

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire
Product Category

BEGA



At BEGA, we believe companies must learn to live lightly, lift people up, and do everything possible to leave our planet better than we found it. Sustainable resource management and the creation of exemplary production facilities, for both our workforce and the environment, have been part of BEGA's basic entrepreneurial principles from the very beginning. We understand success is not just reflected in the profit and loss statement, and fundamentally believe in our ability to do good by being good.

Environmental Product Declaration for BEGA Product(s):

77069

In-grade 24V DC luminaire with twin 90° light apertures.



Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and EN 15804+A2. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

| | |
|---|--|
| EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE | ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428 USA |
| GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER | ASTM, General Program Instructions, v8.0, April 29, 2020 |
| MANUFACTURER NAME AND ADDRESS | BEGA North America 1000 BEGA Way, Carpinteria, CA 93013 United States of America |
| DECLARATION NUMBER | EPD 816 |
| DECLARED PRODUCT & FUNCTIONAL UNIT | Ground Mounted Luminaire Product Functional Unit = 1 system involving a luminaire, a lamp or a component for a luminaire |
| REFERENCE PCR AND VERSION NUMBER | PCR for Building-Related Products and Services, Institut Bauen und Umwelt e.V. (IBU) - Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Re-report according to EN 15804+A2:2019, Version 1.4, 15.04.2024. Part B: Requirements on the EPD for Luminaires, lamps and components for luminaires, V12, 30/09/2024 |
| DESCRIPTION OF PRODUCT(S) APPLICATION/USE | Outdoor architectural lighting products |
| PRODUCT RSL DESCRIPTION | 10 years |
| MARKETS OF APPLICABILITY | North America |
| DATE OF ISSUE | 11/22/2024 |
| PERIOD OF VALIDITY | 5 years |
| EPD TYPE | Product Specific |
| DATASET VARIABILITY | N/A |
| EPD SCOPE | Cradle-to-Grave and Module D (A + B + C + D) |
| YEAR(S) OF REPORTED PRIMARY DATA | 2023 |
| LCA SOFTWARE & VERSION NUMBER | LCA for Experts 10.8.0.14 |
| LCI DATABASE(S) & VERSION NUMBER | LCA for Experts Sphera database & USLCI v2.0 |
| LCIA METHODOLOGY & VERSION NUMBER | TRACI 2.1; CML 4.1; EN 15804+A2 |
| The sub-category PCR review was conducted by: | Institut Bauen und Umwelt e.V. |
| <p>This declaration was independently verified in accordance with ISO 14025: 2006. The IBU: Product Category Rules for Building-Related Products and Services, Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, based on EN 15804+A2 serves as the core PCR.</p> <div> <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL </div> | Tim Brooke, ASTM International |
| <p>This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:</p> | Lindita Bushi, PhD, Athena Sustainable Materials Institute |

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance using EPD information shall consider all relevant information modules over the full life cycle of the products within the building. This PCR allows EPD comparability only when the same functional requirements between products are ensured and the requirements of EN 15804+A2 §5.5 are met. It should be noted that different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

General Information

Description of Company/Organization

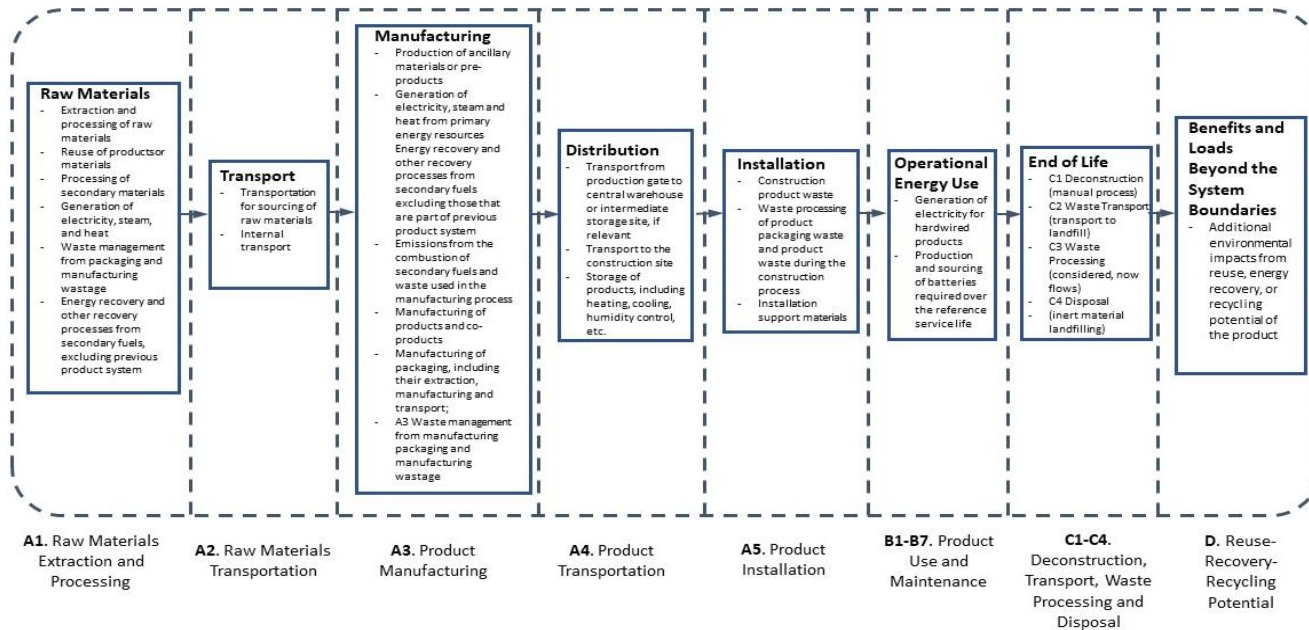
BEGA North America is a leading manufacturer of high-quality outdoor architectural lighting and furniture solutions, with a state-of-the-art manufacturing facilities in Carpinteria, CA, and Broomfield, CO. BEGA has an unwavering commitment to quality above all, in our people, products, partners, and processes.

Product Description

In-grade luminaire to illuminate ground surfaces. Equipped with two 90° light apertures to create a visual boundary on the edge of a pathway. These luminaires affix to a recessed BEGA junction box, supplied with luminaire, eliminating the need for deep recessed housings. Features include:

- 2700K (K27), 3000K (K3), 3500K (K35), 4000K (K4)
- Borosilicate glass
- Marine grade, copper free ($\leq 0.3\%$ copper content) A360.0 aluminum alloy
- High temperature silicone gasket
- Pure anodized aluminum reflector

Flow Diagram



Manufacturer Specific EPD

This product-specific EPD was developed based on the Cradle-to-Grave Life Cycle Assessment. This EPD represents BEGA North America's Carpinteria, CA facility. The EPD accounts for raw material extraction and processing, transport, product manufacturing, distribution, installation, maintenance, disposal, and potential benefits and loads following the end of life disposal. Manufacturing data were gathered directly from company personnel. When updated company-specific data were not available the ratio of production units, within the 2023 calendar year, was used as a proxy. For any product group EPDs, an impact assessment was completed for each product and the highest impacts were reported as conservative representations of the product group. Product grouping was considered appropriate if the individual product impacts differed by no more than $\pm 10\%$ in any impact category.

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

Application

This type of luminaire has a robust and low profile design, making them perfect for public or high-traffic areas. These in-ground fixtures are suitable for either new, poured concrete construction, or can be installed in pre-cored holes for use with materials such as stone or tile. They are designed to bear pressure loads up to 2200 lbs. from vehicles with pneumatic tires. The luminaires must not be used for traffic lanes where they are subject to horizontal pressure from vehicles braking, accelerating and changing direction.

Material Composition

The primary product components and/or materials must be indicated as a percentage mass to enable the user of the EPD to understand the composition of the product in delivery status.

The composition of the Ground Mounted Luminaire product is as follows:

| Material | B77069 |
|-------------------|----------------|
| Aluminum | 1.24% |
| Recycled Aluminum | 67.14% |
| Cardboard | 7.49% |
| Copper | 0.07% |
| Glass | 2.40% |
| Plastic | 2.70% |
| Silicone | 1.42% |
| Stainless Steel | 17.53% |
| Total | 100.00% |

Technical Data

For the declared product, the following technical data in the delivery status must be provided with reference to the test standard:

| Technical Data | |
|---------------------------|--------------------------|
| Product | B77069 |
| Dimensions | 6 1/4" x 1 1/2" x 1 3/4" |
| Weight | 2.1 lbs |
| Operating voltage | 24V DC |
| Minimum start temperature | n/a |
| LED module wattage | 1.3 W |
| System wattage | 1.5 W |
| Controllability | Non-dimming |
| Color rendering index | Ra > 80 |
| Luminaire lumens | 10 lm |
| LED service life (L70) | 60000 hrs |

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

Placing on the Market / Application Rules

The Ground Mounted Luminaire Products conform to the certifications and sustainability regulations below:

- NRTL listed to North American Standards, suitable for wet locations
- Protection class IP 67

Properties of Declared Product as Shipped

Packaging varies according to order quantity. Products are shipped in cardboard boxes and packaging may include plastic wrap and/or shrink wrap, edge protectors, cardboard dividers, vinyl strapping material, packaging tape, and labels. Wood pallets are used with larger shipments.

Methodological Framework

Functional Unit

The declaration refers to the functional unit of 1 system involving a luminaire, a lamp or a component for a luminaire as specified in the PCR.

| Product | B77069 |
|-----------------------------|---|
| Functional unit | 1 system involving a luminaire, a lamp or a component for a luminaire |
| Mass (kg / Functional Unit) | 0.95 |

System Boundary

This is a Cradle-to-Grave and Module D (A + B + C + D) Environmental Product Declaration.

The following life cycle phases were considered:

| Product Stage | | | Construction Process Stage | | Use Stage | | | | | | | End of Life Stage* | | | | Benefits and Loads Beyond the System Boundaries |
|---------------------|-----------|---------------|---------------------------------|------------------------------------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|----------|---|
| Raw material supply | Transport | Manufacturing | Transport from gate to the site | Construction/ installation process | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction /demolition | Transport | Waste processing | Disposal | Reuse-Recovery- Recycling potential |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

Description of the System Boundary Stages Corresponding to the PCR

(X = Included; MND = Module Not Declared)

*This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues.

Any stages not reported have an impact value of 0.

Reference Service Life

The lifetime of this Luminaire Product is 10 years. The building estimated service life is 75 years.

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

Allocation

Allocation was determined on a per kilogram basis for primary data. For secondary data, cut-off methodology was used. All upstream recycling benefits that would have been accounted for in module A1 were nullified and accounted for in module D to avoid allocation by system expansion within the system boundaries.

Cut-off Criteria

Processes whose total contribution to the final result, with respect to their mass and in relation to all considered impact categories, is less than 1% can be neglected. The sum of the neglected processes may not exceed 5% by mass of the considered impact categories. For that a documented assumption is admissible.

For Hazardous Substances the following requirements apply:

- The Life Cycle Inventory (LCI) of hazardous substances will be included, if the inventory is available.
- If the LCI for a hazardous substance is not available, the substance will appear as an input in the LCI of the product, if its mass represents more than 0.1% of the product composition.
- If the LCI of a hazardous substance is approximated by modeling another substance, documentation will be provided.

This EPD is in compliance with the cut-off criteria. No processes were neglected or excluded. Capital items for the production processes (machine, buildings, etc.) were not taken into consideration.

Data Sources

Primary data were collected for every process in the product system under the control of BEGA North America. Secondary data from the LCA for Experts Sphera database & USLCI v2.0 databases were utilized. These data were evaluated and have temporal, geographic, and technical coverage appropriate to the scope of this Luminaire Products product category.

Data Quality

The data sources used are complete and representative of North America in terms of the geographic and technological coverage and are a recent vintage (i.e. less than ten years old). The data used for primary data are based on direct information sources of the manufacturer. Secondary data sets were used for raw materials extraction and processing, end of life, transportation, and energy production flows. Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty.

Period Under Review

The period under review is the full calendar year of 2023.

Treatment of Biogenic Carbon

The uptake and release of biogenic carbon throughout the product life cycle follows EN 15804+A2.

Comparability and Benchmarking

A comparison or an evaluation of EPD data is only possible if all data sets to be compared were created according to EN 15804+A2 and the building context, respectively the product-specific characteristics of performance, are taken into account. Environmental declarations from different programs may not be comparable. Full conformance with the IBU: Product Category Rules for Building-Related Products and Services, Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, v.1.3, August 2021 and IBU: Product Category Rules Part B: Requirements on the EPD for Luminaires, lamps and components for luminaires, Version 7, Published August 2023. allows EPD comparability only when all stages of the product's life cycle have been considered. However, variations and deviations are possible.

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

Estimates and Assumptions

End of Life

The 2021 PEP ecopassport Product Category Rules for Electrical, Electronic and HVAC-R Products, steel and other ferrous metals applies 20% landfill disposed and 80% recycled end of life parameters. As a result, in the End of Life phase, metal materials were assumed to have an 80% recycling rate and 20% landfill rate. All other materials were assumed to have a 100% landfill rate.

Units

The LCA results within this EPD are reported in SI units.

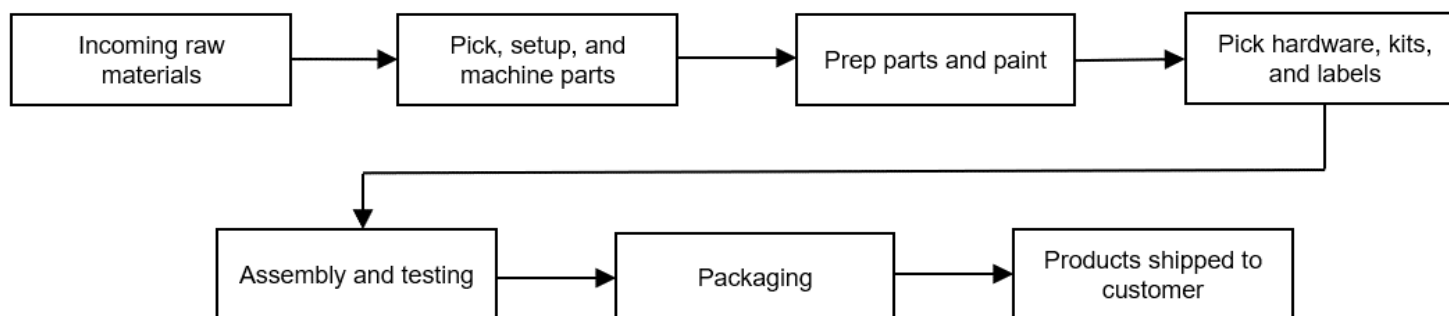
LCA: Scenarios and Additional Technical Information

Background data

For life cycle modeling of the considered products, the LCA for Experts for Life Cycle Engineering, developed by Sphera, is used. The LCA for Experts-database contains consistent and documented datasets which are documented in the online LCA for Experts-documentation. To ensure comparability of results in the LCA, the basic data of the LCA for Experts database were used for energy, transportation and auxiliary materials.

Manufacturing

Materials are received on-site and sent to storage. When a purchase order requiring certain parts is created and scheduled, the required parts are picked and brought to the machine shop area where they are machined as required. If the product requires painting, the components will then go through the painting process. After that, all required parts as well as necessary hardware are prepared into kits and labeled. Next the kit components are assembled and tested and finally assembled. The products are then packaged and shipped from the manufacturing gate.



Packaging

The packaging material is composed of plastic wrap, paper, cardboard, and tape as listed below.

| | | Product |
|--------------------|------------------------|---------|
| Packaging Material | Unit | B77069 |
| Plastic Wrap | kg per Functional Unit | 0.04764 |
| Paper | | 0.00002 |
| Cardboard | | 0.00604 |
| Tape | | 0.00033 |

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

Transportation

| Transport to Building Site (A4) | | |
|---|---------|--------|
| Name | Unit | B77069 |
| Fuel type | - | Diesel |
| Liters of fuel (for freight (combination) truck with a 32t payload) | l/100km | 38 |
| Capacity utilization (including empty runs) | % | 90 |
| Capacity utilization volume factor | - | 1 |
| Transport distance | km | 500 |
| Gross mass of products transported | kg | 0.95 |

Product Installation

Product(s) installed by luminaire industry professionals following national and local guidelines.

| Installation into the building (A5) | | |
|---|--------|--------------------|
| Name | B77069 | Unit per FU |
| Auxiliary materials | 0.54 | kg |
| Auxiliary material transport (Truck) | 71.14 | km |
| Auxiliary material transport (Ship) | 8325 | km |
| Water consumption | 0.00 | m ³ |
| Other resources | 0.00 | kg |
| Electricity consumption | 0.00 | kWh |
| Other energy carriers | 0.00 | MJ |
| Product loss per functional unit | 0.05 | kg |
| Waste materials at install site | 0.10 | kg |
| Output substance (recycle) | 0.02 | kg |
| Output substance (landfill) | 0.01 | kg |
| Output substance (incineration) | 0.00 | kg |
| Packaging waste (recycle) | 0.00 | kg |
| Packaging waste (landfill) | 0.03 | kg |
| Packaging waste (incineration) | 0.00 | kg |
| Direct emissions to ambient air*, soil, and water | 0.02 | kg CO ₂ |
| VOC emissions | - | kg |

*CO₂ emissions to air from disposal of packaging

The replacement (B4) stage is the sum of the impacts for the life cycle of the product (A1+A2+A3+A4+A5+C1+C2+C3+C4) multiplied by the number of times it is replaced during the 75 year Estimated Building Service Life (ESBL), with the number of replacement within that ESBL based upon the product's Reference Service Life (RSL).

| Replacement (B4) | | |
|--|--------|--------------|
| Name | B77069 | Unit per FU |
| Reference Service Life (RSL) | 10 | years |
| Estimated Building Service Life (ESBL) | 75 | years |
| Number of replacements / EBSL | 6.5 | replacements |
| Electricity consumption | 0 | kWh |
| Litres of fuel | 0 | l/100km |
| Replacement of worn parts | 0 | kg |

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

Product Use

The operational energy use phase involves the operational usage of the luminaire product during its Estimated Building Service Life (EBSL).

| Operational Energy Use (B6) | | |
|-----------------------------|--------|----------------|
| Name | B77069 | Unit per EBSL |
| Water consumption | - | m ³ |
| Electricity consumption | 205.3 | kWh |
| Other energy carriers | 0.0 | MJ |
| Equipment output | - | kW |

Disposal

The product can be mechanically disassembled to separate the different materials. 80% of the metal materials used are recyclable. The remainder of components are disposed of according to standard municipal solid waste deposition.

| End of life (C1-C4) | | |
|---------------------------------------|--------|------|
| Name | B77069 | Unit |
| Collected separately | 0.65 | kg |
| Collected as mixed construction waste | 0.30 | kg |
| Reuse | 0.00 | kg |
| Recycling | 0.65 | kg |
| Landfilling | 0.30 | kg |
| Energy recovery | 0.00 | kg |

Re-use Phase

The product is not typically reused during its reference service life. At the end of life, metal components can be mechanically separated and 80% are recycled. The remaining metals and other materials are sent 100% to landfill.

| Re-Use, Recovery, and/or Recycling Potential (D) | | |
|---|--|------|
| Name | Value | Unit |
| Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6) | 0.00 | MJ |
| Net energy benefit from thermal energy due to treatment of waste declared as exported energy in C4 (R<0.6) | 0.00 | MJ |
| Net energy benefit from material flow declared in C3 for energy recovery | 0.00 | MJ |
| Process and conversion efficiencies | - | |
| Further assumptions for scenario development (e.g. further processing technologies, assumptions on correction factors); | 80% of product metal materials are recycled at the end of life (Module D). | |

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

Ground Mounted Luminaire B77069 Results per Functional Unit Over the Building Lifetime of 75 Years - Including Replacements

Results shown below were calculated using TRACI 2.1 Methodology.

| TRACI 2.1 Impact Assessment | | | | | | | | | | | | |
|-----------------------------|--|-------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| Parameter | Parameter | Unit | A1-A3 | A4 | A5 | B4 | B6 | C1 | C2 | C3 | C4 | D |
| GWP | Global warming potential | kg CO ₂ -Eq. | 5.8E+00 | 4.4E-02 | 4.7E-02 | 3.9E+01 | 9.7E+01 | 0.0E+00 | 8.8E-03 | 0.0E+00 | 1.4E-01 | -1.4E+00 |
| ODP | Depletion potential of the stratospheric ozone layer | kg CFC-11 Eq. | 3.4E-11 | 1.7E-12 | 1.6E-13 | 2.3E-10 | 1.1E-11 | 0.0E+00 | 3.3E-13 | 0.0E+00 | 4.8E-16 | -1.6E-13 |
| AP Air | Acidification potential for air emissions | kg SO ₂ -Eq. | 3.4E-02 | 2.7E-04 | 1.7E-03 | 2.4E-01 | 1.2E-01 | 0.0E+00 | 5.3E-05 | 0.0E+00 | 6.6E-04 | -5.3E-03 |
| EP | Eutrophication potential | kg N-Eq. | 1.1E-03 | 1.5E-05 | 1.7E-04 | 9.9E-03 | 1.0E-02 | 0.0E+00 | 2.9E-06 | 0.0E+00 | 2.1E-04 | -2.3E-04 |
| SP | Smog formation potential | kg O ₃ -Eq. | 4.2E-01 | 7.3E-03 | 3.1E-02 | 3.0E+00 | 1.8E+00 | 0.0E+00 | 1.5E-03 | 0.0E+00 | 2.1E-03 | -7.5E-02 |
| FFD | Fossil Fuel Depletion | MJ-surplus | 1.2E+01 | 7.8E-02 | 2.1E-01 | 8.0E+01 | 1.0E+02 | 0.0E+00 | 1.6E-02 | 0.0E+00 | 2.0E-02 | -1.3E+00 |

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results shown below were calculated using CML 2001 - April 2016 Methodology.

| CML 4.1 Impact Assessment | | | | | | | | | | | | |
|---------------------------|--|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| Parameter | Parameter | Unit | A1-A3 | A4 | A5 | B4 | B6 | C1 | C2 | C3 | C4 | D |
| GWP | Global warming potential | kg CO ₂ -Eq. | 5.9E+00 | 4.4E-02 | 4.9E-02 | 4.0E+01 | 9.8E+01 | 0.0E+00 | 8.9E-03 | 0.0E+00 | 1.5E-01 | -1.4E+00 |
| ODP | Depletion potential of the stratospheric ozone layer | kg CFC-11 Eq. | 5.8E-11 | 1.7E-12 | 3.8E-13 | 3.9E-10 | 6.6E-10 | 0.0E+00 | 3.3E-13 | 0.0E+00 | 2.8E-14 | -9.2E-12 |
| AP Air | Acidification potential for air emissions | kg SO ₂ -Eq. | 3.5E-02 | 2.2E-04 | 1.6E-03 | 2.4E-01 | 1.2E-01 | 0.0E+00 | 4.4E-05 | 0.0E+00 | 3.1E-04 | -5.3E-03 |
| EP | Eutrophication potential | kg(PO ₄) ³ -Eq. | 2.6E-03 | 3.9E-05 | 2.5E-04 | 2.1E-02 | 1.3E-02 | 0.0E+00 | 7.8E-06 | 0.0E+00 | 3.0E-04 | -4.5E-04 |
| POCP | Formation potential of tropospheric ozone | kg C ₂ H ₄ -Eq. | 2.3E-03 | 2.6E-05 | 1.0E-04 | 1.7E-02 | 1.0E-02 | 0.0E+00 | 5.1E-06 | 0.0E+00 | 9.0E-05 | -3.8E-04 |
| ADPE | Abiotic depletion potential for non-fossil resources | kg Sb-Eq. | 2.8E-05 | 1.8E-11 | 2.5E-05 | 3.4E-04 | 1.2E-05 | 0.0E+00 | 3.7E-12 | 0.0E+00 | 3.2E-09 | -9.8E-06 |
| ADPF | Abiotic depletion potential for fossil resources | MJ | 1.0E+02 | 5.6E-01 | 1.9E+00 | 6.7E+02 | 1.2E+03 | 0.0E+00 | 1.1E-01 | 0.0E+00 | 1.5E-01 | -1.5E+01 |

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results below contain the resource use throughout the life cycle of the product.

| EN15804+A2 – Core environmental indicators, units and models | | | | | | | | | | | | |
|--|--|--|----------|---------|----------|----------|---------|---------|---------|---------|---------|----------|
| Parameter | Parameter | Unit | A1-A3 | A4 | A5 | B4 | B6 | C1 | C2 | C3 | C4 | D |
| GWP-total | Climate change - total | kg CO ₂ -Eq. | 6.1E+00 | 4.5E-02 | 5.5E-02 | 4.2E+01 | 1.0E+02 | 0.0E+00 | 9.0E-03 | 0.0E+00 | 1.9E-01 | -1.5E+00 |
| GWP-fossil | Climate change - fossil | kg CO ₂ -Eq. | 6.3E+00 | 4.5E-02 | 1.6E-01 | 4.2E+01 | 1.0E+02 | 0.0E+00 | 9.0E-03 | 0.0E+00 | 2.5E-02 | -1.4E+00 |
| GWP-biogenic | Climate change - biogenic | kg CO ₂ -Eq. | -1.3E-01 | 0.0E+00 | -1.0E-01 | -4.3E-01 | 2.3E-02 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.6E-01 | -8.1E-04 |
| GWP-luluc | Climate change - land use and land use change | kg CO ₂ -Eq. | 1.1E-03 | 0.0E+00 | 1.8E-04 | 8.2E-03 | 1.0E-02 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 4.6E-06 | -8.6E-04 |
| ODP | Ozone depletion | kg CFC-11 Eq. | 4.7E-11 | 1.2E-12 | 3.0E-13 | 3.2E-10 | 5.6E-10 | 0.0E+00 | 2.3E-13 | 0.0E+00 | 2.4E-14 | -7.8E-12 |
| AP | Acidification | mol H ⁺ Eq. | 4.1E-02 | 2.9E-04 | 2.0E-03 | 2.8E-01 | 1.3E-01 | 0.0E+00 | 5.9E-05 | 0.0E+00 | 3.8E-04 | -6.1E-03 |
| EP-freshwater | Eutrophication aquatic freshwater | kg(PO ₄) ³ -Eq. | 1.7E-05 | 1.3E-08 | 1.0E-05 | 2.4E-04 | 5.4E-05 | 0.0E+00 | 2.5E-09 | 0.0E+00 | 1.0E-05 | -1.6E-06 |
| EP-marine | Eutrophication aquatic marine | kg N Eq. | 6.6E-03 | 1.1E-04 | 5.1E-04 | 4.8E-02 | 2.9E-02 | 0.0E+00 | 2.3E-05 | 0.0E+00 | 1.6E-04 | -1.2E-03 |
| EP-terrestrial | Eutrophication terrestrial | mol N Eq. | 7.2E-02 | 1.2E-03 | 5.5E-03 | 5.2E-01 | 3.2E-01 | 0.0E+00 | 2.5E-04 | 0.0E+00 | 1.6E-03 | -1.3E-02 |
| POCP | Photochemical ozone formation | NM VOC Eq. | 2.0E-02 | 3.3E-04 | 1.4E-03 | 1.5E-01 | 8.6E-02 | 0.0E+00 | 6.7E-05 | 0.0E+00 | 1.9E-04 | -3.5E-03 |
| ADP-minerals & metals | Depletion of abiotic resources - minerals and metals | kg Sb Eq. | 2.7E-05 | 0.0E+00 | 2.4E-05 | 3.4E-04 | 9.2E-06 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.0E-09 | -9.5E-06 |
| ADP-fossil | Depletion of abiotic resources - fossil fuels | mol N Eq. | 1.0E+02 | 5.7E-01 | 1.9E+00 | 6.9E+02 | 1.6E+03 | 0.0E+00 | 1.1E-01 | 0.0E+00 | 1.5E-01 | -1.7E+01 |
| WDP | Water use | m ³ world Eq. deprived | 6.6E-01 | 0.0E+00 | 4.4E-02 | 4.6E+00 | 1.9E+01 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.2E-03 | -2.9E-01 |

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

EN15804+A2 – Indicators, units and models for additional impact categories

| Parameter | Parameter | Unit | A1-A3 | A4 | A5 | B4 | B6 | C1 | C2 | C3 | C4 | D |
|-----------|---------------------------------------|-------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| PM | Particulate matter emissions | Disease incidence | 4.1E-07 | 1.2E-09 | 3.4E-08 | 2.9E-06 | 1.2E-06 | 0.0E+00 | 2.3E-10 | 0.0E+00 | 2.9E-09 | -1.1E-07 |
| IRP | Ionizing radiation, human health | kBq U235 Eq. | 8.2E-02 | 1.0E-20 | 2.6E-03 | 5.5E-01 | 1.4E+01 | 0.0E+00 | 2.0E-21 | 0.0E+00 | 1.5E-04 | -7.9E-02 |
| ETP-fw | Ecotoxicity (freshwater) | CTUe | 8.0E+01 | 2.4E+00 | 1.8E+00 | 5.7E+02 | 4.5E+02 | 0.0E+00 | 4.8E-01 | 0.0E+00 | 2.6E+00 | -8.5E+00 |
| HTP-c | Human toxicity, cancer effects | CTUh | 2.5E-07 | 1.2E-11 | 3.5E-09 | 1.6E-06 | 1.3E-08 | 0.0E+00 | 2.4E-12 | 0.0E+00 | 2.2E-11 | -1.4E-09 |
| HTP-nc | Human toxicity, non-cancer effects | CTUh | 7.6E-08 | 1.1E-09 | 3.1E-09 | 5.4E-07 | 3.4E-07 | 0.0E+00 | 2.3E-10 | 0.0E+00 | 2.2E-09 | -1.3E-08 |
| SQP | Land use related impacts/Soil quality | dimensionless | 1.0E+01 | 0.0E+00 | 3.2E+00 | 8.8E+01 | 1.8E+02 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.4E-02 | -2.9E+00 |

The table below presents disclaimers with regard to the declaration of relevant core and additional environmental impact indicators according to the following classification.

Disclaimers to the declaration of core and additional environmental impact indicators

| ILCD Classification | Indicator | Disclaimer |
|---------------------|---|------------|
| ILCD Type 1 | Global warming potential (GWP) | None |
| | Depletion potential of the stratospheric ozone layer (ODP) | None |
| | Potential incidence of disease due to PM emissions (PM) | None |
| ILCD Type 2 | Acidification potential, Accumulated Exceedance (AP) | None |
| | Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater) | None |
| | Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine) | None |
| | Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | None |
| | Formation potential of tropospheric ozone (POCP) | None |
| | Potential Human exposure efficiency relative to U235 (IRP) | 1 |
| ILCD Type 3 | Abiotic depletion potential for non-fossil resources (ADP-minerals&metals) | 2 |
| | Abiotic depletion potential for fossil resources (ADP-fossil) | 2 |
| | Water (user) deprivation potential, deprivation-weighted water consumption (WDP) | 2 |
| | Potential Comparative Toxic Unit for ecosystems (ETP-fw) | 2 |
| | Potential Comparative Toxic Unit for humans (HTP-c) | 2 |
| | Potential Comparative Toxic Unit for humans (HTP-nc) | 2 |
| | Potential Soil quality index (SQP) | 2 |

Disclaimer 1 - 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.

Disclaimer 2 - The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Results below contain the resource use throughout the life cycle of the product.

Resource Use

| Parameter | Parameter | Unit | A1-A3 | A4 | A5 | B4 | B6 | C1 | C2 | C3 | C4 | D |
|-----------|--|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| PERE | Renewable primary energy as energy carrier | MJ | 3.0E+01 | 0.0E+00 | 0.0E+00 | 1.9E+02 | 4.2E+02 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.9E-02 | -8.3E+00 |
| PERM | Renewable primary energy resources as material utilization | MJ | 1.5E+00 | 0.0E+00 | 1.6E+00 | 2.0E+01 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PERT | Total use of renewable primary energy resources | MJ | 3.1E+01 | 0.0E+00 | 1.6E+00 | 2.1E+02 | 4.2E+02 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.9E-02 | -8.3E+00 |
| PENRE | Nonrenewable primary energy as energy carrier | MJ | 1.0E+02 | 5.7E-01 | 0.0E+00 | 6.8E+02 | 1.6E+03 | 0.0E+00 | 1.1E-01 | 0.0E+00 | 1.5E-01 | -1.7E+01 |
| PENRM | Nonrenewable primary energy as material utilization | MJ | 3.7E+00 | 0.0E+00 | 1.8E-01 | 2.5E+01 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| PENRT | Total use of nonrenewable primary energy | MJ | 1.1E+02 | 5.7E-01 | 1.8E-01 | 7.1E+02 | 1.6E+03 | 0.0E+00 | 1.1E-01 | 0.0E+00 | 1.5E-01 | -1.7E+01 |
| SM | Use of secondary material | kg | 6.4E-01 | 0.0E+00 | 8.3E-01 | 9.5E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| RSF | Use of renewable secondary fuels | MJ | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| NRSF | Use of nonrenewable secondary fuels | MJ | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| FW | Use of net fresh water | m ³ | 4.1E-02 | 0.0E+00 | 9.5E-04 | 2.7E-01 | 5.9E-01 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 3.4E-05 | -9.0E-03 |

*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

Results below contain the output flows and wastes throughout the life cycle of the product.

| Output Flows and Waste Categories | | | | | | | | | | | | |
|-----------------------------------|---|------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| Parameter | Parameter | Unit | A1-A3 | A4 | A5 | B4 | B6 | C1 | C2 | C3 | C4 | D |
| HWD | Hazardous waste disposed | kg | 2.6E-07 | 0.0E+00 | 1.5E-09 | 1.7E-06 | 9.5E-07 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 3.7E-11 | -6.4E-08 |
| NHWD | Non-hazardous waste disposed | kg | 7.3E-01 | 0.0E+00 | 7.7E-02 | 8.0E+00 | 4.7E-01 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 4.2E-01 | -3.6E+00 |
| HLRW | High-level radioactive waste | kg | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| ILLRW | Intermediate- and low-level radioactive waste | kg | 9.1E-04 | 0.0E+00 | 3.1E-05 | 6.1E-03 | 1.6E-01 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 1.6E-06 | -5.8E-03 |
| CRU | Components for re-use | kg | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| MR | Materials for recycling | kg | 5.1E-04 | 0.0E+00 | 8.4E-02 | 5.5E-01 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 6.6E-01 |
| MER | Materials for energy recovery | kg | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| EE | Recovered energy exported from system | MJ | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |

*All use phase and disposal stages have been considered and only those with non-zero values have been reported

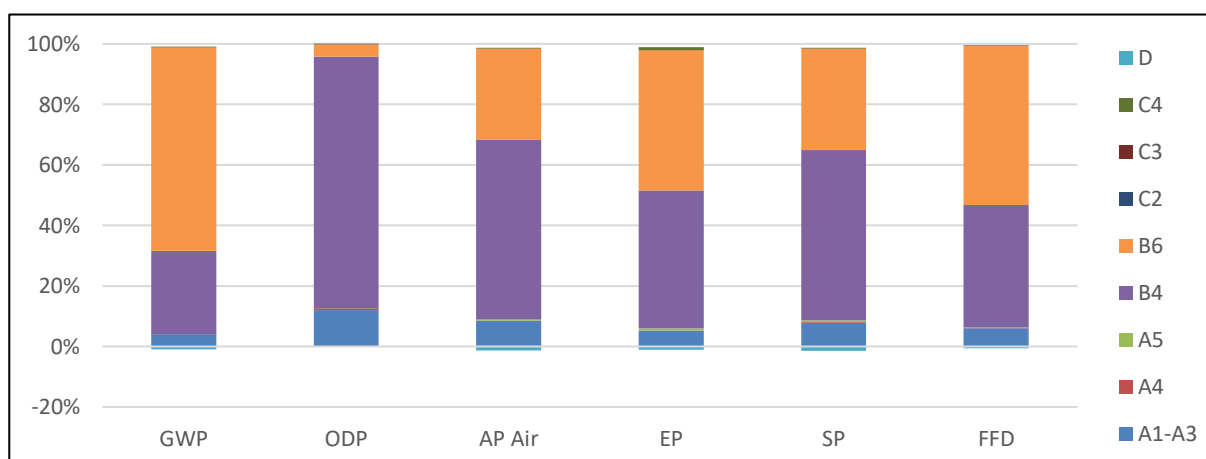
Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the product.

| Resource Use | | | | | | | | | | | | |
|--------------|--|--------------------|---------|---------|---------|---------|----------|----------|----------|----------|----------|----------|
| Parameter | Parameter | Unit | A1-A3 | A4 | A5 | B4 | B6 | C1 | C2 | C3 | C4 | D |
| BCRP | Biogenic Carbon Removal from Product | kg CO ₂ | 1.3E-01 | 0.0E+00 | 0.0E+00 | 8.5E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BCEP | Biogenic Carbon Emissions from Product | kg CO ₂ | 0.0E+00 | 0.0E+00 | 6.5E-03 | 8.5E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.24E-01 | 0.00E+00 |
| BCRK | Biogenic Carbon Removal from Packaging | kg CO ₂ | 1.1E-02 | 0.0E+00 | 0.0E+00 | 7.2E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BCEK | Biogenic Carbon Emissions from Packaging | kg CO ₂ | 0.0E+00 | 0.0E+00 | 1.1E-02 | 7.2E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| BCEW | Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process | kg CO ₂ | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| CCE | Calcination Carbon Emissions | kg CO ₂ | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| CCR | Carbonation Carbon Removal | kg CO ₂ | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| CWNR | Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process | kg CO ₂ | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

*All use phase and disposal stages have been considered and only those with non-zero values have been reported

Ground Mounted Luminaire LCA Interpretation

The operational energy use life cycle stage (B6) dominates the impacts across global warming potential, eutrophication, and fossil fuel depletion. The replacement stage (B4) dominates the impacts across ozone depletion, acidification, and smog from duplicating the upstream material production stages.



Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

Environmental and Health During Manufacturing

BEGA North America has established a robust Environmental, Health, and Safety (EHS) culture. BEGA products incorporate the highest quality materials for long service life and operational reliability. We use low-emissions equipment and less harmful chemical options for our manufacturing processes, and apply best management practices that assist in enforcing proper Industrial Hygiene (IH) evaluation and monitoring of materials, chemicals, and processes used for manufacturing. All programs meet or exceed the minimum requirements of Cal/OSHA and Cal/EPA to provide safe, healthy, and environmentally friendly work areas and products.

Environmental and Health During Installation

Under normal use and installation procedures, there are no health or impairment concerns expected during the installation of BEGA products. The products and materials do not create hazardous waste or air emissions when installed or used.

Extraordinary Effects

Fire

There are no negative environmental effects resulting from exposure to fire.

Water

There are no negative environmental effects resulting from exposure to water.

Mechanical Destruction

There are no negative environmental effects resulting from mechanical destruction.

Delayed Emissions

Global warming potential is calculated using the TRACI 2.1 and CML 4.1 impact assessment methodologies. Delayed emissions are not considered.

Environmental Activities and Certifications

BEGA is committed to social responsibility and minimizing our impact on the environment over time. Our commitment to sustainable resource management is seen throughout our exemplary production facilities, where the electrical power needed for our daily operation includes solar energy. We have also implemented recycling programs that consistently divert more than 90% of our waste from landfills, and manage all hazardous waste through a licensed vendor, and recycled, recovered, or re-used whenever possible. Our efforts towards sustainability earned BEGA North America the “Green Business of the Year” award from the South Coast Area Chamber of Commerce in 2023.

Further Information

BEGA North America
1000 BEGA Way, Carpinteria, CA 93013
United States of America

Environmental Product Declaration

BEGA North America Luminaire Products

Ground Mounted Luminaire Product Category

BEGA



According to
ISO 14025, ISO 14040,
and EN 15804+A2

References

- PCR Part A Product Category Rules for Building-Related Products and Services, Institut Bauen und Umwelt e.V. (IBU) - Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Re-port according to EN 15804+A2:2019, Version 1.4, 15.04.2024
- PCR Part B PCR Guidance-Texts for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU) - Part B: Requirements on the EPD for Luminaires, lamps and components for luminaires, V12, 30/09/2024
- LCA for Experts LCA for Experts Life Cycle Assessment version 10.8.0.14 (Software).
- ISO 14025 ISO 14025: 2006, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.
- ISO 14040 ISO 14040: 2006/AMD1:2020 Environmental management — Life cycle assessment — Principles and framework.
- ISO 14044 ISO 14044: 2006/AMD 1:2017/ AMD 2:2020 Environmental management — Life cycle assessment — Requirements and guidelines.
- EN 15804+A2 EN 15804+A2:2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction product
- ASTM 2020 ASTM International General Program Instructions v8.0, April 29, 2020
- Characterization Method IPCC. 2018. Climate Change 2013. The Physical Science Basis. Cambridge University Press. (<http://www.ipcc.ch/report/ar5/wg1/>).
- Characterization Method Hauschild M.Z., & Wenzel H. Environmental Assessment of Products. Springer, US, Vol. 2, 1998.
- Characterization Method Heijungs R., Guinée J.B., Huppes G., Lankreijer R.M., Udo de Haes H.A., Wegener Sleeswijk A. Environmental Life Cycle Assessment of Products: Guide and Backgrounds. CML. Leiden University, Leiden, 1992.
- Characterization Method Jenkin M.E., & Hayman G.D. Photochemical ozone creation potentials for oxygenated volatile organic compounds: sensitivity to variations in kinetic and mechanistic parameters. Atmospheric Environment. 1999, 33 (8) pp. 1275-1293.
- Characterization Method WMO. 1999. Scientific Assessment of Ozone Depletion: 1998, World Meteorological Organization Global Ozone Research and Monitoring Project - Report No. 44, WMO, Geneva.
- Characterization Method Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers- version 1.2, January 2017.

Contact Information

Study Commissioner

BEGA

BEGA North America

info@bega-us.com | 805-684-0533

LCA Practitioner



Sustainable Solutions
CORPORATION

Sustainable Solutions Corporation

155 Railroad Plaza, Suite 203

Royersford, PA 19468 USA

(+1) 610 569-1047

info@sustainablesolutionscorporation.com

www.sustainablesolutionscorporation.com