



Environmental Product Declaration

In accordance with ISO 14025 and
EN 15804:2012+A2:2019 for:

SASSO 60 recessed

from XAL GmbH

Programme:

The International EPD® System
www.environdec.com

Programme operator:

EPD International AB

EPD registration number: S-P-06225

Publication date: 2022-06-06

Valid until: 2027-06-05



An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



Programme information

Programme: The International EPD® System

Address: EPD International AB
Box 210 60
SE-100 31 Stockholm
Sweden

Website: www.environdec.com

E-mail: info@environdec.com



CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product category rules (PCR):

PCR 2019:14 v.1.11 Construction products, valid until 2024-12-20, UN CPC code(s) – 46539 Other electric lamps and lighting fittings (including lamps and lighting fittings of a kind used for lighting public open spaces or thorough-fares)

PCR review was conducted by:

The Technical Committee of the International EPD® System,
Chair of the PCR review: Claudia A. Peña, info@environdec.com

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

- EPD process certification
 EPD verification

Third party verifier:

Prof. Ing. Vladimír Kočí, Ph.D., MBA
LCA Studio
Šárecká 5, 16000
Prague 6 - Czech Republic
www.lcastudio.cz



In case of recognised individual verifiers:

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:

- Yes No

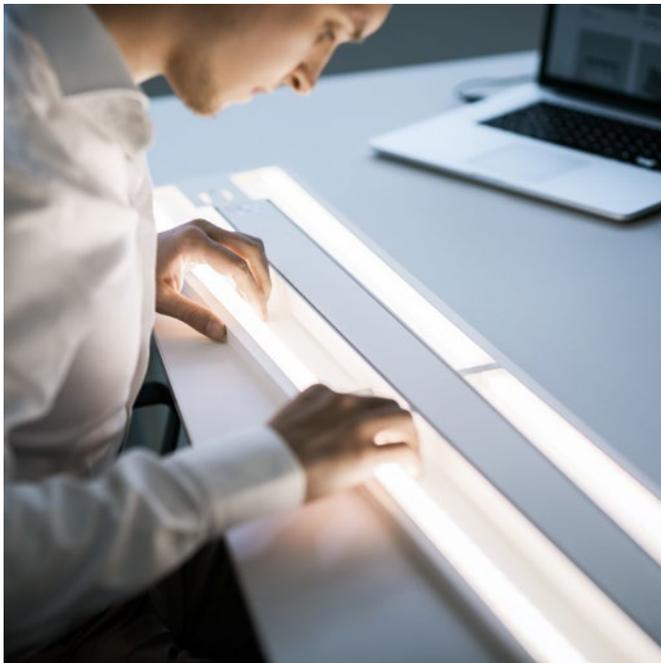
The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Owner of the EPD

XAL GmbH
Auer-Welsbach-Gasse 36
8055 Graz
AUSTRIA

epd@xal.com



Description of the organisation

XAL is an internationally operating manufacturer of high-end luminaires and lighting solutions for shop, office, hotel and residential lighting. For 30 years, XAL has been working with lighting designers, architects and planners to develop custom luminaires of the highest technical standard, with a focus on style and aesthetics. With its headquarters in Graz, Austria, the XAL Group currently employs 1300 people worldwide and has 30 international subsidiaries. We are continuously working on further improving our products – whether in terms of durability, efficiency, the carbon footprint, or also with regard to the replaceability and reusability of components and materials.

Product-related or management system-related certifications

XAL is certified according to several management and CSR standards.

- **ISO 9001** – Quality management systems
- **ISO 14001** – Environmental management systems
- **ISO 45001** – Occupational health and safety management systems
- **Ecovadis** – regular evaluation of our corporate social responsibility based on objective criteria with a focus on the environment, labour and human rights, ethics and responsible procurement.
- **UN Global Compact initiative** – our interactions with each other and our stakeholders, our supply chain management and our resource strategies are guided by the principles of the UN Global compact.

Name and location of production site(s):

The production site is located in Murska Sobota (XAL Svétila, Slovenia), some parts are processed at Dongguan (To Be Lighting Co. Ltd., China).

More information: xal.com



Product name
SASSO 60



Product identification

SASSO adapts to bespoke designs and colour ideas. The product family includes a wide variety of shapes and colours. Depending on the interior design, you can choose from different versions of a round or square SASSO: For flush mounting (optional trim or trimless), or for semi-recessed, surface-mounted, or suspended mounting, as well as with an elegant surface-mounted housing. All versions come in diameters of 60 or 100 mm. The housing colours (white, black, silver and gold) harmonise visually with the interchangeable insets in silver, white, black, gold. This harmonisation crafts a uniform and high-quality overall appearance.

This EPD covers a wide range of our SASSO 60 recessed versions



SASSO 60 round
adjustable with trim



SASSO 60 round
downlight with trim



SASSO 60 square
downlight with trim



SASSO 60 round
adjustable trimless



SASSO 60 round
downlight trimless



SASSO 60 square
downlight trimless



Product description

Small and compact – SASSO 60 trim/trimless complements XAL's SASSO product family with a small, flexible spotlight that is particularly impressive due to its low height. This makes it a suitable lighting solution for ceilings with an unusually low installation depth. Assembly is carried out without tools using a ball catch system. An innovative, patented swivel/swivel joint makes setting SASSO 60 Adjustable's directional spotlight easy.

Technical product information

Round or square recessed spotlight; installation without tools in mounting set with ball plunger system; surface matt silver, white, black, copper or gold; with trim; choice of ADJUSTABLE 360° rotatable and 30° tiltable) and DOWNLIGHT with fixed symmetric (360° rotatable) light emission characteristic; variants with symmetric light emission characteristic ($UGR \leq 16$) with 3 different beam angles – precise due to high quality lens system; passive cooling of LEDs with optimised heat sink geometry; COB (Chip on Board) technology for maximum efficiency; no multiple shadows; efficient LEDs with very good colour rendering; binning initial ≤ 2 MacAdam; light colour 2700K, 3000K or 4000K; CRI ≥ 90 ; L80/50000h; degree of protection from below IP 20, IP 40 or IP 44 (from above IP 20); PC II (power supply) or PC III (spotlights); either non dimmable, 1-10V dimmable or DALI-2 control.

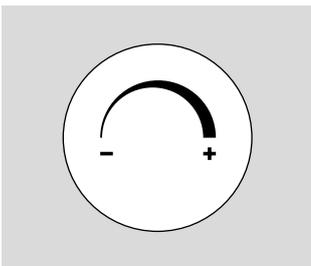


The products covered by this EPD are not only thoroughly tested in our externally accredited in-house facilities but are also third-party tested: CB and ENEC are available.

UN CPC code:

- UN CPC Version 2.1
- 46539

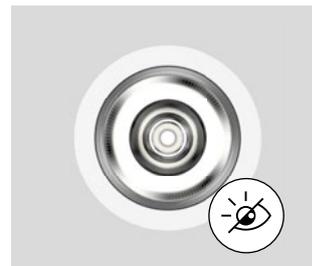
Other electric lamps and lighting fittings (including lamps and lighting fittings of a kind used for lighting public open spaces or thorough-fares)



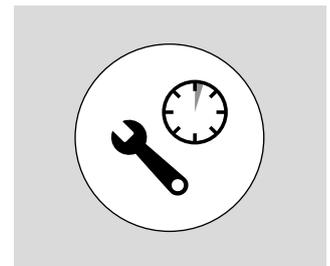
either non dimmable, 1-10 V-dimmable or DALI dimmable



different light colours 2700 K, 3000 K, 4000 K, CWD



glare-free despite direct illumination ($UGR < 16$)



quick and simple installation

Functional unit/declared unit

1 sales unit (SASSO 60 light engine plus mounting accessory). The declared unit is a mean average of three types of light engine types (round adjustable, round downlight and square downlight) and four types of mounting accessories (round recessed trimless, round recessed with trim, square recessed trimless and square recessed with trim) with identical material compositions for the light engines and mounting accessories, respectively. There are insignificant variations (<10%) in the proportions of components for light engines and mounting accessories.

Reference service life:

10-25 years depending on application (14.75 years as weighted average is used to calculate module B6)

Time representativeness: 2021

Database(s) and LCA software used:

ecoinvent v.3.8, Excel modelled

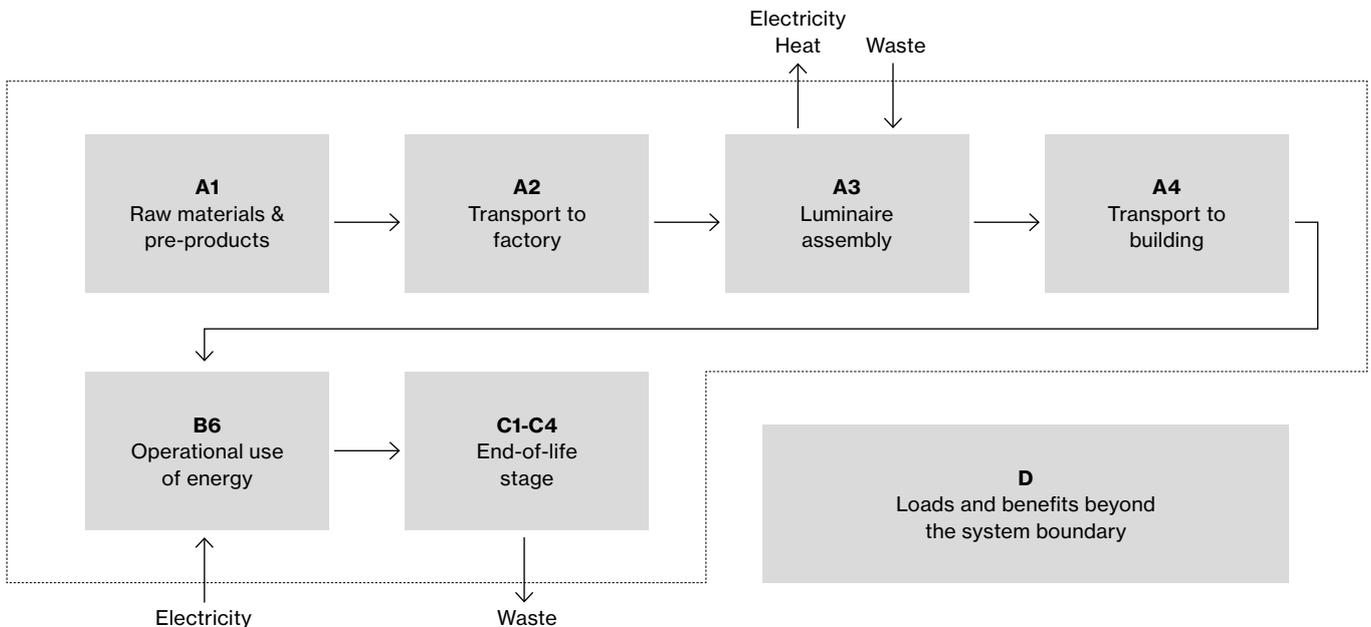
Description of system boundaries:

Cradle to gate with options: modules A1-A3, C1-C4, D and optional modules A4 and B6.

LCA practitioner:

denkstatt GmbH, Hietzinger Hauptstraße 28,
1130 Vienna, Austria

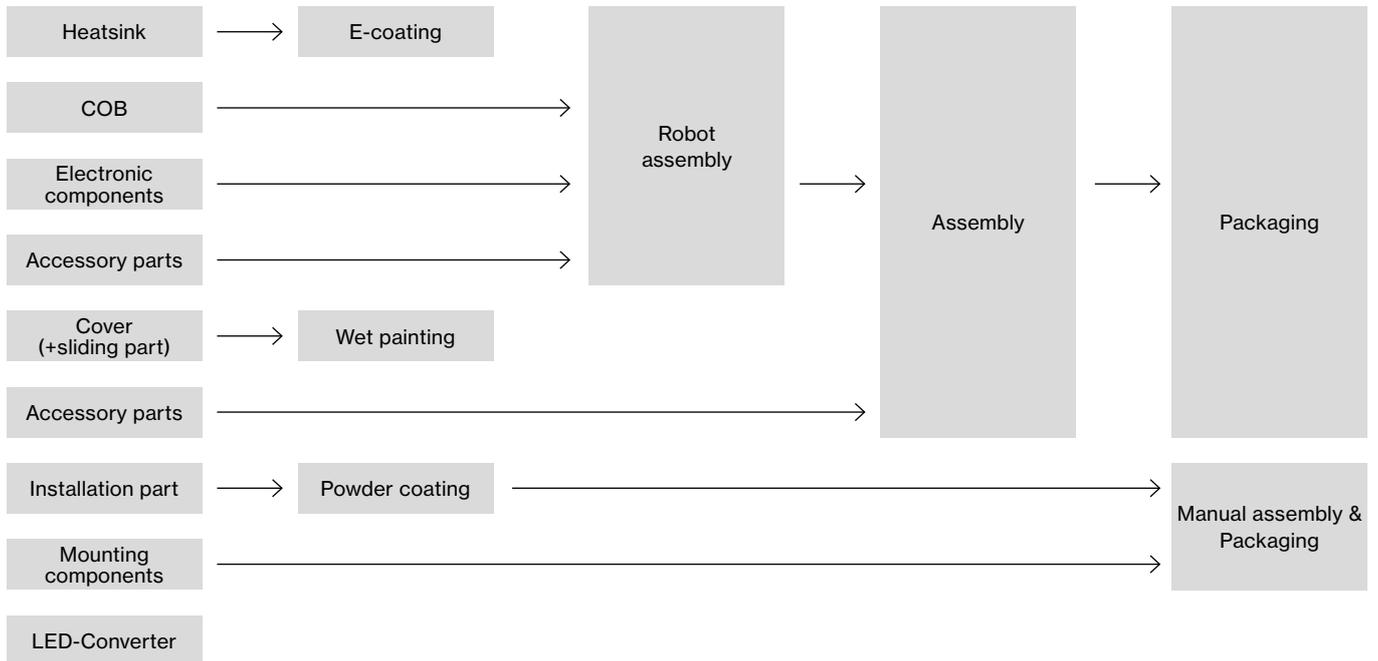
System boundaries



Product stage (A1-A3)

Raw materials for the luminaire production process are pre-produced components which are delivered by external suppliers and assembled at the factory. The assembly process is performed in Slovenia, while powder coating of the accessories is done in China. The respective electricity grid mixes are applied. Transportation of all input materials is included. However, since many of the components are delivered from China via different routes and transport vehicles, data from manufacturer is aggregated. The production of components is modelled with ecoinvent datasets based on their material composition.

Scheme of the production process:



Transport to building (A4)

XAL GmbH delivers luminaires to various countries around the world. Transport is modelled for countries where the sales share is with contribution > 4% and transport is assumed to the capital cities. Truck transport is assumed to be of class EURO 6, 16-32 t.

Use phase (B6)

Electricity consumption during the use stage is modelled based on the technical parameters of the luminaires and is representative for a weighted average of the following applications – office (5%), hospital (5%), hotel (70%), restaurant (15%), and retail (5%). Geography of the electricity mix is modelled by sales shares and is representative for European countries (82.66% - EU, UK, Switzerland, Norway, Liechtenstein) and an average global mix is used for rest of the world (17.34%).

End-of-life stage (C1-C4)

Decomposition of luminaire is assumed to be manual, so no emissions are expected. The following distances are assumed for the respective waste destinations: to recycling – 250 km, to incineration – 50 km, to landfill – 100 km for metal and electronic parts, 20 km for plastic parts. For modules C3 and C4 waste treatment options are considered for broader European and rest-of-the-world contexts based on official statistics and literature sources.

Module D

Module D is calculated in accordance with the provisions of EN 15804+A2 and the EPD International PCR for construction products. Calculated loads/benefits are a result from export of secondary materials and energy from incineration and landfilling. Product packaging waste benefits are also accounted for. There is no export of secondary fuels from this system, so such emissions are not calculated.

Cut-off rules

According to the PCR, not more than 5% of the incoming flows (by mass and energy) per module can be excluded. Data is provided for all inputs and outputs to the factory processes and they are accounted in the model. Materials and processes with negligible contributions (less than 1%) are also included.

Data quality

Primary data representative for the specific production processes is provided by the manufacturer. Data collected refers to all inputs and outputs included in the system boundary and represents the technology of the production process for 2021. Where the information is not precise, generic datasets from the ecoinvent v.3.8 database are used with the appropriate geographic and technological coverage as best as possible.

Electricity grid

The processes at the manufacturing plant use the Slovenian electricity mix. The following energy sources are included for the plant region (based on info from the manufacturer): hydro (0.94%), coal (37.83%), gas (15.51%), nuclear (35.28%), liquid fuels (0.46%), wind (1.33%), solar (1.05%), biomass (1.95%), other (5.65%). The climate impact of the electricity is 5.65E+02 gCO₂-eq./kWh. For the processes at the Chinese factory, the average market electricity mix is used with climate impact 1.04E+03 gCO₂-eq./kWh.

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation

Module	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery staged
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recov-ery-Recycling potential
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	x	x	x	x							x		x	x	x	x	x
Geography	GLO	GLO	SI	RER							RER GLO		RER-RoW	RER-RoW	RER-RoW	RER-RoW	GLO
Specific data used	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acronyms	GLO = global, SI = Slovenia, RER = Europe, RoW = Rest of the world																

Content information

Product components	Weight, kg	Post-consumer material, weight-%	Renewable material, weight-%
Aluminium alloy	9.10E-02	20 %	0 %
Epoxy resin	1.44E-03	0 %	0 %
LED	2.80E-03	0 %	0 %
Ethylene-vinyl acetate copolymer (EVA)	2.25E-03	0 %	0 %
Polycarbonate	1.95E-02	0 %	0 %
Thermal paste (ZnO)	1.67E-04	0 %	0 %
Relief wire	1.01E-02	0 %	0 %
Steel parts	1.29E-02	25 %	0 %
Acrylic resin + TiO	4.51E-04	0 %	0 %
LED Converter	1.13E-01	0 %	0 %
Silicone	1.59E-03	0 %	0 %
Powder coating	4.26E-03	0 %	0 %
TOTAL	2.59E-01	0 %	0 %

Packaging materials	Weight, kg	Weight-% (versus the product)
Paper	3.80E-02	14.7 %
Plastic (LDPE, polyester)	4.75E-03	1.8 %
TOTAL	4.28E-02	16.5 %

The products do not contain any REACH and RoHS SVHC substances in amounts greater than 0.1% (1000 ppm).

Potential environmental impact – mandatory indicators according to EN 15804

Indicator	Unit	A1	A2	A3	Tot. A1-A3	A4	B6	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	1.74E+01	5.78E+00	1.60E-01	2.34E+01	3.39E-02	3.77E+02	0.00E+00	1.17E-02	2.03E-01	1.04E-01	-4.41E+00
GWP-biogenic	kg CO ₂ eq.	1.32E-01	1.02E-02	-2.50E-01	-1.09E-01	7.16E-05	1.82E+01	0.00E+00	2.81E-05	9.81E-03	3.66E-04	1.54E+01
GWP-luluc	kg CO ₂ eq.	2.63E-02	1.65E-02	9.08E-04	4.38E-02	1.42E-05	8.63E-01	0.00E+00	5.72E-06	1.25E-04	1.18E-05	-1.32E-02
GWP-total	kg CO ₂ eq.	1.76E+01	5.80E+00	-8.97E-02	2.33E+01	3.40E-02	3.96E+02	0.00E+00	1.17E-02	2.13E-01	1.04E-01	1.10E+01
ODP	kg CFC 11 eq.	9.58E-07	9.53E-07	2.63E-08	1.94E-06	5.80E-09	1.48E-05	0.00E+00	1.96E-09	4.44E-09	2.00E-09	-3.81E-07
AP	mol H ⁺ eq.	1.21E-01	1.05E-01	2.05E-03	2.27E-01	9.99E-05	2.08E+00	0.00E+00	5.82E-05	4.72E-04	6.03E-05	-3.68E-02
EP-freshwater	kg PO ₄ ³⁻ eq.	4.85E-02	1.06E-02	6.10E-04	5.97E-02	1.75E-05	1.12E+00	0.00E+00	1.03E-05	1.49E-04	1.74E-05	-1.29E-02
EP-freshwater	kg P eq.	1.31E-02	2.72E-04	8.05E-05	1.34E-02	2.57E-06	3.23E-01	0.00E+00	9.85E-07	3.48E-05	3.06E-06	-3.31E-03
EP-marine	kg N eq.	2.23E-02	2.76E-02	6.14E-04	5.05E-02	2.04E-05	3.59E-01	0.00E+00	1.92E-05	1.06E-04	1.94E-05	-6.99E-03
EP-terrestrial	mol N eq.	2.00E-01	3.05E-01	8.46E-03	5.14E-01	2.22E-04	3.28E+00	0.00E+00	2.09E-04	1.09E-03	1.79E-04	-7.37E-02
POCP	kg NMVOC eq.	8.05E-02	8.03E-02	1.87E-03	1.63E-01	8.32E-05	8.95E-01	0.00E+00	5.99E-05	2.95E-04	4.94E-05	-2.55E-02
ADP-minerals&metals*	kg Sb eq.	2.22E-03	1.13E-05	1.16E-06	2.24E-03	1.21E-07	3.05E-03	0.00E+00	5.18E-08	7.73E-06	9.73E-08	-5.21E-04
ADP-fossil*	MJ	2.29E+02	7.83E+01	2.63E+00	3.10E+02	4.92E-01	7.20E+03	0.00E+00	1.68E-01	8.93E-01	1.20E-01	-6.62E+01
WDP*	m ³	7.15E+00	2.68E-01	1.36E-01	7.55E+00	2.17E-03	1.83E+02	0.00E+00	8.08E-04	3.08E-02	8.38E-03	-2.37E+00

Acronyms

GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

Potential environmental impact – additional mandatory and voluntary indicators

Indicator	Unit	A1	A2	A3	Tot. A1-A3	A4	B6	C1	C2	C3	C4	D
GWP-GHG ¹	kg CO ₂ eq.	1.75E+01	5.79E+00	1.61E-01	2.34E+01	3.39E-02	3.78E+02	0.00E+00	1.17E-02	2.04E-01	1.04E-01	-4.42E+00
PM	disease inc.	8.66E-07	3.18E-07	2.85E-08	1.21E-06	2.70E-09	9.01E-06	0.00E+00	9.33E-10	4.76E-09	5.90E-10	-3.34E-07
IRP-HE**	kg U235-Eq	2.09E+00	3.66E-01	1.76E-02	2.48E+00	2.30E-03	1.74E+02	0.00E+00	7.87E-04	7.17E-03	7.68E-04	-5.38E-01
ETP-fw*	CTUe	1.00E+03	5.78E+01	1.56E+01	1.08E+03	4.51E-01	6.01E+03	0.00E+00	1.62E-01	6.15E+00	1.48E+01	-2.26E+02
HTP-c*	CTUh	1.70E-08	2.70E-09	7.78E-10	2.05E-08	1.27E-11	1.52E-07	0.00E+00	5.04E-12	2.31E-10	1.52E-11	-1.79E-08
HTP-nc*	CTUh	5.15E-07	5.55E-08	7.64E-09	5.78E-07	4.09E-10	5.18E-06	0.00E+00	1.47E-10	1.27E-08	1.04E-09	-1.35E-07
Soil quality index*	dimensionless	6.23E+01	3.46E+01	7.29E+01	1.70E+02	3.45E-01	1.27E+03	0.00E+00	1.04E-01	5.59E-01	8.54E-02	-1.03E+03
Acronyms	PM = particulate matter emissions, IRP-HE = ionizing radiation potential-human exposure, ETP-fw = ecotoxicity (freshwater), HTP-c = human toxicity potential, cancer effects, HTP-nc = human toxicity potential, non-cancer effects											

¹ The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

** Disclaimer: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Use of resources

Indicator	Unit	A1	A2	A3	Tot. A1-A3	A4	B6	C1	C2	C3	C4	D
PERE	MJ	2.09E+01	8.12E-01	1.47E+01	3.64E+01	5.85E-03	1.37E+03	0.00E+00	2.26E-03	1.02E-01	9.65E-03	-1.89E+02
PERM	MJ	6.05E-01	0.00E+00	0.00E+00	6.05E-01	0.00E+00						
PERT	MJ	2.15E+01	8.12E-01	1.47E+01	3.70E+01	5.85E-03	1.37E+03	0.00E+00	2.26E-03	1.02E-01	9.65E-03	-1.89E+02
PENRE	MJ	2.44E+02	8.48E+01	2.84E+00	3.32E+02	5.32E-01	7.52E+03	0.00E+00	1.82E-01	9.61E-01	1.29E-01	-7.11E+01
PENRM	MJ	9.60E-01	0.00E+00	0.00E+00	9.60E-01	0.00E+00						
PENRT	MJ	2.45E+02	8.48E+01	2.84E+00	3.32E+02	5.32E-01	7.52E+03	0.00E+00	1.82E-01	9.61E-01	1.29E-01	-7.11E+01
SM	kg	5.84E-02	0.00E+00	0.00E+00	5.84E-02	0.00E+00						
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water											

Waste production and output flows

Waste production

Indicator	Unit	A1	A2	A3	Tot. A1-A3	A4	B6	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.32E-02	1.51E-04	8.84E-06	1.33E-02	1.32E-06	5.07E-03	0.00E+00	4.61E-07	5.48E-04	2.74E-07	2.14E-04
Non-hazardous waste disposed	kg	2.58E+00	2.24E+00	4.90E+00	4.87E+00	2.60E-02	2.85E+01	0.00E+00	7.61E-03	3.00E-02	7.09E-02	-1.03E+00
Radioactive waste disposed	kg	6.35E-04	5.45E-04	9.46E-06	1.19E-03	3.27E-06	4.67E-02	0.00E+00	1.10E-06	2.81E-06	5.90E-07	-2.21E-04

Output flows

Indicator	Unit	A1	A2	A3	Tot. A1-A3	A4	B6	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	8.89E-02	8.89E-02	0.00E+00	0.00E+00	1.60E-01	0.00E+00	1.60E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Information on biogenic carbon content

Results per functional or declared unit

Biogenic Carbon content	Unit	Quantity
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	1.66E-02

Note: 1kg biogenic carbon is equivalent to 44/12kg CO₂.

Reference service life (per application)

	Office	Hospital	Hotel	Restaurant	Retail
RSL, years	15	25	15	10	5

Use phase (B6)

Scenario	Sasso 60 round / square recessed	Unit
Electricity use (14.25 years)	839.35	kWh
Active power	12.7	W
Passive power	0.2	W
Total active time	64125	hours
Total passive time	60705	hours
Dimmable	Non-dimmable, 1-10V dimmable or DALI-2 control	-
Presence control	NO	-

End-of-Life (C1-C4)

Scenario (light engine + mounting accessory)	Sasso 60 round / square recessed	Unit
Collected separately	0.259	kg
Collected with mixed (construction) waste	0	kg
For reuse	0	kg
For recycling	0.130	kg
For energy recovery	0.037	kg
For final disposal	0.092	kg

Module D

Scenario (contributing materials, incl. packaging)	Sasso 60 round / square recessed	Unit
Materials for recycling	0.118	kg
Materials for export of secondary fuels	0	kg
Materials for incineration	0.043	kg
Materials for landfilling	0.006	kg

General Programme Instructions of the International EPD® System.
Version 4.0

Product category rules (PCR) 2019:14 Construction products version
1.11, 2021, The EPD International, 2021

EN 15804:2012+A2:2029 Sustainability of construction works –
Environmental product declarations – Core rules for the product
category of construction products

EN 15193:2007 Energy performance of buildings –
Energy requirements for lighting

ISO 14040 Environmental management –
Life cycle assessment – Principles and framework

ISO 14044 Environmental management –
Life cycle assessment – Requirements and guidelines

Ecoinvent 3.8 database, 2021

Directive 2012/19/EU of the European Parliament and of the Council of
4 July 2012 on waste electrical and electronic equipment (WEEE)

European court of auditors, EU actions and existing challenges on
electronic waste, Review No. 4, 2021

Annex C Default application-specific and material-specific values to
be used in the application of the Circular Footprint Formula, available
on <https://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml> (last visited:
March 2022)

Wood fuels handbook, 2015, Food and agriculture organization of the
United nations

Feature report – Waste recovery: Incineration – The Heating Power of
Refuse, Planete energy, 2015, [www.planete-energies.com/en/medias/
close/incineration-heating-power-refuse](http://www.planete-energies.com/en/medias/close/incineration-heating-power-refuse)

Photocredits

p. 2 HeidelbergCement AG
Heidelberg, DE – by Albert Speer + Partner Architekten with
lighting design by Hailight Lichtplanung, Andreas Haidegger
© Thilo Ross

p. 4 Deansgate Square Manchester, UK – by Lister & Lister with
lighting design by Troup, Bywaters & Anders Lighting
© Billy Boloton

Private Residence
Kreta, GR – by ROOMS GmbH
© Martin Steinhäler