

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

Signify - Smooth Cylinder (TCSC65)

Signify N.V.



MANUFACTURER AND SITE

Manufacturer	Signify N.V.
Address	High Tech Campus 48, 5656 AE Eindhoven, The Netherlands
Contact details	sustainability@signify.com
Website	https://www.signify.com/global
Place of production	PILA, POLAND
Place(s) of raw material origin	EU, APAC
Place(s) of installation and use	EU
Period for data	Calendar Year 2023

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR version 1.2, 24 Mar 2025
Sector	Electrical product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with options, A4-A5, B6, and modules C1-C4, D
EPD author	Signify / Sustainability
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal verification ☒ External verification
EPD verifier	Imane Uald Lamkaddam as an authorized verifier for EPD Hub

PRODUCT SPECIFICATION

Product name	Signify - Smooth Cylinder (TCSC65)
Product number / reference	910771148756 / TCSCPT 12S/840 PSU HWB WH BS T404 295
GTIN (Global Trade Item Number)	Not applicable
NOBB (Norwegian Building Product Database)	Not applicable
A1-A3 Specific data (%)	6.07

PRODUCT DESCRIPTION

Smooth Cylinder – Designed to edge out the ordinary

Meet Smooth Cylinder, the ultimate pendant spotlight that allows you to perfectly match any hospitality and residential environment in a sustainable, stylish, and functional way. Mix and match color and texture options for the front ring and housing for a unique and luxurious effect. This lighting solution comes in different light recipes to suit your needs and offers a honeycomb accessory for reduced glare and better light distribution.

Smooth Cylinder is part of the Smooth family featuring a 3D-printed housing crafted from at least 65% recycled or bio-circular materials and a heatsink from 85% recycled aluminum. Its circular design makes it upgradable, reusable, serviceable, and recyclable, making it a sustainable and long-lasting lighting solution. Also, all luminaires of the Smooth family can seamlessly connect to smart systems (e.g., Interact) for easy lighting management and additional energy savings.

This EPD is intended for business-to-business and/or business-to-consumer communication. Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.2 (24 Mar 2025) and JRC characterization factors EF 3.1. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

PRODUCT CLASSIFICATION

Declared operating voltage, Volt	220-240
Light source colour temperature, Kelvin	4000
Protection index for water and dust (IP)	20
Impact resistance index (IK)	2
Luminous flux, Lumens	1345
Electrical power, Watt	9.7
Luminous efficiency, Lm/W	139
Additional characteristic	Not applicable

ABOUT THE MANUFACTURER

Signify is the world leader in lighting for professionals, consumers and lighting for the Internet of Things. Our energy efficient lighting products, systems and services enable our customers to enjoy a superior quality of light, and make people's lives safer and more comfortable, businesses more productive and cities more liveable.

For more information, please visit: <https://www.signify.com/global>

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	43.29	EU , APAC
Minerals	0.11	EU , APAC
Fossil materials	55.72	EU , APAC
Bio-based materials	0.88	EU

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0.002
Biogenic carbon content in packaging, kg C	0.095

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 unit
Declared unit mass, kg	0.684
Mass of packaging, kg	0.24
Functional unit (from PEP PSR0014)	Provide lighting that delivers an outgoing artificial luminous flux of 1000 lumens during a reference lifetime of 35000 hours
Reference service life (years)	10
Assigned lifetime (hours)	50000
GWP-total, A1-A3 (kg CO ₂ e)	6.41
GWP-fossil, A1-A3 (kg CO ₂ e)	6.73
Secondary material, inputs (%)	22.6
Secondary material, outputs (%)	35.8
Total energy use, A1-A3 (kWh)	26.7
Net freshwater use, A1-A3 (m ³)	5.50E-02

LIFE CYCLE ASSESSMENT

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Beyond the system		D	Reuse, Recovery, Recycling
End of life stage	C4	X	Disposal
	C3	X	Waste processing
	C2	X	Transport
	C1	X	Deconstr./demo.
Use stage	B7	ND	Operational water use
	B6	X	Operational energy use
	B5	ND	Refurbishment
	B4	ND	Replacement
	B3	ND	Repair
	B2	ND	Maintenance
	B1	ND	Use
Installation stage	A5	X	Installation
	A4	X	Transport
Product stage	A3	X	Manufacturing
	A2	X	Transport
	A1	X	Raw materials

Modules not declared = ND.

CUT - OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. There is no neglected unit process more than 1% of total mass or energy flows. The module-specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage. The analysis was performed in One Click LCA EPD Generator, with the 'Cut-Off, EN 15804+A2' allocation method, and characterization factors according to EN 15804:2012+A2:2019/AC:2021 and JRC EF 3.1.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, ancillary materials, energy & water consumption, material loss and waste generation at the manufacturing site are attributed to the bill of materials of the products, therefore, they are allocated by partitioning the quantities on the base of the total production in kg throughout the year. Thus, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging materials	No allocation
Ancillary materials	Allocated by mass
Manufacturing energy and waste	Allocated by mass

Proxy data is used for certain materials due to their unavailability in the database. Conservative choices have been adopted when exact information was missing. Regarding module C1-C4: EOL scenarios are based on default values from EN 50693. For stages description please refer to section Product life cycle in this EPD report.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA Luminaire EPD Generator v2.2.7. The LCA and EPD have been prepared according to the reference standards, EN 50693, and ISO 14040/14044. Ecoinvent v 3.10.1 and One Click LCA databases were used as sources of environmental data. Allocation used in Ecoinvent 3.10.1 environmental data sources follow the methodology 'allocation, cut-off, EN 15804+A2'.

No other sources were used in the modelling of this EPD.

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	No grouping
Grouping method	Not applicable
Variation in GWP-fossil for A1-A3, %	-

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE CYCLE

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production. The material losses occurring during the manufacturing processes are treated as per the waste handling practices in the factory, while scenario assumptions are made in the absence of exact data. The study also considers the fuels used by machines as well as losses during electricity transmission.

The product is made of metals, plastics, and electronic components. All components are transported to the production facility, where the main manufacturing processes primarily are associated with assembly. A2 transport distances are calculated always taking the capital city of component country of origin as a starting point and exact manufacturing location as destination. The finished product can be packaged with polyethylene, cardboard, and/or paper as packaging material before shipment to customers. Manufacturing loss, ancillaries and wastes are calculated according to the data that each manufacturing site is sharing with Signify. The total annual amount of waste in kg is allocated to the total annual production in kg at the specific manufacturing site responsible to produce the studied product. Thus, it is possible to allocate it according to the weight of the product analysed in this study.

Co-product allocation is neglected as revenue of co-product is very low, hence, the waste undergoes a conservative waste treatment.

The use of renewable energy in manufacturing is demonstrated through contractual instruments (GOs, RECs, etc), and its use is ensured throughout the validity period of this EPD.

TRANSPORT AND INSTALLATION (A4-A5)

A4 transport distances are calculated always taking the exact manufacturing location to customer location. If the customer's location is defined as a country or its capital city, the calculation is made to the respective capital city. If the

customer's location is specified as a region, the distance is calculated to the capital city of the best-performing sales country within that region. The transportation method is a combination of lorry and container ship where needed. To be conservative, empty returns are included in this study as implemented through an average load factor in the Ecoinvent transport datapoints. Environmental impacts from installation include waste packaging materials (A5). The packaging waste treatment is assumed to be conservative with incineration without energy recovery. The impacts of energy consumption and the used ancillary materials during installation are considered negligible.

PRODUCT USE AND MAINTENANCE (B1-B7)

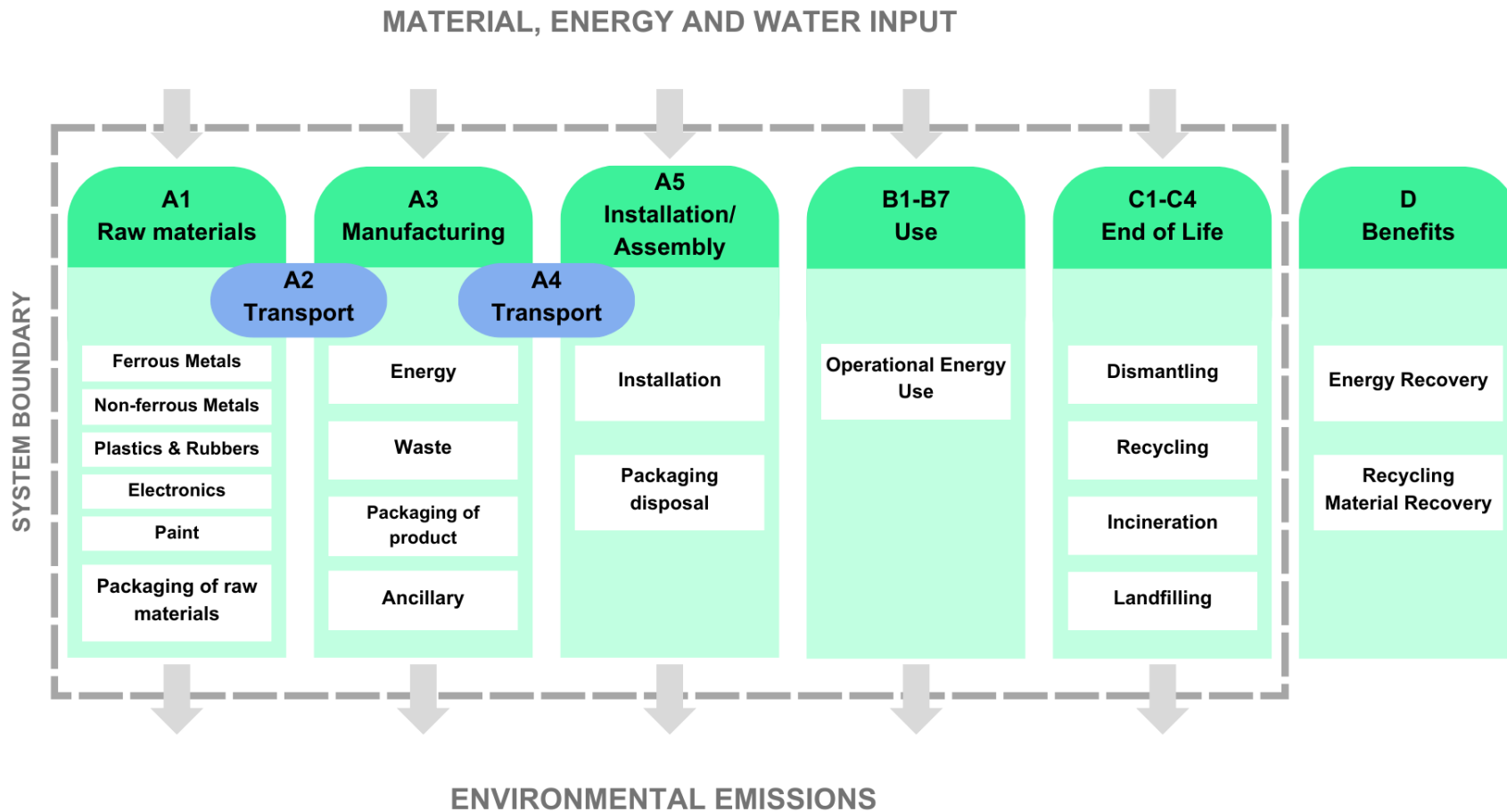
During the use phase, the product consumes electricity (B6), which is calculated multiplying the Wattage x Assigned lifetime (hours) x Country energy mix factor. To know which Country energy mix was used in this EPD, please refer to Annex 2.

The Reference service life in years is calculated according to the main application type of the product, based on annual operating hours. Impacts due to electricity production include direct emissions to air, transformation, and transmission losses.

PRODUCT END OF LIFE (C1-C4, D)

Consumption of energy and natural resources in demolition process is assumed to be negligible. It is assumed that the waste is collected separately and transported to the waste treatment centre. The transport distance is 150 km while the transportation method is assumed to be lorry (C2). According to EN 50693:2019, the sequence of treatment operations occurring to the product shall include depollution, fractions separation and preparation (dismantling, crushing, shredding, sorting), recycling, other material recovery, energy recovery and disposal. In this study, the default values from table G.4 of EN 50693 is used for treating materials in different waste treatment methods. Due to the material and energy recovery potential of parts in the lighting system, the end-of-life product is converted into recycled raw materials, while the energy recovered from incineration displaces electricity and heat production (D). The benefits and loads of incineration and recycling are included in Module D.

LIFE CYCLE FLOW DIAGRAM - SYSTEM BOUNDARY



ENVIRONMENTAL IMPACT DATA, RESULTS PER DECLARED UNIT

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total ¹⁾	kg CO ₂ e	6.30E+00	1.05E-01	4.00E-03	6.41E+00	3.95E-02	3.62E-01	ND	ND	ND	ND	ND	1.60E+02	ND	0.00E+00	2.01E-02	3.43E-01	1.79E-01	-1.09E+00
GWP – fossil	kg CO ₂ e	6.28E+00	1.05E-01	3.37E-01	6.73E+00	3.95E-02	1.50E-02	ND	ND	ND	ND	ND	1.59E+02	ND	0.00E+00	2.00E-02	3.44E-01	1.79E-01	-1.09E+00
GWP – biogenic	kg CO ₂ e	4.65E-03	1.98E-05	-3.41E-01	-3.37E-01	8.95E-06	3.47E-01	ND	ND	ND	ND	ND	3.56E-01	ND	0.00E+00	4.38E-06	-4.24E-04	-2.00E-05	8.32E-05
GWP – LULUC	kg CO ₂ e	8.89E-03	5.26E-05	7.85E-03	1.68E-02	1.77E-05	5.55E-06	ND	ND	ND	ND	ND	4.87E-01	ND	0.00E+00	8.87E-06	2.32E-05	5.28E-06	-1.15E-03
Ozone depletion pot.	kg CFC-11e	1.16E-07	1.53E-09	8.74E-09	1.26E-07	5.83E-10	2.07E-10	ND	ND	ND	ND	ND	2.93E-06	ND	0.00E+00	2.80E-10	2.32E-10	1.35E-10	-5.92E-09
Acidification potential	mol H ⁺ e	5.00E-02	1.86E-03	1.68E-03	5.35E-02	1.35E-04	8.94E-05	ND	ND	ND	ND	ND	9.33E-01	ND	0.00E+00	6.68E-05	1.76E-04	6.16E-05	-1.54E-02
EP-freshwater ²⁾	kg Pe	3.73E-03	5.52E-06	1.46E-04	3.88E-03	3.08E-06	1.51E-06	ND	ND	ND	ND	ND	1.48E-01	ND	0.00E+00	1.56E-06	7.15E-06	1.09E-06	-8.87E-04
EP-marine	kg Ne	6.79E-03	4.77E-04	8.16E-04	8.09E-03	4.43E-05	4.17E-05	ND	ND	ND	ND	ND	1.46E-01	ND	0.00E+00	2.16E-05	6.89E-05	2.10E-04	-1.37E-03
EP-terrestrial	mol Ne	7.28E-02	5.28E-03	5.02E-03	8.31E-02	4.82E-04	3.80E-04	ND	ND	ND	ND	ND	1.31E+00	ND	0.00E+00	2.35E-04	6.06E-04	2.82E-04	-1.55E-02
POCP (“smog”) ³⁾	kg NMVOCe	2.84E-02	1.51E-03	1.60E-03	3.15E-02	1.99E-04	1.08E-04	ND	ND	ND	ND	ND	4.32E-01	ND	0.00E+00	9.30E-05	1.62E-04	8.04E-05	-4.75E-03
ADP-minerals & metals ⁴⁾	kg Sbe	5.03E-04	1.89E-07	1.14E-06	5.04E-04	1.10E-07	4.47E-08	ND	ND	ND	ND	ND	2.14E-03	ND	0.00E+00	6.58E-08	4.32E-07	2.06E-08	-1.39E-04
ADP-fossil resources	MJ	9.18E+01	1.40E+00	4.60E+00	9.78E+01	5.73E-01	1.56E-01	ND	ND	ND	ND	ND	3.69E+03	ND	0.00E+00	2.81E-01	2.16E-01	9.62E-02	-1.35E+01
Water use ⁵⁾	m ³ e depr.	2.24E+00	5.38E-03	1.11E-01	2.35E+00	2.83E-03	1.80E-02	ND	ND	ND	ND	ND	1.01E+02	ND	0.00E+00	1.30E-03	2.46E-02	1.19E-02	-2.41E-01

1) GWP = Global Warming Potential. 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO₄e. 3) POCP = Photochemical ozone formation. 4) ADP = Abiotic depletion potential. 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	3.94E-07	6.47E-09	3.30E-08	4.33E-07	3.96E-09	1.11E-09	ND	ND	ND	ND	ND	3.33E-06	ND	0.00E+00	1.59E-09	1.83E-09	6.95E-10	-7.31E-08
Ionizing radiation ⁶⁾	kBq U235e	4.73E-01	9.19E-04	1.71E-02	4.91E-01	4.99E-04	1.88E-04	ND	ND	ND	ND	ND	1.02E+02	ND	0.00E+00	2.27E-04	1.10E-03	1.34E-04	-9.03E-02
Ecotoxicity (freshwater)	CTUe	1.08E+02	1.50E-01	1.76E+00	1.10E+02	8.11E-02	4.30E-01	ND	ND	ND	ND	ND	5.63E+02	ND	0.00E+00	4.45E-02	7.25E-01	4.83E+00	-9.72E+00
Human toxicity, cancer	CTUh	5.82E-09	2.01E-11	1.88E-10	6.03E-09	6.52E-12	2.07E-11	ND	ND	ND	ND	ND	5.37E-08	ND	0.00E+00	3.41E-12	3.90E-11	2.16E-11	-1.36E-09
Human tox. non-cancer	CTUh	2.49E-07	6.19E-10	4.76E-09	2.54E-07	3.71E-10	8.46E-10	ND	ND	ND	ND	ND	2.78E-06	ND	0.00E+00	1.76E-10	1.49E-09	1.04E-09	-1.26E-07
SQP ⁷⁾	-	2.70E+01	7.49E-01	1.83E+01	4.61E+01	5.77E-01	7.61E-02	ND	ND	ND	ND	ND	8.22E+02	ND	0.00E+00	1.68E-01	1.97E-01	1.28E-01	-5.32E+00

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy ⁸⁾	MJ	8.72E+00	1.49E-02	4.48E-01	9.18E+00	7.86E-03	-4.26E+00	ND	ND	ND	ND	ND	1.01E+03	ND	0.00E+00	3.85E-03	2.46E-02	-1.04E-01	-1.23E+00
Renew. PER as material	MJ	1.38E-01	0.00E+00	3.01E+00	3.14E+00	0.00E+00	-3.06E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	-8.25E-02	0.00E+00
Total use of renew. PER	MJ	8.86E+00	1.49E-02	3.45E+00	1.23E+01	7.86E-03	-7.32E+00	ND	ND	ND	ND	ND	1.01E+03	ND	0.00E+00	3.85E-03	2.46E-02	-1.87E-01	-1.23E+00
Non-re. PER as energy	MJ	8.10E+01	1.40E+00	4.56E+00	8.70E+01	5.73E-01	1.56E-01	ND	ND	ND	ND	ND	3.69E+03	ND	0.00E+00	2.81E-01	-6.02E+00	-6.54E+00	-1.27E+01
Non-re. PER as material	MJ	1.08E+01	0.00E+00	9.22E-03	1.08E+01	0.00E+00	-2.48E-02	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	-5.82E+00	-4.93E+00	0.00E+00
Total use of non-re. PER	MJ	9.18E+01	1.40E+00	4.57E+00	9.78E+01	5.73E-01	1.31E-01	ND	ND	ND	ND	ND	3.69E+03	ND	0.00E+00	2.81E-01	-1.18E+01	-1.15E+01	-1.27E+01
Secondary materials	kg	1.55E-01	0.00E+00	0.00E+00	1.55E-01	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renew. secondary fuels	MJ	5.60E-03	4.46E-06	2.63E-02	3.19E-02	3.10E-06	1.94E-06	ND	ND	ND	ND	ND	4.88E-03	ND	0.00E+00	1.61E-06	9.33E-06	1.69E-06	-1.13E-04
Non-ren. secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m ³	5.24E-02	1.50E-04	2.44E-03	5.50E-02	8.48E-05	2.92E-04	ND	ND	ND	ND	ND	3.19E+00	ND	0.00E+00	3.72E-05	4.47E-04	-2.92E-04	-9.52E-03

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	8.47E-01	2.11E-03	1.94E-02	8.68E-01	9.72E-04	4.73E-03	ND	ND	ND	ND	ND	9.35E+00	ND	0.00E+00	4.90E-04	6.98E-03	1.60E-02	-1.71E-01
Non-hazardous waste	kg	2.26E+01	3.43E-02	7.29E-01	2.33E+01	1.80E-02	2.56E-01	ND	ND	ND	ND	ND	7.23E+02	ND	0.00E+00	9.19E-03	1.89E-01	8.60E-01	-4.39E+00
Radioactive waste	kg	1.18E-04	2.25E-07	4.02E-06	1.22E-04	1.22E-07	4.72E-08	ND	ND	ND	ND	ND	2.62E-02	ND	0.00E+00	5.57E-08	2.71E-07	3.35E-08	-2.21E-05

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	4.14E-03	4.14E-03	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	2.45E-01	0.00E+00	0.00E+00
Materials for energy rec	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	1.69E+00	0.00E+00	0.00E+00
Exported energy – Electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	7.12E-01	0.00E+00	0.00E+00
Exported energy – Heat	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	9.79E-01	0.00E+00	0.00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ e	6.26E+00	1.05E-01	3.71E-01	6.74E+00	3.93E-02	1.49E-02	ND	ND	ND	ND	ND	1.59E+02	ND	0.00E+00	1.99E-02	3.44E-01	1.78E-01	-1.08E+00
Ozone depletion Pot.	kg CFC-11e	1.04E-07	1.22E-09	9.03E-09	1.14E-07	4.66E-10	1.76E-10	ND	ND	ND	ND	ND	2.44E-06	ND	0.00E+00	2.24E-10	2.01E-10	1.14E-10	-5.12E-09
Acidification	kg SO ₂ e	4.24E-02	1.48E-03	1.14E-03	4.50E-02	1.03E-04	6.57E-05	ND	ND	ND	ND	ND	7.95E-01	ND	0.00E+00	5.11E-05	1.35E-04	4.43E-05	-1.34E-02
Eutrophication	kg PO ₄ ³ e	2.19E-02	1.79E-04	8.19E-04	2.29E-02	2.51E-05	2.04E-05	ND	ND	ND	ND	ND	1.03E-01	ND	0.00E+00	1.24E-05	3.16E-05	2.42E-05	-1.59E-03
POCP ("smog")	kg C ₂ H ₄ e	3.79E-03	7.84E-05	1.29E-04	4.00E-03	9.17E-06	5.00E-06	ND	ND	ND	ND	ND	4.33E-02	ND	0.00E+00	4.58E-06	8.87E-06	4.84E-06	-6.67E-04
ADP-elements	kg Sbe	5.00E-04	1.85E-07	1.12E-06	5.02E-04	1.08E-07	3.74E-08	ND	ND	ND	ND	ND	2.14E-03	ND	0.00E+00	6.42E-08	4.24E-07	1.65E-08	-1.39E-04
ADP-fossil	MJ	8.42E+01	1.38E+00	4.32E+00	8.99E+01	5.66E-01	1.53E-01	ND	ND	ND	ND	ND	1.90E+03	ND	0.00E+00	2.78E-01	1.98E-01	9.41E-02	-1.20E+01

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG 9)	kg CO ₂ e	6.29E+00	1.05E-01	3.45E-01	6.74E+00	3.95E-02	1.50E-02	ND	ND	ND	ND	ND	1.59E+02	ND	0.00E+00	2.00E-02	3.44E-01	1.79E-01	-1.09E+00

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows - CH₄ fossil, CH₄ biogenic and Dinitrogen monoxide - were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterization factor for biogenic CO₂ is set to zero.

ENVIRONMENTAL IMPACT DATA, RESULTS PER FUNCTIONAL UNIT

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total ¹⁾	kg CO ₂ éq/FU	3.28E+00	5.49E-02	2.08E-03	3.33E+00	2.06E-02	1.88E-01	ND	ND	ND	ND	ND	8.31E+01	ND	0.00E+00	1.04E-02	1.79E-01	9.30E-02	-5.67E-01
GWP – fossil	kg CO ₂ éq/FU	3.27E+00	5.49E-02	1.76E-01	3.50E+00	2.06E-02	7.83E-03	ND	ND	ND	ND	ND	8.26E+01	ND	0.00E+00	1.04E-02	1.79E-01	9.30E-02	-5.66E-01
GWP – biogenic	kg CO ₂ éq/FU	2.42E-03	1.03E-05	-1.78E-01	-1.75E-01	4.66E-06	1.81E-01	ND	ND	ND	ND	ND	1.85E-01	ND	0.00E+00	2.28E-06	-2.21E-04	-1.04E-05	4.33E-05
GWP – LULUC	kg CO ₂ éq/FU	4.62E-03	2.74E-05	4.08E-03	8.74E-03	9.20E-06	2.89E-06	ND	ND	ND	ND	ND	2.54E-01	ND	0.00E+00	4.62E-06	1.21E-05	2.75E-06	-5.97E-04
Ozone depletion pot.	kg CFC-11e/FU	6.01E-08	7.98E-10	4.55E-09	6.55E-08	3.04E-10	1.08E-10	ND	ND	ND	ND	ND	1.52E-06	ND	0.00E+00	1.46E-10	1.21E-10	7.01E-11	-3.08E-09
Acidification potential	mole H ⁺ e/FU	2.60E-02	9.70E-04	8.75E-04	2.79E-02	7.01E-05	4.65E-05	ND	ND	ND	ND	ND	4.86E-01	ND	0.00E+00	3.48E-05	9.14E-05	3.21E-05	-8.02E-03
EP-freshwater ²⁾	kg Pe/FU	1.94E-03	2.87E-06	7.62E-05	2.02E-03	1.60E-06	7.86E-07	ND	ND	ND	ND	ND	7.69E-02	ND	0.00E+00	8.11E-07	3.72E-06	5.66E-07	-4.62E-04
EP-marine	kg Ne/FU	3.54E-03	2.48E-04	4.25E-04	4.21E-03	2.30E-05	2.17E-05	ND	ND	ND	ND	ND	7.62E-02	ND	0.00E+00	1.13E-05	3.58E-05	1.09E-04	-7.13E-04
EP-terrestrial	mol Ne/FU	3.79E-02	2.75E-03	2.61E-03	4.33E-02	2.51E-04	1.98E-04	ND	ND	ND	ND	ND	6.83E-01	ND	0.00E+00	1.23E-04	3.15E-04	1.47E-04	-8.05E-03
POCP (“smog”) ³⁾	kg NMVOCe/	1.48E-02	7.87E-04	8.31E-04	1.64E-02	1.03E-04	5.64E-05	ND	ND	ND	ND	ND	2.25E-01	ND	0.00E+00	4.84E-05	8.45E-05	4.18E-05	-2.47E-03
ADP-minerals & metals ⁴⁾	kg Sbe/FU	2.62E-04	9.83E-08	5.92E-07	2.62E-04	5.74E-08	2.33E-08	ND	ND	ND	ND	ND	1.12E-03	ND	0.00E+00	3.42E-08	2.25E-07	1.07E-08	-7.26E-05
ADP-fossil resources	MJ/FU	4.78E+01	7.28E-01	2.39E+00	5.09E+01	2.98E-01	8.09E-02	ND	ND	ND	ND	ND	1.92E+03	ND	0.00E+00	1.46E-01	1.12E-01	5.01E-02	-7.03E+00
Water use ⁵⁾	m ³ e priv. /FU	1.16E+00	2.80E-03	5.76E-02	1.23E+00	1.47E-03	9.37E-03	ND	ND	ND	ND	ND	5.24E+01	ND	0.00E+00	6.79E-04	1.28E-02	6.20E-03	-1.26E-01

1) GWP = Global Warming Potential. 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e. 3) POCP = Photochemical ozone formation. 4) ADP = Abiotic depletion potential. 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence /FU	2.05E-07	3.37E-09	1.72E-08	2.26E-07	2.06E-09	5.80E-10	ND	ND	ND	ND	ND	1.73E-06	ND	0.00E+00	8.28E-10	9.55E-10	3.62E-10	-3.81E-08
Ionizing radiation ⁶⁾	kBq U235e/FU	2.46E-01	4.78E-04	8.87E-03	2.56E-01	2.60E-04	9.81E-05	ND	ND	ND	ND	ND	5.31E+01	ND	0.00E+00	1.18E-04	5.73E-04	7.00E-05	-4.70E-02
Ecotoxicity (freshwater)	CTUe/FU	5.64E+01	7.79E-02	9.16E-01	5.74E+01	4.22E-02	2.24E-01	ND	ND	ND	ND	ND	2.93E+02	ND	0.00E+00	2.31E-02	3.77E-01	2.52E+00	-5.06E+00
Human toxicity, cancer	CTUh/FU	3.03E-09	1.05E-11	9.78E-11	3.14E-09	3.39E-12	1.08E-11	ND	ND	ND	ND	ND	2.79E-08	ND	0.00E+00	1.77E-12	2.03E-11	1.13E-11	-7.06E-10
Human tox. non-cancer	CTUh/FU	1.30E-07	3.22E-10	2.48E-09	1.32E-07	1.93E-10	4.40E-10	ND	ND	ND	ND	ND	1.45E-06	ND	0.00E+00	9.16E-11	7.77E-10	5.40E-10	-6.56E-08
SQP ⁷⁾	-/FU	1.41E+01	3.90E-01	9.52E+00	2.40E+01	3.01E-01	3.96E-02	ND	ND	ND	ND	ND	4.28E+02	ND	0.00E+00	8.74E-02	1.03E-01	6.64E-02	-2.77E+00

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy ⁸⁾	MJ/FU	4.54E+00	7.73E-03	2.33E-01	4.78E+00	4.09E-03	-2.22E+00	ND	ND	ND	ND	ND	5.28E+02	ND	0.00E+00	2.01E-03	1.28E-02	-5.42E-02	-6.41E-01
Renew. PER as material	MJ/FU	7.18E-02	0.00E+00	1.56E+00	1.64E+00	0.00E+00	-1.59E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	-4.29E-02	0.00E+00
Total use of renew. PER	MJ/FU	4.61E+00	7.73E-03	1.80E+00	6.42E+00	4.09E-03	-3.81E+00	ND	ND	ND	ND	ND	5.28E+02	ND	0.00E+00	2.01E-03	1.28E-02	-9.71E-02	-6.41E-01
Non-re. PER as energy	MJ/FU	4.22E+01	7.28E-01	2.37E+00	4.53E+01	2.98E-01	8.09E-02	ND	ND	ND	ND	ND	1.92E+03	ND	0.00E+00	1.46E-01	-3.13E+00	-3.41E+00	-6.60E+00
Non-re. PER as material	MJ/FU	5.60E+00	0.00E+00	4.80E-03	5.61E+00	0.00E+00	-1.29E-02	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	-3.03E+00	-2.56E+00	0.00E+00
Total use of non-re. PER	MJ/FU	4.78E+01	7.28E-01	2.38E+00	5.09E+01	2.98E-01	6.80E-02	ND	ND	ND	ND	ND	1.92E+03	ND	0.00E+00	1.46E-01	-6.16E+00	-5.97E+00	-6.60E+00
Secondary materials	kg/FU	8.05E-02	0.00E+00	0.00E+00	8.05E-02	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renew. secondary fuels	MJ/FU	2.91E-03	2.32E-06	1.37E-02	1.66E-02	1.61E-06	1.01E-06	ND	ND	ND	ND	ND	2.54E-03	ND	0.00E+00	8.37E-07	4.86E-06	8.78E-07	-5.87E-05
Non-ren. secondary fuels	MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m ³ /FU	2.73E-02	7.81E-05	1.27E-03	2.86E-02	4.41E-05	1.52E-04	ND	ND	ND	ND	ND	1.66E+00	ND	0.00E+00	1.94E-05	2.33E-04	-1.52E-04	-4.96E-03

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg/FU	4.41E-01	1.10E-03	1.01E-02	4.52E-01	5.06E-04	2.46E-03	ND	ND	ND	ND	ND	4.86E+00	ND	0.00E+00	2.55E-04	3.63E-03	8.31E-03	-8.89E-02
Non-hazardous waste	kg/FU	1.17E+01	1.78E-02	3.79E-01	1.21E+01	9.36E-03	1.33E-01	ND	ND	ND	ND	ND	3.76E+02	ND	0.00E+00	4.78E-03	9.81E-02	4.48E-01	-2.28E+00
Radioactive waste	kg/FU	6.15E-05	1.17E-07	2.09E-06	6.37E-05	6.36E-08	2.46E-08	ND	ND	ND	ND	ND	1.36E-02	ND	0.00E+00	2.90E-08	1.41E-07	1.74E-08	-1.15E-05

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for reuse	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	2.15E-03	2.15E-03	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	1.27E-01	0.00E+00	0.00E+00
Materials for energy rec	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	8.80E-01	0.00E+00	0.00E+00
Exported energy – Electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	3.70E-01	0.00E+00	0.00E+00
Exported energy – Heat	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	5.09E-01	0.00E+00	0.00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ eq./FU	3.26E+00	5.46E-02	1.93E-01	3.51E+00	2.05E-02	7.76E-03	ND	ND	ND	ND	ND	8.27E+01	ND	0.00E+00	1.04E-02	1.79E-01	9.27E-02	-5.63E-01
Ozone depletion Pot.	kg CFC ₁₁ /FU	5.41E-08	6.35E-10	4.70E-09	5.94E-08	2.42E-10	9.15E-11	ND	ND	ND	ND	ND	1.27E-06	ND	0.00E+00	1.16E-10	1.04E-10	5.91E-11	-2.67E-09
Acidification	kg SO ₂ e/FU	2.21E-02	7.71E-04	5.92E-04	2.34E-02	5.36E-05	3.42E-05	ND	ND	ND	ND	ND	4.14E-01	ND	0.00E+00	2.66E-05	7.00E-05	2.31E-05	-6.97E-03
Eutrophication	kg PO ₄ ³ e/FU	1.14E-02	9.33E-05	4.26E-04	1.19E-02	1.30E-05	1.06E-05	ND	ND	ND	ND	ND	5.35E-02	ND	0.00E+00	6.48E-06	1.64E-05	1.26E-05	-8.29E-04
POCP (“smog”)	kg C ₂ H ₄ e/FU	1.97E-03	4.08E-05	6.69E-05	2.08E-03	4.77E-06	2.60E-06	ND	ND	ND	ND	ND	2.26E-02	ND	0.00E+00	2.38E-06	4.61E-06	2.52E-06	-3.47E-04
ADP-elements	kg Sbe/FU	2.60E-04	9.62E-08	5.81E-07	2.61E-04	5.59E-08	1.95E-08	ND	ND	ND	ND	ND	1.11E-03	ND	0.00E+00	3.34E-08	2.20E-07	8.58E-09	-7.25E-05
ADP-fossil	MJ/FU	4.38E+01	7.20E-01	2.25E+00	4.68E+01	2.94E-01	7.94E-02	ND	ND	ND	ND	ND	9.86E+02	ND	0.00E+00	1.44E-01	1.03E-01	4.90E-02	-6.25E+00

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG ⁹⁾	kg CO ₂ e/FU	3.27E+00	5.49E-02	1.80E-01	3.51E+00	2.06E-02	7.83E-03	ND	ND	ND	ND	ND	8.29E+01	ND	0.00E+00	1.04E-02	1.79E-01	9.30E-02	-5.67E-01

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows - CH₄ fossil, CH₄ biogenic and Dinitrogen monoxide - were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterization factor for biogenic CO₂ is set to zero.

SCENARIO DOCUMENTATION

DATA SOURCES

Manufacturing energy scenario documentation – A3 (Energy data source)

1. Energy supply, electricity production, wind, Electricity production, wind, 1-3MW turbine, onshore, Poland, ecoinvent 3.10.1, 0.0176 kgCO₂e/kWh
2. Energy supply, electricity production, co-generation oil and gas, Heat and power co-generation, natural gas, combined cycle power plant, 400MW electrical, Poland, ecoinvent 3.10.1, 0.0295 kgCO₂e/MJ
3. Construction, specialized activities, demolition and site preparation, Market for diesel, burned in building machine, World, ecoinvent 3.10.1, 0.10 kgCO₂e/MJ

Transport scenario documentation - A4

1. Transport, freight, lorry >32 metric ton, EURO5, 397.32 km
2. Transport, freight, sea, container ship, 0.0 km

Installation scenario documentation - A5 (Waste materials data source)

1. Market for corrugated board box, 0.24 kg

Use stages scenario documentation - B6-B7 (Energy data source)

1. Energy supply, electricity transformation and distribution, distribution low voltage, Market group for electricity, low voltage, Europe, 485.0 kWh

TRANSPORT SCENARIO DOCUMENTATION - A4

Scenario parameter	Value
Capacity utilization (including empty return) %	50 %
Bulk density of transported products / kg/m ³	8.94E+01
Volume capacity utilization factor (factor: =1 or <1 or ≥1 for compressed or nested packaged products)	1

INSTALLATION SCENARIO DOCUMENTATION - A5

Scenario parameter	Value
Ancillary materials for installation (specified by material) / kg or other units as appropriate	0
Water use / m ³	0
Other resource use / kg	0
Direct emissions to ambient air, soil and water / kg	0

USE STAGES SCENARIO DOCUMENTATION - B6-B7 USE OF ENERGY AND WATER

Scenario information	Value
Ancillary materials specified by material / kg or units as appropriate	Not applicable
Net fresh water consumption / m ³	0
Power output of equipment / kW	9.7
Characteristic performance, e.g., energy efficiency, emissions, variation of performance with capacity utilization, etc. / Units as appropriate	For more details see product classification table and product description.
Further assumptions for scenario development, e.g., frequency and period of use, number of occupants / Units as appropriate	For more details see product classification table and product description.

END OF LIFE SCENARIO DOCUMENTATION

Scenario information	Value
Collection process – kg collected separately	0.684
Collection process – kg collected with mixed waste	0
Recovery process – kg for re-use	0
Recovery process – kg for recycling	2.45E-01
Recovery process – kg for energy recovery	0
Disposal (total) – kg for final deposition	2.79E-01
Scenario assumptions e.g. transportation	Lorry, 16-32 metric ton, EURO5; 150 km

THIRD-PARTY VERIFICATION STATEMENT

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance are filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15804+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.



Program assistant: Xinyuan Zhang



The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

[Verified tools](#)

Tool verifier: Hai Ha Nguyen

Tool verification validity: 28 March 2025 - 27 March 2028

APPENDIX 1

MATERIAL COMPOSITION

The product material composition is illustrated in the table below. The material weight is given in grams and in percentage on total product weight.

Table 1: Material composition

Material	Weight (g)	Weight-%
Aluminium	155.0	22.66
Copper	8.54	1.25
Other Mineral	0.5	0.07
Other Plastics	174.26	25.48
Printing Paper	6.0	0.88
PCB Copper	17.51	2.56
PCB Iron	18.2	2.66
PCB Support	67.25	9.83
PCB Tin	1.04	0.15
PP / PS-High Impact PS / ABS	139.56	20.41
Silica Sand	0.25	0.04
Steel	95.77	14.0

APPENDIX 2

USE PHASE (B6) VALUES FOR DIFFERENT COUNTRY MIX

In this EPD the B6 impact has been calculated using the energy mix of EU. The table in this appendix is useful for conversion and comparison of B6 values with other energy country mix. The Global Warming Potential Total (GWP tot) value is illustrated for each country. The value refers to 1 kwh.

Example on how to use the table:

If for example this EPD was done according to EU energy mix and you want to see how the GWP total changes according to a Finland country energy mix, you can take the original value in the results table here highlighted in yellow:

ENVIRONMENTAL IMPACT DATA, RESULTS PER DECLARED UNIT

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total ⁽¹⁾	kg CO ₂ e	4.44E-01	4.75E-03	2.34E-02	4.72E-01	9.50E-04	8.13E-03	ND	ND	ND	ND	ND	4.06E-02	ND	0.00E+00	5.50E-04	2.23E-03	7.33E-04	-2.82E-02

Divide that value according to the EU value from the following table (EU = 3.30E-01) and then multiplying for the Finland value from the same table (FINLAND = 1.54E-01).

Thus, the calculation of this example would be:

New B6 GWP tot for Finland = (4.06E-02 / 3.30E-01) x 1.54E-01 = 1.89E-02.

Country	GWP tot (kg CO2 eq. per kwh)		
AFRICA	7.30E-01	GERMANY	3.90E-01
APAC	9.50E-01	INDIA	1.50E+00
AUSTRALIA	8.40E-01	ITALY	3.50E-01
AUSTRIA	2.30E-01	LATAM	3.90E-01
BELGIUM	2.00E-01	NAM	4.50E-01
CHINA	1.02E+00	NETHERLANDS	3.90E-01
DENMARK	1.60E-01	NORWAY	4.50E-02
EU	3.30E-01	ROW	7.30E-01
FINLAND	1.54E-01	SPAIN	2.10E-01
FRANCE	8.70E-02	SWEDEN	3.70E-02
		UK	2.60E-01

Source Ecoinvent 3.10.1

APPENDIX 3 - EPD HUB ALIGNED

This section represents the scaling method for the **B6 module**, following the PEP EcoPassport PSR for luminaries (PSR-0014-ed2.0-EN-2023 07 13). The GWP results were scaled from a reference variant of a product family, based on various light management scenarios and power inputs of the luminaires within the same product family.

To calculate the Scaled Impact (*SI*), we have followed the below methods:

1. Calculate the power scaling factor (PSF), which is the ratio of the power input of the variant in questions P_{in} and the power input of the base variant P_{base} .

$$PSF = \frac{P_{in}}{P_{base}}$$

2. Calculate the Total Scaling factor by multiplying the PSF by the control scaling factor (CSF), where the CSF is determined according the relevant control factor scenario (e.g. if the luminaire has a presence detection system). The presented controls factors values in Table A1 are based on BS EN 15193-1:2017. Please refer to this publication or contact Signify directly for more information.

$$TSF = PSF * CSF$$

Table 1: Light management function (PEP EcoPassport aligned)

Scenario	Abbrev.	CSF
No control	NC	1
Daylight dependency factor	DD	0.75
Presence sensing	PS	0.75
Daylight dependency and presence sensing	DD+PS	0.55

- Lastly, the GWP of the base variant is then scaled by the TSF.

$$\text{Scaled Impact} = \text{GWP}_{\text{case}} * \text{TSF}$$

The following list of product configurations is not exhaustive. Please use the formula defined in point 1 above to calculate the exact power scaling factor (PSF) for any specific configuration.

Table 2: GWP per scaling factor (EPD Hub aligned)

	12NC or Product Family Code	Description	Flux [lm]	Power [W]	Efficacy [lm/W]	PSF	Total Scaling Factor (TSF)				Scaled Impacts (GWP100 B6 - kg CO2eq.)			
							NC	DD	PS	DD+PS	NC	DD	PS	DD+PS
1	TCSC65	TCSCPT 10S/830 PSU HMB	994	7.8	127.4	0.804	0.804	0.603	0.603	0.442	128.3	96.2	96.2	70.5
2	TCSC65	TCSCPT 10S/830 PSU HWB	1059	7.8	135.8	0.804	0.804	0.603	0.603	0.442	128.3	96.2	96.2	70.5
3	TCSC65	TCSCPT 10S/830 PSU HVWB	1020	7.8	130.7	0.804	0.804	0.603	0.603	0.442	128.3	96.2	96.2	70.5
4	TCSC65	TCSCPT 10S/830 PSU CLM24	965	8.1	119.1	0.835	0.835	0.626	0.626	0.459	133.2	99.9	99.9	73.2
5	TCSC65	TCSCPT 10S/830 PSU CLM32	1014	8.1	125.2	0.835	0.835	0.626	0.626	0.459	133.2	99.9	99.9	73.2
6	TCSC65	TCSCPT 10S/830 PSU CLM54	940	8.1	116.1	0.835	0.835	0.626	0.626	0.459	133.2	99.9	99.9	73.2
7	TCSC65	TCSCPT 10S/840 PSU HVWB	1049	7.8	134.5	0.804	0.804	0.603	0.603	0.442	128.3	96.2	96.2	70.5
8	TCSC65	TCSCPT 10S/PC930 PSU HMB	1089	9.7	112.2	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8
9	TCSC65	TCSCPT 10S/PC930 PSU HWB	1160	9.7	119.6	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8
10	TCSC65	TCSCPT 10S/PC930 PSU HVWB	1117	9.7	115.2	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8

11	TCSC65	TCSCPT 10S/PC930 PSU CLM24	1037	10.1	102.6	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
12	TCSC65	TCSCPT 10S/PC930 PSU CLM32	1090	10.1	107.9	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
13	TCSC65	TCSCPT 10S/PC930 PSU CLM54	1010	10.1	100.0	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
14	TCSC65	TCSCPT 10S/PW930 PSU HMB	949	7.8	121.6	0.804	0.804	0.603	0.603	0.442	128.3	96.2	96.2	70.5
15	TCSC65	TCSCPT 10S/PW930 PSU HWB	1011	7.8	129.6	0.804	0.804	0.603	0.603	0.442	128.3	96.2	96.2	70.5
16	TCSC65	TCSCPT 10S/PW930 PSU HVWB	973	7.8	124.8	0.804	0.804	0.603	0.603	0.442	128.3	96.2	96.2	70.5
17	TCSC65	TCSCPT 10S/PW930 PSU CLM24	913	8.1	112.7	0.835	0.835	0.626	0.626	0.459	133.2	99.9	99.9	73.2
18	TCSC65	TCSCPT 10S/PW930 PSU CLM32	960	8.1	118.5	0.835	0.835	0.626	0.626	0.459	133.2	99.9	99.9	73.2
19	TCSC65	TCSCPT 10S/PW930 PSU CLM54	889	8.1	109.8	0.835	0.835	0.626	0.626	0.459	133.2	99.9	99.9	73.2
20	TCSC65	TCSCPT 10S/PW940 PSU HMB	977	7.8	125.2	0.804	0.804	0.603	0.603	0.442	128.3	96.2	96.2	70.5
21	TCSC65	TCSCPT 10S/PW940 PSU HWB	1041	7.8	133.5	0.804	0.804	0.603	0.603	0.442	128.3	96.2	96.2	70.5
22	TCSC65	TCSCPT 10S/PW940 PSU HVWB	1003	7.8	128.5	0.804	0.804	0.603	0.603	0.442	128.3	96.2	96.2	70.5
23	TCSC65	TCSCPT 10S/PW940 PSU CLM24	940	8.1	116.0	0.835	0.835	0.626	0.626	0.459	133.2	99.9	99.9	73.2
24	TCSC65	TCSCPT 10S/PW940 PSU CLM32	988	8.1	122.0	0.835	0.835	0.626	0.626	0.459	133.2	99.9	99.9	73.2

25	TCSC65	TCSCPT 10S/PW940 PSU CLM54	916	8.1	113.1	0.835	0.835	0.626	0.626	0.459	133.2	99.9	99.9	73.2
26	TCSC65	TCSCPT 12S/840 PSU HMB	1262	9.7	130.1	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8
27	TCSC65	TCSCPT 12S/840 PSU HWB	1345	9.7	138.6	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8
28	TCSC65	TCSCPT 12S/840 PSU HVWB	1295	9.7	133.5	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8
29	TCSC65	TCSCPT 12S/840 PSU CLM24	1213	10.1	120.1	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
30	TCSC65	TCSCPT 12S/840 PSU CLM32	1275	10.1	126.2	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
31	TCSC65	TCSCPT 12S/840 PSU CLM54	1182	10.1	117.0	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
32	TCSC65	TCSCPT 12S/PC930 PSU HMB	1287	11.7	110.0	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
33	TCSC65	TCSCPT 12S/PC930 PSU HWB	1371	11.7	117.2	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
34	TCSC65	TCSCPT 12S/PC930 PSU HVWB	1320	11.7	112.8	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
35	TCSC65	TCSCPT 12S/PC930 PSU CLM24	1215	12.2	99.6	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
36	TCSC65	TCSCPT 12S/PC930 PSU CLM32	1277	12.2	104.7	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
37	TCSC65	TCSCPT 12S/PC930 PSU CLM54	1183	12.2	97.0	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
38	TCSC65	TCSCPT 12S/PW930 PSU HMB	1171	9.7	120.7	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8

39	TCSC65	TCSCPT 12S/PW930 PSU HWB	1248	9.7	128.6	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8
40	TCSC65	TCSCPT 12S/PW930 PSU HVWB	1201	9.7	123.9	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8
41	TCSC65	TCSCPT 12S/PW930 PSU CLM24	1115	10.1	110.4	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
42	TCSC65	TCSCPT 12S/PW930 PSU CLM32	1173	10.1	116.1	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
43	TCSC65	TCSCPT 12S/PW930 PSU CLM54	1087	10.1	107.6	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
44	TCSC65	TCSCPT 12S/PW940 PSU HMB	1206	9.7	124.3	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8
45	TCSC65	TCSCPT 12S/PW940 PSU HWB	1285	9.7	132.5	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8
46	TCSC65	TCSCPT 12S/PW940 PSU HVWB	1237	9.7	127.6	1.0	1.0	0.75	0.75	0.55	159.6	119.7	119.7	87.8
47	TCSC65	TCSCPT 12S/PW940 PSU CLM24	1149	10.1	113.7	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
48	TCSC65	TCSCPT 12S/PW940 PSU CLM32	1208	10.1	119.6	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
49	TCSC65	TCSCPT 12S/PW940 PSU CLM54	1119	10.1	110.8	1.041	1.041	0.781	0.781	0.573	166.1	124.6	124.6	91.4
50	TCSC65	TCSCPT 15S/830 PSU HMB	1450	11.7	123.9	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
51	TCSC65	TCSCPT 15S/830 PSU HWB	1545	11.7	132.1	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
52	TCSC65	TCSCPT 15S/830 PSU HVWB	1488	11.7	127.2	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8

53	TCSC65	TCSCPT 15S/830 PSU CLM24	1382	12.2	113.3	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
54	TCSC65	TCSCPT 15S/830 PSU CLM32	1453	12.2	119.1	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
55	TCSC65	TCSCPT 15S/830 PSU CLM54	1346	12.2	110.4	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
56	TCSC65	TCSCPT 15S/840 PSU HMB	1492	11.7	127.5	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
57	TCSC65	TCSCPT 15S/840 PSU HWB	1590	11.7	135.9	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
58	TCSC65	TCSCPT 15S/840 PSU HVWB	1531	11.7	130.8	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
59	TCSC65	TCSCPT 15S/840 PSU CLM24	1422	12.2	116.5	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
60	TCSC65	TCSCPT 15S/840 PSU CLM32	1494	12.2	122.5	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
61	TCSC65	TCSCPT 15S/840 PSU CLM54	1385	12.2	113.5	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
62	TCSC65	TCSCPT 15S/PW940 PSU HMB	1425	11.7	121.8	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
63	TCSC65	TCSCPT 15S/PW940 PSU HWB	1519	11.7	129.8	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
64	TCSC65	TCSCPT 15S/PW940 PSU HVWB	1463	11.7	125.0	1.206	1.206	0.904	0.904	0.663	192.4	144.2	144.2	105.8
65	TCSC65	TCSCPT 15S/PW940 PSU CLM24	1346	12.2	110.3	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
66	TCSC65	TCSCPT 15S/PW940 PSU CLM32	1415	12.2	116.0	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4

67	TCSC65	TCSCPT 15S/PW940 PSU CLM54	1311	12.2	107.5	1.258	1.258	0.944	0.944	0.692	200.7	150.6	150.6	110.4
68	TCSC65	TCSCPT 17S/830 PSU HMB	1665	13.7	121.5	1.412	1.412	1.059	1.059	0.777	225.3	169.0	169.0	124.0
69	TCSC65	TCSCPT 17S/830 PSU HWB	1775	13.7	129.5	1.412	1.412	1.059	1.059	0.777	225.3	169.0	169.0	124.0
70	TCSC65	TCSCPT 17S/830 PSU HVWB	1709	13.7	124.7	1.412	1.412	1.059	1.059	0.777	225.3	169.0	169.0	124.0
71	TCSC65	TCSCPT 17S/830 PSU CLM24	1574	14.3	110.1	1.474	1.474	1.105	1.105	0.811	235.2	176.3	176.3	129.4
72	TCSC65	TCSCPT 17S/830 PSU CLM32	1655	14.3	115.7	1.474	1.474	1.105	1.105	0.811	235.2	176.3	176.3	129.4
73	TCSC65	TCSCPT 17S/830 PSU CLM54	1534	14.3	107.3	1.474	1.474	1.105	1.105	0.811	235.2	176.3	176.3	129.4
74	TCSC65	TCSCPT 17S/PW930 PSU HMB	1590	13.7	116.0	1.412	1.412	1.059	1.059	0.777	225.3	169.0	169.0	124.0
75	TCSC65	TCSCPT 17S/PW930 PSU HWB	1694	13.7	123.7	1.412	1.412	1.059	1.059	0.777	225.3	169.0	169.0	124.0
76	TCSC65	TCSCPT 17S/PW930 PSU HVWB	1632	13.7	119.1	1.412	1.412	1.059	1.059	0.777	225.3	169.0	169.0	124.0
77	TCSC65	TCSCPT 17S/PW930 PSU CLM24	1489	14.3	104.1	1.474	1.474	1.105	1.105	0.811	235.2	176.3	176.3	129.4
78	TCSC65	TCSCPT 17S/PW930 PSU CLM32	1566	14.3	109.5	1.474	1.474	1.105	1.105	0.811	235.2	176.3	176.3	129.4
79	TCSC65	TCSCPT 17S/PW930 PSU CLM54	1451	14.3	101.5	1.474	1.474	1.105	1.105	0.811	235.2	176.3	176.3	129.4
80	TCSC65	TCSCPT 17S/PW940 PSU HMB	1637	13.7	119.5	1.412	1.412	1.059	1.059	0.777	225.3	169.0	169.0	124.0

81	TCSC65	TCSCPT 17S/PW940 PSU HWB	1745	13.7	127.4	1.412	1.412	1.059	1.059	0.777	225.3	169.0	169.0	124.0
82	TCSC65	TCSCPT 17S/PW940 PSU HVWB	1680	13.7	122.7	1.412	1.412	1.059	1.059	0.777	225.3	169.0	169.0	124.0
83	TCSC65	TCSCPT 17S/PW940 PSU CLM24	1534	14.3	107.3	1.474	1.474	1.105	1.105	0.811	235.2	176.3	176.3	129.4
84	TCSC65	TCSCPT 17S/PW940 PSU CLM32	1612	14.3	112.8	1.474	1.474	1.105	1.105	0.811	235.2	176.3	176.3	129.4
85	TCSC65	TCSCPT 17S/PW940 PSU CLM54	1494	14.3	104.5	1.474	1.474	1.105	1.105	0.811	235.2	176.3	176.3	129.4
86	TCSC65	TCSCPT 20S/PC930 PSU HMB	1837	16.8	109.3	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
87	TCSC65	TCSCPT 20S/PC930 PSU HWB	1958	16.8	116.5	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
88	TCSC65	TCSCPT 20S/PC930 PSU HVWB	1885	16.8	112.2	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
89	TCSC65	TCSCPT 20S/830 PSU HMB	2069	16.8	123.2	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
90	TCSC65	TCSCPT 20S/830 PSU HWB	2206	16.8	131.3	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
91	TCSC65	TCSCPT 20S/830 PSU HVWB	2124	16.8	126.4	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
92	TCSC65	TCSCPT 20S/840 PSU HMB	2130	16.8	126.8	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
93	TCSC65	TCSCPT 20S/840 PSU HWB	2270	16.8	135.1	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
94	TCSC65	TCSCPT 20S/840 PSU HVWB	2186	16.8	130.1	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1

95	TCSC65	TCSCPT 20S/PW930 PSU HMB	1976	16.8	117.6	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
96	TCSC65	TCSCPT 20S/PW930 PSU HWB	2106	16.8	125.3	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
97	TCSC65	TCSCPT 20S/PW930 PSU HVWB	2028	16.8	120.7	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
98	TCSC65	TCSCPT 20S/PW940 PSU HMB	2035	16.8	121.1	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
99	TCSC65	TCSCPT 20S/PW940 PSU HWB	2169	16.8	129.1	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1
100	TCSC65	TCSCPT 20S/PW940 PSU HVWB	2089	16.8	124.3	1.732	1.732	1.299	1.299	0.953	276.4	207.3	207.3	152.1

PEP ECOPASSPORT ALIGNED

This section represents the scaling method for the **B6 module**, following the PEP EcoPassport PSR for luminaries (PSR-0014-ed2.0-EN-2023 07 13). The GWP results were scaled from a reference variant of a product family, based on various light management functions, the lumen output (O_{lum}) and reference service life (RSL) of each product within the same product family.

To calculate the Scaled Impact (SI_{pep}), we have followed the below methods:

1. Calculate the power scaling factor (PSF), which is the ratio of the power input of the variant in questions P_{in} and the power input of the base variant P_{base} .

$$PSF = \frac{P_{in}}{P_{base}}$$

2. Using this scaled GWP, we then can apply the PEP Ecopassport method for calculating the environmental impact of the functional unit for a luminary (1000 lumens over 35000 hours), applied to B6, where the Functional Unit application considers the lumen output (O_{lum}) and reference service lifetime (RSL) of the product to estimate the final environmental impact. The scaled impact (SI_{pep}) is presented in Table A4.

$$GSF = \frac{FU_{pep}}{FU_p} = \frac{1,000}{O_{lum}} * \frac{35,000}{RSL}$$

3. Calculate the GWP scaling factor ($PGSF$), by multiplying the PSF by the GSF.

$$PGSF = PSF * GSF$$

4. Calculate the Total Scaling factor by multiplying the PSF by the control scaling factor (CSF), where the CSF is determined according the relevant control factor scenario (e.g. if the luminaire has a presence detection system), as presented in Table A1.

$$TSF = PGSF * CSF$$

Table 3: Light management functions (PEP EcoPassport aligned)

Scenario	Abbrev.	CSF
No control	NC	1
Daylight dependency factor	DD	0.75
Presence sensing	PS	0.75
Daylight dependency and presence sensing	DD+PS	0.55

5. Lastly, the GWP of the base variant is then scaled by the TSF.

$$Scaled\ GWP = GWP_{case} * TSF$$

Table 4: Impact per scaling factor (PEP EcoPassport aligned)

	12NC or Product Family Code	Description	Flux [lm]	Power [W]	Efficacy [lm/W]	PSF	Total Scaling Factor (TSF)				Scaled Impacts (GWP100 B6 - kg CO2eq.)			
							NC	DD	PS	DD+PS	NC	DD	PS	DD+PS
1	TCSC65	TCSCPT 10S/830 PSU HMB	994	7.8	127.4	0.804	0.567	0.425	0.425	0.312	90.5	67.8	67.8	49.8
2	TCSC65	TCSCPT 10S/830 PSU HWB	1059	7.8	135.8	0.804	0.531	0.398	0.398	0.292	84.7	63.5	63.5	46.6
3	TCSC65	TCSCPT 10S/830 PSU HVWB	1020	7.8	130.7	0.804	0.552	0.414	0.414	0.304	88.1	66.1	66.1	48.5
4	TCSC65	TCSCPT 10S/830 PSU CLM24	965	8.1	119.1	0.835	0.605	0.454	0.454	0.333	96.5	72.4	72.4	53.1
5	TCSC65	TCSCPT 10S/830 PSU CLM32	1014	8.1	125.2	0.835	0.576	0.432	0.432	0.317	91.9	68.9	68.9	50.6
6	TCSC65	TCSCPT 10S/830 PSU CLM54	940	8.1	116.1	0.835	0.622	0.467	0.467	0.342	99.2	74.5	74.5	54.6
7	TCSC65	TCSCPT 10S/840 PSU HVWB	1049	7.8	134.5	0.804	0.536	0.402	0.402	0.295	85.5	64.1	64.1	47.1
8	TCSC65	TCSCPT 10S/PC930 PSU HMB	1089	9.7	112.2	1.0	0.643	0.482	0.482	0.354	102.6	76.9	76.9	56.5
9	TCSC65	TCSCPT 10S/PC930 PSU HWB	1160	9.7	119.6	1.0	0.603	0.452	0.452	0.332	96.2	72.1	72.1	53.0
10	TCSC65	TCSCPT 10S/PC930 PSU HVWB	1117	9.7	115.2	1.0	0.627	0.47	0.47	0.345	100.0	75.0	75.0	55.0
11	TCSC65	TCSCPT 10S/PC930 PSU CLM24	1037	10.1	102.6	1.041	0.703	0.527	0.527	0.387	112.2	84.1	84.1	61.8
12	TCSC65	TCSCPT 10S/PC930 PSU CLM32	1090	10.1	107.9	1.041	0.668	0.501	0.501	0.367	106.6	79.9	79.9	58.6

13	TCSC65	TCSCPT 10S/PC930 PSU CLM54	1010	10.1	100.0	1.041	0.721	0.541	0.541	0.397	115.0	86.3	86.3	63.3
14	TCSC65	TCSCPT 10S/PW930 PSU HMB	949	7.8	121.6	0.804	0.593	0.445	0.445	0.326	94.6	71.0	71.0	52.0
15	TCSC65	TCSCPT 10S/PW930 PSU HWB	1011	7.8	129.6	0.804	0.556	0.417	0.417	0.306	88.7	66.5	66.5	48.8
16	TCSC65	TCSCPT 10S/PW930 PSU HVWB	973	7.8	124.8	0.804	0.578	0.433	0.433	0.318	92.2	69.1	69.1	50.7
17	TCSC65	TCSCPT 10S/PW930 PSU CLM24	913	8.1	112.7	0.835	0.64	0.48	0.48	0.352	102.1	76.6	76.6	56.2
18	TCSC65	TCSCPT 10S/PW930 PSU CLM32	960	8.1	118.5	0.835	0.61	0.458	0.458	0.336	97.3	73.1	73.1	53.6
19	TCSC65	TCSCPT 10S/PW930 PSU CLM54	889	8.1	109.8	0.835	0.657	0.493	0.493	0.361	104.8	78.7	78.7	57.6
20	TCSC65	TCSCPT 10S/PW940 PSU HMB	977	7.8	125.2	0.804	0.576	0.432	0.432	0.317	91.9	68.9	68.9	50.6
21	TCSC65	TCSCPT 10S/PW940 PSU HWB	1041	7.8	133.5	0.804	0.54	0.405	0.405	0.297	86.2	64.6	64.6	47.4
22	TCSC65	TCSCPT 10S/PW940 PSU HVWB	1003	7.8	128.5	0.804	0.561	0.421	0.421	0.309	89.5	67.2	67.2	49.3
23	TCSC65	TCSCPT 10S/PW940 PSU CLM24	940	8.1	116.0	0.835	0.622	0.467	0.467	0.342	99.2	74.5	74.5	54.6
24	TCSC65	TCSCPT 10S/PW940 PSU CLM32	988	8.1	122.0	0.835	0.591	0.443	0.443	0.325	94.3	70.7	70.7	51.9
25	TCSC65	TCSCPT 10S/PW940 PSU CLM54	916	8.1	113.1	0.835	0.638	0.479	0.479	0.351	101.8	76.4	76.4	56.0
26	TCSC65	TCSCPT 12S/840 PSU HMB	1262	9.7	130.1	1.0	0.555	0.416	0.416	0.305	88.6	66.4	66.4	48.7

27	TCSC65	TCSCPT 12S/840 PSU HWB	1345	9.7	138.6	1.0	0.521	0.391	0.391	0.287	83.1	62.4	62.4	45.8
28	TCSC65	TCSCPT 12S/840 PSU HVWB	1295	9.7	133.5	1.0	0.541	0.406	0.406	0.298	86.3	64.8	64.8	47.6
29	TCSC65	TCSCPT 12S/840 PSU CLM24	1213	10.1	120.1	1.041	0.601	0.451	0.451	0.331	95.9	72.0	72.0	52.8
30	TCSC65	TCSCPT 12S/840 PSU CLM32	1275	10.1	126.2	1.041	0.572	0.429	0.429	0.315	91.3	68.5	68.5	50.3
31	TCSC65	TCSCPT 12S/840 PSU CLM54	1182	10.1	117.0	1.041	0.616	0.462	0.462	0.339	98.3	73.7	73.7	54.1
32	TCSC65	TCSCPT 12S/PC930 PSU HMB	1287	11.7	110.0	1.206	0.656	0.492	0.492	0.361	104.7	78.5	78.5	57.6
33	TCSC65	TCSCPT 12S/PC930 PSU HWB	1371	11.7	117.2	1.206	0.615	0.461	0.461	0.338	98.1	73.6	73.6	53.9
34	TCSC65	TCSCPT 12S/PC930 PSU HVWB	1320	11.7	112.8	1.206	0.639	0.479	0.479	0.351	102.0	76.4	76.4	56.0
35	TCSC65	TCSCPT 12S/PC930 PSU CLM24	1215	12.2	99.6	1.258	0.725	0.544	0.544	0.399	115.7	86.8	86.8	63.7
36	TCSC65	TCSCPT 12S/PC930 PSU CLM32	1277	12.2	104.7	1.258	0.689	0.517	0.517	0.379	109.9	82.5	82.5	60.5
37	TCSC65	TCSCPT 12S/PC930 PSU CLM54	1183	12.2	97.0	1.258	0.745	0.559	0.559	0.41	118.9	89.2	89.2	65.4
38	TCSC65	TCSCPT 12S/PW930 PSU HMB	1171	9.7	120.7	1.0	0.598	0.449	0.449	0.329	95.4	71.6	71.6	52.5
39	TCSC65	TCSCPT 12S/PW930 PSU HWB	1248	9.7	128.6	1.0	0.561	0.421	0.421	0.309	89.5	67.2	67.2	49.3
40	TCSC65	TCSCPT 12S/PW930 PSU HVWB	1201	9.7	123.9	1.0	0.583	0.437	0.437	0.321	93.0	69.7	69.7	51.2

41	TCSC65	TCSCPT 12S/PW930 PSU CLM24	1115	10.1	110.4	1.041	0.654	0.491	0.491	0.36	104.4	78.3	78.3	57.4
42	TCSC65	TCSCPT 12S/PW930 PSU CLM32	1173	10.1	116.1	1.041	0.621	0.466	0.466	0.342	99.1	74.4	74.4	54.6
43	TCSC65	TCSCPT 12S/PW930 PSU CLM54	1087	10.1	107.6	1.041	0.67	0.503	0.503	0.369	106.9	80.3	80.3	58.9
44	TCSC65	TCSCPT 12S/PW940 PSU HMB	1206	9.7	124.3	1.0	0.581	0.436	0.436	0.32	92.7	69.6	69.6	51.1
45	TCSC65	TCSCPT 12S/PW940 PSU HWB	1285	9.7	132.5	1.0	0.545	0.409	0.409	0.3	87.0	65.3	65.3	47.9
46	TCSC65	TCSCPT 12S/PW940 PSU HVWB	1237	9.7	127.6	1.0	0.566	0.424	0.424	0.311	90.3	67.7	67.7	49.6
47	TCSC65	TCSCPT 12S/PW940 PSU CLM24	1149	10.1	113.7	1.041	0.634	0.476	0.476	0.349	101.2	76.0	76.0	55.7
48	TCSC65	TCSCPT 12S/PW940 PSU CLM32	1208	10.1	119.6	1.041	0.604	0.453	0.453	0.332	96.4	72.3	72.3	53.0
49	TCSC65	TCSCPT 12S/PW940 PSU CLM54	1119	10.1	110.8	1.041	0.651	0.488	0.488	0.358	103.9	77.9	77.9	57.1
50	TCSC65	TCSCPT 15S/830 PSU HMB	1450	11.7	123.9	1.206	0.582	0.436	0.436	0.32	92.9	69.6	69.6	51.1
51	TCSC65	TCSCPT 15S/830 PSU HWB	1545	11.7	132.1	1.206	0.546	0.41	0.41	0.3	87.1	65.4	65.4	47.9
52	TCSC65	TCSCPT 15S/830 PSU HVWB	1488	11.7	127.2	1.206	0.568	0.426	0.426	0.312	90.6	68.0	68.0	49.8
53	TCSC65	TCSCPT 15S/830 PSU CLM24	1382	12.2	113.3	1.258	0.638	0.479	0.479	0.351	101.8	76.4	76.4	56.0
54	TCSC65	TCSCPT 15S/830 PSU CLM32	1453	12.2	119.1	1.258	0.606	0.455	0.455	0.333	96.7	72.6	72.6	53.1

55	TCSC65	TCSCPT 15S/830 PSU CLM54	1346	12.2	110.4	1.258	0.654	0.491	0.491	0.36	104.4	78.3	78.3	57.4
56	TCSC65	TCSCPT 15S/840 PSU HMB	1492	11.7	127.5	1.206	0.566	0.424	0.424	0.311	90.3	67.7	67.7	49.6
57	TCSC65	TCSCPT 15S/840 PSU HWB	1590	11.7	135.9	1.206	0.531	0.398	0.398	0.292	84.7	63.5	63.5	46.6
58	TCSC65	TCSCPT 15S/840 PSU HVWB	1531	11.7	130.8	1.206	0.551	0.413	0.413	0.303	87.9	65.9	65.9	48.3
59	TCSC65	TCSCPT 15S/840 PSU CLM24	1422	12.2	116.5	1.258	0.619	0.464	0.464	0.34	98.8	74.0	74.0	54.3
60	TCSC65	TCSCPT 15S/840 PSU CLM32	1494	12.2	122.5	1.258	0.589	0.442	0.442	0.324	94.0	70.5	70.5	51.7
61	TCSC65	TCSCPT 15S/840 PSU CLM54	1385	12.2	113.5	1.258	0.635	0.476	0.476	0.349	101.3	76.0	76.0	55.7
62	TCSC65	TCSCPT 15S/PW940 PSU HMB	1425	11.7	121.8	1.206	0.592	0.444	0.444	0.326	94.5	70.8	70.8	52.0
63	TCSC65	TCSCPT 15S/PW940 PSU HWB	1519	11.7	129.8	1.206	0.556	0.417	0.417	0.306	88.7	66.5	66.5	48.8
64	TCSC65	TCSCPT 15S/PW940 PSU HVWB	1463	11.7	125.0	1.206	0.576	0.432	0.432	0.317	91.9	68.9	68.9	50.6
65	TCSC65	TCSCPT 15S/PW940 PSU CLM24	1346	12.2	110.3	1.258	0.654	0.491	0.491	0.36	104.4	78.3	78.3	57.4
66	TCSC65	TCSCPT 15S/PW940 PSU CLM32	1415	12.2	116.0	1.258	0.623	0.467	0.467	0.343	99.4	74.5	74.5	54.7
67	TCSC65	TCSCPT 15S/PW940 PSU CLM54	1311	12.2	107.5	1.258	0.672	0.504	0.504	0.37	107.2	80.4	80.4	59.0
68	TCSC65	TCSCPT 17S/830 PSU HMB	1665	13.7	121.5	1.412	0.593	0.445	0.445	0.326	94.6	71.0	71.0	52.0

69	TCSC65	TCSCPT 17S/830 PSU HWB	1775	13.7	129.5	1.412	0.556	0.417	0.417	0.306	88.7	66.5	66.5	48.8
70	TCSC65	TCSCPT 17S/830 PSU HVWB	1709	13.7	124.7	1.412	0.579	0.434	0.434	0.318	92.4	69.3	69.3	50.7
71	TCSC65	TCSCPT 17S/830 PSU CLM24	1574	14.3	110.1	1.474	0.656	0.492	0.492	0.361	104.7	78.5	78.5	57.6
72	TCSC65	TCSCPT 17S/830 PSU CLM32	1655	14.3	115.7	1.474	0.624	0.468	0.468	0.343	99.6	74.7	74.7	54.7
73	TCSC65	TCSCPT 17S/830 PSU CLM54	1534	14.3	107.3	1.474	0.672	0.504	0.504	0.37	107.2	80.4	80.4	59.0
74	TCSC65	TCSCPT 17S/PW930 PSU HMB	1590	13.7	116.0	1.412	0.621	0.466	0.466	0.342	99.1	74.4	74.4	54.6
75	TCSC65	TCSCPT 17S/PW930 PSU HWB	1694	13.7	123.7	1.412	0.583	0.437	0.437	0.321	93.0	69.7	69.7	51.2
76	TCSC65	TCSCPT 17S/PW930 PSU HVWB	1632	13.7	119.1	1.412	0.606	0.455	0.455	0.333	96.7	72.6	72.6	53.1
77	TCSC65	TCSCPT 17S/PW930 PSU CLM24	1489	14.3	104.1	1.474	0.693	0.52	0.52	0.381	110.6	83.0	83.0	60.8
78	TCSC65	TCSCPT 17S/PW930 PSU CLM32	1566	14.3	109.5	1.474	0.659	0.494	0.494	0.362	105.2	78.8	78.8	57.8
79	TCSC65	TCSCPT 17S/PW930 PSU CLM54	1451	14.3	101.5	1.474	0.71	0.532	0.532	0.391	113.3	84.9	84.9	62.4
80	TCSC65	TCSCPT 17S/PW940 PSU HMB	1637	13.7	119.5	1.412	0.604	0.453	0.453	0.332	96.4	72.3	72.3	53.0
81	TCSC65	TCSCPT 17S/PW940 PSU HWB	1745	13.7	127.4	1.412	0.566	0.424	0.424	0.311	90.3	67.7	67.7	49.6
82	TCSC65	TCSCPT 17S/PW940 PSU HVWB	1680	13.7	122.7	1.412	0.589	0.442	0.442	0.324	94.0	70.5	70.5	51.7

83	TCSC65	TCSCPT 17S/PW940 PSU CLM24	1534	14.3	107.3	1.474	0.672	0.504	0.504	0.37	107.2	80.4	80.4	59.0
84	TCSC65	TCSCPT 17S/PW940 PSU CLM32	1612	14.3	112.8	1.474	0.64	0.48	0.48	0.352	102.1	76.6	76.6	56.2
85	TCSC65	TCSCPT 17S/PW940 PSU CLM54	1494	14.3	104.5	1.474	0.69	0.517	0.517	0.38	110.1	82.5	82.5	60.6
86	TCSC65	TCSCPT 20S/PC930 PSU HMB	1837	16.8	109.3	1.732	0.66	0.495	0.495	0.363	105.3	79.0	79.0	57.9
87	TCSC65	TCSCPT 20S/PC930 PSU HWB	1958	16.8	116.5	1.732	0.62	0.465	0.465	0.341	98.9	74.2	74.2	54.4
88	TCSC65	TCSCPT 20S/PC930 PSU HVWB	1885	16.8	112.2	1.732	0.643	0.482	0.482	0.354	102.6	76.9	76.9	56.5
89	TCSC65	TCSCPT 20S/830 PSU HMB	2069	16.8	123.2	1.732	0.585	0.439	0.439	0.322	93.3	70.0	70.0	51.4
90	TCSC65	TCSCPT 20S/830 PSU HWB	2206	16.8	131.3	1.732	0.549	0.412	0.412	0.302	87.6	65.7	65.7	48.2
91	TCSC65	TCSCPT 20S/830 PSU HVWB	2124	16.8	126.4	1.732	0.572	0.429	0.429	0.315	91.3	68.5	68.5	50.3
92	TCSC65	TCSCPT 20S/840 PSU HMB	2130	16.8	126.8	1.732	0.57	0.427	0.427	0.314	91.0	68.1	68.1	50.1
93	TCSC65	TCSCPT 20S/840 PSU HWB	2270	16.8	135.1	1.732	0.533	0.4	0.4	0.293	85.0	63.8	63.8	46.8
94	TCSC65	TCSCPT 20S/840 PSU HVWB	2186	16.8	130.1	1.732	0.554	0.416	0.416	0.305	88.4	66.4	66.4	48.7
95	TCSC65	TCSCPT 20S/PW930 PSU HMB	1976	16.8	117.6	1.732	0.613	0.46	0.46	0.337	97.8	73.4	73.4	53.8
96	TCSC65	TCSCPT 20S/PW930 PSU HWB	2106	16.8	125.3	1.732	0.575	0.431	0.431	0.316	91.7	68.8	68.8	50.4

97	TCSC65	TCSCPT 20S/PW930 PSU HVWB	2028	16.8	120.7	1.732	0.598	0.449	0.449	0.329	95.4	71.6	71.6	52.5
98	TCSC65	TCSCPT 20S/PW940 PSU HMB	2035	16.8	121.1	1.732	0.596	0.447	0.447	0.328	95.1	71.3	71.3	52.3
99	TCSC65	TCSCPT 20S/PW940 PSU HWB	2169	16.8	129.1	1.732	0.559	0.419	0.419	0.307	89.2	66.9	66.9	49.0
100	TCSC65	TCSCPT 20S/PW940 PSU HVWB	2089	16.8	124.3	1.732	0.58	0.435	0.435	0.319	92.5	69.4	69.4	50.9