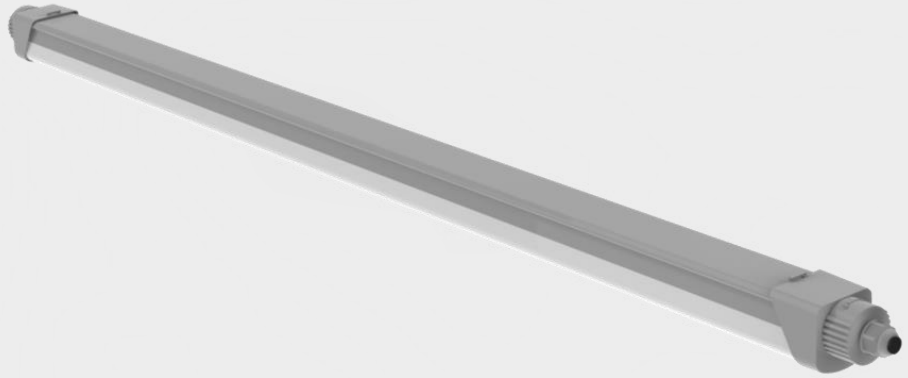

2315 LED

ENVIRONMENTAL PRODUCT DECLARATION

PRODUCT ENVIRONMENTAL PROFILE OF LED WATER-PROOF LUMINAIRE

Reference product: 2315 G4 S 1500 55/38/ML-840 ET PC +LV

Registration number	TXPL-00002- V01.01-EN	**Drafting rules**	PCR-ed4-EN-2021 09 06
		Supplemented by	PSR-0014-ed2.0-EN-2023 07 13
Verifier accreditation number	VH31	**Information and reference documents**	www.pep-ecopassport.org
Date of publication	10-2023	**Validity period**	5 years
Internal		**External**	x

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

PEP are compliant with XP C08-100-1:2016 or EN 50693:2019.

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

Document in compliance with ISO 14025 on Type III environmental declarations.

Content of the PEP report

1 General information

1.1 Company information

TRILUX Simplify Your Light represents the most simple and reliable path to customized, energy-efficient and sustainable lighting solutions. In the dynamic and ever more complex lighting market, customers are provided with optimal advice, ideal orientation and perfect light. To ensure this, TRILUX offers a wide portfolio of technologies as well as high-performance partners within the TRILUX Group, and unites single components to create custom-designed complete solutions – always perfectly matched to customer requirements and specific applications.

In this way, complex and extensive projects are simply and rapidly realized from a single source. According to the principle of "SIMPLIFY YOUR LIGHT", planning, installation and ease of use, besides quality and cost efficiency, is focused on for customers.

1.2 Product information

The name of the product under study is “LED Water-proof luminaire”.
As an ideal 1:1 LED refurbishment solution with multi-lumen technology, it can be mounted to walls and ceilings, can be suspended, is very robust and also easy and flexible to install.
The LED Water-proof luminaire complies with fundamental requirements of applicable EU regulations and product safety legislation and bears the CE symbol. The luminaire is also ENEC-certified by an independent testing authority.

- Rapid connection system with tool-free screwed cap reduces installation effort
- Thanks to slidable mounting clips, can be individually adapted to the existing fixing points
- Variants available with integrated through-wiring
- Suitable for wall, ceiling and suspended mounting
- UV-stabilised polycarbonate – robust and reliable
- High efficiency (130 lm/W) and reliable service life (50,000 h, L70)
- Flexible luminous flux setting thanks to multi-lumen technology (3,800 lm and 2,600 lm or 5,600 lm and 3,800 lm)

1 General information

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.

The assessed products range covers lighting luminaires from the “LED Water-proof luminaire” family, which including 2315 G4 S 1500 55/38/ML-840 ET PC +LV and 2315 G4 S 1200 38/26/ML-840 ET PC +LV. 2315 G4 S 1500 55/38/ML-840 ET PC +LV and 2315 G4 S 1200 38/26/ML-840 ET PC +LV have all characteristics described in PSR-0014-ed2.0-EN-2023 07 13 as belong to a homogeneous environmental family.
The reference product is 2315 G4 S 1500 55/38/ML-840 ET PC +LV and the key information are summarized in the following table.

Table 1: Key technological data

Information	Unit	
Light source	-	Integrated LED module
Power supply	-	Internal
Color temperature	K	4000
Protection index for water and dust (IP)	-	IP65
Impact resistance index (IK)	-	IK08
Nominal operating voltage	V	220-240
Declared lifetime of the luminaire	Hours	50000
Declaration lifetime of the light source	Hours	50000
Outgoing luminous flux/Useful output flux	Lumen	5600/3800
Electrical input power	W	43/29
Luminous efficiency	Lumen/W	130
Dimension	mm	1570x60x60

For the LED Water-proof luminaire with an assigned lifetime of 50,000 hours that can be installed both in indoor and outdoor applications, the LED Water-proof luminaire has the following annual service time.

Table 2: LED Water-proof luminaire annual operating times according to the type of building

Type of building	Annual operating hours by default	Operational lifetime (years)
Residential building	3500	14.3
Office	2500	20
Educational institutions	2000	25
Hospital	5000	10
Hotel	5000	10
Catering	2500	20
Sports establishments	4000	12.5
Retail (wholesale and retail services)	5000	10
Industry (manufacturing plants)	4000	12.5
Urban	4000	12.5
Sport (recreational)	2500	20
Zone, open space	4000	12.5

Following the requirements of the PSR, the operational lifetime of LED Water-proof luminaire is 10 years.

1 General information

1.3 Functional Unit

The functional unit of LED Water-proof luminaire is defined as “Provide lighting that delivers an outgoing artificial luminous flux of 1,000 lumens during a reference lifetime of 35,000 hours”.

The reference flow is the amount 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 LED Water-proof luminaire corresponding to the functional unit shall take into account 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 LED Water-proof luminaire is 5,600 Lumen. The assigned lifetime of the LED Water-proof luminaire is 50,000 Hours, which estimated by the test report. The reference flow is calculated as: (1,000/outgoing luminous flux of the analyzed product in lumens) x (35,000/declared product lifetime of the analyzed product in hours). Consequently, the reference flow of the LED Water-proof luminaire corresponds to:

(1,000/5,600) x (35,000/50,000) = 0.125

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 3.

Table 4 showed the extrapolation coefficients at product level based on the technical parameters of LED Water-proof luminaire, and the extrapolation coefficients at functional unit level shall be taken into account with the following formula:

$$\boldsymbol{Extrapolation\ coefficent\ at\ the\ product\ level} \times \frac{\boldsymbol{Lighting\ output\ of\ reference\ product\ (lumens)}}{\boldsymbol{Lighting\ output\ of\ concerned\ product\ (lumens)}}$$

Table 3: The parameters of homogeneous environmental family was used in rules of extrapolation

Parameter	Unit	2315 G4 S 1500 55/38/ML-840 ET PC +LV	2315 G4 S 1200 38/26/ML-840 ET PC +LV
Lighting output	Lumens	5600/3800	3800/2600
Weight of light source	g	67	52
Weight of luminaire structure and his packaging	g	1188.16	961.89
Weight of control gear	g	51.5	47.5
Weight of light management system	g	0	0
Weight of product including its light source	g	826.3	698.62
Weight of product including its packaging	g	1306.66	1061.91
Weight of packaging	g	480.36	363.29
Power	W	43/29	29/20
Theoretical coefficient of energy saving	/	1	1

1 General information

Table 4: The extrapolation coefficients at product level (declared unit)

Life cycle stages	2315 G4 S 1500 55/38/ML-840 ET PC +LV	2315 G4 S 1200 38/26/ML-840 ET PC +LV
Manufacturing stage (A1-A3)	1.000	0.813
Distribution stage (A4)	1.000	0.812
Installation stage (A5)	1.000	0.756
Use stage (B1-B7)	1.000	0.674
End of life stage (C1-C4)	1.000	0.845
Module D	1.000	0.815

2 Constituent materials

2.1 Overview

Table 5: Product composition

Information	Weight [in kg]	Share [in %]
Product	0.827	63.26
Packaging	0.480	36.74

2.2 Product

Table 6: Material composition – Product

Information	Weight [in kg]	Share [in %]
Metal	0.033	4.04
Plastics	0.573	69.22
Others	0.221	26.74

2.3 Packaging

Table 7: Material composition – Packaging

Information	Weight [in kg]	Share [in %]
Paper/board	0.320	66.68
Wooden pallet	0.160	33.31
Self-adhesive	0.00004	0.01

3 Information on life cycle stages

3.1 Manufacturing stage

The manufacturer sources all parts from international suppliers. Within the manufacturing site in China, the manufacturer produced Printed Circuit Board Assembly through surface mounting and hole-through mounting process from the Printed Circuit Board using energy and auxiliaries. Then the product was assembled and tested using energy. Afterwards the product is packed in packaging materials and distributed to the client.

3.2 Distribution stage

The main market of the 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 PEP-PCR–ed4-EN-2021 09 06 is considered in the model:
Ship: 19,000 km
Lorry: 1,000 km

3.3 Installation stage

During installation, product testing takes 0.05 hours and consumes 0.00215 kWh electricity. There is no material input is required to installation. The End-of-life scenario of packaging materials was used according to PSR-0014-ed2.0-EN-2023 07 13. The transport of packaging materials following 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. Due to the assigned lifetime of integrated LED module is 50,000 Hours, which is the same as LED Water-proof luminaire, there is no light sources need to be replaced. Furthermore, no standard repairs or refurbishments are foreseen. The use of the product does consume electricity, but no water.

The main market of the product is Europe, and the distribution ratio of country/region is the following:

Country/Region	Share (%)	Energy model
Germany	4	Electricity, low voltage {DE}| market for electricity, low voltage | Cut-off, S
France	23	Electricity, low voltage {FR}| market for electricity, low voltage | Cut-off, S
Poland	22	Electricity, low voltage {PL}| market for electricity, low voltage | Cut-off, S
Spain	8	Electricity, low voltage {ES}| market for electricity, low voltage | Cut-off, S
Netherland	18	Electricity, low voltage {NL}| market for electricity, low voltage | Cut-off, S
Other countries in EU	25	Electricity, low voltage {RER}| market group for | Cut-off, S

3 Information on life cycle stages

3.5 End-of-life stage

The product and its PCB falls under the Waste from Electrical and Electronic Equipment (WEEE) directive 2012/19/EU. The valuable fractions (Aluminium, Steel and Plastics, etc) are recycling within the default recycling recovering rate established in WEEE REPORT of LED Water-proof luminaire. The remaining parts assumed that 100% are sent to sanitary landfill for disposal according to PEP-PCR-ed4- EN-2021 09 06. The End-of-life scenario was used as following:

- Recycling: 80.2%
- Incineration with energy recovery: 8.8%
- Landfilling: 11%

3.6 Benefits and loads beyond the system boundaries stage

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 PEP-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, 5,600 lumens during 50,000 hours)

Information	Unit	Value
Total weight of product going into reuse	kg	0.000
Total weight of product going into recycling	kg	0.663
Share of metals	%	5
Share of plastics	%	75
Share of others	%	20
Total weight of product going into incineration with energy recovery	kg	0.073
Share of plastics	%	6
Share of others	%	94
Total weight of packaging going into reuse	kg	0.160
Total weight of packaging going into recycling	kg	0.263
Share of Paper/board	%	100
Total weight of packaging going into incineration with energy recovery	kg	0.029
Share of Paper/board	%	100

4 Life cycle assessment

4.1 Introduction

2315 G4 S 1500 55/38/ML-840 ET PC +LV and 2315 G4 S 1200 38/26/ML-840 ET PC +LV 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 3 months. The environmental information included in this study cover all the stages of the life cycle ("cradle to grave"). 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, but only B6 in this study), End-of-life stage (C1-C4) and benefits and loads beyond the system boundaries stage (D).

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 1,000 lumens over a reference lifetime of 35,000 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	1.69E+02	2.23E+00	6.87E-03	4.67E-02	7.51E-02	1.64E-02
ODP	kg CFC11 eq	3.46E-06	1.63E-06	1.06E-10	9.66E-11	1.15E-09	8.15E-11
POCP	kg NMVOC eq	3.87E-01	1.04E-02	3.97E-05	1.44E-04	1.22E-03	3.92E-05
AP	mol H+ eq	8.45E-01	2.09E-02	2.95E-05	2.48E-04	1.53E-03	2.65E-05
EP-freshwater	kg P eq	1.75E-01	1.80E-03	5.45E-07	8.99E-06	3.69E-06	8.55E-07
EP-marine	kg N eq	1.47E-01	2.69E-03	1.08E-05	5.10E-05	3.96E-04	2.00E-05
EP-terrestrial	mol N eq	1.28E+00	2.81E-02	1.16E-04	5.44E-04	4.37E-03	1.00E-04
WDP	m^3 depriv.	2.78E+01	7.83E-01	4.25E-04	5.22E-03	3.30E-03	4.60E-04
ADPE	MJ	3.15E+03	3.23E+01	9.49E-02	4.38E-01	9.61E-01	6.97E-02
ADPF	kg Sb eq	1.76E-03	2.30E-04	2.16E-08	1.84E-07	1.16E-07	2.25E-08
GWP-fossil	kg CO_2 eq	1.68E+02	2.21E+00	6.86E-03	4.66E-02	7.50E-02	5.76E-03
GWP-biogenic	kg CO_2 eq	1.11E+00	1.37E-02	2.22E-06	9.32E-06	1.97E-05	1.06E-02
GWP-lulut	kg CO_2 eq	2.13E-01	4.08E-03	3.52E-06	1.84E-05	5.01E-05	2.63E-06

4 Life cycle assessment

Table 9: Results core environmental impact indicators per functional unit

Impact category	Unit	Use	End of life				Benefits and loads beyond the system boundar-ies stage
		B6	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	1.67E+02	3.29E-02	1.10E-02	7.51E-02	8.67E-03	-5.68E-01
ODP	kg CFC11 eq	2.38E-06	5.66E-11	2.35E-10	1.37E-09	4.04E-12	-2.75E-08
POCP	kg NMVOC eq	3.78E-01	2.70E-05	6.73E-05	2.74E-04	4.20E-06	-3.21E-03
AP	mol H+ eq	8.30E-01	3.62E-05	4.43E-05	6.22E-04	1.95E-06	-9.75E-03
EP-freshwater	kg P eq	1.73E-01	2.69E-06	7.64E-07	6.55E-05	1.81E-07	-7.79E-04
EP-marine	kg N eq	1.44E-01	1.04E-05	1.68E-05	8.17E-05	2.03E-05	-8.45E-04
EP-terrestrial	mol N eq	1.26E+00	9.87E-05	1.79E-04	7.99E-04	5.53E-06	-9.59E-03
WDP	m^3 depriv.	2.72E+01	1.39E-03	7.60E-04	1.21E-01	1.37E-04	-3.29E-01
ADPE	MJ	3.13E+03	7.35E-02	1.57E-01	1.26E+00	3.90E-03	-9.29E+00
ADPF	kg Sb eq	1.60E-03	4.72E-08	2.90E-08	4.44E-06	7.13E-10	-1.00E-04
GWP-fossil	kg CO_2 eq	1.66E+02	3.28E-02	1.09E-02	7.34E-02	7.01E-04	-5.65E-01
GWP-biogenic	kg CO_2 eq	1.09E+00	1.63E-05	3.95E-06	1.59E-03	7.97E-03	-2.31E-03
GWP-lulut	kg CO_2 eq	2.10E-01	1.15E-05	5.09E-06	1.24E-04	2.49E-07	-7.33E-04

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	5.52E+02
Renewable primary energy (raw material)	MJ	1.35E+00
Total use of renewable primary energy	MJ	5.54E+02
Non-renewable primary energy (without raw material)	MJ	3.15E+03
Non-renewable primary energy (raw material)	MJ	2.30E+00
Total use of non-renewable primary energy	MJ	3.15E+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	M3	3.01E+00
Hazardous waste disposed	kg	0.00E+00
Non-hazardous waste disposed	kg	1.50E-02
Radioactive waste disposed	kg	0.00E+00
Components for reuse	kg	2.00E-02
Materials for recycling	kg	1.16E-01

4 Life cycle assessment

Table 10: Results of mandatory indicators per functional unit

Indicators	Unit	Value
Materials for energy recovery	kg	1.27E-02
Exported energy	MJ	0.00E+00
Biogenic carbon content of the product	kg	0.00E+00
Biogenic carbon content of the associated packaging	kg	3.00E-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 5600 lumens over a reference lifetime of 50,000 hours).

Table 11: Results core environmental impact indicators per unit of product (declared unit, 5600 lumens during 50,000 hours)

Impact category	Unit	Total	Manufacturing			Distribution	Installation
			A1	A2	A3	A4	A5
GWP-total	kg CO_2 eq	1.35E+03	1.18E+01	3.63E-02	2.47E-01	3.97E-01	8.66E-02
ODP	kg CFC11 eq	2.77E-05	8.63E-06	5.62E-10	5.11E-10	6.07E-09	4.31E-10
POCP	kg NMVOC eq	3.09E+00	5.48E-02	2.10E-04	7.63E-04	6.45E-03	2.08E-04
AP	mol H+ eq	6.76E+00	1.11E-01	1.56E-04	1.31E-03	8.11E-03	1.40E-04
EP-freshwater	kg P eq	1.40E+00	9.51E-03	2.89E-06	4.76E-05	1.95E-05	4.52E-06
EP-marine	kg N eq	1.17E+00	1.42E-02	5.72E-05	2.70E-04	2.10E-03	1.06E-04
EP-terrestrial	mol N eq	1.03E+01	1.49E-01	6.12E-04	2.88E-03	2.31E-02	5.31E-04
WDP	m^3 depriv.	2.22E+02	4.15E+00	2.25E-03	2.76E-02	1.74E-02	2.43E-03
ADPE	MJ	2.52E+04	1.71E+02	5.02E-01	2.32E+00	5.09E+00	3.69E-01
ADPF	kg Sb eq	1.41E-02	1.22E-03	1.14E-07	9.73E-07	6.15E-07	1.19E-07
GWP-fossil	kg CO_2 eq	1.34E+03	1.17E+01	3.63E-02	2.47E-01	3.97E-01	3.05E-02
GWP-biogenic	kg CO_2 eq	8.91E+00	7.27E-02	1.17E-05	4.93E-05	1.04E-04	5.61E-02
GWP-lulut	kg CO_2 eq	1.70E+00	2.16E-02	1.86E-05	9.72E-05	2.65E-04	1.39E-05

4 Life cycle assessment

Table 11: Results core environmental impact indicators per unit of product (declared unit, 5600 lumens during 50,000 hours)

Impact category	Unit	Use	End of life				Benefits and loads beyond the system boundar-ies stage
		B6	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	1.34E+03	2.63E-01	8.76E-02	6.01E-01	6.94E-02	-4.55E+00
ODP	kg CFC11 eq	1.90E-05	4.53E-10	1.88E-09	1.10E-08	3.23E-11	-2.20E-07
POCP	kg NMVOC eq	3.03E+00	2.16E-04	5.38E-04	2.19E-03	3.36E-05	-2.57E-02
AP	mol H+ eq	6.64E+00	2.90E-04	3.54E-04	4.98E-03	1.56E-05	-7.80E-02
EP-freshwater	kg P eq	1.39E+00	2.15E-05	6.11E-06	5.24E-04	1.45E-06	-6.23E-03
EP-marine	kg N eq	1.16E+00	8.32E-05	1.34E-04	6.54E-04	1.63E-04	-6.76E-03
EP-terrestrial	mol N eq	1.01E+01	7.89E-04	1.43E-03	6.39E-03	4.43E-05	-7.67E-02
WDP	m^3 depriv.	2.17E+02	1.11E-02	6.08E-03	9.72E-01	1.10E-03	-2.63E+00
ADPE	MJ	2.50E+04	5.88E-01	1.26E+00	1.01E+01	3.12E-02	-7.44E+01
ADPF	kg Sb eq	1.28E-02	3.77E-07	2.32E-07	3.55E-05	5.71E-09	-8.03E-04
GWP-fossil	kg CO_2 eq	1.33E+03	2.63E-01	8.76E-02	5.87E-01	5.61E-03	-4.52E+00
GWP-biogenic	kg CO_2 eq	8.70E+00	1.31E-04	3.16E-05	1.27E-02	6.38E-02	-1.85E-02
GWP-lulut	kg CO_2 eq	1.68E+00	9.19E-05	4.07E-05	9.93E-04	2.00E-06	-5.86E-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 12: Results of mandatory indicators per unit of product (declared unit, 5600 lumens during 50,000 hours)

Indicators	Unit	Value
Renewable primary energy (without raw material)	MJ	4.42E+03
Renewable primary energy (raw material)	MJ	1.08E+01
Total use of renewable primary energy	MJ	4.43E+03
Non-renewable primary energy (without raw material)	MJ	2.52E+04
Non-renewable primary energy (raw material)	MJ	1.84E+01
Total use of non-renewable primary energy	MJ	2.52E+04
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	M3	2.41E+01
Hazardous waste disposed	kg	0.00E+00
Non-hazardous waste disposed	kg	1.20E-01

4 Life cycle assessment

Table 12: Results of mandatory indicators per unit of product (declared unit, 5600 lumens during 50,000 hours)

Indicators	Unit	Value
Radioactive waste disposed	kg	0.00E+00
Components for reuse	kg	1.60E-01
Materials for recycling	kg	9.26E-01
Materials for energy recovery	kg	1.01E-01
Exported energy	MJ	0.00E+00
Biogenic carbon content of the product	kg	0.00E+00
Biogenic carbon content of the associated packaging	kg	2.40E-01