# ENVIRONMENTAL PRODUCT DECLARATION

## IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

**UniStreet/LumiStreet gen2 Solar**

**VGP282/VGP292/VGP393**

Signify N.V.

EPD HUB
Publishing date 2024-02-14

# GENERAL INFORMATION

## MANUFACTURER

| | |
|---|---|
| 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 |

## EPD STANDARDS, SCOPE AND VERIFICATION

| | |
|---|---|
| Program operator | EPD Hub, hub@epdhub.com |
| Reference standard | EN 15804+A2:2019 and ISO 14025 |
| PCR | EPD Hub Core PCR version 1.0, 1 Feb 2022 |
| Sector | Electrical product |
| Category of EPD | Pre-verified EPD |
| Scope of the EPD | Cradle to gate with options, A4-B7, and modules C1-C4, D |
| EPD author | Sustainability Signify |
| EPD verification | Independent verification of this EPD and data, according to ISO 14025:<br>☑ Internal certification ☐External verification |

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 lighting products may not be comparable if they do not comply with EN 15804 and if they are not compared in a lighting context.

## PRODUCT

| | |
|---|---|
| Product name | UniStreet/LumiStreet gen2 Solar Mini |
| Additional labels | VGP282 40 4S/730 24V III DM10 48/60S |
| Product reference | 910925868304 |
| Place of production | Poland |
| Period for data | 2022 |
| Averaging in EPD | No averaging |
| Variation in GWP-fossil for A1-A3 | % |

## ENVIRONMENTAL DATA SUMMARY

| | |
|---|---|
| **Declared unit** | 1 unit of 3520 lumens over 100000 hours |
| **Declared unit mass** | 4.633 kg |
| **GWP-fossil, A1-A3 (kgCO2e)** | 1.04E+02 |
| **GWP-total, A1-A3 (kgCO2e)** | 1.03E+02 |
| **Secondary material, inputs (%)** | 6.87 |
| **Secondary material, outputs (%)** | 64.3 |
| **Total energy use, A1-A3 (kWh)** | 301.0 |
| **Total water use, A1-A3 (m3e)** | 4.31E-01 |

# PRODUCT AND MANUFACTURER

## 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 DESCRIPTION

Designed for large-scale projects, our luminaire is the ideal solution for municipalities who seek to meet their sustainability goals. Thanks to its energy efficiency and low initial cost, UniStreet/UniStreet gen2 Solar enables a fast payback and significant energy savings in a short period of time. All, by using the free, abundant solar power. UniStreet/UniStreet gen2 Solar, comes with several different optics and lumen packages customized to fit exact project requirements. Thanks to Service tag, you will enjoy the benefits of hassle free installation and maintenance while at the end of its lifetime our luminaire is ready to be dismantled and recycled. The compact luminaire, using high-quality materials is also easy to dismantle and recycle at the end of its lifetime

## PRODUCT RAW MATERIAL MAIN COMPOSITION

| Raw material category | Amount, mass- % | Material origin |
|---|---|---|
| Metals | 78.03 | APAC , EU |
| Minerals | 16.19 | EU |
| Fossil materials | 5.79 | APAC , EU |
| Bio-based materials | 0 | Not applicable |

## BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

| | |
|---|---|
| Biogenic carbon content in product, kg C | 0 |
| Biogenic carbon content in packaging, kg C | 0.163 |

## FUNCTIONAL UNIT AND SERVICE LIFE

| | |
|---|---|
| Declared unit | 1 Product |
| Mass per declared unit | 4.633 kg |
| Functional unit | 1 unit of 3520 lumens over 100000 hours |
| Reference service life | 100000 hours |

## 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

## SYSTEM BOUNDARY

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

| Product stage | | | Assembly stage | | Use stage | | | | | | | End of life stage | | | | Beyond the system boundaries | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D | | |
| x | x | x | x | x | MNR | MNR | MNR | MNR | MNR | x | MNR | MNR | x | x | x | x | | |
| Raw materials | Transport | Manufacturing | Transport | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstr./demol. | Transport | Waste processing | Disposal | Reuse | Recovery | Recycling |

*Modules not relevant = MNR.*

## MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, electricity, and waste formed in the production processes at Signify's manufacturing facilities are included in this stage.

The product is made of metals, plastics, and electronic components. All components are transported to Signify's production facility, where the main manufacturing processes primarily are associated with assembly. The finished product is packaged with polyethylene, cardboard, and/or paper as packaging material before being sent 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 for the production of the studied luminaire. Thus, it is possible to allocate it according to the weight of the product analysed in this study. Some of the wastes are due to ancillary materials used during manufacturing while the rest is due to material losses.

## TRANSPORT AND INSTALLATION (A4-A5)

Transport distances were calculated on the base of the supplier location and manufacturing location and then made a cumulative group choosing the conservative scenario. Environmental impacts from installation include waste packaging materials (A5). The impacts of energy consumption and the used ancillary materials during installation are considered negligible.

## PRODUCT USE AND MAINTENANCE (B1-B7)

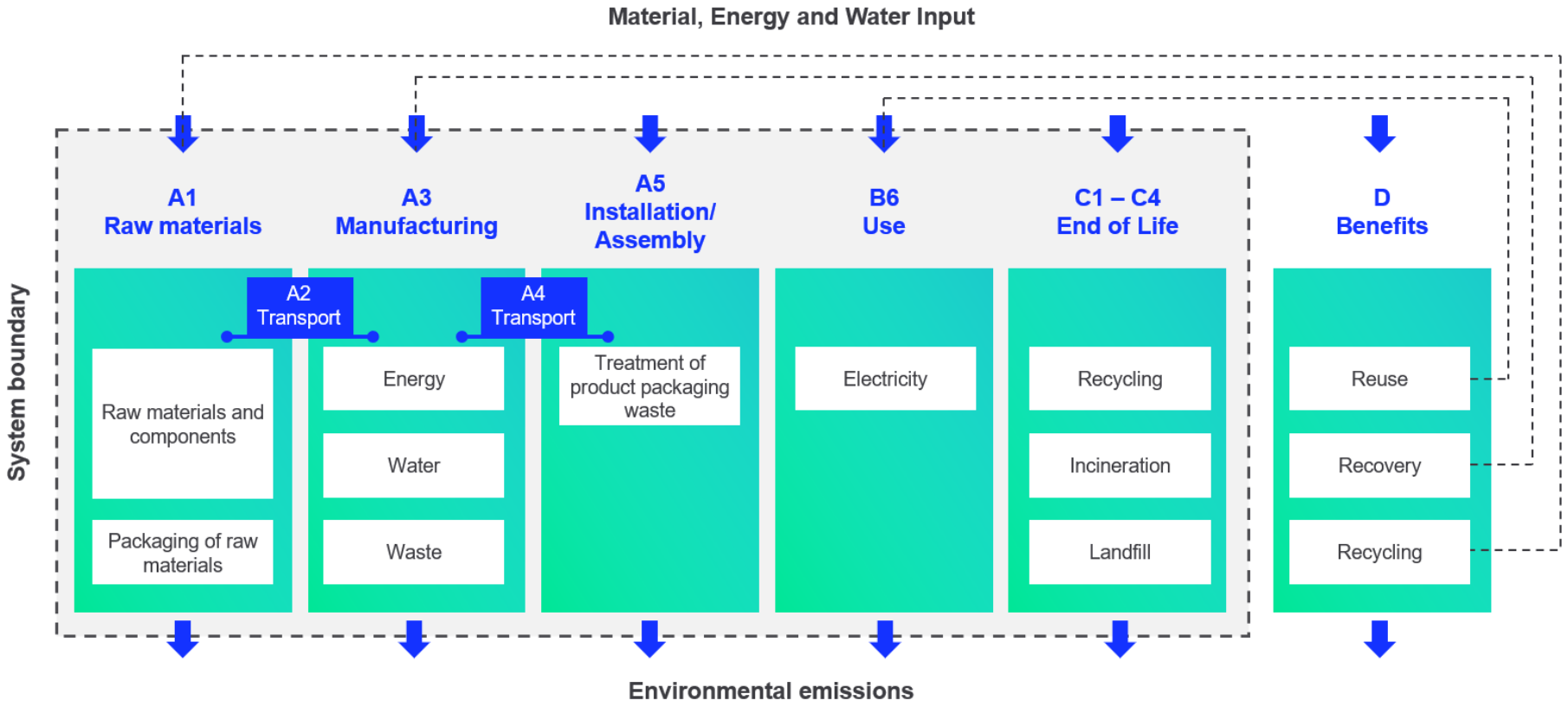
During the use phase, the product consumes electricity from Europe's electricity grid mix (B6). The total power consumption of the reference product is calculated as follows: Wattage x Reference lifetime = kWh consumed throughout the entire use phase B6.

## 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. Transportation distance to treatment is assumed as 150 km and 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.

# SYSTEM BOUNDARY



# LIFE-CYCLE ASSESSMENT

## 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. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. 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.

## 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 or volume |
| Manufacturing energy and waste | Allocated by mass or volume |

This EPD is created with a most conservative scenario in A1-A3 in terms of material composition.

## AVERAGES AND VARIABILITY

| | |
|---|---|
| Type of average | No averaging |
| Averaging method | Not applicable |
| Variation in GWP-fossil for A1-A3 | Not applicable |

This EPD is product and factory specific and does not contain average calculations. It is created with a most conservative scenario in A1-A3 in terms of material composition.

## LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. EcoInvent 3.8 database was used as the source of environmental data.

# ENVIRONMENTAL IMPACT DATA

## CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GWP – total[1)] | kg $CO_2$e | 1.02E+02 | 9.48E-01 | -5.96E-03 | 1.03E+02 | 9.46E-01 | 6.05E-01 | MNR | MNR | MNR | MNR | MNR | 8.44E+02 | MNR | MNR | 6.62E-02 | 3.07E-01 | 3.09E-01 | -4.83E+01 |
| GWP – fossil | kg $CO_2$e | 1.02E+02 | 9.47E-01 | 5.80E-01 | 1.04E+02 | 9.45E-01 | 1.61E-02 | MNR | MNR | MNR | MNR | MNR | 8.42E+02 | MNR | MNR | 6.62E-02 | 3.07E-01 | 3.09E-01 | -4.83E+01 |
| GWP – biogenic | kg $CO_2$e | -3.29E-01 | 0.00E+00 | -5.89E-01 | -9.18E-01 | 3.66E-04 | 5.89E-01 | MNR | MNR | MNR | MNR | MNR | 0.00E+00 | MNR | MNR | 0.00E+00 | 0.00E+00 | 0.00E+00 | -5.17E-03 |
| GWP – LULUC | kg $CO_2$e | 1.43E-01 | 5.94E-04 | 2.68E-03 | 1.46E-01 | 3.49E-04 | 5.28E-06 | MNR | MNR | MNR | MNR | MNR | 1.97E+00 | MNR | MNR | 2.44E-05 | 1.00E-04 | 5.93E-05 | -3.59E-03 |
| Ozone depletion pot. | kg $CFC_{-11}$e | 3.75E-06 | 1.96E-07 | 7.17E-08 | 4.02E-06 | 2.18E-07 | 1.55E-09 | MNR | MNR | MNR | MNR | MNR | 4.27E-05 | MNR | MNR | 1.52E-08 | 8.00E-09 | 5.69E-09 | -1.30E-06 |
| Acidification potential | mol $H^+$e | 6.92E-01 | 2.32E-02 | 2.43E-03 | 7.18E-01 | 4.00E-03 | 1.21E-04 | MNR | MNR | MNR | MNR | MNR | 4.81E+00 | MNR | MNR | 2.80E-04 | 8.36E-04 | 2.63E-04 | -4.81E-01 |
| EP-freshwater[2)] | kg Pe | 4.24E-03 | 4.62E-06 | 2.51E-05 | 4.27E-03 | 7.74E-06 | 1.62E-07 | MNR | MNR | MNR | MNR | MNR | 8.92E-02 | MNR | MNR | 5.42E-07 | 3.16E-06 | 9.35E-07 | -3.01E-03 |
| EP-marine | kg Ne | 1.05E-01 | 5.76E-03 | 1.12E-03 | 1.11E-01 | 1.19E-03 | 5.11E-05 | MNR | MNR | MNR | MNR | MNR | 6.38E-01 | MNR | MNR | 8.33E-05 | 1.92E-04 | 8.60E-05 | -5.36E-02 |
| EP-terrestrial | mol Ne | 1.15E+00 | 6.40E-02 | 7.03E-03 | 1.22E+00 | 1.31E-02 | 5.31E-04 | MNR | MNR | MNR | MNR | MNR | 7.26E+00 | MNR | MNR | 9.19E-04 | 2.18E-03 | 8.68E-04 | -6.17E-01 |
| POCP ("smog")[3)] | kg NMVOCe | 3.34E-01 | 1.68E-02 | 1.78E-03 | 3.52E-01 | 4.20E-03 | 1.33E-04 | MNR | MNR | MNR | MNR | MNR | 1.99E+00 | MNR | MNR | 2.94E-04 | 5.89E-04 | 2.52E-04 | -1.78E-01 |
| ADP-minerals & metals[4)] | kg Sbe | 1.11E-03 | 1.57E-06 | 3.08E-06 | 1.11E-03 | 2.22E-06 | 5.09E-08 | MNR | MNR | MNR | MNR | MNR | 7.86E-03 | MNR | MNR | 1.55E-07 | 7.54E-06 | 1.10E-07 | -1.37E-04 |
| ADP-fossil resources | MJ | 9.93E+02 | 1.26E+01 | 7.71E+00 | 1.01E+03 | 1.42E+01 | 1.20E-01 | MNR | MNR | MNR | MNR | MNR | 1.79E+04 | MNR | MNR | 9.94E-01 | 9.07E-01 | 5.67E-01 | -4.72E+02 |
| Water use[5)] | $m^3$e depr. | 1.86E+01 | 4.34E-02 | 2.19E-01 | 1.88E+01 | 6.35E-02 | 2.84E-02 | MNR | MNR | MNR | MNR | MNR | 4.90E+02 | MNR | MNR | 4.45E-03 | 2.40E-02 | 3.83E-02 | -3.09E+00 |

*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, PEF

| 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 | 7.70E-06 | 5.22E-08 | 4.42E-08 | 7.80E-06 | 1.09E-07 | 1.12E-09 | MNR | MNR | MNR | MNR | MNR | 1.58E-05 | MNR | MNR | 7.63E-09 | 1.09E-08 | 4.97E-09 | -2.60E-06 |
| Ionizing radiation[6)] | kBq U235e | 3.30E+00 | 5.84E-02 | 2.00E-02 | 3.38E+00 | 6.76E-02 | 4.35E-04 | MNR | MNR | MNR | MNR | MNR | 4.85E+02 | MNR | MNR | 4.74E-03 | 5.55E-03 | 2.88E-03 | -2.82E+00 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ecotoxicity (freshwater) | CTUe | 3.02E+03 | 9.03E+00 | 2.16E+01 | 3.05E+03 | 1.28E+01 | 8.30E-01 | MNR | MNR | MNR | MNR | MNR | 1.22E+04 | MNR | MNR | 8.94E-01 | 4.32E+00 | 3.33E+02 | -8.55E+02 |
| Human toxicity, cancer | CTUh | 1.22E-07 | 4.96E-10 | 4.12E-10 | 1.23E-07 | 3.14E-10 | 3.73E-11 | MNR | MNR | MNR | MNR | MNR | 3.99E-07 | MNR | MNR | 2.20E-11 | 1.34E-10 | 2.86E-10 | 2.56E-09 |
| Human tox. non-cancer | CTUh | 2.38E-06 | 7.05E-09 | 6.67E-09 | 2.40E-06 | 1.26E-08 | 1.56E-09 | MNR | MNR | MNR | MNR | MNR | 1.31E-05 | MNR | MNR | 8.85E-10 | 5.68E-09 | 4.71E-09 | -8.54E-07 |
| SQP[7)] | - | 2.76E+02 | 5.83E+00 | 1.65E+01 | 2.98E+02 | 1.64E+01 | 6.54E-02 | MNR | MNR | MNR | MNR | MNR | 3.24E+03 | MNR | MNR | 1.15E+00 | 1.63E+00 | 8.02E-01 | -8.59E+01 |

*6) EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator; 7) SQP = Land use related impacts/soil quality.*

## 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 | 7.01E+01 | 1.04E-01 | 6.26E+00 | 7.65E+01 | 1.60E-01 | 3.97E-03 | MNR | MNR | MNR | MNR | MNR | 3.65E+03 | MNR | MNR | 1.12E-02 | 1.30E-01 | 2.47E-02 | -6.05E+00 |
| Renew. PER as material | MJ | 2.99E+00 | 0.00E+00 | 5.16E+00 | 8.15E+00 | 0.00E+00 | -5.16E+00 | MNR | MNR | MNR | MNR | MNR | 0.00E+00 | MNR | MNR | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Total use of renew. PER | MJ | 7.31E+01 | 1.04E-01 | 1.14E+01 | 8.46E+01 | 1.60E-01 | -5.16E+00 | MNR | MNR | MNR | MNR | MNR | 3.65E+03 | MNR | MNR | 1.12E-02 | 1.30E-01 | 2.47E-02 | -6.05E+00 |
| Non-re. PER as energy | MJ | 9.86E+02 | 1.26E+01 | 7.47E+00 | 1.01E+03 | 1.42E+01 | 1.20E-01 | MNR | MNR | MNR | MNR | MNR | 1.79E+04 | MNR | MNR | 9.94E-01 | 9.08E-01 | 5.67E-01 | -4.72E+02 |
| Non-re. PER as material | MJ | 7.16E+00 | 0.00E+00 | 5.82E-02 | 7.22E+00 | 0.00E+00 | -5.82E-02 | MNR | MNR | MNR | MNR | MNR | 0.00E+00 | MNR | MNR | 0.00E+00 | -2.08E+00 | -2.08E+00 | 0.00E+00 |
| Total use of non-re. PER | MJ | 9.94E+02 | 1.26E+01 | 7.53E+00 | 1.01E+03 | 1.42E+01 | 6.19E-02 | MNR | MNR | MNR | MNR | MNR | 1.79E+04 | MNR | MNR | 9.94E-01 | -1.17E+00 | -1.51E+00 | -4.72E+02 |
| Secondary materials | kg | 3.18E-01 | 5.02E-03 | 4.00E-01 | 7.23E-01 | 3.94E-03 | 1.43E-04 | MNR | MNR | MNR | MNR | MNR | 1.84E+00 | MNR | MNR | 2.76E-04 | 8.99E-04 | 1.77E-03 | 1.97E+00 |
| Renew. secondary fuels | MJ | 4.98E-02 | 2.18E-05 | 2.83E-02 | 7.82E-02 | 3.98E-05 | 2.38E-06 | MNR | MNR | MNR | MNR | MNR | 1.50E-02 | MNR | MNR | 2.79E-06 | 4.63E-05 | 1.16E-05 | -7.73E-04 |
| Non-ren. secondary fuels | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | MNR | MNR | MNR | MNR | MNR | 0.00E+00 | MNR | MNR | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Use of net fresh water | $m^3$ | 4.25E-01 | 1.07E-03 | 5.19E-03 | 4.31E-01 | 1.84E-03 | 5.01E-04 | MNR | MNR | MNR | MNR | MNR | 1.54E+01 | MNR | MNR | 1.29E-04 | 7.77E-04 | 3.36E-04 | -1.43E-01 |

*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 | 1.88E+01 | 1.70E-02 | 2.95E-02 | 1.88E+01 | 1.88E-02 | 1.83E-04 | MNR | MNR | MNR | MNR | MNR | 6.43E+01 | MNR | MNR | 1.32E-03 | 6.47E-03 | 2.06E-03 | -7.61E+00 |
| Non-hazardous waste | kg | 1.56E+02 | 1.83E-01 | 4.73E-01 | 1.56E+02 | 3.09E-01 | 4.01E-01 | MNR | MNR | MNR | MNR | MNR | 4.07E+03 | MNR | MNR | 2.17E-02 | 3.19E-01 | 1.56E+00 | -1.36E+02 |
| Radioactive waste | kg | 1.66E-03 | 8.73E-05 | 1.29E-05 | 1.76E-03 | 9.50E-05 | 1.93E-07 | MNR | MNR | MNR | MNR | MNR | 1.30E-01 | MNR | MNR | 6.65E-06 | 3.76E-06 | 0.00E+00 | -1.04E-03 |

## 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 re-use | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | MNR | MNR | MNR | MNR | MNR | 0.00E+00 | MNR | MNR | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Materials for recycling | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | MNR | MNR | MNR | MNR | MNR | 0.00E+00 | MNR | MNR | 0.00E+00 | 2.98E+00 | 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 | MNR | MNR | MNR | MNR | MNR | 0.00E+00 | MNR | MNR | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Exported energy | MJ | 0.00E+00 | 0.00E+00 | 1.59E-01 | 1.59E-01 | 0.00E+00 | 0.00E+00 | MNR | MNR | MNR | MNR | MNR | 0.00E+00 | MNR | MNR | 0.00E+00 | 2.18E+00 | 0.00E+00 | 0.00E+00 |

## ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

| Impact category | Unit | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Global Warming Pot. | kg $CO_2$e | 9.92E+01 | 9.40E-01 | 6.00E-01 | 1.01E+02 | 9.36E-01 | 1.55E-02 | MNR | MNR | MNR | MNR | MNR | 8.34E+02 | MNR | MNR | 6.55E-02 | 3.05E-01 | 3.07E-01 | -4.73E+01 |
| Ozone depletion Pot. | kg $CFC_{-11}$e | 3.27E-06 | 1.56E-07 | 6.08E-08 | 3.48E-06 | 1.72E-07 | 1.35E-09 | MNR | MNR | MNR | MNR | MNR | 3.71E-05 | MNR | MNR | 1.21E-08 | 6.50E-09 | 4.58E-09 | -1.11E-06 |
| Acidification | kg $SO_2$e | 5.84E-01 | 1.85E-02 | 1.77E-03 | 6.04E-01 | 3.11E-03 | 8.82E-05 | MNR | MNR | MNR | MNR | MNR | 4.08E+00 | MNR | MNR | 2.18E-04 | 6.70E-04 | 2.03E-04 | -4.15E-01 |
| Eutrophication | kg $PO_4^3$e | 1.65E-01 | 2.16E-03 | 1.29E-03 | 1.69E-01 | 7.08E-04 | 6.57E-05 | MNR | MNR | MNR | MNR | MNR | 3.14E+00 | MNR | MNR | 4.96E-05 | 2.27E-04 | 4.39E-04 | -1.17E-01 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POCP (“smog”) | kg $C_2H_4e$ | 3.34E-02 | 4.87E-04 | 1.24E-04 | 3.40E-02 | 1.21E-04 | 2.76E-06 | MNR | MNR | MNR | MNR | MNR | 1.67E-01 | MNR | MNR | 8.50E-06 | 2.49E-05 | 1.38E-05 | -2.06E-02 |
| ADP-elements | kg Sbe | 1.09E-03 | 1.53E-06 | 2.70E-06 | 1.09E-03 | 2.15E-06 | 3.99E-08 | MNR | MNR | MNR | MNR | MNR | 7.84E-03 | MNR | MNR | 1.50E-07 | 7.53E-06 | 1.02E-07 | -1.33E-04 |
| ADP-fossil | MJ | 9.93E+02 | 1.26E+01 | 7.66E+00 | 1.01E+03 | 1.42E+01 | 1.20E-01 | MNR | MNR | MNR | MNR | MNR | 1.79E+04 | MNR | MNR | 9.94E-01 | 9.07E-01 | 5.67E-01 | -4.72E+02 |

# APPENDIX (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 refernce 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 A1: 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.

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

**Table A2 Scaled GWP per scaling factor (EPD Hub aligned)**

| Configuration | 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 |
| VGP282, VGP292, VGP293 LED15-4S/730/730 | 1320.0 | 7.5 | 176.0 | 0.352 | 0.352 | 0.264 | 0.264 | 0.194 | 297.1 | 222.8 | 222.8 | 163.7 |
| VGP282, VGP292, VGP293 LED17-4S/730/730 | 1496.0 | 8.6 | 174.0 | 0.404 | 0.404 | 0.303 | 0.303 | 0.222 | 341.0 | 255.7 | 255.7 | 187.4 |
| VGP282, VGP292, VGP293 LED20-4S/730/730 | 1760.0 | 10.3 | 170.9 | 0.484 | 0.484 | 0.363 | 0.363 | 0.266 | 408.5 | 306.4 | 306.4 | 224.5 |
| VGP282, VGP292, VGP293 LED22-4S/730/730 | 1936.0 | 11.4 | 169.8 | 0.535 | 0.535 | 0.401 | 0.401 | 0.294 | 451.5 | 338.4 | 338.4 | 248.1 |
| VGP282, VGP292, VGP293 LED25-4S/730/730 | 2200.0 | 13.1 | 167.9 | 0.615 | 0.615 | 0.461 | 0.461 | 0.338 | 519.1 | 389.1 | 389.1 | 285.3 |
| VGP282, VGP292, VGP293 LED30-4S/730/730 | 2640.0 | 16.0 | 165.0 | 0.751 | 0.751 | 0.563 | 0.563 | 0.413 | 633.8 | 475.2 | 475.2 | 348.6 |
| VGP282, VGP292, VGP293 LED35-4S/730/730 | 3080.0 | 18.4 | 167.4 | 0.864 | 0.864 | 0.648 | 0.648 | 0.475 | 729.2 | 546.9 | 546.9 | 400.9 |
| VGP282 40 4S/730 24V III DM10 48/60S | 3520.0 | 21.3 | 165.3 | 1.0 | 1.0 | 0.75 | 0.75 | 0.55 | 844.0 | 633.0 | 633.0 | 464.2 |
| VGP282, VGP292, VGP293 LED45-4S/730/730 | 3960.0 | 24.3 | 163.0 | 1.141 | 1.141 | 0.856 | 0.856 | 0.628 | 963.0 | 722.5 | 722.5 | 530.0 |
| VGP282, VGP292, VGP293 LED50-4S/730/730 | 4400.0 | 27.2 | 161.8 | 1.277 | 1.277 | 0.958 | 0.958 | 0.702 | 1077.8 | 808.6 | 808.6 | 592.5 |
| VGP282, VGP292, VGP293 LED55-4S/730/730 | 4840.0 | 30.2 | 160.3 | 1.418 | 1.418 | 1.063 | 1.063 | 0.78 | 1196.8 | 897.2 | 897.2 | 658.3 |
| VGP282, VGP292, VGP293 LED60-4S/730/730 | 5220.0 | 33.2 | 157.2 | 1.559 | 1.559 | 1.169 | 1.169 | 0.857 | 1315.8 | 986.6 | 986.6 | 723.3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VGP282, VGP292, VGP293 LED65-4S/730/730 | 5655.0 | 36.3 | 155.8 | 1.704 | 1.704 | 1.278 | 1.278 | 0.937 | 1438.2 | 1078.6 | 1078.6 | 790.8 |
| VGP282, VGP292, VGP293 LED70-4S/730/730 | 6090.0 | 39.4 | 154.6 | 1.85 | 1.85 | 1.388 | 1.388 | 1.018 | 1561.4 | 1171.5 | 1171.5 | 859.2 |
| VGP282, VGP292, VGP293 LED75-4S/730/730 | 6525.0 | 42.5 | 153.5 | 1.995 | 1.995 | 1.496 | 1.496 | 1.097 | 1683.8 | 1262.6 | 1262.6 | 925.9 |
| VGP282, VGP292, VGP293 LED80-4S/730/730 | 6960.0 | 45.7 | 152.3 | 2.146 | 2.146 | 1.609 | 1.609 | 1.18 | 1811.2 | 1358.0 | 1358.0 | 995.9 |
| VGP282, VGP292, VGP293 LED85-4S/730/730 | 7395.0 | 48.9 | 151.2 | 2.296 | 2.296 | 1.722 | 1.722 | 1.263 | 1937.8 | 1453.4 | 1453.4 | 1066.0 |
| VGP282, VGP292, VGP293 LED90-4S/730/730 | 7830.0 | 50.7 | 154.4 | 2.38 | 2.38 | 1.785 | 1.785 | 1.309 | 2008.7 | 1506.5 | 1506.5 | 1104.8 |
| VGP282, VGP292, VGP293 LED95-4S/730/730 | 8170.0 | 53.8 | 151.9 | 2.526 | 2.526 | 1.894 | 1.894 | 1.389 | 2131.9 | 1598.5 | 1598.5 | 1172.3 |
| VGP282, VGP292, VGP293 LED100-4S/730/730 | 8600.0 | 57.0 | 150.9 | 2.676 | 2.676 | 2.007 | 2.007 | 1.472 | 2258.5 | 1693.9 | 1693.9 | 1242.4 |
| VGP282, VGP292, VGP293 LED105-4S/730/730 | 9030.0 | 60.1 | 150.2 | 2.822 | 2.822 | 2.117 | 2.117 | 1.552 | 2381.8 | 1786.7 | 1786.7 | 1309.9 |
| VGP282, VGP292, VGP293 LED110-4S/730/730 | 9460.0 | 63.4 | 149.2 | 2.977 | 2.977 | 2.233 | 2.233 | 1.637 | 2512.6 | 1884.7 | 1884.7 | 1381.6 |
| VGP282, VGP292, VGP293 LED115-4S/730/730 | 9890.0 | 66.6 | 148.5 | 3.127 | 3.127 | 2.345 | 2.345 | 1.72 | 2639.2 | 1979.2 | 1979.2 | 1451.7 |
| VGP282, VGP292, VGP293 LED120-4S/730/730 | 10200.0 | 69.9 | 145.9 | 3.282 | 3.282 | 2.462 | 2.462 | 1.805 | 2770.0 | 2077.9 | 2077.9 | 1523.4 |
| VGP282, VGP292, VGP293 LED15-4S/740/740 | 1320.0 | 7.2 | 183.3 | 0.338 | 0.338 | 0.254 | 0.254 | 0.186 | 285.3 | 214.4 | 214.4 | 157.0 |
| VGP282, VGP292, VGP293 LED17-4S/740/740 | 1496.0 | 8.2 | 182.4 | 0.385 | 0.385 | 0.289 | 0.289 | 0.212 | 324.9 | 243.9 | 243.9 | 178.9 |
| VGP282, VGP292, VGP293 LED20-4S/740/740 | 1760.0 | 9.8 | 179.6 | 0.46 | 0.46 | 0.345 | 0.345 | 0.253 | 388.2 | 291.2 | 291.2 | 213.5 |
| VGP282, VGP292, VGP293 LED22-4S/740/740 | 1936.0 | 10.9 | 177.6 | 0.512 | 0.512 | 0.384 | 0.384 | 0.282 | 432.1 | 324.1 | 324.1 | 238.0 |
| VGP282, VGP292, VGP293 LED25-4S/740/740 | 2200.0 | 12.6 | 174.6 | 0.592 | 0.592 | 0.444 | 0.444 | 0.326 | 499.6 | 374.7 | 374.7 | 275.1 |
| VGP282, VGP292, VGP293 LED30-4S/740/740 | 2640.0 | 15.3 | 172.5 | 0.718 | 0.718 | 0.538 | 0.538 | 0.395 | 606.0 | 454.1 | 454.1 | 333.4 |
| VGP282, VGP292, VGP293 LED35-4S/740/740 | 3080.0 | 18.1 | 170.2 | 0.85 | 0.85 | 0.637 | 0.637 | 0.468 | 717.4 | 537.6 | 537.6 | 395.0 |
| VGP282, VGP292, VGP293 LED35-4S/740/740 | 3080.0 | 17.6 | 175.0 | 0.826 | 0.826 | 0.619 | 0.619 | 0.454 | 697.1 | 522.4 | 522.4 | 383.2 |
| VGP282, VGP292, VGP293 LED40-4S/740/740 | 3520.0 | 20.4 | 172.5 | 0.958 | 0.958 | 0.718 | 0.718 | 0.527 | 808.6 | 606.0 | 606.0 | 444.8 |
| VGP282, VGP292, VGP293 LED45-4S/740/740 | 3960.0 | 23.2 | 170.7 | 1.089 | 1.089 | 0.817 | 0.817 | 0.599 | 919.1 | 689.5 | 689.5 | 505.6 |
| VGP282, VGP292, VGP293 LED50-4S/740/740 | 4400.0 | 26.0 | 169.2 | 1.221 | 1.221 | 0.916 | 0.916 | 0.672 | 1030.5 | 773.1 | 773.1 | 567.2 |
| VGP282, VGP292, VGP293 LED55-4S/740/740 | 4840.0 | 28.9 | 167.5 | 1.357 | 1.357 | 1.018 | 1.018 | 0.746 | 1145.3 | 859.2 | 859.2 | 629.6 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VGP282, VGP292, VGP293 LED60-4S/740/740 | 5280.0 | 31.7 | 166.6 | 1.488 | 1.488 | 1.116 | 1.116 | 0.818 | 1255.9 | 941.9 | 941.9 | 690.4 |
| VGP282, VGP292, VGP293 LED65-4S/740/740 | 5655.0 | 34.7 | 163.0 | 1.629 | 1.629 | 1.222 | 1.222 | 0.896 | 1374.9 | 1031.4 | 1031.4 | 756.2 |
| VGP282, VGP292, VGP293 LED70-4S/740/740 | 6090.0 | 37.6 | 162.0 | 1.765 | 1.765 | 1.324 | 1.324 | 0.971 | 1489.7 | 1117.5 | 1117.5 | 819.5 |
| VGP282, VGP292, VGP293 LED75-4S/740/740 | 6525.0 | 40.6 | 160.7 | 1.906 | 1.906 | 1.429 | 1.429 | 1.048 | 1608.7 | 1206.1 | 1206.1 | 884.5 |
| VGP282, VGP292, VGP293 LED80-4S/740/740 | 6960.0 | 43.6 | 159.6 | 2.047 | 2.047 | 1.535 | 1.535 | 1.126 | 1727.7 | 1295.5 | 1295.5 | 950.3 |
| VGP282, VGP292, VGP293 LED85-4S/740/740 | 7395.0 | 46.7 | 158.4 | 2.192 | 2.192 | 1.644 | 1.644 | 1.206 | 1850.0 | 1387.5 | 1387.5 | 1017.9 |
| VGP282, VGP292, VGP293 LED90-4S/740/740 | 7830.0 | 48.4 | 161.8 | 2.272 | 2.272 | 1.704 | 1.704 | 1.25 | 1917.6 | 1438.2 | 1438.2 | 1055.0 |
| VGP282, VGP292, VGP293 LED95-4S/740/740 | 8265.0 | 51.4 | 160.8 | 2.413 | 2.413 | 1.81 | 1.81 | 1.327 | 2036.6 | 1527.6 | 1527.6 | 1120.0 |
| VGP282, VGP292, VGP293 LED100-4S/740/740 | 8700.0 | 54.4 | 159.9 | 2.554 | 2.554 | 1.915 | 1.915 | 1.405 | 2155.6 | 1616.3 | 1616.3 | 1185.8 |
| VGP282, VGP292, VGP293 LED105-4S/740/740 | 9135.0 | 57.4 | 159.1 | 2.695 | 2.695 | 2.021 | 2.021 | 1.482 | 2274.6 | 1705.7 | 1705.7 | 1250.8 |
| VGP282, VGP292, VGP293 LED110-4S/740/740 | 9460.0 | 60.5 | 156.4 | 2.84 | 2.84 | 2.13 | 2.13 | 1.562 | 2397.0 | 1797.7 | 1797.7 | 1318.3 |
| VGP282, VGP292, VGP293 LED115-4S/740/740 | 9890.0 | 63.5 | 155.7 | 2.981 | 2.981 | 2.236 | 2.236 | 1.64 | 2516.0 | 1887.2 | 1887.2 | 1384.2 |
| VGP282, VGP292, VGP293 LED120-4S/740/740 | 10320.0 | 66.7 | 154.7 | 3.131 | 3.131 | 2.348 | 2.348 | 1.722 | 2642.6 | 1981.7 | 1981.7 | 1453.4 |
| VGP282, VGP292, VGP293 LED125-4S/740/740 | 10750.0 | 69.8 | 154.0 | 3.277 | 3.277 | 2.458 | 2.458 | 1.802 | 2765.8 | 2074.6 | 2074.6 | 1520.9 |
| VGP282, VGP292, VGP293 LED129-4S/740/740 | 11094.0 | 72.3 | 153.4 | 3.394 | 3.394 | 2.546 | 2.546 | 1.867 | 2864.5 | 2148.8 | 2148.8 | 1575.7 |
| VGP282, VGP292, VGP293 LED15-4S/830/830 | 1320.0 | 8.1 | 163.0 | 0.38 | 0.38 | 0.285 | 0.285 | 0.209 | 320.7 | 240.5 | 240.5 | 176.4 |
| VGP282, VGP292, VGP293 LED17-4S/830/830 | 1496.0 | 9.3 | 160.9 | 0.437 | 0.437 | 0.328 | 0.328 | 0.24 | 368.8 | 276.8 | 276.8 | 202.6 |
| VGP282, VGP292, VGP293 LED20-4S/830/830 | 1760.0 | 11.2 | 157.1 | 0.526 | 0.526 | 0.395 | 0.395 | 0.289 | 443.9 | 333.4 | 333.4 | 243.9 |
| VGP282, VGP292, VGP293 LED22-4S/830/830 | 1936.0 | 12.5 | 154.9 | 0.587 | 0.587 | 0.44 | 0.44 | 0.323 | 495.4 | 371.4 | 371.4 | 272.6 |
| VGP282, VGP292, VGP293 LED25-4S/830/830 | 2200.0 | 14.4 | 152.8 | 0.676 | 0.676 | 0.507 | 0.507 | 0.372 | 570.5 | 427.9 | 427.9 | 314.0 |
| VGP282, VGP292, VGP293 LED30-4S/830/830 | 2640.0 | 17.6 | 150.0 | 0.826 | 0.826 | 0.619 | 0.619 | 0.454 | 697.1 | 522.4 | 522.4 | 383.2 |
| VGP282, VGP292, VGP293 LED35-4S/830/830 | 3045.0 | 21.0 | 145.0 | 0.986 | 0.986 | 0.74 | 0.74 | 0.542 | 832.2 | 624.6 | 624.6 | 457.4 |
| VGP282, VGP292, VGP293 LED40-4S/830/830 | 3480.0 | 23.5 | 148.1 | 1.103 | 1.103 | 0.827 | 0.827 | 0.607 | 930.9 | 698.0 | 698.0 | 512.3 |
| VGP282, VGP292, VGP293 LED45-4S/830/830 | 3915.0 | 26.8 | 146.1 | 1.258 | 1.258 | 0.944 | 0.944 | 0.692 | 1061.8 | 796.7 | 796.7 | 584.0 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VGP282, VGP292, VGP293 LED50-4S/830/830 | 4350.0 | 30.1 | 144.5 | 1.413 | 1.413 | 1.06 | 1.06 | 0.777 | 1192.6 | 894.6 | 894.6 | 655.8 |
| VGP282, VGP292, VGP293 LED55-4S/830/830 | 4785.0 | 33.5 | 142.8 | 1.573 | 1.573 | 1.18 | 1.18 | 0.865 | 1327.6 | 995.9 | 995.9 | 730.1 |
| VGP282, VGP292, VGP293 LED60-4S/830/830 | 5220.0 | 37.0 | 141.1 | 1.737 | 1.737 | 1.303 | 1.303 | 0.955 | 1466.0 | 1099.7 | 1099.7 | 806.0 |
| VGP282, VGP292, VGP293 LED65-4S/830/830 | 5655.0 | 40.5 | 139.6 | 1.901 | 1.901 | 1.426 | 1.426 | 1.046 | 1604.4 | 1203.5 | 1203.5 | 882.8 |
| VGP282, VGP292, VGP293 LED70-4S/830/830 | 6020.0 | 44.0 | 136.8 | 2.066 | 2.066 | 1.549 | 1.549 | 1.136 | 1743.7 | 1307.4 | 1307.4 | 958.8 |
| VGP282, VGP292, VGP293 LED75-4S/830/830 | 6450.0 | 47.6 | 135.5 | 2.235 | 2.235 | 1.676 | 1.676 | 1.229 | 1886.3 | 1414.5 | 1414.5 | 1037.3 |
| VGP282, VGP292, VGP293 LED80-4S/830/830 | 6880.0 | 51.2 | 134.4 | 2.404 | 2.404 | 1.803 | 1.803 | 1.322 | 2029.0 | 1521.7 | 1521.7 | 1115.8 |
| VGP282, VGP292, VGP293 LED85-4S/830/830 | 7310.0 | 54.9 | 133.2 | 2.577 | 2.577 | 1.933 | 1.933 | 1.417 | 2175.0 | 1631.5 | 1631.5 | 1195.9 |
| VGP282, VGP292, VGP293 LED90-4S/830/830 | 7740.0 | 56.6 | 136.7 | 2.657 | 2.657 | 1.993 | 1.993 | 1.461 | 2242.5 | 1682.1 | 1682.1 | 1233.1 |
| VGP282, VGP292, VGP293 LED95-4S/830/830 | 8075.0 | 60.2 | 134.1 | 2.826 | 2.826 | 2.119 | 2.119 | 1.554 | 2385.1 | 1788.4 | 1788.4 | 1311.6 |
| VGP282, VGP292, VGP293 LED100-4S/830/830 | 8500.0 | 63.8 | 133.2 | 2.995 | 2.995 | 2.246 | 2.246 | 1.647 | 2527.8 | 1895.6 | 1895.6 | 1390.1 |
| VGP282, VGP292, VGP293 LED105-4S/830/830 | 8925.0 | 67.4 | 132.4 | 3.164 | 3.164 | 2.373 | 2.373 | 1.74 | 2670.4 | 2002.8 | 2002.8 | 1468.6 |
| VGP282, VGP292, VGP293 LED110-4S/830/830 | 9240.0 | 71.1 | 130.0 | 3.338 | 3.338 | 2.503 | 2.503 | 1.836 | 2817.3 | 2112.5 | 2112.5 | 1549.6 |

** Note that if the product is non-dimmable, only the values for "NC (No Control)" are valid; if the driver type is PSU, only the values for "NC (No Control)"and "PS (presence sensing)" for are valid.*

# APPENDIX (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 A3: 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.

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

As described in the EPD, calculations are made based on dataset describing electricity available on the low voltage level in Europe for year 2022 (source Ecoinvent 3.8 database). This value should be adjusted depending on specific project requirements. Presented controls factors and functional unit conversion values are based on the PEP EcoPassport PSR for luminaries (PSR-0014-ed2.0-EN-2023 07 13). Please refer to this publication or contact Signify directly for more information.

**Table A4 Scale impact per scaling factor (PEP EcoPassport aligned)**

| Configuration | 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 |
| VGP282, VGP292, VGP293 LED15-4S/730/730 | 1320.0 | 7.5 | 176.0 | 0.352 | 0.093 | 0.07 | 0.07 | 0.051 | 78.5 | 59.1 | 59.1 | 43.0 |
| VGP282, VGP292, VGP293 LED17-4S/730/730 | 1496.0 | 8.6 | 174.0 | 0.404 | 0.095 | 0.071 | 0.071 | 0.052 | 80.2 | 59.9 | 59.9 | 43.9 |
| VGP282, VGP292, VGP293 LED20-4S/730/730 | 1760.0 | 10.3 | 170.9 | 0.484 | 0.096 | 0.072 | 0.072 | 0.053 | 81.0 | 60.8 | 60.8 | 44.7 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VGP282, VGP292, VGP293 LED22-4S/730/730 | 1936.0 | 11.4 | 169.8 | 0.535 | 0.097 | 0.073 | 0.073 | 0.053 | 81.9 | 61.6 | 61.6 | 44.7 |
| VGP282, VGP292, VGP293 LED25-4S/730/730 | 2200.0 | 13.1 | 167.9 | 0.615 | 0.098 | 0.074 | 0.074 | 0.054 | 82.7 | 62.5 | 62.5 | 45.6 |
| VGP282, VGP292, VGP293 LED30-4S/730/730 | 2640.0 | 16.0 | 165.0 | 0.751 | 0.1 | 0.075 | 0.075 | 0.055 | 84.4 | 63.3 | 63.3 | 46.4 |
| VGP282, VGP292, VGP293 LED35-4S/730/730 | 3080.0 | 18.4 | 167.4 | 0.864 | 0.098 | 0.074 | 0.074 | 0.054 | 82.7 | 62.5 | 62.5 | 45.6 |
| VGP282 40 4S/730 24V III DM10 48/60S | 3520.0 | 21.3 | 165.3 | 1.0 | 0.099 | 0.074 | 0.074 | 0.054 | 83.6 | 62.5 | 62.5 | 45.6 |
| VGP282, VGP292, VGP293 LED45-4S/730/730 | 3960.0 | 24.3 | 163.0 | 1.141 | 0.1 | 0.075 | 0.075 | 0.055 | 84.4 | 63.3 | 63.3 | 46.4 |
| VGP282, VGP292, VGP293 LED50-4S/730/730 | 4400.0 | 27.2 | 161.8 | 1.277 | 0.102 | 0.076 | 0.076 | 0.056 | 86.1 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED55-4S/730/730 | 4840.0 | 30.2 | 160.3 | 1.418 | 0.102 | 0.076 | 0.076 | 0.056 | 86.1 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED60-4S/730/730 | 5220.0 | 33.2 | 157.2 | 1.559 | 0.104 | 0.078 | 0.078 | 0.057 | 87.8 | 65.8 | 65.8 | 48.1 |
| VGP282, VGP292, VGP293 LED65-4S/730/730 | 5655.0 | 36.3 | 155.8 | 1.704 | 0.106 | 0.08 | 0.08 | 0.058 | 89.5 | 67.5 | 67.5 | 49.0 |
| VGP282, VGP292, VGP293 LED70-4S/730/730 | 6090.0 | 39.4 | 154.6 | 1.85 | 0.105 | 0.079 | 0.079 | 0.058 | 88.6 | 66.7 | 66.7 | 49.0 |
| VGP282, VGP292, VGP293 LED75-4S/730/730 | 6525.0 | 42.5 | 153.5 | 1.995 | 0.108 | 0.081 | 0.081 | 0.059 | 91.2 | 68.4 | 68.4 | 49.8 |
| VGP282, VGP292, VGP293 LED80-4S/730/730 | 6960.0 | 45.7 | 152.3 | 2.146 | 0.107 | 0.08 | 0.08 | 0.059 | 90.3 | 67.5 | 67.5 | 49.8 |
| VGP282, VGP292, VGP293 LED85-4S/730/730 | 7395.0 | 48.9 | 151.2 | 2.296 | 0.108 | 0.081 | 0.081 | 0.059 | 91.2 | 68.4 | 68.4 | 49.8 |
| VGP282, VGP292, VGP293 LED90-4S/730/730 | 7830.0 | 50.7 | 154.4 | 2.38 | 0.107 | 0.08 | 0.08 | 0.059 | 90.3 | 67.5 | 67.5 | 49.8 |
| VGP282, VGP292, VGP293 LED95-4S/730/730 | 8170.0 | 53.8 | 151.9 | 2.526 | 0.109 | 0.082 | 0.082 | 0.06 | 92.0 | 69.2 | 69.2 | 50.6 |
| VGP282, VGP292, VGP293 LED100-4S/730/730 | 8600.0 | 57.0 | 150.9 | 2.676 | 0.11 | 0.083 | 0.083 | 0.061 | 92.8 | 70.1 | 70.1 | 51.5 |
| VGP282, VGP292, VGP293 LED105-4S/730/730 | 9030.0 | 60.1 | 150.2 | 2.822 | 0.11 | 0.083 | 0.083 | 0.061 | 92.8 | 70.1 | 70.1 | 51.5 |
| VGP282, VGP292, VGP293 LED110-4S/730/730 | 9460.0 | 63.4 | 149.2 | 2.977 | 0.11 | 0.083 | 0.083 | 0.061 | 92.8 | 70.1 | 70.1 | 51.5 |
| VGP282, VGP292, VGP293 LED115-4S/730/730 | 9890.0 | 66.6 | 148.5 | 3.127 | 0.109 | 0.082 | 0.082 | 0.06 | 92.0 | 69.2 | 69.2 | 50.6 |
| VGP282, VGP292, VGP293 LED120-4S/730/730 | 10200.0 | 69.9 | 145.9 | 3.282 | 0.112 | 0.084 | 0.084 | 0.062 | 94.5 | 70.9 | 70.9 | 52.3 |
| VGP282, VGP292, VGP293 LED15-4S/740/740 | 1320.0 | 7.2 | 183.3 | 0.338 | 0.09 | 0.068 | 0.068 | 0.05 | 76.0 | 57.4 | 57.4 | 42.2 |
| VGP282, VGP292, VGP293 LED17-4S/740/740 | 1496.0 | 8.2 | 182.4 | 0.385 | 0.09 | 0.068 | 0.068 | 0.05 | 76.0 | 57.4 | 57.4 | 42.2 |
| VGP282, VGP292, VGP293 LED20-4S/740/740 | 1760.0 | 9.8 | 179.6 | 0.46 | 0.092 | 0.069 | 0.069 | 0.051 | 77.6 | 58.2 | 58.2 | 43.0 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VGP282, VGP292, VGP293 LED22-4S/740/740 | 1936.0 | 10.9 | 177.6 | 0.512 | 0.093 | 0.07 | 0.07 | 0.051 | 78.5 | 59.1 | 59.1 | 43.0 |
| VGP282, VGP292, VGP293 LED25-4S/740/740 | 2200.0 | 12.6 | 174.6 | 0.592 | 0.094 | 0.071 | 0.071 | 0.052 | 79.3 | 59.9 | 59.9 | 43.9 |
| VGP282, VGP292, VGP293 LED30-4S/740/740 | 2640.0 | 15.3 | 172.5 | 0.718 | 0.095 | 0.071 | 0.071 | 0.052 | 80.2 | 59.9 | 59.9 | 43.9 |
| VGP282, VGP292, VGP293 LED35-4S/740/740 | 3080.0 | 18.1 | 170.2 | 0.85 | 0.097 | 0.073 | 0.073 | 0.053 | 81.9 | 61.6 | 61.6 | 44.7 |
| VGP282, VGP292, VGP293 LED35-4S/740/740 | 3080.0 | 17.6 | 175.0 | 0.826 | 0.094 | 0.071 | 0.071 | 0.052 | 79.3 | 59.9 | 59.9 | 43.9 |
| VGP282, VGP292, VGP293 LED40-4S/740/740 | 3520.0 | 20.4 | 172.5 | 0.958 | 0.095 | 0.071 | 0.071 | 0.052 | 80.2 | 59.9 | 59.9 | 43.9 |
| VGP282, VGP292, VGP293 LED45-4S/740/740 | 3960.0 | 23.2 | 170.7 | 1.089 | 0.096 | 0.072 | 0.072 | 0.053 | 81.0 | 60.8 | 60.8 | 44.7 |
| VGP282, VGP292, VGP293 LED50-4S/740/740 | 4400.0 | 26.0 | 169.2 | 1.221 | 0.098 | 0.074 | 0.074 | 0.054 | 82.7 | 62.5 | 62.5 | 45.6 |
| VGP282, VGP292, VGP293 LED55-4S/740/740 | 4840.0 | 28.9 | 167.5 | 1.357 | 0.098 | 0.074 | 0.074 | 0.054 | 82.7 | 62.5 | 62.5 | 45.6 |
| VGP282, VGP292, VGP293 LED60-4S/740/740 | 5280.0 | 31.7 | 166.6 | 1.488 | 0.098 | 0.074 | 0.074 | 0.054 | 82.7 | 62.5 | 62.5 | 45.6 |
| VGP282, VGP292, VGP293 LED65-4S/740/740 | 5655.0 | 34.7 | 163.0 | 1.629 | 0.101 | 0.076 | 0.076 | 0.056 | 85.2 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED70-4S/740/740 | 6090.0 | 37.6 | 162.0 | 1.765 | 0.101 | 0.076 | 0.076 | 0.056 | 85.2 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED75-4S/740/740 | 6525.0 | 40.6 | 160.7 | 1.906 | 0.103 | 0.077 | 0.077 | 0.057 | 86.9 | 65.0 | 65.0 | 48.1 |
| VGP282, VGP292, VGP293 LED80-4S/740/740 | 6960.0 | 43.6 | 159.6 | 2.047 | 0.102 | 0.076 | 0.076 | 0.056 | 86.1 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED85-4S/740/740 | 7395.0 | 46.7 | 158.4 | 2.192 | 0.103 | 0.077 | 0.077 | 0.057 | 86.9 | 65.0 | 65.0 | 48.1 |
| VGP282, VGP292, VGP293 LED90-4S/740/740 | 7830.0 | 48.4 | 161.8 | 2.272 | 0.102 | 0.076 | 0.076 | 0.056 | 86.1 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED95-4S/740/740 | 8265.0 | 51.4 | 160.8 | 2.413 | 0.101 | 0.076 | 0.076 | 0.056 | 85.2 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED100-4S/740/740 | 8700.0 | 54.4 | 159.9 | 2.554 | 0.102 | 0.076 | 0.076 | 0.056 | 86.1 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED105-4S/740/740 | 9135.0 | 57.4 | 159.1 | 2.695 | 0.102 | 0.076 | 0.076 | 0.056 | 86.1 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED110-4S/740/740 | 9460.0 | 60.5 | 156.4 | 2.84 | 0.105 | 0.079 | 0.079 | 0.058 | 88.6 | 66.7 | 66.7 | 49.0 |
| VGP282, VGP292, VGP293 LED115-4S/740/740 | 9890.0 | 63.5 | 155.7 | 2.981 | 0.104 | 0.078 | 0.078 | 0.057 | 87.8 | 65.8 | 65.8 | 48.1 |
| VGP282, VGP292, VGP293 LED120-4S/740/740 | 10320.0 | 66.7 | 154.7 | 3.131 | 0.106 | 0.08 | 0.08 | 0.058 | 89.5 | 67.5 | 67.5 | 49.0 |
| VGP282, VGP292, VGP293 LED125-4S/740/740 | 10750.0 | 69.8 | 154.0 | 3.277 | 0.108 | 0.081 | 0.081 | 0.059 | 91.2 | 68.4 | 68.4 | 49.8 |
| VGP282, VGP292, VGP293 LED129-4S/740/740 | 11094.0 | 72.3 | 153.4 | 3.394 | 0.109 | 0.082 | 0.082 | 0.06 | 92.0 | 69.2 | 69.2 | 50.6 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VGP282, VGP292, VGP293 LED15-4S/830/830 | 1320.0 | 8.1 | 163.0 | 0.38 | 0.101 | 0.076 | 0.076 | 0.056 | 85.2 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED17-4S/830/830 | 1496.0 | 9.3 | 160.9 | 0.437 | 0.102 | 0.076 | 0.076 | 0.056 | 86.1 | 64.1 | 64.1 | 47.3 |
| VGP282, VGP292, VGP293 LED20-4S/830/830 | 1760.0 | 11.2 | 157.1 | 0.526 | 0.105 | 0.079 | 0.079 | 0.058 | 88.6 | 66.7 | 66.7 | 49.0 |
| VGP282, VGP292, VGP293 LED22-4S/830/830 | 1936.0 | 12.5 | 154.9 | 0.587 | 0.106 | 0.08 | 0.08 | 0.058 | 89.5 | 67.5 | 67.5 | 49.0 |
| VGP282, VGP292, VGP293 LED25-4S/830/830 | 2200.0 | 14.4 | 152.8 | 0.676 | 0.107 | 0.08 | 0.08 | 0.059 | 90.3 | 67.5 | 67.5 | 49.8 |
| VGP282, VGP292, VGP293 LED30-4S/830/830 | 2640.0 | 17.6 | 150.0 | 0.826 | 0.11 | 0.083 | 0.083 | 0.061 | 92.8 | 70.1 | 70.1 | 51.5 |
| VGP282, VGP292, VGP293 LED35-4S/830/830 | 3045.0 | 21.0 | 145.0 | 0.986 | 0.113 | 0.085 | 0.085 | 0.062 | 95.4 | 71.7 | 71.7 | 52.3 |
| VGP282, VGP292, VGP293 LED40-4S/830/830 | 3480.0 | 23.5 | 148.1 | 1.103 | 0.111 | 0.083 | 0.083 | 0.061 | 93.7 | 70.1 | 70.1 | 51.5 |
| VGP282, VGP292, VGP293 LED45-4S/830/830 | 3915.0 | 26.8 | 146.1 | 1.258 | 0.112 | 0.084 | 0.084 | 0.062 | 94.5 | 70.9 | 70.9 | 52.3 |
| VGP282, VGP292, VGP293 LED50-4S/830/830 | 4350.0 | 30.1 | 144.5 | 1.413 | 0.113 | 0.085 | 0.085 | 0.062 | 95.4 | 71.7 | 71.7 | 52.3 |
| VGP282, VGP292, VGP293 LED55-4S/830/830 | 4785.0 | 33.5 | 142.8 | 1.573 | 0.115 | 0.086 | 0.086 | 0.063 | 97.1 | 72.6 | 72.6 | 53.2 |
| VGP282, VGP292, VGP293 LED60-4S/830/830 | 5220.0 | 37.0 | 141.1 | 1.737 | 0.116 | 0.087 | 0.087 | 0.064 | 97.9 | 73.4 | 73.4 | 54.0 |
| VGP282, VGP292, VGP293 LED65-4S/830/830 | 5655.0 | 40.5 | 139.6 | 1.901 | 0.118 | 0.088 | 0.088 | 0.065 | 99.6 | 74.3 | 74.3 | 54.9 |
| VGP282, VGP292, VGP293 LED70-4S/830/830 | 6020.0 | 44.0 | 136.8 | 2.066 | 0.12 | 0.09 | 0.09 | 0.066 | 101.3 | 76.0 | 76.0 | 55.7 |
| VGP282, VGP292, VGP293 LED75-4S/830/830 | 6450.0 | 47.6 | 135.5 | 2.235 | 0.121 | 0.091 | 0.091 | 0.067 | 102.1 | 76.8 | 76.8 | 56.5 |
| VGP282, VGP292, VGP293 LED80-4S/830/830 | 6880.0 | 51.2 | 134.4 | 2.404 | 0.123 | 0.092 | 0.092 | 0.068 | 103.8 | 77.6 | 77.6 | 57.4 |
| VGP282, VGP292, VGP293 LED85-4S/830/830 | 7310.0 | 54.9 | 133.2 | 2.577 | 0.124 | 0.093 | 0.093 | 0.068 | 104.7 | 78.5 | 78.5 | 57.4 |
| VGP282, VGP292, VGP293 LED90-4S/830/830 | 7740.0 | 56.6 | 136.7 | 2.657 | 0.12 | 0.09 | 0.09 | 0.066 | 101.3 | 76.0 | 76.0 | 55.7 |
| VGP282, VGP292, VGP293 LED95-4S/830/830 | 8075.0 | 60.2 | 134.1 | 2.826 | 0.122 | 0.091 | 0.091 | 0.067 | 103.0 | 76.8 | 76.8 | 56.5 |
| VGP282, VGP292, VGP293 LED100-4S/830/830 | 8500.0 | 63.8 | 133.2 | 2.995 | 0.123 | 0.092 | 0.092 | 0.068 | 103.8 | 77.6 | 77.6 | 57.4 |
| VGP282, VGP292, VGP293 LED105-4S/830/830 | 8925.0 | 67.4 | 132.4 | 3.164 | 0.123 | 0.092 | 0.092 | 0.068 | 103.8 | 77.6 | 77.6 | 57.4 |
| VGP282, VGP292, VGP293 LED110-4S/830/830 | 9240.0 | 71.1 | 130.0 | 3.338 | 0.127 | 0.095 | 0.095 | 0.07 | 107.2 | 80.2 | 80.2 | 59.1 |

** Note that if the product is non-dimmable, only the values for "NC (No Control)" are valid; if the driver type is PSU, only the values for "NC (No Control)"and "PS (presence sensing)" for are valid.*