Environmental Product Declaration

according to ISO 14025 and EN 15804

Declaration holder	Fachverband Schloss- und Beschlagindustrie e.V.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Program holder	Institut Bauen und Umwelt e.V. (IBU)
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Valid To	15.06.2019

Aluminium Door Hardware

Fachverband Schloss- und Beschlagindustrie e.V.

FVSB

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1. General Information

Fachverband Schloss- und Beschlagindustrie e.V.

Program holder

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Germany

Declaration number

EPD-FVS-2014067-IBA1-DE

This declaration is based on the product category regulations:

Locks and Fittings, 10-2013
(PCR-tested and approved by the independent testing committee)

Date of issue

16.06.2014

Valid To

15.06.2019

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

Dr. Burkhart
Lehmann (Chairman
IBU)

Aluminium Door Hardware

Owner of the Declaration

Fachverband Schloss- und Beschlagindustrie e.V.

Offerstrasse 12
42551 Velbert

Declared Product/Declared Unit

An aluminium door fitting with an average weight of 0.6 kg

Scope of Validity:

This sample environmental declaration relates to an average aluminium fitting assembly for doors.

The values determined to calculate the LCA originate from a member company selected by the Fachverband Schloss- und Beschlagindustrie e.V.

The product is representative for the product group according to the Fachverband Schloss- und Beschlagindustrie e.V. The assembly location is Germany. The owner of the declaration is liable for the fundamental information and verification; any liability by the IBU in relation to manufacturer's information, LCA data and verification is excluded.

Verification

CEN standard EN 15804 serves as the core PCR

Independent verification of the declaration and data by an independent third party in accordance with ISO 14025

internal x external

Prof. Dr. Birgit Grahl,
Independent tester appointed by SVA

2. Product

2.1 Product description

This hardware mainly consists of various aluminium alloys in differing proportions and can also contain subordinate shares of other metals. Product weights between 0.350 kg and 0.750 kg are normal depending on the design. The hardware opens and closes interior and exterior doors. It consists of the handle which serves to open and close the door manually, alternatively a knob and the backplate or escutcheon, normally with a keyhole for operating the built-in lock. The hardware can be used on wood, plastic or metal doors.

2.2 Range of application

Operating the handle moves the built-in lock or the latch bolt from the closed to the open position and back again. The handle is responsible for the manual movement of the pivotable or slidable door leaf and together with the other components of the door ensures that building physics-related and possibly other technical properties such as burglar resistance are achieved safely. The hardware is normally installed in the door leaf by the door manufacturer.

2.3 Technical Data

Not relevant.

2.4 Placing on the market/Application rules

DIN EN 1906, DIN EN 179, DIN 18255.

2.5 Delivery status

The door fitting sets shown here are supplied in standard formats and with standard openings with regard to combinations with fitted locks and usually fitted to the door leaf by the door manufacturer. They may also be offered individually by building suppliers. The end customer receives the fitted door fitting.

2.6 Base materials/Ancillary materials

The declared fitting parts consist of various galvanised steels (30%), aluminium alloys (60%) and small amounts of plastics (10%).
Plant oil-based cooling agents may be used during cutting to size, punching and boring. These have no effect on the material composition of the end product.

2.7 Manufacture

The hardware is manufactured at the factory in three steps:
- Prefabrication (cutting to size and punching, aluminium casting)
- Prefitting of assemblies
- Final assembly

A part of the pre-products are manufactured in Germany. The escutcheon and handle components are made in China.

2.8 Environment and health during manufacturing

No environmental interactions which must be especially taken into account occur during the manufacture of the hardware.
Air: The compressed air (pneumatic cylinder) required for processing is produced in enclosed plants and cleaned with filter systems.
Water/soil: Water and ground are not contaminated as no waste water is produced during the manufacturing process.
Cleaning agents are not used in the manufacturing process.
Sound emissions Regular sound emission tests at the production locations show that only the cutting and punching areas, which are labelled as a noise zone, are relevant as regards work protection laws. Employees always wear ear protection and are subject to monitoring by the company doctor.

2.9 Product processing/Installation

The hardware is either sent directly to the door manufacturer by the manufacturer or supplied ready-to-use to the building materials trade. Processing recommendations are provide. During final fitting of the door care must be taken that the fitting is fitted properly. On its home page, the Fachverband Schloss- und Beschlagindustrie e.V. recommends the VHBH and VHBE brochures which describe the manufacturer's and the end user's obligations.

2.10 Packaging

The fitting sets are normally packaged in disposal packaging made of recyclable cardboard. There is no elaborate sales packaging if deliveries are made directly to the processor (door manufacturer). The packaging mainly serves as protection during transport. Cardboard, PE film and wooden pallets are used as packaging material for the representative product.

2.11 Condition of use

The materials result from the raw materials de-scribed in Chapter 2.1. The fittings described are maintenance-free and are not subject to wear under normal use.

2.12 Environment and health during use

Material-specific reactions or reciprocal reactions with the environment/the user's health are not expected.

2.13 Reference service life

The products are designed for permanent use and certified accordingly. With Class 4 they fulfil the currently highest quality standard in accordance with DIN EN 1906.

2.14 Extraordinary effects Fire

Metal fittings are classified as not combustible. Aluminium fittings have a steel core. They are therefore allocated to Class D / D1 in accordance with DIN EN 13501-1 and DIN EN 1906.

Water

No negative effects for the environment and drinking water protection are to be expected from the effects of flooding. A function test must be performed once the floods have subsided. Corrosion can lead to consequential damage.

Mechanical destruction

The mechanical destruction of door handle hardware is not expected in case of ordinary use. In practice, the hardware is only damaged if the entire door is destroyed and renewed as necessary.

2.15 End of life phase

The materials used are high-quality raw materials which can be recycled at the end of the use phase. No environmental contamination occurs when the fittings are dismantled. On the other hand, continued use of the fitting does not normally make economic sense.

2.16 Disposal

The fitting is to be disposed of separately if a door is dismantled. The simple dismantling option means the hardware in the post-use phase can be completely given over to recycling. Disposal is superfluous because it would be possible without special conditions or influencing of the environment stating the waste code 17.04.07 according to the European Waste Catalogue.

2.17 Further information

Aluminium hardware is manufactured in various designs depending on the type and amount of stress on the door. Generally, the same hardware is suitable for both wooden and plastic surfaces.

3. LCA: Calculation rules

3.1 Declared unit

The declaration relates to a set of aluminium hardware for doors, manufactured by a member company of the Fachverband Schloss- und Beschlagindustrie e.V. in Germany. The product is representative for the product group. The total weight of the declared average door fitting is 0.614 kg.

Specification of the declared unit

Designation	Value	Unit
Declared unit	1	Piece/Product
Conversion factor to 1 kg	1.6	-
Declared unit (alternative)	-	kg

3.2 System boundary

EPD type: Cradle to gate - with options. The calculated LCA addresses the
life cycle stage of product manufacture as well as a recycling scenario. Product manufacture includes modules A1 (raw materials provision and pre-product manufacture), A2 (transport) and A3 (manufacture). The recycling scenario includes modules C2 (transport for disposal/recycling), C3 (waste recycling) and C4 (disposal). Credits from re-use, recovery and recycling potential are shown in module D in accordance with DIN EN 15804.

3.3 Estimates and assumptions

The declared aluminium fitting was calculated on the basis of production data from a member company of the Fachverband
Schloss- und Beschlagindustrie e.V. To calculate the values, a manufacturer of aluminium door hardware was selected by the Fachverband Schloss- und Beschlagindustrie e.V. as being representative for further Fachverband Schloss- und Beschlagindustrie e.V. companies. The aluminium door fitting on which the calculation in this declaration is based was also deliberately chosen so that it best represents the respective product group. The manufacturing processes and raw materials are comparable due to the normative specifications and requirements for further use.
The actual transport distances were used for the transport of the raw materials to the factory. A transport distance of 200 km was estimated for recycling.

3.4 Cut-off criteria

All production data collected was taken into account in the LCA. Processes which contribute less than 1% by weight to the final result and in all impact categories have been ignored.
It can be assumed that the ignored processes would have contributed less than 5% respectively to the impact categories included.
Machines, plant and infrastructure needed for manufacture have been ignored.
Transport for packaging has been ignored.

3.5 Background data

The **GaBi 6** software system for integrated balancing developed by PE INTERNATIONAL was used to model the life cycle for the manufacture of aluminium hardware. The consistent data records in the GaBi 6 database are documented in the GaBi 6 online documentation. The basic data in the GaBi database was used for energy, transport and auxiliary materials. The LCA was produced for the reference area of Germany. This means that in addition to the production processes within these framework conditions, the preliminary stages relevant for Germany such as electricity or energy source provision were used. The electricity mix for Germany in relation to the year 2009 was used.

3.6 Data quality

All background data records relevant for the LCA were taken from the GaBi 6 software database. The last review of the background data used was less than four years ago.

The relevant member company made current primary data from production in 2013 available. This production data was checked for plausibility. According to the manufacturer's data, the representativeness of the declared product is excellent.

The database contained corresponding data records for all upstream products. The data quality can be regarded as being excellent.

3.7 Period under review

The data basis for this LCA is current data from a member company of the Fachverband Schloss- und Beschlagindustrie e.V. from 2013.

3.8 Allocation

No allocations from PE INTERNATIONAL were made as only the finished aluminium door hardware components are assembled at the representative company. All factory data relates exclusively to the declared product.

3.9 Comparability

Comparison or evaluation of EPD data is really only possible if all data records to be compared were produced in accordance with DIN EN 15804 and the building context and the product-specific technical features are taken into account.

4. LCA: Scenarios and additional technical information

Transport to recycling (C2)

Designation	Value	Unit
Transport distance	200	km
Capacity utilisation (including empty runs)	85	%

End of life (C1-C4)

Designation	Value	Unit
Collected separately	0	kg
Collected as mixed aluminium construction waste	0.614	kg
Re-use	0	kg
Recycling	0.534	kg
Energy recovery	0.019	kg
Landfilling	0.061	kg

Re-use, recovery and recycling potential (D), relevant scenarios

Designation	Value	Unit
Steel recycling	0.153	kg
Aluminium recycling	0.381	kg
Polyamide 6 energy recovery GF 30	0.019	kg

5 LCA Results:

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 boundary
Raw material supply	Transport	Manufacture	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / Demolition	Transport	Waste processing	Disposal	Re-use, recovery or recycling potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	MND	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: Aluminium door fitting: [0,614 kg each]

Parameter	Unit	A1 - A3	C2	C4	D
Global Warming Potential	[kg CO_2 eq.]	1.1E +1	6.1E-3	3.4E-2	-3.6E+0
Depletion potential of the stratospheric ozone layer	[kg CFC11 eq.]	6.1E-10	1.3E-13	1.5E-12	1.6E-9
Acidification potential of land and water	[kg SO_2 eq.]	8.1E-3	2.7E-5	5.9E-5	-2.0E-2
Eutrophication potential	[kg $(PO_4)^{3-}$ eq.]	7.4E-3	6.5E-6	1.5E-5	-9.3E-4
Formation potential for tropospheric ozone	[kg Ethen eq.]	5.8E-3	-9.2E-6	4.6E-6	-1.1E-3
Abiotic depletion potential for non-fossil resources	[kg Sb eq.]	9.3E-6	2.8E-10	1.1E-9	-1.3E-6
Abiotic depletion potential for fossil resources	[MJ]	1.3E+2	8.3E-2	3.3E-2	-3.4E+1

RESULTS OF THE LCA – RESOURCE USE: Aluminium door fitting: [0,614 kg each]

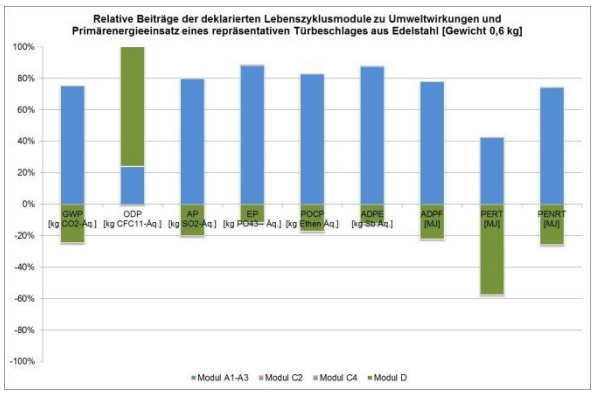
Parameter	Unit	A1 - A3	C2	C4	D
Renewable primary energy as energy source	[MJ]	1.0E+1	5.0E-3	1.9E-3	-1.4E+1
Renewable primary energy resources as material	[MJ]	0.0E+0	-	-	-
Total use of renewable primary energy	[MJ]	1.0E+1	5.0E-3	1.9E-3	-1.4E+1
Non-renewable primary energy as energy source	[MJ]	1.2E+2	8.4E-2	3.5E-2	-4.2E+1
Non-renewable primary energy resources as material	[MJ]	6.4E-2	-	-	-
Total use of non-renewable primary energy	[MJ]	1.3E+2	8.4E-2	3.5E-2	-4.2E+1
Use of secondary material	[kg]	0.0E+0	0.0E+0	0.0E+0	-
Use of renewable secondary fuels	[MJ]	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Use of non-renewable secondary fuels	[MJ]	0.0E+0	0.0E+0	0.0E+0	0.0E+0
Use of net fresh water	[m^3]	-	-	-	-

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: Aluminium door fitting: [0,614 kg each]

Parameter	Unit	A1 - A3	C2	C4	D
Hazardous waste disposal	[kg]	-	-	-	-
Non-hazardous waste disposed	[kg]	-	-	-	-
Radioactive waste disposed	[kg]	-	-	-	-
Components for re-use	[kg]	-	-	-	-
Materials for recycling	[kg]	-	-	-	5.4E-1
Materials for energy recovery	[kg]	-	-	-	-
Exported electrical energy	[MJ]	-	-	6.0E-2	-
Exported thermal energy	[MJ]	-	-	1.4E-1	-

** The indicators cannot be identified (SVA resolution dated 07/01/2013).*

6. LCA: Interpretation



As can be seen from the diagram, the contributions from modules A1-A3 and the credits(module D) dominate. The credits arise from -recycling of metallic preliminary products and the thermal recycling of plastic materials.
The largest contribution to **Global Warming Potential (GWP, 100 years)** comes from preliminary product provision (97%) - mainly from the manufacture of aluminium ingots in China (90%). 2.5% of GWP gas emissions are caused by the production process itself. This is mainly attributable to the use of electrical energy. A total of 31% of total GWP emissions can be avoided through recycling (credit in module D);

aluminium recycling provides the dominant contribution here.
100% of the **Ozone Depletion Potential (ODP)** comes from upstream chains. The manufacture of the aluminium ingots (73%) contributes especially to the total ODP. Halogenated organic emissions (R 114, dichlorotetrafluoroethane) are released by the use of nuclear power in the manufacturing processes of the preliminary products. The values in module D (impacts attributable to recycling) also contribute to the overall impacts of this effect category. This is due to the fact that the electricity used in recycling has a higher share of nuclear energy (European electricity mix) than
the electricity mix for the manufacture of Chinese aluminium ingots (the Chinese electricity mix has an approximately 2% share of nuclear energy and the European mix around 30%). The emissions during recycling are caused by RKFs which are used as a cooling agent in nuclear power stations.
The **Acidification Potential (AP)** is dominated by 96% in the production stage by the provision of raw materials (module A1). The greatest effects therefore result from the manufacture of stainless steel (93%). Above all, sulphur dioxide (67%) and nitrogen oxide (33%) dominate the AP A credit of approximately 25% is offset mainly by recycling aluminium.
The largest contribution to **eutrophication potential (EP)** comes from preliminary product provision (93%), mainly the aluminium components (Escutcheon and handle) (90%). The EP is dominated by nitrogen oxide emissions (96%) due to energy production and use. A total of approximately 13% of the total emissions are credited.
The **Abiotic Depletion Potential (ADPE non-fossil)** is mainly caused by the manufacturing stage (module A1-A3). The upstream chains (A1) (approx. 96%) contribute mainly to the total ADPE. The largest contribution is made by the production of galvanised steel (approx. 79%). The disposal stage (C2 and C3) has no significant influence. The credit is approximately 14% in total.
The **Abiotic Depletion Potential (ADP fossil)** results mainly from the contribution of the up-stream chains in module A1 (96%). The use of aluminium (84%) makes a particularly large contribution to the ADPF. A credit of approximately 29% is generated mainly by recycling aluminium.
The **ozone smog potential (POCP) i**s triggered by the provision of the pre-products. Modules A2 and A3 (approx. 4%) have less effect than A1 (approx. 96%). Especially the NMVOC group, sulphur dioxide and nitrogen oxide contribute to POCP. The credit here is 21%.
The **entire primary energy requirement** is divided into 92% from non-renewable energy sources and 8% from renewable sources.
68% of the **entire renewable primary energy requirement (PERT)** results from the pre-product manufacture upstream chains (module A1). The influence of the manufacture of the aluminium components is particularly apparent at approximately 64%. Approximately 32% comes from module A3, which is attributable to the renewable part of the electricity mix. Aluminium scrap is credited with European aluminium as it is assumed that recycling of the product will take place in Europe. The aluminium escutcheon and handle preliminary products are manufactured with Chinese aluminium. For the manufacture of European aluminium, the electricity mix contains a higher share of renewable energy sources than for Chinese aluminium. The credit is higher than the loads in the production stage for this reason.
With regard to the **entire non-renewable primary energy requirement (PENRT)**, the pre-product manufacture upstream chains contribute 97% (largely from cast aluminium production at approx. 84%). A total of 35% is credited which comes mainly from recycling the metallic preliminary products.

7. Requisite evidence

No further evidence is required according to the PCR for locks and hardware.

8. References

Institut Bauen und Umwelt e.V. (IBU) Berlin (Eds.):

General principles
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Product category rules for construction products
Part A: Calculation rules for the LCA and requirements in the background report. 2013-04

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

EN 15804:
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European Waste Catalogue dated 10th December 2001 (Federal Legal Gazette p. 3379) last modified by Article 5 Paragraph 22 of the law dated 24th February 2012 (Federal Legal Gazette p. 212).

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GaBi 6: 2011B
GaBi 6: Documentation of GaBi 6 data records in the integrated balancing database. LBP, LBP, University of Stuttgart and PE International, 2011 http://documentation.gabi-software.com/,

DIN EN 13501-1
DIN EN 13501-1:2010-01: Fire classification of construction products and building elements - Part 1 Classification using data from reaction to fire tests

DIN 18255
DIN 18255:2002-05: Building hardware -Door lever handles, backplates and escutcheons - Definitions, dimensions, requirements and marking

VHBH Directive
VHBH 2009-11; Hardware for windows and balcony doors - guidelines/advice on the product and on liability.

VHBE Directive
VHBE 2009-11; Hardware for windows and balcony doors - guidelines/advice for end users.

DIN EN 179
DIN EN 179:2008-04: Building hardware - Emergency exit devices operated by a lever handle or push pad, for use on escape routes - Requirements and test methods

DIN EN 1906
DIN EN 1906:2012-12: Building hardware - Lever handles and knob furniture - Requirements and test methods

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