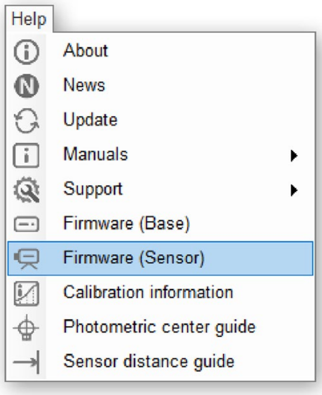
This menu point allows you to check the current mainboard firmware version (in LabSpion and BaseSpion situated in the Base). If no mainboard is connected via USB this menu point is not visible. You may also update the firmware directly using the "Update firmware button"

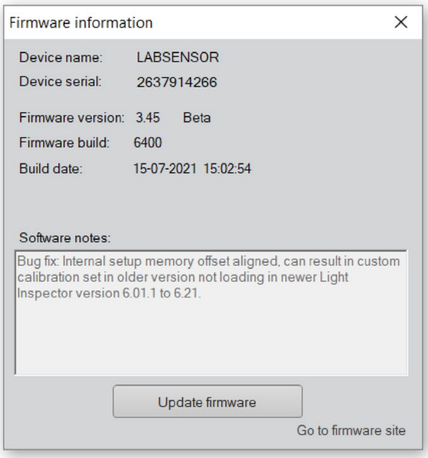




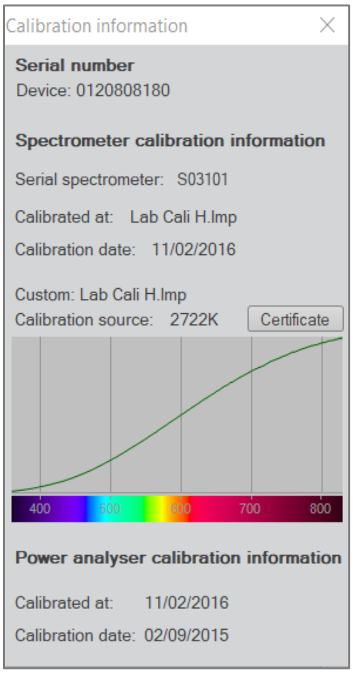
9.7. Window: Firmware (Sensor)

This menu point allows you to check the current sensor firmware version (in LabSpion and BaseSpion situated in the sensor house). If no sensor is connected via USB this menu point is not visible. You may also update the firmware directly using the “Update firmware button”





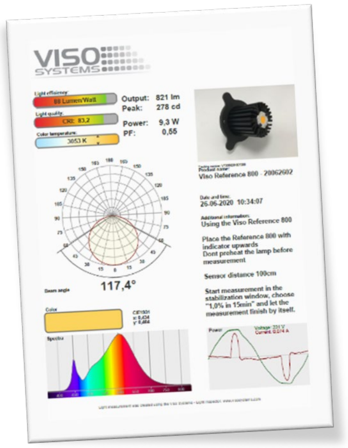
9.8. Window: Calibration Information



Checking the Calibration Status

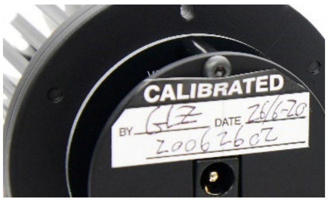
A special Viso reference light source (Reference 800) is included with all Viso system. (Previously, a smaller LED E14 bulb was included).

The light source has its own power supply, and both parts are labelled with identical calibration date and numbers. Never measure without the original power supply.



Right after factory calibration of your system, the reference light source was measured, and a certificate was issued. The certificate is part of the delivery. The certificate can also be downloaded from Viso's website using the calibration number on the labels.

With the reference lamp you can quickly check your calibration status:



- Check whether the total flux in lumen and peak candela is close to the original values.
- Check whether the shape of the spectrum is close to the original shape.
- Check whether the spectrum looks spiky or jagged.

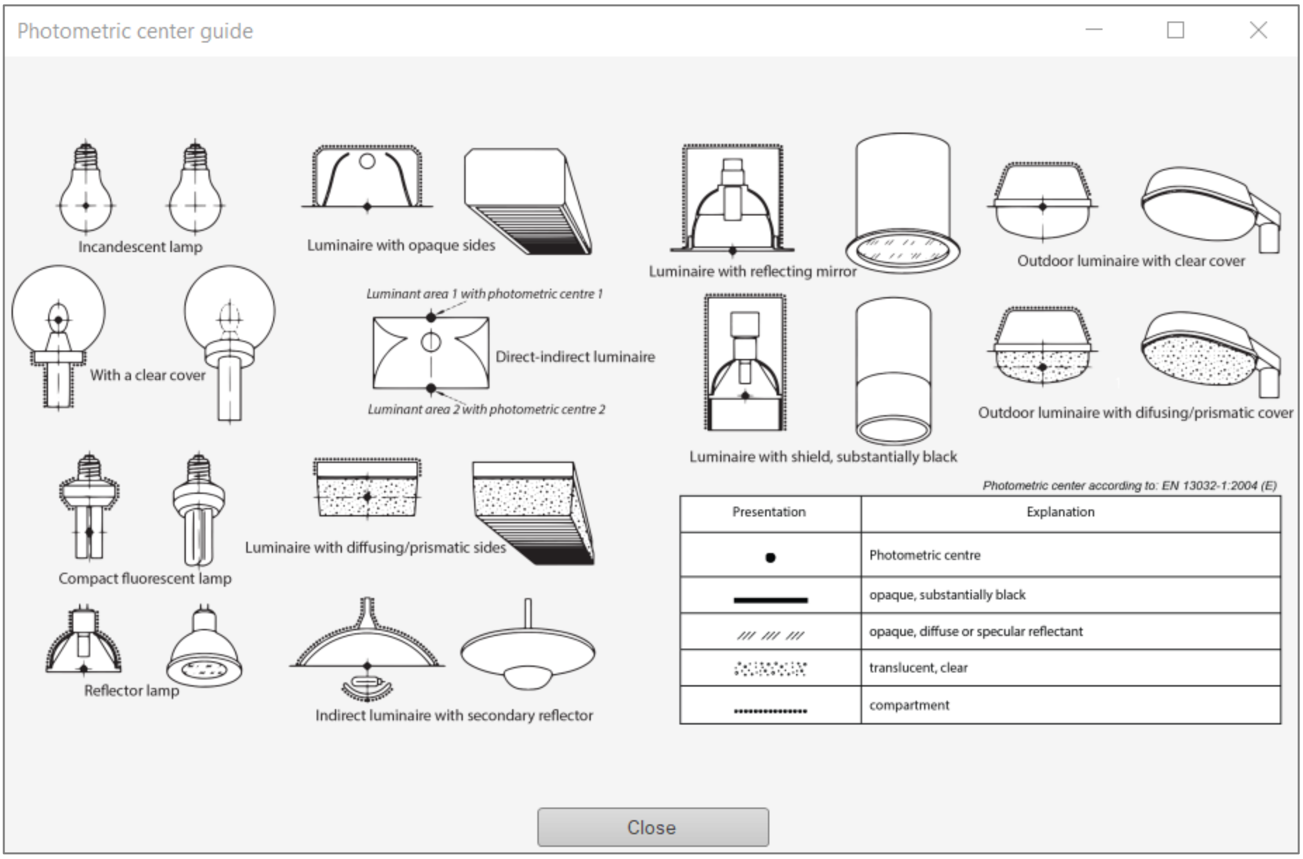
If you are not happy with the result, the system needs to be calibrated. Viso recommends calibration every year, or minimum every 2 years. Viso provides calibration service, or you may do your own calibrations using the Viso CALI-T50 or other traceable calibration light sources.

Check-up Procedure

Please follow the instructions in the REF-800 user manual.

9.9. Window: Photometric Center Guide

This menu point opens a guide to working with photometric centers. Read more in [page 55, Internal Photometric Centers.]



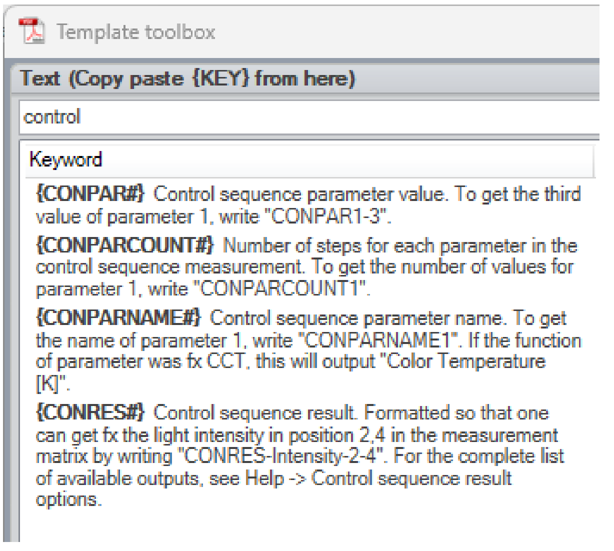
For in-depth practical advice, please read Guidelines - Practical measurement setup.

9.10. Control Sequence Result Options

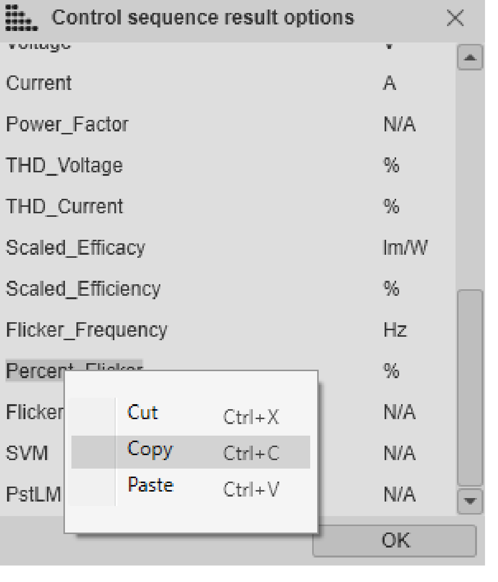
The window contains result indicators to be used, when generating control sequence output reports.

Read more in page 46, Window: Control sequence configuration.

When building control sequency output reports (Spreadsheets or PDF templates), you can use these result option with the keywords {CONPAR#} and {CONRES#}

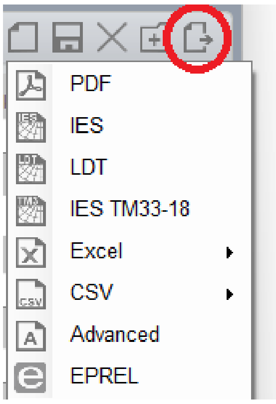


It is possible to mark-up, right-click and copy the content of the list.



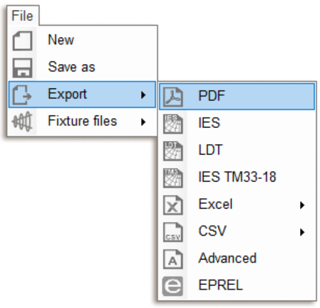
10. Exports and Reports

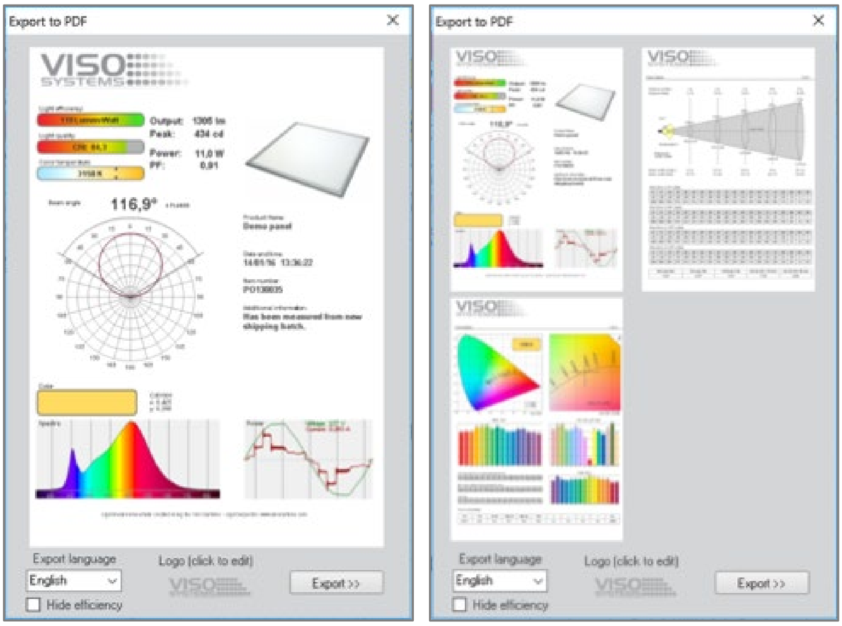
The Light Inspector software allows you to generate various kinds of output (standard and customized), and you may export all raw data for further compilation and computation.



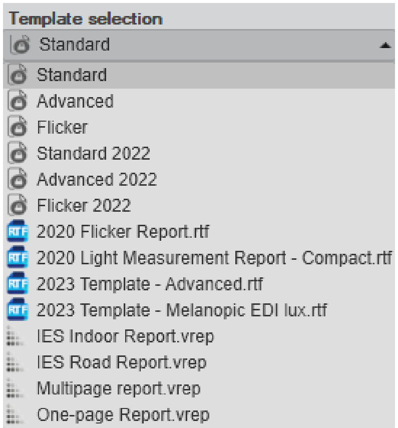
PDF-reports

Using the Light Inspector, you can automatically generate and edit a variety of reports once you have made a measurement.

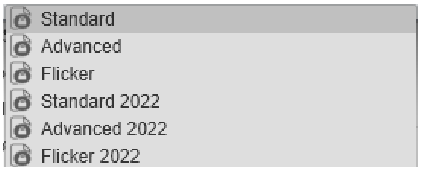




Once you have made a Light measurement, click *on File → Export → PDF*, and there are some options:



- **Fixed**

  These are hardcoded standard reports that cannot be changed. These reports will work also if you do not have Microsoft Office installed.
  There are two sets available – the original version (that many clients use) and the newer 2022 versions. You may change the logo with the “Logo (click to change)”-feature.

- **Samples – Editable rtf – edit in Microsoft Word**

  These are reports that you can use as they are, or change them as you wish with Microsoft Word. See *page 134, Creating Custom PDF Report.*

- **Samples – Editable vrep – edit in Viso Report Builder**

  These are customizable standard reports that you can change. These reports will work also if you do not have Microsoft Office installed.
  These are reports that you can use as they are, or change them as you wish with the built in Viso vrep editor. See *page 134, Creating Custom PDF Report.*

Download PDF report templates from Viso’s website as plug-ins

In this page on the www.visosystems.com you can download Viso plugins for the Light Inspector software.

Plugin features

- Compatible with Viso Light Inspector
- Contains .rtf-files (edit in MS Word)
- Download is free
- Plugin allows you to build your own PDF output templates

Download instructions

- Press the download button for the template you need
- Once the template is downloaded, go to your “Download” folder and double click on the file
- Now, the template will automatically be added to your templates collection in your dedicated measurements folder (usually *C:\Users\’YourUserName’\Documents\Viso Systems\Light Inspector*). The template is available as a PDF template in the PDF report generator in the Light Inspector software.

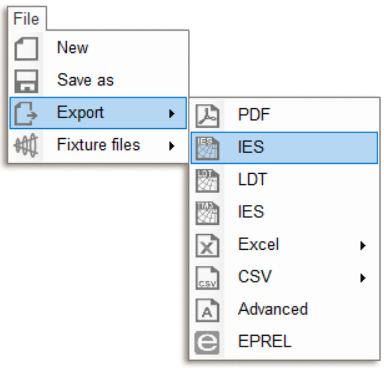
Customizing the templates

As with other Viso templates you may also change all plug-in templates for your own purposes. The templates are all .rtf (rich text format) files that can be altered in MS Word. The templates are organized as sections that you may use separately or collect into your own master templates:

- Open the Main template (contains overall measurement conditions and results)
- Open the template with contents that you want to add. Press Ctrl+A, then Ctrl+C. Now, all contents are copied to your clipboard
- Revert to the Main template. Press Crtl+End, then Ctrl+V. Now the full contents of the other template have been added
- Save template under a new name in your standard measurements folder (format: .rtf file).

IES and LDT Export

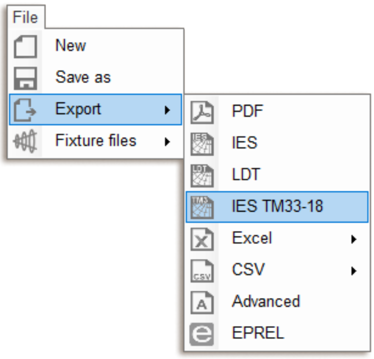
These two features output standard light distribution files that are used in Dialux, Relux and other 3D light planning software. These formats just include photometric data and do not contain color information besides overall CCT. Read more in [page 35, Tab: Export]. To export to IES simply select: *File → Export → IES* or LDT

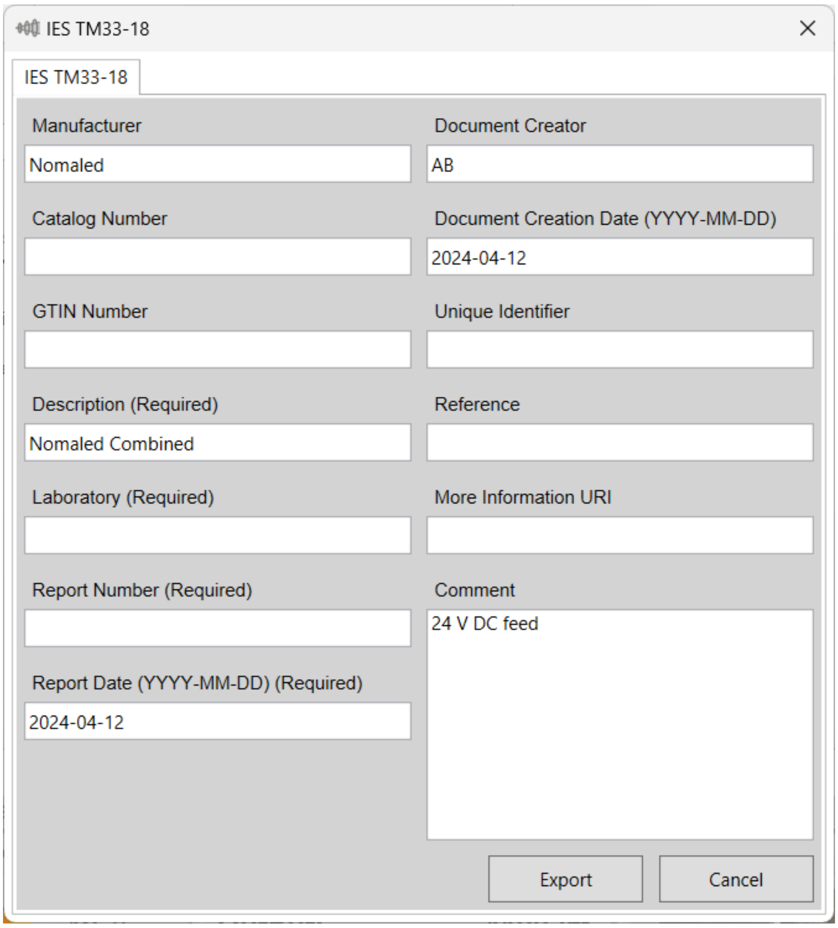


XML Export (IES TM 33-18)

The system also allows you to export in the structured and machine-readable photometric format TM 33-18 (XML). To export to IES simply select: *File → Export →*

IES TM33-18 and fill in the window that appears. Then click Export.





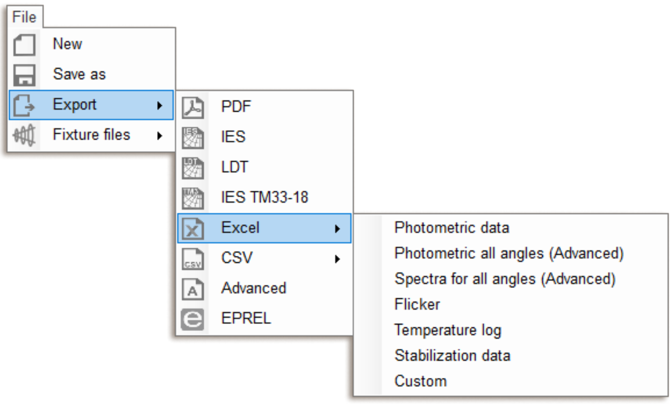
MS Excel and CSV Export

These export features allow you to export all photometric and spectrometric data as well as flicker data (provided that you own a LabFlicker Instrument).

You may either export this information directly to MS Excel or to a CSV (comma separated values) file.

Measurements can be exported to a CSV tab separated file, so that the measurement data can be imported into Excel or other calculation software.

- To export to MS Excel, go to: *File → Export → Excel*



- To export to CSV, go to: *File → Export → CSV*
  Here you have six/eight options:

Export type	File Contents	MS Excel	CSV
Photo metric data	Candela/angle/C-plane and watt/nm	x	x
Photo metric all angles (advanced)	Candela, x, y, u', v', CRI, R9 Power per SR and Photons per second/angle/C-plane and watt/nm	x	x
Spectra for all angles (advanced)	watt/nm/angle/C-plane	x	x
Flicker data	50.000 data points (for SVM) and various flicker metrics	x	x
Flicker data, PstLM	3.600.000 data points (for SVM and PstLM) and various flicker metrics (too large for Excel)	-	x
Temperature log	Log data for every second of the measurement and for every probe	x	x
Stabilization data	Log data for Intensity, Voltage, Current, Power, CCT, (x,y) for every 4 seconds of the stabilization period	x	x
Custom CSV	Make your own data output spreadsheets – see page 130	x	x

Example of 'Photometric all angles' export:

Date and t	8. februar 2016 17:28:02															
Item number																
Efficiency	65															
CRI	82,97															
R9	20,9															
CCT	3096															
Lumens	303,7															
Peak cd	0,17															
Spherical	360															
Power	4,71															
PF	0,89															
CIE x	0,425															
CIE y	0,391															
Number o	360															
		C0											C90			
Angle		Candela	CCT	x	y	u'	v'	CRI	R9	Power SR	Photons P		Candela	CCT	x	y
0		59,453	3150	0,428	0,391	0,25	0,343	84,2	28,12	0,1921	0,93734		59,453	3150	0,428	0,391
1		59,453	3150	0,428	0,391	0,25	0,343	84,18	28,08	0,191888	0,93622		59,452	3150	0,428	0,391
2		59,438	3150	0,427	0,391	0,25	0,343	84,17	28,13	0,191567	0,934501		59,438	3150	0,428	0,391
3		59,409	3150	0,428	0,391	0,25	0,343	84,17	28,13	0,191478	0,934119		59,422	3150	0,428	0,391
4		59,381	3150	0,428	0,391	0,25	0,343	84,18	28,13	0,191418	0,933901		59,401	3150	0,428	0,391
5		59,352	3150	0,428	0,391	0,25	0,343	84,18	28,13	0,191357	0,933682		59,375	3150	0,428	0,391
6		59,306	3150	0,428	0,391	0,25	0,343	84,18	28,12	0,191252	0,933221		59,342	3150	0,428	0,391
7		59,246	3150	0,428	0,391	0,25	0,343	84,17	28,04	0,191004	0,931987		59,291	3150	0,428	0,391
8		59,186	3150	0,427	0,391	0,25	0,343	84,16	27,97	0,190757	0,930753		59,231	3150	0,428	0,391
9		59,125	3150	0,427	0,391	0,25	0,343	84,15	27,89	0,190509	0,929518		59,167	3150	0,428	0,391
10		59,048	3150	0,427	0,391	0,25	0,343	84,15	27,86	0,190194	0,927926		59,102	3150	0,428	0,391
11		58,961	3150	0,427	0,391	0,25	0,343	84,15	27,85	0,189827	0,926067		59,026	3150	0,428	0,391
12		58,874	3150	0,427	0,391	0,25	0,343	84,14	27,84	0,189461	0,924207		58,948	3150	0,428	0,391
13		58,772	3150	0,427	0,391	0,25	0,343	84,14	27,84	0,189095	0,922348		58,856	3150	0,428	0,391
14		58,656	3150	0,427	0,391	0,25	0,343	84,14	27,84	0,188855	0,921298		58,757	3150	0,428	0,391
15		58,54	3150	0,427	0,391	0,25	0,343	84,13	27,84	0,188626	0,920318		58,641	3150	0,428	0,391
16		58,424	3150	0,427	0,391	0,25	0,343	84,12	27,84	0,188397	0,919337		58,518	3150	0,428	0,391
17		58,291	3150	0,427	0,391	0,25	0,343	84,12	27,85	0,188019	0,917556		58,389	3150	0,428	0,392
18		58,132	3150	0,427	0,391	0,25	0,343	84,13	27,86	0,187236	0,913584		58,239	3150	0,428	0,392
19		57,973	3150	0,427	0,391	0,25	0,343	84,13	27,87	0,186453	0,909613		58,079	3150	0,428	0,392
20		57,809	3150	0,427	0,391	0,25	0,343	84,14	27,89	0,18567	0,905641		57,912	3150	0,428	0,391
21		57,611	3150	0,427	0,391	0,25	0,343	84,14	27,86	0,184989	0,902283		57,743	3150	0,428	0,391
22		57,408	3150	0,427	0,391	0,25	0,343	84,13	27,82	0,184372	0,899308		57,545	3150	0,428	0,391
23		57,204	3150	0,427	0,391	0,25	0,343	84,13	27,77	0,183756	0,896334		57,344	3150	0,428	0,391
24		56,987	3150	0,427	0,391	0,25	0,343	84,12	27,72	0,183139	0,89336		57,135	3150	0,428	0,391
25		56,741	3150	0,427	0,391	0,25	0,343	84,12	27,67	0,182345	0,889486		56,913	3150	0,428	0,391
26		56,493	3150	0,427	0,391	0,25	0,343	84,12	27,61	0,181544	0,885578		56,671	3150	0,428	0,391
27		56,246	3150	0,427	0,391	0,25	0,343	84,13	27,56	0,180743	0,88167		56,414	3150	0,428	0,391
28		55,96	3150	0,427	0,391	0,25	0,343	84,12	27,53	0,179927	0,877692		56,14	3150	0,428	0,391
29		55,656	3150	0,427	0,391	0,25	0,343	84,12	27,53	0,179079	0,873559		55,843	3150	0,428	0,391

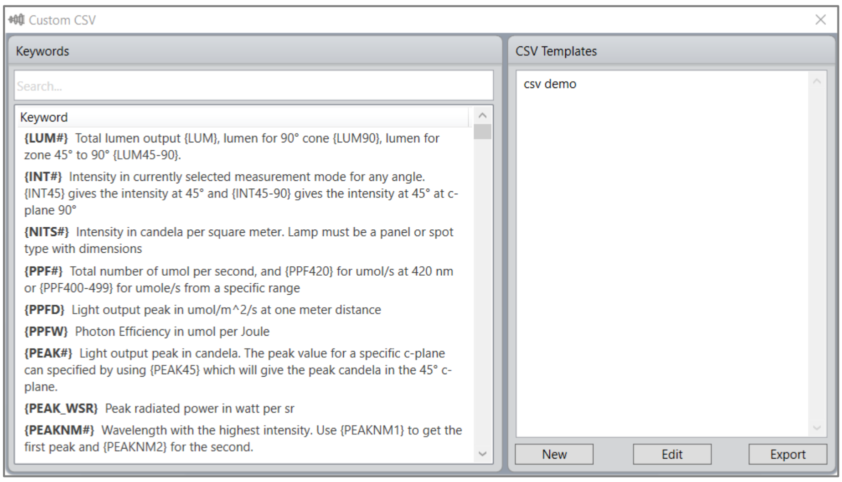
Custom CSV files and MS Excel files

The Light Inspector allows to generate your own customizes CSV and XLS files using the same keywords as in the PDF reports (*page 134,*

Creating Custom PDF Report*).*

Select *File → Export → CSV → Custom, or*
Select *File → Export → Excel → Custom*

Then then a window like this opens:



In this dialogue window you can make, edit and export your own customized CSV/XLS files using the keywords on the left-hand side. You may add your own texts.

Right-click templates to delete.

The templates will be saved to your standard measurements folder.

CSV files normally opens smoothly with MS Excel.
If this fails, you can try importing the CSV data:

- Open an empty MS Excel spreadsheet.
- In menu “Data”, pick “get Data”, and “From File”, and “From Text/CSV”.
- Then you will get into a window that allows you to organize the import.

XLS templates can also contain normal formatting, and graphics, and makes it possible to design your own excel-based output reports, entirely in your own graphical design.

Advanced Export

This feature allows you to export to the same formats as above while resampling to other numbers of C-planes and higher/lower resolutions.

EPREL

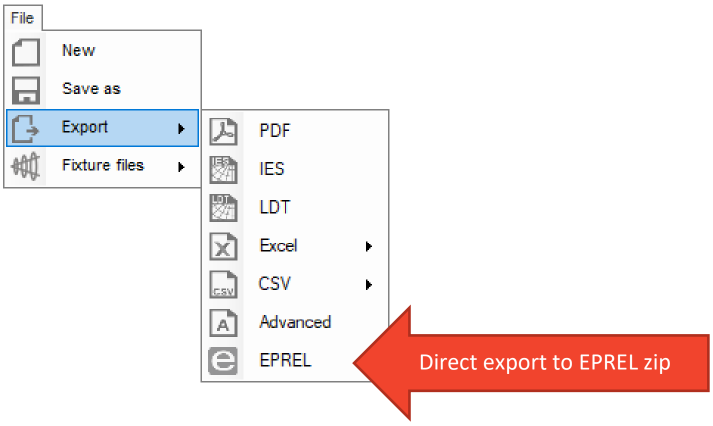
As of September 1, 2021, the European regulation on lighting equipment (module, lamps, control gear and luminaires) changed. Read more in this flyer.

The EPREL lighting database enables customers to access this data easily via a QR tag on product labels. Manufacturers and importers are obliged to upload different kinds of product information: Product model description, General information incl. energy consumption, energy Label, technical documentation, etc., in the format of special Zip-files.

The existing rules under Regulation (EU) 874/2012 are repealed and replaced by new energy labeling requirements for light sources under Regulation (EU) 2019/2015, the so-called ELR (Energy Label Regulation) on the energy labeling of light sources. It was amended on December 17, 2020, by Regulation (EU) 2021/340.

Similarly, Regulation (EU) 1194/2012 is replaced by Regulation (EU) 2019/2020 called SLR (Single Lighting Regulation). This regulation covers the functional and performance requirements for light sources and control gear. It was amended on February 23, 2021, by Regulation (EU) 2021/341.

With The Light Inspector EPREL feature, it is possible to export directly into EPREL zip file format by going into *File-Export → EPREL*. The EPREL export automatically generates embedded light measurement report, spectrum image and registration-data.xml.

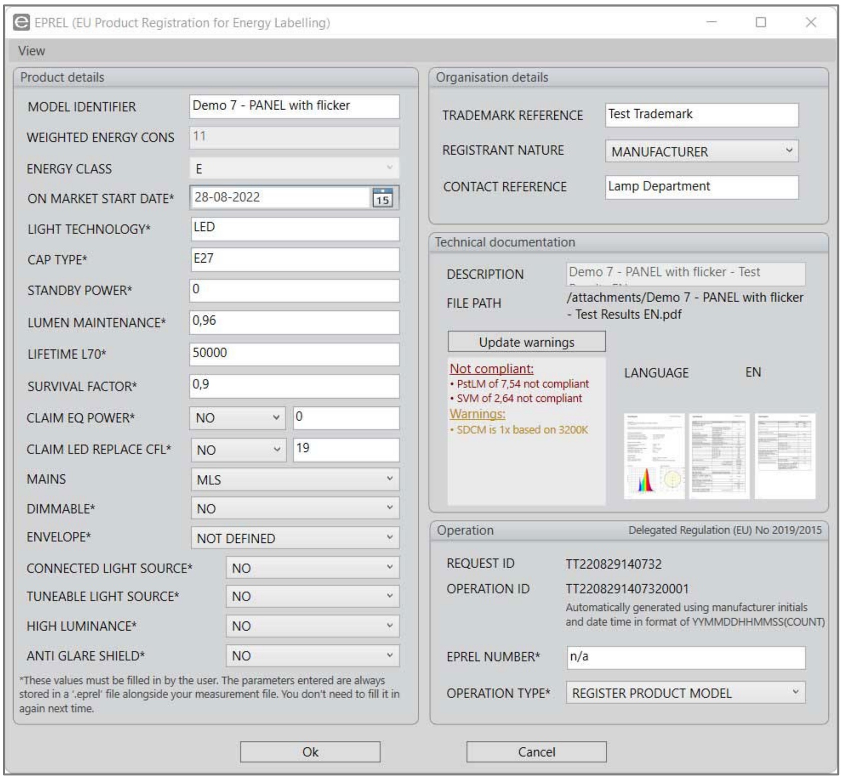


A new window opens. This window contains fields that are necessary for you to accept or change before generation of the XML file. Most information (like CCT, Spectral Power distribution, CRI, lumen package, beam angle, chromaticity coordinates etc.) are not shown in this window because this information is just pulled directly from your light measurement and into the XML file. This is done while paying respect to EPREL requirements: Correct no. of decimals, rounding CCT to the nearest 100, sticking to the maximum beam angle and not the usual average beam angle, etc.).

The system will also give you “warnings” and “non-compliance” messages if some is wrong with your light measurements.

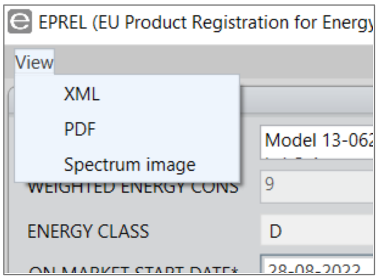
Texts in the window comply with the choice of terminology in the EPREL system.

Use your mouse to hover of the different fields to get more information on how to fill in everything correctly (“mouse-over tool tips”).



Store the xml file locally and use your online EPREL registration to upload this xml.-file directly.

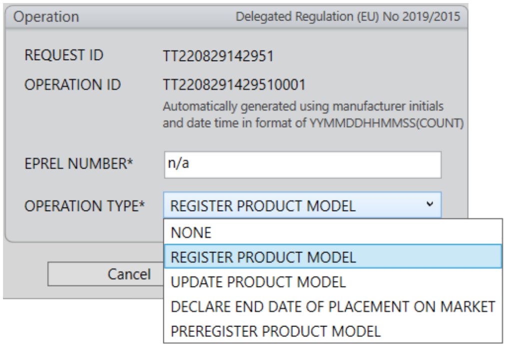
Click “View” in the upper left-hand corner to see your expected outputs – XML file and the spectrum are as specified in the EPREL requirements. The report is an extra feature that allows you to upload and more detailed report for your clients to see.



When you are done adjusting all fields, simply press ‘OK’ to generate your EPREL zip file, and choose where to save it locally.

The system will remember Organization Details and Operation Details, so that you don’t have to type these every time.

It is possible to use the system for several ERPEL operations:

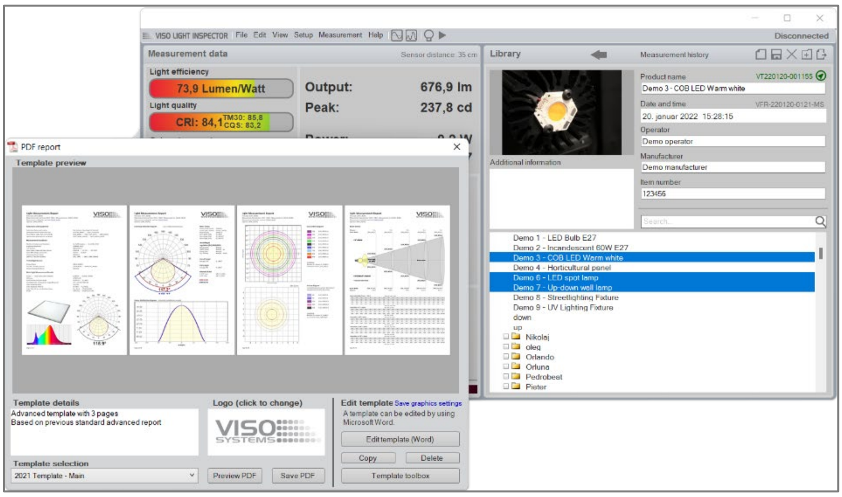


It is possible to select mains type in the EPREL export, MLS or NMLS (mains or non-mains connected) manually. If mains type is not selected will the software automatically select MLS if lamp voltage is higher than 85V NMLS if lower than 85V.

Keywords:
{EU_DIR} returns EU Ecodesign directionality (DLS = directional, or NDLS =non-directional)
{EU_ECLASS} returns EU Ecodesign energy class (A, B, C….)
{EU_USEFUL} returns EU Ecodesign Useful Luminous Flux [lm]
{EU_WPWR} returns efficacy ratio in W/W.

Exporting Several PDF Files at Once

Light Inspector can export several measurement files at once, simply hold CTRL down and select the files you want to export and go to File – Export and choose the format you want. Then click ‘Save PDF’.



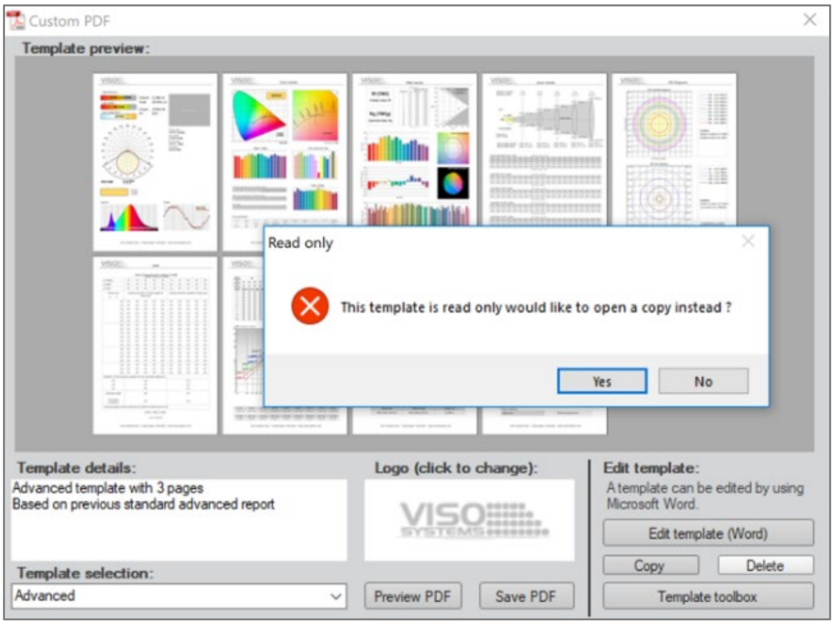
Creating Custom PDF Reports

This powerful feature allows you to fully customize your report design to facilitate your corporate identity by using Microsoft Word editor/Viso vrep Editor to create your special report templates. This features also gives you the option to only show the measurement data which are essential for your type of product.

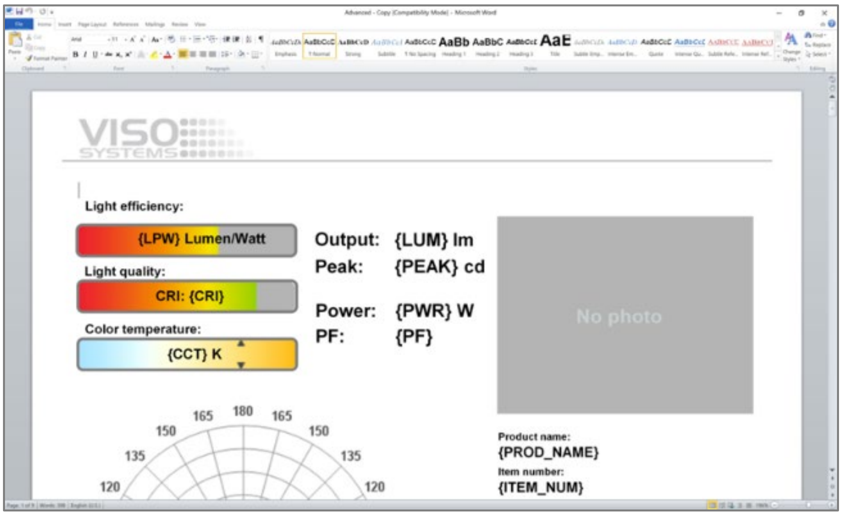
The Light Inspector is the first software to fully give you the power over your reporting reducing the workflow as lighting fixture data sheets can go directly from light measurement to the website without the need of marketing post design.

There are two ways to start creating your own customized report. Either edit one of the preinstalled templates or create your own from a blank template. The template files are read only so you will be asked to open and save a copy to work on.

All templates (in .rtf format and .vrep format) are stored in your preferred measurement folder, usually C:\Users\'UserName'\Documents\Viso Systems\Light Inspector.



Word or Viso vrep Editor will automatically open with a template copy:

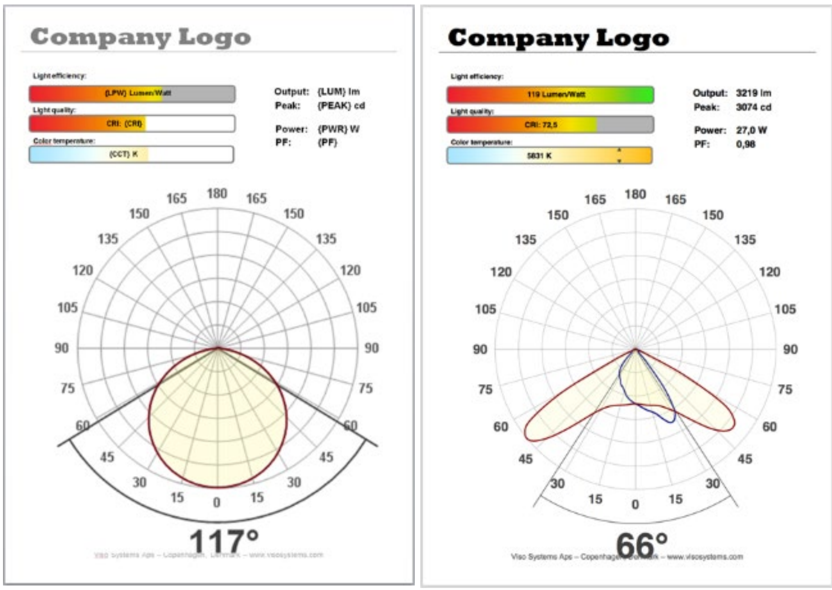


Now everything in the document can be stretched, shrunk, deleted or inserted as you like. Company logo, background etc. can all be made after your company's choice.

In the Word document, everything is illustrated in "placeholder" bitmap images but when you do a PDF report using the template, everything will be in vector graphics with fine details.

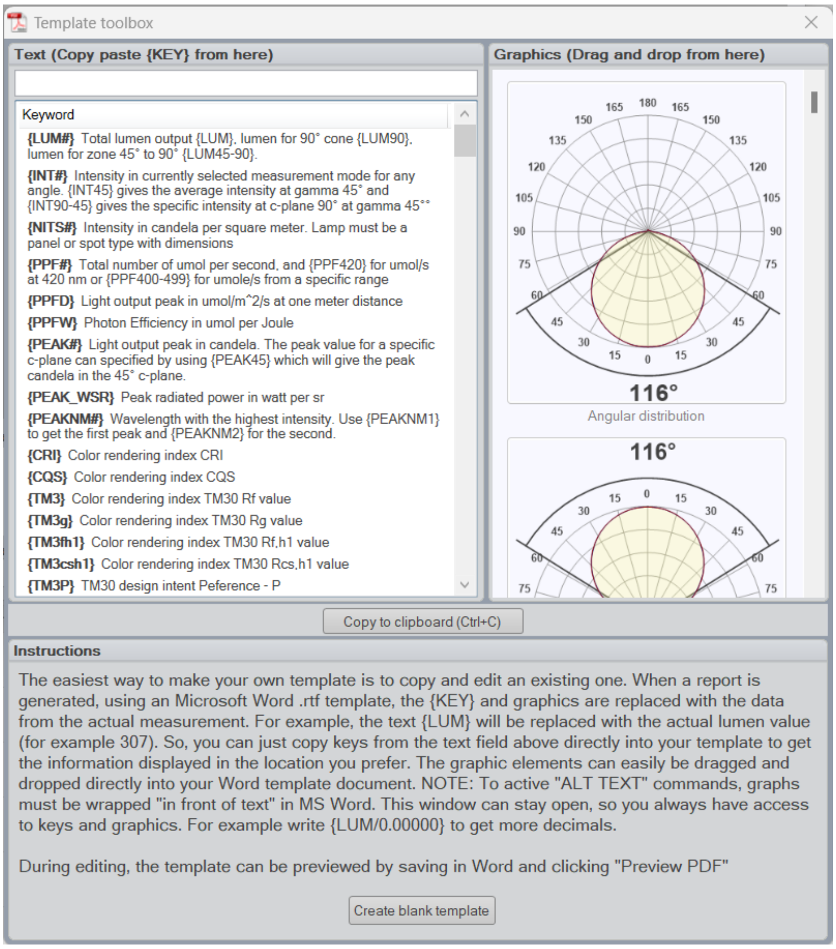
All of the 'value spaces' in the Word document are displayed like e.g. {LUM} but when the document is saved and used for PDF report, these spaces will be filled with the actual values from the measurement.

Like the picture below where the left one is from Word and the right one is the exported pdf.



Insert graphics and values in MS Word

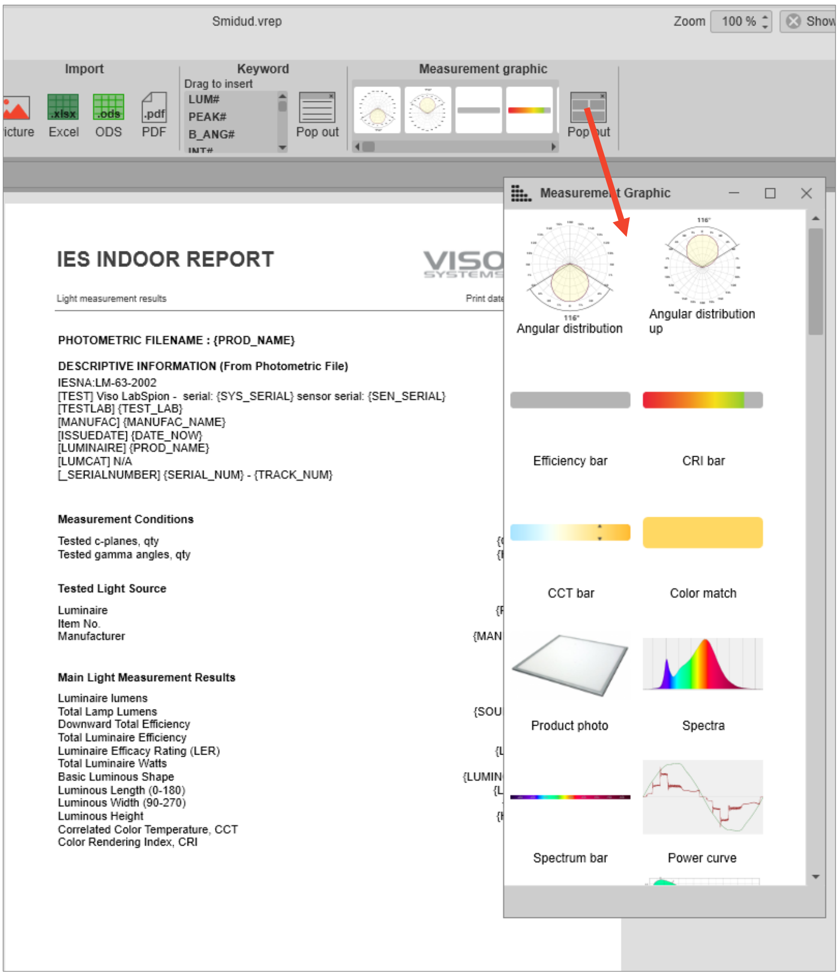
To insert components into a document, click on ‘Template Toolbox’. From here you can search and copy value keys, e.g. {LUM#}, and insert them into the Word template. Graphics can be dragged and dropped into the template.



- From the main Custom PDF window, click Edit template on the bottom right.
- A Word document will open, and all elements can be edited-deleted-reorganized, simply using MS Word and embedded objects as MS Excel
- All the images are Vector graphics, so you will avoid the fuzzy bitmap issues
- For tips on editing templates, click on the Template toolbox on the bottom of the Custom PDF window.
- When you click on the Template toolbox, you will also find standard text, which explains the meaning of all metrics on the list. By clicking on these individual items, you add the label

Insert graphics and values in Viso Report Builder

In Report Builder, you can access the Keyword and Graphics overviews in pop out windows. Drag and top the desired content to your report:

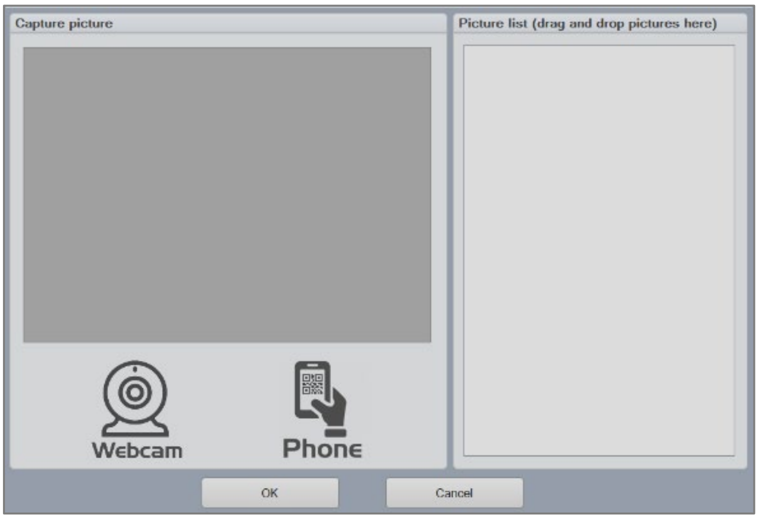


Adding photos and other graphics

You can add as many photos, graphics, and drawings as you wish. The images that you add will be saved in the .fixture file.

Open the graphics entry window by click this area in the Library window:

Then, this window opens:



You now have the option of:

- Clicking the “Webcam” icon and enter a snapshot from the webcam on your PC, and/or
- Clicking the “Phone” icon and adding a photo directly from your smartphone camera through a QR code, and/or
- Dragging-and-dropping graphics and photos onto the picture list on the right-hand side.
- Finally, press “save” or “CLTR+S”

All files can be part of your pdf reports:

- Open your rtf-file report template in the MS Word editor.
- Drag-and-drop as many “Product Photo” images from the Toolbox to the .rft file as needed.
- Right-click each image and add alternative through the “Edit Alt Text...” command. Add keyword {PIC1} to the Alt Text of the first image, {PIC2} to the Alt Text of the second image and so on. The general keyword {PIC#}.
- Make sure that that all image wrappings are set to be **in front of the text**

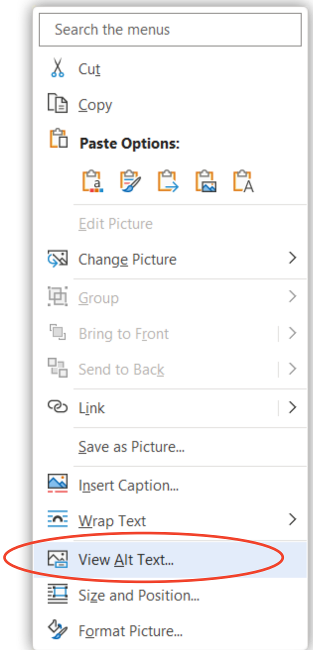


Image options

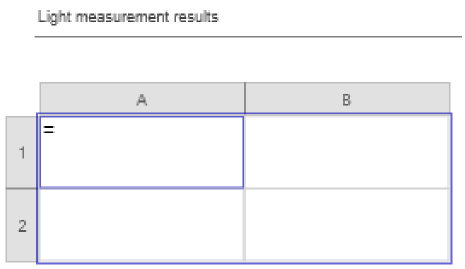
Some graphics allow you to make small customizations, such as scaling of isolux diagrams, choice of units etc. This is done by adding keywords to the graphics in MS Word. These keywords adjust default graphical setting. Examples:

- If you have more than one product photo in your fixture file, you may use them all in the PDF reports. Just indicate keyword {PIC1}, {PIC2}, {PIC3}... in the product photo Alt Text in MS Word.
- The Iso-Illuminance plot can be customized in several ways, such as mounting height, plot dimensions and plot limit illuminances.
- Angular distribution plots normally just show two sets of curves: Plane C0-C180 in red and Plane C90-C270 in blue. Adding the keyword SHOWPEAKPLANE to the Alt Text adds a third, green curve to the plot: The plane including the peak intensity. This is especially applicable in streetlighting.

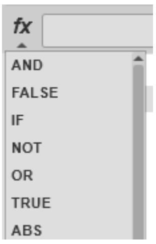
Working with tables and calculated fields

In .rtf files, you can embed excel spreadsheets, work with algorithms and custom graphics. Contact Viso Systems info@visosystems.com to get more advice and inspiration.

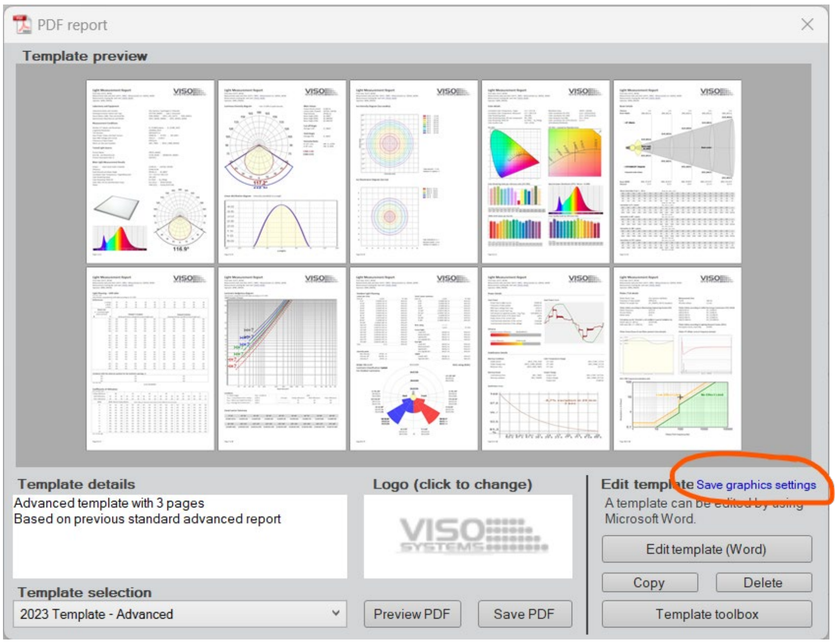
In .vrep files, you can do basic calculations directly in tables. Start writing an expression beginning with “0”, and row/column indicators will appear:



Get an overview of the functions by clicking the FX button:



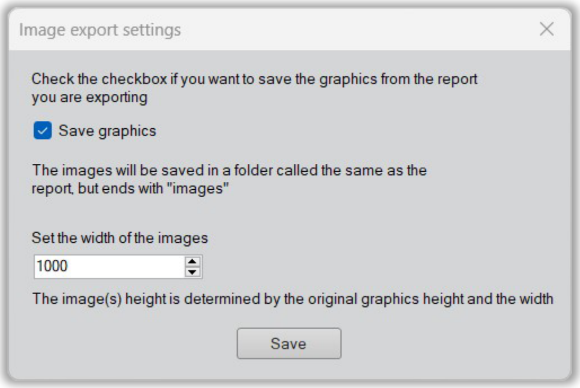
Exporting standard graphics and PNG files



It is possible to export all standard graphics related to a specific PDF report to separate PNG files.

The graphics are vector graphics that combine visual elements with the specific data extracted from your measurement, and by specifying the desired resolution (image pixel width) the system can also generate PNG files of those graphics.

When you generate the PDF report, the PNG-files will be stored in the same location in a new folder that will have the same name as your PDF report + “images”:



Exporting graphics does not work for “Fixed” report templates.

11. Special Measurement Situations

11.1. Avoiding Straylight

If the space surrounding the goniometer is not completely dark, reflected light from the device under test may influence measurements. Very often reflected light from the background of the goniometer will cause measuring errors. Hence, for light sources that only emit light in an angle from -90 to 90 degrees you will sometime find measurement results indicating that 1-5% of the light are above 90 degrees. Such results can be omitted in two ways

By reducing straylight (making the space and especially the backdrop darker). See more these guidelines on how to make an optimal light measurement lab: Guidelines - building a lighting laboratory

By cancelling out the upper parts of the output – see *page 91, Window: Spherical Limit.*

You can make a simple visual test of your straylight conditions

- Stand just behind the sensor head
- Prevent direct eyesight to a small light source (overshadow the light source itself) with your hand and perform a measurement cycle
- While measuring, look for parts of the surroundings that reflect light in your direction.

11.2. No light in the sensor's direction

Sometime when measuring side emitters, there is practically no light that hits the sensor in the start position. This means that the integration time will be set to a high level (such as 1 second or more) to get enough signal. This will also increase the influence of noise.

When the gonio starts moving, it will move quite slowly because of the long integration time.

At some point, the gonio will move to a direction where the sensor is hit by more light, which will oversaturate the sensor. The gonio arm will move the source to the new max. output direction, reset the integration time to a lower level, and redo the c-plane, where over-saturation happened.

Potentially, this can happen more than one time during measurement. Eventually, you will have a correct measurement, but it takes more time that usually.

There are two ways of avoiding this:

1) Set the integration time manually: Before starting a new measurement, turn the DUT on the gonio so that the peak hits the sensor. The set the integration time manually, as described in page 42, Manual setting of integration time.
2) Use the the auto-c-plane functionality: After determining the correct amount of c-planes, the DUT will automatically be turned to the peak direction getting the correct integration time, and staying in that position

for stabilization, so that the sensor can more accurately capture intensity changes.

11.3. Scaling: Extra Long/Wide Linear Light Sources

Many LED Lamps are linear with a uniform light distribution all over. As a result, it is not necessary to measure the entire length. This is a valid solution because by definition, long distance type-c measurements assume light source to be point shaped, i.e. having no physical size.

Measuring just a fraction of the whole luminaire is advantage also with large luminaires with a low and diffuse output because such luminaires of lead to long measurement time. By measuring e.g., only half, the measurement distance can also be halved, and the signal-to-noise ratio will be 2 squares = 4 times better.

Linear Lamp function

If a linear lamp is 300 cm, it is possible to measure 100 cm and Light Inspector will help extrapolating the photometrics in the *Edit → Photometric → Linear Lamp*. The Linear Lamp feature assumes that the measured portion of the light source is representative of the entire length. As this is not always the case, care should be taken that extrapolation of measurement results increases the inaccuracy of the results. Thus, it is recommended not to extrapolate more than 500%.

In some linear lamps, there is a considerable voltage drop from one end to the other in which case it is good practice to measure a fraction of both end and averaging. Alternatively, it is possible to measure a fraction in the exact middle of the fixture under the assumption that the output in the middle represents a valid average.

The Linear Lamp function is originally a function dedicated to Viso LightSpion with extender, making the system capable of measuring linear light sources by masking of the fixture, so only a specific portion of the light is measured. After the measuring process is finished, the actual length of the light source is typed into the software and the complete light output of the linear light sources is then calculated. With a Viso LightSpion system there is a special masking frame ("Light port") that ensures that the system just sees a small fraction of the light source. But it is possible to mask off other fixtures with cardboard or duct tape or the like.

For linear light sources of flexible lengths such as LED strips it is possible to get the light output information specified in lumen per meter or foot.

Other extrapolations

See more about this in the LightSpion User Manual.

Another option is to extrapolate extra-long or wide luminaires manually in *Edit → Photometric*:

- Measure a fraction of your light source
- Perform the follow steps to extrapolate to the full size:
    - Set the full light source size under the "Dimensions" tab
    - Set the lumen package to the measured value multiplied by the full light source size divided by the measured size
    - Set the power to a value related to the full length in *Edit → Power*.

Such extrapolations are valid if the measured piece represents the full length in terms of efficacy, spectrum and light distribution. The measured piece should not be less than 20% of the full length.

11.4. Calculating 'Nits'

By definition, type-c goniometers assume light sources to be (approximately) point shaped, i.e., with no physical size.

Luminance [cd/m2] is a measure of brightness, and brightness distributions on surfaces. The measure is dependent on viewing angle.

To measure luminance distributions, you would need a luminance camera that contains a calibrated imaging sensor. You can also measure luminances in specific surface points with a simpler luminance meter.

Report keywords
{NITS} returns the average luminance in the 0-deg direction in candela per m^2.

If the light source **is plain** and has a **uniform luminance distribution**, the luminance in a given direction can be calculated simply as the measured intensity [cd] divided by the apparent area of the luminous surface. For PC screens and TV sets this luminance is called Nits. Nits will be calculated by using the luminous surface area typed manually by the client. Nits is only valid in a viewing angle which is orthogonal to the luminous surface.

Hence, 'Nits' is an average measure of the luminance straight forward from a uniformly lit surface such as a screen. Take the measured candela value at 0 degree and then divide with the area of the panel being measured. So, nits = (Candela @ 0 deg) / (panel area in square meter)

It is even possible to make it happen automatically by using excel calculation in the custom PDF template.

Luminance values for other directions can also be calculated, again on condition that the light source is plain and uniformly lit:

$$\text{Luminance [cd/m}^2\text{]} = \frac{\text{Intensity [cd] @}\alpha°}{\text{panel area [m}^2\text{]} \cdot \cos\alpha}$$

Where α represents the angle of vision to luminous surface.

11.5. Measuring output changes over time

The following describes a way to records the output of a fixture over a set time, essentially to see if the output is varying over time. The principle is setting a custom warm-up period (or let it run until to manually skip = no auto-start):

1. Make sure you have software version 7.16 or later.
2. Click the 'play' button.
3. Set the number of measurement planes to zero.
4. Click Start.
5. When the stabilization window appears, click on the drop-down list and pick 'Custom stabilization'.
6. Click radio button 'Start after time' and set the number of minutes you would like to run.

7. You will now get your Intensity, Voltage, Current, Power, CCT, CIEx, and CIEy logged every 4 seconds or so.

8. Once the measurement is completed, save it as usually.

9. See the curves directly in the software with View -> Stabilization.

10. Export with Export -> Excel -> Stabilization data.

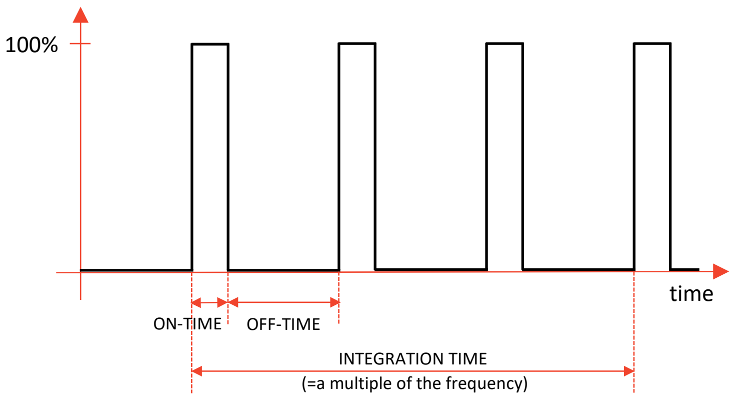
11.6. Measuring Pulsed Light Sources (without LabAnalyzer w/ sensor sync)

Some light sources such as strobe lights for the entertainment business purposely emit pulsed light.

Provided that the modulation pattern is known, these light sources can also be measured with a standard Viso solution.

Method:

1. Establish the modulation pattern in terms of on/off flash time and frequency F (in sec.)



2. Make a measurement with an integration time, which is a multiple of 1/F. The integration time of the spectrometer can be set manually by selecting *Setup* → *Integration time*. See more details about integration time in *page 40, Window: Integration Time.*

3. Calculate the on-time lumen package:

$$\text{On-time lumen} = \text{Measured lumen} \cdot \frac{\text{OFF-TIME} + \text{ON-TIME}}{\text{ON-TIME}}$$

4. Adjust the lumen package in the following way:
Go to *Edit* → *Photometrics* → *Modify*. Check the Modify lumen box and overwrite with the measured “On-time lumen”

5. Now, the dashboard will show the on-time light distribution curve, the on-time lumen package and the on-time peak value. All exported figures and reports will reflect the changes.

Example:

A sample strobe light has a flash rate frequency F of 30 Hz.
As 1/F is 0,0333.... (an infinite amount of decimals), we choose an integration time that covers 3 periods = 0,1 sec (finite). Before making our measurement, we manually set our integration time to 0,1 sec.

Report keywords

These keywords only return values if the measurement was made with a LabAnalyzer w/ sensor sync.

{FLASH_PERIOD} returns the total flash period in seconds.

{FLASH_PERIOD_PWR} returns the average power to the complete flash period in W.

{FLASH_TIME} returns the time of the flash inside the period. If the flash consist of multiple bursts, this keyword returns the time from the first burst start to where the last burst ends.

{FLASH_CUR_PEAK} returns the peak electrical current in A during the period

{FLASH_PWR_PEAK} returns the peak electrical power in W during the period

{FLASH_BURST_COUNT} if a flash consists of two or more sub-bursts this keyword returns the quantity

{FLASH_BURST_TIME#} returns the time in sec of a specific flash burst pulse. Use # to specify which.

{FLASH_BURST_TIME_TO_NEXT#} returns the time in sec between flash burst pulses. Use # to specify which.

We make a measurement and pay extra attention:
If the signal is weak (much noise in spectrum) increase to a larger integration, e.g. 15 periods. If the sensor oversaturates during measurement, move the sensor further away. The intensity drops with the distance in the second power.

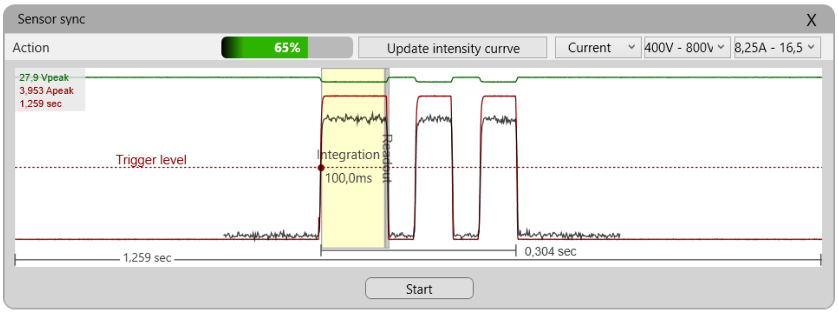
After measurement, check that shape of the light distribution looks according to expectations.

Then, calculate on-time lumen with the formula above (point 3). Modify the lumen package accordingly.

Add remarks about frequency and on-time fraction to the “Additional information” field and save your modified measurement.

11.7. Measuring Pulsed Light Sources (with LabAnalyzer w/ sensor sync)

With the special LabAnalyzer with sensor synchronization, it is possible to measure pulsed light sources (strobe lights, flashes, indicator lamps etc.) automatically. Please see the dedicated user manual for this product.



The system detects the flash waveform and frequency by analyzing the light source current draw and synchronizes the sensor integration time to fit this, so that light is only measured when “on”.

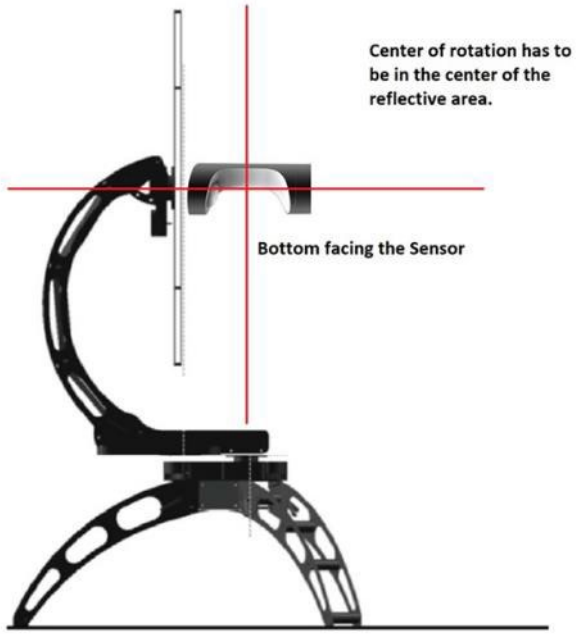
11.8. Omni-directional Light Sources

Some light sources emit light in the direction of the tower/arm of the goniometer. In these cases that full measurement can be done by measuring the light source twice – pointing in opposite directions and combining the two measurements into one. Below is a description of how to proceed with a side-emitting or omnidirectional light source on a LabSpion system, but the principle can be transferred to other Viso goniometers.

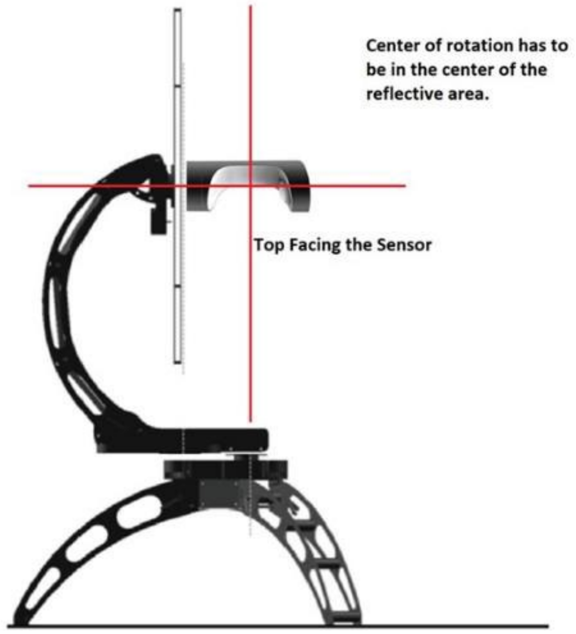
<u>Measuring an Omnidirectional or Side Beam Lighting Fixture</u>

1. Bollard fixtures: Remove the post to cut down the weight
2. Mount the lighting fixture as shown below and then carefully align the center of the light source/reflective area to the center of rotation of the LabSpion, maybe use the Bosch Laser that came with system.
3. Maybe mark the exact center on the lamp, so you can replicate the alignment.

4. With the lamp mounted and aligned, then do a quick 4 plane measurement to see how the if the measurement goes as planned.
5. If everything goes as expected then do a more detailed measurement, e.g., an 18-plane measurement).
6. If there is (almost) no light hits the sensor in the start position, it is an advantage to use the auto-c-plane functionality: After determining the correct amount of c-planes, the DUT will automatically be turned to the peak direction for stabilization, so that the sensor can more accurately capture intensity changes.



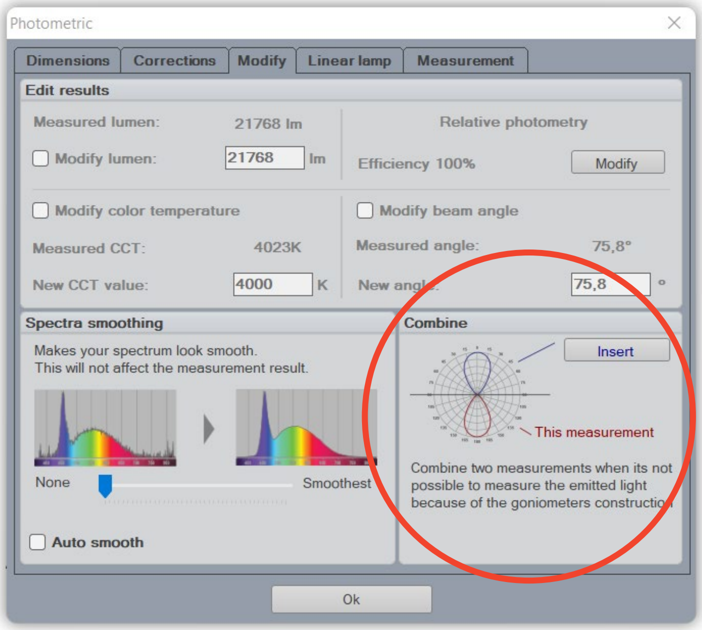
7. When this first measurement is done that is done save the measurement and flip and re-align the lamp on the LabSpion, like so:



8. Repeat the measurement steps from above. Important: Both measurements must have the same c-plane quantity.

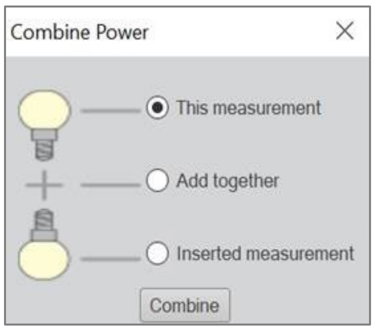
9. When you have saved the last measurement.

10. You should have two measurements, that you should be able to combine using the combine feature in *Edit* → *Photometric* → *Modify*



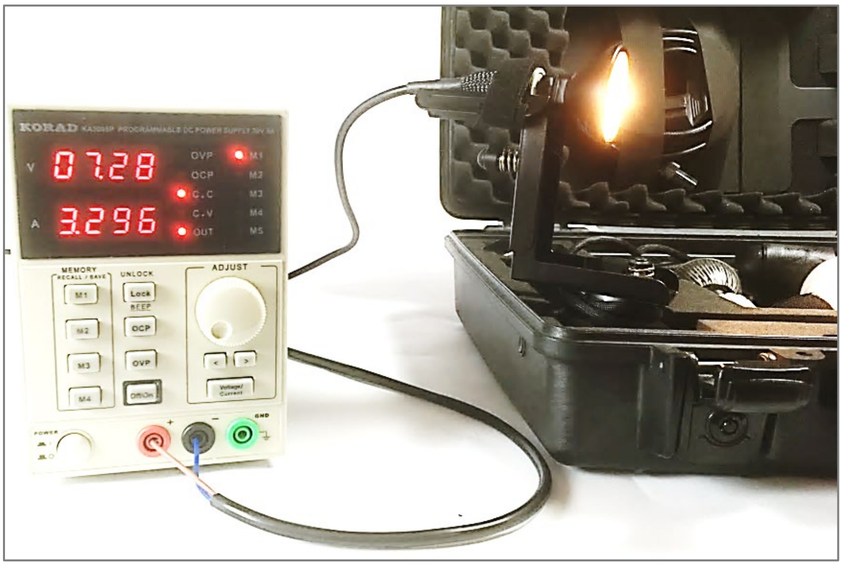
11. This should be done from the measurement with the bottom facing the sensor and then select the measurement where the top faces the sensor. When combining, the output from the two measurements will not be added. The method essentially discards light in the upper hemisphere from one measurement and discards light in the lower hemisphere from the other measurement before joining them.

12. In the combine power: Select the appropriate option and click combine.



13. Now save the combined measurement with a new name.

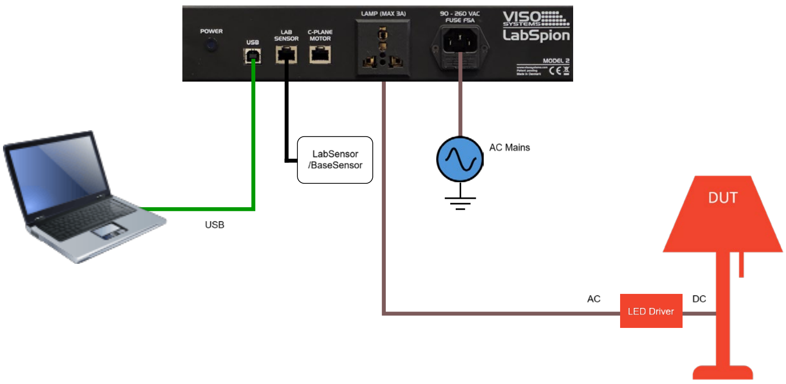
11.9. Using external power supplies and power analyzers



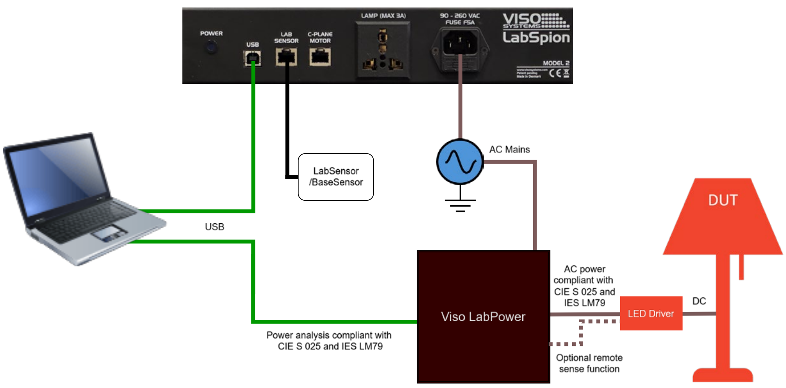
Possible Viso AC power supply configurations

The configuration examples below show the possible configurations using Viso solutions. The mainboard panel shown is a LabSpion panel, but BaseSpion (and LightSpion) work the same way.

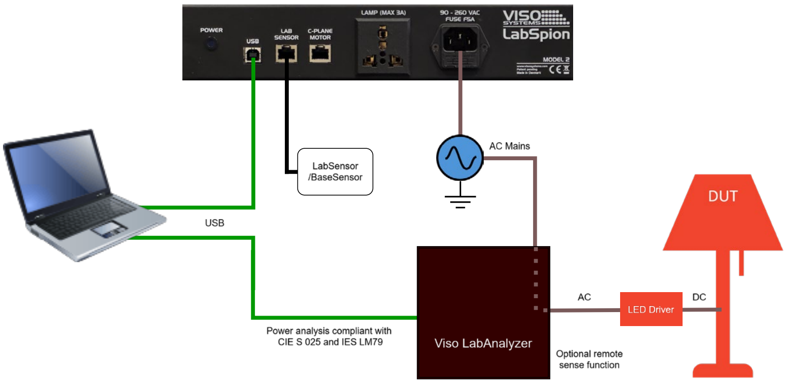
Standard configuration



Configuration with Viso LabPower

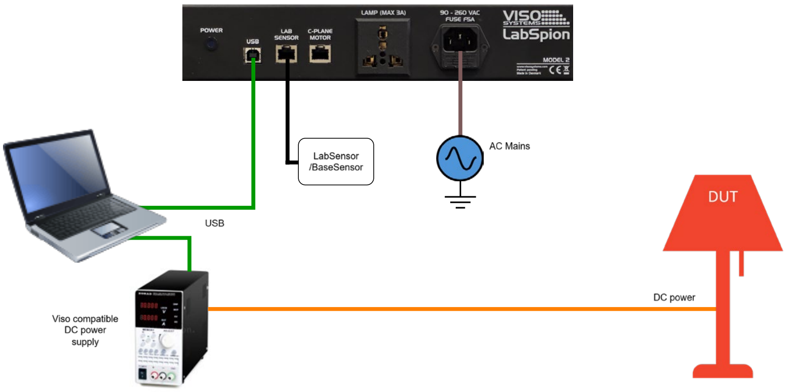


Configuration with Viso LabAnalyzer

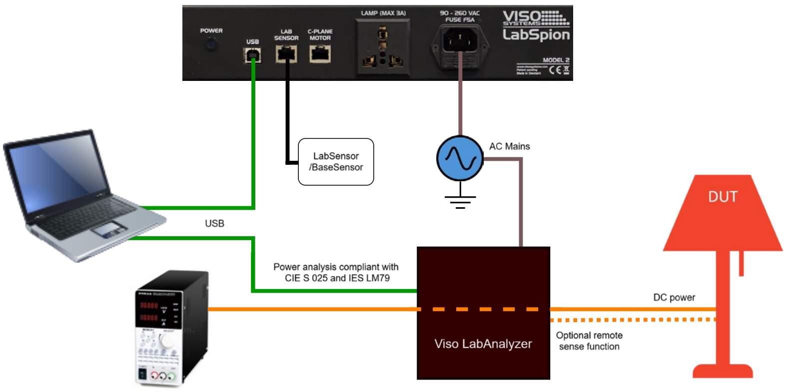


Possible Viso DC power supply configurations

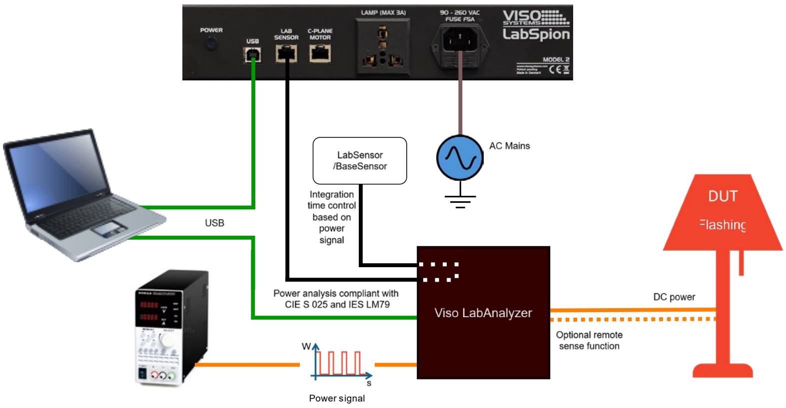
Standard configuration with Viso compatible with Light Inspector Software



Configuration with LabAnalyzer



Configuration with LabAnalyzer w/ sensor synchronization



Without Viso software interface

When measuring low voltage light sources such as 12 V MR16 lamps or strips, an external low voltage power supply must be used.

Any low voltage power supply can be used. If you want the measured power to be seen from the low voltage side the power details must be typed in manually by going into *Edit* → *Power*.

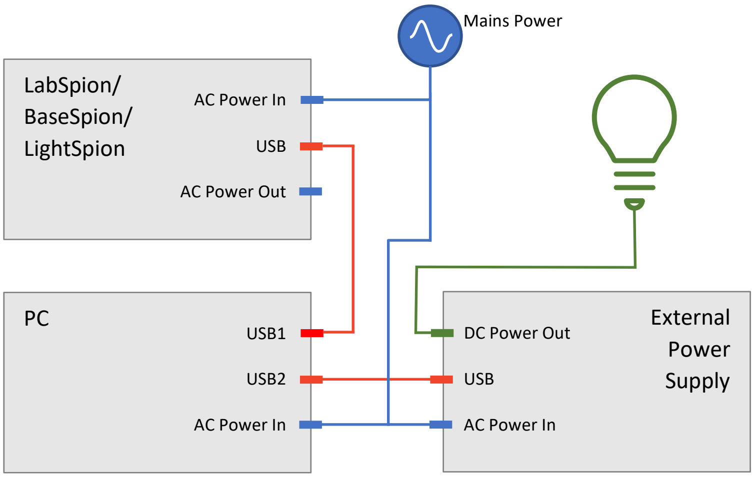
With Viso software interface

Using external power AC/DC power supplies and power analyzers that have a dedicated Light Inspector interface makes it possible to communicate directly with the external device: Power settings can be set, and output can be transferred directly to your measurement results. The Light Inspector software is compatible with these external units:

- DC: Manson SSP-8160/SSP-8162
- DC: KORAD KA3005P
- DC: KORAD KWR103
- DC: VELLEMAN PS3005D /PS3005 DN
- AC: GW Instek APS-7100E and GPM-8310
- Power Analyzer: Yokogawa WT310E
- Power Analyzer: BK Precision 5335C

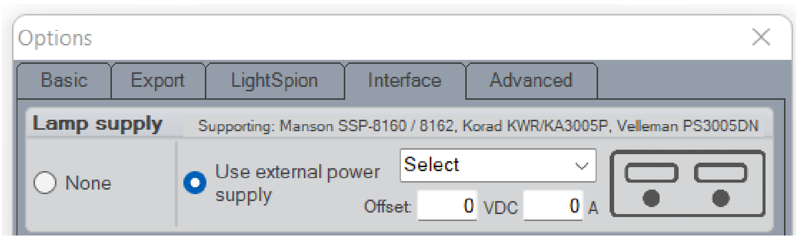
Connecting the compatible external unit

Connect the power supply via USB:

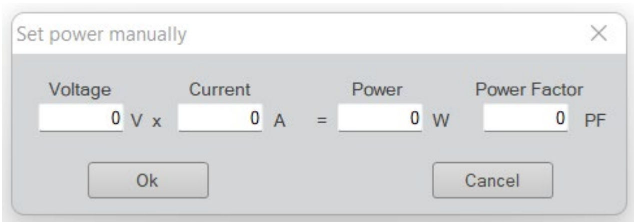


In the software, go to into *Setup* → *Options* → *Interface*. Click ‘Use external power supply’/’Use external power analyzer’ and select the correct COM line in the drop-down list.

It is possible manually to correct VDC and A values communicated from DC power suppliers with a fixed offset, but normally this function is not necessary.



Once communication is established, you may turn the light source on and off through the software. You may also set the AC feed with the software. Go to *Edit* → *Power* → *Set Power Manually*:



If you need to boost the voltage range, two constant voltage power supplies can be connected in series and the offset (voltage) of the supply that is not connected via USB can be typed into the offset field, so you get a correct voltage reading.

Viso System does not distribute the Manson, Velleman or Korad power supplies but they can be purchased online.

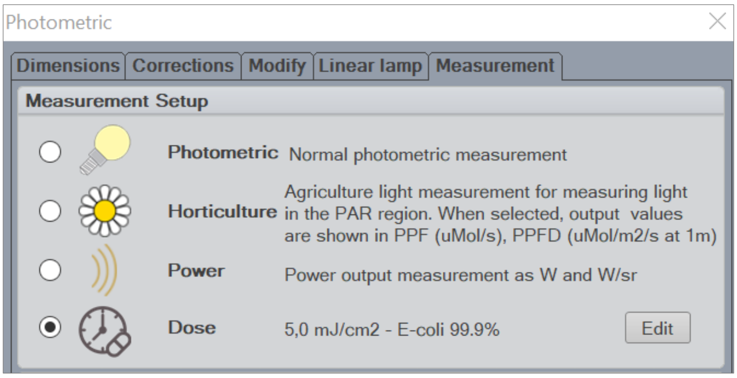
11.10. Working with doses of light / radiant exposure

Section 7.1 briefly described how you can shift your measurement setup to Dose Units. With Dose Units, your output will be radiated power in W and W/sr and furthermore in specific dose time/dosage (hh:mm) – also called radiant exposure in e.g., J/m2 or MJ/cm^2. This setting is particularly interesting for UV lighting – germicidal UV lighting and for other UV purposes such as curing of glue and plastics.

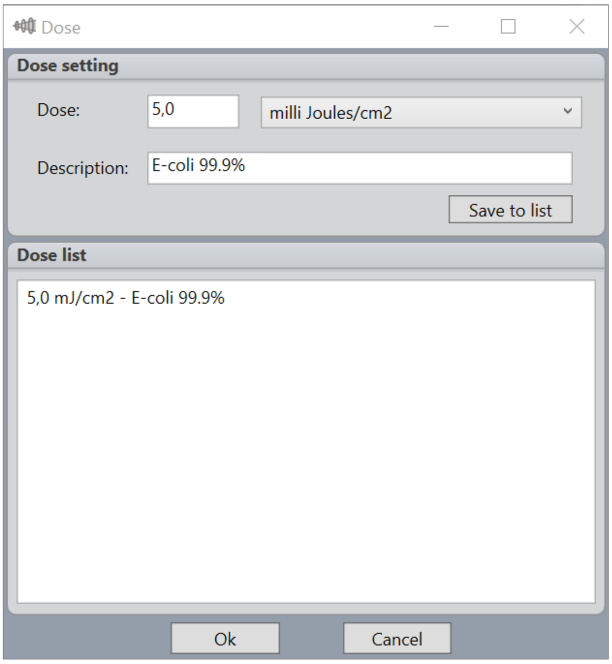
Click *Edit* → *Photometric* and choose tab “Measurement”.

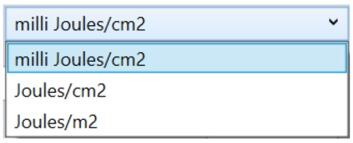
Example

The degree of inactivation by UV light is directly related to the UV dose applied to water. Dosages for a 90% kill of most bacteria and viruses range between 2,000 and 8,000 µW/cm2. Larger parasites such as cryptosporidium require a lower dose for inactivation. As a result, the U.S. Environmental Protection Agency has accepted UV disinfection as a method for drinking water plants to obtain cryptosporidium, giardia or virus inactivation credits. For example, for a 90% reduction of cryptosporidium, a minimum dose of 2,500 µJ/cm2 is required based on the U.S. EPA UV Guidance Manual published in 2006



Click “Edit” button to open the dose setting window. Here you can enter the dose/radiant exposure that is relevant to your scientific purposes. The default dose in the list is a dose that inactivates E-coli bacteria[5]. https://photometriceditor.com/



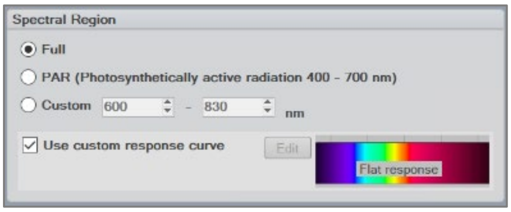


You may delete items in the list by right-clicking on them and choosing ‘delete’.

You may enter your own doses by entering values in the Dose and Description fields and choosing a unit. Then click ‘Save to list’. Your list will exist also after software updates.

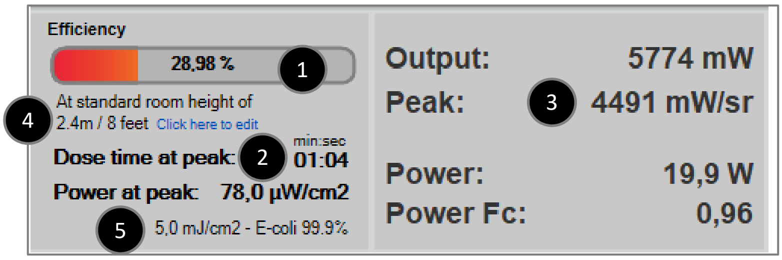
Please note that shifting to dose units does not take into account whether the spectrum wavelengths are actually in the required action interval – e.g. UV-C. To get accurate dose result you should either limit your wavelength output region or load a dedicated response curve (see *section 11.11, Working with Special Response/Sensitivity Curves)*:

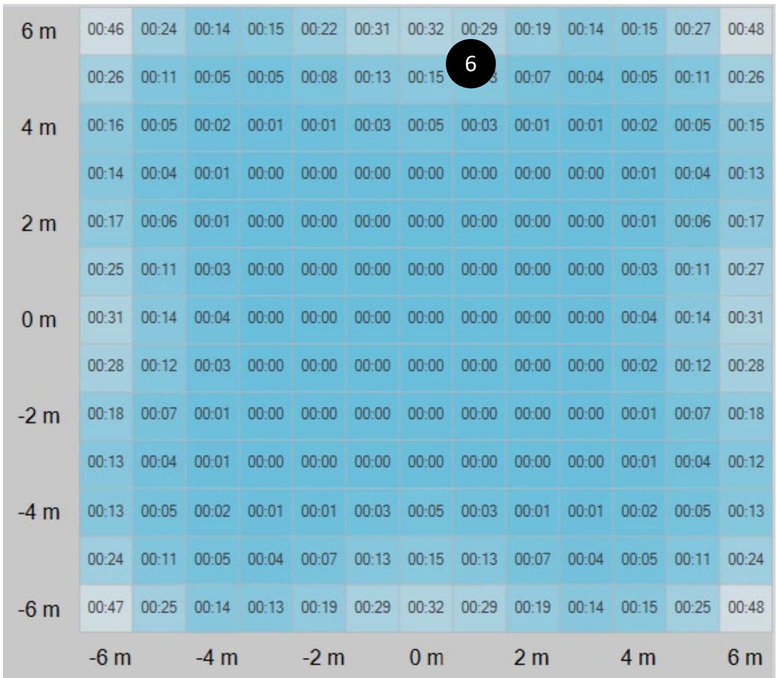
[5] Viso Systems takes no responsibility for correctness of inactivation doses or inactivation results.



In this way, you can prevent e.g. visible wavelengths contribute to the UV dose results.

When choosing Dose Units, your dashboard will change to show:



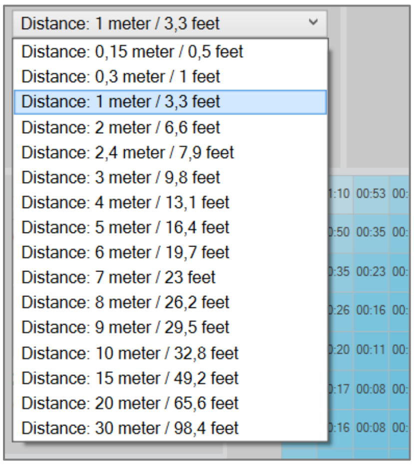


❶ Radiation efficiency – radiated light (W) per input power (W)

❷ Dose time at peak in hours:minutes. The example shows the dose time to inactivate 99.9% of Covid virus is 3 minutes - depending on ❹ (distance to surface) and ❺ (dose)

❸ Irradiance at peak in µW/cm2 - depending on 4 (distance to surface)

❹ Distance from light source to irradiation target plane ("room height") in meter or feet. Standard value is 2.4 m/8 ft. Click to choose other standard values:



Report keywords
{DOSETXT} returns the dose description text
{DOSEUNIT} returns the specified dose unit.
{DOSEVALUE} returns the specified dose

❺ Dose – your choice of dose to work with specific viruses or bacteria. An expression that indicates a specific energy that inactivates a specific proportion of a viruses/bacteria population. Standard is the UV dose that inactivates 99,9% E-coli bacteria. Change by clicking "Edit" in measurement setup.

❻ Dose map: Floor size dependent on distance: x and y axis lengths are approximately +/- 3 times the height. This plot is fixed in the dashboard but can be customized in the output reports.

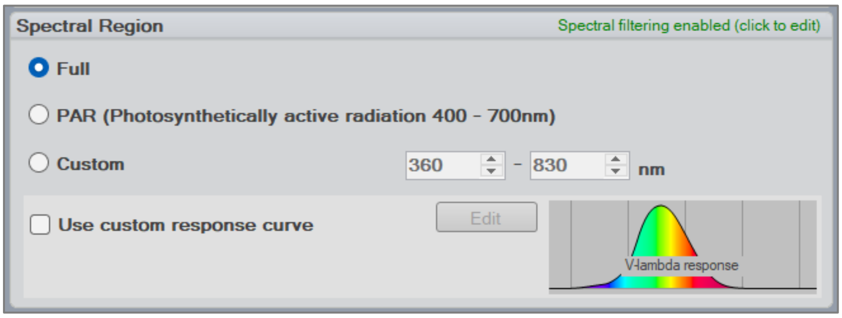
11.11. Working with Special Response/Sensitivity Curves

Under the **Measurement Setup** you can also change the response. Default response curve is the human eye photopic sensitivity - CIE photopic luminosity function V(λ).

Other response/sensitivity curves can be entered:

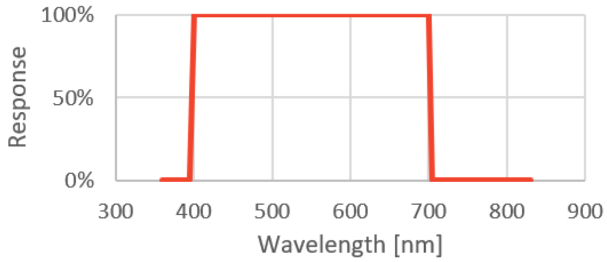
- Curves that indicate other human eye sensitivity scenarios: Scotopic and mesopic light conditions are interesting in outdoor lighting
- Blue light hazard sensitivity curves
- Melanopic, α-opic curves etc. are interesting in photobiology
- Photosynthesis action spectra are interesting in horticultural lighting
- Curves that indicate specific virus/bacteria sensitivity to wavelengths

Click *Edit* → *Photometric* and choose tab "Measurement" – and go to Spectral Region:

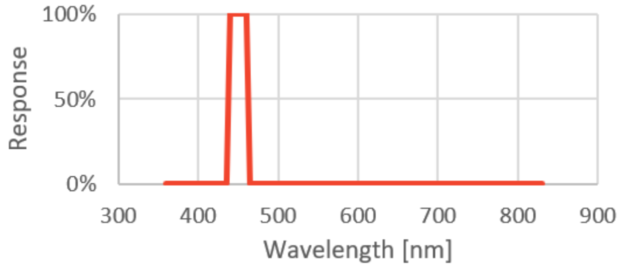


The simplest way of narrowing your results to certain wavelengths is to limit the results to a shorter spectral range.

Full	Will include the full spectral range for the specific system. ▪ Most LightSpions: 350-800 nm ▪ BaseSensor and LabSensor VIS: 360 - 830 nm ▪ BaseSensor and LabSensor UV-VIS: 200 - 850 nm
PAR range	PAR light is the wavelengths of light within the visible range of 400 to 700 nanometers (nm) which drive photosynthesis. This corresponds to a very primitive response curve being:

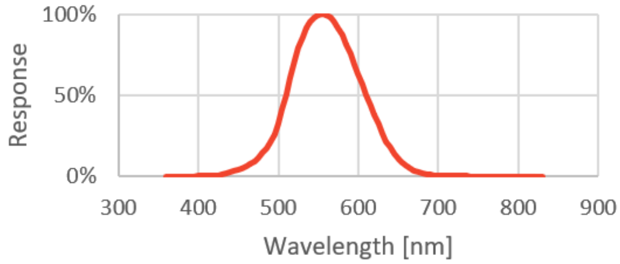


Custom range	*Set your own range, e.g., from 444-464 nm.* *This corresponds to a very primitive response curve being:*

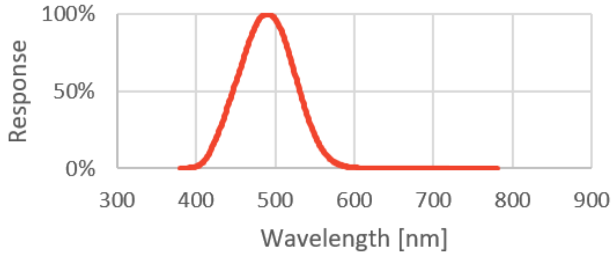


A custom response Curve ("Action Spectrum")

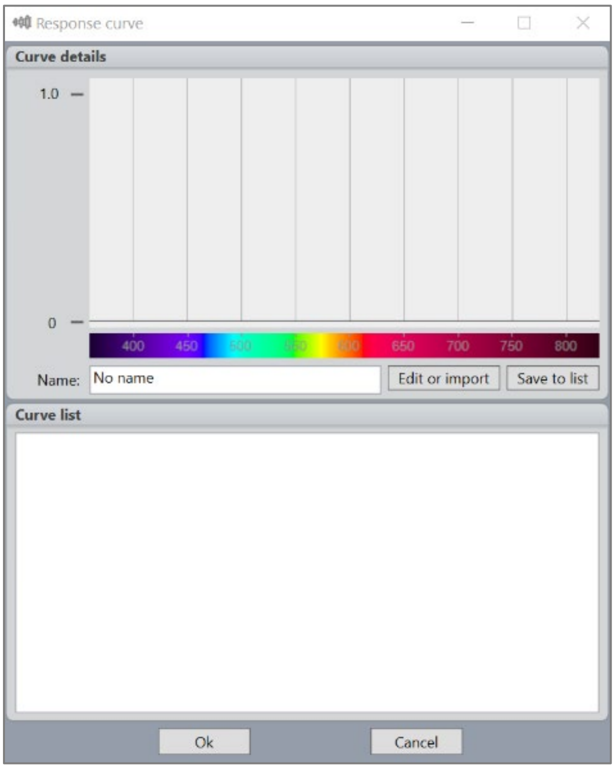
Set your own response curve ("Action Spectrum"). Default is the v-lambda curve:



You can set any response curve, e.g., CIE S 026 Melanopic action spectrum:



Entering your own special response curve is performed in a special dialogue that opens when you tick of "Use Custom response curve":



In this window, you will be able to work with your own detailed response curves. You can always go back to standard settings. The curves that you enter and save will be

Example: Scotopic response curve

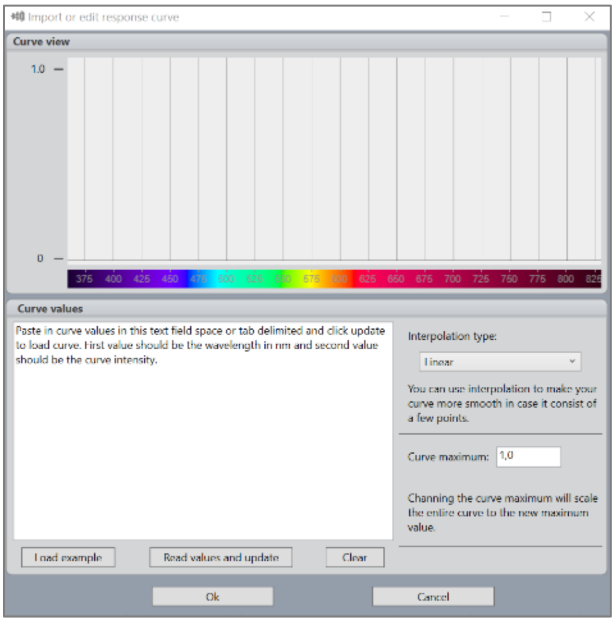
	A	B
1	nm	Scotopic
2	360	0,00000000000
3	370	0,00000000000
4	380	0,00058900000
5	390	0,00220900000
6	400	0,00929000000
7	410	0,03484000000
8	420	0,09660000000
9	430	0,19980000000
10	440	0,32810000000
11	450	0,45500000000
12	460	0,56700000000
13	470	0,67600000000
14	480	0,79300000000
15	490	0,90400000000
16	500	0,98200000000
17	510	0,99700000000
18	520	0,93500000000
19	530	0,81100000000
20	540	0,65000000000
21	550	0,48100000000
22	560	0,32880000000
23	570	0,20760000000
24	580	0,12120000000
25	590	0,06550000000
26	600	0,03315000000
27	610	0,01593000000
28	620	0,00737000000
29	630	0,00333500000
30	640	0,00149700000
31	650	0,00067700000
32	660	0,00031290000
33	670	0,00014800000
34	680	0,00007150000
35	690	0,00003533000
36	700	0,00001780000
37	710	0,00000914000
38	720	0,00000478000
39	730	0,00000254600
40	740	0,00000137900
41	750	0,00000076000
42	760	0,00000042500
43	770	0,00000024130
44	780	0,00000013900
45	790	0,00000000000
46	800	0,00000000000
47	810	0,00000000000
48	820	0,00000000000
49	830	0,00000000000

stored in your standard folder (usually: C:\Users\'UserName'\Documents\Viso Systems\Light Inspector). Consequently, your custom response curves can be applied to of your any measurement afterwards, unless you choose to delete it.

Initially, this window is empty.

In the example below, we will enter a new custom response curve, the so-called scotopic vision curve (low-level, "nighttime" human visual response).

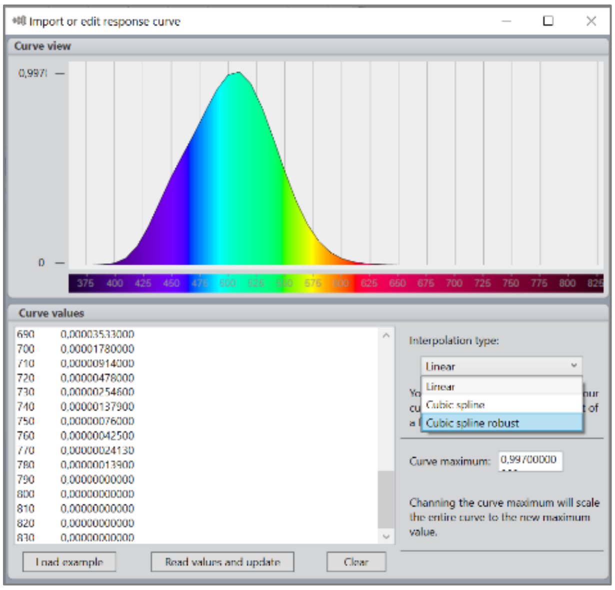
First, press "Edit or Import", and this window opens:



Mark and delete the help text "Paste in curve value is this text field...)".

You may now paste your own values (less the headlines) of response as a function of wavelength. Response values between 0 and 1 or 0 and 100% as in the example to the left. Simply copy and paste from your resource (e.g., Word, csv-file, excel etc.).

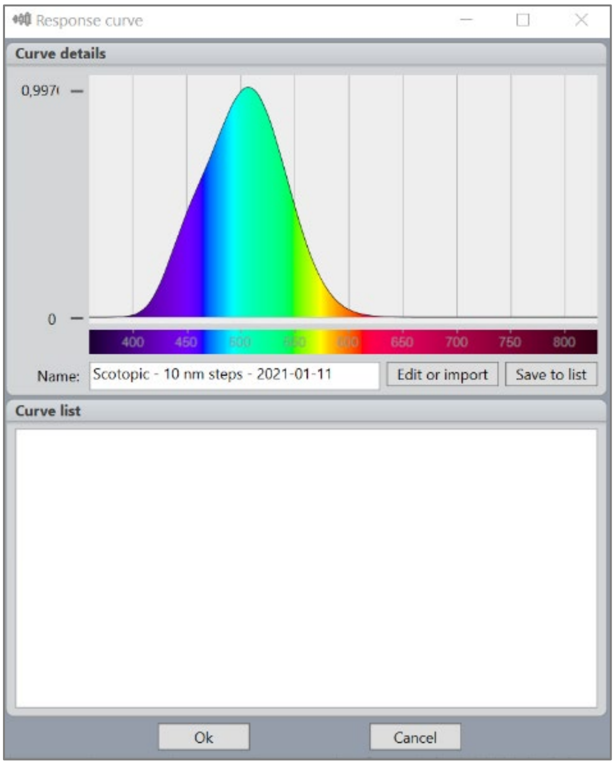
Then press "Read values and update". The window now looks like this:



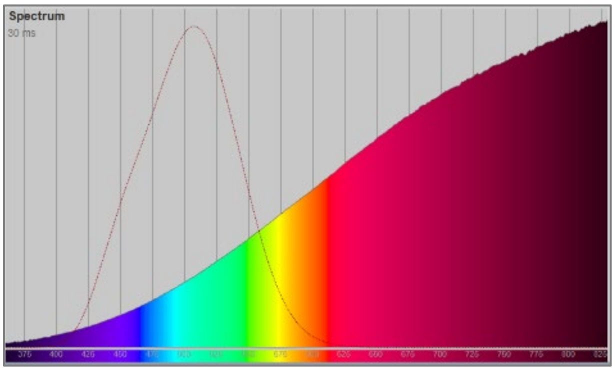
The curve looks a little jagged since data only consists of values for every 10 nm. Per default, the system uses linear interpolation between values. The interpolation type can be altered via the "Interpolation type" button to suit your needs. All posterior calculations will be based on this choice.

Further, the curve maximum value can be altered = typed in manually. This feature can be used to normalize your curve if values are not between 0 and 1.

When done, press OK, and you will return to the curve list window. You should now name your new response curve and save it to your personal list (press "Save to List". Adding a meaningful name and maybe a date will help you keep track of your custom curves:



Choose your new curve from the list and press "Ok". You will now return to the dashboard. The Spectrum area has now changed to reflect that you have applied a custom response curve. The curve is overlayed with the spectrum:



This feature will remind you of your special setting while also giving a direct and intuitive impression of the match between the spectrum and the response.

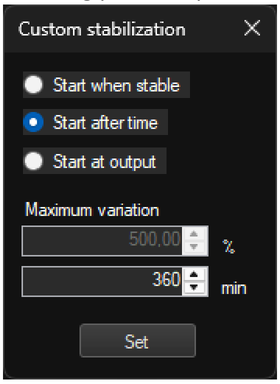
11.12. Using a Viso system to Test Long Term Effects and Battery Depletion

Any Viso system can be used to check for effects on light output over several hours. This is done by using the normal stabilization system – but in a different way:

1) Start your light measurement as normally with the play button.

2) Choose “0 planes” = point measurement (no rotation)

3) When the stabilization window opens, choose a “custom warm up” and how long you want your measurement to run, e.g., 360 minutes:



Alternatively, choose ‘No auto start’ in which case the measurement will ned when you manually click ‘Skip and continue’ or hit ‘Enter’.

4) Your output will now be monitored and logged for approximately every 5 seconds.

5) Get your results with File -> Export -> Excel -> Stabilization data: Intensity, Voltage, Current, Power, CCT, CIEx, CIEy as a function of time.

6) You can also get specific results with the special keywords below (PDF reports, Custom Excel reports etc.)

Report keywords

In the following “stabilization period” refer the whole output-over-time measurement.

Stabilization criteria:

{WUC_CHNG_MAX} Stabilization max change in %, {WUC_STBL_PER} stabilization period in minutes, and {WUC_MIN_TIME} stabilization period minimum in minutes

Stabilization results:

{WU_TIME} stabilization time. Formatted as ’23 min 12 sec’ and {WU_END_SEC} returns the warm-up end time in seconds - formatted as ‘s’. Can be used when reading out intensity values using {WU_INT#} to get the maximum curve time which can be read out.

{WU_VARI} stabilization variation in %

{WU_START_CCT} Stabilization CCT at start, and CTT change {WU_CHNG_CCT}

{WU_START_OUT} Stabilization Output in lumen at start, and output change {WU_CHNG_OUT}

{WU_MAX_INT} Stabilization maximum intensity. The maximum intensity during the stabilization period.

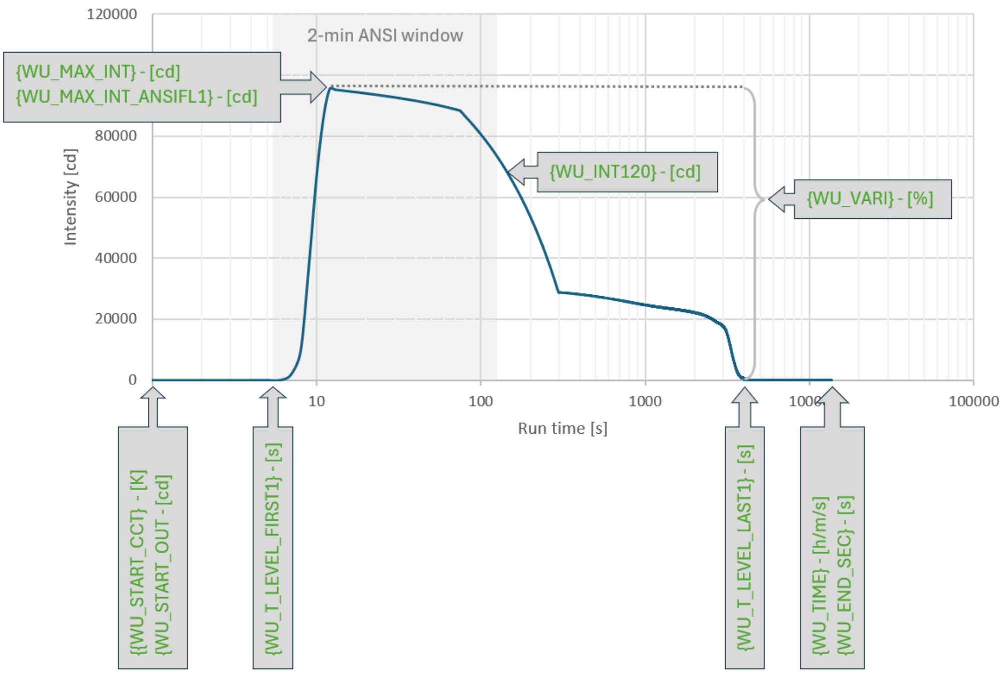
{WU_MAX_INT_ANSIFL#} Stabilization maximum intensity in accordance with ANSI FL1 with start threshold in percent of max. The maximum intensity during the stabilization period occurring between 30 s and 120 s after the start threshold is reached. Example {WU_MAX_INT_ANSIFL1} for 1% start threshold.

{WU_T_LEVEL_FIRST#} Time of first occurrence of a given intensity level in percent during the stabilization. Can be used to find the on time for a battery-driven light source. Example {WU_T_LEVEL_FIRST1} for a 1% level.

{WU_T_LEVEL_LAST#} Time of last occurrence of a given intensity level in percent during the stabilization. Can be used to find the time of depletion (off time) for a battery-driven light source. Example {WU_T_LEVEL_LAST1} for a 1% level.

{WU_T_MAX_INT#} Stabilization time of maximum intensity. The time when the maximum intensity during the stabilization period was reached. Optionally specify the percentage threshold from when the time shall be calculated

{WU_T_MAX_INT_ANSIFL#} Stabilization time of maximum intensity in accordance with ANSI FL1 with on-level threshold in percent of max. The maximum intensity during the stabilization period occurring between 30 s and 120 s after the start threshold is reached. Example {WU_T_MAX_INT_ANSIFL1} for 1% start threshold.



11.13. Compliance with CIE S 025/E:2015

(Test Method for LED lamps, LED luminaires and LED Modules)

The standard test conditions and tolerance intervals of CIE DIS 025 (laboratory conditions)	Standard test condition	Tolerance interval	Applicable for	Customer's Responsibility
Ambient temperature	25.0 °C	±1.2 °C	LED lamps / luminaires, light engines	Yes
Surface temperature	Nominal operating temperature t^p	±2.5 °C	LED modules	Yes
Air movement	Stationary air	0 m/s to 0.25 m/s		Yes (large light sources: Increase resolution to reduce movement speed)
Test voltage/Test current	Nominal voltage, nominal current	±0.4 % for root mean square value (RMS) alternate voltage; ±0.2 % for direct voltage and current		Yes

Summary of special requirements defined by the CIE DIS 025 standard for measuring instruments.	Requirement	Notes	Viso LabSpion / BaseSpion Specs	Viso Conformity	Customer's Responsibility
Calibration uncertainty for voltmeter and ammeter	AC: ≤0.2 % DC: ≤0.1 %		90 VAC - 260 VAC <+/- 0.5V (no internal DC power analyzer)	Yes – at 230VAC and higher	At 90-120 VAC and DC use external power supply
Calibration uncertainty and bandwidth of AC power meters	≤0.5 %		@230V: 0 – 600 W (Avg: +/- 0.1 W) @230V: 0 – 300 W (Avg: +/- 0.1 W)	Yes (for power >5 W)	<5W, use external power supply
	Bandwidth ≥ 100 kHz	kHz or 30 kHz are authorized without high-frequency components	600 kHz	Yes	
Internal impedance voltmeter	≥1 MΩ	An even higher internal impedance of the measuring instrument is necessary for devices under test with high impedance	0.56 MΩ	No	Possible via external power supply
Harmonic content and frequency uncertainty of operating voltage	≤1.5 %	≤3 % for power factors >0.9			Possible via external power supply
	±0.2 % of the required frequency				Possible via external power supply

Summary of special requirements defined by the CIE DIS 025 standard for measuring instruments.	Requirement	Notes	Viso LabSpion / BaseSpion Specs	Viso Conformity	Customer's Responsibility
AC component for direct-current supply	≤0.5 % (rms)			No	Possible via external power supply
Electric and photometric stabilization for the device under test	LED lamps and luminaires:	≥30 min and relative difference of maximum and minimum measured values of the previous 15 minutes <0.5 %	In software	Yes	
	LED modules:	Operating temperature t_p achieved and retained for 15 min in an interval of ±1 °C	In software	Yes	Possible via external temperature probes
Spectral sensitivity photometer	V(λ) mismatch index f1` ≤3 %		Calculated from spectral data	Yes	
Wavelength range and wavelength uncertainty for the spectroradiometer	380 – 780 nm		360-830 nm	Yes	
	≤0.5 nm (k=2)		0.2-0.35 nm	Yes	
Bandwidth and scanning interval spectroradiometer	≤5 nm		5 nm	Yes	
Angular alignment and resolution angular display goniometer	±0.5° aiming		±0.1°	Yes	
	≤0.1 ° display		±0.1°	Yes	
Photometric (test) distance	Beam angle ≥90°: ≥5xD			Possible	Yes
	Beam angle ≥60°: ≥10xD			Possible	Yes
	Narrow angular distribution / steep gradients: ≥15xD			Possible	Yes
	Large non-luminous areas with maximum distance S: ≥15x(D+S)			Possible	Yes
Burning position	Measurement in specified burning position or correction to behavior of the device under test in the specified burning position	Not necessary for LED modules with temperature regulation	The light source is not always in its designed operating condition during test and stabilization	Yes – correction possible through standard procedure (see page 64, Window: Lamp Orientation Test (S 025))	

12. Software Specifications

Compatible with	Windows 7, 8, 10, and 11/ 64bit
System requirements	minimum 8GB RAM
Export	PDF, IES, LDT, TM33-18 XML, CSV, Excel, ERPEL XML

13. Appendix 1: Laboratory Checklist

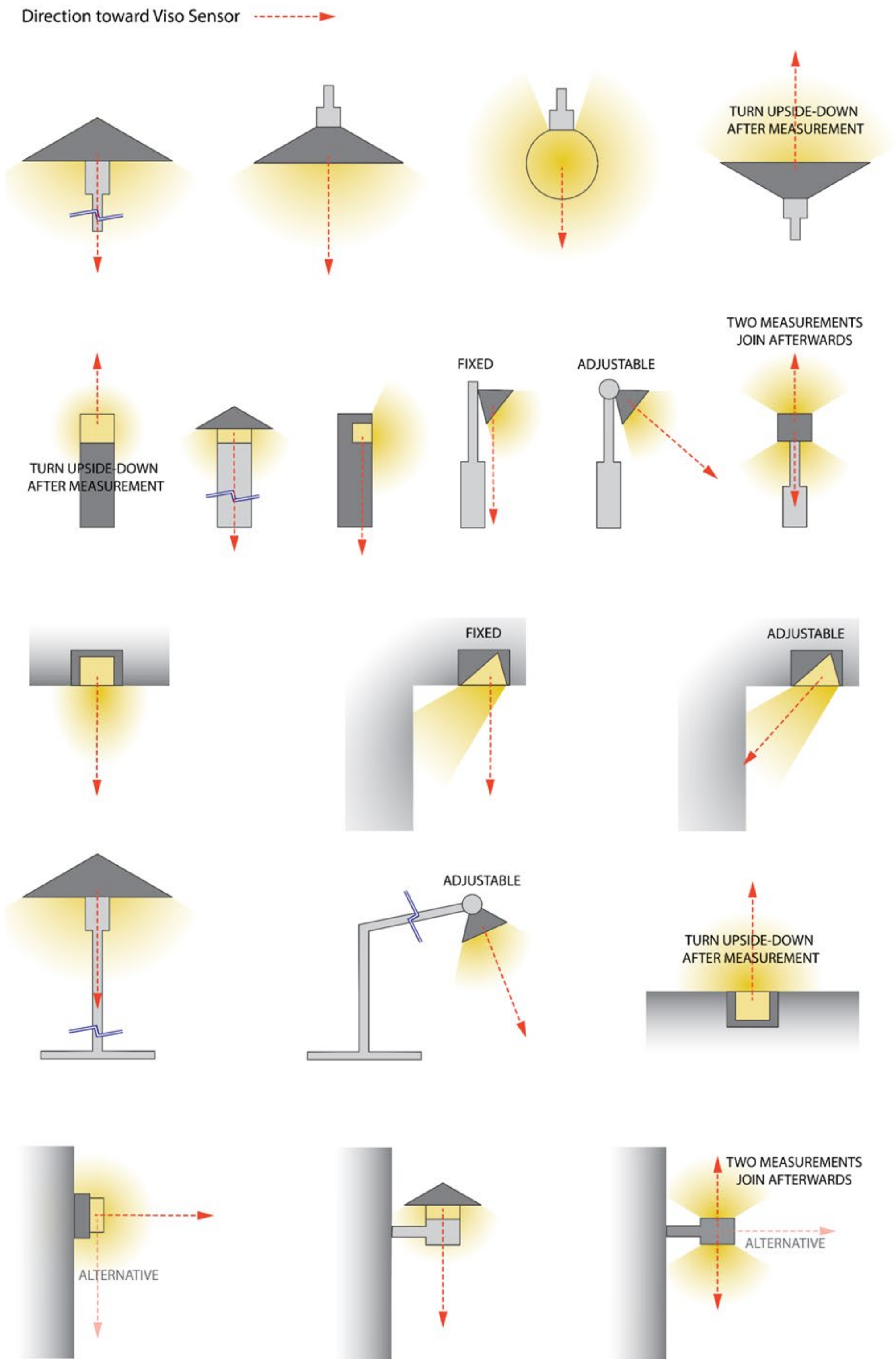
Before measurement

- ☐ All hardware is level and connected
- ☐ Internet connection is on
- ☐ PC is not occupied with other tasks
- ☐ Light source (photometric center) is centered with sensor (horizontally)
- ☐ Light source (photometric center) is centered with rotation axis (vertically)
- ☐ LabSpion/BaseSpion: Sensor is moved to correct position
- ☐ LabSpion: Sensor distance is measured with laser (if moved)
- ☐ Laboratory general lighting is off
- ☐ Real-time tracking on/off
- ☐ Light sources is preheated/stabilized
- ☐ Number of C-planes is adapted to light source
- ☐ Measurement resolution is adapted to light source
- ☐ Measurement area is adapted to light source
- ☐ ....
- ☐ ....

After measurement

- ☐ Flicker measurements added
- ☐ Library information entered. Photo added
- ☐ Dimensions are added
- ☐ CCT target value added (for SDCM)
- ☐ Measurement saved
- ☐ ....
- ☐ ....

14. Appendix 2 – Orientation of Luminaires During Measurements



At Viso Systems we design, develop and manufacture OEM- and customer-specific goniophotometer solutions. Our mission is to support customers with powerful and yet easy to use control measurements solutions. Products are developed and manufactured in Copenhagen, Denmark.

Light measurement made easy