Product Life Cycle Assessment - LCA

LUXeye Sense DALI BT (LMS)

This life cycle assessment of the LUXeye Sense DALI BT light management system (LMS) comprises the entire life of the product from raw material extraction and acquisition through material production and manufacturing to usage and end-of-life treatment including recycling and final disposal.

The method for these analyses was an assessment following in principle the ISO 14040 and 14044 international standards. Apart from primary energy consumption, the impact on the environment was evaluated in specific categories. The LCA was conducted using the GaBi life cycle modelling program.

Product description

LUXeye Sense DALI BT is a lighting control unit with an integrated light and presence sensor for energy savings, a DALI interface and Bluetooth® radio technology for control via a smartphone.

Electrical and optical data

	Unit	Value
Nominal voltage	V	220-240
Mains frequency	Hz	50-60
System wattage	W	0.40
Weight	kg	0.144
Dimensions	mm	Diameter 95.0 x height 81.0
Detection area	m²	10 (at 5 m installation height)

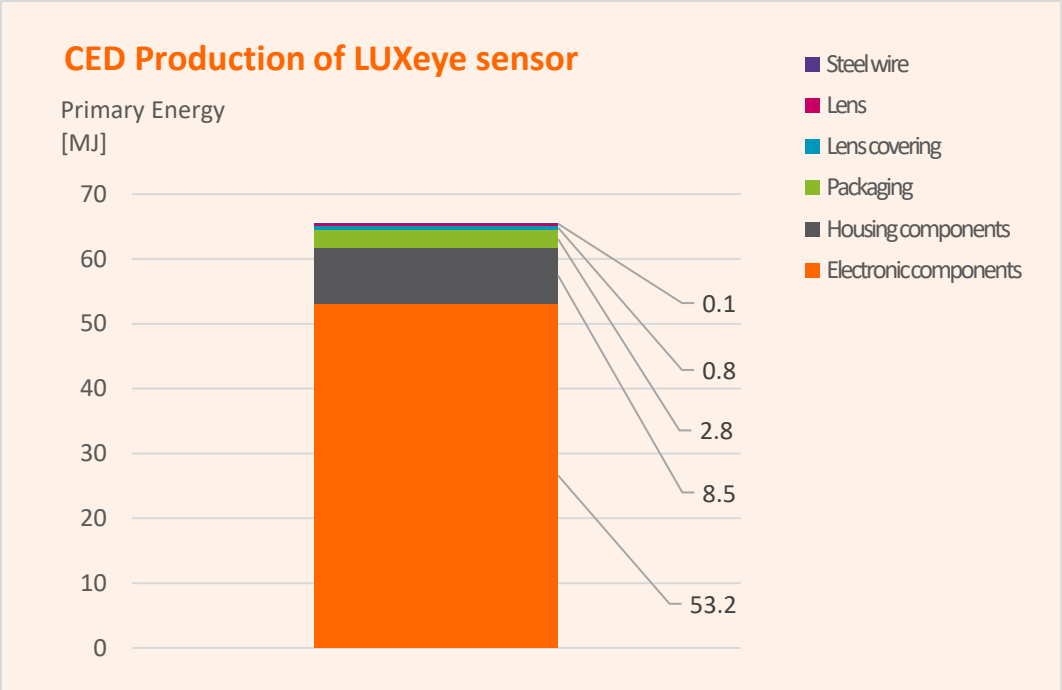
Material composition

In order to consider the weight of the different materials especially in small components and components in compounds, the following values have been calculated (rounded values).

MATERIAL	WEIGHT	PERCENTAGE
PLASTIC COMPONENTS	76 g	27.9 %
ELECTRONIC COMPONENTS	64 g	23.6 %
STEEL WIRE	4 g	1.5 %
PACKAGING	128 g	47.0 %
TOTAL	**271 g**	**100.0 %**

Determining CED (Cumulative Energy Demand) during the production phase

To determine the amount of energy needed in the manufacturing phase, all the materials used, their masses and production steps are considered. During this phase, transportation of the major components is also taken into account. The cumulative energy demand during the production phase is shown in the diagram below. At over 80%, production of the electronic components accounts for the majority of the energy required.



Calculating CED during the usage phase

The LUXeye sensor is constantly working while taking power from the grid. Therefore a lifespan of 175,200 hours (20 years) for the usage phase has been assumed, resulting in a CED of 779 MJ_{Prim} based on the German energy mix.

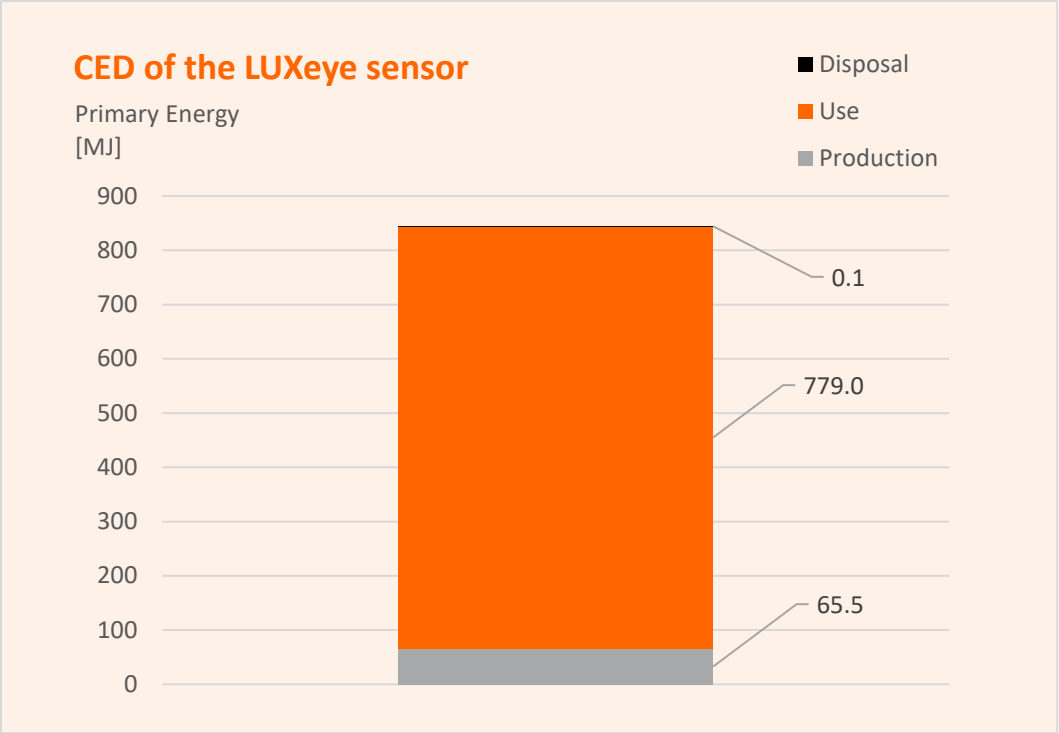
1.)	Electrical power consumption during life (175,200 hours)	0.4 W_{El} * 175,200 h = 70.08 kWh_{El}
2.)	Energy mix (includes average power plant efficiency)	1 kWh_{El} requires 3.0875 kWh_{Prim}
3.)	Cumulative energy demand	70.08 kWh_{El} * 3.0875 kWh_{Prim}/kWh_{El} = 216.37 kWh_{Prim} 216.37 kWh_{Prim} * 3.6 MJ_{Prim}/kWh_{Prim} = 778.94 MJ_{Prim}

Disposal phase

In this assessment, incineration of the plastic components, printed circuit board and the LUXeye packaging in a municipal waste-to-energy plant, and recycling of the steel parts are assumed. This represents the worst-case scenario. During this process, a small amount of energy can be recovered.

CED of LUXeye

The following diagram shows the results of the life cycle assessment of the LUXeye Sense DALI BT. Analysis shows that over 92% of the energy is consumed during the usage phase.



Light management system

The LUXeye sensor as a light management system offers high energy-saving potential depending on its usage. Total savings of 30 to 60% can be achieved by adjusting presence detection, daylight-dependent regulation, light intensity and individual regulation. Evaluation of the energy-saving potential of light management systems is not the subject of this analysis.

Environmental impacts of all life cycle phases

Impact Category	**Unit**	**Production**	**Usage**	**Disposal**
Cumulative Energy Demand (CED)	MJ	65.5	779.0	0.1
Global Warming Potential (GWP)	kg CO_2 eq.	4.2	43.0	0.4
Acidification Potential (AP)	kg SO_2 eq.	0.024	0.064	0.000
Eutrophication Potential (EP)	Kg PO_4 eq.	0.002	0.010	0.000
Photochemical Ozone Creation Potential (POCP)	Kg Ethane eq.	0.002	0.004	0.000
Human Toxicity Potential (HTP)	Kg DCB eq.	1.24	1.45	0.01
Abiotic Depletion Potential (ADP) (fossil)	MJ	53	418	0