Environmental Product Declaration

in accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021

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Butterfly Valve 565L

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com. The EPD owner has the sole ownership, liability, and responsibility for the EPD. This EPD covers multiple versions of different sizes of the Butterfly Valve 565L, which are based on a representative product size and are otherwise identical. The different versions covered by this EPD can be seen on page 2.

Declaration owner	Georg Fischer Piping Systems Ltd.
Programme: Programme operator:	The International EPD® System, www.environdec.com EPD International AB Box 210 60 SE-100 31 Stockholm Sweden E-Mail: info@environdec.com
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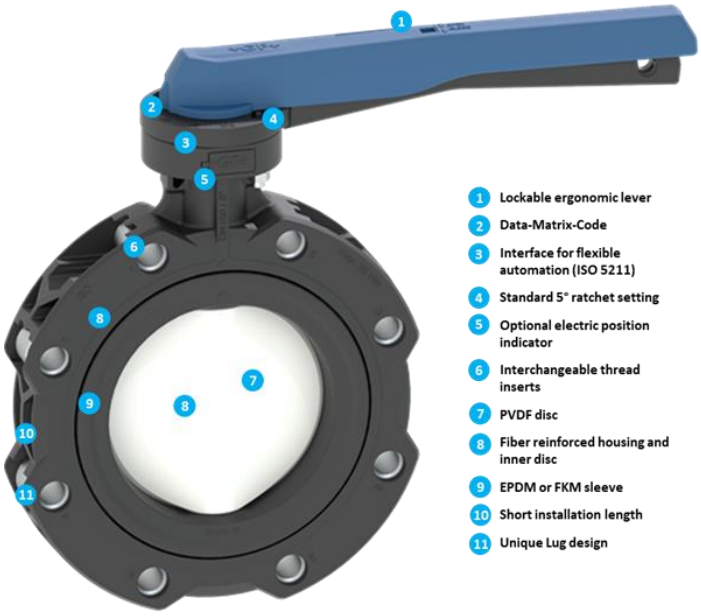
Name and Version of PCR:	PCR 2019:14 Construction products, version 1.3.3
LCA practitioner:	Swiss Climate AG Taubenstrasse 32, CH 3011 Bern contact@swissclimate.ch
Third-party verification: Third-party verifier: Approved by:	Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Dr. Nikolay Minkov GREENZERO AX GmbH The International EPD® System

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company Information

GF Piping Systems, founded in 1802, is a division of Georg Fischer AG with its headquarters in Schaffhausen, Switzerland. GF Piping Systems is the leading flow solutions provider worldwide, enabling the safe and sustainable transport of fluids. The company specializes in plastic piping systems and system solutions as well as services in all project phases. The product portfolio includes pipes, fittings, valves and the corresponding automation and jointing technology for industry, building technology as well as water and gas utilities. GF Piping Systems proactively incorporates its environmental responsibility into its everyday business activities.

Product Information



The investigated product is the Butterfly Valve (BuV) 565L in the configuration DN 100 with hand lever, produced in Seewis, Switzerland. The EPD applies to this specific product system including the available dimensions (see below). BuV 565L is a lug-style valve mainly made of plastic materials. It offers a replacement to metal solutions. It is lightweight, resistant to corrosion and suitable both for water and water treatment applications (e.g. sea water, drinking water and industrial water). It falls under the UN CPC Code 4324 “Taps, cocks, valves and similar appliances for pipes, boiler shells, tanks, vats or the like”.

Dimension	Weight [kg]	Actuation	Factor
DN50	1.308	Lever	0.32
DN65	1.542	Lever	0.38
DN80	1.712	Lever	0.42
DN100	4.102	Lever	1.00
DN125	3.086	Lever	0.75
DN150	4.029	Lever	0.98
DN200	5.276	Lever	1.29
DN250	8.837	Bare Shaft	2.15
DN300	12.614	Bare Shaft	3.08

Material	Weight (kg)
Fiber reinforced polyamide	2.09
Ferrous metals	1.51
Other plastics and rubbers	0.45

Packaging Material	Weight per unit (kg)
Cardboard multipackaging	0.03

Content declaration	Product Code	Pieces	Material
Cap	748436020	1	Other plastics and rubbers
Disc	198204465	1	Fibre reinforced polyamide
Flat Washer	161481508	2	Ferrous metals
Hex head screws fully threaded	161486850	2	Ferrous metals
Hexagon nut	198800700	2	Ferrous metals
Lever	198204493	1	Fibre reinforced polyamide
Leverlock	198204496	1	Fibre reinforced polyamide
O-Ring	748410059	2	Other plastics and rubbers
Ratchet	198204490	1	Fibre reinforced polyamide
Seat Liner	748436025	1	Other plastics and rubbers
Shaft	198811445	1	Ferrous metals
Shaft lock	198204481	1	Fibre reinforced polyamide
Spring	161486745	2	Ferrous metals
Thread inserts	198811418	8	Ferrous metals
Lug Body	198204695	1	Fibre reinforced polyamide

Life Cycle Analysis Information

The underlying Life Cycle Assessment (LCA) has been conducted in accordance with ISO 14040 and ISO 14044. The study is also performed according to PCR 2019:14 Construction products and construction services, version 1.3.3 and the EN 15804:2012+A2:2019/AC:2021. The EN15804 reference package based on EF 3.0 was used to conduct the study.

Declared unit: 1 kg valve with conversion factor 4.102 to represent the weight of one butterfly valve BuV 565 L with DN 100

Time representativeness: The specific data have been collected for the year 2022. Background data are a maximum of 10 years old.

Database and LCA software used: Ecoinvent 3.9, SimaPro (Version 9.4.0.2)

System boundaries: cradle to gate with options

Reference service life: 23 years

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-Potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	EU 27	EU 27	CH	CH/USA/ DE/CN	USA/ DE/CN	-	-	-	-	-	-	-	USA/ DE/CN	USA/ DE/CN	USA/ DE/CN	USA/ DE/CN	USA/ DE/CN
Share of specific data	>90%			>90%	>90%	-	-	-	-	-	-	-	-	-	-	-	-
Variation between products and sites	0%			0%	0%	-	-	-	-	-	-	-	-	-	-	-	-

X =Included, ND = not declared

The applied cut-off criteria are in line with the EN 15804:2012 A2:2019/AC:2021 and the respective PCR2019:14 Version 1.3.3. A minimum of 95 % of total inflows (mass and energy) per module is included in the life cycle inventory (LCI) data. As there is co-production in the stage A3 manufacturing, a mass-based allocation approach was chosen to allocate the total input and output flows to the declared unit.

Product stage

A1 The production of the raw material was modeled using generic European data (source: ecoinvent) and complemented by specific data from GF Piping Systems to consider the company specific combination of raw materials.

A2 Wherever possible, the specific transport distances were considered. Data from ecoinvent with the respective parameters was used to model the transportation. Data of an average lorry (EURO5) and average load factor from ecoinvent was selected.

A3 The use of energy is the most important input for this process step. Fittings and valve parts are injection molded. For the production of GF Piping Systems components, the electricity mix for the respective location in Seewis was used (market-based electricity supply). The production facility is powered by 100% renewable hydroelectricity from Europe with a climate impact of 0.0078 kg CO_2-eq./kWh. The purchase is EECS certified and guarantees of origin (GO) are purchased accordingly.

Construction process

The manufactured product, BuV 565L, is shipped to the distribution center of GF in Schaffhausen, Switzerland and from there distributed to the installation sites. These installation sites are located in Stuttgart, Germany, Shanghai, China and Irvine, United States. Transportation modes and distances to the installation site are as listed below. Average load transportation vehicles and load factors from ecoinvent were used for the analysis.
Distances and transportation modes for the transportation of a BuV 565L to the installation site are as follows:

A4

	Germany / Stuttgart	China / Shanghai	US / Irvine	Weighted average
Transport Mode				
By truck	333 km	652 km	676 km	514 km
By ship		13’170 km	12’402 km	7’059 km
By aircraft		1’637 km	1’733 km	923 km

As there are three installation sites, a weighted average scenario was calculated. According to sales figures, 45 % of the products are shipped to EU, 31 % to Asia and 24 % to the US. Importantly, it is assumed that in the scenario for Shanghai and Irvine for 82 % of the sold units are transported using sea freight while the remaining 18 % are transported using air freight.

A5 At the installation site, the BuV 565L is installed into an overarching piping system. No energy or material inputs are needed for the installation of BuV 565L.

End of life stage

C1 Deconstruction of the system uses mainly manual work. The environmental impact is therefore negligible compared to the impact of the whole system and below the cut-off criteria defined in EN 15804:2012+A2:2019.

C2 Transportation to the end-of-life treatment facilities is carried out by truck. Distances are estimated at 50 km to the next waste disposal site.

C3 It is assumed that in Germany all metal parts and 20 % of the fiber reinforced polyamide, plastics and rubbers are recycled. The other parts are incinerated with energy recovery. The extracted energy is in the form of electricity and thermal energy. In China and the United States, 80 % of the metal parts are recycled. With regard to fiber reinforced polyamide, plastics and rubbers a share of 20 % is recycled. All remaining waste generated in China and the United States is landfilled (see C4).

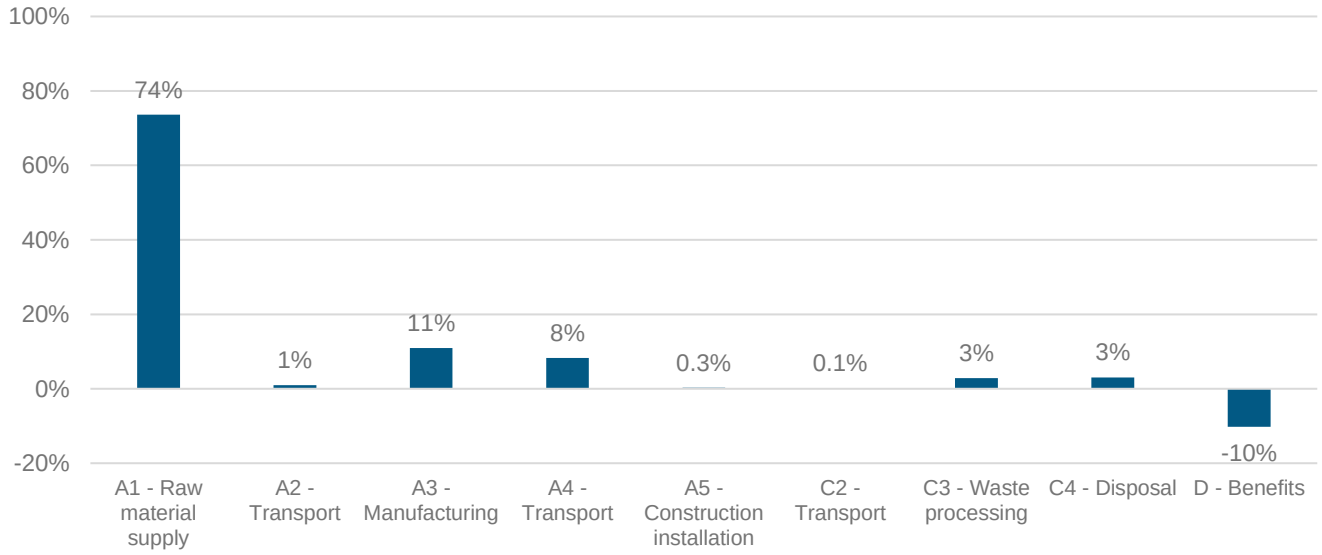
C4 In China and the United States, 20 % of the metal parts are landfilled. 80 % of the fiber reinforced polyamide, plastics and rubbers are disposed of in a landfill close to the installation sites in Shanghai and Irvine.

Environmental Performance

As Module C is taken into account in the EPD, it should be noted that the results of Modules A1-A3 (A1-A5 for services) must not be used in isolation without taking the results of Module C into account. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Parameter climate change

The figure below shows the contribution of the different life cycle phases to the overall impact in terms of the core environmental impact indicator “Climate Change – Total”.



Core environmental impact indicators

Parameters describing core environmental impact indicators		Product stage				Construction Stage		End of life			Beyond the system
		Raw material supply	Transport	Manufacturing	Total (of product stage)	Transport	Construction installation	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-Potential
		A1	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**C2**	**C3**	**C4**	**D**
Climate change - Total	kg CO2 eq.	7.28E+00	9.53E-02	1.08E+00	8.45E+00	8.19E-01	2.75E-02	6.91E-03	2.84E-01	3.00E-01	-1.01E+00
Climate change - Fossil	kg CO2 eq.	7.25E+00	9.52E-02	9.80E-01	8.33E+00	8.21E-01	3.33E-03	6.90E-03	1.16E-01	1.87E-02	-1.01E+00
Climate change - Biogenic	kg CO2 eq.	2.27E-02	9.27E-05	9.63E-02	1.19E-01	-2.09E-03	2.42E-02	4.55E-06	1.68E-01	2.81E-01	7.92E-04
Climate change - Land use and LU change	kg CO2 eq.	3.06E-03	3.81E-05	1.04E-03	4.14E-03	1.58E-04	6.09E-08	2.96E-06	2.50E-06	7.45E-06	-2.52E-04
Ozone depletion	kg CFC-11 eq.	2.31E-07	2.22E-08	7.70E-08	3.30E-07	1.84E-07	2.56E-11	1.53E-09	9.18E-10	1.09E-09	-1.87E-08
Acidification	mol H+ eq.	3.31E-02	3.90E-04	4.68E-03	3.81E-02	5.98E-03	1.30E-05	2.87E-05	6.76E-05	5.54E-05	-4.55E-03
Eutrophication freshwater	kg P eq.	1.28E-03	6.34E-06	4.27E-04	1.72E-03	1.87E-05	1.25E-06	5.43E-07	8.53E-06	4.99E-06	-1.92E-04
Eutrophication aquatic marine	kg N eq.	8.50E-03	1.17E-04	1.19E-03	9.81E-03	1.91E-03	2.02E-05	8.38E-06	3.57E-05	5.60E-04	-1.17E-03
Eutrophication terrestrial	mol N eq.	5.47E-02	1.28E-03	8.73E-03	6.47E-02	2.09E-02	6.42E-05	9.15E-05	3.04E-04	1.52E-04	-7.27E-03
Photochemical ozone formation	kg NMVOC eq.	1.85E-02	4.01E-04	2.59E-03	2.15E-02	5.44E-03	2.81E-05	2.86E-05	7.56E-05	1.10E-04	-2.41E-03
Depletion of abiotic resources - minerals and metals[1]	kg Sb eq.	6.45E-05	3.08E-07	1.44E-05	7.92E-05	5.11E-07	3.70E-10	2.33E-08	2.08E-08	2.19E-08	-9.85E-06
Depletion of abiotic resources - fossil fuels[1]	MJ	1.02E+02	1.46E+00	1.35E+01	1.17E+02	1.15E+01	1.84E-03	1.03E-01	7.43E-02	1.06E-01	-1.43E+01
Water use[1]	m³ depriv.	5.71E+00	4.80E-03	3.06E-01	6.03E+00	1.36E-02	5.18E-05	3.89E-04	1.82E-03	3.73E-03	-8.57E-01

[1] The results of this environmental impact indicator must be used with caution, as the uncertainties in these results are high or because there is only limited experience with the indicator.

Additional environmental impact indicators

Parameters describing additional environmental impact indicators		Product stage				Construction Stage		End of life			Beyond the system
		Raw material supply	Transport	Manufacturing	Total (of product stage)	Transport	Construction installation	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-Potential
		A1	A2	A3	A1-A3	A4	A5	C2	C3	C4	D
Particulate Matter emissions	disease inc.	4.32E-07	9.32E-09	4.85E-08	4.89E-07	1.60E-08	6.10E-09	6.49E-10	5.78E-10	6.79E-10	-5.32E-08
Ionizing radiation, human health[2]	kBq U-235 eq	4.46E-01	7.50E-03	1.77E-01	6.30E-01	5.18E-02	8.15E-06	4.74E-04	2.88E-04	6.63E-04	-6.08E-02
Eco-toxicity (freshwater)[1]	CTUe	7.71E+01	1.15E+00	2.79E+01	1.06E+02	6.61E+00	1.30E+01	9.08E-02	5.79E-01	1.60E+00	-8.00E+00
Human toxicity, cancer effects[1]	CTUh	4.38E-08	3.62E-11	1.00E-08	5.38E-08	1.33E-10	9.91E-11	2.66E-12	3.26E-11	1.04E-11	-6.51E-09
Human toxicity, non-cancer effects[1]	CTUh	6.39E-08	1.22E-09	1.70E-08	8.22E-08	9.40E-09	4.65E-10	8.82E-11	1.20E-09	4.80E-10	-2.26E-09
Land use related impacts / Soil quality[1]	Pt	1.61E+01	1.28E+00	6.17E+00	2.41E+01	2.49E+00	5.75E-03	8.68E-02	4.28E-02	1.91E-01	-1.96E+00

[1] The results of this environmental impact indicator must be used with caution, as the uncertainties in these results are high or because there is only limited experience with the indicator.
[2] This impact category mainly deals with the possible effect of low-dose ionising radiation on human health in the nuclear fuel cycle. It does not take into account effects due to possible nuclear accidents and occupational hazards, nor the disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is also not measured by this indicator.

Parameters describing resource use

Parameters describing resource use		Product stage				Construction Stage		End of life			Beyond the system
		Raw material supply	Transport	Manufacturing	Total (of product stage)	Transport	Construction installation	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-Potential
		A1	A2	A3	A1-A3	A4	A5	C2	C3	C4	D
Primary energy resources – Renewable: Use as energy carrier	MJ, net calorific value	7.95E+00	2.07E-02	9.39E+00	1.74E+01	1.08E-01	1.15E-05	1.25E-03	2.39E-03	4.78E-03	-1.30E+00
Primary energy resources – Renewable: Used as raw materials	MJ, net calorific value	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
Primary energy resources – Renewable: Total	MJ, net calorific value	7.95E+00	2.07E-02	9.39E+00	1.74E+01	1.08E-01	1.15E-05	1.25E-03	2.39E-03	4.78E-03	-1.30E+00
Primary energy resources – Non-renewable: Use as energy carrier	MJ, net calorific value	7.96E+01	1.55E+00	9.92E+00	9.11E+01	1.20E+01	7.19E-04	1.09E-01	8.03E-02	1.12E-01	-1.54E+01
Primary energy resources – Non-renewable: Used as raw materials	MJ, net calorific value	2.80E+01	0.00E+00	4.55E+00	3.26E+01	9.80E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Primary energy resources – Non-renewable: Total	MJ, net calorific value	1.08E+02	1.55E+00	1.45E+01	1.24E+02	1.21E+01	7.19E-04	1.09E-01	8.03E-02	1.12E-01	-1.54E+01
Secondary material	kg	8.21E-02	0.00E+00	0.00E+00	8.21E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	m^3	9.09E-02	1.55E-04	1.22E-02	1.03E-01	6.41E-04	5.70E-07	1.46E-05	7.12E-05	1.21E-04	-4.57E-02

Parameters describing waste production

Parameters describing waste production		Product stage				Construction Stage		End of life			Beyond the system
		Raw material supply	Transport	Manufacturing	Total (of product stage)	Transport	Construction installation	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-Potential
		A1	A2	A3	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed	kg	5.07E-05	3.70E-06	2.14E-05	7.58E-05	2.90E-05	5.09E-09	2.62E-07	2.38E-07	3.55E-07	-4.29E-06
Non-hazardous waste disposed	kg	2.29E+00	1.01E-01	5.58E-01	2.95E+00	7.97E-02	3.94E-04	6.79E-03	6.14E-02	3.15E-01	-3.54E-01
Radioactive waste disposed	kg	1.63E-04	9.83E-06	6.23E-05	2.35E-04	8.05E-05	1.08E-08	6.65E-07	2.38E-07	5.47E-07	-1.88E-05

Parameters describing output flows

Parameters describing waste production		Product stage				Construction Stage		End of life			Beyond the system
		Raw material supply	Transport	Manufacturing	Total (of product stage)	Transport	Construction installation	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-Potential
		A1	A2	A3	A1-A3	A4	A5	C2	C3	C4	D
Components for reuse	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
Material recycling	kg	0.00E+00	0.00E+00	8.84E-02	8.84E-02	0.00E+00	0.00E+00	0.00E+00	4.55E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	4.91E-02	4.91E-02	0.00E+00	1.96E-02	0.00E+00	2.23E-01	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	3.45E-01	3.45E-01	0.00E+00	3.44E-02	0.00E+00	8.69E-01	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	9.01E-01	9.01E-01	0.00E+00	8.99E-02	0.00E+00	2.27E+00	0.00E+00	0.00E+00

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