PRODUCT ENVIRONMENTAL PROFILE

PRODUCT ENVIRONMENTAL PROFILE OF LUMINAIRES FOR RECESSED LED LUMINAIRE

Reference product: Siella G9 M84 PW19 34-46/4ML-840 ETDD

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Independent verification of the declaration and data, in compliance with ISO 14025: 2006

Internal		**External**	x

The PCR review was conducted by a panel of experts chaired by Julie Orgelet (DDemain)

PEPs are compliant with XP C08-100-1:2016 and EN 50693:2019 or NF E38-500:2022

The components of the present PEP cannot be compared with elements from another program.

Document complies with ISO 14025:2006 “Environmental labels and declarations. Type III environmental declarations”

CONTENT OF THE PEP REPORT

1 GENERAL INFORMATION

1.1 Company information

TRILUX - Simplify Your Light stands for the simplest way to intelligent, individual light. For more than 100 years TRILUX has been inspiring its customers with high-quality and individual lighting solutions - because light is our passion. This includes not only innovative luminaires but also perfectly matched lighting solutions for offices, industry, healthcare, education, retail and sports. At TRILUX we know that the perfect luminaire alone is not enough. TRILUX focuses on people and contributes with its solutions to a sustainable, healthy and connected world. Because where there is light, there is life.

1.2 Product information

The name of the product under study is “Recessed LED Luminaire”.
Recessed LED Luminaire makes it possible to use two different optical systems to illuminate the different areas in an office building with a uniform product design. With UGR19 glare control, the luminaire with microprismatic optic is suitable for the standard-compliant illumination of VDU workstations. The translucent optic with UGR22 glare control is recommended for all other areas. The adjustability of the luminous flux in up to 4 steps and the colour temperature between 3,000 K and 4,000 K in just one product makes lighting design even more flexible.
The external control gear unit of Siella enables particularly simple installation and trouble-free replacement in the event of a defect. It can be mounted separately from the luminaires and connected to the luminaire via plug & play. The large connection compartment enables standard mains forwarding without an additional connection box.

- Top performance at a top price: Entry-level solution with high efficiency (up to 155 lm/W) and long service life (L80 70,000h)
- Good quality and durability: High quality aluminium frame and sturdy housing rear panel
- Fit for one-to-one refurbishment: Module sizes, mounting variety and adjustable luminous fluxes are especially suitable for refurbishing conventional lighting
- Mounting in next to no time – mains forwarding included: The external control gear unit with integrated mains forwarding function can be connected to the luminaire via plug & play
- Mounting variety: As a lay-in luminaire, for plasterboard ceilings or surface mounted – Siella G9 offers the right solution for different mounting situations

Further technical information can be obtained by contacting Heidestraße, D-59759 Arnsberg, Germany or on the website https://www.trilux.com or by E-Mail s.ke@trilux.com.

Technical Data

The evaluated product family includes a range of different product characteristics. These have all the characteristics described in PSR-0014-ed2.0-EN-2023 07 13 as belonging to a homogeneous environmental family. The evaluated product family can be divided into switchable and dimmable series. The categorization is based on the presence or absence of energy saving functions. The dimmable series can be connected via DALI, Zigbee or Casambi. According to Table 5 in PSR-0014-ed2.0-EN-2023 07 13, the energy saving coefficients of the dimmable series are equal to 0.5. For the switchable series, there are no energy saving functions and energy saving coefficients are equal to 1. This family includes the following products in the following table:

Table 1: The energy saving functions among Recessed LED Luminaire

TK	TOC	Description	Energy saving functions	Energy saving coefficient
10411517	6000627851	Siella G9 M84 PW19 34-46/4ML-840 ETDD	DALI	0.5
10411518	6000627940	Siella G9 M73 DW 34-46/4ML-8MC ET	/	1.0
10411519	6000628051	Siella G9 M73 DW 34-46/4ML-8MC ETDD	DALI	0.5
10411520	6000628140	Siella G9 M73 PW19 34-46/4ML-8MC ET	/	1.0
10411521	6000628251	Siella G9 M73 PW19 34-46/4ML-8MC ETDD	DALI	0.5
10411522	6000628340	Siella G9 M73 PW19 34-46/ML-840 ET	/	1.0
10411523	6000628451	Siella G9 M73 PW19 34-46/ML-840 ETDD	DALI	0.5
10411512	6000627340	Siella G9 M84 DW 34-46/4ML-8MC ET	/	1.0
10411513	6000627451	Siella G9 M84 DW 34-46/4ML-8MC ETDD	DALI	0.5
10411514	6000627540	Siella G9 M84 PW19 34-46/4ML-8MC ET	/	1.0
10411515	6000627651	Siella G9 M84 PW19 34-46/4ML-8MC ETDD	DALI	0.5
10411516	6000627740	Siella G9 M84 PW19 34-46/4ML-840 ET	/	1.0
10411530	6000628540	Siella G9 M46 PW19 34-46/4ML-8MC ET	/	1.0
10411531	6000628640	Siella G9 M46 PW19 34-46/4ML-8MC ETDD	DALI	0.5
10411542	6000727265	Siella G9 M73 PW19 34-46/4ML-8MC ETWD-S	DALI	0.5
10411543	6000727365	Siella G9 M73 PW19 34-46/4ML-8MC ETWD	Zigbee	0.5
10411540	6000727465	Siella G9 M84 PW19 34-46/4ML-8MC CAS	Casambi	0.5

The reference product is the Siella G9 M84 PW19 34-46/4ML-840 ETDD. The most important information is summarized in the following table:

Table 2: Key technological data

Information	Unit	Description
Light source	-	Integrated LED module
Control gear	-	External
Color temperature	K	4000
Protection index for water and dust (IP)	-	IP40 (Room side)
Impact resistance index (IK)	-	IK03
Nominal operating voltage	V	220-240
Declared lifetime of the luminaire	Hours	70000
Declaration lifetime of the light source	Hours	70000
Outgoing luminous flux/Useful output flux	Lumen	3400/3800/4200/4600
Electrical input power	W	22/24.5/27/29.5
Luminous efficiency	Lumen/W	Up to 155
Dimension	mm	620 x 620 x 32

For the Recessed LED Luminaire with an assigned lifetime of 70000 hours that can be installed in indoor applications, the Recessed LED Luminaire has the following annual service time.

Table 3: Recessed LED Luminaire annual operating times according to the type of building

Type of building	Annual operating hours by default	Operational lifetime (years)
Residential building	3500	20.00
Office	2500	28.00
Educational institutions	2000	35.00
Hospital	5000	14.00
Hotel	5000	14.00
Catering	2500	28.00
Sports establishments	4000	17.50
Retail (wholesale and retail services)	5000	14.00
Industry (manufacturing plants)	4000	17.50

Following the requirements of the PSR, the operational lifetime of Recessed LED Luminaire is 14 years.

1.3 Functional unit

The functional unit of Recessed LED Luminaire is defined as “Provide lighting that delivers an outgoing artificial luminous flux of 1000 lumens during a reference lifetime of 35000 hours”.

The reference flow is the amounts of products needed to provide the defined function. All other input and output flows in the analysis quantitatively relate to it. The reference flow of Recessed LED Luminaire corresponding to the functional unit shall consider the value of the outgoing artificial luminous flux as well as the rated lifetime of the luminaire. According to test report, the outgoing artificial luminous flux of the Recessed LED Luminaire is 4600 Lumen. The assigned lifetime of the Recessed LED Luminaire is 70000 Hours, which estimated by the test report.

The reference flow is calculated as: (1000/outgoing luminous flux of the analyzed product in lumens) x (35000/declared product lifetime of the analyzed product in hours). Consequently, the reference flow of the Recessed LED Luminaire corresponds to:

(1000/4600) x (35000/70000) = 0.109

1.4 Homogeneous environmental family

The present PEP declaration is valid for all the products in the described homogenous environmental family. The parameters used to calculate the coefficients according to the rules of extrapolation required in PSR-0014-ed2.0-EN-2023 07 13 are listed in Table 14 and the range of variations for the products in the same family are listed in Table 4.

Table 4: The range of variations for the products in the same family

Parameter	Value for the reference product	Minimum value in product range	Maximum value in product range
Power (W)	22/24.5/27/29.5	22/24.5/27/29.5	22/24.5/27/29.5
Lumen (lm)	3400/3800/4200/4600 @4000K	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	4600lm @4000K 4300lm @3000K
Weight of luminaire (g)	2198.46	1882.49	2378.46
Weight of packaging (g)	926.39	880.46	926.39
Theoretical coefficient of energy saving	0.5	0.5	1.0

2.1 Overview

Table 5: Product composition

Information	Weight [in kg]	Share [in %]
Product	2.201	69.58
Packaging	0.962	30.42

2.2 Product

Table 6: Material composition – Product

Information	Weight [in kg]	Share [in %]
Metals	1.244	56.51
Plastics	0.763	34.66
Others	0.194	8.83

2.3 Packaging

Table 7: Material composition – Packaging

Information	Weight [in kg]	Share [in %]
Paper/board	0.755	78.50
Plywood	0.206	21.37
Plastics	0.001	0.13

3.1 Manufacturing

The manufacturer acquires all parts from suppliers. At the manufacturing site located in China, the manufacturer fabricated Printed Circuit Board Assembly through surface mounting and hole-through mounting processes from the Printed Circuit Board by utilizing energy and auxiliaries. Subsequently, the product was assembled and tested with the application of energy. In the end, the product is packaged in packaging materials and distributed to the client.

3.2 Distribution

The main market for product is Europe and there is no specific data are available. For this reason, an intercontinental transport from China to the arrival of the product at the place of use following PCR–ed4- EN-2021 09 06 is considered in the model.
Ship: 19,000 km
Lorry: 1000 km

3.3 Installation

During the installation process, product testing lasts for 0.05 hours and consumes 0.001475 kWh of electricity. No material input is required for installation. The end-of-life scenario of packaging materials was utilized in accordance with PSR-0014-ed2.0-EN-2023 07 13. The transportation of packaging materials follows PSR-0014-ed2.0-EN-2023 07 13.
Lorry: 100 km

3.4 Use stage

The product has no direct emissions, and no maintenance is required. Given that the assigned lifetime of the integrated LED module is 70,000 Hours, which is the same as that of the Recessed LED Luminaire, no light sources need replacement. Furthermore, no standard repairs or refurbishments are anticipated. The use of the product consumes electricity, but no water.
The Siella G9 M84 PW19 34-46/4ML-840 ETDD can be connected via DALI, which has a light management function in accordance with PSR-0014-ed2.0-EN-2023 07 13. The energy saving coefficients as per Table 5 in PSR-0014-ed2.0-EN-2023 07 13 shall be applied.

The market of the product is Europe, and the distribution ratio by country/region is as follows:

Country/Region	Share (%)	Energy model
Germany	50.00	Electricity, low voltage {DE}| market for electricity, low voltage | Cut-off, S
France	33.00	Electricity, low voltage {FR}| market for electricity, low voltage | Cut-off, S
Netherland	2.00	Electricity, low voltage {NL}| market for electricity, low voltage | Cut-off, S
Austria	2.00	Electricity, low voltage {AT}| market for electricity, low voltage | Cut-off, S
Spain	2.00	Electricity, low voltage {ES}| market for electricity, low voltage | Cut-off, S
Romania	2.00	Electricity, low voltage {RO}| market for electricity, low voltage | Cut-off, S
Italy	2.00	Electricity, low voltage {IT}| market for electricity, low voltage | Cut-off, S
Other countries in EU	7.00	Electricity, low voltage {RER}| market group for | Cut-off, S

3.5 End of life

There is no specific data are available to calculate the shipment of product from the installation site to the approved treatment centers. The default distance is 1000 km by lorry was used according to PCR-ed4- EN-2021 09 06.
The product and its PCB falls under the Waste from Electrical and Electronic Equipment (WEEE) directive 2012/19/EU. The valuable fractions (Aluminum, Steel and Plastics, etc.) are recycling within the default recycling recovering rate established in WEEE REPORT of Recessed LED Luminaire. The remaining parts assumed that 100% are sent to sanitary landfill for disposal according to PEP-PCR-ed4- EN-2021 09 06.

3.6 Benefits and loads beyond the system boundaries

The reuse/recycling of the product (incl. packaging) and incineration with energy recovery generates environmental benefits by avoiding the production of primary materials or energy. The scope of the Module D is With Net Benefits and the net benefits and loads beyond the system boundaries are calculated using the formulas described in PCR–ed4- EN-2021 09 06. The amount and type of material flows used for the calculation of benefits are listed in Table 8.

Table 8: Material flows for reuse, recycling and/or recovery per unit of product (declared unit, 4600 lumens during a lifetime of 70000 hours)

Information	Unit	Value
Total weight of product going into reuse	kg	0.000
Total weight of product going into recycling	kg	2.054
Share of metals	%	59.957
Share of plastics	%	29.443
Share of others	%	10.600
Total weight of product going into incineration with energy recovery	kg	0.015
Share of metals	%	0.000
Share of plastics	%	28.571
Share of others	%	71.429
Total weight of packaging going into reuse	kg	0.206
Total weight of packaging going into recycling	kg	0.620
Share of Paper/board	%	99.914
Share of Plastics	%	0.086
Total weight of packaging going into incineration with energy recovery	kg	0.068
Share of Paper/board	%	99.298
Share of Plastics	%	0.702

4.1 Introduction

The Recessed LED Luminaire evaluated in this PEP are in lined with EN 60598-1.
The primary data collected were representative of a current scenario in terms of geographical coverage and technological, which coverage averaged 6 months. The environmental information included in this study cover all the stages of the life cycle ("cradle to grave"). The life cycle be divided into manufacturing stage (A1-A3), distribution stage (A4), installation stage (A5), use stage (B1-B7, the value of B1-B7 except B6 are 0 and not reflected in the table 9 and table 11), End-of-life stage (C1-C4) and benefits and loads beyond the system boundaries stage (D). The results refer to the core environmental impact indicators and mandatory indicators describing resource use, waste categories, and output flows according to PEP-PCR–ed4- EN-2021 09 06.

The environmental impacts assessment of the reference product has been performed using Simapro 9.5 software. Background datasets have been retrieved from Ecoinvent 3.9.1. The results refer to the core environmental impact indicators and mandatory indicators describing resource use, waste categories, and output flows according to PEP-PCR–ed4- EN-2021 09 06.

4.2 Results per functional unit

The following results of the environmental declaration have been developed by considering an outgoing artificial luminous flux of 1000 lumens over a reference lifetime of 35000 hours.

Table 9: Results core environmental impact indicators per functional unit

Impact category	Unit	Total	Manufacturing			Distribution	Installation
			A1	A2	A3	A4	A5
GWP-total	kg CO_2 eq	3.86E+01	2.36E+00	3.87E-02	2.65E-02	1.05E-01	2.15E-02
ODP	kg CFC11 eq	6.80E-07	1.10E-07	5.98E-10	5.48E-11	1.60E-09	1.01E-10
POCP	kg NMVOC eq	8.36E-02	9.71E-03	2.24E-04	8.18E-05	1.70E-03	5.05E-05
AP	mol H+ eq	1.49E-01	1.43E-02	1.66E-04	1.41E-04	2.14E-03	3.29E-05
EP-freshwater	kg P eq	4.42E-02	1.15E-03	3.07E-06	5.10E-06	5.15E-06	8.38E-07
EP-marine	kg N eq	3.23E-02	2.51E-03	6.09E-05	2.89E-05	5.53E-04	2.63E-05
EP-terrestrial	mol N eq	2.67E-01	2.51E-02	6.52E-04	3.09E-04	6.10E-03	1.28E-04
WDP	m^3 depriv.	5.81E+00	4.14E-01	2.40E-03	2.96E-03	4.61E-03	5.54E-04
ADPF	MJ	9.82E+02	3.06E+01	5.35E-01	2.49E-01	1.34E+00	8.46E-02
ADPE	kg Sb eq	6.81E-04	1.45E-04	1.22E-07	1.04E-07	1.62E-07	2.69E-08
GWP-fossil	kg CO_2 eq	3.80E+01	2.32E+00	3.87E-02	2.64E-02	1.05E-01	7.17E-03
GWP-biogenic	kg CO_2 eq	5.24E-01	3.43E-02	1.25E-05	5.28E-06	2.76E-05	1.43E-02
GWP-lulut	kg CO_2 eq	6.06E-02	4.47E-03	1.99E-05	1.04E-05	7.00E-05	3.03E-06

Impact category	Unit	Use	End of life				Benefits and loads beyond the system boundaries stage
		B6	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	3.56E+01	7.62E-02	2.54E-02	2.58E-01	1.10E-02	-1.03E+00
ODP	kg CFC11 eq	5.62E-07	1.31E-10	5.45E-10	5.22E-09	5.11E-12	-1.33E-08
POCP	kg NMVOC eq	7.05E-02	6.27E-05	1.56E-04	1.11E-03	5.31E-06	-3.50E-03
AP	mol H+ eq	1.29E-01	8.41E-05	1.03E-04	2.99E-03	2.47E-06	-5.54E-03
EP-freshwater	kg P eq	4.27E-02	6.24E-06	1.77E-06	2.62E-04	2.29E-07	-6.34E-04
EP-marine	kg N eq	2.87E-02	2.41E-05	3.90E-05	3.13E-04	2.57E-05	-1.09E-03
EP-terrestrial	mol N eq	2.31E-01	2.29E-04	4.16E-04	3.25E-03	7.00E-06	-1.07E-02
WDP	m^3 depriv.	5.33E+00	3.23E-03	1.76E-03	5.05E-02	1.74E-04	-2.61E-01
ADPF	MJ	9.46E+02	1.71E-01	3.64E-01	3.45E+00	4.94E-03	-1.44E+01
ADPE	kg Sb eq	5.07E-04	1.09E-07	6.72E-08	2.82E-05	9.03E-10	-1.86E-05
GWP-fossil	kg CO_2 eq	3.51E+01	7.62E-02	2.54E-02	2.49E-01	8.87E-04	-1.02E+00
GWP-biogenic	kg CO_2 eq	4.57E-01	3.79E-05	9.17E-06	8.80E-03	1.01E-02	-6.68E-03
GWP-lulut	kg CO_2 eq	5.57E-02	2.66E-05	1.18E-05	2.91E-04	3.16E-07	-1.74E-03

Acronyms: GWP-total=Global Warming Potential total; GWP-biogenic=Global Warming Potential biogenic; GWP-fossil=Global Warming Potential fossil; GWP-lulut=Global Warming Potential land use and land use transformation; ODP=Ozone Depletion; AP=Acidification; E=Eutrophication; POCP=Photochemical ozone formation; ADPE=Depletion of abiotic resources-minerals and metals; ADPF=Depletion of abiotic resources-fossil fuels; WDP=Water resource deprivation.

Table 10: Results of mandatory indicators per functional unit

Indicators	Unit	Value
Renewable primary energy (without raw material)	MJ	1.81E+02
Renewable primary energy (raw material)	MJ	3.16E+00
Total use of renewable primary energy	MJ	1.85E+02
Non-renewable primary energy (without raw material)	MJ	9.80E+02
Non-renewable primary energy (raw material)	MJ	2.18E+00
Total use of non-renewable primary energy	MJ	9.82E+02
Use of secondary materials	kg	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00
Net use of fresh water	m^3	4.42E-01
Hazardous waste disposed	kg	0.00E+00
Non-hazardous waste disposed	kg	2.18E-02
Radioactive waste disposed	kg	0.00E+00
Components for reuse	kg	2.24E-02
Materials for recycling	kg	2.97E-01
Materials for energy recovery	kg	9.14E-03
Exported energy	MJ	0.00E+00
Biogenic carbon content of the product	kg of C	0.00E+00
Biogenic carbon content of the associated packaging	kg of C	5.24E-02

4.3 Results per unit of product

The following results of the environmental declaration have been developed by considering one product (outgoing artificial luminous flux of 4600 lumens over a declared lifetime of 70000 hours).

Table 11: Results core environmental impact indicators per unit of product (declared unit, 4600 lumens during a lifetime of 70000 hours)

Impact category	Unit	Total	Manufacturing			Distribution	Installation
			A1	A2	A3	A4	A5
GWP-total	kg CO_2 eq	3.54E+02	2.16E+01	3.55E-01	2.43E-01	9.62E-01	1.97E-01
ODP	kg CFC11 eq	6.24E-06	1.01E-06	5.49E-09	5.02E-10	1.47E-08	9.27E-10
POCP	kg NMVOC eq	7.67E-01	8.91E-02	2.05E-03	7.51E-04	1.56E-02	4.63E-04
AP	mol H+ eq	1.37E+00	1.31E-01	1.52E-03	1.29E-03	1.96E-02	3.02E-04
EP-freshwater	kg P eq	4.05E-01	1.06E-02	2.82E-05	4.68E-05	4.73E-05	7.68E-06
EP-marine	kg N eq	2.96E-01	2.31E-02	5.59E-04	2.66E-04	5.07E-03	2.42E-04
EP-terrestrial	mol N eq	2.45E+00	2.30E-01	5.98E-03	2.83E-03	5.59E-02	1.17E-03
WDP	m^3 depriv.	5.33E+01	3.79E+00	2.20E-02	2.72E-02	4.23E-02	5.08E-03
ADPF	MJ	9.01E+03	2.81E+02	4.91E+00	2.28E+00	1.23E+01	7.76E-01
ADPE	kg Sb eq	6.25E-03	1.33E-03	1.12E-06	9.57E-07	1.49E-06	2.46E-07
GWP-fossil	kg CO_2 eq	3.48E+02	2.13E+01	3.55E-01	2.43E-01	9.61E-01	6.57E-02
GWP-biogenic	kg CO_2 eq	4.81E+00	3.15E-01	1.15E-04	4.85E-05	2.53E-04	1.32E-01
GWP-lulut	kg CO_2 eq	5.56E-01	4.10E-02	1.82E-04	9.56E-05	6.42E-04	2.78E-05

Impact category	Unit	Use	End of life				Benefits and loads beyond the system boundaries stage
		B6	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	3.27E+02	6.99E-01	2.33E-01	2.37E+00	1.01E-01	-9.47E+00
ODP	kg CFC11 eq	5.15E-06	1.20E-09	5.00E-09	4.79E-08	4.69E-11	-1.22E-07
POCP	kg NMVOC eq	6.47E-01	5.76E-04	1.43E-03	1.02E-02	4.88E-05	-3.21E-02
AP	mol H+ eq	1.18E+00	7.72E-04	9.43E-04	2.74E-02	2.27E-05	-5.08E-02
EP-freshwater	kg P eq	3.92E-01	5.73E-05	1.63E-05	2.40E-03	2.10E-06	-5.81E-03
EP-marine	kg N eq	2.63E-01	2.21E-04	3.57E-04	2.87E-03	2.36E-04	-1.00E-02
EP-terrestrial	mol N eq	2.12E+00	2.10E-03	3.81E-03	2.99E-02	6.42E-05	-9.78E-02
WDP	m^3 depriv.	4.89E+01	2.97E-02	1.62E-02	4.63E-01	1.59E-03	-2.39E+00
ADPF	MJ	8.68E+03	1.56E+00	3.34E+00	3.16E+01	4.53E-02	-1.32E+02
ADPE	kg Sb eq	4.65E-03	1.00E-06	6.16E-07	2.59E-04	8.28E-09	-1.70E-04
GWP-fossil	kg CO_2 eq	3.22E+02	6.99E-01	2.33E-01	2.28E+00	8.14E-03	-9.39E+00
GWP-biogenic	kg CO_2 eq	4.19E+00	3.48E-04	8.42E-05	8.07E-02	9.25E-02	-6.13E-02
GWP-lulut	kg CO_2 eq	5.11E-01	2.44E-04	1.08E-04	2.67E-03	2.90E-06	-1.60E-02

Acronyms: GWP-total=Global Warming Potential total; GWP-biogenic=Global Warming Potential biogenic; GWP-fossil=Global Warming Potential fossil; GWP-lulut=Global Warming Potential land use and land use transformation; ODP=Ozone Depletion; AP=Acidification; E=Eutrophication; POCP=Photochemical ozone formation; ADPE=Depletion of abiotic resources-minerals and metals; ADPF=Depletion of abiotic resources-fossil fuels; WDP=Water resource deprivation.

Table 12: Results of mandatory indicators per unit of product (declared unit, 4600 lumens during a lifetime of 70000 hours)

Indicators	Unit	Value
Renewable primary energy (without raw material)	MJ	1.66E+03
Renewable primary energy (raw material)	MJ	2.89E+01
Total use of renewable primary energy	MJ	1.69E+03
Non-renewable primary energy (without raw material)	MJ	8.99E+03
Non-renewable primary energy (raw material)	MJ	2.00E+01
Total use of non-renewable primary energy	MJ	9.01E+03
Use of secondary materials	kg	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00
Net use of fresh water	m^3	4.06E+00
Hazardous waste disposed	kg	0.00E+00
Non-hazardous waste disposed	kg	2.00E-01
Radioactive waste disposed	kg	0.00E+00
Components for reuse	kg	2.06E-01
Materials for recycling	kg	2.72E+00
Materials for energy recovery	kg	8.39E-02
Exported energy	MJ	0.00E+00
Biogenic carbon content of the product	kg of C	0.00E+00
Biogenic carbon content of the associated packaging	kg of C	4.81E-01

5 Extrapolation coefficients to a homogeneous environmental family

The extrapolation coefficients at product level (declared unit) are listed in table 13 and the parameters of homogeneous environmental family was used in rules of extrapolation are listed in table 14.

Table 13: The extrapolation coefficients at product level (declared unit)

Product name	Manufacturing stage	Distribution stage	Installation stage	Use stage	End of life stage	Module D
Siella G9 M84 PW19 34-46/4ML-840 ETDD	1.000	1.000	1.000	1.000	1.000	1.000
Siella G9 M73 DW 34-46/4ML-8MC ET	0.905	0.884	0.950	2.000	0.856	0.908
Siella G9 M73 DW 34-46/4ML-8MC ETDD	0.930	0.913	0.958	1.000	0.894	0.933
Siella G9 M73 PW19 34-46/4ML-8MC ET	1.012	0.970	0.950	2.000	0.978	1.012
Siella G9 M73 PW19 34-46/4ML-8MC ETDD	1.031	0.997	0.958	1.000	1.013	1.031
Siella G9 M73 PW19 34-46/ML-840 ET	0.933	0.928	0.950	2.000	0.919	0.933
Siella G9 M73 PW19 34-46/ML-840 ETDD	0.954	0.954	0.958	1.000	0.952	0.954
Siella G9 M84 DW 34-46/4ML-8MC ET	0.947	0.928	0.995	2.000	0.900	0.950
Siella G9 M84 DW 34-46/4ML-8MC ETDD	0.970	0.956	1.000	1.000	0.938	0.972
Siella G9 M84 PW19 34-46/4ML-8MC ET	1.057	1.019	0.995	2.000	1.029	1.057
Siella G9 M84 PW19 34-46/4ML-8MC ETDD	1.075	1.046	1.000	1.000	1.066	1.076
Siella G9 M84 PW19 34-46/4ML-840 ET	0.982	0.975	0.995	2.000	0.967	0.982
Siella G9 M46 PW19 34-46/4ML-8MC ET	1.031	0.999	0.953	2.000	1.019	1.031
Siella G9 M46 PW19 34-46/4ML-8MC ETDD	1.041	1.017	0.934	1.000	1.052	1.042
Siella G9 M73 PW19 34-46/4ML-8MC ETWD	1.013	0.968	0.958	1.000	0.972	1.013
Siella G9 M73 PW19 34-46/4ML-8MC ETWD-S	1.039	1.005	0.958	1.000	1.025	1.039
Siella G9 M84 PW19 34-46/4ML-8MC CAS	1.067	1.035	1.000	1.000	1.050	1.067

Note: The extrapolation coefficients are intended at product level (declared unit) and not at functional unit, and the extrapolation coefficients at functional unit level shall be taken into account with the following formula:

Extrapolation coefficient at the product level x Lighting output of reference product (lumens)/ Lighting output of concerned product (lumens)

Table 14: The parameters of homogeneous environmental family was used in rules of extrapolation

Product name	Power (W)	Lumen (lm)	Weight of product (g)	Weight of packaging (g)	Weight of luminaire structure (g)	Weight of Control gear (g)	Weight of light source (g)
Siella G9 M84 PW19 34-46/4ML-840 ETDD	22/24.5/27/29.5	3400/3800/4200/4600 @4000K	2198.460	926.390	1850.640	236.960	110.860
Siella G9 M73 DW 34-46/4ML-8MC ET	22/24.5/27/29.5	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	1882.490	880.460	1546.750	163.990	171.750
Siella G9 M73 DW 34-46/4ML-8MC ETDD	22/24.5/27/29.5	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	1964.460	887.360	1555.750	236.960	171.750
Siella G9 M73 PW19 34-46/4ML-8MC ET	22/24.5/27/29.5	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	2150.990	880.460	1769.920	163.990	217.080
Siella G9 M73 PW19 34-46/4ML-8MC ETDD	22/24.5/27/29.5	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	2227.460	887.360	1773.420	236.960	217.080
Siella G9 M73 PW19 34-46/ML-840 ET	22/24.5/27/29.5	3400/3800/4200/4600 @4000K	2020.490	880.460	1745.640	163.990	110.860
Siella G9 M73 PW19 34-46/ML-840 ETDD	22/24.5/27/29.5	3400/3800/4200/4600 @4000K	2093.460	887.360	1745.640	236.960	110.860
Siella G9 M84 DW 34-46/4ML-8MC ET	22/24.5/27/29.5	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	1978.490	921.510	1642.750	163.990	171.750
Siella G9 M84 DW 34-46/4ML-8MC ETDD	22/24.5/27/29.5	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	2061.460	926.390	1652.750	236.960	171.750
Siella G9 M84 PW19 34-46/4ML-8MC ET	22/24.5/27/29.5	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	2261.490	921.510	1880.420	163.990	217.080
Siella G9 M84 PW19 34-46/4ML-8MC ETDD	22/24.5/27/29.5	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	2342.960	926.390	1888.920	236.960	217.080
Siella G9 M84 PW19 34-46/4ML-840 ET	22/24.5/27/29.5	3400/3800/4200/4600 @4000K	2125.490	921.510	1850.640	163.990	110.860
Siella G9 M46 PW19 34-46/4ML-8MC ET	22/24.5/27/29.5	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	2239.490	882.820	1873.000	163.990	202.500
Siella G9 M46 PW19 34-46/4ML-8MC ETDD	22/24.5/27/29.5	3400/3800/4200/4600 @4000K 3150/3500/3900/4300 @3000K	2312.460	865.200	1873.000	236.960	202.500
Siella G9 M73 PW19 34-46/4ML-8MC ETWD	29.5	4600lm @4000K 4300lm @3000K	2136.000	887.360	1773.420	145.500	217.080
Siella G9 M73 PW19 34-46/4ML-8MC ETWD-S	29.5	4600lm @4000K 4300lm @3000K	2253.430	887.360	1819.850	216.500	217.080
Siella G9 M84 PW19 34-46/4ML-8MC CAS	29.5	4600lm @4000K 4300lm @3000K	2307.590	926.390	1888.920	201.590	217.080