

VHS

Branchevereniging
hang- & sluitwerk



Milieuverklaring

Nederlandse bijlage

Raam- en deurkrukken en beslag

Behorend bij:

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	ARGE – The European Federation of Locks and Building Hardware Manufacturers
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-ARG-20230542-IBG1-EN
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Valid to	01.04.2029

Door and window handles

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

*Deze bijlage is alleen geldig in combinatie met de bijbehorende ARGE EPD en voor producten
geleverd door een licentienemer van de Branchevereniging Hang- en Sluitwerk VHS*

AXA

AXA Stenman Nederland B.V. is als
licentienemer van de Branchevereniging Hang-
en Sluitwerk VHS gerechtigd deze EPD te
verstrekken



Basis voor opname in de Nationale Milieudatabase (NMD) - LCA resultaten

Raam- en deurkrukken

Product namen in NMD Hoofdstuk

Raam- en deurkrukken en beslag deuren binnen per stuk, leden VHS B&U 32:3
Raam- en deurkrukken en beslag deuren buiten per stuk, leden VHS B&U 31:3
Raam- en deurkrukken en beslag puien binnen per stuk, leden VHS B&U 32:40
Raam- en deurkrukken en beslag puien buiten per stuk, leden VHS B&U 31:4
Raam- en deurkrukken en beslag ramen binnen per stuk, leden VHS B&U 32:2
Raam- en deurkrukken en beslag ramen buiten per stuk, leden VHS B&U 31:2

Omschrijving product:

Raam- en deurkruk mechanismen die het openen, sluiten en gesloten houden van ramen en deuren mogelijk maken

Functionele eenheid: Stuks
Gewicht product: 0,749 kg/stuk
Levensduur: 30 jaar

	Parameter	Eenheid	productie A1 + A2 + A3	transport -> bouwplaats A4	bouwfase A5	gebruik van product B1	onderhoud B2	reparatie B3	vervangen B4	opknappen B5	deconstructie / sloop C1	transport -> afval C2	afvalverwerking C3	afvalverwijdering C4	Baten en lasten voorbij de systeemgrenzen D
Milieu- impactcatego- rien (set 1)	uitputting van abiotische grondstoffen, ex fossiele energiedragers	kg antimony eq.	3,55E-03	2,37E-06	4,49E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,68E-08	2,14E-09	1,28E-09	-1,55E-03
	uitputting van fossiele energiedragers	kg antimony eq.	3,59E-02	5,57E-03	1,06E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,31E-05	5,87E-05	6,29E-06	-1,43E-02
	klimaatverandering	kg CO2 eq.	5,56E+00	7,65E-01	2,86E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,85E-03	7,18E-03	4,41E-03	-2,32E+00
	ozonlaag aantasting	kg CFK-11 eq.	3,68E-07	1,42E-07	2,69E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,08E-09	3,77E-10	1,53E-10	-1,12E-07
	fotochemische oxidantvorming	kg ethyleen eq.	1,01E-02	3,76E-04	7,28E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,76E-06	7,82E-07	6,87E-07	-6,48E-03
	verzuring	kg SO2 eq.	2,02E-01	1,79E-03	3,84E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,01E-05	1,14E-05	3,92E-06	-1,29E-01
	vermesting	kg PO4 eq.	5,49E-02	2,86E-04	7,35E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,14E-06	2,62E-06	7,84E-07	-3,62E-02
	humana-toxicologische effecten	kg 1,4-dichloorbenzeen eq.	2,67E+01	2,88E-01	5,98E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,53E-03	4,96E-04	5,58E-04	-1,89E+01
	ecotoxicologische effecten, aquatisch (zoetwater)	kg 1,4-dichloorbenzeen eq.	4,70E-01	7,98E-03	3,13E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,92E-05	1,35E-05	7,89E-04	-3,10E-01
	ecotoxicologische effecten, aquatisch (zeewater)	kg 1,4-dichloorbenzeen eq.	2,50E+03	3,09E+01	8,22E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,71E-01	7,05E-02	2,07E-01	-1,73E+03
	ecotoxicologische effecten, terrestrisch	kg 1,4-dichloorbenzeen eq.	1,15E-01	1,03E-03	2,89E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,73E-06	1,18E-05	1,34E-06	-6,17E-02
	MKI	EUR	4,28E+00	7,90E-02	2,32E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,40E-04	4,92E-04	3,40E-04	-2,86E+00
Milieu- impactcatego- rien (set 2)	klimaatverandering - totaal	kg CO2-eq.	5,57E+00	7,72E-01	7,77E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,91E-03	7,46E-03	4,43E-03	-2,38E+00
	klimaatverandering - fossiel	kg CO2-eq.	5,64E+00	7,72E-01	2,88E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,91E-03	7,35E-03	4,43E-03	-2,38E+00
	klimaatverandering - biogeen	kg CO2-eq.	7,85E-02	2,43E-04	4,89E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,46E-06	1,08E-04	1,31E-06	5,46E-03
	klimaatverandering - landgebruik en verandering landgebruik	kg CO2-eq.	1,30E-02	2,24E-04	4,25E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,65E-06	2,68E-06	2,84E-07	-4,04E-03
	ozonlaag aantasting	kg CFC11-eq.	4,08E-07	1,78E-07	3,36E-09	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,35E-09	3,55E-10	1,86E-10	-1,22E-07
	verzuring	mol H+ eq.	2,41E-03	2,13E-03	4,77E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,04E-05	1,60E-05	5,17E-06	-1,46E-01
	vermesting zoetwater	kg P-eq.	1,52E-02	1,09E-05	2,18E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,68E-08	3,34E-07	1,86E-08	-1,08E-02
	vermesting zeewater	kg N-eq.	1,36E-02	3,99E-04	1,08E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,50E-05	2,57E-06	1,76E-06	-7,50E-03
	vermesting land	mol N-eq.	2,77E-01	4,57E-03	1,21E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,65E-04	5,12E-05	1,89E-05	-9,91E-02
	smogvorming	kg NMVOC-eq.	4,50E-02	1,76E-03	4,15E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,60E-05	7,36E-06	5,56E-06	-2,78E-02
	uitputting van abiotisch grondstoffen mineralen en metalen	kg Sb-eq.	3,55E-03	2,37E-06	4,49E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,68E-08	2,14E-09	1,28E-09	-1,55E-03
	uitputting van abiotisch grondstoffen fossiele brandstoffen	MJ, net cal. val.	6,45E+01	1,18E+01	2,24E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,01E-02	1,06E-01	1,29E-02	-2,41E+01
	watergebruik	m3 world eq. deprived	1,45E+00	5,86E-02	1,48E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,95E-04	6,14E-04	8,13E-05	-8,44E-01
	luchtverontreiniging	kg PM10-eq.	7,76E-07	4,92E-08	9,78E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,51E-10	6,41E-11	1,20E-10	-3,38E-07
	ioniserende straling	kBq U235-eq.	1,83E-01	5,21E-02	9,78E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,90E-04	2,43E-04	4,89E-05	-5,89E-02
	ecotoxiciteit (zoetwater)	CTUe	1,54E+03	7,50E+00	1,48E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,90E-02	2,66E-02	8,41E-02	-1,05E+03
	humane toxiciteit, carcinogeen	CTUh	2,40E-08	2,43E-10	6,16E-12	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,14E-12	6,58E-13	1,43E-12	-1,54E-08
	humane toxiciteit, non-carcinogeen	CTUh	2,00E-06	9,31E-09	2,53E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,40E-11	2,61E-11	1,93E-11	-1,34E-06
	landgebruik gerelateerde impact / bodempkwaliteit	Pt	7,26E+01	8,24E+00	1,55E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,45E-02	2,52E-02	2,08E-02	-2,19E+01
Grondstofpa- rameters	gebruik van hernieuwbare primaire energie exclusief hernieuwbare primaire energie gebruikt als materialen	MJ, net cal. val.	8,12E+00	1,74E-01	4,69E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,22E-03	1,10E-02	3,85E-04	
	gebruik van hernieuwbare primaire energie gebruikt als materialen	MJ, net cal. val.	5,86E+00	0,00E+00	-4,68E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
	totaal gebruik van hernieuwbare primaire energie (hernieuwbare primaire energie en hernieuwbare primaire energie gebruikt als materialen)	MJ, net cal. val.	1,40E+01	1,74E-01	3,36E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,22E-03	1,10E-02	3,85E-04	
	gebruik van niet-hernieuwbare primaire energie exclusief niet hernieuwbare energie gebruikt als materialen	MJ, net cal. val.	6,87E+01	1,25E+01	4,42E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,57E-02	1,14E-01	4,13E-02	
	gebruik van niet-hernieuwbare primaire energie gebruikt als materialen	MJ, net cal. val.	2,38E-01	0,00E+00	-2,03E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,77E-02	
	totaal gebruik van niet-hernieuwbare primaire energie (niet-hernieuwbare primaire energie en niet-hernieuwbare primaire energie gebruikt als materialen)	MJ, net cal. val.	6,89E+01	1,25E+01	2,38E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,57E-02	1,14E-01	1,37E-02	
	gebruik van secundaire materialen	kg	4,06E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
	gebruik van hernieuwbare secundaire brandstoffen	MJ, net cal. val.	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
	gebruik van niet-hernieuwbare secundaire brandstoffen	MJ, net cal. val.	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
	netto gebruik van zoet water	m3	4,54E-02	2,01E-03	4,53E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,83E-05	7,37E-05	1,46E-06	
Afvalcatego- rien	gevaarlijk afval	kg	8,46E-04	6,95E-06	2,09E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,57E-08	2,88E-07	1,61E-08	
	niet-gevaarlijk afval	kg	1,72E+00	5,70E-01	1,09E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,24E-03	2,60E-04	3,06E-02	
	radioactief afval	kg	1,85E-04	8,09E-05	1,52E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,11E-07	2,56E-07	7,50E-08	
Output stromen*	materialen voor hergebruik	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
	materialen voor recycling	kg	6,35E-02	0,00E+00	5,81E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,75E-01	0,00E+00	
	materialen voor energie	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	
	geëxporteerde energie, elektrisch	MJ	0,00E+00	0,00E+00	9,22E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,98E-03	
	geëxporteerde energie, thermisch	MJ	0,00E+00	0,00E+00	1,59E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,86E-03	

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Door and window handles

ARGE – The European Federation of Locks and Building Hardware Manufacturers

www.ibu-epd.com | <https://epd-online.com>



AXA

AXA Stenman Nederland B.V. is als
licentienemer van de Branchevereniging Hang-
en Sluitwerk VHS gerechtigd deze EPD te



1. General Information

ARGE – The European Federation of Locks and Building Hardware Manufacturers

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-ARG-20230542-IBG1-EN

This declaration is based on the product category rules:

Building Hardware products, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

02.04.2024

Valid to

01.04.2029



Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)



Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Door and window handles

Owner of the declaration

ARGE – The European Federation of Locks and Building Hardware Manufacturers
Offerstraße 12
42551 Velbert
Germany

Declared product / declared unit

1 kg of door or window handle

Scope:

This ARGE EPD covers handles intended to be used in door and window assemblies of varying materials and applications. The reference product used to calculate the impact this product group has on the environment is a door handle composed primarily of brass 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 door and window handles 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 door and window handles manufactured in Europe by ARGE member companies.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR		
Independent verification of the declaration and data according to ISO 14025:2011		
☐	internally	☒ externally



Dr. Matthew Fishwick,
(Independent verifier)

2. Product

2.1 Product description/Product definition

This EPD covers handle mechanisms for the opening and maintaining in a closed position of doors or windows in buildings.

For the application and use the respective national provisions at the place of use apply.

2.2 Application

These products are designed to be integrated into door or window assemblies consisting of various materials and used for various applications. They may be used on all kinds of doors and windows (both inside and outside).

2.3 Technical Data

Ideally, products should comply with a suitable technical specification. *EN 1906* and *EN 13126* are examples of such specifications and some products will comply with them. The relevant grading structure according to *EN 1906* is shown in the following table:

Name	Value	Unit
Category of use	1 - 4	Grade
Durability	6, 7	Grade
Test door mass	-	Grade
Suitability for fire resistance & smoke control doors	0, A, A1, B, B1, C, C1, D, D1	Grade
Safety	0, 1	Grade
Corrosion resistance	0 – 5	Grade
Security – burglar resistance	0 – 4	Grade
Type of operation	A, B, U	Grade

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

2.4 Delivery status

The products are sold by unit. Deliveries of individual items are possible but are an exception. Standard deliveries comprise a larger quantity of handles, as they are marketed as "B2B" products and not to end-users.

2.5 Base materials/Ancillary materials

Composition of product analysed for this EPD:

The values given in the table below are 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 (0.00% – 74.15%)	74.15	%
Steel (0.00% – 89.48%)	24.97	%
PEHD (polyethylene high density) (0.00% – 0.65%)	0.61	%
Acetal (POM - polyoxymethylene) (0.00% – 8.51%)	0.27	%
Aluminium (0.00% – 68.97%)	0	%
Stainless steel (0.00% – 62.45%)	0	%
Nylon 6 (0.00% – 27.54%)	0	%
Nylon 66 (0.00% – 0.21%)	0	%
Zamak (0.00% – 9.24%)	0	%
Zinc (0.00% – 93.41%)	0	%
Epoxy (0.00% – 18.19%)	0	%

Brass is an alloy of zinc and copper. Components made of brass are made by forging, die-casting or other types of mechanical processing.

Steel is produced by combining iron with carbon as well as other elements depending on the desired characteristics. Components made of steel are formed by different types of mechanical processing.

PEHD (polyethylene high-density) is a thermoplastic polymer produced from the monomer ethylene. Components made of PEHD are formed by injection moulding or other thermal forming processes.

Acetal, or polyoxymethylene (POM), is produced by polymerisation of anhydrous formaldehyde. Components made of Acetal are formed by injection moulding or other thermal forming processes.

Aluminium is a non-ferrous metal produced from bauxite by the Bayer process. Components made of aluminium are manufactured by extrusion or other types of mechanical processing.

Stainless steel is produced by combining iron with chromium as well as other elements depending on the desired characteristics. Components made of steel are formed by stamping or other types of mechanical processing.

Nylon 6 is a polymer, in particular polyamide. It is formed by the ring-opening polymerisation of caprolactam. Components made of Nylon 6 are formed by injection moulding or other thermal forming processes.

Nylon 66 is a polymer, in particular polyamide. It is formed by the polycondensation of hexamethylenediamine and adipic acid in equal parts. Components made of Nylon 66 are formed by injection moulding or other thermal forming processes.

Zamak is an alloy with a base metal of zinc and alloying elements of aluminium, magnesium, and copper. Components made of Zamak are die-cast.

Zinc is a slightly brittle metal. Zinc is used as an anti-corrosion agent when galvanising components made of steel.

Epoxy is the family of basic components or cured end products of epoxy resins, also known as polyepoxides. Epoxy may be used e.g., as an adhesive, sealant or for coating components.

1) This product/article/at least one partial article contains substances listed in the *ECHA candidate list* (date: 14.06.2023) exceeding 0.1 percentage by mass: Certain components may contain small amounts of lead (CAS no. 7439-92-1) as an alloying element.

2) This product/article/at least one partial article contains other cancerogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the *ECHA candidate list*, exceeding 0.1 percentage by mass: no.

3) Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) *Ordinance on Biocide Products No. 528/2012*): no.

2.6 Manufacture

The production of a handle normally follows a 3-step procedure:

1. Manufacture of components: this step might include a surface treatment in the factory or by external contractors.
2. Preassembly of modules (in the factory).
3. Final assembly (in the factory).

2.7 Environment and health during manufacturing

Regular measurements of air quality and noise levels are carried out by the manufacturers, the ARGE member companies. The results shall be within the mandatory safety levels. In areas where employees are exposed to chemical products, the required protective clothing and technical protective devices shall be provided. Regular health checks are mandatory for employees in production facilities.

2.8 Product processing/Installation

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

2.9 Packaging

Normally, each individual product is packed in paper or cardboard. These individual products are then packed in a cardboard box and stacked on wooden pallets for transport to the customer.

Waste from product packaging is collected separately for waste disposal (including recycling).

2.10 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.

2.11 Environment and health during use

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

2.12 Reference service life

The reference service life is 30 years under normal working conditions. This corresponds to passing a mechanical endurance test of 100.000 cycles as specified in the *EN 1906*. 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.

2.13 Extraordinary effects

Fire

In general, the product is suitable for use in a fire resisting and/or smoke control door/window sets according to the classes specified in *EN 1906*, unless it is classified in class/grade 0.

Water

The declared product is intended to be used in buildings under normal conditions (indoor or outdoor use). 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.

2.14 Re-use phase

Removal of door or window handle components (for re-use or recycling) shall have no adverse effect on the environment.

2.15 Disposal

Door or window handle components should be recycled 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.

2.16 Further information

Details of all types and variants can be found on the manufacturers' websites. The respective website addresses are available at <https://arge.org>.

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 and then use this as a correction factor to determine the true values for 1 kg of product in the tables (Section 5).

Declared unit

Name	Value	Unit
Declared unit	1	kg
Mass of declared product	0.749	kg
Raw density	1	kg/m ³

3.2 System boundary

Type of the EPD: "cradle to gate with options, with modules C1 – C4, and module D (A1-A3, C1-C3, D and additional modules)"

The analysis of the product life cycle includes the production and transport of the raw materials, the 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 for recycling. No recycling processes are taken into account except for transport and 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 the raw material.

A4 module represents the transport of the finished door/window handle 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.

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 locks. Module C3 covers the recycling of the individual elements according to European averages, with the remaining waste divided between incineration and landfill. Such a mixed scenario is declared due to the complex material mix of the product and the dependency of the EoL-route on the EoL-route of the product the door/window handle has been integrated into.

In practice, the end of life has been modelled as follows:

- when a material is sent for 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 with a distance of 30 km. Parts sent for recycling include electricity consumption (grinding) and a flow ('Materials for recycling, unspecified').

3.3 Estimates and assumptions

The LCA data of the declared handle had been calculated by the production data of a total of 3 ARGE member companies, collecting data on 11 different products. These companies had been chosen by ARGE as being representative by means of their production processes and their market share. The handle chosen as representative for this calculation follows the "worst-case" principle as explained under 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 the life cycle modelling of the considered product, all relevant background datasets are taken from *ecoinvent v3.8* (system model: cut-off by classification).

3.6 Data quality

The objective of this evaluation is to evaluate the environmental impacts generated by the products throughout their entire life cycles. To this end, *ISO 14040*, *ISO 14044* and *EN 15804* have been met regarding the quality of data on the following different criteria:

Time: The life cycle inventory data used come from:

- Data collected specifically for this study on the ARGE member companies' manufacturing sites. Datasets are based on 1-year averaged data (time period: January 2013 to December 2013 considered representative for

2022).

- In the absence of collected data, generic data from the *ecoinvent v3.8* database has been used. This is updated regularly and is representative of current processes (the entire database having been updated in 2021).

Geography: Data come from production sites of the ARGE member companies. Generic data come from the *ecoinvent* database, representative for European production processes.

Technology: Material shaping technologies are based on European technology in the case of the use of generic data.

A total of 11 typical products (based on sales figures) have been evaluated and the worst-case results are used in section 5 of this EPD.

3.7 Period under review

The data of the LCA is based on the annual production data of an ARGE member company from 2013, considered also representative for the year 2022.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: Europe

3.9 Allocation

The products are produced in numerous production sites. All data were 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.

3.10 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. *ecoinvent v3.8* (system model: cut-off by classification) has been used as the background database.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

Information on the biogenic carbon content at factory gate

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO₂.

Name	Value	Unit
Biogenic carbon content in product	0	kg C
Biogenic carbon content in accompanying packaging	0.342	kg C

The following information is the basis of the declared modules within the LCA in this EPD.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	25.8	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

Reference service life

Name	Value	Unit
Reference service life	30	a
Test cycles over RSL (EN 1906)	100'000	cycles

End of life (C1-C4)

Name	Value	Unit
Collected separately waste type	1	kg
Recycling	0.609	kg
Energy recovery	0.18	kg
Landfilling	0.211	kg

It is assumed that a 16–32-ton truck is used to transport the product:

- Transport to shredding facility for metal recovery: 150 km
- Transport to municipal waste incineration plant: 50 km
- Transport to landfill: 30 km

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

Module D contains the benefits and loads beyond the system boundary related to the recycling of metals, which result from the treatment of recycled materials from the point of end-of-waste status to the point of substitution (as costs) and the substitution of primary resources (as benefits).

According to *EN 16710*, clause 6.4.3.3: 'In module D substitution effects are calculated only for the resulting net output flow.

For building hardware, the following rules apply for the quantification of net output flows:

- all production scrap and cuttings leave modules A1-B3 as sorted scrap without allocated burdens from primary production;

the corresponding amounts are declared as material for recycling (MFR);

- net amounts of a metal leaving the product system are quantified as the material for recycling leaving modules A1-C4 minus the input of secondary scrap (secondary material, SM) to the product system;
- in the case of brass and zinc alloys, which are composed of two different constituting metals, no difference shall be made between the input of secondary constituting metals (Cu and Zn; Cu and Sn) and its alloys (CuZn; CuSn).

Negative net output flows have not been considered in the quantification of module D.

It also includes the benefits and loads related to 'exported energy electricity' and 'exported energy heat' resulting from the energy recovery from plastic wastes in a municipal waste incineration plant as modelled in Modules A3, A5 and C4.

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.

The set of characterisation factors EF3.0 has been used for the life cycle assessment.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

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	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg of door or window handle

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq	6.47E+00	1.04E+00	1.29E+00	0	1.57E-02	3.37E-03	7.47E-03	-1.83E+00
GWP-fossil	kg CO ₂ eq	7.71E+00	1.04E+00	3.86E-02	0	1.57E-02	3.37E-03	7.46E-03	-1.82E+00
GWP-biogenic	kg CO ₂ eq	-1.25E+00	0	1.25E+00	0	0	0	0	0
GWP-luluc	kg CO ₂ eq	1.75E-02	4.16E-04	7.9E-06	0	6.26E-06	8.39E-06	3.64E-06	-3.64E-03
ODP	kg CFC11 eq	6.38E-07	2.41E-07	4.55E-09	0	3.63E-09	1.71E-10	1.27E-09	-1.02E-07
AP	mol H ⁺ eq	3.94E-01	2.96E-03	6.43E-05	0	4.45E-05	1.73E-05	3.24E-05	-1.19E-01
EP-freshwater	kg P eq	1.69E-03	7.42E-06	1.48E-07	0	1.12E-07	3.78E-07	6.38E-08	-5.29E-04
EP-marine	kg N eq	2.19E-02	5.87E-04	1.54E-05	0	8.84E-06	2.22E-06	1.1E-05	-5.9E-03
EP-terrestrial	mol N eq	4.31E-01	6.55E-03	1.7E-04	0	9.85E-05	2.57E-05	1.2E-04	-8.47E-02
POCP	kg NMVOC eq	7.65E-02	2.52E-03	5.85E-05	0	3.79E-05	7.03E-06	3.64E-05	-2.36E-02
ADPE	kg Sb eq	8.71E-03	3.69E-06	7.04E-08	0	5.55E-08	8.16E-09	1.43E-08	-2.93E-03
ADPF	MJ	1.03E+02	1.58E+01	3E-01	0	2.37E-01	7.13E-02	9.48E-02	-2.22E+01
WDP	m ³ world eq deprived	6.94E+00	4.8E-02	1.06E-03	0	7.23E-04	7.97E-04	-4.06E-04	-2.08E+00

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; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg of door or window handle

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.83E+01	2.22E-01	-7.05E-01	0	3.34E-03	1.35E-02	1.4E-03	-5.41E+00
PERM	MJ	7.82E+00	0	-6.25E+00	0	0	0	0	0
PERT	MJ	2.61E+01	2.22E-01	-6.96E+00	0	3.34E-03	1.35E-02	1.4E-03	-5.41E+00
PENRE	MJ	1.03E+02	1.58E+01	5.72E-01	0	2.37E-01	7.2E-02	1.16E-01	-2.23E+01
PENRM	MJ	3.18E-01	0	-2.71E-01	0	0	0	-2.12E-02	0
PENRT	MJ	1.04E+02	1.58E+01	3E-01	0	2.37E-01	7.2E-02	9.48E-02	-2.23E+01
SM	kg	5.43E-01	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
FW	m ³	1.37E-01	1.67E-03	7.78E-05	0	2.52E-05	4.59E-05	1.99E-04	-3.63E-02

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 - WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg of door or window handle

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	3.07E-03	4.12E-05	8.73E-07	0	6.2E-07	2.53E-08	1.8E-07	-8.41E-04
NHWD	kg	3.67E+00	8.31E-01	1.65E-02	0	1.25E-02	2.68E-04	3.89E-01	-9.02E-01
RWD	kg	7.68E-04	2.28E-04	4.27E-06	0	3.44E-06	9.59E-07	1.22E-06	-1.29E-04
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	8.48E-02	0	7.75E-01	0	0	5.04E-01	0	0

MER	kg	0	0	0	0	0	0	0	0
EEE	MJ	0	0	3.62E-02	0	0	0	9E-04	0
EET	MJ	0	0	2.4E-01	0	0	0	5.96E-03	0

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; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:

1 kg of door or window handle

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	1.29E-06	8.36E-08	1.64E-09	0	1.26E-09	4.63E-11	9.52E-10	-2.73E-07
IR	kBq U235 eq	4.89E-01	6.85E-02	1.28E-03	0	1.03E-03	6.5E-04	3.65E-04	-9.99E-02
ETP-fw	CTUe	2.96E+03	1.24E+01	2.43E-01	0	1.86E-01	3.59E-02	5.42E-01	-9.8E+02
HTP-c	CTUh	7.16E-08	3.98E-10	9.7E-12	0	5.99E-12	9.59E-13	7E-12	-2.17E-08
HTP-nc	CTUh	4.73E-06	1.25E-08	3.36E-10	0	1.88E-10	3.12E-11	8.35E-11	-1.55E-06
SQP	SQP	1.7E+02	1.1E+01	2.06E-01	0	1.65E-01	1.1E-02	1.61E-01	-3.91E+01

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 –

for the indicator 'Potential Human exposure efficiency relative to U235'. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 –

for the indicators 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', 'potential comparative toxic unit for humans – cancerogenic', 'Potential comparative toxic unit for humans - not cancerogenic', 'potential soil quality index'. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

6. LCA: Interpretation

Figure 1 illustrates the relative contributions of the different modules along the life cycle of the declared products.

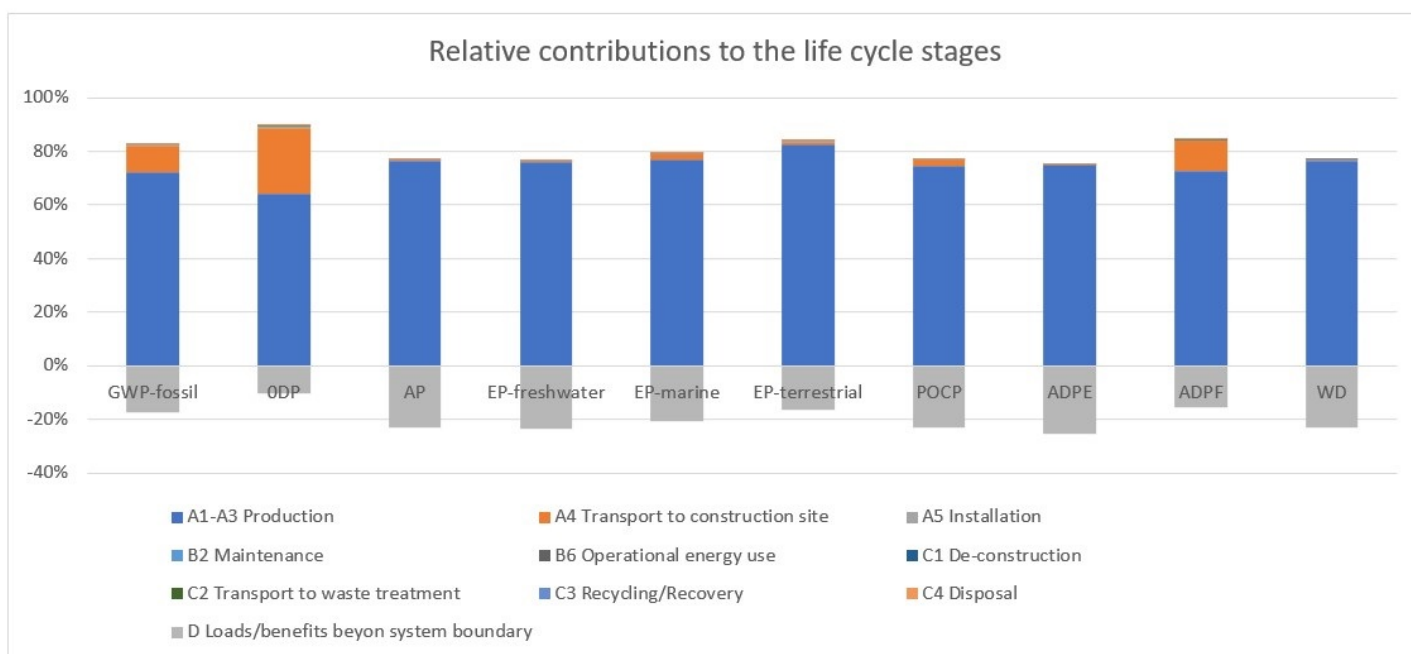


Figure 1: Environmental impacts of door and window handles along its life cycle

The largest part of environmental impacts is caused during production (modules A1-A3); comparably small impacts are caused during the transport of the product to the construction site (via the manufacturer of the product, which the door/window handle has been integrated into).

All the other modules related to the product life cycle are not significant.

Benefits and burdens beyond the system boundary (module D) are in the order of 10 % to 25 % of the impacts over the product life cycle (modules A1-A3) and relate basically to the recycling of metals.

A total of 11 typical products (based on sales figures) have been evaluated and the worst-case results are used in section 5 of this EPD. In chapter 2.5, the tabulated range of relative

weight per material ensures that the variability of results stays within +/- 40% of the declared values (assessed for the indicators GWP, PENRT, and non-hazardous waste).

7. Requisite evidence

No testing results are required by the PCR part B.

8. References

Product category rules of IBU

IBU (2021)

IBU (2021): General Instructions for the EPD Programme of the Institut Bauen und Umwelt e.V. (General Instructions for the IBU EPD Programme). Version 2.0, Institut Bauen und Umwelt, Berlin.

IBU (2021)

IBU (2021): PCR Part A: Calculation rules for the life cycle assessment and requirements on the project report according to EN 15804+A2. Version 1.3., Institut Bauen und Umwelt, Berlin.

IBU (2023)

IBU (2023): PCR Part B: Requirements on the EPD for building hardware products, Institut Bauen und Umwelt, Berlin.

Standards and legal documents

EN 15804

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

EN 17610

EN 17610:2022, Building hardware - Environmental product declarations - Product category rules complementary to EN 15804 for building hardware.

ISO 14025

ISO 14025:2006-07, Environmental labels and declarations - Type III Environmental declarations - Principles and procedures.

ISO 14044

EN ISO 14044:2006, Environmental management - Life cycle assessment - Requirements and guidance (ISO 14044:2006).

EN 1906

EN 1906:2012, Building hardware - Lever handles and knob

furniture - Requirements and test methods.

EN 13126

EN 13126-3:2023, Building hardware - Hardware for windows and door-height windows - Requirements and test methods - Part 3: Handles, primarily for Tilt and Turn, Tilt-First and Turn-Only hardware.

ISO 15686

ISO 15686:1, -2, -7 and -8. Service life planning (various parts).

ECHA candidate list

Candidate List of substances of very high concern for Authorisation, published in accordance with Article 59(10) of the REACH Regulation. European Chemicals Agency, Brussels.

Ordinance on Biocide Products No. 528/2012

REGULATION (EU) No 528/2012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 22 May 2012 concerning the making available on the market and use of biocidal products.

European List of Waste

Commission Decision of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste (notified under document number C(2000) 1147).

Additional references

BBSR 2017

BBSR (2017): Nutzungsdauer von Bauteilen in Lebenszyklusanalysen nach Bewertungssystem Nachhaltiges Bauen (BNB). Version vom 24.10.2017, Bundesinstitut für Bau-, Stadt- und Raumforschung, Berlin.

ecoinvent v3.8

<http://www.ecoinvent.org>

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