

# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

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)
Declaration number	EPD-ARG-20160189-IBG1-EN
ECO EPD Ref. No.	ECO-00000409
Issue date	14.09.2016
Valid to	13.09.2022

Lock cylinders

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

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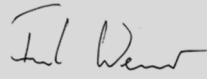
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## 1. General Information

<p><b>ARGE</b></p> <hr/> <p><b>Programme holder</b>          IBU - Institut Bauen und Umwelt          e.V. Panoramastr. 1          10178 Berlin          Germany</p> <hr/> <p><b>Declaration number</b>          EPD-ARG-20160189-IBG1-EN</p> <p><b>This Declaration is based on the Product Category Rules:</b>          Building Hardware products, 02.2016          (PCR tested and approved by the SVR)</p> <hr/> <p><b>Issue date</b>          14.09.2016</p> <hr/> <p><b>Valid to</b>          13.09.2022</p>	<p><b>Lock cylinders</b></p> <hr/> <p><b>Owner of the Declaration</b>          ARGE; European Federation of Associations of Lock and Builders Hardware Manufacturers          Offerstraße 12, 42551 Velbert          Germany</p> <hr/> <p><b>Declared product / Declared unit</b>          1 kg of lock cylinder</p> <p><b>Scope:</b>          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</p> <hr/> <p><b>Verification</b>          The CEN Norm /EN 15804/ serves as the core PCR          Independent verification of the declaration according to /ISO 14025/  <input type="checkbox"/> internally    <input checked="" type="checkbox"/> externally</p>
<p>          Prof. Dr.-Ing. Horst J. Bossenmayer          (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p>          Dr. Burkhard Lehmann          (Managing Director IBU)</p>	<p>          Dr. Frank Werner          (Independent verifier appointed by SVR)</p>

## 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 (RSL) for this product is 10 years. This is based on a mechanical endurance test as specified in /EN 1303/. The product is guaranteed to maintain its performance for at least 50 000 cycles of use.

## 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

## 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).

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.

### 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
Recycling (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

## 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 <sub>2</sub> -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 <sub>2</sub> -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 <sub>4</sub> ) <sup>3-</sup> -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 <sup>3</sup> ]	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	1.00E+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:

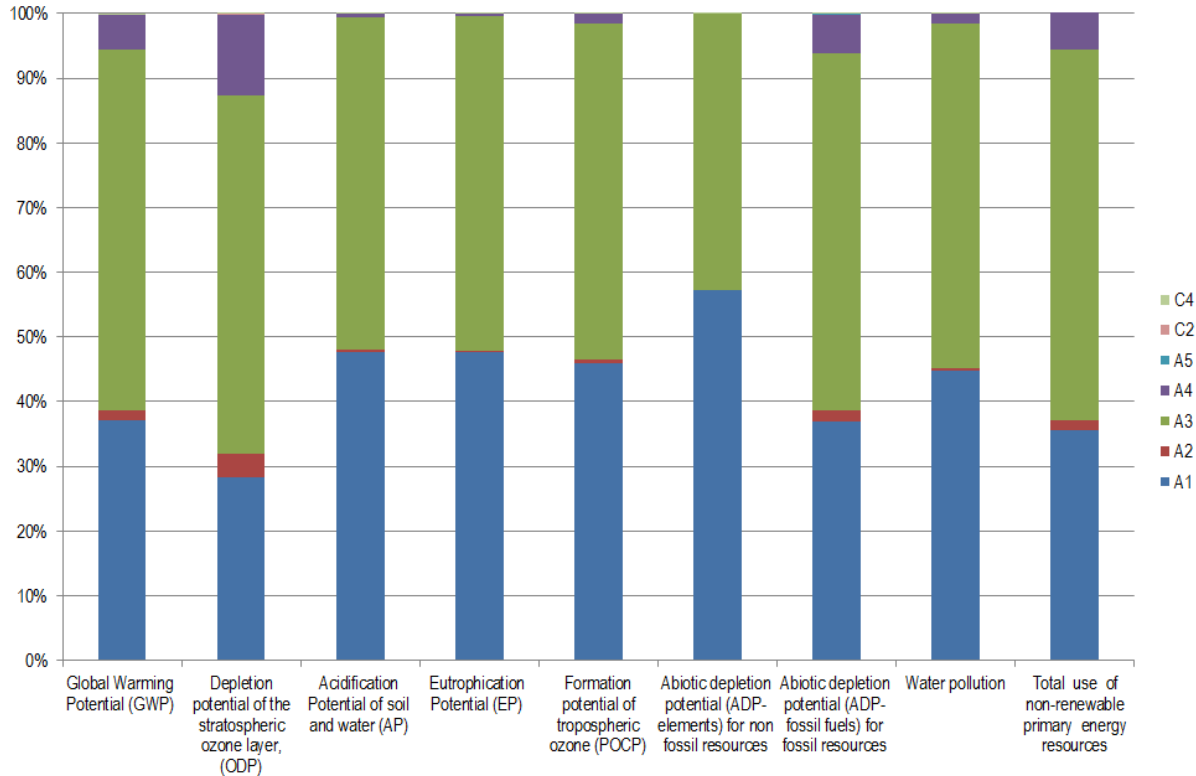
- scenario 1: the product is considered to be 100% incinerated
- scenario 2: the product is considered to be 100% landfilled
- scenario 3: the product is considered to be 100% recycled

## 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

### ISO 14040

ISO 14040:2006-10, Environmental management – Life cycle assessment – Principles and framework (ISO 14040:2006).” German and English version EN ISO 14040:2006

### DIN EN ISO 14044

DIN EN ISO 14044:2006-10, Environmental Management – Life Cycle Assessment Requirements and Instructions (ISO 14044:2006); German and English version EN ISO 14044:2006

### CEN/TR 15941

CEN/TR 15941:2010-03, Sustainability of construction works –Environmental Product Declarations – Methodology for selection and use of generic data; German version CEN/TR 15941:2010

### EN 1303

EN 1303:2015, Cylinders for locks- Requirements and test methods.

### FD P01-015

FD P01-015: 2006, Environmental quality of construction products - Energy and transport data sheet

### European Waste Code

epa – European Waste Catalogue and Hazardous Waste List - 01-2002.

### Ecoinvent 3.1

Ecoinvent 3.1 - Allocation Recycling database.

### IBU PCR part A

Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project report, 2016-08.

### IBU PCR part B

Part B: Requirements on the EPD for Building Hardware products, 2016-02.



**Institut Bauen und Umwelt**

Institut Bauen und Umwelt e.V., Berlin(pub.):  
Generation of Environmental Product Declarations  
(EPDs);  
[www.ibu-epd.de](http://www.ibu-epd.de)

Declarations — Core rules for the product category of  
construction products

**ISO 14025**

DIN EN ISO 14025:2011-10: Environmental labels and  
declarations — Type III environmental declarations —  
Principles and procedures

**EN 15804**

EN 15804:2012-04+A1 2013: Sustainability of  
construction works — Environmental Product



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**DÉCLARATION ENVIRONNEMENTALE DE PRODUIT**  
selon ISO 14025 et EN 15804

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**Informations supplémentaires conformément à  
la NF EN 15804/CN et aux exigences légales  
françaises sur les déclarations  
environnementales de produits**



## 1. Domaine d'application de cette annexe

Cette annexe à la DEP n°. EPD-ARG-20160189-IBG1-EN pour les cylindres de serrures par l'ARGE: Fédération Européenne des Associations de Fabricants de Serrures et de Ferrures contient des informations supplémentaires permettant d'atteindre la conformité avec les normes françaises et les textes législatifs français suivants :

- NF EN 15804+A1:2014-04, Contribution des ouvrages de construction au développement durable — Déclarations environnementales sur les produits — Règles régissant les catégories de produits de construction
- NF EN 15804/CN:2016-06, Contribution des ouvrages de construction au développement durable — Déclarations environnementales sur les produits — Règles régissant les catégories de produits de construction — Complément national à la NF EN 15804+A1
- Arrêté du 23 décembre 2013 relatif à la déclaration environnementale des produits de construction et de décoration destinés à un usage dans les ouvrages de bâtiment, Version consolidée au 23 juin 2016.

## 2. Avertissement

Les informations contenues dans cette annexe et dans la DEP correspondante ont été fournies sous la responsabilité de l'ARGE; Fédération Européenne des Associations de Fabricants de Serrures et de Ferrures selon NF EN 15804+A1 et le complément national NF EN 15804+A1/CN.

Toute utilisation, partielle ou totale, des informations fournies dans ce document devra être accompagnée, à tout le moins, par la référence explicite à la DEP originale et à l'émetteur de celle-ci, qui devra pouvoir en fournir un exemplaire complet.

La norme EN 15804+A1 définit les Règles pour la définition des catégories de produit (RCP).

NOTE 1 : La traduction littérale en français du terme anglais « Environmental Product Declaration » est « Déclaration Environnementale de Produit » (DEP). Cependant, un autre terme, FDES (fiche de déclaration environnementale et sanitaire), est couramment employé. Cette fiche comporte la déclaration environnementale et des informations sanitaires concernant le produit qu'elle concerne. La FDES est donc une « DEP » complétée par des informations sanitaires.

## 3. Produits déclarés et cadre de validité de la DEP

Pour le cadre de validité, voire chapitre 2.6 de la DEP IBU.

## 4. ACV : Indicateurs complémentaires

Les deux indicateurs « pollution de l'eau » et « pollution de l'air » sont calculés sur la base d'une approche de « volumes critiques » selon la norme NF EN 15804/CN.

L'indicateur « gaz de process fourni à l'extérieur » est un indicateur de l'inventaire du cycle de vie.

Les résultats de cette annexe sont valides pour l'unité fonctionnelle suivante :

- Une pièce de cylindre de serrures à 0,294 kg avec une durée de vie de référence de 10 ans (voir la IBU DEP pour tous détails concernant les conditions de référence).

Pour les détails des frontières du système et d'autres aspects méthodologiques de l'ACV, veuillez consulter les articles correspondants de la DEP.

## 5. ACV : Résultats

### DESCRIPTION DES FRONTIÈRES DU SYSTÈME (X = INCLUS DANS L'ACV ; MND = MODULE NON DÉCLARÉ ; MNR = MODULE PAS RELEVANT)

PHASE DE PRODUCTION			PHASE DU PROCESSUS DE CONSTRUCTION		PHASE D'UTILISATION							PHASE DE FIN DE VIE				BÉNÉFICES ET CHARGES AU-DELÀ DES FRONTIÈRES DU SYSTÈME
Fourniture des matières premières	Transport	Production	Transport de la sortie d'usine jusqu'au chantier	Assemblage	Utilisation	Maintenance	Réparation	Remplacement	Réhabilitation	Consommation d'énergie en fonctionnement	Consommation d'eau en fonctionnement	Déconstruction démolition	Transport	Traitement des déchets	Élimination	Potentiel de Réutilisation-Récupération-Recyclage
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MPR	MPR	MPR	MPR	MPR	MPR	MPR	X	X	X	X	MND

### RÉSULTATS DE L'ACV - IMPACT ENVIRONNEMENTALE : 1 pièce de cylindre de serrures (0,294 kg)

	Unit	A1-A3	A4	A5	C1	C2	C3	C4
GWP	[kg CO <sub>2</sub> -Eq.]	3,12E+00	1,73E-01	2,25E-03	0,00E+00	1,48E-03	1,17E-03	3,50E-03
ODP	[kg CFC11-Eq.]	2,23E-07	3,18E-08	9,00E-11	0,00E+00	2,72E-10	1,25E-10	2,55E-11
AP	[kg SO <sub>2</sub> -Eq.]	1,12E-01	7,03E-04	3,65E-06	0,00E+00	6,03E-06	4,85E-06	1,28E-06
EP	[kg (PO <sub>4</sub> ) <sup>3-</sup> -Eq.]	3,26E-02	1,19E-04	1,64E-06	0,00E+00	1,02E-06	5,44E-07	2,45E-06
POCP	[kg ethene-Eq.]	5,50E-03	7,88E-05	8,58E-07	0,00E+00	6,76E-07	2,67E-07	5,73E-07
ADPE	[kg Sb-Eq.]	2,11E-03	5,73E-07	1,04E-09	0,00E+00	4,91E-09	4,76E-10	2,41E-10
ADPF	[MJ]	4,15E+01	2,64E+00	8,88E-03	0,00E+00	2,26E-02	1,79E-02	2,23E-03
AirP	[m <sup>3</sup> ]	3,35E+03	2,38E+01	8,00E-02	0,00E+00	2,04E-01	5,70E-02	3,15E-02
WaterP	[m <sup>3</sup> ]	3,94E+00	6,12E-02	3,91E-04	0,00E+00	5,23E-04	2,87E-04	5,09E-04

légende	GWP = Potentiel de réchauffement global ; ODP = Potentiel d'appauvrissement de la couche d'ozone stratosphérique ; AP = Potentiel d'acidification du sol et de l'eau ; EP = Potentiel d'eutrophisation ; POCP = Potentiel de formation de l'ozone troposphérique ; ADPE = Potentiel d'épuisement abiotique des ressources non fossiles ; ADPF = Potentiel d'épuisement abiotique des ressources fossiles ; AirP = Pollution de l'air ; EauP = Pollution de l'eau ;							
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### RÉSULTATS DE L'ACV - UTILISATION DES RESSOURCES : 1 pièce de cylindre de serrures (0,294 kg)

	Unit	A1-A3	A4	A5	C1	C2	C3	C4
PERE	[MJ]	5,47E+00	3,29E-02	5,59E-04	0,00E+00	2,83E-04	2,32E-03	1,15E-04
PERM	[MJ]	6,41E-01	0,00E+00	-4,20E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	6,12E+00	3,29E-02	-4,20E-01	0,00E+00	2,83E-04	2,32E-03	1,15E-04
PENRE	[MJ]	4,62E+01	2,68E+00	1,06E-02	0,00E+00	2,30E-02	2,63E-02	2,54E-03
PENRM	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	4,62E+01	2,68E+00	1,06E-02	0,00E+00	2,30E-02	2,63E-02	2,54E-03
SM	[kg]	1,17E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m <sup>3</sup> ]	5,00E-02	5,06E-04	6,94E-06	0,00E+00	4,35E-06	8,82E-06	4,97E-06

légende	PERE = Utilisation de ressources d'énergie primaire renouvelable, à l'exclusion des ressources d'énergie primaire renouvelable utilisées comme matières premières ; PERM = Utilisation de ressources d'énergie primaire renouvelable utilisées en tant que matières premières ; PERT = Utilisation totale de ressources d'énergie primaire renouvelable ; PENRE = Utilisation de ressources d'énergie primaire non renouvelable, à l'exclusion des ressources d'énergie primaire renouvelable utilisées comme matières premières ; PENRM = Utilisation de d'énergie primaire non renouvelable utilisées en tant que matières premières ; PENRT = Utilisation totale de ressources d'énergie primaire non renouvelable ; SM = Utilisation de matériaux secondaires ; RSF = Utilisation de combustibles secondaires renouvelables ; NRSF = Utilisation de combustibles secondaires non renouvelables ; FW = Utilisation nette d'eau douce							
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### RÉSULTATS DE L'ACV - FLUX DE SORTIE ET CATÉGORIES DE DÉCHETS : 1 pièce de cylindre de serrures (0,294 kg)

	Unit	A1-A3	A4	A5	C1	C2	C3	C4
HWD	[kg]	4,88E-01	1,66E-03	6,88E-05	0,00E+00	1,42E-05	8,26E-05	8,47E-04
NHWD	[kg]	1,08E+01	1,38E-01	6,59E-03	0,00E+00	1,18E-03	3,73E-04	3,79E-03
RWD	[kg]	1,34E-04	1,80E-05	6,09E-08	0,00E+00	1,54E-07	1,42E-07	1,41E-08
CRU	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	2,35E-01	0,00E+00	2,87E-02	0,00E+00	0,00E+00	1,35E-01	0,00E+00
MER	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	[MJ]	1,56E-04	0,00E+00	7,20E-03	0,00E+00	0,00E+00	0,00E+00	4,41E-03
EET	[MJ]	3,23E-04	0,00E+00	1,51E-02	0,00E+00	0,00E+00	0,00E+00	9,03E-03
EET	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

légende	HWD = Déchets dangereux éliminés ; NHWD = Déchets non dangereux éliminés ; RWD = Déchets radioactifs éliminés ; CRU = Composants destinés à la réutilisation ; MFR = Matériaux destinés au recyclage ; MER = Matériaux destinés à la récupération de l'énergie ; EEE = Énergie électrique fournie à l'extérieur ; EET = Énergie thermique fournie à l'extérieur ; EEP = Gaz et process fourni à l'extérieur							
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Le scénario de fin de vie représente le scénario mixte Européen déclaré dans la DEP.

## 6. ACV : Valeurs indicateur cumulées

	PHASE DE PRODUCTION	PHASE DU PROCESSUS DE CONSTRUCTION	PHASE D'UTILISATION	PHASE DE FIN DE VIE	CYCLE DE VIE TOTAL
	A1-A3	A4-A5	B1-B7	C1-C4	A1-C4

### RÉSULTATS DE L'ACV - IMPACT ENVIRONNEMENTALE: 1 pièce de cylindre de serrures (0,294 kg)

Paramètre	Unité	A1-A3	A4-A5	B1-B7	C1-C4	A1-C4
GWP	[kg CO <sub>2</sub> -Eq.]	3,12E+00	1,75E-01	0,00E+00	6,15E-03	3,29E+00
ODP	[kg CO <sub>2</sub> -Eq.]	2,23E-07	3,18E-08	0,00E+00	4,23E-10	2,55E-07
AP	[kg SO <sub>2</sub> -Eq.]	1,12E-01	7,06E-04	0,00E+00	1,22E-05	1,13E-01
EP	[kg (PO <sub>4</sub> ) <sup>3</sup> -Eq.]	3,26E-02	1,21E-04	0,00E+00	4,02E-06	3,26E-02
POCP	[kg éthène-Eq.]	5,50E-03	7,97E-05	0,00E+00	1,52E-06	5,59E-03
ADPE	[kg Sb-Eq.]	2,11E-03	5,74E-07	0,00E+00	5,63E-09	2,11E-03
ADPF	[MJ]	4,15E+01	2,65E+00	0,00E+00	4,28E-02	4,41E+01
AirP	[m <sup>3</sup> ]	3,35E+03	2,39E+01	0,00E+00	2,92E-01	3,35E+03
EauP	[m <sup>3</sup> ]	3,94E+00	6,15E-02	0,00E+00	1,32E-03	4,00E+00

légende	GWP = Potentiel de réchauffement global ; ODP = Potentiel d'appauvrissement de la couche d'ozone stratosphérique ; AP = Potentiel d'acidification du sol et de l'eau ; EP = Potentiel d'eutrophisation ; POCP = Potentiel de formation de l'ozone troposphérique ; ADPE = Potentiel d'épuisement abiotique des ressources non fossiles ; ADPF = Potentiel d'épuisement abiotique des ressources fossiles ; AirP = Pollution de l'air ; EauP = Pollution de l'eau ;
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### RÉSULTATS DE L'ACV - UTILISATION DES RESSOURCES : 1 pièce de cylindre de serrures (0,294 kg)

Paramètre	Unité	A1-A3	A4-A5	B1-B7	C1-C4	A1-C4
PERE	[MJ]	5,47E+00	3,35E-02	0,00E+00	2,71E-03	5,53E+00
PERM	[MJ]	6,41E-01	-4,20E-01	0,00E+00	0,00E+00	2,20E-01
PERT	[MJ]	6,12E+00	-3,87E-01	0,00E+00	2,71E-03	5,73E+00
PENRE	[MJ]	4,62E+01	2,69E+00	0,00E+00	5,18E-02	4,91E+01
PENRM	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	4,62E+01	2,69E+00	0,00E+00	5,18E-02	4,91E+01
SM	[kg]	1,17E-01	0,00E+00	0,00E+00	0,00E+00	1,17E-01
RSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m <sup>3</sup> ]	5,00E-02	5,13E-04	0,00E+00	1,81E-05	5,03E-02

légende	PERE = Utilisation de ressources d'énergie primaire renouvelable, à l'exclusion des ressources d'énergie primaire renouvelable utilisées comme matières premières ; PERM = Utilisation de ressources d'énergie primaire renouvelable utilisées en tant que matières premières ; PERT = Utilisation totale de ressources d'énergie primaire renouvelable ; PENRE = Utilisation de ressources d'énergie primaire non renouvelable, à l'exclusion des ressources d'énergie primaire renouvelable utilisées comme matières premières ; PENRM = Utilisation de d'énergie primaire non renouvelable utilisées en tant que matières premières ; PENRT = Utilisation totale de ressources d'énergie primaire non renouvelable ; SM = Utilisation de matériaux secondaires ; RSF = Utilisation de combustibles secondaires renouvelables ; NRSF = Utilisation de combustibles secondaires non renouvelables ; FW = Utilisation nette d'eau douce
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### RÉSULTS DE L'ACV – FLUX DE SORTIE ET CATEGORIES DE DÉCHETS : 1 pièce de cylindre de serrures (0,294 kg)

Paramètre	Unité	A1-A3	A4-A5	B1-B7	C1-C4	A1-C4
HWD	[kg]	4,88E-01	1,73E-03	0,00E+00	9,44E-04	4,91E-01
NHWD	[kg]	1,08E+01	1,44E-01	0,00E+00	5,34E-03	1,09E+01
RWD	[kg]	1,34E-04	1,81E-05	0,00E+00	3,10E-07	1,52E-04
CRU	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	[kg]	2,35E-01	2,87E-02	0,00E+00	1,35E-01	3,97E-01
MER	[kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	[MJ]	1,56E-04	7,20E-03	0,00E+00	4,41E-03	1,18E-02
EET	[MJ]	3,23E-04	1,51E-02	0,00E+00	9,03E-03	2,45E-02
EEP	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

légende	HWD = Déchets dangereux éliminés ; NHWD = Déchets non dangereux éliminés ; RWD = Déchets radioactifs éliminés ; CRU = Composants destinés à la réutilisation ; MFR = Matériaux destinés au recyclage ; MER = Matériaux destinés à la récupération de l'énergie ; EEE = Énergie électrique fournie à l'extérieur ; EET = Énergie thermique fournie à l'extérieur ; EEP = Gaz et process fourni à l'extérieur
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## 7. Informations supplémentaires sur le rejet de substances dangereuses dans l'air à l'intérieur des bâtiments, dans le sol et dans l'eau pendant la phase d'utilisation.

### 7.1 Air à l'intérieur des bâtiments

Pas de relevance pour le produit déclaré.

### 7.2 Sol et eau

Pas de relevance pour le produit déclaré.

## 8. Contribution du produit à la qualité de vie à l'intérieur des bâtiments

### 8.1 Confort hygrothermique

Pas de relevance pour le produit déclaré.

### 8.2 Confort acoustique

Pas de relevance pour le produit déclaré.

### 8.3 Confort visuel

Pas de relevance pour le produit déclaré.

### 8.4 Confort olfactif

Pas de relevance pour le produit déclaré.

## 9. Références

### NF EN 15804+A1

NF EN 15804+A1:2014-04, Contribution des ouvrages de construction au développement durable — Déclarations environnementales sur les produits — Règles régissant les catégories de produits de construction

### NF EN 15804/CN

NF EN 15804/CN:2014-04, Contribution des ouvrages de construction au développement durable — Déclarations environnementales sur

les produits — Règles régissant les catégories de produits de construction — Complément national à la NF EN 15804+A1

### Arrêté du 23 décembre 2013

Arrêté du 23 décembre 2013 relatif à la déclaration environnementale des produits de construction et de décoration destinés à un usage dans les ouvrages de bâtiment, Version consolidée au 23 juin 2016.

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