# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

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|---|---|
| Owner of the Declaration | ARGE; European Federation of Associations of Lock and Builders Hardware Manufacturers |
| Programme holder | Institut Bauen und Umwelt e.V. (IBU) |
| Publisher | Institut Bauen und Umwelt e.V. (IBU) |
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Lock cylinders

## ARGE; European Federation of Associations of Lock and Builders Hardware Manufacturers

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# 1. General Information

ARGE

**Programme holder**
IBU - Institut Bauen und Umwelt e.V.
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Germany

**Declaration number**
EPD-ARG-20160189-IBG1-EN

**This Declaration is based on the Product Category Rules:**
Building Hardware products, 02.2016
(PCR tested and approved by the SVR)

**Issue date**
14.09.2016

**Valid to**
13.09.2022

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Managing Director IBU)

Lock cylinders

**Owner of the Declaration**
ARGE; European Federation of Associations of Lock and Builders Hardware Manufacturers
Offerstraße 12, 42551 Velbert
Germany

**Declared product / Declared unit**
1 kg of lock cylinder

**Scope:**
This ARGE EPD covers cylinders, used to operate locks by means of a key.
The reference product used to calculate the impact this product group has on the environment is a lock cylinder composed primarily of brass, zinc-based alloy and steel, and has been selected for the LCA (Life Cycle Assessment) because it is the product with the highest impact for 1 kg of product. A validity scope analysis has also been carried out to determine the limiting factors for lock cylinders covered by this EPD. In a preliminary study (simplified LCA), it has been confirmed that this EPD represents the worst case condition and it can therefore be used to cover all lock cylinders manufactured in Europe by ARGE member companies.
The owner of the declaration shall be liable for the underlying information and evidence, but the ARGE programme holder (IBU) cannot be held responsible for manufacturer's information, life cycle assessment data or evidence

**Verification**

| |
|---|
| The CEN Norm /EN 15804/ serves as the core PCR |
| Independent verification of the declaration according to /ISO 14025/ |
| ☐ internally ☒ externally |

Dr. Frank Werner
(Independent verifier appointed by SVR)

# 2. Product

## 2.1 Product description
This EPD refers to cylinders used to operate, by means of a key, the bolt throwing mechanism within a lock. It covers lock cylinders with varying material compositions and security grades.

## 2.2 Application
These products are designed to be mounted in lock assemblies of varying materials intended for use on interior or exterior doors.

## 2.3 Technical Data
Ideally, products should comply with a suitable technical specification. /EN 1303/ - Cylinders for locks is an example of such a specification and some products will comply with this. The relevant grading structure is shown in the following table

| Name | Value | Unit |
|---|---|---|
| Category of use | 1 | Grade |
| Durability | 4 - 6 | Grade |
| door mass | 0 | Grade |
| Suitability for use in fire resisting and/or smoke control doors | 0, A, B | Grade |
| Safety | 0 | Grade |
| Corrosion resistance and temperature | 0, A, B | Grade |
| Key related security | 1 - 6 | Grade |
| Attack resistance | 0, A, B, D | Grade |

## 2.4 Application rules

Since /EN 1303/ is not a harmonized standard, it is not subject to the terms of the CPR and compliance with the standard is purely voluntary. National provisions however (e.g. Building Regulations) may apply.

## 2.5 Delivery status

The products are sold by unit. Deliveries of a single unit might be possible but will be an exception. Regular deliveries will cover a larger amount of locks as they are put on the market as "B2B" products and not for a final customer.

## 2.6 Base materials / Ancillary materials

**Composition of products analysed for this EPD:**
The values are given for the product analysed for this EPD. Ranges of values for other products covered by the validity scope analysis are shown in brackets

| Name | Value | Unit |
|---|---|---|
| Brass (24.88% – 92.61%) | 67.62 | % |
| Zinc-based alloy (0.00% – 39.98%) | 19.71 | % |
| Steel (4.15% – 41.48%) | 10.34 | % |
| Sintered iron (0.00% – 2.81%) | 2.25 | % |
| Nickel (0.00% – 0.75%) | 0 | % |
| Nickel silver (0.00% – 11.19%) | 0 | % |
| Bronze (0.00% – 0.75%) | 0 | % |
| Stainless steel (0.00% – 11.44%) | 0 | % |
| Iron (0.00% – 3.03%) | 0 | % |
| Nylon 6 (0.00% – 5.15%) | 0 | % |

Nylon 66 and Acetal as ancillary material.

The product contains no substances cited on the REACH list of hazardous substances.

**Zinc-based alloy** is an alloy of four separate metals: zinc, aluminium, magnesium and copper. Subcomponents of the lock cylinder, which are made from zinc-based alloy are diecast.
**Steel** is produced by combining iron with carbon as well as other elements depending on the desired characteristics. The subcomponents made of steel are formed by stamping.
**Brass** is an alloy of zinc and copper. Subcomponents made of brass are made by forging.
**Nickel silver** is an alloy of copper (~60%) with nickel (~20%) and zinc (~20%). Subcomponents made of nickel silver are formed by stamping.
**Nylon 66** is a polyamide produced by the polycondensation of hexamethylenediamine and adipic acid in equal parts. This can then be combined with glass fibres to improve its mechanical properties. Subcomponents made of nylon are formed by injection moulding.
**Acetal**, or polyoxymethylene, is produced via polymerisation of anhydrous formaldehyde. Subcomponents made of acetal are also formed by injection moulding.

## 2.7 Manufacture

The production of a lock cylinder regularly follows a 3 step procedure:
1. Prefabrication of the semi-finished products (usually by stamp punching or laser cutting) This step might include a surface treatment on factory site or by external manufacturers.
2. Preassembly of assembly modules (onsite factory)
3. Final assembly (onsite factory)

## 2.8 Environment and health during manufacturing

Regular measurements of air quality and noise levels are performed by ARGE member manufacturers. The results are within compulsory safety limits. In areas where employees are exposed to chemical products, prescribed safety clothes and technical safety devices are provided. Regular health checks are mandatory for employees of production sites.

## 2.9 Product processing/Installation

The installation of the product could vary depending on the type of door and the specific situation but products shall not require energy consumption for installation.

## 2.10 Packaging

Normally each single product is packaged in paper. Larger amounts of 12 to 50 packaged products are then packed in a cardboard box and stacked on wooden pallets for transport to the customer (Door or window manufacturers).
Waste from product packaging is collected separately for waste disposal (including recycling).

## 2.11 Condition of use

Once installed, the products shall require no servicing during their expected service lives. There shall be no consumption of water or energy linked to their use, and they shall not cause any emissions.

## 2.12 Environment and health during use

No environmental damage or health risks are to be expected during normal conditions of use.

## 2.13 Reference service life

The Reference Service Life is 10 years under normal working conditions. This corresponds to passing a mechanical endurance test of 50.000 cycles as specified in the /EN 1303/. The Reference Service Life is dependent on the actual frequency of use and environmental conditions. It is required that installation, as well as maintenance of the product, must be done in line with instructions provided by the manufacturer.

## 2.14 Extraordinary effects

**Fire**
Fire resistance claims would be by manufacturer's declaration only, since there are no fire resistance requirements in /EN 1303/.

**Water**
The declared product is intended to be used in buildings under normal conditions (indoor or outdoor). It shall not emit hazardous substances in the event of flooding.

**Mechanical destruction**
Mechanical destruction of the declared product shall not materially alter its composition, or have any adverse effect on the environment.

## 2.15 Re-use phase

Removal of the cylinder (for re-cycling or re-use) shall have no adverse effect on the environment.

### 2.16 Disposal

Lock cylinder components should be re-cycled wherever possible, providing that there is no adverse effect on the environment. The waste code in accordance with the /European Waste Code/ is 17 04 07.

### 2.17 Further information

Details of all types and variants are to be shown on the manufacturers' websites listed on http://arge.org/members/members-directory.htm

## 3. LCA: Calculation rules

### 3.1 Declared Unit

The declared unit for all products covered by ARGE EPD is 1 kg (of product). Since individual products will rarely weigh exactly 1 kg it is necessary to establish the exact weight of the product then use this as a correction factor to determine the true values for 1 kg of product in the tables (Section 5)
A total of 8 typical products (based on sales figures) have been evaluated, and the worst case results are used in the tables.

**Correction factor**

| Name | Value | Unit |
|---|---|---|
| Declared unit mass | 1 | Kg |
| Mass of declared product | 0.294 | Kg |
| Correction factor | Divide by 0.294 | |

### 3.2 System boundary

This type of the EPD covers "cradle-to-grave" requirements.
The analysis of the product life cycle includes the production and transport of the raw materials, manufacture of the product and the packaging materials, which are declared in modules A1-A3.
Losses during production are considered as waste and are sent to recycling. No recycling processes are taken into account except transport and an electricity consumption for grinding the metals. When recycled metals are used as raw material, only their transformation process is taken into account, and not the extraction of raw material.
A4 module represents the transport of the finished product to the installation site.
There is no waste associated with the installation of the product. The A5 module therefore represents only the disposal of the product packaging.
For the RSL considered for this study, there are no inputs or outputs for the stages B1-B7.
The End-of-Life (EoL) stages are also considered. The transportation to the EoL disposal site is taken into account in module C2. Module C4 covers the disposal of the lock cylinders. Module C3 covers the recycling of the individual elements according to European averages, with the remaining waste divided between incineration and landfill. The same assumption as for waste to recycling in A3 is used here.
For end of life modules (C1 to C4) the system boundaries from the /XP P01-064/CN/ standard have been followed, see annex H.2 and H.6 of the standard document cited previously for figures and further details.

In practice the end-of-life has been modelled as follows:
- When material is sent to recycling generic transport and electric consumption of a shredder is taken into account (corresponding to the process "Grinding, metals"). Only then is the material considered to have attained the "end-of-waste" state.
- Each type of waste is modelled as a transport to the treatment site over a distance of 30 km (source: /FD P01-015/). Parts sent to recycling include an electricity consumption (grinding) and a flow ("Materials for recycling, unspecified").

Four scenarios for the end-of-life of the products have been declared for this EPD:
- 1. 100% of the product going to landfill
- 2. 100% of the product going to incineration
- 3. 100% of the product going to recycling
- 4. Mixed scenario consisting of the previous three scenarios, values depending of the amount of waste going to recycling.

Module D has not been declared.

### 3.3 Estimates and assumptions

The LCA data of the declared lock cylinder has been calculated from the production data of in total 4 ARGE member companies, representing 8 different products. These companies had been chosen by ARGE as being representative by means of their production processes and their market shares. The product chosen as representative for this calculation follows the "worst case" principle as explained in section 6. LCA interpretation.

### 3.4 Cut-off criteria

The cut -off criteria considered are 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The total neglected input flows per module shall be a maximum of 5% of energy usage and mass.
For this study, all input and output flows have been considered at 100%, including raw materials as per the product composition provided by the manufacturer and packaging of raw materials as well as the final product. Energy and water consumptions have also been considered at 100% according to the data provided. With the approach chosen, no significant environmental impacts are known to have been cut-off.

### 3.5 Background data

For life cycle modelling of the considered product, all relevant background datasets are taken from the ecoinvent 3.1 – Alloc Rec database. The life cycle analysis software used is SimaPro (V8.0.5), developed by PRé Consulting.

### 3.6 Data quality

The time factor, the life cycle inventory data used comes from:
Data collected specifically for this study on the ARGE manufacturers' sites. Data sets are based on 1-year averaged data (time period: January 2013 to December 2013).
In the absence of collected data, generic data from the ecoinvent V3 database. This is updated regularly and is representative of current processes (the entire database having been updated in 2014).

### 3.7 Period under review

The data of the LCA is based on the annual production data of several ARGE member companies from 2013. Other values, e.g. for the processing of the base materials, are taken from the/ ecoinvent v3/.1 Alloc Rec where the dataset age varies for each dataset, see ecoinvent documentation for more information.

### 3.8 Allocation

The products are produced in numerous production sites. All data was provided by the manufacturers of the products per unit and then divided by the mass of the product to give a value per kg of product produced.

The assumptions relating to the EoL of the product are described in the section System Boundaries.
Metal losses during production (stage A3) are considered as waste.

### 3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account. The used background database has to be mentioned.

## 4. LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment for Modules Not Declared (MND).

**Transport to the building site (A4)**

| Name | Value | Unit |
|---|---|---|
| Litres of fuel | 0.0045 | l/100km |
| Transport distance | 3500 | km |
| Capacity utilisation (including empty runs) | 36 | % |

**Installation into the building (A5)**

| Name | Value | Unit |
|---|---|---|
| Material loss | 0.137 | kg |

The scope of this study does not cover the installation of the product, which varies depending on the type of door and the specific situation. The disposal of the product packaging has been taken into account.
End of life packaging is a mix between recycling, landfill and incineration according to French ADEME statistics.
No re-use of packaging is considered in this study.

**Reference service life**

| Name | Value | Unit |
|---|---|---|
| Reference service life (condition of use : see §2.13) | 10 | a |

**End of life (C1-C4)**

| Name | Value | Unit |
|---|---|---|
| Collected separately (All scenarii) | 1 | kg |
| Recycling (Mixed scenario) | 0.458 | kg |
| Energy recovery (Mixed scenario) | 0.249 | kg |
| Landfilling (Mixed scenario) | 0.293 | kg |
| Incineration (100% incineration scenario) Scenario 1 | 1 | kg |
| Landfilling (Landfill scenario) Scenario 2 | 1 | kg |
| Recyling (100% recycling scenario) Scenario 3 | 1 | kg |

it is assumed that a 16-32 ton truck is used to transport the product over the (up to) 30 km distance between the dismantling site and the next treatment site (source: FD P01-015).

**Reuse, recovery and/or recycling potentials (D), relevant scenario information**

As Module D has not been declared, materials destined for recycling have been accounted for in the indicator “Materials for recycling” however no benefit has been allocated.

## 5. LCA: Results

In Table 1 "Description of the system boundary", the declared modules are indicated with an "X"; all modules that are not declared within the EPD but where additional data are available are indicated with "MND". Those data can also be used for building assessment scenarios. The values are declared with three valid digits in exponential form.

**DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)**

| 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 the gate to the site | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction 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 | MND | MND | MND | MND | MND | MND | MND | MND | X | X | X | MND |

**RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 kg of lock cylinder**

| Parameter | Unit | A1-A3 | A4 | A5 | C2 | C2/1 | C2/2 | C2/3 | C3 | C3/1 | C3/2 | C3/3 | C4 | C4/1 | C4/2 | C4/3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GWP | [kg $CO_2$-Eq.] | 1.06E+1 | 5.89E-1 | 7.64E-3 | 5.05E-3 | 5.05E-3 | 5.05E-3 | 5.05E-3 | 3.97E-3 | 0.00E+0 | 0.00E+0 | 8.66E-3 | 1.19E-2 | 5.23E-1 | 4.97E-1 | 0.00E+0 |
| ODP | [kg CFC11-Eq.] | 7.56E-7 | 1.08E-7 | 3.06E-10 | 9.26E-10 | 9.26E-10 | 9.26E-10 | 9.26E-10 | 4.26E-10 | 0.00E+0 | 0.00E+0 | 9.30E-10 | 8.69E-11 | 4.02E-9 | 3.43E-9 | 0.00E+0 |
| AP | [kg $SO_2$-Eq.] | 3.81E-1 | 2.39E-3 | 1.24E-5 | 2.05E-5 | 2.05E-5 | 2.05E-5 | 2.05E-5 | 1.65E-5 | 0.00E+0 | 0.00E+0 | 3.60E-5 | 4.36E-6 | 2.58E-4 | 1.24E-4 | 0.00E+0 |
| EP | [kg $(PO_4)^{3-}$-Eq.] | 1.11E-1 | 4.06E-4 | 5.59E-6 | 3.48E-6 | 3.48E-6 | 3.48E-6 | 3.48E-6 | 1.85E-6 | 0.00E+0 | 0.00E+0 | 4.04E-6 | 8.33E-6 | 7.52E-5 | 5.94E-4 | 0.00E+0 |
| POCP | [kg ethene-Eq.] | 1.87E-2 | 2.68E-4 | 2.92E-6 | 2.30E-6 | 2.30E-6 | 2.30E-6 | 2.30E-6 | 9.09E-7 | 0.00E+0 | 0.00E+0 | 1.98E-6 | 1.95E-6 | 1.60E-5 | 1.41E-4 | 0.00E+0 |
| ADPE | [kg Sb-Eq.] | 7.18E-3 | 1.95E-6 | 3.55E-9 | 1.67E-8 | 1.67E-8 | 1.67E-8 | 1.67E-8 | 1.62E-9 | 0.00E+0 | 0.00E+0 | 3.53E-9 | 8.19E-10 | 4.69E-8 | 2.47E-8 | 0.00E+0 |
| ADPF | [MJ] | 1.40E+2 | 8.97E+0 | 3.02E-2 | 7.69E-2 | 7.69E-2 | 7.69E-2 | 7.69E-2 | 6.10E-2 | 0.00E+0 | 0.00E+0 | 1.33E-1 | 7.57E-3 | 3.73E-1 | 2.80E-1 | 0.00E+0 |

| Caption | GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources |
|---|---|

**RESULTS OF THE LCA - RESOURCE USE: 1 kg of lock cylinder**

| Parameter | Unit | A1-A3 | A4 | A5 | C2 | C2/1 | C2/2 | C2/3 | C3 | C3/1 | C3/2 | C3/3 | C4 | C4/1 | C4/2 | C4/3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERE | [MJ] | 1.86E+1 | 1.12E-1 | 1.90E-3 | 9.61E-4 | 9.61E-4 | 9.61E-4 | 9.61E-4 | 7.88E-3 | 0.00E+0 | 0.00E+0 | 1.72E-2 | 3.90E-4 | 1.14E-2 | 2.11E-2 | 0.00E+0 |
| PERM | [MJ] | 2.18E+0 | 0.00E+0 | -1.43E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| PERT | [MJ] | 2.08E+1 | 1.12E-1 | -1.43E+0 | 9.61E-4 | 9.61E-4 | 9.61E-4 | 9.61E-4 | 7.88E-3 | 0.00E+0 | 0.00E+0 | 1.72E-2 | 3.90E-4 | 1.14E-2 | 2.11E-2 | 0.00E+0 |
| PENRE | [MJ] | 1.57E+2 | 9.13E+0 | 3.62E-2 | 7.82E-2 | 7.82E-2 | 7.82E-2 | 7.82E-2 | 8.94E-2 | 0.00E+0 | 0.00E+0 | 1.95E-1 | 8.64E-3 | 3.86E-1 | 3.53E-1 | 0.00E+0 |
| PENRM | [MJ] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| PENRT | [MJ] | 1.57E+2 | 9.13E+0 | 3.62E-2 | 7.82E-2 | 7.82E-2 | 7.82E-2 | 7.82E-2 | 8.94E-2 | 0.00E+0 | 0.00E+0 | 1.95E-1 | 8.64E-3 | 3.86E-1 | 3.53E-1 | 0.00E+0 |
| SM | [kg] | 3.98E-1 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| RSF | [MJ] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| NRSF | [MJ] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| FW | [$m^3$] | 1.70E-1 | 1.72E-3 | 2.36E-5 | 1.48E-5 | 1.48E-5 | 1.48E-5 | 1.48E-5 | 3.00E-5 | 0.00E+0 | 0.00E+0 | 6.54E-5 | 1.69E-5 | 1.17E-3 | 3.42E-4 | 0.00E+0 |

| Caption | 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 |
|---|---|

**RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg of lock cylinder**

| Parameter | Unit | A1-A3 | A4 | A5 | C2 | C2/1 | C2/2 | C2/3 | C3 | C3/1 | C3/2 | C3/3 | C4 | C4/1 | C4/2 | C4/3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HWD | [kg] | 1.66E+0 | 5.64E-3 | 2.34E-4 | 4.83E-5 | 4.83E-5 | 4.83E-5 | 4.83E-5 | 2.81E-4 | 0.00E+0 | 0.00E+0 | 6.14E-4 | 2.88E-3 | 2.66E-1 | 1.24E-3 | 0.00E+0 |
| NHWD | [kg] | 3.67E+1 | 4.68E-1 | 2.24E-2 | 4.01E-3 | 4.01E-3 | 4.01E-3 | 4.01E-3 | 1.27E-3 | 0.00E+0 | 0.00E+0 | 2.77E-3 | 1.29E-2 | 1.45E-2 | 1.00E+0 | 0.00E+0 |
| RWD | [kg] | 4.55E-4 | 6.13E-5 | 2.07E-7 | 5.25E-7 | 5.25E-7 | 5.25E-7 | 5.25E-7 | 4.83E-7 | 0.00E+0 | 0.00E+0 | 1.05E-6 | 4.81E-8 | 1.35E-6 | 2.65E-6 | 0.00E+0 |
| CRU | [kg] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| MFR | [kg] | 7.99E-1 | 0.00E+0 | 9.76E-2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 4.58E-1 | 0.00E+0 | 0.00E+0 | 1.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| MER | [kg] | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 |
| EEE | [MJ] | 5.29E-4 | 0.00E+0 | 2.45E-2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 1.50E-2 | 1.39E+0 | 0.00E+0 | 0.00E+0 |
| EET | [MJ] | 1.10E-3 | 0.00E+0 | 5.14E-2 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 0.00E+0 | 3.07E-2 | 2.85E+0 | 0.00E+0 | 0.00E+0 |

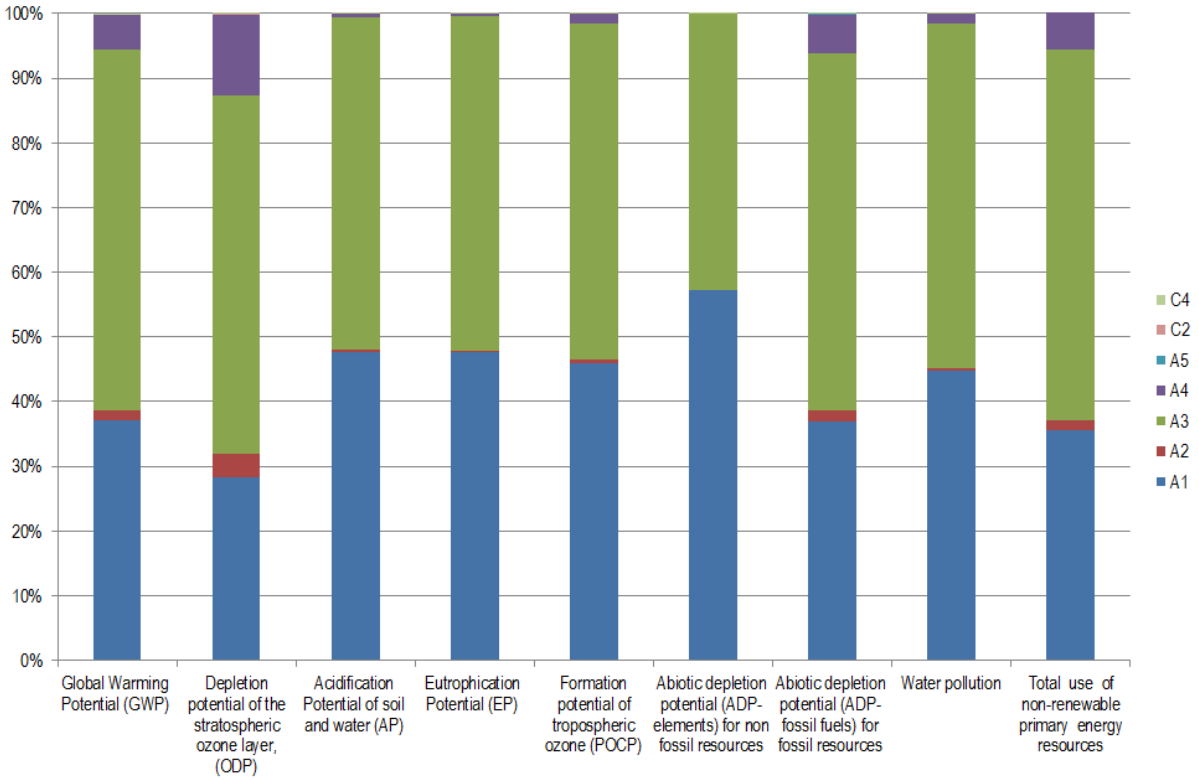
| Caption | HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy |
|---|---|

Other end of life scenarios have been calculated in order to build specific end of life scenario at the building level:
- scenario 1: the product is considered to be 100% incinerated
- scenario 2: the product is considered to be 100% landfilled
- scenario 3: the product is considered to be 100% recycled

## 6. LCA: Interpretation

Production stages (A1 and A3) are the main contributors to all environment indicators. A1 impacts are mainly due to brass and zinc extraction and production. A3 impacts come from the turning process and brass losses during the manufacturing of the product. Transport stage A4 has a non-negligible impact on ODP.

The results are conservative as complying with the composition given in section 2.6.




## 7. Requisite evidence

No testing results are required by the PCR part B.

## 8. References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