

# Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019

## LK Pipe Bending Support

LK Systems AB

|                          |   |
|--------------------------|---|
| Programme:               | The International EPD® System, <a href="http://www.environdec.com">www.environdec.com</a> |
| Programme operator:      | EPD International AB  |
| EPD registration number: | S-P-10526   |
| Publication date:        | 2023-12-29  |
| Valid until:             | 2028-12-29  |
| New version date:        | 2024-10-16<br><i>New products added.</i>  |



*This EPD covers multiple products made from the same materials. An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at [www.environdec.com](http://www.environdec.com)*

**Programme:**

The International EPD<sup>®</sup> System

**Address:**

EPD International AB  
Box 210 60  
SE-100 31 Stockholm  
Sweden

**Website:**

[www.environdec.com](http://www.environdec.com)

**E-mail:**

[info@environdec.com](mailto:info@environdec.com)

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)  
Product category rules (PCR): 2019:14, Construction products (EN 15804:A2) (1.2.5)

PCR review was conducted by: Claudia A. Peña, The Technical Committee of the International EPD<sup>®</sup> System.

Contact: [info@environdec.com](mailto:info@environdec.com)

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

☐ EPD process certification ☒ EPD verification

**Third party verifier:**

Daniel Böckin, PhD  
Miljögiraff AB, [daniel@miljogiraff.se](mailto:daniel@miljogiraff.se)  
Approved by: The International EPD<sup>®</sup> System.

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterization factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.



## Company information

### Owner of the EPD

LK Systems AB  
Johannesfredsvägen 7  
168 69 Bromma  
Sweden

### Contact

info@lksystems.se  
<https://www.lksystems.se/>

**LK Systems** is the leading manufacturer of easy-to-install systems for heating and tap water distribution in the Nordic region. Our prefabrication factory provides customized solutions to simplify the installation process even further. From idea to final solution, you can be sure of the smartest answers for your everyday challenges, today and tomorrow.

### For the simpler, smarter everyday

Simpler. Smarter. More sustainable. At LK, we believe there's a better way to do everything. That's why – from water, heating and hydronic solutions to pipe extrusion – we push for innovation over status quo and simplicity over complexity. It's a belief all of us at LK apply to every product and solution we create.

### Location of production site:

Germany

## Product information

LK Pipe Bending Support Open with and without mounting plate are intended to hold LK Universal/Heating Pipe on place. Used for fixing pipes in 90°-bends. Fitted on any conduit pipe or directly on the pipe. The products come in different versions to match the installation and pipe dimensions.

See additional information for product included.

Further information can be found at <https://www.lksystems.se/>

The EPD represents several product versions and is a representative value based on LK Pipe Bending Support (2417938) the declared unit. The results presented in the EPD show the results of the representative product, with variations staying within 10% (GWP-GHG). Please see the appendix for the total weight of the products included in the EPD.

## LCA information

### Functional unit / declared unit

In accordance with EN 15804 + A2 the declared unit is 1 kg of mass.

### Time representativeness

2022

### Database

Ecoinvent 3.9.1. - "allocation cut off by classification" is used throughout the study.

### LCA software used

SimaPro 9.5.

### Geographical scope

Production: Europe

Construction site: Sweden

Specific name and location of manufacturing plants are confidential and only included in LCA report

### LCA Report

LK Systems AB, Report no. 29

### Description of system boundaries

The scope of the EPD is cradle to gate with options, including A4, A5, C, and D. Table 1 shows the declared modules. The system boundary includes all processes needed for raw material extraction, transport, manufacturing, and disposal. Figure 1 provides an overview of the included processes.

|   | Product stage       |    |           |    | Construction process stage |    | Use stage |    |                           |    |     |    |             | End of life stage |        |    |             | Resource recovery stage |               |  |                        |  |                       |  |                            |  |           |  |                  |  |          |  |                                    |
|---|---------------------|----|-----------|----|----------------------------|----|-----------|----|---------------------------|----|-----|----|-------------|-------------------|--------|----|-------------|-------------------------|---------------|--|------------------------|--|-----------------------|--|----------------------------|--|-----------|--|------------------|--|----------|--|------------------------------------|
|   | Raw material supply |    | Transport |    | Manufacturing              |    | Transport |    | Construction installation |    | Use |    | Maintenance |                   | Repair |    | Replacement |                         | Refurbishment |  | Operational energy use |  | Operational water use |  | De-construction demolition |  | Transport |  | Waste processing |  | Disposal |  | Reuse-Recovery-Recycling-potential |
| Module  | A1                  | A2 | A3        | A4 | A5                         | B1 | B2        | B3 | B4                        | B5 | B6  | B7 | C1          | C2                | C3     | C4 | D           |                         |               |  |                        |  |                       |  |                            |  |           |  |                  |  |          |  |                                    |
| Modules declared  | X                   | X  | X         | X  | X                          | ND | ND        | ND | ND                        | ND | ND  | ND | X           | X                 | X      | X  | X           |                         |               |  |                        |  |                       |  |                            |  |           |  |                  |  |          |  |                                    |
| Geography   | DE                  | DE | DE        | EU | SE                         |    |           |    |                           |    |     |    | SE          | SE                | SE     | SE | SE          |                         |               |  |                        |  |                       |  |                            |  |           |  |                  |  |          |  |                                    |
| Specific data used  | 14%                 |    |           |    |                            | -  | -         | -  | -                         | -  | -   | -  | -           | -                 | -      | -  | -           |                         |               |  |                        |  |                       |  |                            |  |           |  |                  |  |          |  |                                    |
| Variation, products   | 2%                  |    |           |    |                            | -  | -         | -  | -                         | -  | -   | -  | -           | -                 | -      | -  | -           |                         |               |  |                        |  |                       |  |                            |  |           |  |                  |  |          |  |                                    |
| Variation, sites  | -                   |    |           |    |                            | -  | -         | -  | -                         | -  | -   | -  | -           | -                 | -      | -  | -           |                         |               |  |                        |  |                       |  |                            |  |           |  |                  |  |          |  |                                    |
| X = Modules included in the analysis                      ND = Module not declared                      O= Optional modules |                     |    |           |    |                            |    |           |    |                           |    |     |    |             |                   |        |    |             |                         |               |  |                        |  |                       |  |                            |  |           |  |                  |  |          |  |                                    |

**Table 1.** Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation.

## Content information

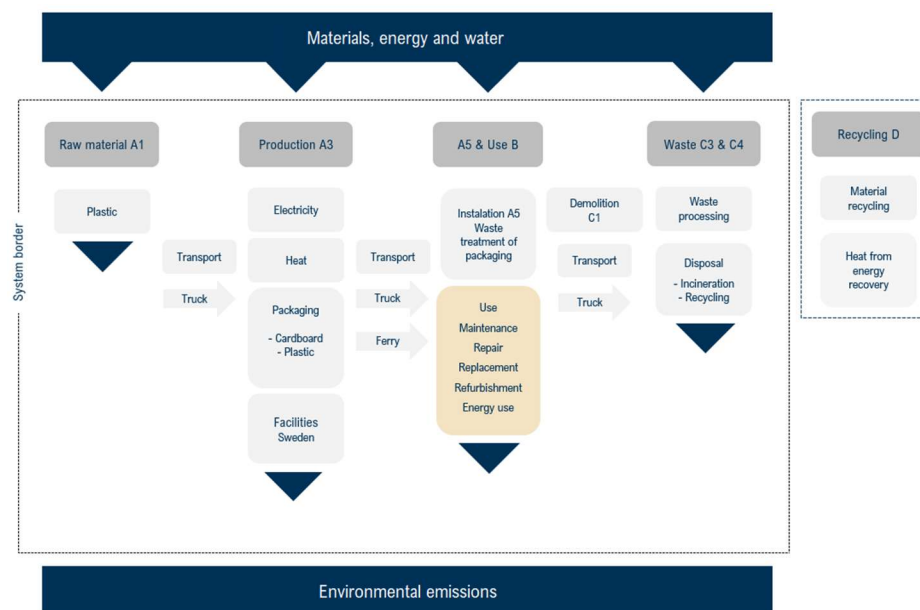
Table 2, shows the weight of the raw material of the declared product.

| Product components         | Weight, kg | Pre-consumer material, weight-% | Post-consumer material, weight-% | Renewable material, weight-% |
|----------------------------|------------|---------------------------------|----------------------------------|------------------------------|
| Polyamide glass reinforced | 1          | 0                               | 85                               | 0                            |
| TOTAL                      | 1          | 0                               | 0                                | 0                            |

| Packaging materials | Weight, kg | Weight-% (versus the product) |
|---------------------|------------|-------------------------------|
| Cardboard box       | 0,016      | 1,6                           |
| Plastic             | 0,048      | 4,8                           |
| Pallet              | 0,00008    | 0,008                         |
| TOTAL               | 0,064      | 6,4                           |

The declared product contains no dangerous substances from the candidate list of SVHC for Authorization.



**Figure 1,** overview of the included processes.  
Light gray represents modules included.  
Yellow represents modules not declared.



## Product life-cycle

### Raw material supply, transport & manufacturing (A1-A3)

The manufacturing process includes the manufacturing of the raw materials used for the final product. After the manufacturing of the product is completed, it is packed in a plastic bag and then cardboard box, which is then stacked on a pallet and then transported to warehouse. The production process flow contains the same steps in all manufacturing locations. See figure 2 below for the process flow step by step.



Figure 2, Production process flow.

### Transport & installation (A4-A5)

Transportation impacts represent the transport from warehouse to the construction site. The transport distance is based on the average distance and is performed by truck using fuel. It is assumed that there are no environmental aspects during the installation of the product, except for the waste management of the packaging after installation.

### Product End-of-Life (C1-C4, D)

The end-of-life stage (C1) of the product is assumed to have no environmental impacts during the demolition of the product. When the building where the product is installed is demolished, it is assumed that the product will be transported 50 km to the nearest waste disposal facility and then material recycled at 13% (Naturvårdsverket, 2023), while the remaining 87% will end up in combustible waste. The cardboard box is assumed to be material recycled at 78% (Fråne, A. et al., 2021),

while the remaining 22% is assumed to end up in combustible waste. The product and packaging are assumed to be sent to the nearest waste facility. In the resource recovery stage, the benefits will be mostly energy recovery, with a smaller portion dedicated to material recycling.

### Cut-off rules

According to EN 15804, life cycle inventory data shall include a minimum of 95% of total inflows (mass and energy) per module. If less than 100% of the inflows are accounted for, proxy data or extrapolation should be used to achieve 100% completeness.

### Background data

The data quality of the background data is considered good. All specific data, including processes and volume of different materials, has been collected by questionnaire and through personal contact with the manufacturer. The Ecoinvent database, which is the world's largest LCI data library, has been used. It contains data for specific geographical regions relevant to this study, which have been analyzed to be the most suitable for the various steps in the process. Information on biogenic carbon content is calculated using the formula from EN 350-2 and information from IVL. The collected data represent average yearly data for 2022 and are assumed to be representative for the EPDs period of validity of 5 years.

### Electricity data

The electricity used in stage A3 accounts for less than 30% of the total energy used in stages A1-A3.

## Allocation and assumptions

The declared unit values for 1 kg of the product used in this study are calculated based on the total weight of the product produced during the year under study. The content of raw materials can vary slightly between different product dimensions and is examined with high accuracy to ensure that the variation of GWP-GHG stays within 10%. Data is allocated for the energy use of the declared unit based on production rate with complexity and high accuracy. The raw materials necessary for manufacturing and the amount of packaging allocated to the product are based on the amount of material used to manufacture the declared unit, including waste. The declared unit is based on LK Pipe Bending Support (2417938) and the variance of the declared products is less than 10%, based on the data quality requirements outlined in PCR 2019:14.

The used product is assumed to be transported 50 km to the nearest waste disposal facility. The waste treatment assumes that the product is installed in the building and deconstructed when the building is demolished. The product is assumed to be material recycled at 13%, and the cardboard box is assumed to be material recycled at 78%. The remaining plastic in the product and the plastic packaging are assumed to be incinerated with energy recovery efficiency at 61%.



## Recycling of packaging and product

As part of our producer responsibility framework, LK is affiliated with FTI, the Packaging and Newspaper Collection, which is the business community's collection system for recycling packaging. The product is to be recycled as plastic and the packaging as cardboard and plastic. None of the recycled materials are classified as hazardous waste.

## Environmental information

Potential environmental impact – mandatory indicators according to EN 15804.

Results of declared unit of the study.

| Indicator                        | Unit          | Tot.A1-A3 | A4       | A5       | C1 | C2       | C3       | C4 | D         |
|----------------------------------|---------------|-----------|----------|----------|----|----------|----------|----|-----------|
| GWP-fossil                       | kg CO2 eq.    | 2,38E+00  | 2,33E-01 | 3,86E-02 | 0  | 9,24E-03 | 2,04E+00 | 0  | -1,07E+00 |
| GWP-biogenic                     | kg CO2 eq.    | 6,61E-02  | 2,13E-04 | 1,74E-02 | 0  | 8,46E-06 | 2,55E-04 | 0  | 3,96E-03  |
| GWP-luluc                        | kg CO2 eq.    | 2,56E-03  | 1,15E-04 | 1,18E-06 | 0  | 4,56E-06 | 4,20E-05 | 0  | -1,35E-03 |
| GWP-total                        | kg CO2 eq.    | 2,45E+00  | 2,33E-01 | 5,60E-02 | 0  | 9,25E-03 | 2,04E+00 | 0  | -1,06E+00 |
| ODP                              | kg CFC 11 eq. | 2,07E-08  | 5,07E-09 | 2,53E-10 | 0  | 2,01E-10 | 1,20E-08 | 0  | -1,54E-08 |
| AP                               | mol H+ eq.    | 9,63E-03  | 5,09E-04 | 1,50E-05 | 0  | 2,02E-05 | 5,15E-04 | 0  | -6,53E-03 |
| EP-freshwater                    | kg P eq.      | 9,38E-04  | 1,66E-05 | 2,95E-07 | 0  | 6,57E-07 | 1,15E-05 | 0  | -1,16E-04 |
| EP-marine                        | kg N eq.      | 2,90E-03  | 1,28E-04 | 7,35E-06 | 0  | 5,09E-06 | 2,65E-04 | 0  | -2,08E-03 |
| EP-terrestrial                   | mol N eq.     | 1,87E-02  | 1,31E-03 | 6,69E-05 | 0  | 5,18E-05 | 2,37E-03 | 0  | -1,83E-02 |
| POCP                             | kg NMVOC eq.  | 6,27E-03  | 7,90E-04 | 1,88E-05 | 0  | 3,13E-05 | 6,18E-04 | 0  | -4,48E-03 |
| ADP-minerals&metals <sup>2</sup> | kg Sb eq.     | 6,94E-06  | 7,61E-07 | 6,59E-09 | 0  | 3,02E-08 | 2,12E-07 | 0  | -9,17E-07 |
| ADP-fossil <sup>2</sup>          | MJ            | 3,45E+01  | 3,31E+00 | 2,02E-02 | 0  | 1,31E-01 | 3,91E-01 | 0  | -1,60E+01 |
| WDP <sup>2</sup>                 | m3            | 1,48E+00  | 1,36E-02 | 5,12E-04 | 0  | 5,41E-04 | 2,19E-02 | 0  | -1,02E+00 |

### Acronyms

GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic;  
 GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer;  
 AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients Inreaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;  
 EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone;  
 ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential;  
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption



## Potential environmental impact – additional mandatory indicators according to EN 15804.

| Indicator                               | Unit         | Tot.A1-A3 | A4       | A5       | C1 | C2       | C3       | C4 | D         |
|---|--------------|-----------|----------|----------|----|----------|----------|----|-----------|
| Particulate matter                      | disease inc. | 1,07E-07  | 1,74E-08 | 4,63E-10 | 0  | 6,88E-10 | 3,62E-09 | 0  | -8,91E-08 |
| Ionising radiation <sup>1</sup>         | kBq U-235 eq | 2,30E-01  | 4,48E-03 | 7,53E-05 | 0  | 1,78E-04 | 2,99E-03 | 0  | -4,78E-02 |
| Ecotoxicity, freshwater <sup>2</sup>    | CTUe         | 1,43E+01  | 3,27E+00 | 2,41E-01 | 0  | 1,30E-01 | 1,02E+01 | 0  | -4,46E+00 |
| Human toxicity, cancer <sup>2</sup>     | CTUh         | 1,30E-09  | 2,12E-10 | 1,65E-11 | 0  | 8,42E-12 | 7,86E-10 | 0  | -7,58E-10 |
| Human toxicity, non-cancer <sup>2</sup> | CTUh         | 3,35E-08  | 2,00E+00 | 8,39E-03 | 0  | 7,95E-02 | 1,14E-01 | 0  | -5,05E+01 |
| Land use <sup>2</sup>                   | Pt           | 1,09E+01  | 4,69E-09 | 1,68E-10 | 0  | 1,86E-10 | 5,54E-09 | 0  | -1,67E-08 |

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.

## Climate impact IPCC GWP 100

| Indicator | Unit       | Tot.A1-A3 | A4       | A5       | C1 | C2       | C3       | C4 | D         |
|-----------|------------|-----------|----------|----------|----|----------|----------|----|-----------|
| GWP-GHG   | kg CO2 eq. | 2,41E+00  | 2,33E-01 | 3,86E-02 | 0  | 9,25E-03 | 2,04E+00 | 0  | -1,07E+00 |

The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product.

This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

## Use of resources

| Indicator | Unit | Tot.A1-A3 | A4       | A5       | C1 | C2       | C3       | C4 | D         |
|-----------|------|-----------|----------|----------|----|----------|----------|----|-----------|
| PERE      | MJ   | 4,06E+00  | 5,20E-02 | 9,75E-04 | 0  | 2,06E-03 | 3,83E-02 | 0  | -1,23E+01 |
| PERM      | MJ   | 7,26E-01  | 0        | 0        | 0  | 0        | 0        | 0  | 0         |
| PERT      | MJ   | 4,78E+00  | 5,20E-02 | 9,75E-04 | 0  | 2,06E-03 | 3,83E-02 | 0  | -1,23E+01 |
| PENRE     | MJ   | 3,69E+01  | 3,52E+00 | 2,15E-02 | 0  | 1,39E-01 | 4,18E-01 | 0  | -1,72E+01 |
| PENRM     | MJ   | 4,57E+01  | 0        | 0        | 0  | 0        | 0        | 0  | 0         |
| PENRT     | MJ   | 8,26E+01  | 3,52E+00 | 2,15E-02 | 0  | 1,39E-01 | 4,18E-01 | 0  | -1,72E+01 |
| SM        | kg   | 8,50E-01  | 0        | 0        | 0  | 0        | 0        | 0  | 0         |
| RSF       | MJ   | 0         | 0        | 0        | 0  | 0        | 0        | 0  | 0         |
| NRSF      | MJ   | 0         | 0        | 0        | 0  | 0        | 0        | 0  | 0         |
| FW        | m3   | 2,60E-02  | 5,54E-04 | 4,07E-05 | 0  | 2,20E-05 | 1,12E-03 | 0  | -1,45E-02 |

### Acronyms

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials;  
 PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources;  
 PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;  
 PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources;  
 SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels;  
 FW = Use of net fresh water

## Waste production and output flows

### Waste production

| Indicator                    | Unit | Tot.A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|------------------------------|------|-----------|----|----|----|----|----|----|---|
| Hazardous waste disposed     | kg   | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0 |
| Non-hazardous waste disposed | kg   | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0 |
| Radioactive waste disposed   | kg   | 0         | 0  | 0  | 0  | 0  | 0  | 0  | 0 |

Note: Ecoinvent database include all waste treatment processes within the system boundaries, i.e. there are no waste flows exiting the system boundaries and the waste indicators to be declared are therefore zero.

### Output flows

| Indicator                     | Unit | Tot.A1-A3 | A4 | A5        | C1 | C2 | C3        | C4 | D |
|-------------------------------|------|-----------|----|-----------|----|----|-----------|----|---|
| Components for re-use         | kg   | 0         | 0  | 0         | 0  | 0  | 0         | 0  | 0 |
| Material for recycling        | kg   | 0         | 0  | 3,90E-02  | 0  | 0  | 1,30E-01  | 0  | 0 |
| Materials for energy recovery | kg   | 0         | 0  | 2,70E-02  | 0  | 0  | 8,70E-01  | 0  | 0 |
| Exported energy, electricity  | MJ   | 0         | 0  | 0         | 0  | 0  | 0         | 0  | 0 |
| Exported energy, thermal      | MJ   | 0         | 0  | -8,05E-02 | 0  | 0  | -2,43E+01 | 0  | 0 |

## Information on biogenic carbon content

Results per functional or declared unit

| Biogenic carbon content              | Unit | Quantity |
|--------------------------------------|------|----------|
| Biogenic carbon content in product   | kg C | 0        |
| Biogenic carbon content in packaging | kg C | 1,47E-02 |

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO<sub>2</sub>.

## Additional information

| Product   | Product number | Weight (kg) | Central Product Classification |
|---|----------------|-------------|--------------------------------|
| LK Pipe Bending Support, 16                     | 2417938        | 0,033       | 3917400099                     |
| LK Pipe Bending Support, 34                     | 2435503        | 0,178       | 3917400099                     |
| LK Pipe Bending Support, 25                     | 2435500        | 0,114       | 3917400099                     |
| LK Pipe Bending Support, 20                     | 2435498        | 0,061       | 3917400099                     |
| LK Pipe Bending Support, 12                     | 2435496        | 0,023       | 3917400099                     |
| LK Pipe Bending Support with mounting plate, 20 | 2435499        | 0,070       | 3917400099                     |
| LK Pipe Bending Support with mounting plate, 16 | 2435497        | 0,038       | 3917400099                     |
| LK Pipe Bending Support with mounting plate.34  | 2435504        | 0,200       | 3917400099                     |
| LK Pipe Bending Support with mounting plate,25  | 2435502        | 0,118       | 3917400099                     |
| LK Pipe Bending Support Open PiP 25             | 2435505        | 0,065       | 3917400099                     |
| LK Pipe Bending Support Open 42mm               | 2435518        | 0,161       | 3917400099                     |

## References

General Programme Instructions of the International EPD® System. Version 4.0.

PCR Construction Products. 2019:14, version 1.2.5, the International EPD System, Date 2022-11-01.

EN 15804:2012+A2:2019/AC:2021, "Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products"

EN ISO 14025:2010 Environmental labels and declarations - Type III environmental declarations - Principles and procedures, Edited in 2010

EN ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework, 2006.

EN ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines, 2006.

PRé Consultants, "SimaPro 9.5." (PRé Consultants, 2019), <http://www.pre-sustainability.com/simapro>

Ahmad, N. et al., (2017) Liquefaction of natural rubber to liquid fuels via hydrous pyrolysis, Liquefaction of natural rubber to liquid fuels via hydrous pyrolysis | Elsevier Enhanced Reader

Ecoinvent, 'Ecoinvent' <<https://www.ecoinvent.org/database/database.html>

Eriksson, E. et al., (2010) Carbon Footprint of Cartons in Europe – Carbon Footprint methodology and biogenic carbon sequestration, IVL.  
Carbon footprint of cartons in Europe – Carbon Footprint methodology and biogenic carbon sequestration (ivl.se)

EUTREND model, Struijs et al, 2009b, as implemented in ReCiPe; <http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml>

Material recycling paper: Fråne, A. et al., (2021) Sveriges återvinning av förpackningar och tidningar, Naturvårdsverket.  
[https://www.naturvardsverket.se/contentassets/568ba7678ce94e25b99cfc1b02ad7e2a/forpackningsrapport\\_2020\\_211027.pdf](https://www.naturvardsverket.se/contentassets/568ba7678ce94e25b99cfc1b02ad7e2a/forpackningsrapport_2020_211027.pdf)

Material recycling plastic: Naturvårdsverket 2023-03-06 <https://www.naturvardsverket.se/amnesomraden/plast/>

Quality losses cardboard box: Eckhart, R. (2021) Recyclability of cartonboard and carton.  
<https://www.procarton.com/wp-content/uploads/2022/01/25-Loops-Study-English-v3.pdf>