

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH
15804+A2 &
ISO 14025 / ISO 21930



**AQUASYSTEM PP-R &
PP-RCT PIPES AND FITTINGS**
GEORG FISCHER

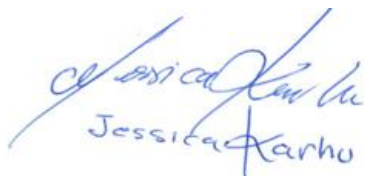
GENERAL INFORMATION

MANUFACTURER INFORMATION

Manufacturer	GEORG FISCHER HAKAN PLASTIK BORU VE PROFIL SAN. TIC. A.S.
Address	ORGANIZE SANAYII BÖLGESİ G.O. PASA MAH. İSTIKLAL CAD. N° 11 ÇERKEZKÖY TEKİRDAĞ/TURKEY
Contact details	iletisim@hakan.com.tr
Website	https://www.gfps.com/com/en.html

PRODUCT IDENTIFICATION

Product name	Aquasystem PP-R and PP-RCT
Place of production	ORGANIZE SANAYII BÖLGESİ G.O. PASA MAH. İSTIKLAL CAD. N° 11 ÇERKEZKÖY TEKİRDAĞ/TURKEY



Jessica Karhu
RTS EPD Committee secretary



Laura Apilo
Managing Director

EPD INFORMATION

EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

EPD program operator	The Building Information Foundation RTS sr Malminkatu 16 A, 00100 Helsinki, Finland http://cer.rts.fi
EPD standards	This EPD is in accordance with EN 15804+A2 and ISO 14025 / ISO 21930 standards.
Product category rules (PCR)	The CEN standard EN 15804+A2 serves as the core PCR. In addition, the RTS PCR (English version, 26.8.2020) is used.
EPD author	Ipek Goktas, at One Click LCA Ltd Suvilahdenkatu 10 B 00500 Helsinki, Finland www.oneclicklca.com
EPD verification	Independent verification of this EPD and data, according to ISO 14025: <input type="checkbox"/> Internal certification <input checked="" type="checkbox"/> External verification
EPD verifier	Silvia Vilčeková, Silcert, s.r.o.
Verification date	09.08.2021
EPD number	RTS_146_21
ECO Platform nr.	-
Publishing date	16.08.2021
EPD valid until	16.08.2026

PRODUCT INFORMATION

PRODUCT DESCRIPTION

Aquasystem PP-R Piping Systems is a lightweight piping system made of PP-R copolymer material (Type-3), with high mechanical strength and resistance to corrosion for the usage of pressured systems.

Aquasystem PP-RCT is made of Polypropylene Random copolymer with modified Crystallinity and Temperature resistance. The system withstands higher operating pressures at extreme temperatures, provides higher flow rates and resistant to chlorine.

PRODUCT APPLICATION

Aquasystem PP-R and PP-RCT Pipe systems are applicable for hot and cold-water systems, central heating systems, drinking water and treated water supply systems, industrial piping systems (transfer and discharge of chemicals), air conditioner systems and solar collectors.

PRODUCT RAW MATERIAL COMPOSITION

Raw materials	Weight [kg]	Post-consumer [%]	Renewable [%]	Material origin
Polypropylene	0.96	-	-	Europe, RoW
Glass fibre	0.03	-	-	Europe
Calcite	< 0.01	-	-	Europe
Adhesive	< 0.01	-	-	Europe

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass [%]	Material origin
Metals	-	-
Minerals	3%	Europe
Fossil materials	97%	Europe, RoW
Bio-based materials	-	-

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0.1 % (1000 ppm).

PRODUCT STANDARDS

TS EN ISO 15874-1: Plastics piping systems for hot and cold-water installations - Polypropylene (PP) - Part 1: General

TS EN ISO 15874-2: Plastics piping systems for hot and cold-water installations - Polypropylene (PP) - Part 2: Pipes

TS EN ISO 15874-3: Plastics piping systems for hot and cold-water installations - Polypropylene (PP) - Part 3: Fittings

TS 13715: Glass fibre reinforced, multilayer polypropylene pipes used for hot and cold-water supply systems - Pressure pipes

DIN 8077: Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT – Dimensions

DIN 8078: Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT - General quality requirements and testing

TECHNICAL SPECIFICATIONS

Products are made of PP-based materials and additives. Monolayer pipes are manufactured by extrusion process, glass reinforced pipes are manufactured co-extrusion process and fittings are manufactured by plastic injection moulding. The product range diameter is from d20 mm to d200 mm with the pipe classes of SDR11 (S5), SDR7,4 (S3,2) and SDR6 (S2,5). Pipe to pipe and fitting to pipe connections could be by socket, butt and electrofusion welding, moreover the connections could be mechanical jointing and flanges.

PHYSICAL PROPERTIES OF THE PRODUCT

System and Material Properties	Value/Unit	Standard/Test Method
Density	0.909 g/cm ³	ISO 1183
MFR 190/5 MFR 230/2,16 MFR 230/5	0.55 g/10 min 0.3 g/10 min 1.2 g/10 min	ISO 1133
Ultimate Breaking Stress (50 mm/min)	25 MPa	ISO 527/1+2
VICAT Softening Temperature VST/A/50	132 °C	ISO 306
Thermal Expansion Coefficient	0.035 mm/m°K *	DIN 53752
Thermal Conductivity Coefficient	0.24 W/m°K	DIN 52612

* Thermal Expansion Coefficient is 0.15 mm/m°K for conventional pipes.

ADDITIONAL INFORMATION

Further information: <https://www.gfps.com/com/en/products-solutions/systems/aquasystem.html>

PRODUCT LIFE CYCLE

MANUFACTURING AND PACKAGING (A1-A3)

For Piping:

- Income quality check for raw materials
- Feeding the raw material
- Melting of the raw material
- Forming the outer diameter with extrusion head (co-extrusion for multilayers)
- Calibrating the outer and inner diameter
- Cooling
- Outer diameter control (on-going)
- Cooling
- Cutting and Packaging
- Final Quality Control

For Fitting:

- Income quality check for raw materials
- Feeding the raw material
- Mixing PP-R with masterbatch
- Melting of the raw material
- Forming the part with injection moulding
- Cooling
- Taking the part
- Separating the gutters from plastic parts
- Quality Control
- Packaging
- Final Quality Control

TRANSPORT AND INSTALLATION (A4-A5)

Annual delivery rates are taken into consideration for delivery scenario. (A4) Transportation impacts occurred from delivering of the product cover direct exhaust emissions of fuel, environmental impacts of fuel production, as well as related infrastructure emissions.

Environmental impacts from installation into the building include packaging material waste 'carton and plastic film' and weight loss from the product. The impacts of energy consumption and used ancillary materials during installation are negligible. (A5)

PRODUCT USE AND MAINTENANCE (B1-B7)

This EPD does not cover use phase. Air, soil and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

At the end-of-life, in the demolition phase 100% of the end-of-life product is assumed to be collected separately; however, consumption of energy and natural resources in demolition process assumed to be negligible. (C1) The collected end-of-life product is sent to the closest facilities for incineration, recycling and landfilling by lorry which is the most common transportation method (C2). 50% and 44% of end-of-life product is converted to energy in incineration plant and recycled respectively (C3); accordingly, 6% of end-of-life product is landfilled (C4). Due to the incineration and recycling potential of polypropylene, the end-of-life product is converted into energy and recycled raw materials (D).

LIFE CYCLE ASSESSMENT

LIFE CYCLE ASSESSMENT INFORMATION

Period for data year 2020

DECLARED AND FUNCTIONAL UNIT

Declared unit 1 kg PP-R & PP-RCT pipe and fitting

Mass per declared unit 1 kg

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product 0 kg C

Biogenic carbon content in packaging 0.009 kg C

SYSTEM BOUNDARY

The scope of the EPD is "cradle to gate with modules A4, A5, C1-C4 and D". The modules A1 (Raw material supply), A2 (Transport) and A3 (Manufacturing), A4 (Transport), A5 (Assembly) as well as C1 (Deconstruction/ demolition), C2 (Transport at end-of-life), C3 (Waste processing), C4 (Disposal) and D (benefits and loads beyond the system boundary) are included in the study.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x	x	x
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the *EN 15804A1:2012+A2:2019* and *RTS PCR, 26.8.2020*. The study does not exclude any hazardous materials or substances.

The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes which data are available for are included in the calculation. There is no neglected unit process more than 1% of total mass and energy flows. The total neglected input and output flows do also not exceed 5% of energy usage or mass. The life cycle analysis includes all industrial processes from raw material acquisition to production, distribution, and end-of-life stages.

The modules B1-B7 have not been calculated nor included in the LCA calculations.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy, and water use related to company management and sales activities are excluded.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is based on annual production rate of the reference year and made with high accuracy and precision. The values for 1 kg of the produced product which is used within this study are calculated by considering the total product weight per annual production. The product output is fixed to 1 kg and the corresponding amount of product is used in the calculations.

In the production plant, several kinds of products are produced; however, since there are separate energy meters for each production line, total annual consumed energy in the production line is allocated per 1 kg of product considering the annual production. Packaging material allocation is handled according to the ratio of the annual production of the declared product to the total annual production at the factory since the produced products and used packaging materials for all are similar. There is no co-product or by-product allocation, because all of the broken or fewer quality products are sent back to the production; accordingly, the energy consumption for preparing the discarded product as raw material is included in the energy consumption per 1 kg of product.

This LCA study is conducted in accordance with all methodological considerations, such as performance, system boundaries, data quality, allocation procedures, and decision rules to evaluate inputs and outputs.

All estimations and assumptions are given below.

- Modules A2, A4 & C2: Vehicle capacity utilization volume factor is assumed to be 1 which means full load. It may vary but as the role of transportation emission in total results is small and so the variety in load assumed to be negligible. Empty returns are not

considered as it is assumed that return trip is used by transportation companies to serve the needs of other clients.

- Module A4: Transportation doesn't cause losses as products are packaged properly. Also, volume capacity utilisation factor is assumed to be 1 for the nested packaged products. Additionally, transportation distances and vehicle types are assumed according to the delivery in the last year.
- Module A5: Weight loss from cutting process during installation is assumed to be 1%. Weight loss from product and waste from packaging materials are assumed to be incinerated. Consumed energy and other sources for installation is negligible.
- Module C1: Consumed energy and other sources for demolition process of the product is negligible.
- Module C2: Transportation distance to the closest disposal area is estimated as 50 km and the transportation method is assumed as lorry which is the most common.
- Modules C3, C4: 50% and 44% of end-of-life product are assumed to be incinerated and recycled according to *Our World in Data*. Hence, 6% of end-of-life product is landfill waste.
- Module D: The benefits of energy recovering are taken into consideration according to the energy efficiency specified in *Eriksson, O & Finnveden, G., 2017*. Primary contents of the recycled end-of-life polypropylene are assumed to be raw materials for further productions.

AVERAGES AND VARIABILITY

The results represent the average of the PP-R & PP-RCT pipe and fitting systems.

ENVIRONMENTAL IMPACT DATA

The LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Note: “ENVIRONMENTAL IMPACTS - EN 15804+A1, CML / ISO 21930” and “ENVIRONMENTAL IMPACTS - TRACI 2.1” are presented in ANNEX-1 and ANNEX-2 respectively.

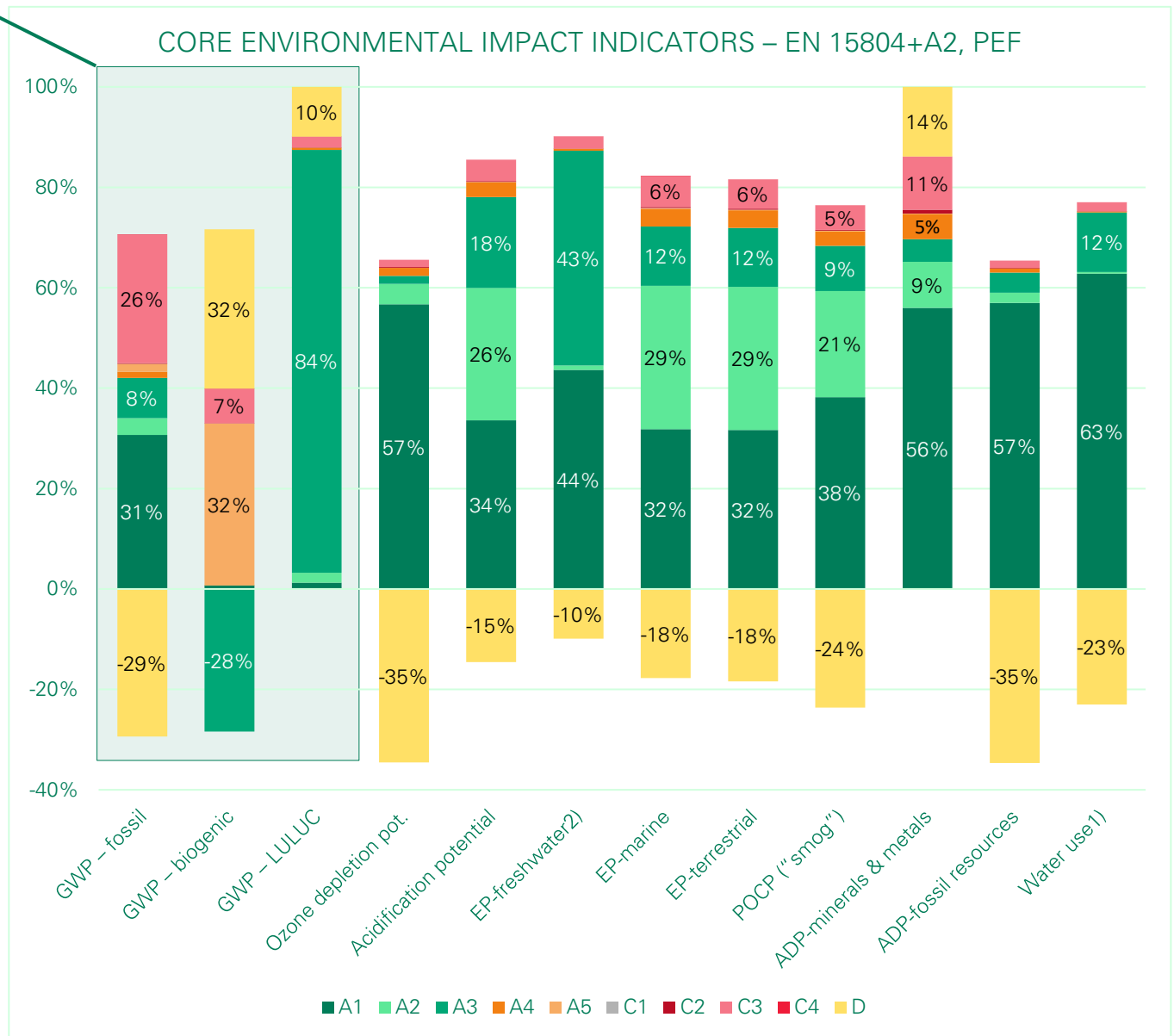
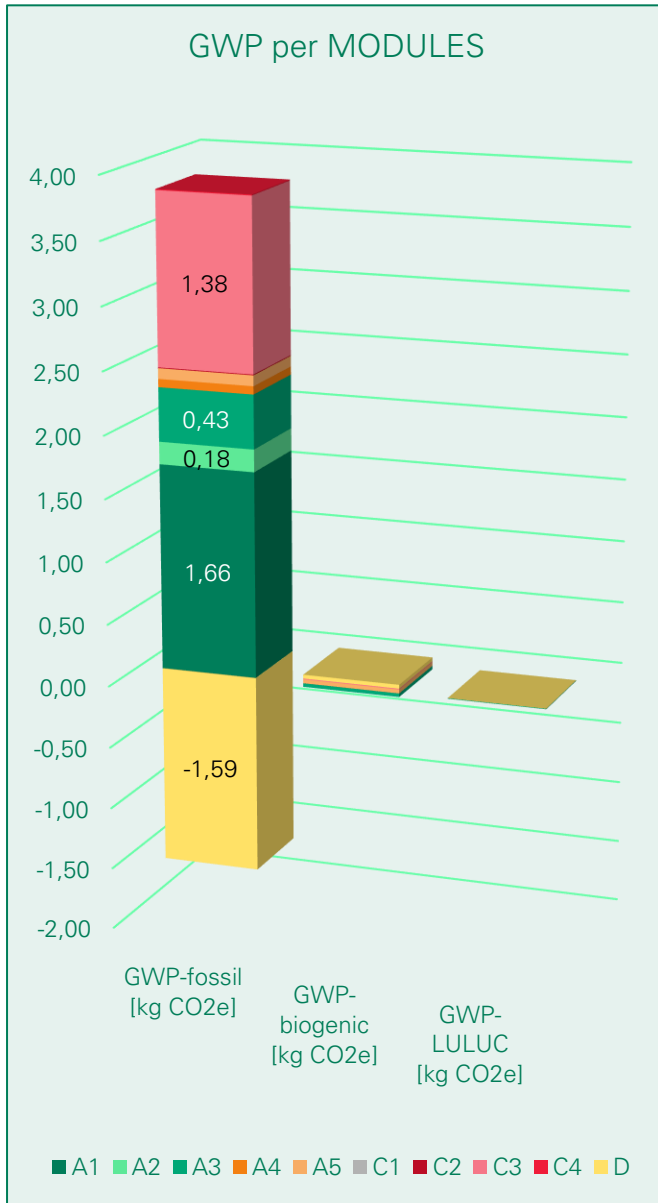
CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Climate change – total	kg CO ₂ e	1.66E+00	1.80E-01	4.09E-01	2.25E+00	6.51E-02	1.17E-01	MND	0.00E+00	6.31E-03	1.39E+00	7.52E-03	-1.56E+00
Climate change – fossil	kg CO ₂ e	1.66E+00	1.80E-01	4.33E-01	2.27E+00	6.50E-02	8.52E-02	MND	0.00E+00	6.31E-03	1.38E+00	7.52E-03	-1.59E+00
Climate change – biogenic	kg CO ₂ e	6.67E-04	3.91E-06	-2.79E-02	-2.73E-02	4.00E-05	3.17E-02	MND	0.00E+00	3.86E-06	6.80E-03	6.77E-06	3.12E-02
Climate change – LULUC	kg CO ₂ e	6.22E-05	1.01E-04	4.22E-03	4.39E-03	2.22E-05	1.74E-07	MND	0.00E+00	2.23E-06	1.09E-04	3.32E-07	4.96E-04
Ozone depletion	kg CFC11e	5.34E-07	3.80E-08	1.52E-08	5.87E-07	1.50E-08	7.92E-11	MND	0.00E+00	1.45E-09	1.26E-08	1.95E-10	-3.25E-07
Acidification	mol H ⁺ e	5.40E-03	4.24E-03	2.92E-03	1.26E-02	4.72E-04	1.13E-05	MND	0.00E+00	2.60E-05	6.71E-04	5.47E-06	-2.34E-03
Eutrophication, aquatic freshwater ¹	kg Pe	5.12E-05	1.01E-06	5.02E-05	1.02E-04	5.03E-07	9.04E-09	MND	0.00E+00	5.45E-08	2.77E-06	1.17E-08	-1.16E-05
Eutrophication, aquatic marine	kg Ne	1.17E-03	1.05E-03	4.34E-04	2.66E-03	1.30E-04	5.34E-06	MND	0.00E+00	7.69E-06	2.25E-04	3.11E-06	-6.52E-04
Eutrophication, terrestrial	mol Ne	1.30E-02	1.17E-02	4.82E-03	2.96E-02	1.43E-03	5.78E-05	MND	0.00E+00	8.50E-05	2.37E-03	2.02E-05	-7.56E-03
Photochemical ozone formation	kg NMVOCe	5.57E-03	3.08E-03	1.31E-03	9.96E-03	4.22E-04	1.39E-05	MND	0.00E+00	2.67E-05	7.02E-04	7.42E-06	-3.44E-03
Abiotic depletion, minerals & metals ²	kg Sbe	1.15E-05	1.88E-06	9.24E-07	1.43E-05	1.04E-06	1.36E-08	MND	0.00E+00	1.57E-07	2.17E-06	6.77E-09	2.85E-06
Abiotic depletion of fossil resources ²	MJ	6.89E+01	2.45E+00	4.88E+00	7.62E+01	9.91E-01	7.99E-03	MND	0.00E+00	9.62E-02	1.71E+00	1.49E-02	-4.19E+01
Water use ²	m ³ e deprived	1.24E+00	6.58E-03	2.34E-01	1.48E+00	3.54E-03	1.21E-04	MND	0.00E+00	3.42E-04	3.47E-02	6.62E-04	-4.54E-01

¹ The required characterisation method and data are in kg P-eq; to get PO₄e, multiply the result by 3.07.

² EN 15804+A2 Disclaimer 2: “The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.”

Reading Example: 1.00E-03 = 1.00 × 10⁻³ = 0.001
 1.00E+03 = 1.00 × 10⁺³ = 1000



ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Particulate matter	Incidence	7.41E-08	8.90E-09	1.45E-08	9.75E-08	5.46E-09	5.40E-11	MND	0.00E+00	4.87E-10	1.48E-08	1.04E-10	-1.25E-08
Ionizing radiation, human health ³	kBq U235e	5.14E-02	1.06E-02	3.60E-03	6.56E-02	4.33E-03	1.22E-05	MND	0.00E+00	4.21E-04	4.12E-03	5.82E-05	-1.55E-02
Eco-toxicity (freshwater) ²	CTUe	1.24E+01	1.66E+00	5.98E+00	2.00E+01	7.45E-01	2.08E-02	MND	0.00E+00	7.51E-02	2.49E+00	1.49E-02	-3.85E+00
Human toxicity, cancer effects ²	CTUh	1.45E-10	8.65E-11	8.04E-11	3.12E-10	2.16E-11	3.01E-12	MND	0.00E+00	2.13E-12	3.02E-10	4.11E-13	2.03E-10
Human toxicity, non-cancer effects ²	CTUh	6.62E-09	1.61E-09	3.85E-09	1.21E-08	8.63E-10	1.21E-10	MND	0.00E+00	8.62E-11	4.38E-09	9.97E-12	-1.31E-09
Land use related impacts/soil quality ²	-	9.38E-02	1.37E+00	2.99E-01	1.76E+00	1.36E+00	2.32E-03	MND	0.00E+00	1.07E-01	1.02E+00	5.26E-02	1.10E+00

² EN 15804+A2 Disclaimer 2: “The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.”

³ EN 15804+A2 Disclaimer 1: “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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.”

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Renewable PER used as energy	MJ	8.08E-01	2.17E-02	1.61E+00	2.44E+00	1.20E-02	1.72E-04	MND	0.00E+00	1.37E-03	7.26E-02	2.60E-04	-2.95E-02
Renewable PER used as materials	MJ	0.00E+00	0.00E+00	3.65E-01	3.65E-01	0.00E+00	-3.65E-01	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable PER	MJ	8.08E-01	2.17E-02	1.97E+00	2.80E+00	1.20E-02	-3.65E-01	MND	0.00E+00	1.37E-03	7.26E-02	2.60E-04	-2.95E-02
Non-renewable PER used as energy	MJ	2.34E+01	2.45E+00	4.85E+00	3.07E+01	9.91E-01	7.99E-03	MND	0.00E+00	9.62E-02	1.71E+00	1.49E-02	-2.21E+01
Non-renewable PER used as materials	MJ	4.55E+01	0.00E+00	3.35E-02	4.55E+01	0.00E+00	-4.88E-01	MND	0.00E+00	0.00E+00	-4.23E+01	0.00E+00	-1.98E+01
Total use of non-renewable PER	MJ	6.89E+01	2.45E+00	4.88E+00	7.62E+01	9.91E-01	-4.80E-01	MND	0.00E+00	9.62E-02	-4.06E+01	1.49E-02	-4.19E+01
Use of secondary materials	kg	3.07E-04	0.00E+00	2.00E-04	5.07E-04	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.18E-01
Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m ³	2.65E+01	3.31E-04	2.38E-03	2.65E+01	1.96E-04	2.15E-05	MND	0.00E+00	1.82E-05	6.94E-04	1.67E-05	-1.15E+01

PER abbreviation stands for primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Hazardous waste	kg	5.10E-03	2.69E-03	2.59E-02	3.37E-02	9.81E-04	5.87E-04	MND	0.00E+00	1.00E-04	0.00E+00	2.70E-05	2.19E-02
Non-hazardous waste	kg	1.28E-01	1.18E-01	2.09E+00	2.34E+00	9.83E-02	3.16E-02	MND	0.00E+00	8.32E-03	0.00E+00	5.94E-02	4.98E-01
Radioactive waste	kg	3.58E-06	1.71E-05	3.68E-06	2.43E-05	6.82E-06	1.61E-08	MND	0.00E+00	6.58E-07	0.00E+00	8.88E-08	5.29E-06

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	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	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	4.36E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.22E-02	MND	0.00E+00	0.00E+00	4.95E-01	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

KEY INFORMATION TABLE (RTS) – KEY INFORMATION PER KG OF PRODUCT

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Climate change – total	kg CO ₂ e	1.66E+00	1.80E-01	4.09E-01	2.25E+00	6.51E-02	1.17E-01	MND	0.00E+00	6.31E-03	1.39E+00	7.52E-03	-1.56E+00
Abiotic depletion, minerals & metals ²	kg Sbe	1.15E-05	1.88E-06	9.24E-07	1.43E-05	1.04E-06	1.36E-08	MND	0.00E+00	1.57E-07	2.17E-06	6.77E-09	2.85E-06
Abiotic depletion of fossil resources ²	MJ	6.89E+01	2.45E+00	4.88E+00	7.62E+01	9.91E-01	7.99E-03	MND	0.00E+00	9.62E-02	1.71E+00	1.49E-02	-4.19E+01
Water use ²	m ³ e deprived	1.24E+00	6.58E-03	2.34E-01	1.48E+00	3.54E-03	1.21E-04	MND	0.00E+00	3.42E-04	3.47E-02	6.62E-04	-4.54E-01
Use of secondary materials	kg	3.07E-04	0.00E+00	2.00E-04	5.07E-04	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.18E-01
Biogenic carbon content in product	kg C	N/A	N/A	0.00E+00	0.00E+00	N/A	N/A	MND	N/A	N/A	N/A	N/A	N/A
Biogenic carbon content in packaging	kg C	N/A	N/A	8.64E-03	8.64E-03	N/A	N/A	MND	N/A	N/A	N/A	N/A	N/A

² EN 15804+A2 Disclaimer 2: "The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator."

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	Electricity, high voltage, production mix, Ecoinvent v3.6, Turkey, 2019
Electricity CO ₂ e/kWh	0.54 kg CO ₂ e / kWh

Transport scenario documentation

Scenario parameter	Value
A4 specific transport CO ₂ e emissions, kg CO ₂ e / tkm	0.0465
A4 average transport distance, km	1356

End of life scenario documentation

Scenario parameter	Value
Collection process – kg collected separately	0.9900
Collection process – kg collected with mixed waste	-
Recovery process – kg for re-use	-
Recovery process – kg for recycling	0.4356
Recovery process – kg for energy recovery	0.4950
Disposal (total) – kg for final deposition	0.0594
Scenario assumptions for transportation	End-of-life product is transported 50 km with an average lorry

BIBLIOGRAPHY

ISO 14025:2010 Environmental labels and declarations - Type III environmental declarations. Principles and procedures.

ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.

ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.

ISO 21930:2017 Sustainability in building construction - Environmental declaration of building products

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

RTS PCR 26.8.2020 RTS PCR protocol: EPDs published by the Building Information Foundation RTS sr. (English version)

Ecoinvent database v3.6

Plastics Europe database, 2012

Our World in Data: Extrapolated change in plastic fate to 2050

Eriksson, O & Finnveden, G., 2017: Energy Recovery from Waste Incineration—The Importance of Technology Data and System Boundaries on CO₂ Emissions

GF PPRC LCA Report 25.06.2021

ANNEX-1: ENVIRONMENTAL IMPACTS - EN 15804+A1, CML / ISO 21930

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global warming potential	kg CO ₂ e	1.62E+00	1.78E-01	4.30E-01	2.23E+00	6.44E-02	8.51E-02	MND	0.00E+00	6.25E-03	1.38E+00	5.33E-03	-1.49E+00
Depletion of stratospheric ozone	kg CFC11e	4.59E-08	3.01E-08	1.25E-08	8.85E-08	1.19E-08	7.15E-11	MND	0.00E+00	1.15E-09	1.04E-08	1.55E-10	-8.92E-08
Acidification	kg SO ₂ e	4.43E-03	3.31E-03	2.51E-03	1.03E-02	3.01E-04	7.87E-06	MND	0.00E+00	1.29E-05	5.29E-04	5.36E-06	-1.65E-03
Eutrophication	kg (PO ₄) ³ e	1.23E-03	3.79E-04	1.52E-03	3.13E-03	4.42E-05	6.76E-06	MND	0.00E+00	2.67E-06	8.39E-04	2.63E-04	4.05E-04
Photochemical ozone formation	kg C ₂ H ₄ e	3.64E-04	9.05E-05	9.22E-05	5.46E-04	1.22E-05	1.37E-07	MND	0.00E+00	8.31E-07	3.82E-05	1.12E-06	-2.55E-04
Abiotic depletion of non-fossil resources	kg Sbe	1.15E-05	1.88E-06	9.24E-07	1.43E-05	1.04E-06	1.36E-08	MND	0.00E+00	1.57E-07	2.17E-06	6.77E-09	2.85E-06
Abiotic depletion of fossil resources	MJ	6.89E+01	2.45E+00	4.88E+00	7.62E+01	9.91E-01	7.99E-03	MND	0.00E+00	9.62E-02	1.71E+00	1.49E-02	-4.19E+01

ANNEX-2: ENVIRONMENTAL IMPACTS - TRACI 2.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global warming potential	kg CO ₂ e	1.62E+00	1.78E-01	4.31E-01	2.23E+00	6.43E-02	8.51E-02	MND	0.00E+00	6.24E-03	1.38E+00	5.65E-03	-1.50E+00
Ozone depletion	kg CFC11e	4.99E-08	4.02E-08	1.74E-08	1.08E-07	1.59E-08	8.37E-11	MND	0.00E+00	1.53E-09	1.37E-08	2.07E-10	-1.16E-07
Acidification	kg SO ₂ e	4.55E-03	3.60E-03	2.42E-03	1.06E-02	4.06E-04	1.05E-05	MND	0.00E+00	2.26E-05	6.29E-04	4.87E-06	-1.98E-03
Eutrophication	kg Ne	3.25E-03	1.80E-04	4.19E-04	3.85E-03	3.84E-05	3.56E-06	MND	0.00E+00	3.19E-06	1.15E-04	2.36E-06	-1.30E-03
Photochemical smog formation	kg O ₃ e	7.62E-02	6.70E-02	2.69E-02	1.70E-01	8.23E-03	3.32E-04	MND	0.00E+00	4.87E-04	1.35E-02	1.16E-04	-4.49E-02
Depletion of non-renewable energy	MJ	1.02E+01	3.57E-01	3.63E-01	1.09E+01	1.42E-01	1.11E-03	MND	0.00E+00	1.37E-02	2.13E-01	2.04E-03	-6.71E+00

ABOUT THE MANUFACTURER

Founded in Switzerland in 1802, Georg Fischer Corporation operates in three main business lines: GF Piping Systems, GF Casting Solutions and GF Machining Solutions. Georg Fischer is present in 34 countries with 57 production plants and 136 companies.

GF Piping Systems, the largest business line of Georg Fischer Corporation, is one of the leading companies in plastic and metal piping systems in the world. GFPS produces system solutions and high-quality components for the secure transmission of water and gas in industries, utilities and building technology. Reaching out to over 100 countries with its more than 30 production plants, GF Piping Systems acquired Hakan Plastik in 2013.

Founded in 1965, Hakan Plastik has achieved so many breakthroughs as the first company that produced the silent pipe in Turkey and has reflected the importance that it attaches to development and change to its products and services as well.



EPD AUTHOR AND CONTRIBUTORS

Manufacturer	GEORG FISCHER HAKAN PLASTIK BORU VE PROFIL SAN. TIC. A.S.
EPD author	One Click LCA Ltd, www.oneclicklca.com
EPD verifier	Silvia Vilčeková, Silcert, s.r.o.
EPD program operator	The Building Information Foundation RTS sr
Background data	Ecoinvent 3.6 (cut-off) and Plastics Europe 2012
LCA software	One Click LCA Pre-Verified EPD Generator for Plumbing Products, Components, Equipment and Systems