ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	VIR – Valvoindustria Ing. Rizzio S.p.A.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-VIR-20230494-IBC1-EN
Issue date	11/01/2024
Valid to	10/01/2029

Different brass valves family constituted by full bore ball valves, gate valves and fixed-orifice balancing valves

Vir Valvoindustria Ing. Rizzio Spa

Institut Bauen und Umwelt e.V.

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

ECO PLATFORM EPD VERIFIED

1. General Information

Vir Valvoindustria Ing. Rizzio Spa

Programme holder

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

Declaration number

EPD-VIR-20230494-IBC1-EN

This declaration is based on the product category rules:

Fittings and connections for water supply, 01/08/2021
(PCR checked and approved by the SVR)

Issue date

11/01/2024

Valid to

10/01/2029

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

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

Different brass valves family constituted by full bore ball valves, gate valves and fixed-orifice balancing valves

Owner of the declaration

VIR – Valvoindustria Ing. Rizzio S.p.A.
Via circonvallazione 10
13018 Valduggia (VC)
Italy

Declared product / declared unit

The declared unit is 1 kg of the average valve of the family

Scope:

This Environmental Product Declaration refers to a declared unit of 1 kg of the average valve of the brass family - type '340' '56' and 'Serie 9510' - produced at the production site of VIR - Valvoindustria Ing. Rizzio S.p.A. in Via circonvallazione 10, 13018 Valduggia (VC), Italy.
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

Vito D'Incognito,
(Independent verifier)

2. Product

2.1 Product description/Product definition

The process starts with the manufacturing of raw brass pieces for valves obtained from casting and hot-moulding then the pieces are mechanically worked and assembled with valves components (e.g. handles, gaskets, balls, fittings, etc.). Declared units refer to three different types of valves - 340, 56 and Serie 9510. Every valve typology contains valves with different dimensions and weights. However, the same manufacturing process and the similarities of valves allow a declared unit based on a mass unit of products.

Type of valve	Nomenclature for the brass series	DN (range)
Full bore ball valve	340	8 - 100
Gate valve	56	15 - 100
Fixed-orifice balancing valve	Serie 9510	15 - 50

For the use and application of the product, the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

2.2 Application

Model 340: Water from 0°C to 150°C and air from -10°C to 150°C
Model 56: Water from 0°C to 150°C
Model 9510: Water from -10°C to 130°C

2.3 Technical Data

The valves are tested according to *EN 12266*-1 standard.

Technical data

Name	Value	Unit
medium	Water, air	
Nominal diameter (DN)	10 - 100	
Weight	0.00009 - 0.0086	t
Housing material	Brass	
spindle material	Brass	

Performance data of the product with respect to its characteristics are in accordance with the relevant technical provision.

2.4 Delivery status

The valves are delivered fully assembled, tested, and packaged with a plastic envelope and a carton box, to Italy and to the rest of the World (mainly where manufacturer's branches are located). For land transport the products are delivered by trucks, while for sea routes they are transported by cargo ships.

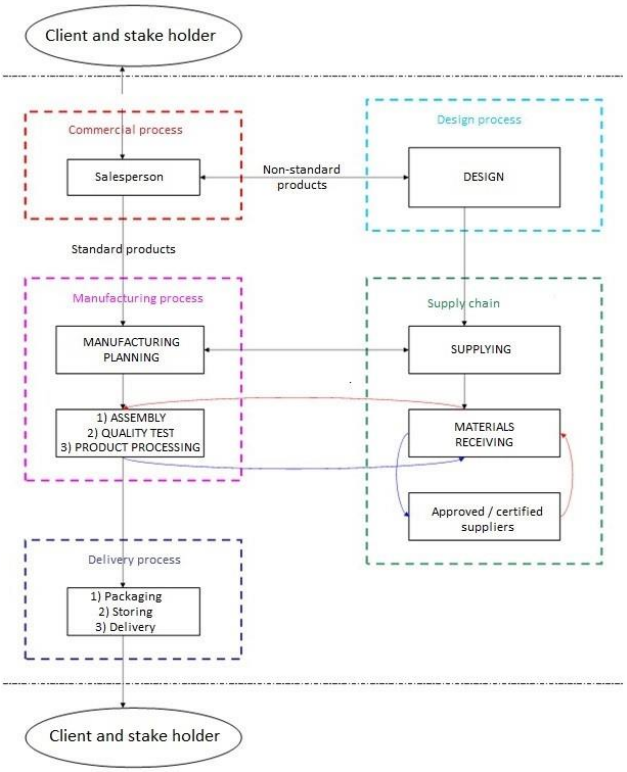
2.5 Base materials/Ancillary materials

Name	Value	Unit
Brass	0.8373	kg
Steel	0.0992	kg
Aluminium	0.0162	kg
ABS	0.0284	kg
PTFE	0.0094	kg
Polypropylene	0.0031	kg
Polyoxymethylene	0.0024	kg
EPDM rubber	0.0024	kg
NBR rubber	0.0008	kg
Synthetic rubber	0.0008	kg

This product contains substances listed in the candidate list (date: 14.06.2023) exceeding 0.1 percentage by mass:

- Lead (CAS 7439-92-1) - concentration range: 1.6% - 2.8%.

2.6 Manufacture



2.7 Environment and health during manufacturing

The manufacturing stage is made in accordance with the Italian regulation.

2.8 Product processing/Installation

1. BLASTING: the brass pieces are subjected to a surface treatment by a sandblasting machine and steel grit;
2. TURNING: the valves are machined by transfer machines or numerical control machining centres (CNC) cooled by cooling oil. The brass turning is dried by centrifuge and conveyed to a silo for sale as a secondary raw material;
3. ASSEMBLY: the valves are assembled by automatic machines by performing 100% air test and fixing the components with adhesives;
4. PACKAGING AND STORAGE: following the quality check, the valves are packaged ensuring adequate protection and stored for shipment.

2.9 Packaging

The packaging materials are the following:

- Wood (7.3 %);
- Paper and cardboard (78.8 %);
- Polyethylene (0.8 %);
- Plastic film (13.1 %).

The disposal of the packaging is consistent with the regulation of the countries of sale.

2.10 Condition of use

No auxiliaries or consumables are incurred during maintenance, and use of the Valves. Regular maintenance is advised to ensure a service life of at least 10 years.

2.11 Environment and health during use

There are no known impact relations between product, environment and health during use.

2.12 Reference service life

Regular maintenance is advised to ensure a service life which is minimum 10 years.

2.13 Extraordinary effects

Fire

Due to the predominant use of brass and steel which are considered nonflammable or flame retardant, no additional influence on the environment in case of fire is to be expected.

Water

Two water contaminants can be found into the valve: lead and nickel.

Mechanical destruction

No impacts on the environment are expected in the case of an unforeseeable mechanical destruction.

2.14 Re-use phase

With reference to the material composition of the product system in accordance with section 2.5, the metallurgical materials contained in the product are suitable for material recycling.

2.15 Disposal

If there is no specific regulation for the valve disposal, VIR reccommends to:
- Recycle the metal parts to reuse it as raw material;
- Send to specifical end-of-life guarantees and others PTFE (Polytetrafluoroethylene), NBR (Nitril-Butadiene-rubber) and EPDM (ethylene propylene diene monomer rubber) elements, since they could be contaminated by the liquids flowing in the valve;
- Collect all the packaging to the local waste sorting system.

2.16 Further information

Contact data for more detailed information: Please refer to the last page of this Declaration

3. LCA: Calculation rules

3.1 Declared Unit

The functional unit is constituted as the weighted average between the three type of valves. The mass of assembled products corresponding to each family has been used as the weight of the average.

Deklarierte Einheit

Name	Value	Unit
Declared unit	1	kg
Gross density	8460	kg/m^3

The use of an average EPD seems to be consistent due to the low variability of the three type of valves. All the valves included in the average are manufactured by the same producer, in the same plant, with the same manufacturing proccesses. Since there is only one production site the modellization is highly geographically representative and background data have the same inluence on all the considered type of valves.

3.2 System boundary

Type of the EPD: cradle to gate with options

Modules A1-A3, A4 and A5

Here there is the production of the necessary raw materials and energies, including all corresponding upstream chains and the actual procurement transports. Furthermore, the entire manufacturing phase was mapped, including the treatment of production waste until the endofwaste status (EoW) was reached. In addition the distribution transports (A4) and the installation (with also packaging waste generated during installation) was taken into account.

Modules C1-C4

The modules include the environmental impacts for dismantling of the valve and the treatment of the waste categories until end-of-waste status (EoW) is reached, including the associated transports at the end of the product life cycle.

Module D

Identification of the benefits and impacts of the product outside the system boundary. Recycling of metal scrap results in credits of the raw material.

3.3 Estimates and assumptions

The Brass used in the valves production was modelled assuming that it comes only from new material. In C2, the distance between the use site and the disposal site is assumed to be 50 km.

3.4 Cut-off criteria

The effect associated with the neglected mass shares is less than 5 % of the effect categories per module.

3.5 Background data

The LCA software *Simapro 9.5.0.1* was used to model the life cycle. The entire manufacturing process, as well as energy consumption, were modelled on the basis of manufacturer specific data. However, generic background datasets were used for the upstream and downstream processes. The background datasets used were taken from the current version of the *Ecoinvent 3.9.1* database.
Where possible, Italian datasets were used for modules A1-A3, A5, C1, C3, C4 and D; the corresponding European datasets for distribution transports (A4, C2).

3.6 Data quality

The background datasets used for accounting purposes mainly originate from the respective updated *Ecoinvent 3.9.1* databases, through the software *Simapro 9.5.0.1*, at the time of calculation. The data for the examined products was captured on the basis of evaluations of internal production and environmental data, the collection of LCA relevant data within the supply chain, as well as the evaluation of relevant data for the energy supply. The collected data were checked for plausibility and consistency. Good representativity can be assumed.

3.7 Period under review

Life cycle assessment data refer to 2021.

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: Global

3.9 Allocation

All raw materials, and supplies could be (clearly) assigned to the declared product. All required energies, waste produced in the manufacturing processes and production emissions are allocated to each family on the basis of the total mass of valves produced. No byproducts are produced or any other allocation is needed.

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. The background database used is *Ecoinvent 3.9.1*, through the software *Simapro 9.5.0.1.*

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

There is no biogenic carbon content in the product, while differently, the packaging has a non-zero amount.

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

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.1331	kg C

The A1, A2, A3, C1, C2, C3, C4 and D stage have been considered separately. The optional A4 and A5 stage have also been considered.

Transport from the gate to the site (A4)

Name	Value	Unit
Land transport distance	185.59	km
Sea transport distance	1594.24	km

Regular maintenance is advised to ensure a service life of at least 10 years.

5. LCA: Results

The following table shows the results of the LCA for 1kg of Brass Valve

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 Average Brass Valve

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	9.65E+00	5.1E-02	3.18E-02	0	9.43E-03	9.85E-02	4.87E-03	-2.69E+00
GWP-fossil	kg CO_2 eq	9.59E+00	5.09E-02	7.54E-03	0	9.42E-03	5.71E-02	4.87E-03	-2.66E+00
GWP-biogenic	kg CO_2 eq	1.87E-01	1.14E-05	-7.69E-02	2.81E-05	2.43E-02	0	8.51E-06	4.13E-02
GWP-luluc	kg CO_2 eq	2.29E-02	6.45E-06	1.12E-02	2.94E-05	3.14E-07	0	4.57E-06	1.43E-04
ODP	kg CFC11 eq	3.34E-05	1E-09	1.78E-11	0	2.05E-10	7.51E-10	1.35E-11	-3.18E-08
AP	mol H^+ eq	3.8E-01	5.96E-04	5.72E-06	0	3.07E-05	3.92E-04	4.35E-06	-1.92E-01
EP-freshwater	kg P eq	3.03E-02	2.97E-06	1.48E-07	0	6.59E-07	1.27E-05	8.55E-08	-1.52E-02
EP-marine	kg N eq	2.27E-02	1.59E-04	1.49E-05	0	1.06E-05	1.55E-04	1.03E-04	-1.01E-02
EP-terrestrial	mol N eq	2.91E-01	1.74E-03	2.54E-05	0	1.11E-04	1.37E-03	1.67E-05	-1.37E-01
POCP	kg NMVOC eq	8.5E-02	5.29E-04	8.45E-06	0	4.59E-05	4.38E-04	6.77E-06	-3.87E-02
ADPE	kg Sb eq	5.07E-03	1.27E-07	1.28E-09	0	3.02E-08	4.89E-07	1.3E-09	-2.64E-03
ADPF	MJ	1.16E+02	6.91E-01	7.81E-03	0	1.33E-01	6.78E-01	1.26E-02	-3.37E+01
WDP	m^3 world eq deprived	6.63E+00	2.45E-03	4.57E-04	0	5.44E-04	5.46E-03	5.21E-04	-3.05E+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 Average Brass Valve

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.48E+01	5.65E-03	1.32E-04	0	1.29E-03	1.3E-02	1.77E-04	-7.02E+00
PERM	MJ	1.01E+01	3.42E-03	9.32E-05	0	7.85E-04	1.94E-02	8.51E-05	-1.8E+00
PERT	MJ	2.48E+01	9.07E-03	2.25E-04	0	2.07E-03	3.24E-02	2.62E-04	-8.82E+00
PENRE	MJ	1.15E+02	6.91E-01	0	0	0	-1.84E-03	0	1.73E-02
PENRM	MJ	3.89E-02	0	0	0	0	1.84E-03	0	-1.73E-02
PENRT	MJ	1.16E+02	6.91E-01	0	0	0	0	0	0
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND
FW	m^3	6.77E+00	2.45E-03	4.54E-04	0	5.42E-04	5.47E-03	5.21E-04	-3.13E+00

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 Average Brass Valve

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	2.9E-03	4.12E-06	3.93E-08	0	8.5E-07	3.9E-06	6.13E-08	-1.4E-03
NHWD	kg	2.46E+00	2.46E-02	1.75E-02	0	6.52E-03	3.26E-02	4.81E-02	-1.06E+00
RWD	kg	2.83E-04	1.82E-07	3.49E-09	0	4.34E-08	3.65E-07	4.79E-09	-8.75E-05
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	6.06E-01	0	0
MER	kg	0	0	5.5E-03	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	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 Average Brass Valve

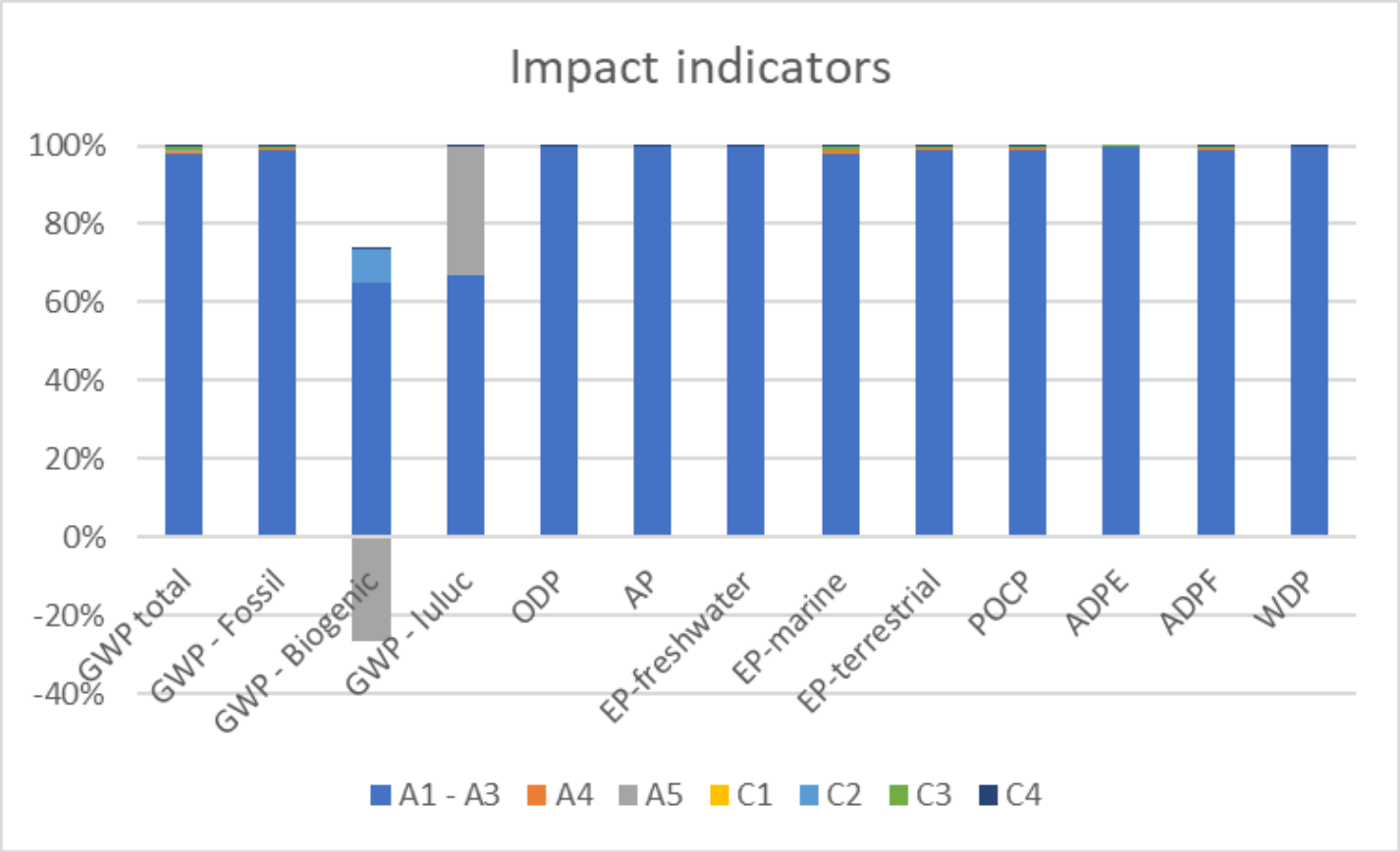
Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	ND	ND	ND	ND	ND	ND	ND	ND
IR	kBq U235 eq	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	ND	ND	ND	ND	ND	ND	ND	ND
HTP-c	CTUh	ND	ND	ND	ND	ND	ND	ND	ND
HTP-nc	CTUh	ND	ND	ND	ND	ND	ND	ND	ND
SQP	SQP	ND	ND	ND	ND	ND	ND	ND	ND

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



The *EN 15804* characterization factors were used for the evaluation. The results of the *EN 15804* categories refer to the potential environmental impacts over a period of 100 years. The main impacts clearly come from A1 - A3 stages while the end-of-life (C1-C4) stages results show to have low relevance.

Specifically, the main impacts are in the A1 and A3 modules and they are generated by the material production, while the transport related modules impacts are very low (A2 and A4). The negative value related to GWP - Biogenic refers to the presence of wood in the packaging.

7. Requisite evidence

8. References

Standards

EN 15804
EN 15804:2012+A1 2013, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

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 12266-1
EN 12266-1:2012, Industrial valves - Testing of metallic valves - Part 1: Pressure tests, test procedures and acceptance criteria - Mandatory requirements.

ISO 14025
EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

Further References

SimaPro
SimaPro software and databases. Version 9.4.0.2, PRè Sustainability B.V. https://simapro.com/, 2023.

Ecoinvent Version 3.8
Database for life cycle assessment (life cycle inventory data), Version 3.8, 2021.

Product Category Rules Part A
Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. Version 2.1 (17.11.2021).

Product Category Rules Part B
Requirements on the EPD for Fittings and connections for water supply. Version 5 (31.05.2023).

Publisher

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Programme holder

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Author of the Life Cycle Assessment

ICIM Consulting srl
Piazza Don Enrico Mapelli 75
20099 Sesto San Giovanni
Italy

+39 02 72534800
info@icimconsulting.it
www.icimconsulting.it

Owner of the Declaration

VIR – Valvoindustria Ing. Rizzio S.p.A.
Via circonvallazione 10
13018 Valduggia (VC)
Italy

+39016347891
info@vironline.com
www.vironline.com

ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	VIR – Valvoindustria Ing. Rizzio S.p.A.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-VIR-20230495-IBC1-EN
Issue date	11/01/2024
Valid to	10/01/2029

Different bronze valves family constituted by full bore ball valves, gate valves and fixed-orifice balancing valves

Vir Valvoindustria Ing. Rizzio Spa

Institut Bauen und Umwelt e.V.

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

ECO PLATFORM EPD VERIFIED

1. General Information

Vir Valvoindustria Ing. Rizzio Spa

Programme holder

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

Declaration number

EPD-VIR-20230495-IBC1-EN

This declaration is based on the product category rules:

Fittings and connections for water supply, 01/08/2021
(PCR checked and approved by the SVR)

Issue date

11/01/2024

Valid to

10/01/2029

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

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

Different bronze valves family constituted by full bore ball valves, gate valves and fixed-orifice balancing valves

Owner of the declaration

VIR – Valvoindustria Ing. Rizzio S.p.A.
Via circonvallazione 10
13018 Valduggia (VC)
Italy

Declared product / declared unit

The declared unit is 1 kg of the average valve of the family

Scope:

This Environmental Product Declaration refers to a declared unit of 1 kg of the average valve of the bronze family - type '380' '100/100LK' and 'Serie 9580' - produced at the production site of VIR - Valvoindustria Ing. Rizzio S.p.A. in Via circonvallazione 10, 13018 Valduggia (VC), Italy.
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

Vito D'Incognito,
(Independent verifier)

2. Product

2.1 Product description/Product definition

The process starts with the manufacturing of raw bronze pieces for valves obtained from casting and hot-moulding then the pieces are mechanically worked and assembled with valves components (e.g. handles, gaskets, balls, fittings, etc.). Declared units refer to three different types of valves - 380, 100/100LK and Serie 9580. Every valve typology contains valves with different dimensions and weights. However, the same manufacturing process and the similarities of valves allow a declared unit based on a mass unit of products.

Type of valve	Nomenclature for the bronze series	DN (range)
Full bore ball valve	380	10 - 80
Gate valve	100, 100LK	15 - 50
Fixed-orifice balancing valve	Serie 9580	15 - 50

For the use and application of the product, the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

2.2 Application

Model 380: Water and air from -10°C to 185°C
Model 100/100LK: Water from -10°C to 170°C
Model 9580: Water from -10°C to 130°C

2.3 Technical Data

The valves are tested according to *EN 12266-1* standard.

Technical data

Name	Value	Unit
medium	Water, air	
Nominal diameter (DN)	10 - 80	
Weight	0.000132 - 0.0062	t
Housing material	Bronze	
spindle material	Bronze	

Performance data of the product with respect to its characteristics are in accordance with the relevant technical provision.

2.4 Delivery status

The valves are delivered fully assembled, tested, and packaged with a plastic envelope and a carton box, to Italy and to the rest of the world (mainly where manufacturer's branches are located). For land transport the products are delivered by trucks, while for sea routes they are transported by cargo ships.

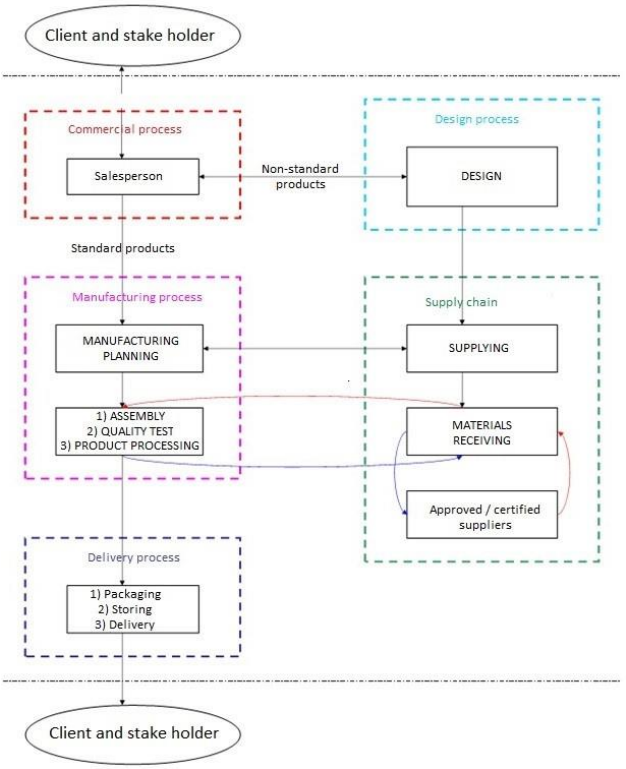
2.5 Base materials/Ancillary materials

Name	Value	Unit
Bronze	0.6455	kg
Brass	0.2396	kg
Steel	0.0533	kg
Aluminium	0.0158	kg
ABS	0.0277	kg
PTFE	0.0092	kg
Polypropylene	0.0031	kg
Polyoxymethylene	0.0023	kg
EPDM rubber	0.0023	kg
NBR rubber	0.0008	kg
Graphite	0.0004	kg

This product contains substances listed in the candidate list (date: 14.06.2023) exceeding 0.1 percentage by mass:

- Lead (CAS 7439-92-1) - concentration range: 1.6% - 2.8%.

2.6 Manufacture



2.7 Environment and health during manufacturing

The manufacturing stage is made in accordance with the Italian regulation.

2.8 Product processing/Installation

1. FOUNDRY: preparation of cores and shells, material preparation, bronze casting, stamping, cooling and valve removal, finishing;
2. BLASTING: the bronze valves are subjected to a surface treatment by a sandblasting machine and steel grit;
3. TURNING: the valves are machined by transfer machines or numerical control machining centres (CNC)

cooled by cooling oil. The brass turning is dried by centrifuge and conveyed to a silo for sale as a secondary raw material;
4. ASSEMBLY: the valves are assembled by automatic machines by performing 100% air test and fixing the components with adhesives;
5. PACKAGING AND STORAGE: following the quality check, the valves are packaged ensuring adequate protection and stored for shipment.

2.9 Packaging

The packaging materials are the following:

- Wood (11.1 %);
- Paper and cardboard (87.5 %);
- Polyethylene (1.3 %);
- Plastic film (0.1 %).

The disposal of the packaging is consistent with the regulation of the countries of sale.

2.10 Condition of use

No auxiliaries or consumables are incurred during maintenance, and use of the Valves. Regular maintenance is advised to ensure a service life of at least 10 years.

2.11 Environment and health during use

There are no known impact relations between product, environment and health during use.

2.12 Reference service life

Regular maintenance is advised to ensure a service life which is minimum 10 years.

2.13 Extraordinary effects

Fire

Due to the predominant use of bronze and brass which are considered nonflammable or flame retardant, no additional influence on the environment in case of fire is to be expected.

Water

Two water contaminants can be found into the valve: lead and nickel.

Mechanical destruction

No impacts on the environment are expected in the case of an unforeseeable mechanical destruction.

2.14 Re-use phase

With reference to the material composition of the product system in accordance with section 2.5, the metallurgical materials contained in the product are suitable for material recycling.

2.15 Disposal

If there is no specific regulation for the valve disposal, VIR reccommends to:
- Recycle the metal parts to reuse it as raw material;
- Send to specifical end-of-life guarantees and others PTFE (Polytetrafluoroethylene), NBR (Nitril-Butadiene-rubber) and EPDM (ethylene propylene diene monomer rubber) elements, since they could be contaminated by the liquids flowing in the valve;
- Collect all the packaging to the local waste sorting system.

2.16 Further information

Contact data for more detailed information: Please refer to the last page of this Declaration

3. LCA: Calculation rules

3.1 Declared Unit

The functional unit is constituted as the weighted average between the three types of valves. The mass of assembled products corresponding to each family has been used as the weight of the average.

Deklarierte Einheit

Name	Value	Unit
Declared unit	1	kg
Gross Density	8700	kg/m^3

The use of an average EPD seems to be consistent due to the low variability of the three types of valves. All the valves included in the average are manufactured by the same producer, in the same plant, with the same manufacturing proccess. Since there is only one production site the modellization is highly geographically representative and background data have the same inluence on all the considered types of valves.

3.2 System boundary

Type of the EPD: cradle to gate with options

Modules A1-A3, A4 and A5

Here there is the production of the necessary raw materials and energies, including all corresponding upstream chains and the actual procurement transports. Furthermore, the entire manufacturing phase was mapped, including the treatment of production waste until the endofwaste status (EoW) was reached. In addition the distribution transports (A4) and the installation (with also packaging waste generated during installation) was taken into account.

Modules C1-C4

The modules include the environmental impacts for dismantling of the valve and the treatment of the waste categories until end-of-waste status (EoW) is reached, including the associated transports at the end of the product life cycle.

Module D

Identification of the benefits and impacts of the product outside the system boundary. Recycling of metal scrap results in credits of the raw material.

3.3 Estimates and assumptions

The bronze used in the valves production was modelled assuming that it comes only from new material. In C2, the distance between the use site and the disposal site is assumed to be 50 km.

3.4 Cut-off criteria

The effect associated with the neglected mass shares is less than 5 % of the effect categories per module.

3.5 Background data

The LCA software *Simapro 9.5.0.1* was used to model the life cycle. The entire manufacturing process, as well as energy consumption, were modelled on the basis of manufacturer specific data. However, generic background datasets were used for the upstream and downstream processes. The background datasets used were taken from the current version of the *Ecoinvent 3.9.1* database.
Where possible, Italian datasets were used for modules A1-A3, A5, C1, C3, C4 and D; the corresponding European datasets for distribution transports (A4, C2).

3.6 Data quality

The background datasets used for accounting purposes mainly originate from the respective updated *Ecoinvent 3.9.1* databases, through the software *Simapro 9.5.0.1*, at the time of calculation. The data for the examined products was captured on the basis of evaluations of internal production and environmental data, the collection of LCA relevant data within the supply chain, as well as the evaluation of relevant data for the energy supply. The collected data were checked for plausibility and consistency. Good representativity can be assumed.

3.7 Period under review

Life cycle assessment data refer to 2021.

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: Global

3.9 Allocation

All raw materials, and supplies could be (clearly) assigned to the declared product. All required energies, waste produced in the manufacturing processes and production emissions are allocated to each family on the basis of the total mass of valves produced. No byproducts are produced or any other allocation is needed.

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. The background database used is *Ecoinvent 3.9.1*, through the software *Simapro 9.5.0.1.*

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

There is no biogenic carbon content in the product, while differently, the packaging has a non-zero amount.

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.13301	kg C

The A1-A3, C1, C2, C3, C4 and D stage have been considered separately. The optional A4 and A5 stage have also been considered.

Transport from the gate to the site (A4)

Name	Value	Unit
Land transport distance	255.57	km
Sea transport distance	5932.27	km

Regular maintenance is advised to ensure a service life of at least 10 years.

5. LCA: Results

The following table shows the results of the LCA for 1kg of Bronze Valve

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 Average Bronze Valve

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	1.31E+01	1.08E-01	3.12E-02	0	9.43E-03	9.86E-02	4.97E-03	-4.09E+00
GWP-fossil	kg CO_2 eq	1.31E+01	1.08E-01	7.3E-03	0	9.42E-03	5.72E-02	4.97E-03	-4.07E+00
GWP-biogenic	kg CO_2 eq	7.09E-02	7.63E-05	-8.58E-03	3.1E-05	2.39E-02	0	8.51E-06	4.13E-02
GWP-luluc	kg CO_2 eq	2.04E-02	4.14E-05	9.8E-03	6.99E-05	3.09E-07	0	4.57E-06	1.43E-04
ODP	kg CFC11 eq	3.27E-05	1.96E-09	1.74E-11	0	2.05E-10	7.52E-10	1.38E-11	-4.55E-08
AP	mol H^+ eq	4.86E-01	1.95E-03	5.61E-06	0	3.07E-05	3.93E-04	4.44E-06	-3.13E-01
EP-freshwater	kg P eq	3.83E-02	5.37E-06	1.45E-07	0	6.59E-07	1.27E-05	8.73E-08	-2.51E-02
EP-marine	kg N eq	2.82E-02	5.02E-04	1.47E-05	0	1.06E-05	1.55E-04	1.05E-04	-1.59E-02
EP-terrestrial	mol N eq	3.84E-01	5.53E-03	2.49E-05	0	1.11E-04	1.38E-03	1.71E-05	-2.22E-01
POCP	kg NMVOC eq	1.1E-01	1.57E-03	8.3E-06	0	4.59E-05	4.39E-04	6.91E-06	-6.23E-02
ADPE	kg Sb eq	6.94E-03	2.13E-07	1.25E-09	0	3.02E-08	4.89E-07	1.33E-09	-4.77E-03
ADPF	MJ	1.6E+02	1.42E+00	7.66E-03	0	1.33E-01	6.79E-01	1.28E-02	-4.99E+01
WDP	m^3 world eq deprived	7.95E+00	4.44E-03	4.46E-04	0	5.44E-04	5.46E-03	5.32E-04	-4.11E+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 Average Bronze Valve

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.68E+01	9.9E-03	1.3E-04	0	1.29E-03	1.31E-02	1.81E-04	-1.07E+01
PERM	MJ	1.05E+01	5.96E-03	9.14E-05	0	7.85E-04	1.94E-02	8.69E-05	-2.98E+00
PERT	MJ	2.73E+01	1.59E-02	2.21E-04	0	2.07E-03	3.25E-02	2.68E-04	-1.37E+01
PENRE	MJ	1.59E+02	1.42E+00	-3.59E-02	0	1.33E-01	6.79E-01	1.28E-02	-4.99E+01
PENRM	MJ	9.55E-01	0	4.36E-02	0	0	0	0	1.18E-02
PENRT	MJ	1.6E+02	1.42E+00	7.66E-03	0	1.33E-01	6.79E-01	1.28E-02	-4.99E+01
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	ND	ND	ND	ND	ND	ND	ND	ND
FW	m^3	8.15E+00	4.44E-03	4.43E-04	0	5.42E-04	5.48E-03	5.32E-04	-4.27E+00

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 Average Bronze Valve

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	1.55E-03	8E-06	3.85E-08	0	8.5E-07	3.9E-06	6.26E-08	-1.74E-04
NHWD	kg	2.99E+00	3.52E-02	1.72E-02	0	6.52E-03	3.27E-02	4.91E-02	-1.69E+00
RWD	kg	3.03E-04	3.02E-07	3.44E-09	0	4.34E-08	3.66E-07	4.89E-09	-1.12E-04
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	6.46E-01	0	0
MER	kg	0	0	5.38E-03	0	0	0	0	0
EEE	MJ	0	0	0	0	0	0	0	0
EET	MJ	0	0	0	0	0	0	0	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 Average Bronze Valve

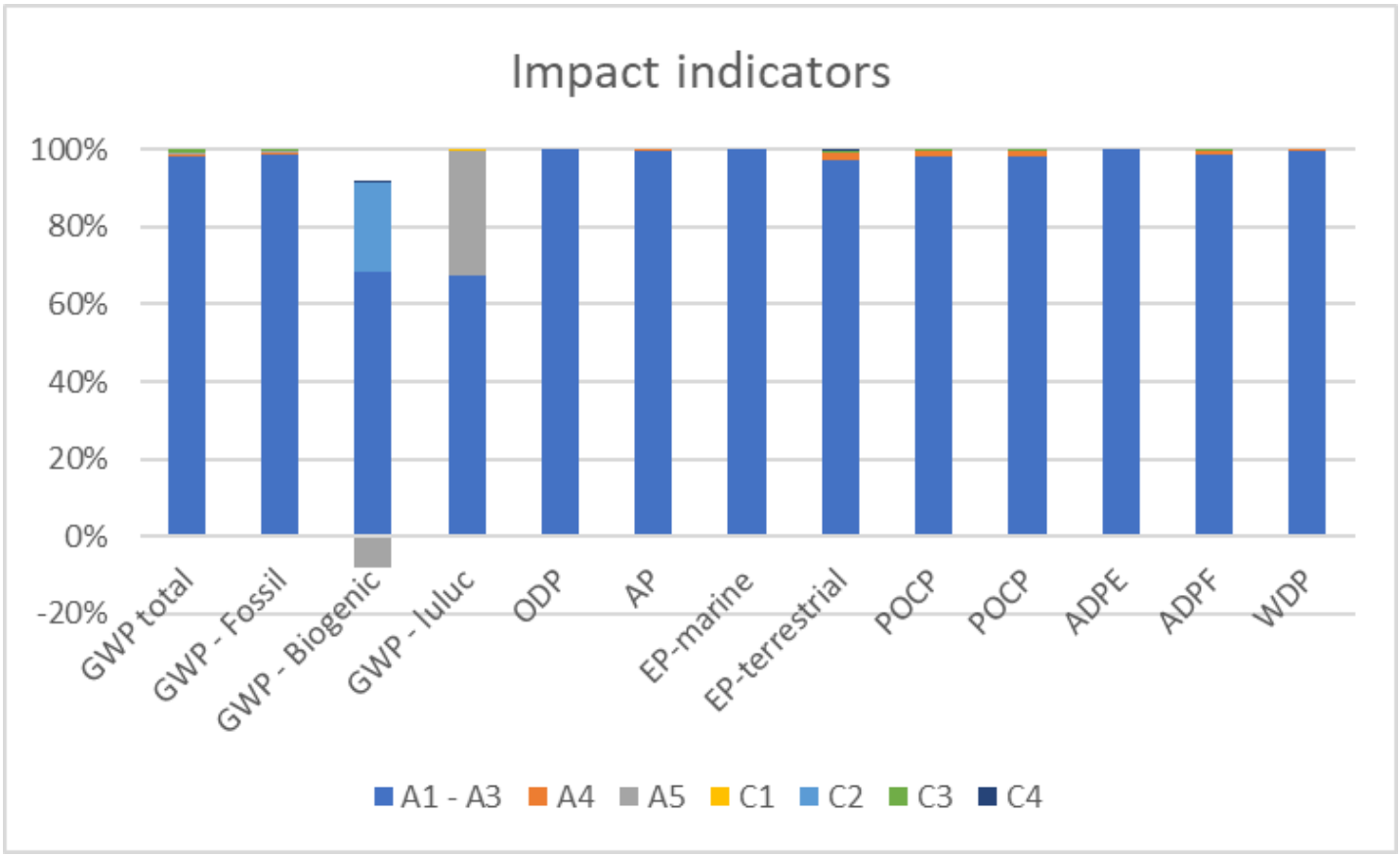
Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	ND	ND	ND	ND	ND	ND	ND	ND
IR	kBq U235 eq	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	ND	ND	ND	ND	ND	ND	ND	ND
HTP-c	CTUh	ND	ND	ND	ND	ND	ND	ND	ND
HTP-nc	CTUh	ND	ND	ND	ND	ND	ND	ND	ND
SQP	SQP	ND	ND	ND	ND	ND	ND	ND	ND

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



The EN 15804 characterization factors were used for the evaluation. The results of the EN 15804 categories refer to the potential environmental impacts over a period of 100 years.The main impacts clearly come from A1 - A3 stages while the end-of-life (C1-C4) stages results show to have low relevance. Specifically, the main impacts are in the A1 and A3 modules and they are generated by the material production, while the transport related modules impacts are very low (A2 and A4). The negative value related to GWP - Biogenic refers to the presence of wood in the packaging.

7. Requisite evidence

8. References

Standards

EN 15804
EN 15804:2012+A1 2013, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

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 12266-1
EN 12266-1:2012, Industrial valves - Testing of metallic valves - Part 1: Pressure tests, test procedures and acceptance criteria - Mandatory requirements.

ISO 14025
EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

Further References

SimaPro
SimaPro software and databases. Version 9.4.0.2, PRè Sustainability B.V. https://simapro.com/, 2023.

Ecoinvent Version 3.8
Database for life cycle assessment (life cycle inventory data), Version 3.8, 2021.

Product Category Rules Part A
Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. Version 2.1 (17.11.2021).

Product Category Rules Part B
Requirements on the EPD for Fittings and connections for water supply. Version 5 (31.05.2023).

Publisher

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Programme holder

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Author of the Life Cycle Assessment

ICIM Consulting srl
Piazza Don Enrico Mapelli 75
20099 Sesto San Giovanni
Italy

+39 02 72534800
info@icimconsulting.it
www.icimconsulting.it

Owner of the Declaration

VIR – Valvoindustria Ing. Rizzio S.p.A.
Via circonvallazione 10
13018 Valduggia (VC)
Italy

+39016347891
info@vironline.com
www.vironline.com