



Product Environmental Profile of luminaires for LED Panel

Reference product: 2330 G3 S M73 PW19 3629ML-840 ET



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

1 General information

1.1 Product information

The name of the product under study is “LED Panel”.

2330 LED is a recessed luminaire for system ceilings in 600 x 600 mm grid size. It scores points with pleasantly uniform light distribution and with UGR < 19 is suitable for VDU workstations. With adjustable light colour (multi-colour) and adjustable luminaire luminous flux (multi-lumen), the luminaire can be adapted to local conditions.

The LED Panel is designed for a broad range of indoor applications, such as offices, corridors, foyers, conference rooms, sales areas and waiting zones.

The 2330 LED is in conformity with the applicable European Directives and Regulations, inter alia:

- Low voltage Directive 2014/35/EU
- Electromagnetic Compatibility 2014/30/EU
- Ecodesign for energy-related products (EU) 2019/2015
- Restriction of Hazardous Substances 2011/65/EU

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 Panel” family, which including 2330 G3 S M73 PW19 3629ML-840 ET and 2330 G3 S M84 PW19 3629ML-840 ET. 2330 G3 S M73 PW19 3629ML-840 ET and 2330 G3 S M84 PW19 3629ML-840 ET have all characteristics described in PSR-0014-ed1.0-EN2018 07 18 as belong to a homogeneous environmental family.

The reference product is 2330 G3 S M73 PW19 3629ML-840 ET and the key informations are summarized in the following table.

Table 1: Key technological data

Information	Unit	
Light source	-	Integrated LED module
Power supply	-	External
Color temperature	K	4000
Protection index for water and dust (IP)	-	IP20/IP40 (surface)
Impact resistance index (IK)	-	IK02
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	3700
Electrical input power	W	31
Luminous efficiency	Lumen/W	120
Dimension	mm	595x595x33

For the LED Panel with a assigned lifetime of 50,000 hours that can be installed in indoor applications such as offices, corridors, foyers, conference rooms, sales areas and waiting zones, the LED Panel has the following annual service time.

Table 2: LED Panel 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	2500	20
Hospital	5000	10
Hotel	5000	10
Catering	2500	20

Following the requirements of the PSR, the operational lifetime of LED Panel is 10 years.

1.2 Functional unit

The functional unit of LED Panel 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 Panel 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 Panel is 3,700 Lumen. The assigned lifetime of the LED Panel is 50,000 Hours, which estimated by the test report.

The reference flow is calculated as: $(1,000/\text{outgoing luminous flux of the analyzed product in lumens}) \times (35,000/\text{declared product lifetime of the analyzed product in hours})$. Consequently, the reference flow of the LED Panel corresponds to:

$$(1,000/3,700) \times (35,000/50,000) = 0.189$$

1.3 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-ed1.0-EN2018 07 18 are listed in Table 3.

Table 4 showed the extrapolation coefficients at product level based on the technical

parameters of LED Panel, and the extrapolation coefficients at functional unit level shall be taken into account with the following formula:

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

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

Parameter	Unit	2330 G3 S M73 PW19 3629ML- 840 ET	2330 G3 S M84 PW19 3629ML- 840 ET
Lighting output	Lumens	3700	3700
Weight of light source	g	864.2	903.6
Weight of luminaire structure and his packaging	kg	1.8230	1.8944
Weight of power equipment	kg	0.1838	0.1812
Weight of light management system	kg	0	0
Weight of product including its light source	kg	1.9142	2.0142
Weight of product including its packaging	kg	2.8696	2.9802
Weight of packaging	kg	0.9556	0.9656
Power	W	31	31

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

Life cycle stages	2330 G3 S M73 PW19 3629ML-840 ET	2330 G3 S M84 PW19 3629ML-840 ET
Manufacturing stage (A1-A3)	1.000	1.042
Distribution stage (A4)	1.000	1.039
Installation stage (A5)	1.000	1.010
Use stage (B1-B7)	1.000	1.000
End of life stage (C1-C4)	1.000	1.046

2 Constituent materials

2.1 Overview

Table 5: Product composition

Information	Weight [in kg]	Share [in %]
Product	1.919	66.83
Packaging	0.952	33.17

2.2 Product

Table 6: Material composition – Product

Information	Weight [in kg]	Share [in %]
Metals	1.019	53.11
Plastics	0.730	38.06
Others	0.169	8.83

2.3 Packaging

Table 7: Material composition – Packaging

Information	Weight [in kg]	Share [in %]
Paper/board	0.946	99.33
Self-adhesive	0.0001	0.01
Plastics	0.006	0.66



3 Information on life cycle stages

3.1 Manufacturing

The manufacturer sources all parts from international suppliers. The manufacturer in China 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

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

During installation, product testing takes 0.1 hours and consumes 0.0031 kWh electricity. There is no material input is required to installation. The product is unpacked and the packaging materials are sent for recycling in Europe. The transport of packaging materials following PEP-PCR–ed4- EN-2021 09 06:

Lorry: 1,000 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 Panel, 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 market of the product is Europe, and the distribution ratio of country/region is the following:

Country/Region	Share (%)	Energy model
Germany	50	Electricity, low voltage {DE} market for electricity, low voltage Cut-off, S
France	31	Electricity, low voltage {FR} market for electricity, low voltage Cut-off, S
Poland	9.5	Electricity, low voltage {PL} market for electricity, low voltage

		Cut-off, S
Spain	5.6	Electricity, low voltage {ES} market for electricity, low voltage Cut-off, S
Others	3.9	Electricity, low voltage {RER} market group for Cut-off, S

3.5 End of life

The product and its PCB falls under the Waste from Electrical and Electronic Equipment (WEEE) directive 2012/19/EU. The End-of-life scenario was used according to PSR-0014-ed1.0-EN2018 07 18 and is the following:

- Recycling: 77%
- Incineration with energy recovery: 6%
- Incineration without energy recovery: 8.5%
- Landfilling: 8.5%

3.6 Benefits and loads beyond the system boundaries

The 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, 3700 lumens during 50,000 hours)

Information	Unit	Value
Total weight going into reuse	kg	0.000
Total weight of product going into recycling	kg	1.477
Share of metals	%	69
Share of plastics	%	31
Share of others	%	0
Total weight of packaging going into recycling	kg	0.952
Share of Paper/board	%	99
Share of plastics	%	1
Total weight of product going into incineration with energy recovery	kg	0.115
Share of plastics	%	100



Share of others	%	0
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4 Environmental impacts

4.1 Introduction

2330 G3 S M73 PW19 3629ML-840 ET and 2330 G3 S M84 PW19 3629ML-840 ET 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 one year. 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	Use	End of life	Benefits and loads beyond the system boundaries stage



		A1	A2	A3	A4	A5	B6	C1	C2	C3	C4	D	
GWP-total	kg CO2 eq	1.15E+02	4.10E+00	3.50E-02	7.23E-02	1.65E-01	3.53E-02	1.10E+02	1.15E-01	3.84E-02	4.77E-01	3.96E-02	-1.30E+00
ODP	kg CFC11 eq	3.51E-06	2.12E-06	5.58E-10	1.47E-10	2.52E-09	5.02E-10	1.38E-06	1.98E-10	8.23E-10	8.76E-09	4.85E-11	-9.70E-08
POCP	kg NMVOC eq	2.54E-01	1.41E-02	2.08E-04	2.39E-04	2.68E-03	2.08E-04	2.35E-01	9.48E-05	2.36E-04	1.48E-03	2.27E-05	-4.58E-03
AP	mol H+ eq	5.22E-01	2.21E-02	1.49E-04	3.85E-04	3.37E-03	1.46E-04	4.93E-01	1.27E-04	1.55E-04	2.16E-03	1.48E-05	-6.44E-03
EP-	kg P eq	1.44E-02	3.42E-04	3.20E-07	1.55E-06	9.46E-07	4.15E-07	1.40E-02	9.29E-07	3.04E-07	2.53E-05	1.85E-07	-6.40E-04
freshwater													
EP-	kg N eq	7.17E-02	3.76E-03	5.39E-05	7.65E-05	8.68E-04	5.36E-05	6.63E-02	3.14E-05	5.84E-05	4.02E-04	4.33E-05	-1.43E-03
marine													
EP-	mol N eq	8.46E-01	4.05E-02	5.82E-04	8.44E-04	9.59E-03	5.70E-04	7.89E-01	3.46E-04	6.28E-04	4.11E-03	5.82E-05	-1.34E-02
terrestrial													
WDP	m3 depriv.	1.68E+01	7.66E-01	2.51E-03	8.10E-03	7.24E-03	4.41E-03	1.58E+01	4.89E-03	2.67E-03	2.01E-01	1.60E-03	-2.48E-01
ADPE	MJ	2.61E+03	4.44E+01	4.97E-01	6.79E-01	2.11E+00	4.35E-01	2.55E+03	2.58E-01	5.50E-01	6.37E+00	2.01E-02	-1.76E+01
ADPF	kg Sb eq	1.74E-03	4.21E-04	9.47E-08	2.85E-07	2.55E-07	1.07E-07	1.31E-03	1.66E-07	1.02E-07	2.39E-06	4.14E-09	-6.56E-06
GWP-	kg CO2 eq	1.14E+02	4.04E+00	3.49E-02	7.23E-02	1.65E-01	3.33E-02	1.09E+02	1.15E-01	3.84E-02	4.63E-01	1.80E-02	-1.29E+00
fossil													
GWP-	kg CO2 eq	1.24E+00	5.28E-02	1.18E-05	1.44E-05	4.34E-05	1.95E-03	1.15E+00	5.73E-05	1.39E-05	1.30E-02	2.16E-02	-1.05E-02
biogenic													
GWP-lulut	kg CO2 eq	1.70E-01	6.54E-03	1.72E-05	2.85E-05	1.10E-04	1.58E-05	1.62E-01	4.03E-05	1.79E-05	7.41E-04	1.32E-06	-2.10E-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	4.51E+02
Renewable primary energy (raw material)	MJ	3.72E+00
Total use of renewable primary energy	MJ	4.55E+02
Non-renewable primary energy (without raw material)	MJ	2.60E+03
Non-renewable primary energy (raw material)	MJ	5.46E+00
Total use of non-renewable primary energy	MJ	2.61E+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	1.76E+00
Hazardous waste disposed	kg	2.31E-03
Non-hazardous waste disposed	kg	5.93E-02
Radioactive waste disposed	kg	0.00E+00
Components for reuse	kg	0.00E+00
Materials for recycling	kg	4.59E-01
Materials for energy recovery	kg	2.18E-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	8.94E-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 3700 lumens over a reference lifetime of 50,000 hours).

Table 11: Results core environmental impact indicators per unit of product (declared unit, 3700 lumens during 50,000 hours)

Impact category	Unit	Total	Manufacturing			Distribution	Installation	Use	End of life				Benefits and loads beyond the system boundaries stage
			A1	A2	A3	A4	A5	B6	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq	6.11E+02	2.17E+01	1.85E-01	3.83E-01	8.73E-01	1.87E-01	5.84E+02	6.10E-01	2.03E-01	2.52E+00	2.09E-01	-6.87E+00
ODP	kg CFC11 eq	1.86E-05	1.12E-05	2.95E-09	7.76E-10	1.33E-08	2.65E-09	7.30E-06	1.05E-09	4.35E-09	4.64E-08	2.56E-10	-5.13E-07
POCP	kg NMVOC eq	1.34E+00	7.49E-02	1.10E-03	1.26E-03	1.42E-02	1.10E-03	1.24E+00	5.02E-04	1.25E-03	7.82E-03	1.20E-04	-2.42E-02
AP	mol H ⁺ eq	2.76E+00	1.17E-01	7.88E-04	2.03E-03	1.78E-02	7.72E-04	2.61E+00	6.73E-04	8.22E-04	1.14E-02	7.85E-05	-3.41E-02
EP-freshwater	kg P eq	7.60E-02	1.81E-03	1.69E-06	8.20E-06	5.00E-06	2.20E-06	7.40E-02	4.91E-06	1.61E-06	1.34E-04	9.79E-07	-3.38E-03
EP-marine	kg N eq	3.79E-01	1.99E-02	2.85E-04	4.05E-04	4.59E-03	2.84E-04	3.51E-01	1.66E-04	3.09E-04	2.13E-03	2.29E-04	-7.59E-03
EP-terrestrial	mol N eq	4.48E+00	2.14E-01	3.08E-03	4.46E-03	5.07E-02	3.02E-03	4.17E+00	1.83E-03	3.32E-03	2.17E-02	3.08E-04	-7.10E-02
WDP	m ³ depriv.	8.87E+01	4.05E+00	1.33E-02	4.29E-02	3.83E-02	2.33E-02	8.34E+01	2.59E-02	1.41E-02	1.06E+00	8.45E-03	-1.31E+00
ADPE	MJ	1.38E+04	2.35E+02	2.63E+00	3.59E+00	1.12E+01	2.30E+00	1.35E+04	1.36E+00	2.91E+00	3.37E+01	1.06E-01	-9.30E+01

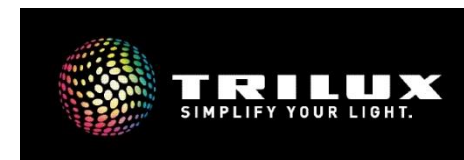


ADPF	kg Sb eq	9.18E-03	2.23E-03	5.01E-07	1.51E-06	1.35E-06	5.65E-07	6.94E-03	8.76E-07	5.37E-07	1.27E-05	2.19E-08	-3.47E-05
GWP-fossil	kg CO2 eq	6.03E+02	2.14E+01	1.85E-01	3.82E-01	8.72E-01	1.76E-01	5.77E+02	6.09E-01	2.03E-01	2.45E+00	9.51E-02	-6.80E+00
GWP-biogenic	kg CO2 eq	6.58E+00	2.79E-01	6.25E-05	7.64E-05	2.29E-04	1.03E-02	6.11E+00	3.03E-04	7.34E-05	6.86E-02	1.14E-01	-5.56E-02
GWP-lulut	kg CO2 eq	8.97E-01	3.46E-02	9.09E-05	1.51E-04	5.82E-04	8.37E-05	8.57E-01	2.13E-04	9.45E-05	3.92E-03	6.97E-06	-1.11E-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, 3700 lumens during 50,000 hours)

Indicators	Unit	Value
Renewable primary energy (without raw material)	MJ	2.39E+03
Renewable primary energy (raw material)	MJ	1.97E+01
Total use of renewable primary energy	MJ	2.41E+03
Non-renewable primary energy (without raw material)	MJ	1.38E+04
Non-renewable primary energy (raw material)	MJ	2.89E+01
Total use of non-renewable primary energy	MJ	1.38E+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	M ³	9.34E+00



Hazardous waste disposed	kg	1.22E-02
Non-hazardous waste disposed	kg	3.14E-01
Radioactive waste disposed	kg	0.00E+00
Components for reuse	kg	0.00E+00
Materials for recycling	kg	2.43E+00
Materials for energy recovery	kg	1.15E-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	4.73E-01