

Energy-efficient residential luminaires

A project on luminaires: Why?

The energy label for light sources has been renewed in September 2021. It defines which products need to show the label. Because luminaires are predominantly built with LED-components which are "exchangeable by an expert", most luminaires do not need to show the energy label, or only for the removable LED-components. And most of the LED-components are per definition "exchangeable by an expert", even glued parts are removable.

As a result, **most luminaires** on the market today **do not show an energy label**.

However, losses of light such as the design of the lamp or the lampshade or a glass cover are not accounted for. The energy efficiency on the label for the build-in LED-component or inserted LED-bulb does not take this into account.

Especially luminaires with bulbs (which are exchangeable by the consumer) are increasingly popular. Here the situation is even more dire, as there is not even a way defined how the efficiency of such luminaires could be measured. Requirements are non-existent, because the energy label is on the bulbs which are inserted by the consumer.

The goal of this project was to **identify ways to measure and define criteria to compare energy-efficiency** of all luminaires.

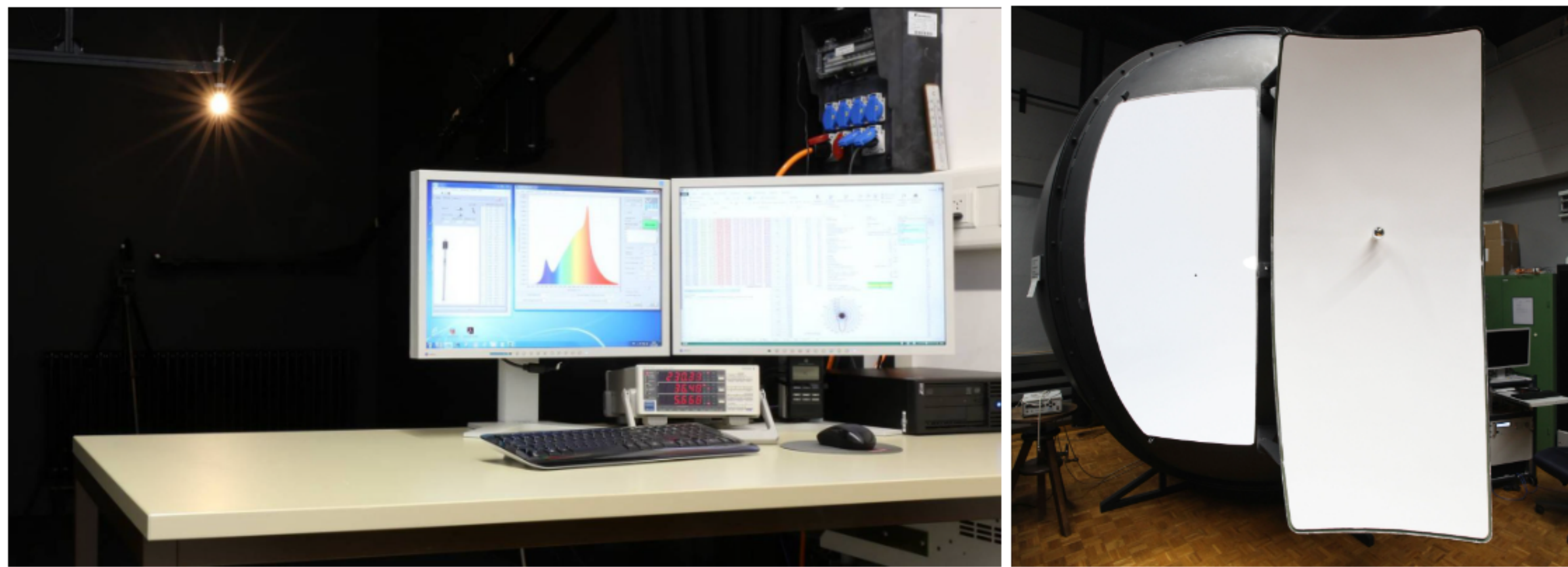
Energy-efficiency of luminaires with exchangeable bulbs

For a series of luminaires, a proposed method to measuring energy-efficiency for luminaires with exchangeable bulbs was put to the test. The proposition was to use a reference bulb which would fit the specific luminaire. The bulb was measured on its own, as well as inserted into the luminaire, thus replicating a luminaire with a non-removable LED-component, a light source on its own.

The energy efficiency was then defined as a percentage of the luminous flux from the luminaire divided by the luminous flux from just the reference bulb on its own.

Measuring energy efficiency of luminaires: How?

In the project, over 160 luminaires were measured in two independent laboratories, the [Laboratory 'Optics' of the Swiss Federal Institute of Metrology METAS](#) and the [lighting laboratory of the Institute for Photonics and Robotics at the University of Applied Sciences of the Grisons](#). Both labs are well equipped to carry out the measuring of all types of luminaires. While UAS Grisons is using a goniometer (left), METAS has an impressive newly retrofitted 4m diameter integrated sphere that fits even large luminaires with ease (right).



Measured values include common attributes such as luminous flux, color temperature, power, flicker.

How to improve the energy label?

The definition of luminaires with LED-components which are "exchangeable by an expert" needs to be adapted to **"exchangeable by the consumer"**. Furthermore, the definition should specify that it should **not require any tools**, thus excluding all the luminaires that are using LED-components and not simple bulbs to insert.

As a result all these luminaires will have to be measured as a complete product, because they are then considered to be a complete light source as defined in the standard.

To address the issue of luminaires with exchangeable bulbs by the consumer, it is proposed that a series of **suitable reference bulbs are to be defined**, with which the luminaires will have to be measured in order to calculate the **energy-efficiency as percentage of luminous flux of the reference bulb**. Similar to other product groups, manufacturers should define which of the reference bulbs is to be used (depending on the product design). This is also to be shown on the label, in order for the consumer to be able to purchase a bulb similar to the reference bulb.



More information:

- Contact: policy@topten.ch
- Download the full study (german): [Energieeffizienzbeurteilung von Wohnleuchten, BFE 2025](#)