ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

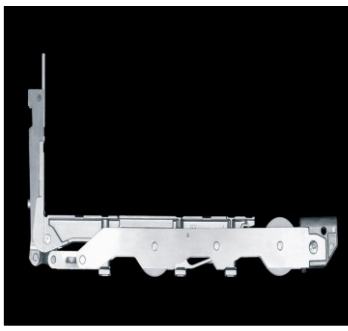
Owner of the Declaration	Fachverband Schloss- und Beschlagindustrie e.V.
Publisher	Institut Bauen und Umwelt (IBU)
Programme Holder	Institut Bauen und Umwelt (IBU)
Declaration Number	EPD-FVS-20130198-IBG1-EN
Issue Date	23/09/2013
Valid To	22/09/2018

Sliding Hardware

Fachverband Schloss- und Beschlagindustrie e.V.

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com



1 General Information

Fachverband Schloss- und Beschlagindustrie e.V.

Programme Holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastrasse 1
D-10178 Berlin

Declaration Number
EPD-FVS-20130198-IBG1-EN

This declaration is based on the product category regulations:
PCR Locks and Builders Hardware, 07-2012
(PCR-tested and approved by the independent testing committee)

Issue Date
23/09/2013

Valid to
22/09/2018

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

Prof. Dr.-Ing. Hans-Wolf Reinhardt
(Chairman of SVA)

Sliding Hardware

Owner of the Declaration
Fachverband Schloss- und Beschlagindustrie e.V.
Offerstrasse 12
D-42551 Velbert

Declared Product/Declared Unit
A representative sliding hardware set for windows or patio doors with a total weight of 9.92kg.

Scope of Validity:
This sample environmental declaration relates to a representative sliding hardware set for windows or patio doors.

The values determined to calculate the LCA originate from a member company selected by the Fachverband Schloss- und Beschlagindustrie e.V. The average product is representative for the product group according to the Fachverband Schloss- und Beschlagindustrie e.V. The production and installation location is Germany.

The owner of the declaration is liable for the fundamental information and verification; any liability by the IDU in relation to manufacturers' information, LCA data and verification is excluded.

Verification

CEN standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025
☐ internal ☒ external

Prof. Dr. Bir
(Independent tester appointed by SVA)

2 Product

2.1 Product Description

This hardware mainly consists of various metal alloys in differing proportions. They can be lifting, pivoting or parallel sliding/tipping sliding hardware. Product weights between 3.42 kg and 9.92 kg are normal depending on the version. The hardware opens and closes sliding doors or windows. Concealed hardware is common nowadays.

2.2 Application

The window casement is moved from a closed to an open position and back again by using the handle. Several locking points are operated by a system built into the window casement. The fitting is responsible for the manual movement of the liftable, pivotable or slidable window casement and together with the other components of the window ensures that building physics-related and possibly other properties such as burglar resistance are achieved safely. The hardware is normally installed in the window frame by the window manufacturer.

2.3 Technical Data

Not relevant.

2.4 Placing on the market/Application rules

DIN EN 13126-16, DIN 13857, QM 346, QM 347

2.5 Delivery status

The hardware being examined here is supplied in standard sizes and adapted to the necessary window or door format by the window manufacturer. The hardware weight for a reference window sized FFB 1.480 mm x FFH 2.180 mm is approximately 25 kg including the ground sill. Fitting weights for larger or smaller window sizes can be extrapolated via the lengths of the frames.

The hardware is supplied ready to fit and factory fitted by the processing company. The end customer receives the completely assembled window for installation in a building.

2.6 Base materials/Ancillary materials

The declared hardware consists of various galvanised steels (36%), stainless steel (9%) 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)
- Prefitting of assemblies
- Final assembly
- Exposed metal surfaces are generally anodised, varnished, powder-coated or galvanised. This is partly carried out by supply partners. All requirements of quality, environmental and work safety management systems were complied with in the process.

Only galvanising was examined as a surface treatment for the LCA.

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/Ground: 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 normally sent directly from the manufacturer to the window manufacturer. Processing recommendations are provided. During final fitting of the window care must be taken that the fitting is fitted properly. In particular the maximum window/casement weights approved by the manufacturer must be complied with. 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 because deliveries are made directly to the processor. The packaging mainly serves as protection during transport.

2.11 Condition of use

The materials result from the raw materials described in Chapter 2.1 The hardware described is maintained according to the manufacturer's specifications. They are not subject to wear under normal use.

2.12 Environment and health during manufacturing

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, tested accordingly and classified according to DIN EN 13126-1.

2.14 Extraordinary effects

Fire

Metal hardware is classified as not combustible. As regards its reaction to fire, it is allocated to Class A1 in accordance with DIN EN 13501-1.

Water

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

Mechanical destruction

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

2.15 Re-use 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 seals are dismantled. On the other hand, continued use of the fitting does not normally make economic sense.

2.16 Disposal

The seal is to be disposed of separately if a window is removed. 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

Hardware is manufactured in various designs depending on the type of window. Generally, the same hardware is suitable for both wooden and plastic profiles. Especially matched materials are normally also used for hardware on aluminium profiles.

3 LCA: Calculation rules

3.1 Declared unit

The declaration relates to one set of sliding hardware manufactured by a member company of the Fachverband Schloss- und Beschlagindustrie e.V. This average product is representative for the product group. The total weight of the declared average sliding hardware is 9.92 kg.

Specification of the declared unit

Designation	Value	Unit
Conversion factor to 1 kg	0.10	-
Declared unit	1	Piece/Product

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), A2 (transport) and A3 (manufacture). The recycling scenario includes modules C2 8transport for disposal/recycling), C3 (waste recycling) and C4 (disposal). Credits from reuse, recovery and recycling potential are shown in module D in accordance with DIN EN 15804.

3.3 Estimates and assumptions

The declared sliding hardware 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 sliding hardware was selected by the Fachverband Schloss- und Beschlagindustrie e.V. as being representative for further Fachverband Schloss- und Beschlagindustrie e.V. companies. The hardware on which the calculation in this declaration is based was also deliberately chosen so that it best represents each product group. The manufacturing processes and raw materials are comparable due to the normative specifications and requirements.

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 balance. 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 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 relevant for the LCA was taken from the GaBi 6 database. The last revision of the background data used for balancing was less than four years ago.

The corresponding member company made current primary data from production in 2011 available. This production data was checked for plausibility. According 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 2011.

3.8 Allocation

No allocations were made as the hardware is manufactured on independent production lines. All factory data relates exclusively to the declared products.

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

The following technical information forms the basis of the declared modules or can be used for the development of specific scenarios in the context of a building assessment if modules are not declared (MND)

Transport to recycling (C2)

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

End of life (C1-C4)

Collected separately	100 %
Collected as mixed construction waste	0%
Re-use	0 %
Recycling	85 %
Energy recovery	5 %
Landfilling	10 %

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	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: Sliding Hardware [9.92 kg/product]

		Manufacture	Disposal			Credit
Parameter	**Unit**	**A1-A3**	**C2**	**C3**	**C4**	**D**
GWP	[kg CO_2-Eq.]	7.2E+01	9.9E-02	1.0E+00	5.7E-02	-3.7E+01
ODP	[kg CFC11-Eq.]	4.9E-06	2.1E-12	2.5E-11	1.1E-11	-3.0E-06
AP	[kg SO_2-Eq.]	2.8E-01	4.4E-04	1.8E-03	8.5E-05	-1.7E-07
EP	[kg PO_4^{3-}- Eq.]	1.8E-02	1.1E-04	4.6E-04	1.3E-05	-7.8E-03
POCP	[kg Ethen Eq.]	2.3E-02	-1.5E-04	1.1E-04	2.2E-05	-1.2E-02
ADPE	[kg Sb Eq.]	1.5E-03	4.5E-09	1.1E-08	5.0E-09	-9.9E-04
ADPF	[MJ]	7.6E+02	1.4E+00	6.5E-01	1.9E-01	-3.5E+02
Key	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 for tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources					

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: Sliding Hardware [9.92 kg/product]

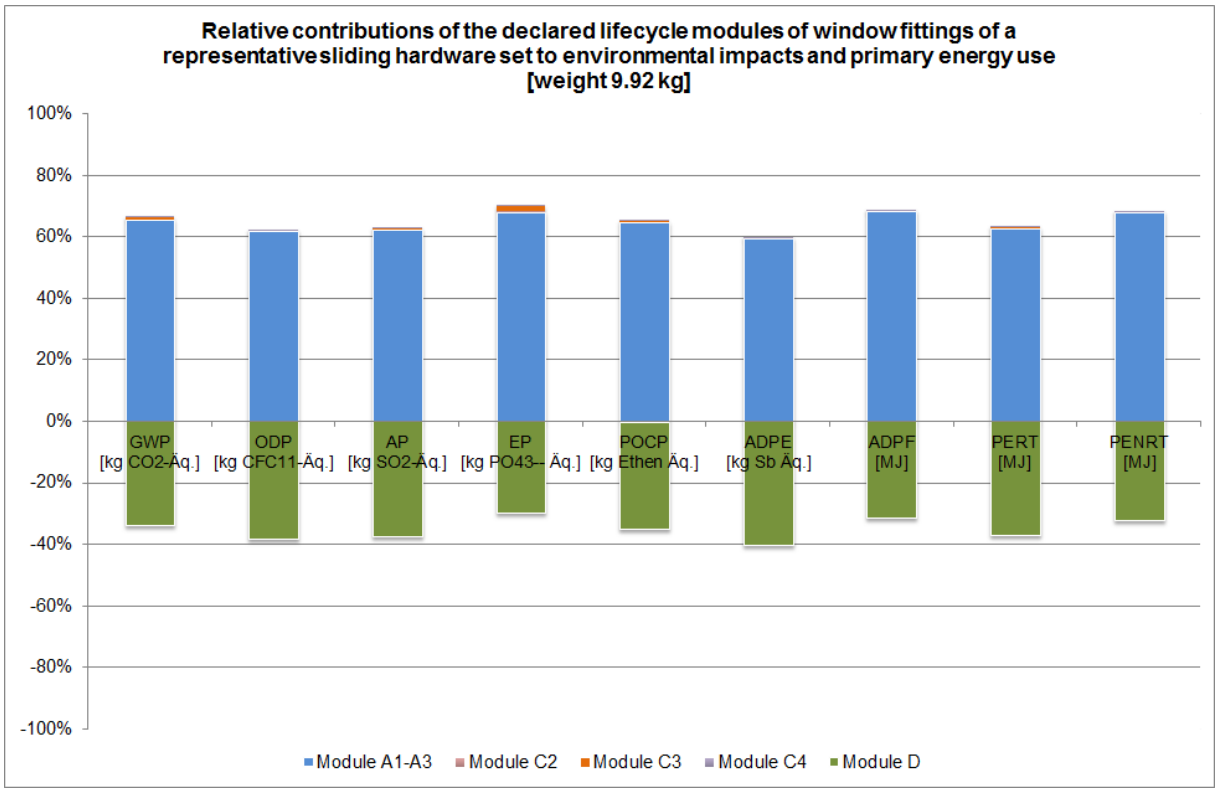
		Manufacture	Disposal			Credit
Parameter	**Unit**	**A1-A3**	**C2**	**C3**	**C4**	**D**
PERE	[MJ]	2.1E+02	8.0E-02	2.6E-02	1.4E-02	-1.3E+02
PERM	[MJ]	-	-	-	-	-
PERT	[MJ]	2.1E+02	8.0E-02	2.6E-02	1.4E-02	-1.3E+02
PENRE	[MJ]	9.5E+02	1.4E+00	6.9E-01	1.9E-01	-4.6E+02
PENRM	[MJ]	2.1E+01	-	-	-	-
PENRT	[MJ]	9.7E+02	1.4E+00	6.9E-01	1.9E-01	-4.6E+02
SM	[kg]	-	-	-	-	-
RSF	[MJ]	4.8E-03	1.0E-05	8.9E-06	3.4E-04	3.2E-03
NRSF	[MJ]	5.0E-02	1.1E-04	9.3E-05	8.1E-04	3.4E-02
FW	[m^3]	*	*	*	*	*
Key	PERE = Renewable primary energy as energy source; PERM = Renewable primary energy resources as material utilisation; PERT = Total use of renewable primary energy resources; PENRE = Non-renewable primary energy as energy source; PENRM = Non-renewable primary energy as material utilisation; 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 - ENVIRONMENTAL IMPACT: Sliding Hardware [9.92 kg/product]

		Manufacture	Disposal			Credit
Parameter	**Unit**	**A1-A3**	**C2**	**C3**	**C4**	**D**
HWD	[kg]	*	*	*	*	*
NHWD	[kg]	*	*	*	*	*
RWD	[kg]	7.4E-02	1.9E-06	1.7E-05	3.5E-06	-3.8E-02
CRU	[kg]	-	-	-		0.0E+00
MFR	[kg]	-	-	-		8.5E+00
MER	[kg]	-	-	-		0.0E+00
EE [elec.]	[MJ]	-	-	-		1.5E+00
EE [ther.]	[MJ]	-	-	-		3.5E+00
Key	HWD = Hazardous waste disposal; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported thermal energy					

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

6 LCA: Interpretation



The largest contribution to **Global Warming Potential (GWP, 100 years)** comes from preliminary product provision (90%) - mainly from the manufacture of continuous aluminium casting and the silicone seals. 9% of global warming gas emissions are caused by the manufacturing process itself. This can be mainly attributed to electricity requirements. A total of 51% of all GWP emissions are credited; the dominant contribution comes from recycling the aluminium (68%).

99% of the **Ozone Depletion Potential (ODP)** comes from upstream chains. The manufacture of the aluminium extrusions (84%) and the galvanised steel (8%) contribute 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. These can in turn be attributed to the CFCs used for cooling in nuclear power stations. The credit is for 61%, 99% of which originates from recycling aluminium.

The **Acidification Potential (AP)** is dominated by 94% in the production stage by the provision of raw materials (module A1). The greatest effects therefore result from the manufacture of aluminium extrusions (64%). Above all sulphur dioxide (73%) and nitrogen oxide (25%) dominate the AP. A credit of 59% is offset mainly by recycling the aluminium.

The largest contribution to **eutrophication potential (EP)** comes from preliminary product provision (85%), mainly the aluminium extrusions (47%). The EP is dominated by nitrogen oxide emissions due to the energy provider implementation. A total of 44% of the total emissions are credited.

The **Abiotic Depletion Potential (ADP non-fossil)** is mainly caused by the manufacturing stage (module A1-A3). The upstream chains (A1) (99%) contribute mainly to the total ADP. The disposal stage (C2 and C3) has no significant influence. The credit is 67% in total.

The **Abiotic Depletion Potential (ADP fossil)** results mainly from the contribution of the upstream chains in module A1 (87%). The use of sheet aluminium (49%) and galvanised steel (24%) makes a particularly large contribution to the ADPF. A credit of 47% is offset mainly by recycling the aluminium.

The **ozone smog potential (POCP)** is triggered by the provision of the pre-products. Modules A2 and A3 (2%) can be ignored compared to A1 (96%). Especially the MNVOC group, sulphur dioxide and nitrogen oxide contribute to POCP. The credit here is 52%.

The **entire primary energy requirement** is divided between 85% from non-renewable energy sources and 15% from renewable sources.

83% 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 extrusions is particularly apparent at 88% and the zinc pressure casting at 7%. The production process (A3) supplies 17%. The credit (module D) totals 59%, of which the largest part is attributable to aluminium recycling.

With regard to the **entire non-renewable primary energy requirement (PENRT)** the pre-product manufacture upstream chains contribute 87% (largely from aluminium manufacture). The production of the sliding hardware itself contributes 12%. A

total of 47% is credited which comes mainly from recycling the metallic pre-products.

7 Requisite evidence

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

8 References

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General principles

For the Institut Bauen und Umwelt e.V. (IBU)'s EPD range, 2011-09, www.bau-umwelt.de

PCR 2012, Part A

Calculation rules for the LCA and requirements of the background report, Institut Bauen und Umwelt e.V., September 2012, www.bau-umwelt.de

PCR 2012, Part B

Instructions for building-related products and services, Part B: Requirements of the EPD for PCR door locks and hardware, Institut Bauen und Umwelt e.V., www.bau-umwelt.de, July 2012, Version 1.0

ISO 14025

ISO 14025:2007-10, Environmental labels and declarations - Type III Environmental declarations - Principles and procedures (ISO 14025:2006);

DIN EN 15804

DIN EN 15804:2012-04: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction

AVV

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).

GaBi 6

GaBi 6 Software and database for Life Cycle Engineering, JKP (Institute for Polymer Testing and Polymer Science) University of Stuttgart and PE Europe AG, Leinfelden-Echterdingen, 2012

GaBi 6 2011B

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

DIN EN 13126-1

DIN EN 13129-1:2006-05: Requirements common to all types of hardware.

DIN EN 13126-16

DIN EN 13126-16:2008-04: Hardware for horizontal and vertical pivot windows

DIN EN 13126-17

DIN EN 13126-17:2004-08: Hardware for horizontal and vertical pivot windows

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 EN 1350113857

DIN EN 1312613857:2008-06: Safety distances when reaching through regular openings.

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.

QM 346

QM 346 Version 09/08

ift ZERT; certification programme for hardware to EN 13126-16

QM 347

QM 347 Version 09/08

ift ZERT; certification programme for hardware to EN 13126-17

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