ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

Signify - Smooth Cylinder (TCSC65)

Signify N.V.

EPD HUB, HUB-4973

Published on 22.01.2026, last updated on 22.01.2026, valid until 22.01.2031

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	910771148758 / TCSCPR 12S/840PSU-E HWBWHBST40468295BKBK
GTIN (Global Trade Item Number)	Not applicable
NOBB (Norwegian Building Product Database)	Not applicable
A1-A3 Specific data (%)	5.88

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	10.3
Luminous efficiency, Lm/W	131
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	45.15	EU , APAC
Minerals	0.07	APAC
Fossil materials	54	EU , APAC
Bio-based materials	0.78	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	0.767
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_2e)	7.89
GWP-fossil, A1-A3 (kg CO_2e)	8.2
Secondary material, inputs (%)	21.5
Secondary material, outputs (%)	36.3
Total energy use, A1-A3 (kWh)	31.8
Net freshwater use, A1-A3 (m^3)	6.56E-02

LIFE CYCLE ASSESSMENT

SYSTEM BOUNDARY

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

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

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)

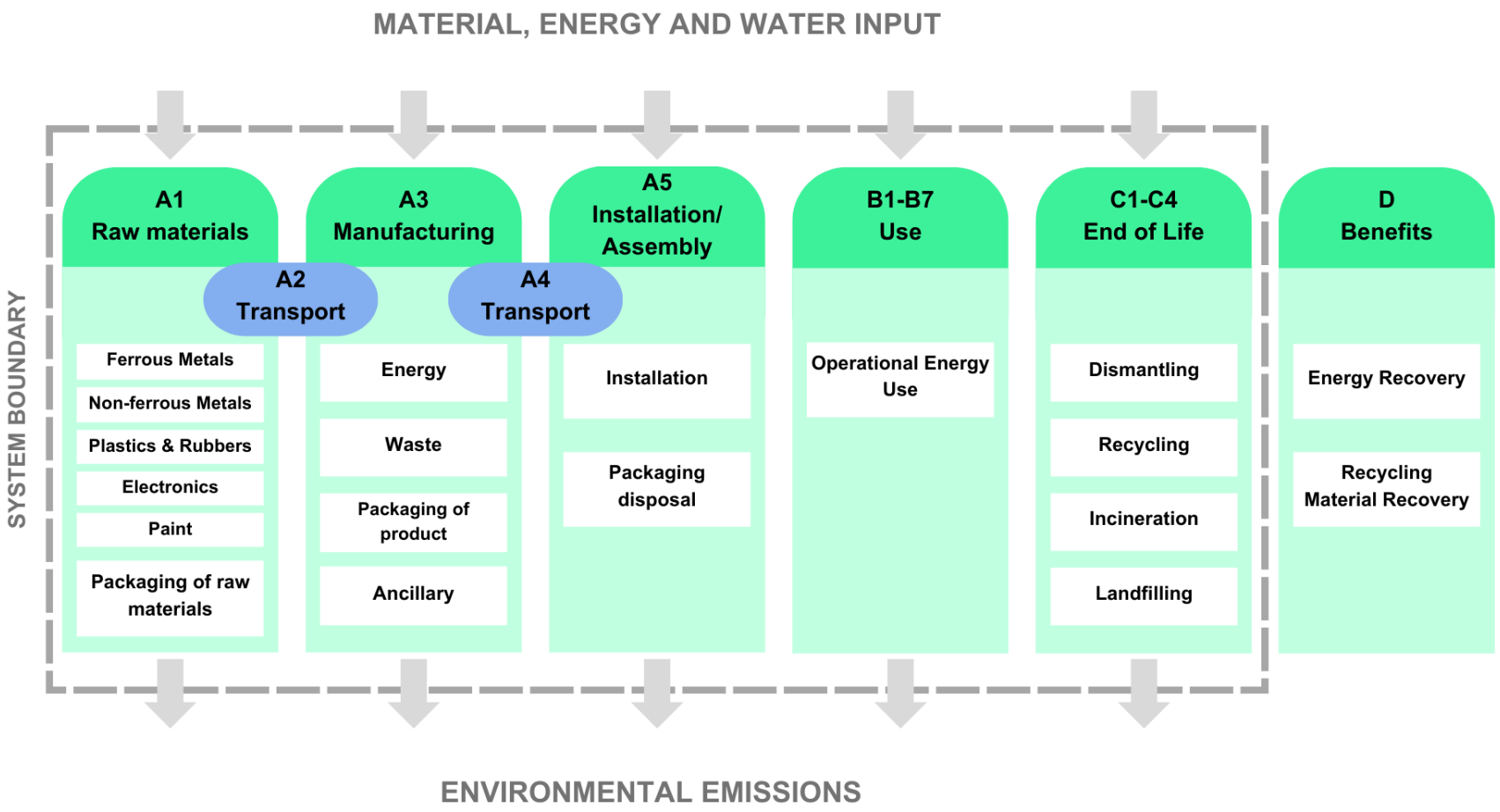
During the use phase, the product consumes electricity (B6), which is calculated multiplying the Wattage x Assigned lifetime (hours) x Country energy mix factor. To know which Country energy mix was used in this EPD, please refer to Annex 2.

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 de-pollution, 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_2e	7.75E+00	1.32E-01	8.76E-03	7.89E+00	4.31E-02	3.62E-01	ND	ND	ND	ND	ND	1.69E+02	ND	0.00E+00	2.25E-02	3.78E-01	1.97E-01	-1.68E+00
GWP – fossil	kg CO_2e	7.73E+00	1.32E-01	3.41E-01	8.20E+00	4.31E-02	1.50E-02	ND	ND	ND	ND	ND	1.69E+02	ND	0.00E+00	2.25E-02	3.79E-01	1.97E-01	-1.68E+00
GWP – biogenic	kg CO_2e	9.25E-03	2.55E-05	-3.41E-01	-3.31E-01	9.76E-06	3.47E-01	ND	ND	ND	ND	ND	3.78E-01	ND	0.00E+00	4.91E-06	-4.25E-04	-2.22E-05	-1.66E-03
GWP – LULUC	kg CO_2e	1.10E-02	6.50E-05	7.85E-03	1.89E-02	1.93E-05	5.55E-06	ND	ND	ND	ND	ND	5.17E-01	ND	0.00E+00	9.95E-06	2.60E-05	5.94E-06	-1.43E-03
Ozone depletion pot.	kg CFC_{-11}e	1.36E-07	1.93E-09	8.96E-09	1.47E-07	6.36E-10	2.07E-10	ND	ND	ND	ND	ND	3.11E-06	ND	0.00E+00	3.14E-10	2.60E-10	1.50E-10	-8.47E-09
Acidification potential	mol H^+e	5.99E-02	2.07E-03	1.69E-03	6.37E-02	1.47E-04	8.94E-05	ND	ND	ND	ND	ND	9.91E-01	ND	0.00E+00	7.49E-05	1.98E-04	6.84E-05	-2.08E-02
EP-freshwater[2)]	kg Pe	4.45E-03	7.39E-06	1.47E-04	4.60E-03	3.35E-06	1.51E-06	ND	ND	ND	ND	ND	1.57E-01	ND	0.00E+00	1.75E-06	8.14E-06	1.22E-06	-1.20E-03
EP-marine	kg Ne	8.40E-03	5.35E-04	8.20E-04	9.75E-03	4.82E-05	4.17E-05	ND	ND	ND	ND	ND	1.55E-01	ND	0.00E+00	2.43E-05	7.63E-05	2.40E-04	-2.10E-03
EP-terrestrial	mol Ne	8.95E-02	5.92E-03	5.06E-03	1.01E-01	5.25E-04	3.80E-04	ND	ND	ND	ND	ND	1.39E+00	ND	0.00E+00	2.64E-04	6.77E-04	3.13E-04	-2.28E-02
POCP ("smog")[3)]	kg NMVOCe	3.42E-02	1.72E-03	1.61E-03	3.75E-02	2.16E-04	1.08E-04	ND	ND	ND	ND	ND	4.59E-01	ND	0.00E+00	1.04E-04	1.82E-04	8.92E-05	-7.01E-03
ADP-minerals & metals[4)]	kg Sbe	5.88E-04	2.55E-07	1.15E-06	5.89E-04	1.20E-07	4.47E-08	ND	ND	ND	ND	ND	2.28E-03	ND	0.00E+00	7.38E-08	5.00E-07	2.29E-08	-1.49E-04
ADP-fossil resources	MJ	1.09E+02	1.78E+00	4.66E+00	1.16E+02	6.25E-01	1.56E-01	ND	ND	ND	ND	ND	3.92E+03	ND	0.00E+00	3.15E-01	2.44E-01	1.08E-01	-1.96E+01
Water use[5)]	m^3e depr.	2.68E+00	7.13E-03	1.11E-01	2.80E+00	3.09E-03	1.80E-02	ND	ND	ND	ND	ND	1.07E+02	ND	0.00E+00	1.46E-03	2.72E-02	1.31E-02	-3.55E-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	4.94E-07	8.83E-09	3.32E-08	5.36E-07	4.31E-09	1.11E-09	ND	ND	ND	ND	ND	3.54E-06	ND	0.00E+00	1.78E-09	2.06E-09	7.78E-10	-1.13E-07
Ionizing radiation[6)]	kBq U235e	5.47E-01	1.22E-03	1.71E-02	5.65E-01	5.44E-04	1.88E-04	ND	ND	ND	ND	ND	1.08E+02	ND	0.00E+00	2.55E-04	1.25E-03	1.50E-04	-1.24E-01
Ecotoxicity (freshwater)	CTUe	1.26E+02	1.99E-01	1.76E+00	1.28E+02	8.84E-02	4.30E-01	ND	ND	ND	ND	ND	5.98E+02	ND	0.00E+00	4.98E-02	7.99E-01	5.65E+00	-1.23E+01
Human toxicity, cancer	CTUh	6.77E-09	2.47E-11	1.89E-10	6.98E-09	7.11E-12	2.07E-11	ND	ND	ND	ND	ND	5.70E-08	ND	0.00E+00	3.82E-12	4.29E-11	2.39E-11	-1.86E-09
Human tox. non-cancer	CTUh	2.77E-07	8.41E-10	4.78E-09	2.82E-07	4.05E-10	8.46E-10	ND	ND	ND	ND	ND	2.95E-06	ND	0.00E+00	1.97E-10	1.67E-09	1.16E-09	-1.44E-07
SQP[7)]	-	3.14E+01	1.08E+00	1.83E+01	5.07E+01	6.29E-01	7.61E-02	ND	ND	ND	ND	ND	8.73E+02	ND	0.00E+00	1.88E-01	2.24E-01	1.43E-01	-6.70E+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	1.02E+01	1.97E-02	4.78E-01	1.07E+01	8.56E-03	-4.26E+00	ND	ND	ND	ND	ND	1.08E+03	ND	0.00E+00	4.32E-03	2.81E-02	-1.04E-01	-1.51E+00
Renew. PER as material	MJ	1.45E-01	0.00E+00	3.00E+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	-1.09E-04	-8.27E-02	0.00E+00
Total use of renew. PER	MJ	1.03E+01	1.97E-02	3.48E+00	1.38E+01	8.56E-03	-7.32E+00	ND	ND	ND	ND	ND	1.08E+03	ND	0.00E+00	4.32E-03	2.80E-02	-1.87E-01	-1.51E+00
Non-re. PER as energy	MJ	9.74E+01	1.78E+00	4.61E+00	1.04E+02	6.25E-01	1.56E-01	ND	ND	ND	ND	ND	3.92E+03	ND	0.00E+00	3.15E-01	-6.50E+00	-7.25E+00	-1.77E+01
Non-re. PER as material	MJ	1.18E+01	0.00E+00	7.31E-03	1.18E+01	0.00E+00	-2.48E-02	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	-6.32E+00	-5.43E+00	0.00E+00
Total use of non-re. PER	MJ	1.09E+02	1.78E+00	4.62E+00	1.16E+02	6.25E-01	1.31E-01	ND	ND	ND	ND	ND	3.92E+03	ND	0.00E+00	3.15E-01	-1.28E+01	-1.27E+01	-1.77E+01
Secondary materials	kg	1.65E-01	0.00E+00	0.00E+00	1.65E-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	6.01E-03	6.26E-06	2.63E-02	3.24E-02	3.38E-06	1.94E-06	ND	ND	ND	ND	ND	5.18E-03	ND	0.00E+00	1.80E-06	1.06E-05	1.87E-06	-1.43E-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	6.30E-02	2.01E-04	2.45E-03	6.56E-02	9.24E-05	2.92E-04	ND	ND	ND	ND	ND	3.39E+00	ND	0.00E+00	4.18E-05	4.96E-04	-3.30E-04	-9.79E-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	1.07E+00	2.73E-03	1.95E-02	1.09E+00	1.06E-03	4.73E-03	ND	ND	ND	ND	ND	9.92E+00	ND	0.00E+00	5.49E-04	7.71E-03	1.79E-02	-2.99E-01
Non-hazardous waste	kg	2.59E+01	4.54E-02	7.60E-01	2.67E+01	1.96E-02	2.56E-01	ND	ND	ND	ND	ND	7.68E+02	ND	0.00E+00	1.03E-02	2.06E-01	9.61E-01	-7.08E+00
Radioactive waste	kg	1.37E-04	2.99E-07	4.03E-06	1.41E-04	1.33E-07	4.72E-08	ND	ND	ND	ND	ND	2.78E-02	ND	0.00E+00	6.25E-08	3.09E-07	3.75E-08	-3.02E-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	4.64E-03	4.64E-03	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	2.78E-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	1.85E+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	7.79E-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	1.07E+00	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_2e	7.70E+00	1.31E-01	3.75E-01	8.21E+00	4.28E-02	1.49E-02	ND	ND	ND	ND	ND	1.69E+02	ND	0.00E+00	2.23E-02	3.79E-01	1.96E-01	-1.67E+00
Ozone depletion Pot.	kg CFC_{-11}e	1.24E-07	1.53E-09	9.22E-09	1.34E-07	5.07E-10	1.76E-10	ND	ND	ND	ND	ND	2.60E-06	ND	0.00E+00	2.51E-10	2.25E-10	1.26E-10	-7.40E-09
Acidification	kg SO_2e	5.07E-02	1.65E-03	1.14E-03	5.35E-02	1.12E-04	6.57E-05	ND	ND	ND	ND	ND	8.45E-01	ND	0.00E+00	5.74E-05	1.52E-04	4.92E-05	-1.80E-02
Eutrophication	kg PO_4^{3}e	2.39E-02	2.05E-04	8.22E-04	2.49E-02	2.73E-05	2.04E-05	ND	ND	ND	ND	ND	1.09E-01	ND	0.00E+00	1.40E-05	3.51E-05	2.71E-05	-2.03E-03
POCP (“smog”)	kg C_2H_4e	4.52E-03	8.88E-05	1.29E-04	4.74E-03	9.99E-06	5.00E-06	ND	ND	ND	ND	ND	4.60E-02	ND	0.00E+00	5.14E-06	9.91E-06	5.37E-06	-9.47E-04
ADP-elements	kg Sbe	5.85E-04	2.50E-07	1.12E-06	5.87E-04	1.17E-07	3.74E-08	ND	ND	ND	ND	ND	2.27E-03	ND	0.00E+00	7.20E-08	4.90E-07	1.84E-08	-1.49E-04
ADP-fossil	MJ	1.00E+02	1.76E+00	4.38E+00	1.07E+02	6.16E-01	1.53E-01	ND	ND	ND	ND	ND	2.01E+03	ND	0.00E+00	3.11E-01	2.24E-01	1.05E-01	-1.76E+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 CO2e	7.74E+00	1.32E-01	3.49E-01	8.22E+00	4.31E-02	1.50E-02	ND	ND	ND	ND	ND	1.69E+02	ND	0.00E+00	2.25E-02	3.79E-01	1.97E-01	-1.68E+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	4.03E+00	6.88E-02	4.56E-03	4.11E+00	2.24E-02	1.88E-01	ND	ND	ND	ND	ND	8.82E+01	ND	0.00E+00	1.17E-02	1.97E-01	1.02E-01	-8.76E-01
GWP – fossil	kg CO_2 éq/FU	4.02E+00	6.88E-02	1.78E-01	4.27E+00	2.24E-02	7.83E-03	ND	ND	ND	ND	ND	8.77E+01	ND	0.00E+00	1.17E-02	1.97E-01	1.02E-01	-8.74E-01
GWP – biogenic	kg CO_2 éq/FU	4.81E-03	1.33E-05	-1.77E-01	-1.72E-01	5.08E-06	1.81E-01	ND	ND	ND	ND	ND	1.97E-01	ND	0.00E+00	2.55E-06	-2.21E-04	-1.15E-05	-8.62E-04
GWP – LULUC	kg CO_2 éq/FU	5.70E-03	3.38E-05	4.08E-03	9.82E-03	1.00E-05	2.89E-06	ND	ND	ND	ND	ND	2.69E-01	ND	0.00E+00	5.18E-06	1.36E-05	3.09E-06	-7.44E-04
Ozone depletion pot.	kg CFC_{-11}e/FU	7.10E-08	1.00E-09	4.66E-09	7.66E-08	3.31E-10	1.08E-10	ND	ND	ND	ND	ND	1.62E-06	ND	0.00E+00	1.64E-10	1.35E-10	7.80E-11	-4.41E-09
Acidification potential	mole H^+e/FU	3.12E-02	1.08E-03	8.80E-04	3.31E-02	7.64E-05	4.65E-05	ND	ND	ND	ND	ND	5.16E-01	ND	0.00E+00	3.90E-05	1.03E-04	3.56E-05	-1.08E-02
EP-freshwater[2)]	kg Pe/FU	2.32E-03	3.84E-06	7.63E-05	2.40E-03	1.74E-06	7.86E-07	ND	ND	ND	ND	ND	8.17E-02	ND	0.00E+00	9.09E-07	4.23E-06	6.35E-07	-6.26E-04
EP-marine	kg Ne/FU	4.37E-03	2.78E-04	4.27E-04	5.07E-03	2.51E-05	2.17E-05	ND	ND	ND	ND	ND	8.09E-02	ND	0.00E+00	1.26E-05	3.97E-05	1.25E-04	-1.09E-03
EP-terrestrial	mol Ne/FU	4.66E-02	3.08E-03	2.63E-03	5.23E-02	2.73E-04	1.98E-04	ND	ND	ND	ND	ND	7.25E-01	ND	0.00E+00	1.37E-04	3.52E-04	1.63E-04	-1.18E-02
POCP ("smog")[3)]	kg NMVOCe/	1.78E-02	8.98E-04	8.40E-04	1.95E-02	1.13E-04	5.64E-05	ND	ND	ND	ND	ND	2.39E-01	ND	0.00E+00	5.43E-05	9.45E-05	4.64E-05	-3.65E-03
ADP-minerals & metals[4)]	kg Sbe/FU	3.06E-04	1.33E-07	5.96E-07	3.07E-04	6.25E-08	2.33E-08	ND	ND	ND	ND	ND	1.18E-03	ND	0.00E+00	3.84E-08	2.60E-07	1.19E-08	-7.78E-05
ADP-fossil resources	MJ/FU	5.68E+01	9.24E-01	2.43E+00	6.02E+01	3.25E-01	8.09E-02	ND	ND	ND	ND	ND	2.04E+03	ND	0.00E+00	1.64E-01	1.27E-01	5.60E-02	-1.02E+01
Water use[5)]	m^3e priv. /FU	1.39E+00	3.71E-03	5.78E-02	1.45E+00	1.61E-03	9.37E-03	ND	ND	ND	ND	ND	5.56E+01	ND	0.00E+00	7.61E-04	1.41E-02	6.81E-03	-1.85E-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	2.57E-07	4.59E-09	1.73E-08	2.79E-07	2.24E-09	5.80E-10	ND	ND	ND	ND	ND	1.84E-06	ND	0.00E+00	9.28E-10	1.07E-09	4.05E-10	-5.86E-08
Ionizing radiation[6)]	kBq U235e/FU	2.85E-01	6.37E-04	8.89E-03	2.94E-01	2.83E-04	9.81E-05	ND	ND	ND	ND	ND	5.64E+01	ND	0.00E+00	1.33E-04	6.53E-04	7.83E-05	-6.43E-02
Ecotoxicity (freshwater)	CTUe/FU	6.57E+01	1.04E-01	9.19E-01	6.67E+01	4.60E-02	2.24E-01	ND	ND	ND	ND	ND	3.11E+02	ND	0.00E+00	2.59E-02	4.16E-01	2.94E+00	-6.41E+00
Human toxicity, cancer	CTUh/FU	3.52E-09	1.29E-11	9.81E-11	3.63E-09	3.70E-12	1.08E-11	ND	ND	ND	ND	ND	2.96E-08	ND	0.00E+00	1.99E-12	2.23E-11	1.25E-11	-9.67E-10
Human tox. non-cancer	CTUh/FU	1.44E-07	4.38E-10	2.49E-09	1.47E-07	2.11E-10	4.40E-10	ND	ND	ND	ND	ND	1.54E-06	ND	0.00E+00	1.03E-10	8.67E-10	6.03E-10	-7.50E-08
SQP[7)]	-/FU	1.63E+01	5.61E-01	9.52E+00	2.64E+01	3.28E-01	3.96E-02	ND	ND	ND	ND	ND	4.54E+02	ND	0.00E+00	9.80E-02	1.16E-01	7.46E-02	-3.49E+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	5.31E+00	1.03E-02	2.49E-01	5.57E+00	4.46E-03	-2.22E+00	ND	ND	ND	ND	ND	5.60E+02	ND	0.00E+00	2.25E-03	1.46E-02	-5.40E-02	-7.88E-01
Renew. PER as material	MJ/FU	7.55E-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	-5.66E-05	-4.31E-02	0.00E+00
Total use of renew. PER	MJ/FU	5.38E+00	1.03E-02	1.81E+00	7.20E+00	4.46E-03	-3.81E+00	ND	ND	ND	ND	ND	5.60E+02	ND	0.00E+00	2.25E-03	1.46E-02	-9.71E-02	-7.88E-01
Non-re. PER as energy	MJ/FU	5.07E+01	9.24E-01	2.40E+00	5.40E+01	3.25E-01	8.09E-02	ND	ND	ND	ND	ND	2.04E+03	ND	0.00E+00	1.64E-01	-3.38E+00	-3.77E+00	-9.22E+00
Non-re. PER as material	MJ/FU	6.13E+00	0.00E+00	3.81E-03	6.13E+00	0.00E+00	-1.29E-02	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	-3.29E+00	-2.83E+00	0.00E+00
Total use of non-re. PER	MJ/FU	5.68E+01	9.24E-01	2.41E+00	6.02E+01	3.25E-01	6.80E-02	ND	ND	ND	ND	ND	2.04E+03	ND	0.00E+00	1.64E-01	-6.67E+00	-6.60E+00	-9.22E+00
Secondary materials	kg/FU	8.59E-02	0.00E+00	0.00E+00	8.59E-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	3.13E-03	3.26E-06	1.37E-02	1.68E-02	1.76E-06	1.01E-06	ND	ND	ND	ND	ND	2.70E-03	ND	0.00E+00	9.38E-07	5.51E-06	9.74E-07	-7.43E-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	3.28E-02	1.05E-04	1.27E-03	3.42E-02	4.81E-05	1.52E-04	ND	ND	ND	ND	ND	1.76E+00	ND	0.00E+00	2.17E-05	2.58E-04	-1.72E-04	-5.10E-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	5.57E-01	1.42E-03	1.01E-02	5.69E-01	5.51E-04	2.46E-03	ND	ND	ND	ND	ND	5.16E+00	ND	0.00E+00	2.86E-04	4.01E-03	9.29E-03	-1.56E-01
Non-hazardous waste	kg/FU	1.35E+01	2.36E-02	3.95E-01	1.39E+01	1.02E-02	1.33E-01	ND	ND	ND	ND	ND	3.99E+02	ND	0.00E+00	5.36E-03	1.07E-01	5.00E-01	-3.68E+00
Radioactive waste	kg/FU	7.13E-05	1.56E-07	2.10E-06	7.36E-05	6.93E-08	2.46E-08	ND	ND	ND	ND	ND	1.45E-02	ND	0.00E+00	3.25E-08	1.61E-07	1.95E-08	-1.57E-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	2.42E-03	2.42E-03	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	0.00E+00	ND	0.00E+00	0.00E+00	1.45E-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	9.62E-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	4.05E-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	5.57E-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 éq./FU	4.01E+00	6.84E-02	1.95E-01	4.27E+00	2.23E-02	7.76E-03	ND	ND	ND	ND	ND	8.78E+01	ND	0.00E+00	1.16E-02	1.97E-01	1.02E-01	-8.69E-01
Ozone depletion Pot.	kg CFC_{-11}e/FU	6.44E-08	7.98E-10	4.80E-09	7.00E-08	2.64E-10	9.15E-11	ND	ND	ND	ND	ND	1.35E-06	ND	0.00E+00	1.31E-10	1.17E-10	6.57E-11	-3.85E-09
Acidification	kg SO_2e/FU	2.64E-02	8.57E-04	5.96E-04	2.79E-02	5.84E-05	3.42E-05	ND	ND	ND	ND	ND	4.40E-01	ND	0.00E+00	2.98E-05	7.90E-05	2.56E-05	-9.37E-03
Eutrophication	kg PO_4^{3}e/FU	1.24E-02	1.07E-04	4.28E-04	1.30E-02	1.42E-05	1.06E-05	ND	ND	ND	ND	ND	5.69E-02	ND	0.00E+00	7.26E-06	1.83E-05	1.41E-05	-1.06E-03
POCP (“smog”)	kg C_2H_4e/FU	2.35E-03	4.62E-05	6.73E-05	2.47E-03	5.20E-06	2.60E-06	ND	ND	ND	ND	ND	2.40E-02	ND	0.00E+00	2.67E-06	5.16E-06	2.80E-06	-4.93E-04
ADP-elements	kg Sbe/FU	3.05E-04	1.30E-07	5.85E-07	3.05E-04	6.10E-08	1.95E-08	ND	ND	ND	ND	ND	1.18E-03	ND	0.00E+00	3.75E-08	2.55E-07	9.55E-09	-7.77E-05
ADP-fossil	MJ/FU	5.22E+01	9.14E-01	2.28E+00	5.54E+01	3.21E-01	7.94E-02	ND	ND	ND	ND	ND	1.05E+03	ND	0.00E+00	1.62E-01	1.16E-01	5.47E-02	-9.16E+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_2e/FU	4.03E+00	6.88E-02	1.82E-01	4.28E+00	2.24E-02	7.83E-03	ND	ND	ND	ND	ND	8.80E+01	ND	0.00E+00	1.17E-02	1.97E-01	1.02E-01	-8.75E-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, 515.0000000000001 kWh

TRANSPORT SCENARIO DOCUMENTATION - A4

Scenario parameter	Value
Capacity utilization (including empty return) %	50 %
Bulk density of transported products / kg/m3	9.74E+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 / m³	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 / m³	0
Power output of equipment / kW	10.3
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	0.767
Collection process – kg collected with mixed waste	0
Recovery process – kg for re-use	0
Recovery process – kg for recycling	2.78E-01
Recovery process – kg for energy recovery	0
Disposal (total) – kg for final deposition	3.12E-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	183.0	23.85
Copper	8.04	1.05
Other Mineral	0.5	0.07
Other Plastics	197.28	25.71
Printing Paper	6.0	0.78
PCB Copper	20.06	2.61
PCB Iron	20.75	2.71
PCB Support	77.0	10.04
PCB Tin	1.19	0.15
PP / PS-High Impact PS / ABS	140.04	18.25
Steel	113.37	14.78

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_2e	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)	GERMANY	3.90E-01
AFRICA	7.30E-01	INDIA	1.50E+00
APAC	9.50E-01	ITALY	3.50E-01
AUSTRALIA	8.40E-01	LATAM	3.90E-01
AUSTRIA	2.30E-01	NAM	4.50E-01
BELGIUM	2.00E-01	NETHERLANDS	3.90E-01
CHINA	1.02E+00	NORWAY	4.50E-02
DENMARK	1.60E-01	ROW	7.30E-01
EU	3.30E-01	SPAIN	2.10E-01
FINLAND	1.54E-01	SWEDEN	3.70E-02
FRANCE	8.70E-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 familiy.

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

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

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

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	TCSCPS 10S/830 PSU-E HMB	994	8.6	115.5	0.835	0.835	0.626	0.626	0.459	141.5	106.1	106.1	77.8
2	TCSC65	TCSCPS 10S/830 PSU-E HWB	1059	8.6	123.1	0.835	0.835	0.626	0.626	0.459	141.5	106.1	106.1	77.8
3	TCSC65	TCSCPS 10S/830 PSU-E HVWB	1020	8.6	118.6	0.835	0.835	0.626	0.626	0.459	141.5	106.1	106.1	77.8
4	TCSC65	TCSCPS 10S/830 PSU-E CLM24	965	8.9	108.4	0.864	0.864	0.648	0.648	0.475	146.4	109.8	109.8	80.5
5	TCSC65	TCSCPS 10S/830 PSU-E CLM32	1014	8.9	114.0	0.864	0.864	0.648	0.648	0.475	146.4	109.8	109.8	80.5
6	TCSC65	TCSCPS 10S/830 PSU-E CLM54	940	8.9	105.6	0.864	0.864	0.648	0.648	0.475	146.4	109.8	109.8	80.5
7	TCSC65	TCSCPS 10S/840 PSU-E HMB	1022	8.6	118.9	0.835	0.835	0.626	0.626	0.459	141.5	106.1	106.1	77.8
8	TCSC65	TCSCPS 10S/840 PSU-E HWB	1090	8.6	126.7	0.835	0.835	0.626	0.626	0.459	141.5	106.1	106.1	77.8
9	TCSC65	TCSCPS 10S/840 PSU-E HVWB	1049	8.6	122.0	0.835	0.835	0.626	0.626	0.459	141.5	106.1	106.1	77.8
10	TCSC65	TCSCPS 10S/840 PSU-E CLM24	993	8.9	111.5	0.864	0.864	0.648	0.648	0.475	146.4	109.8	109.8	80.5

11	TCSC65	TCSCPS 10S/840 PSU-E CLM32	1044	8.9	117.2	0.864	0.864	0.648	0.648	0.475	146.4	109.8	109.8	80.5
12	TCSC65	TCSCPS 10S/840 PSU-E CLM54	967	8.9	108.7	0.864	0.864	0.648	0.648	0.475	146.4	109.8	109.8	80.5
13	TCSC65	TCSCPS 10S/PC930 PSU-E HMB	1089	10.3	105.7	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
14	TCSC65	TCSCPS 10S/PC930 PSU-E HWB	1160	10.3	112.6	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
15	TCSC65	TCSCPS 10S/PC930 PSU-E HVWB	1117	10.3	108.5	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
16	TCSC65	TCSCPS 10S/PC930 PSU-E CLM24	1037	10.7	96.9	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
17	TCSC65	TCSCPS 10S/PC930 PSU-E CLM32	1090	10.7	101.8	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
18	TCSC65	TCSCPS 10S/PC930 PSU-E CLM54	1010	10.7	94.4	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
19	TCSC65	TCSCPS 10S/PW930 PSU-E HMB	949	8.6	110.3	0.835	0.835	0.626	0.626	0.459	141.5	106.1	106.1	77.8
20	TCSC65	TCSCPS 10S/PW930 PSU-E HWB	1011	8.6	117.6	0.835	0.835	0.626	0.626	0.459	141.5	106.1	106.1	77.8
21	TCSC65	TCSCPS 10S/PW930 PSU-E HVWB	973	8.6	113.2	0.835	0.835	0.626	0.626	0.459	141.5	106.1	106.1	77.8
22	TCSC65	TCSCPS 10S/PW930 PSU-E CLM24	913	8.9	102.6	0.864	0.864	0.648	0.648	0.475	146.4	109.8	109.8	80.5
23	TCSC65	TCSCPS 10S/PW930 PSU-E CLM32	960	8.9	107.8	0.864	0.864	0.648	0.648	0.475	146.4	109.8	109.8	80.5
24	TCSC65	TCSCPS 10S/PW930 PSU-E CLM54	889	8.9	99.9	0.864	0.864	0.648	0.648	0.475	146.4	109.8	109.8	80.5

25	TCSC65	TCSCPS 12S/830 PSU-E HMB	1226	10.3	119.1	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
26	TCSC65	TCSCPS 12S/830 PSU-E HWB	1307	10.3	126.9	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
27	TCSC65	TCSCPS 12S/830 PSU-E HVWB	1259	10.3	122.2	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
28	TCSC65	TCSCPS 12S/830 PSU-E CLM24	1179	10.7	110.2	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
29	TCSC65	TCSCPS 12S/830 PSU-E CLM32	1240	10.7	115.9	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
30	TCSC65	TCSCPS 12S/830 PSU-E CLM54	1149	10.7	107.4	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
31	TCSC65	TCSCPS 12S/840 PSU-E HMB	1262	10.3	122.5	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
32	TCSC65	TCSCPS 12S/840 PSU-E HWB	1345	10.3	130.6	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
33	TCSC65	TCSCPS 12S/840 PSU-E HVWB	1295	10.3	125.7	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
34	TCSC65	TCSCPS 12S/840 PSU-E CLM24	1213	10.7	113.4	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
35	TCSC65	TCSCPS 12S/840 PSU-E CLM32	1275	10.7	119.2	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
36	TCSC65	TCSCPS 12S/840 PSU-E CLM54	1182	10.7	110.5	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
37	TCSC65	TCSCPS 12S/PW930 PSU-E HMB	1171	10.3	113.7	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
38	TCSC65	TCSCPS 12S/PW930 PSU-E HWB	1248	10.3	121.1	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2

39	TCSC65	TCSCPS 12S/PW930 PSU-E HVWB	1201	10.3	116.6	1.0	1.0	0.75	0.75	0.55	169.4	127.1	127.1	93.2
40	TCSC65	TCSCPS 12S/PW930 PSU-E CLM24	1115	10.7	104.2	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
41	TCSC65	TCSCPS 12S/PW930 PSU-E CLM32	1173	10.7	109.6	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
42	TCSC65	TCSCPS 12S/PW930 PSU-E CLM54	1087	10.7	101.6	1.039	1.039	0.779	0.779	0.571	176.0	132.0	132.0	96.7
43	TCSC65	TCSCPS 15S/830 PSU-E HMB	1450	12.0	120.8	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
44	TCSC65	TCSCPS 15S/830 PSU-E HWB	1545	12.0	128.7	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
45	TCSC65	TCSCPS 15S/830 PSU-E HVWB	1488	12.0	124.0	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
46	TCSC65	TCSCPS 15S/830 PSU-E CLM24	1382	12.6	109.7	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0
47	TCSC65	TCSCPS 15S/830 PSU-E CLM32	1453	12.6	115.3	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0
48	TCSC65	TCSCPS 15S/830 PSU-E CLM54	1346	12.6	106.8	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0
49	TCSC65	TCSCPS 15S/840 PSU-E HMB	1492	12.0	124.3	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
50	TCSC65	TCSCPS 15S/840 PSU-E HWB	1590	12.0	132.5	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
51	TCSC65	TCSCPS 15S/840 PSU-E HVWB	1531	12.0	127.6	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
52	TCSC65	TCSCPS 15S/840 PSU-E CLM24	1422	12.6	112.8	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0

53	TCSC65	TCSCPS 15S/840 PSU-E CLM32	1494	12.6	118.6	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0
54	TCSC65	TCSCPS 15S/840 PSU-E CLM54	1385	12.6	109.9	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0
55	TCSC65	TCSCPS 15S/PW930 PSU-E HMB	1384	12.0	115.3	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
56	TCSC65	TCSCPS 15S/PW930 PSU-E HWB	1475	12.0	122.9	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
57	TCSC65	TCSCPS 15S/PW930 PSU-E HVWB	1420	12.0	118.4	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
58	TCSC65	TCSCPS 15S/PW930 PSU-E CLM24	1307	12.6	103.7	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0
59	TCSC65	TCSCPS 15S/PW930 PSU-E CLM32	1374	12.6	109.0	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0
60	TCSC65	TCSCPS 15S/PW930 PSU-E CLM54	1273	12.6	101.1	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0
61	TCSC65	TCSCPS 15S/PW940 PSU-E HMB	1425	12.0	118.8	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
62	TCSC65	TCSCPS 15S/PW940 PSU-E HWB	1519	12.0	126.6	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
63	TCSC65	TCSCPS 15S/PW940 PSU-E HVWB	1463	12.0	121.9	1.165	1.165	0.874	0.874	0.641	197.4	148.1	148.1	108.6
64	TCSC65	TCSCPS 15S/PW940 PSU-E CLM24	1346	12.6	106.8	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0
65	TCSC65	TCSCPS 15S/PW940 PSU-E CLM32	1415	12.6	112.3	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0
66	TCSC65	TCSCPS 15S/PW940 PSU-E CLM54	1311	12.6	104.1	1.223	1.223	0.917	0.917	0.673	207.2	155.4	155.4	114.0

67	TCSC65	TCSCPS 17S/840 PSU-E HMB	1713	14.0	122.4	1.359	1.359	1.019	1.019	0.747	230.3	172.7	172.7	126.6
68	TCSC65	TCSCPS 17S/840 PSU-E HWB	1826	14.0	130.4	1.359	1.359	1.019	1.019	0.747	230.3	172.7	172.7	126.6
69	TCSC65	TCSCPS 17S/840 PSU-E HVWB	1758	14.0	125.6	1.359	1.359	1.019	1.019	0.747	230.3	172.7	172.7	126.6
70	TCSC65	TCSCPS 17S/840 PSU-E CLM24	1620	14.7	110.2	1.427	1.427	1.07	1.07	0.785	241.8	181.3	181.3	133.0
71	TCSC65	TCSCPS 17S/840 PSU-E CLM32	1703	14.7	115.8	1.427	1.427	1.07	1.07	0.785	241.8	181.3	181.3	133.0
72	TCSC65	TCSCPS 17S/840 PSU-E CLM54	1578	14.7	107.4	1.427	1.427	1.07	1.07	0.785	241.8	181.3	181.3	133.0
73	TCSC65	TCSCPS 17S/PC930 PSU-E HMB	1662	16.0	103.9	1.553	1.553	1.165	1.165	0.854	263.1	197.4	197.4	144.7
74	TCSC65	TCSCPS 17S/PC930 PSU-E HWB	1772	16.0	110.7	1.553	1.553	1.165	1.165	0.854	263.1	197.4	197.4	144.7
75	TCSC65	TCSCPS 17S/PC930 PSU-E HVWB	1706	16.0	106.6	1.553	1.553	1.165	1.165	0.854	263.1	197.4	197.4	144.7
76	TCSC65	TCSCPS 17S/PC930 PSU-E HMB	1586	16.0	99.1	1.553	1.553	1.165	1.165	0.854	263.1	197.4	197.4	144.7
77	TCSC65	TCSCPS 17S/PC930 PSU-E HWB	1695	16.0	105.9	1.553	1.553	1.165	1.165	0.854	263.1	197.4	197.4	144.7
78	TCSC65	TCSCPS 17S/PC930 PSU-E HVWB	1630	16.0	101.8	1.553	1.553	1.165	1.165	0.854	263.1	197.4	197.4	144.7
79	TCSC65	TCSCPS 17S/PW930 PSU-E HMB	1590	14.0	113.5	1.359	1.359	1.019	1.019	0.747	230.3	172.7	172.7	126.6
80	TCSC65	TCSCPS 17S/PW930 PSU-E HWB	1694	14.0	121.0	1.359	1.359	1.019	1.019	0.747	230.3	172.7	172.7	126.6

81	TCSC65	TCSCPS 17S/PW930 PSU-E HVWB	1632	14.0	116.5	1.359	1.359	1.019	1.019	0.747	230.3	172.7	172.7	126.6
82	TCSC65	TCSCPS 17S/PW930 PSU-E CLM24	1489	14.7	101.3	1.427	1.427	1.07	1.07	0.785	241.8	181.3	181.3	133.0
83	TCSC65	TCSCPS 17S/PW930 PSU-E CLM32	1566	14.7	106.5	1.427	1.427	1.07	1.07	0.785	241.8	181.3	181.3	133.0
84	TCSC65	TCSCPS 20S/PC930 PSU-E HMB	1837	17.9	102.6	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
85	TCSC65	TCSCPS 20S/PC930 PSU-E HWB	1958	17.9	109.4	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
86	TCSC65	TCSCPS 20S/PC930 PSU-E HVWB	1885	17.9	105.3	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
87	TCSC65	TCSCPS 20S/830 PSU-E HMB	2069	17.9	115.6	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
88	TCSC65	TCSCPS 20S/830 PSU-E HWB	2206	17.9	123.2	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
89	TCSC65	TCSCPS 20S/830 PSU-E HVWB	2124	17.9	118.7	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
90	TCSC65	TCSCPS 20S/840 PSU-E HMB	2130	17.9	119.0	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
91	TCSC65	TCSCPS 20S/840 PSU-E HWB	2270	17.9	126.8	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
92	TCSC65	TCSCPS 20S/840 PSU-E HVWB	2186	17.9	122.1	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
93	TCSC65	TCSCPS 20S/PW930 PSU-E HMB	1976	17.9	110.4	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
94	TCSC65	TCSCPS 20S/PW930 PSU-E HWB	2106	17.9	117.6	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0

95	TCSC65	TCSCPS 20S/PW930 PSU-E HVWB	2028	17.9	113.3	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
96	TCSC65	TCSCPS 20S/PW940 PSU-E HMB	2035	17.9	113.7	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
97	TCSC65	TCSCPS 20S/PW940 PSU-E HWB	2169	17.9	121.2	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0
98	TCSC65	TCSCPS 20S/PW940 PSU-E HVWB	2089	17.9	116.7	1.738	1.738	1.304	1.304	0.956	294.5	220.9	220.9	162.0

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 refernce 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 familiy.

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 (Olum) and reference service lifetime (RSL) of the product to estimate the final environmental impact. The scaled impact (SIpep) 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 (P*GSF*), 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	TCSCPS 10S/830 PSU-E HMB	994	8.6	115.5	0.835	0.589	0.442	0.442	0.324	99.8	74.9	74.9	54.9
2	TCSC65	TCSCPS 10S/830 PSU-E HWB	1059	8.6	123.1	0.835	0.552	0.414	0.414	0.304	93.5	70.1	70.1	51.5
3	TCSC65	TCSCPS 10S/830 PSU-E HVWB	1020	8.6	118.6	0.835	0.573	0.43	0.43	0.315	97.1	72.9	72.9	53.4
4	TCSC65	TCSCPS 10S/830 PSU-E CLM24	965	8.9	108.4	0.864	0.626	0.47	0.47	0.344	106.1	79.6	79.6	58.3
5	TCSC65	TCSCPS 10S/830 PSU-E CLM32	1014	8.9	114.0	0.864	0.596	0.447	0.447	0.328	101.0	75.7	75.7	55.6
6	TCSC65	TCSCPS 10S/830 PSU-E CLM54	940	8.9	105.6	0.864	0.644	0.483	0.483	0.354	109.1	81.8	81.8	60.0
7	TCSC65	TCSCPS 10S/840 PSU-E HMB	1022	8.6	118.9	0.835	0.572	0.429	0.429	0.315	96.9	72.7	72.7	53.4
8	TCSC65	TCSCPS 10S/840 PSU-E HWB	1090	8.6	126.7	0.835	0.536	0.402	0.402	0.295	90.8	68.1	68.1	50.0
9	TCSC65	TCSCPS 10S/840 PSU-E HVWB	1049	8.6	122.0	0.835	0.557	0.418	0.418	0.306	94.4	70.8	70.8	51.8
10	TCSC65	TCSCPS 10S/840 PSU-E CLM24	993	8.9	111.5	0.864	0.609	0.457	0.457	0.335	103.2	77.4	77.4	56.8
11	TCSC65	TCSCPS 10S/840 PSU-E CLM32	1044	8.9	117.2	0.864	0.58	0.435	0.435	0.319	98.3	73.7	73.7	54.0
12	TCSC65	TCSCPS 10S/840 PSU-E CLM54	967	8.9	108.7	0.864	0.626	0.47	0.47	0.344	106.1	79.6	79.6	58.3

13	TCSC65	TCSCPS 10S/PC930 PSU-E HMB	1089	10.3	105.7	1.0	0.643	0.482	0.482	0.354	108.9	81.7	81.7	60.0
14	TCSC65	TCSCPS 10S/PC930 PSU-E HWB	1160	10.3	112.6	1.0	0.603	0.452	0.452	0.332	102.2	76.6	76.6	56.3
15	TCSC65	TCSCPS 10S/PC930 PSU-E HVWB	1117	10.3	108.5	1.0	0.627	0.47	0.47	0.345	106.2	79.6	79.6	58.5
16	TCSC65	TCSCPS 10S/PC930 PSU-E CLM24	1037	10.7	96.9	1.039	0.701	0.526	0.526	0.386	118.8	89.1	89.1	65.4
17	TCSC65	TCSCPS 10S/PC930 PSU-E CLM32	1090	10.7	101.8	1.039	0.667	0.5	0.5	0.367	113.0	84.7	84.7	62.2
18	TCSC65	TCSCPS 10S/PC930 PSU-E CLM54	1010	10.7	94.4	1.039	0.72	0.54	0.54	0.396	122.0	91.5	91.5	67.1
19	TCSC65	TCSCPS 10S/PW930 PSU-E HMB	949	8.6	110.3	0.835	0.616	0.462	0.462	0.339	104.4	78.3	78.3	57.4
20	TCSC65	TCSCPS 10S/PW930 PSU-E HWB	1011	8.6	117.6	0.835	0.578	0.433	0.433	0.318	97.9	73.4	73.4	53.9
21	TCSC65	TCSCPS 10S/PW930 PSU-E HVWB	973	8.6	113.2	0.835	0.6	0.45	0.45	0.33	101.7	76.2	76.2	55.9
22	TCSC65	TCSCPS 10S/PW930 PSU-E CLM24	913	8.9	102.6	0.864	0.663	0.497	0.497	0.365	112.3	84.2	84.2	61.8
23	TCSC65	TCSCPS 10S/PW930 PSU-E CLM32	960	8.9	107.8	0.864	0.631	0.473	0.473	0.347	106.9	80.1	80.1	58.8
24	TCSC65	TCSCPS 10S/PW930 PSU-E CLM54	889	8.9	99.9	0.864	0.68	0.51	0.51	0.374	115.2	86.4	86.4	63.4
25	TCSC65	TCSCPS 12S/830 PSU-E HMB	1226	10.3	119.1	1.0	0.571	0.428	0.428	0.314	96.7	72.5	72.5	53.2
26	TCSC65	TCSCPS 12S/830 PSU-E HWB	1307	10.3	126.9	1.0	0.536	0.402	0.402	0.295	90.8	68.1	68.1	50.0

27	TCSC65	TCSCPS 12S/830 PSU-E HVWB	1259	10.3	122.2	1.0	0.556	0.417	0.417	0.306	94.2	70.7	70.7	51.8
28	TCSC65	TCSCPS 12S/830 PSU-E CLM24	1179	10.7	110.2	1.039	0.617	0.463	0.463	0.339	104.5	78.4	78.4	57.4
29	TCSC65	TCSCPS 12S/830 PSU-E CLM32	1240	10.7	115.9	1.039	0.587	0.44	0.44	0.323	99.5	74.6	74.6	54.7
30	TCSC65	TCSCPS 12S/830 PSU-E CLM54	1149	10.7	107.4	1.039	0.633	0.475	0.475	0.348	107.3	80.5	80.5	59.0
31	TCSC65	TCSCPS 12S/840 PSU-E HMB	1262	10.3	122.5	1.0	0.555	0.416	0.416	0.305	94.0	70.5	70.5	51.7
32	TCSC65	TCSCPS 12S/840 PSU-E HWB	1345	10.3	130.6	1.0	0.521	0.391	0.391	0.287	88.3	66.2	66.2	48.6
33	TCSC65	TCSCPS 12S/840 PSU-E HVWB	1295	10.3	125.7	1.0	0.541	0.406	0.406	0.298	91.7	68.8	68.8	50.5
34	TCSC65	TCSCPS 12S/840 PSU-E CLM24	1213	10.7	113.4	1.039	0.6	0.45	0.45	0.33	101.7	76.2	76.2	55.9
35	TCSC65	TCSCPS 12S/840 PSU-E CLM32	1275	10.7	119.2	1.039	0.57	0.427	0.427	0.314	96.6	72.3	72.3	53.2
36	TCSC65	TCSCPS 12S/840 PSU-E CLM54	1182	10.7	110.5	1.039	0.615	0.461	0.461	0.338	104.2	78.1	78.1	57.3
37	TCSC65	TCSCPS 12S/PW930 PSU-E HMB	1171	10.3	113.7	1.0	0.598	0.449	0.449	0.329	101.3	76.1	76.1	55.7
38	TCSC65	TCSCPS 12S/PW930 PSU-E HWB	1248	10.3	121.1	1.0	0.561	0.421	0.421	0.309	95.1	71.3	71.3	52.4
39	TCSC65	TCSCPS 12S/PW930 PSU-E HVWB	1201	10.3	116.6	1.0	0.583	0.437	0.437	0.321	98.8	74.0	74.0	54.4
40	TCSC65	TCSCPS 12S/PW930 PSU-E CLM24	1115	10.7	104.2	1.039	0.652	0.489	0.489	0.359	110.5	82.9	82.9	60.8

41	TCSC65	TCSCPS 12S/PW930 PSU-E CLM32	1173	10.7	109.6	1.039	0.62	0.465	0.465	0.341	105.0	78.8	78.8	57.8
42	TCSC65	TCSCPS 12S/PW930 PSU-E CLM54	1087	10.7	101.6	1.039	0.669	0.502	0.502	0.368	113.4	85.1	85.1	62.4
43	TCSC65	TCSCPS 15S/830 PSU-E HMB	1450	12.0	120.8	1.165	0.563	0.422	0.422	0.31	95.4	71.5	71.5	52.5
44	TCSC65	TCSCPS 15S/830 PSU-E HWB	1545	12.0	128.7	1.165	0.528	0.396	0.396	0.29	89.5	67.1	67.1	49.1
45	TCSC65	TCSCPS 15S/830 PSU-E HVWB	1488	12.0	124.0	1.165	0.549	0.412	0.412	0.302	93.0	69.8	69.8	51.2
46	TCSC65	TCSCPS 15S/830 PSU-E CLM24	1382	12.6	109.7	1.223	0.62	0.465	0.465	0.341	105.0	78.8	78.8	57.8
47	TCSC65	TCSCPS 15S/830 PSU-E CLM32	1453	12.6	115.3	1.223	0.589	0.442	0.442	0.324	99.8	74.9	74.9	54.9
48	TCSC65	TCSCPS 15S/830 PSU-E CLM54	1346	12.6	106.8	1.223	0.636	0.477	0.477	0.35	107.8	80.8	80.8	59.3
49	TCSC65	TCSCPS 15S/840 PSU-E HMB	1492	12.0	124.3	1.165	0.546	0.41	0.41	0.3	92.5	69.5	69.5	50.8
50	TCSC65	TCSCPS 15S/840 PSU-E HWB	1590	12.0	132.5	1.165	0.513	0.385	0.385	0.282	86.9	65.2	65.2	47.8
51	TCSC65	TCSCPS 15S/840 PSU-E HVWB	1531	12.0	127.6	1.165	0.532	0.399	0.399	0.293	90.1	67.6	67.6	49.6
52	TCSC65	TCSCPS 15S/840 PSU-E CLM24	1422	12.6	112.8	1.223	0.602	0.452	0.452	0.331	102.0	76.6	76.6	56.1
53	TCSC65	TCSCPS 15S/840 PSU-E CLM32	1494	12.6	118.6	1.223	0.572	0.429	0.429	0.315	96.9	72.7	72.7	53.4
54	TCSC65	TCSCPS 15S/840 PSU-E CLM54	1385	12.6	109.9	1.223	0.618	0.464	0.464	0.34	104.7	78.6	78.6	57.6

55	TCSC65	TCSCPS 15S/PW930 PSU-E HMB	1384	12.0	115.3	1.165	0.589	0.442	0.442	0.324	99.8	74.9	74.9	54.9
56	TCSC65	TCSCPS 15S/PW930 PSU-E HWB	1475	12.0	122.9	1.165	0.553	0.415	0.415	0.304	93.7	70.3	70.3	51.5
57	TCSC65	TCSCPS 15S/PW930 PSU-E HVWB	1420	12.0	118.4	1.165	0.574	0.43	0.43	0.316	97.3	72.9	72.9	53.5
58	TCSC65	TCSCPS 15S/PW930 PSU-E CLM24	1307	12.6	103.7	1.223	0.656	0.492	0.492	0.361	111.1	83.4	83.4	61.2
59	TCSC65	TCSCPS 15S/PW930 PSU-E CLM32	1374	12.6	109.0	1.223	0.623	0.467	0.467	0.343	105.6	79.1	79.1	58.1
60	TCSC65	TCSCPS 15S/PW930 PSU-E CLM54	1273	12.6	101.1	1.223	0.673	0.505	0.505	0.37	114.0	85.6	85.6	62.7
61	TCSC65	TCSCPS 15S/PW940 PSU-E HMB	1425	12.0	118.8	1.165	0.572	0.429	0.429	0.315	96.9	72.7	72.7	53.4
62	TCSC65	TCSCPS 15S/PW940 PSU-E HWB	1519	12.0	126.6	1.165	0.537	0.403	0.403	0.295	91.0	68.3	68.3	50.0
63	TCSC65	TCSCPS 15S/PW940 PSU-E HVWB	1463	12.0	121.9	1.165	0.557	0.418	0.418	0.306	94.4	70.8	70.8	51.8
64	TCSC65	TCSCPS 15S/PW940 PSU-E CLM24	1346	12.6	106.8	1.223	0.636	0.477	0.477	0.35	107.8	80.8	80.8	59.3
65	TCSC65	TCSCPS 15S/PW940 PSU-E CLM32	1415	12.6	112.3	1.223	0.605	0.454	0.454	0.333	102.5	76.9	76.9	56.4
66	TCSC65	TCSCPS 15S/PW940 PSU-E CLM54	1311	12.6	104.1	1.223	0.653	0.49	0.49	0.359	110.6	83.0	83.0	60.8
67	TCSC65	TCSCPS 17S/840 PSU-E HMB	1713	14.0	122.4	1.359	0.556	0.417	0.417	0.306	94.2	70.7	70.7	51.8
68	TCSC65	TCSCPS 17S/840 PSU-E HWB	1826	14.0	130.4	1.359	0.52	0.39	0.39	0.286	88.1	66.1	66.1	48.5

69	TCSC65	TCSCPS 17S/840 PSU-E HVWB	1758	14.0	125.6	1.359	0.541	0.406	0.406	0.298	91.7	68.8	68.8	50.5
70	TCSC65	TCSCPS 17S/840 PSU-E CLM24	1620	14.7	110.2	1.427	0.616	0.462	0.462	0.339	104.4	78.3	78.3	57.4
71	TCSC65	TCSCPS 17S/840 PSU-E CLM32	1703	14.7	115.8	1.427	0.586	0.44	0.44	0.322	99.3	74.6	74.6	54.6
72	TCSC65	TCSCPS 17S/840 PSU-E CLM54	1578	14.7	107.4	1.427	0.634	0.476	0.476	0.349	107.4	80.7	80.7	59.1
73	TCSC65	TCSCPS 17S/PC930 PSU-E HMB	1662	16.0	103.9	1.553	0.654	0.491	0.491	0.36	110.8	83.2	83.2	61.0
74	TCSC65	TCSCPS 17S/PC930 PSU-E HWB	1772	16.0	110.7	1.553	0.613	0.46	0.46	0.337	103.9	77.9	77.9	57.1
75	TCSC65	TCSCPS 17S/PC930 PSU-E HVWB	1706	16.0	106.6	1.553	0.637	0.478	0.478	0.35	107.9	81.0	81.0	59.3
76	TCSC65	TCSCPS 17S/PC930 PSU-E HMB	1586	16.0	99.1	1.553	0.685	0.514	0.514	0.377	116.1	87.1	87.1	63.9
77	TCSC65	TCSCPS 17S/PC930 PSU-E HWB	1695	16.0	105.9	1.553	0.641	0.481	0.481	0.353	108.6	81.5	81.5	59.8
78	TCSC65	TCSCPS 17S/PC930 PSU-E HVWB	1630	16.0	101.8	1.553	0.668	0.501	0.501	0.367	113.2	84.9	84.9	62.2
79	TCSC65	TCSCPS 17S/PW930 PSU-E HMB	1590	14.0	113.5	1.359	0.598	0.449	0.449	0.329	101.3	76.1	76.1	55.7
80	TCSC65	TCSCPS 17S/PW930 PSU-E HWB	1694	14.0	121.0	1.359	0.561	0.421	0.421	0.309	95.1	71.3	71.3	52.4
81	TCSC65	TCSCPS 17S/PW930 PSU-E HVWB	1632	14.0	116.5	1.359	0.583	0.437	0.437	0.321	98.8	74.0	74.0	54.4
82	TCSC65	TCSCPS 17S/PW930 PSU-E CLM24	1489	14.7	101.3	1.427	0.671	0.503	0.503	0.369	113.7	85.2	85.2	62.5

83	TCSC65	TCSCPS 17S/PW930 PSU-E CLM32	1566	14.7	106.5	1.427	0.638	0.479	0.479	0.351	108.1	81.2	81.2	59.5
84	TCSC65	TCSCPS 20S/PC930 PSU-E HMB	1837	17.9	102.6	1.738	0.662	0.497	0.497	0.364	112.2	84.2	84.2	61.7
85	TCSC65	TCSCPS 20S/PC930 PSU-E HWB	1958	17.9	109.4	1.738	0.622	0.467	0.467	0.342	105.4	79.1	79.1	57.9
86	TCSC65	TCSCPS 20S/PC930 PSU-E HVWB	1885	17.9	105.3	1.738	0.645	0.484	0.484	0.355	109.3	82.0	82.0	60.1
87	TCSC65	TCSCPS 20S/830 PSU-E HMB	2069	17.9	115.6	1.738	0.587	0.44	0.44	0.323	99.5	74.6	74.6	54.7
88	TCSC65	TCSCPS 20S/830 PSU-E HWB	2206	17.9	123.2	1.738	0.551	0.413	0.413	0.303	93.4	70.0	70.0	51.3
89	TCSC65	TCSCPS 20S/830 PSU-E HVWB	2124	17.9	118.7	1.738	0.574	0.43	0.43	0.316	97.3	72.9	72.9	53.5
90	TCSC65	TCSCPS 20S/840 PSU-E HMB	2130	17.9	119.0	1.738	0.572	0.429	0.429	0.315	96.9	72.7	72.7	53.4
91	TCSC65	TCSCPS 20S/840 PSU-E HWB	2270	17.9	126.8	1.738	0.535	0.401	0.401	0.294	90.6	67.9	67.9	49.8
92	TCSC65	TCSCPS 20S/840 PSU-E HVWB	2186	17.9	122.1	1.738	0.556	0.417	0.417	0.306	94.2	70.7	70.7	51.8
93	TCSC65	TCSCPS 20S/PW930 PSU-E HMB	1976	17.9	110.4	1.738	0.615	0.461	0.461	0.338	104.2	78.1	78.1	57.3
94	TCSC65	TCSCPS 20S/PW930 PSU-E HWB	2106	17.9	117.6	1.738	0.577	0.433	0.433	0.317	97.8	73.4	73.4	53.7
95	TCSC65	TCSCPS 20S/PW930 PSU-E HVWB	2028	17.9	113.3	1.738	0.6	0.45	0.45	0.33	101.7	76.2	76.2	55.9
96	TCSC65	TCSCPS 20S/PW940 PSU-E HMB	2035	17.9	113.7	1.738	0.598	0.449	0.449	0.329	101.3	76.1	76.1	55.7

97	TCSC65	TCSCPS 20S/PW940 PSU-E HWB	2169	17.9	121.2	1.738	0.561	0.421	0.421	0.309	95.1	71.3	71.3	52.4
98	TCSC65	TCSCPS 20S/PW940 PSU-E HVWB	2089	17.9	116.7	1.738	0.582	0.436	0.436	0.32	98.6	73.9	73.9	54.2