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GFIX JOINTS

Issue date: 02/09/2026

Valid until: 01/09/2031

FUCOLI SOMEPAL – FUNDIÇÃO DE FERRO, S.A.



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1. GENERAL INFORMATION

1.1. The DAPHabitat System

Programme operator:	Associação Plataforma para a Construção Sustentável www.clusterhabitat.pt geral@clusterhabitat.pt  Cluster Habitat Sustentável
Address:	R. Coronel Veiga Simão, Ed. CTCV Lufapo Hub 3025-307 Coimbra
Email address:	deptechnico@clusterhabitat.pt
Telephone number:	(+351) 234 401 576
Website:	www.daphabitat.pt
Logo:	

1.2. EPD owner

Name of the owner:	Fucoli Somepal – Fundação de Ferro, S.A.
Production site:	Head Office: Estrada de Coselhas, 3000-125 Coimbra Portugal Branch: Rua de Aveiro, 50, 3050-420 Pampilhosa Portugal
Address (head office):	Estrada de Coselhas, 3000-125 Coimbra Portugal
Telephone number:	+351 239 490 100
Email address:	geral@fucoli-somepal.pt
Website:	www.fucoli-somepal.pt
Logo:	
Information concerning the applicable management Systems:	ISO 9001:2015 – Quality Management Systems ISO 14001:2015 – Environmental Management Systems (Coimbra facilities only) ISO 45001:2018 – Occupational Health and Safety Management Systems
Specific aspects regarding production:	CAErev.3 nº 24510 – Manufacture of cast iron castings
Organization's environmental policy:	Fucoli Somepal, S.A., has as its: Mission: To be a benchmark partner for all Entities in the production and supply of cast iron products, where Quality, Innovation, Environment, Occupational Health and Safety and Social Responsibility, combined with the application of the best available techniques, ensure the guarantee of the quality of

what they do, sustainable development and a proactive and responsible attitude towards the society in which they operate.

Vision:

Fucoli-Somepal, S.A. intends to be a company of excellence in its field of activity, harmonising its technical, economic and financial performance with the principles of sustainability.

Policy:

- Customer satisfaction regarding their needs and expectations;
 - Environmental protection through pollution prevention, minimization of environmental impacts, and sustainable use of resources;
 - Prevention of injuries and ill health, eliminating hazards and minimizing risks in the workplace;
 - Creation of added value for all interested parties;
 - Compliance with legal and regulatory requirements, standards and practices, both national and international, always seeking to go beyond mere compliance;
 - Continuous improvement of what they do, with defined objectives;
 - Motivation and training of human resources in order to foster a culture of involvement and creativity, promoting the generation of ideas;
 - Ensuring equal opportunities and equal treatment, seeking to avoid all forms of discrimination not related to the requirements for job performance;
 - Practice of fair wages in accordance with the cost of living of the region;
 - Continuously ensuring practices that facilitate work-life balance;
 - Ensuring the existence of an attractive working environment, guaranteeing reasonable working hours and condemning all practices of child or forced labor;
- Promoting consultation and participation of workers and their representatives.

1.3. Information concerning the EPD

Authors:	1. Centro Tecnológico da Cerâmica e do Vidro 2. Fucoli Somepal – Fundação de ferro, S.A.
Contact of the authors:	1. CTCV materials: habitat iParque – Parque Tecnológico de Coimbra – Lote 6 3040-540 Antanhol – Portugal (T) +351 239 499 200 Marisa Almeida: marisa@ctcv.pt 2. Fucoli Somepal, S.A.: Estrada de Coselhas, 3000-125 Coimbra Portugal (T) +351 239 490 100 e-mail: sede@fucoli-somepal.pt elsa.silva@fucoli-somepal.pt
Issue date:	02/09/2026
Registration date:	18/09/2026
Registration number:	DAP 023:2026
Valid until:	01/09/2031
Representativity of the EPD (location, manufacturer, group of manufacturers):	EPD for one product class (GFIX joints), manufactured in two industrial units, belonging to a single producer (Fucoli Somepal, S.A.).

EPD scope:	Cradle-to-grave EPD with Module D (A1–D).
Type of EPD	Specific EPD
Geographical representation	Portugal/Europe

1.4. Verification demonstration

External independent verification, accordingly, with the standard NP ISO 14025:2009 and EN 15804:2012+A2:2019	
Certification Body	Verifier
	
(CERTIF – Associação para a Certificação)	(Helena Gervásio)

1.5. EPD registration

Programme Operator

(Associação Plataforma para a Construção Sustentável)

1.6. PCR (Product Category Rules) basic model

Name:	Base model PCR for construction products
Issue date:	February 2026 Edition
Number of registrations on the database:	RCP-mb001
Version:	Version 3.1.1

Identification and contact of the coordinator(s):	Marisa Almeida marisa@ctcv.pt Luís Arroja arroja@ua.pt José Dinis Silvestre jose.silvestre@ist.utl.pt
Identification and contact of the authors:	Marisa Almeida marisa@ctcv.pt Luís Arroja arroja@ua.pt José Silvestre jds@civil.ist.utl.pt Fausto Freire Cristina Rocha Ana Paula Duarte Ana Cláudia Dias Helena Gervásio Victor Ferreira Ricardo Mateus António Baio Dias Ana Karolina Santos
Composition of the Sectorial Panel:	-
Consultation period:	18/11/2015 - 18/01/2016 12/08/2023 – 30/11/2023
Valid until:	01/06/2027

CEN standard EN 15804 serves as the core Product Category Rules (PCR).

1.7. Information concerning the product/product class

Identification of the product:	GFIX joints in cast iron.
Illustration of the product:	 Multimaterial joint with claws GFIX System Multimaterial Flange joint with claws - GFIX System Figure 1 – Examples of GFIX joints manufactured by Fucoli.
Brief description of the product:	The multimaterial joint and the flange/multimaterial joint with claws GFIX® System from Fucoli-Somepal are joints that allow the connection of pipes with different external diameters and/or materials. They are composed of a body and clamping rings made of ductile cast iron (EN-GJS-500-7), fully coated with epoxy paint with a minimum thickness of 250 µm. The sealing and locking system consist of a gasket and a claw system with rivets made of hardened steel that secure the pipes. The declared unit of this EPD refers to different joints; each type of joint has different dimensions and weights. However, the manufacturing process is the same, and therefore the declared unit is based on mass, i.e., per kilogram.

	<table><tr><th>Material</th><th>Percentage (by mass)</th></tr><tr><td>Ductile Cast Iron</td><td>82.8%</td></tr><tr><td>Stainless Steel (Screws, Anchors and Clips)</td><td>5.7%</td></tr><tr><td>POM (Support + Clips)</td><td>4.7%</td></tr><tr><td>EPDM Gasket</td><td>2.5%</td></tr><tr><td>Epoxy Coating</td><td>2.4%</td></tr><tr><td>Others</td><td>1.9%</td></tr></table>	Material	Percentage (by mass)	Ductile Cast Iron	82.8%	Stainless Steel (Screws, Anchors and Clips)	5.7%	POM (Support + Clips)	4.7%	EPDM Gasket	2.5%	Epoxy Coating	2.4%	Others	1.9%
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Epoxy Coating	2.4%														
Others	1.9%														
Main technical characteristics of the product:	Table 1: Technical characteristics of the joints <table><tr><th>Model</th><th>Characteristic</th><th>Units</th></tr><tr><td rowspan="5">GFIX</td><td>Service temperature</td><td>0 to 70°C</td></tr><tr><td>Flow direction</td><td>Bidirectional</td></tr><tr><td>Nominal diameter</td><td>50 to 400 mm</td></tr><tr><td>Weight</td><td>6 to 70 kg 5 to 52 kg</td></tr><tr><td>Corrosion protection</td><td>Epoxy coating with a minimum thickness of 250 µm</td></tr></table>	Model	Characteristic	Units	GFIX	Service temperature	0 to 70°C	Flow direction	Bidirectional	Nominal diameter	50 to 400 mm	Weight	6 to 70 kg 5 to 52 kg	Corrosion protection	Epoxy coating with a minimum thickness of 250 µm
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	Flow direction	Bidirectional													
	Nominal diameter	50 to 400 mm													
	Weight	6 to 70 kg 5 to 52 kg													
	Corrosion protection	Epoxy coating with a minimum thickness of 250 µm													
Description of the product’s application/use:	GFIX cast iron joints for drinking water, neutral liquids, and gas, such as: • Drinking water • Wastewater/ sanitation • Gas														
Placing on the market / Rules of application in the market / Technical rules of the product:	The various cast iron joint products manufactured by Fucoli carry the following certificates: • ACS Certificate • GSK Certificate														
Packaging information:	Average mass of packaging materials per declared/functional unit (1 kg of product): - Paper and cardboard: 1.37 g/kg; - Plastic: 0.69 g/kg; - Wooden pallet: 15.857 g/kg.														
Quality control	The entire production process is controlled to ensure consistent product quality across the two Fucoli-Somepal factories. The selection of raw material sources is rigorous and meticulous. All raw materials are analyzed in the laboratory before being received. All products are manufactured from ductile cast iron EN-GJS-500-7. Product machining is performed using the latest CNC machining technologies. Standards: • EN 1092-2 • EN 12201-2 • EN ISO 1452-2 • DIN 8074 • EN 558 • EN 14525 • EN 545														
Special delivery conditions:	Not applicable.														
Components and substances to declare:	The product does not contain any substance on the REACH Candidate List of Substances of Very High Concern (SVHC) above 0.1% by mass.														

Where explanatory material may be obtained:	See more on the website: https://www.fucoli-somepal.pt/
History of the LCA studies:	Not applicable.

1.8. Calculation rules of the LCA

Declared unit:	1 kg “average” of GFIX cast iron joints.
System boundaries:	Cradle-to-grave EPD (A1 to D).
Criteria for the exclusion:	In accordance with section 6.3.5 of NP EN 15804, the exclusion criteria for unit processes is 1% of the total energy consumption and 1% of the total mass of inputs, with special attention to ensure that a total of no more than 5% of energy and mass flows are excluded in the product stage. The following processes were not considered in this study, as they can be covered by the exclusion criteria or fall within the scope of the standard: • Environmental burdens associated with the construction of industrial infrastructure and the manufacture of machinery and equipment; • Environmental burdens related to infrastructure (production and maintenance of vehicles and roads) for the transport of pre-products; • Long-term emissions.
Assumption and limitations:	For processes over which the producers have no influence or specific information, such as raw material extraction, generic data from the Ecoinvent database, version 3.9.1, were used. The dataset used to model electricity, and natural gas production was adapted to the national context. The electricity mix was updated for the year 2023 using information from Redes Energéticas Nacionais (REN), the Regulatory Authority for Energy Services (ERSE), and the Directorate-General for Energy and Geology (DGEG), in order to obtain more current results regarding environmental impacts generated by the electricity grid in Portugal. The natural gas process was modelled based on the information provided in the Energy in Portugal 2023 report by DGEG, regarding the countries of origin of its imports. The environmental impacts presented in this EPD refer to a weighted average of all GFIX joints produced by Fucoli in 2023.
Quality and other characteristics about the information used in the LCA:	The production data collected correspond to the year 2023 and reflect the actual situation (years 2022 and 2021). The generic data used come from the Ecoinvent v3.9.1 database and meet the quality criteria (age, geographic and technological coverage, plausibility, etc.) for generic data. Most of the information (energy and water consumption, pollutant emissions, etc.) is measured or calculated directly at the company level, being specific and verified data. Carbon dioxide emissions were collected according to the emission factors mentioned by CELE (ETS – Emissions Trading Scheme). Detailed data for raw material mixes were obtained through primary data collection from the company. The overall data quality can be considered good in terms of geographic and temporal coverage.
Allocation rules:	In addition to GFIX joints, Fucoli also produces other types of products, which constitutes a situation of multifunctionality. To determine the inputs and outputs associated only with the production of GFIX joints, the unit process subdivision procedure was first adopted. Thus, only operations related to the production of the product under study were considered, while operations exclusive to other products were excluded. Subsequently, for the included operations, an allocation procedure based on the mass of the different products produced was applied. In the joint production process, there is also

	multifunctionality associated with recycling. On one hand, steel from scrap is consumed, so the environmental impacts associated with the production of this steel relate to operations occurring after the collection and sorting of the scrap.
Software used for the assessment:	SimaPro 9.5
Background database used for the LCA:	Ecoinvent 3.9.1
Comparability of EPD for construction products:	The EPD of construction products and services cannot be comparable in case they are not produced according to EN 15804 and EN 15942 and according to the comparability conditions determined by ISO 14025.

1.9. Use of the average environmental performance

This EPD presents the average environmental performance of the GFIX joint product range manufactured by Fucoli during the year 2023.

The results presented are representative of the average environmental performance of the products covered by this EPD and are based on the average production and consumption data of the manufacturing facility. Given the nature of this EPD, any variations in the environmental performance of individual product references are not considered significant and do not affect the representativeness of the reported results.

1.10. Technical information for Reference Service Life (RSL)

Parameter	Units	Results**
Reference service life	Years	50
Declared product properties (at the gate) and finishes, etc.	Appropriate units	See Table 1. For more information, contact Fucoli or request their technical datasheets.
Design application parameters (if instructed by the manufacturer), including references to appropriate practices and application codes	Appropriate units	For more information, contact Fucoli or request their technical datasheets.
Assumed workmanship quality when installed according to manufacturer instructions	Appropriate units	For more information, contact Fucoli or request their technical datasheets.
External environment (for outdoor applications), e.g., weathering, pollutants, UV and wind exposure, building orientation, shading, temperature	Appropriate units	Product use does not consume resources, release effluents or emissions, or generate waste.
Internal environment (for indoor applications), e.g., temperature, humidity, chemical exposure	Appropriate units	Product use does not consume resources, release effluents or emissions, or generate waste.
Service conditions, e.g., frequency of use, chemical exposure	Appropriate units	The product can be used for temporary services or as a pressurization tool for testing pipe sections and is therefore reconditionable.
Maintenance, e.g., frequency of use, mechanical exposure	Appropriate units	Maintenance is not required during the product's service life.
**results expressed per declared unit		

1.11. Flow diagram of input and output of the process

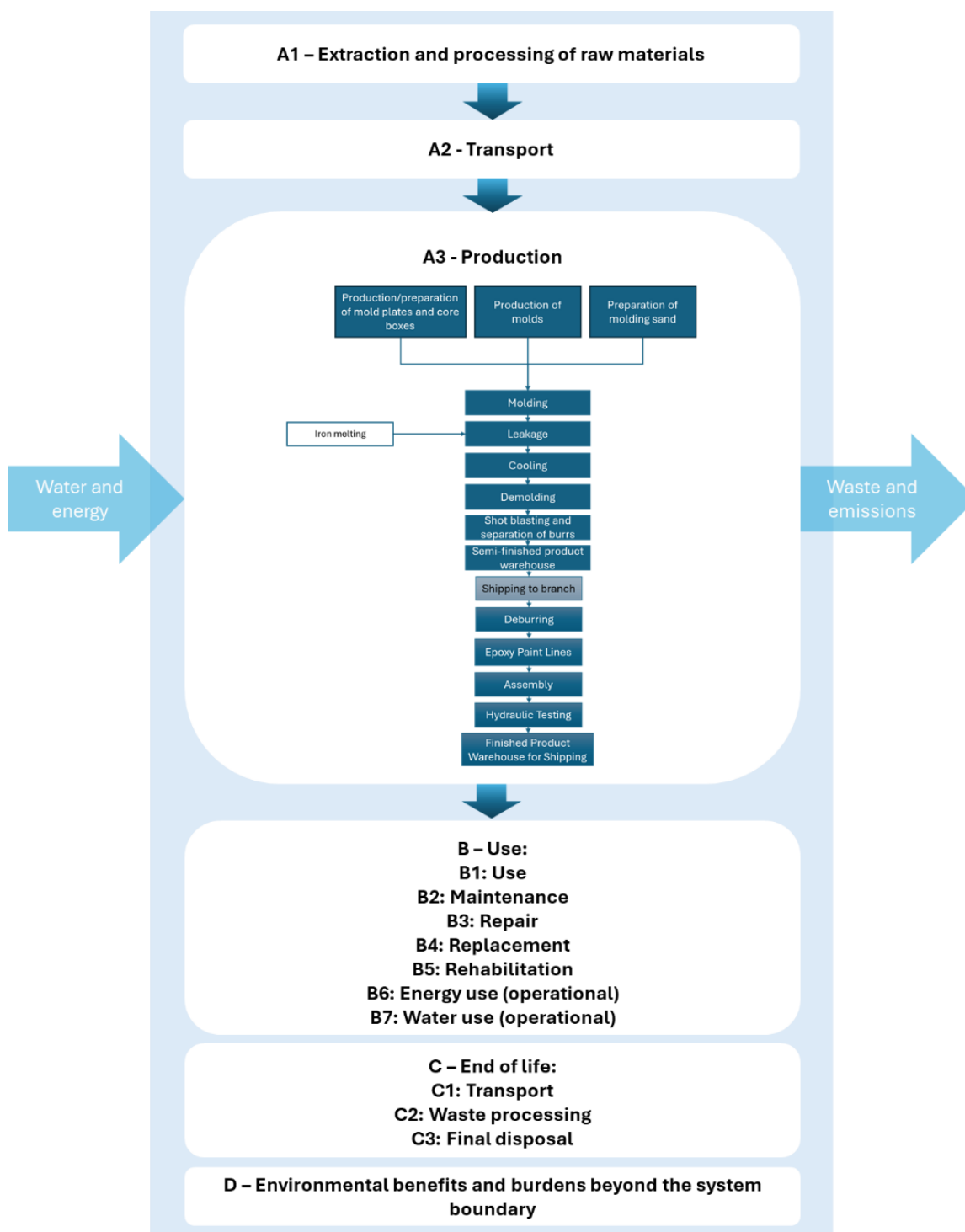


Figure 2: Life cycle stages of GFIX cast iron joints (A1-D).

2. CORE ENVIRONMENTAL IMPACT INDICATORS

2.1. Description of the system boundaries

(✓ = included; ND = module not declared)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction and demolition	Transport	Waste processing	Disposal	Reuse, recovery, potential recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Production Stage, A1-A3

This stage includes Module A1 (Extraction and processing of raw materials), A2 (Transport of raw materials by road (truck) and/or rail to the manufacturing plant), and A3 (product manufacturing).

Regarding the manufacturing process, Fucoli-Somepal, S.A. receives ferrous scrap sourced externally from other applications, with defined characteristics — namely free of contaminants — which is melted to obtain the final product.

In addition to externally sourced scrap, the process also reuses gating systems and defective rejected parts, as well as other ferrous scrap generated from maintenance activities, provided it meets acceptable process conditions.

The production process takes place in two manufacturing facilities (headquarters and branch), as described and illustrated in the flowchart below.

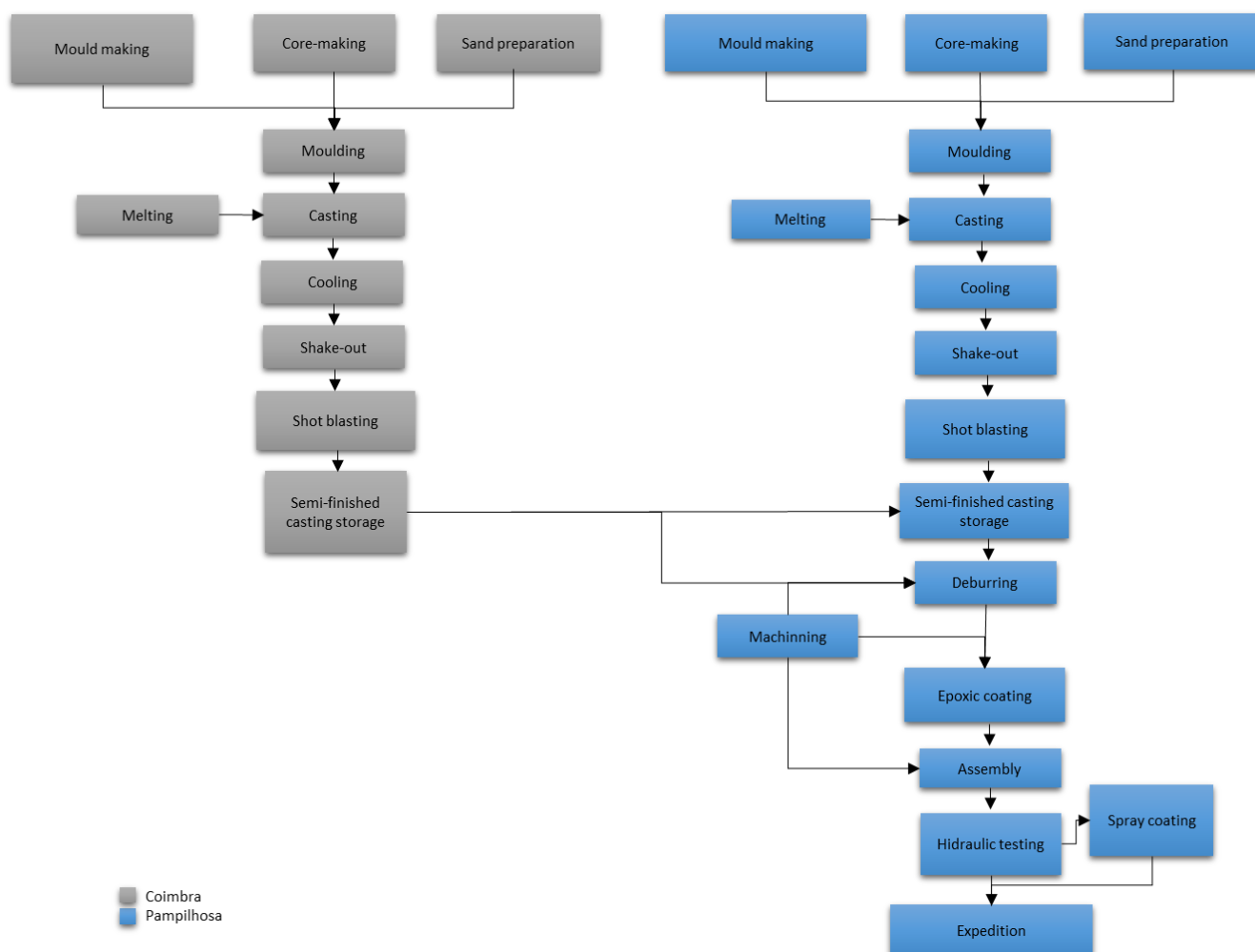


Figure 3: Flowchart of the production process for GFIX cast iron gaskets

Main Industrial Unit (Coimbra)

Ductile iron production begins with the preparation of molds and cores used to shape the parts. Molding is predominantly carried out using green sand, with quality control performed prior to repouring.

Metal melting takes place in an induction furnace, followed by chemical composition adjustment and treatment to obtain ductile iron. The metal is poured automatically, cooled until solidification, and the parts are demolded, with sand recovery.

Pampilhosa Branch

At this unit, the production process covers all stages, from mold design to shipment of the final product. Molding may be performed using different processes depending on part requirements, always with quality verification prior to pouring.

Melting is carried out in an induction furnace, followed by metal treatment to obtain ductile iron. Pouring is manual and followed by cooling and demolding, with sand recovery.

The parts undergo cleaning, finishing, machining, and coating operations. In the final stage, they are assembled, tested where applicable, inspected, and shipped according to customer specifications.

Use Stage, B1-B7

Modules B1, B2, B3, B4, B5, B6 and B7 are not relevant in accordance with EN 15804:2012+A2:2019+AC:2021.

B1 - The environmental impacts generated during the use stage are very low and can therefore be neglected.

B2 - Cast iron joint products for underground and other uses do not require maintenance during use if applied correctly. The environmental impacts are, in this case, assumed to be zero.

B3 - Cast iron joint products for underground and other uses do not require repair during the use stage if applied correctly. The environmental impacts are, in this case, assumed to be zero.

B4 - Cast iron joint products for underground use and others do not require replacement during the use stage and, therefore, no impact should be declared at this replacement stage.

B5 - Cast iron joint products for underground use and others do not require rehabilitation during the use stage and, therefore, no impact should be declared at this stage.

B6 - Cast iron joint products for underground and other uses do not consume energy during the use of the building. The environmental impacts are, in this case, assumed to be zero.

B7 - Cast iron joint products for underground and other uses do not use water during the use of the building. The environmental impacts are, in this case, assumed to be zero.

In summary, no technical operations are required during the use phase until the end of the service life. Therefore, GFIX ductile iron joint systems intended for the conveyance of potable water, wastewater, or gas have no impact during this stage.

End of life stage, C1-C4

C1 – Deconstruction/Demolition: Removal of the joints is carried out through excavation performed by qualified professionals.

C2 – Transport to waste processing: Transport from the dismantling site to the waste treatment facility, with an average distance of 50 km.

C3 – Waste Processing for reuse, recovery and/or recycling and C4 – Disposal: It is assumed that the product, which contains 96% metals, is treated as waste in a collective recycling facility. The remaining 4% is assumed to generate slag during metal recycling, as only limited separation is carried out during waste handling.

Reuse, recovery and/or recycling potencial, expressed as net impacts or benefits, D

Benefits beyond the system boundary are associated with metal recycling and the subsequent substitution of primary iron production.

2.1.1. Justification for the exemption to declare modules C and D

Not applicable.

2.2. Core environmental impact indicators

		Global warming potential - total;	Global warming potential fossil;	Global warming potential - biogenic;	Global warming potential land use and land use change;	Depletion potential of the stratospheric ozone layer;	Acidification potential;
		GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP
Unit		kg CO ₂ eq.	kg CO ₂ eq.	kg CO ₂ eq.	kg CO ₂ eq.	kg CFC 11 eq.	mol H ⁺ eq.
Modules A1-A3		1.24E+00	1.20E+00	2.74E-02	9.99E-03	6.01E-08	4.05E-03
Module A4	Scenario A4.1	4.48E-02	4.48E-02	1.35E-05	8.78E-07	9.68E-10	5.63E-05
	Scenario A4.2	3.52E-01	3.52E-01	1.06E-04	6.89E-06	7.60E-09	4.42E-04
Module A5	Scenario A5.1	2.58E-01	2.25E-01	3.28E-02	3.36E-04	2.46E-09	6.63E-04
Module B1	Scenario B1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	Scenario B2.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B3	Scenario B3.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	Scenario B4.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	Scenario B5.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	Scenario B6.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	Scenario B7.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	Scenario C1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	Scenario C2.1	7.47E-03	7.46E-03	2.26E-06	1.46E-07	1.61E-10	9.39E-06
Module C3	Scenario C3.1	1.50E-01	1.50E-01	3.25E-04	1.61E-05	4.95E-10	1.74E-04
Module C4	Scenario C4.1	1.69E-02	1.67E-02	1.93E-04	4.78E-06	5.64E-11	5.04E-05
Module D	Scenario D.1	-7.95E-02	-7.93E-02	-1.35E-04	-1.79E-05	-1.75E-09	-2.74E-04

LEGEND:

	Product stage
	Construction process stage
	Use stage
	End of life stage
	Benefits and loads beyond the system boundary

NOTES: P.C.I. – Net calorific value. Units expressed per declared unit (1 kg).

		Eutrophication potential aquatic freshwater;	Eutrophication potential aquatic marine;	Eutrophication potential terrestrial;	Formation potential of tropospheric ozone;	Abiotic depletion potential for non-fossil resources;	Abiotic depletion potential for fossil resources potential;	Water (user) deprivation potential;
		EP-freshwater	EP-marine	EP-terrestrial	POCP	ADP-minerals&metals	ADP-fossil	WDP
Unit		Unit	kg N eq.	mol N eq.	Kg CO ₂ eq.	kg Sb eq.	MJ, P.C.I	m ³ World eq. deprived
Modules A1-A3		3.86E-05	9.26E-04	1.04E-02	4.12E-03	2.11E-06	1.99E+01	3.21E-01
Module A4	Scenario A4.1	3.52E-08	1.40E-05	1.36E-04	1.05E-04	1.54E-09	5.96E-01	5.45E-04
	Scenario A4.2	2.76E-07	1.10E-04	1.07E-03	8.23E-04	1.21E-08	4.68E+00	4.28E-03
Module A5	Scenario A5.1	4.04E-06	1.68E-04	1.90E-03	5.81E-04	7.02E-08	1.57E+00	5.12E-02
Module B1	Scenario B1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	Scenario B2.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B3	Scenario B3.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	Scenario B4.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	Scenario B5.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	Scenario B6.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	Scenario B7.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	Scenario C1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	Scenario C2.1	5.87E-09	2.33E-06	2.27E-05	1.75E-05	2.57E-10	9.93E-02	9.09E-05
Module C3	Scenario C3.1	3.39E-07	8.01E-05	8.18E-04	2.43E-04	2.61E-09	3.25E-01	6.37E-03
Module C4	Scenario C4.1	2.06E-07	1.49E-05	1.69E-04	4.64E-05	2.63E-08	8.09E-02	7.88E-04
Module D	Scenario D.1	-3.81E-06	-5.91E-05	-6.81E-04	-3.85E-04	-1.54E-08	-8.04E-01	-1.64E-02

LEGEND:

	Product stage
	Construction process stage
	Use stage
	End of life stage
	Benefits and loads beyond the system boundary

NOTES: P.C.I. – Net calorific value

Units expressed per declared unit (1 kg).

The values to be indicated in the table shall be presented with two significant figures or scientific notation. This numeric representation should be uniform for the same index.

“The results obtained for the indicators “Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)”, “Abiotic depletion potential for fossil resources potential (ADP-fossil)” and “Water (user) deprivation potential (WDP)” should be used with caution since the uncertainties associated with them are high or there is little experience with the indicator.”

2.3. Additional environmental impact indicators

		Potential incidence of disease due to PM emissions	Potential Human exposure efficiency relative to U235	Potential Comparative Toxic Unit for ecosystems	Potential Comparative Toxic Unit for humans, cancer effects	Potential Comparative Toxic Unit for humans, not cancer effects	Potential soil quality index
		PM	IRP	ETP-fw	HTP-c	HTP-nc	SQP
Unit		Incidência de doença	kBq U 235 eq.	CTUe	CTUh	CTUh	-
Modules A1-A3		1.83E-07	6.54E-02	1.02E+01	1.75E-08	1.02E-08	5.82E+03
Module A4	Scenario A4.1	2.70E-09	9.48E-05	2.64E-01	2.78E-12	3.08E-10	1.13E-03
	Scenario A4.2	2.12E-08	7.44E-04	2.08E+00	2.18E-11	2.42E-09	8.89E-03
Module A5	Scenario A5.1	1.17E-08	7.06E-03	6.10E-01	5.47E-10	1.04E-09	1.76E+02
Module B1	Scenario B1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	Scenario B2.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B3	Scenario B3.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	Scenario B4.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	Scenario B5.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	Scenario B6.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	Scenario B7.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	Scenario C1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	Scenario C2.1	4.50E-10	1.58E-05	4.41E-02	4.63E-13	5.14E-11	1.89E-04
Module C3	Scenario C3.1	6.67E-09	6.84E-04	4.27E-01	6.20E-11	6.30E-10	2.11E-02
Module C4	Scenario C4.1	4.66E-10	6.22E-05	8.42E-02	2.81E-10	7.00E-10	3.37E-02
Module D	Scenario D.1	-5.36E-09	-8.01E-04	-2.27E-01	-5.22E-10	-3.69E-10	-7.90E-02

LEGEND:

	Product stage
	Construction process stage
	Use stage
	End of life stage
	Benefits and loads beyond the system boundary

NOTES: Units expressed per declared unit (1 kg).

The impact indicator "POTENTIAL HUMAN EXPOSURE EFFICIENCY RELATIVE TO U235" focuses mainly on the possible impact of a low dose of ionising radiation on human health resulting from the nuclear fuel cycle. It does not consider effects arising from possible nuclear accidents, occupational exposure or 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. The results of the indicators "POTENTIAL COMPARATIVE TOXIC UNIT FOR ECOSYSTEMS (ETP-FW)", "POTENTIAL COMPARATIVE TOXIC UNIT FOR HUMANS, CANCER EFFECTS", "POTENTIAL COMPARATIVE TOXIC UNIT FOR HUMANS, NOT CANCER EFFECTS" and "POTENTIAL SOIL QUALITY INDEX" should be used with caution as the uncertainties associated with them are high or there is little experience with the indicator.

2.4. Indicators describing resource use

		Primary energy					
		EPR	RR	TRR	EPNR	RNR	TRNR
Unit		MJ. P.C.I.	MJ. P.C.I.	MJ. P.C.I.	MJ. P.C.I.	MJ. P.C.I.	MJ. P.C.I.
Modules A1-A3		4.82E+00	2.70E-01	5.09E+00	1.98E+01	1.14E-01	1.99E+01
Module A4	Scenario A4.1	8.44E-04	0.00E+00	8.44E-04	6.09E-01	0.00E+00	6.09E-01
	Scenario A4.2	6.63E-03	0.00E+00	6.63E-03	4.78E+00	0.00E+00	4.78E+00
Module A5	Scenario A5.1	2.31E-01	2.19E-01	4.50E-01	1.74E+00	0.00E+00	1.74E+00
Module B1	Scenario B1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	Scenario B2.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B3	Scenario B3.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	Scenario B4.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	Scenario B5.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	Scenario B6.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	Scenario B7.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	Scenario C1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	Scenario C2.1	1.41E-04	0.00E+00	1.41E-04	1.02E-01	0.00E+00	1.02E-01
Module C3	Scenario C3.1	1.47E-02	0.00E+00	1.47E-02	3.25E-01	0.00E+00	3.25E-01
Module C4	Scenario C4.1	3.29E-03	0.00E+00	3.29E-03	8.09E-02	0.00E+00	8.09E-02
Module D	Scenario D.1	-2.18E-02	0.00E+00	-2.18E-02	0.00E+00	8.04E-01	0.00E+00

LEGEND:

	Product stage
	Construction process stage
	Use stage
	End of life stage
	Benefits and loads beyond the system boundary

EPR = use of renewable primary energy excluding renewable primary energy resources used as raw materials; RR = use of renewable primary energy resources used as raw materials; TRR = total use of renewable primary energy resources (EPR + RR); EPNR = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; RNR = use of non-renewable primary energy resources used as raw materials; TRNR = total use of non-renewable primary energy resources (EPNR + RNR);

NOTE: Units expressed per declared unit (1 kg).

		Secondary materials and fuels. and use of water			
		MS	CSR	CSNR	Net use of fresh water
Unit		kg	MJ. P.C.I.	MJ. P.C.I.	m ³
Modules A1-A3		8.48E-01	0.00E+00	0.00E+00	8.23E-03
Module A4	Scenario A4.1	0.00E+00	0.00E+00	0.00E+00	1.14E-05
	Scenario A4.2	0.00E+00	0.00E+00	0.00E+00	8.93E-05
Module A5	Scenario A5.1	0.00E+00	0.00E+00	0.00E+00	1.20E-03
Module B1	Scenario B1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	Scenario B2.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B3	Scenario B3.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	Scenario B4.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	Scenario B5.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	Scenario B6.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	Scenario B7.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	Scenario C1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	Scenario C2.1	0.00E+00	0.00E+00	0.00E+00	1.90E-06
Module C3	Scenario C3.1	0.00E+00	0.00E+00	0.00E+00	2.32E-04
Module C4	Scenario C4.1	0.00E+00	0.00E+00	0.00E+00	2.26E-05
Module D	Scenario D.1	0.00E+00	0.00E+00	0.00E+00	-4.42E-04

LEGEND:

	Product stage
	Construction process stage
	Use stage
	End of life stage
	Benefits and loads beyond the system boundary

MS = use of secondary material; CSR = use of renewable secondary fuels; CSNR = use of non-renewable secondary fuels.

NOTE: Units expressed per declared unit (1 kg).

The values to be indicated in the table shall be presented with two significant figures or scientific notation. This numeric representation should be uniform for the same index

2.5. Other environmental information describing different waste categories

		Hazardous waste disposed	Non-hazardous waste disposed	Radioactive waste disposed
Unit		kg	kg	kg
Modules A1-A3		4.38E-04	4.11E-01	3.08E-05
Module A4	Scenario A4.1	1.52E-06	2.40E-05	4.16E-06
	Scenario A4.2	1.19E-05	1.88E-04	3.27E-05
Module A5	Scenario A5.1	1.44E-05	2.03E-02	7.36E-06
Module B1	Scenario B1.1	0.00E+00	0.00E+00	0.00E+00
Module B2	Scenario B2.1	0.00E+00	0.00E+00	0.00E+00
Module B3	Scenario B3.1	0.00E+00	0.00E+00	0.00E+00
Module B4	Scenario B4.1	0.00E+00	0.00E+00	0.00E+00
Module B5	Scenario B5.1	0.00E+00	0.00E+00	0.00E+00
Module B6	Scenario B6.1	0.00E+00	0.00E+00	0.00E+00
Module B7	Scenario B7.1	0.00E+00	0.00E+00	0.00E+00
Module C1	Scenario C1.1	0.00E+00	0.00E+00	0.00E+00
Module C2	Scenario C2.1	2.53E-07	4.00E-06	6.94E-07
Module C3	Scenario C3.1	1.76E-06	2.85E-02	5.35E-07
Module C4	Scenario C4.1	2.38E-07	1.00E-01	3.90E-08
Module D	Scenario D.1	-8.33E-06	-1.06E-02	-6.04E-07

LEGEND:

	Product stage
	Construction process stage
	Use stage
	End of life stage
	Benefits and loads beyond the system boundary

NOTE: Units expressed per declared unit (1 kg).

The values to be indicated in the table should be presented with two significant figures or scientific notation. This numeric representation should be uniform for the same indicator.

2.6. Environmental information describing output flows

		Components for re-use	Materials for recycling	Materials for energy recovery	Exported energy
					Energy carrier 1
Unit		kg	kg	kg	MJ
Modules A1-A3		0.00E+00	1.17E-01	1.89E-03	1.49E-02
Module A4	Scenario A4.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Scenario A4.2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module A5	Scenario A5.1	0.00E+00	2.81E-02	5.09E-03	4.88E-02
Module B1	Scenario B1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B2	Scenario B2.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B3	Scenario B3.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B4	Scenario B4.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B5	Scenario B5.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B6	Scenario B6.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module B7	Scenario B7.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C1	Scenario C1.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	Scenario C2.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C3	Scenario C3.1	0.00E+00	5.90E-01	0.00E+00	0.00E+00
Module C4	Scenario C4.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module D	Scenario D.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00

LEGEND:

	Product stage
	Construction process stage
	Use stage
	End of life stage
	Benefits and loads beyond the system boundary

NOTE: Units expressed per declared unit (1 kg).

The values to be indicated in the table should be presented with two significant figures or scientific notation. This numeric representation should be uniform for the same indicator.

2.7. Information describing the biogenic carbon content at the factory gate

Biogenic carbon content*	Units**	Modules A1-A3 (results)
Biogenic carbon content in product	Kg C	Not applicable
Biogenic carbon content in accompanying packaging	Kg C	5.02E-03
* 1 kg biogenic carbon is equivalent to 44/12 kg of CO ₂ . ** This information can be omitted whenever the content of biogenic carbon in the product, or in the respective packaging, is less than 5% of the mass of the product, or the respective packaging.		

3. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

3.1. Module A4 Transport to the building site – Construction process stage

The scenarios for module A4 are described in the following table:

Destination	Type of transport	Average Distance (km)
National – Scenario A4.1	Truck with 25 ton capacity	300
Europe (Italy) – Scenario A4.2	Truck with 25 ton capacity	2355

3.2. Module A5 Installation of the product in the building – Construction process stage

Installation of the GFIX joint/valve does not require additional consumables. The system is mechanical, relying solely on bolt tightening. Therefore, Module A5 only includes packaging waste treatment and negligible impacts associated with the installation process.

3.3. Module B1 - Use stage

The GFIX joint is a passive component within the water or gas distribution network, with no consumption of energy, reagents, or materials during the use phase. There are no operational emissions attributable to the product.

3.4. Module B2 - Maintenance

Not applicable/zero impact.

The GFIX multi-material joint is a passive component, with no requirements for scheduled maintenance, retightening, lubrication, cleaning, or replacement of parts. Tightness is ensured by its mechanical design and sealing ring, without the need for consumables or periodic operations. Therefore, Module B2 is considered to have zero impact.

3.5. Module B3 - Repair

Not applicable/zero impact.

The GFIX joint/valve is not repairable. In the event of accidental external damage, the component is fully replaced (addressed under Module B4, if applicable). No repair kits or consumables are used.

3.6. Module B4 – Replacement

Normally not applicable / zero impact.

The service life of the GFIX joint is equivalent to the service life of the pipeline in which it is installed. Therefore, no scheduled replacement is assumed throughout the life cycle.

Replacement would only occur in the event of an extraordinary circumstance (mechanical accident or external structural failure), which is not considered representative for LCA purposes.

3.7. Module B5 - Refurbishment

Not applicable.

GFIX joints are not subject to refurbishment, retrofit, or upgrade operations throughout the service life of the system.

3.8. Module B6 - Energy usage (operational)

Zero impact (passive product).

The GFIX joint does not consume electrical, thermal, or mechanical energy during use. Any hydraulic pressure loss is attributed to the piping system, not to the joint element.

3.9. Module B7 - Water usage (operational)

Zero impact.

The product does not consume water and does not require washing or cleaning cycles throughout its service life.

3.10. Modulo C1 - Demolition – End-of-Life Stage

Disassembly (C1) is simple and does not consume materials or energy, so the impact is considered practically zero.

3.11. Modulo C2 - Transportation – End-of-Life Stage

Transport to the destination (C2) is the main contribution of Module C, considering an average distance of 50 km.

3.12. Module C3 - Waste processing for reuse, recovery, and recycling – End-of-Life Stage

In processing (C3), the metallic fraction is almost entirely recycled, reducing the need for primary raw materials.

Destination	Result	Unit of measure
Recycling (C3)	95	%

3.13. Module C4 - Waste disposal – End-of-Life Stage

Final disposal (C4) involves only small polymeric fractions and coatings.

3.14. Scenarios and technical information for module D

Module D of the GFIX joint reflects the environmental benefits of recycling the metallic fraction (ductile iron), considering the substitution of primary raw materials and conventional energy with resources recovered at end-of-life.

3.15. Additional environmental information regarding the release of hazardous substances into air, soil, and water during the use stage

Not applicable.

4. REFERENCES

- ✓ Instruções Gerais do Sistema DAPHabitat. Versão 3.1.1 February 2026 (em www.daphabitat.pt);
- ✓ RCP – modelo base para produtos e serviços de construção. Sistema DAPHabitat. Versão 3.1.1 February 2026 (em www.daphabitat.pt);
- ✓ NP ISO 14025:2009 Rótulos e declarações ambientais – Declarações ambientais Tipo III – Princípios e procedimentos;
- ✓ EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products;
- ✓ EN 15942:2021 Sustainability of construction works – Environmental product declarations – Communication format business-to-business.
- ✓ ECO Platform Guidelines, 2024.