

ENVIRONMENTAL PRODUCT DECLARATION

HANDRAILS

INPRO CORPORATION



Handrail systems are designed for wall protection and decoration.



Since 1979, Inpro has been eliminating building-related worries by making and servicing products with an obsessive commitment to protecting safety, health, environment and appearance. Inpro Corporation®, headquartered in Muskego, WI, is the nation's premier manufacturer of architectural products in five divisions including: door and wall protection, washroom systems and commercial surfaces, engineered metal products, privacy systems and architectural signage.

Inpro Corporation is committed to sustainable business practices in our dealings with employees, customers, suppliers, government entities and our community neighbors – all with an eye toward our obligation to future generations.



ENVIRONMENTAL PRODUCT DECLARATION

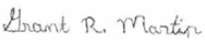



Handrails



According to ISO 14025,
EN 15804, and ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Environment 333 Pfingsten Road Northbrook, IL 60611	https://www.ul.com/ https://spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	General Program Instructions v.2.4 July 2018	
MANUFACTURER NAME AND ADDRESS	Inpro Corporation S80 W18766 Apollo Drive, Muskego, WI 53150	
DECLARATION NUMBER	4789164167.102.1	
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Handrail, 1 m	
REFERENCE PCR AND VERSION NUMBER	Part B: Wall and Door Protection EPD Requirements, UL 10010-10	
DESCRIPTION OF PRODUCT APPLICATION/USE	Handrails are designed to protect your interior walls from damage, and safeguard the people who rely on your buildings from slips and falls	
PRODUCT RSL DESCRIPTION (IF APPL.)	N/A	
MARKETS OF APPLICABILITY	North America	
DATE OF ISSUE	October 1, 2019	
PERIOD OF VALIDITY	5 Years	
EPD TYPE	Product Specific	
RANGE OF DATASET VARIABILITY	N/A	
EPD SCOPE	Cradle to gate with options (packaging disposal, end of life)	
YEAR(S) OF REPORTED PRIMARY DATA	2018	
LCA SOFTWARE & VERSION NUMBER	GaBi ts v9.1	
LCI DATABASE(S) & VERSION NUMBER	GaBi 2019 (service pack 38)	
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1	

	PCR Peer Review Panel
	Chair: Dr. Lindita Bushi
	epd@ulenvironment.com
This declaration was independently verified in accordance with ISO 14025:2006. <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	 Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	 Thomas P. Gloria, Industrial Ecology Consultants

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

1. Product Definition and Information

1.1. Description of Company/Organization

Inpro Corporation (Inpro) is a manufacturer of building protection products. Products include wall protection, privacy systems, building joining systems and signage. The world headquarters and manufacturing campus is located in Muskego, Wisconsin. On-site manufacturing processes include plastic extrusion, injection molding, coloring, assembly, and other processes.

Inpro has established, documented, and implemented an ISO 14001 certified environmental management system and maintains and continually improves the effectiveness of this system.

Environmental Policy

Inpro is committed to sustainable business practices in our dealings with employees, customers, suppliers, government entities and our community neighbors—all with an eye toward our obligation to future generations. Through our business operations, we shall:

- Communicate environmental practices to all employees.
- Develop products and processes to minimize adverse environmental impacts.
- Comply with environmental regulations and other requirements.
- Prevent pollution, conserve resources and reduce waste.
- Continually improve our environmental management system.

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1.2. Product Description

This EPD covers Inpro's handrail products listed in Table 2. Also listed is the mass per unit length, including accessories and adhesives but excluding packaging materials.

Inpro handrail systems (CSI MasterFormat 10 26 16) are designed for pedestrian safety and wall protection. Handrails are comprised of an aluminum retainer and an extruded vinyl cover. Accessories include returns, corners and brackets. Brackets are molded plastic or metal, depending on the system. Cover materials include rigid vinyl or Inpro's G2 proprietary BioBlend, a blend of polyethylene terephthalate glycol-modified (PETG) and biopolymer.

Each product's results are presented individually, therefore no averaging of products was required.



According to ISO 14025,
EN 15804 and ISO 21930:2017

Table 1: Product categories

Representative Product	Products Included
G2-1200	G2-1200 G2-1100 G2-800
G2-900	G2-2000 G2-900
G2-3000	G2-3000
G2-3500	G2-3500
800	1200 1100 1000 800 800W 855 1255
2000	2000 900 2000W 900W
3000	3055 3000 3000FV 3000FVfV
A1200	800 1200
3500	3500VV 3500FVfV
2000 (with stainless steel brackets)	2000 900 940 2000W 900W (all w/ stainless steel brackets)



Handrails

According to ISO 14025,
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800 Handrails



3500 Handrails



900 Handrails



2000 Handrails

1.3. Application

Handrails can be used in a wide range of commercial applications and building types such as schools, hospitals, restaurants, research centers, assisted living facilities, and hotels. Anywhere where increased personnel and/or equipment traffic would damage wall corners or patrons would need more stability in corridors.



Handrails

According to ISO 14025,
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1.4. Declaration of Methodological Framework

This EPD is declared under a “cradle-to-gate with options” system boundary. As such, it includes life cycle stages A1-A5 (excluding installation energy requirements), C2-C4, and D.

Allocation of manufacturing inputs was done on a mass-basis.

For recycled content and disposal at end-of-life, metals are modeled as being recycled according to the avoided burden approach, while cardboard packaging is modeled with the cut-off approach. Additional details can be found in section 2.8. No known flows are deliberately excluded from this EPD.

1.5. Technical Requirements

UL Classified handrails conform with NFPA Class A fire rating. Handrails have a CC1 classification, as tested in accordance with the procedures specified in ASTM D-635-74, Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position, as referenced in UBC 52-4-1988. Rigid vinyl profile materials have an Impact Strength of 30.2 ft-lbs/inch of thickness as tested in accordance with the procedures specified in ASTM D-256-90b, Impact Resistance of Plastics. Handrails show resistance to stain when tested in accordance with applicable provisions of ASTM D-543. Rigid vinyl does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.

1.6. Properties of Declared Product as Delivered

A variety of handrail products are covered in this EPD. Both vinyl and vinyl substitute, with retainers of aluminum. The vinyl snap on cover of 0.080" (2mm) thickness shall be extruded from chemical and stain resistant polyvinyl chloride with the addition of impact modifiers. No plasticizers shall be added (plasticizers may aid in bacterial growth). The aluminum is a continuous retainer of .070" (1.8mm) thickness and shall be fabricated from 6063-T5 aluminum, with a mill finish and application. G2 BioBlend® handrails are a blend of PETG and biopolymer: Snap-on cover of 0.080" (2mm) thickness shall be extruded from chemical and stain resistant G2 BioBlend®. There are various lengths and angles available.

1.7. Material Composition

The breakdown of material content for each product family is shown in Table 2. These materials have been cross-referenced against the “Candidate List of Substances of Very High Concern (SVHC)” from the European Chemicals Agency. No SVHC substances are present in the products and are thus not reported in this EPD.

Table 2: Declaration of materials and chemical substances in percent [%] of total mass of product

	Stainless Steel Handrail	G2 1200	G2 900	G2 3000	G2 3500 VV	800W	2000W	3000 FVfV	A1200	3500 FVfV	2000W WITH STAINLESS STEEL BRACKET/ALU MINUM BRACKET 940
Adhesive				0.93				1.02			
Aluminum		68.44	71.90	59.17	29.50	67.96	71.35	65.08	59.33	42.56	45.83
G2		31.56	28.10	32.10	40.58						
Polyvinyl Chloride (PVC)						32.04	28.65	23.89	40.67	36.54	17.67
Regrind				7.79	8.13			10.01		6.38	
Stainless steel					21.79					14.52	36.50



Stainless steel handrail	100.00								
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1.8. Manufacturing

Manufacturing of Inpro’s products begins with raw material extraction and processing. Resins are purchased and compounded and formed, via extrusion or injection molding, into various components. Acrylonitrile butadiene styrene (ABS) components used in conjunction with polyvinyl chloride (PVC) components are coated with a polyvinyl alcohol film in order to achieve a wood grain finish.

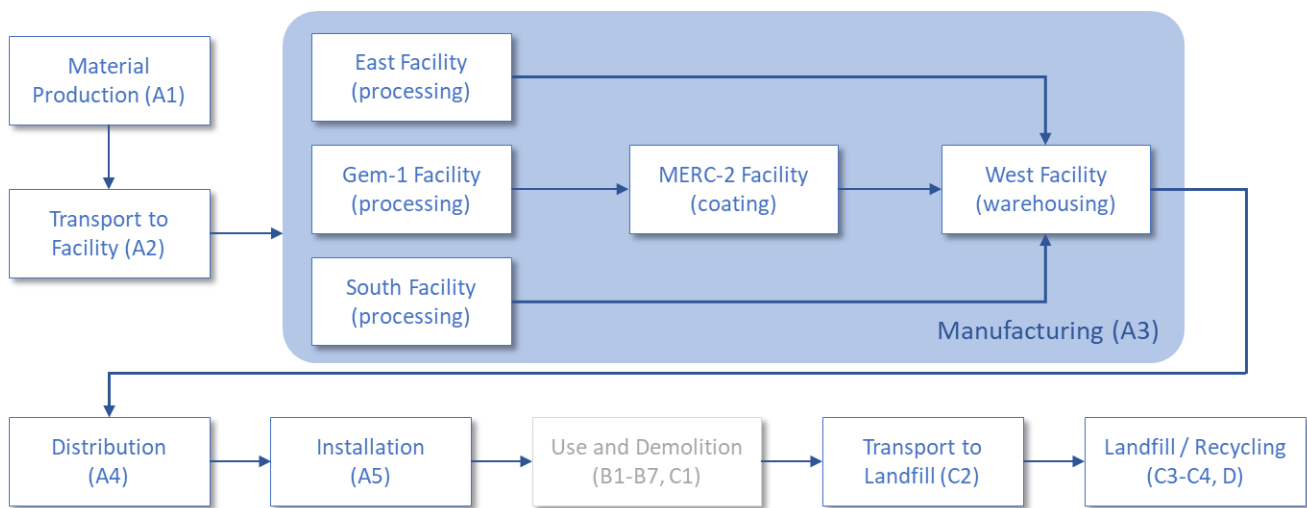


Figure 1: Process flow diagram

1.9. Packaging

All products are packaged with cardboard only. Packaging materials are not assumed to be reused. Since no primary data are available, the disposal assumptions provided in Part A (UL Environment, 2018) are used.

1.10. Transportation

Inbound transportation distances via truck for the transport of the raw materials to production facilities were included. As they are small mass components, installation accessories and packaging were assumed to have an inbound transport distance of 100 miles. Transport of the finished product 660 miles via truck to the construction site is also included, based on customer data.

1.11. Product Installation

Installation will vary with product. Handrails are installed with a variety of methods. Systems include retainers and end caps, which are mechanically attached to the wall. Extruded covers are snapped over the retainers to complete the installation. Installation materials shipped with the product are included in A1-A3 results. Module A5 includes only packaging disposal; however, given that installation is typically done manually, it is anticipated that excluded impacts would only be associated with any scrap generated.

1.12. Use

The use phase is not included in the scope of this study. However, once installed, the products do not directly consume energy.

1.13. Reference Service Life and Estimated Building Service Life

As the use phase is not included in the scope of this study, a reference service life is not declared.

1.14. Reuse, Recycling, and Energy Recovery

While some plastic products can be recycled or reused, Inpro products are conservatively assumed to be landfilled. Metal components, however, are recycled based on US average recycling rates.

1.15. Disposal

At the end-of-life, Inpro products are removed from the deconstructed building. The waste is then disposed of in a landfill per PCR requirements (UL Environment, 2018) (see Table 4). Landfill, recycling, and incineration emissions from paper, plastic, or wood packaging are allocated to installation (module A5).

2. Life Cycle Assessment Background Information

2.1. Function or Declared Unit

Per the product category rules, the functional unit for this analysis is 1 m of product. The reference flow for each product within the product category is presented in Table 3.

Table 3: Declared unit reference flows

NAME	WEIGHT [KG/M]
Stainless Steel Handrail	1.51
G2 1200	2.07
G2 900	0.702
G2 3000	2.45
G2 3500 VV	1.71
800W	2.08
2000W	1.07
3000 FVfV	2.23
A1200	2.38
3500 FVfV	2.57
2000W WITH STAINLESS STEEL BRACKET/ALUMINUM BRACKET 940	1.67

2.2. System Boundary

A cradle-to-gate with options system boundary was used for the analysis. Within these boundaries the following stages

were included:

- Product stage: modules A1 to A3
- Construction stage: modules A4 and A5
 - o Where A5 includes only the disposal of packaging
- End-of-life stage: modules C2 to C4

Per the PCR, capital goods and infrastructure flows are assumed to not significantly affect LCA results or conclusions and thus excluded from the analysis.

2.3. Estimates and Assumptions

The analysis uses the following assumptions:

- Inbound transportation distances for packaging and installation accessory materials were assumed to be 100 miles (160 km) via truck
- Since primary data were not available to describe end-of-life treatment of plastics and packaging, the default values specified by the PCR Part A (UL Environment, 2018) were applied (Table 4).

Table 4. Default end-of-life assumptions from the PCR

COMPONENT	RECYCLED	LANDFILLED	INCINERATED
Product	0%	100%	0%
Paper packaging	75%	20%	5%
Plastic packaging	15%	68%	17%

2.4. Cut-off Criteria

For the processes within the system boundary, all available energy and material flow data have been included in the model. In cases where no matching life cycle inventories are available to represent a flow, proxy data have been applied based on conservative assumptions regarding environmental impacts. Cut-off criteria, however, were applied to exclude capital goods and infrastructure as these are assumed to not significantly affect LCA results nor conclusions.

2.5. Data Sources

The LCA model was created using the GaBi ts Software system for life cycle engineering, developed by thinkstep AG (thinkstep, 2019). Background life cycle inventory data for raw materials and processes were obtained from the GaBi 2019 database (service pack 38). Primary manufacturing data were collected from Inpro facilities.

2.6. Data Quality

Geographical Coverage

Data are intended to represent Inpro’s production in Wisconsin. In order to satisfy cut-off criteria, proxy datasets were used as needed for raw material inputs to address lack of data for a specific material or for a specific geographical region. These proxy datasets were chosen for their representativeness of the actual product. Additionally, European data or global data were used when North American data (for raw materials sourced in the US) were not available.

Temporal Coverage

Foreground data represent 2018 production. The majority of background datasets are based on data from the last 4 years (since 2015).

Technological Coverage

The primary data represent production of the products under evaluation. Secondary data were chosen to be specific to the technologies in question (or appropriate proxy data used where necessary).

Completeness

Foreground processes were checked for mass balance and completeness of the emissions inventory. No data were knowingly omitted.

2.7. Period under Review

Primary data collected represent production during the 2018 calendar year. This analysis is intended to represent production in 2018.

2.8. Allocation

Allocation of manufacturing inputs and outputs was done on a mass-basis. Allocation of transportation was based on mass.

Allocation is necessary to address recycled content, post-production scrap, and waste at end-of-life. The substitution allocation approach is applied to metal (aluminum and steel alloys). Under this approach, end-of-life scrap is first balanced out with any open scrap inputs into production. Only the remaining net scrap is then modeled as being sent to material recycling in order to avoid double-counting the benefits of using recycled content. If more scrap is recovered at product end-of-life than is required in the manufacturing stage, the product system receives a credit equal to the burden of primary material production minus the burden of recycling scrap into secondary material based on the mass of secondary material produced (reflected in module D results). This credit represents the avoided burden of primary material production.

Substitution allocation is also applied to plastic recovered from manufacturing and recycled externally (ABS and PVC, as applicable). Only internally recycled scrap is used as an input to the production process, therefore the net scrap approach does not apply.

The cut-off approach is applied for paper and corrugates since these contain significant recycled contents and primary and secondary material production is closely intertwined. Any open scrap inputs into manufacturing remain unconnected. The system boundary in end of life is drawn after scrap collection to account for the collection rate, which generates an open scrap output for the product system. The processing and recycling of the scrap then becomes part of the subsequent product system and is not considered in this study.

2.9. Comparability (Optional)

No comparisons or benchmarking is included in this EPD. LCA results across EPDs can be calculated with different background databases, modeling assumptions, geographic scope and time periods, all of which are valid and acceptable according to the Product Category Rules (PCR) and ISO standards. Caution should be used when attempting to compare EPD results.

3. Life Cycle Assessment Scenarios

Table 5. Transport to the building site (A4)

NAME	ALL PRODUCTS	UNIT
Fuel type	Diesel	
Liters of fuel	42	L/100km
Vehicle type	Truck	
Transport distance	660	mi
Truck capacity utilization (including empty runs, mass based)	67	%
Gross density of products transported	Varies with product	kg/m ³
Weight of products transported (if gross density not reported)	N/A	kg
Volume of products transported (if gross density not reported)	N/A	m ³
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	1	-

Table 6: Installation into the building (A5)

Name	Stainless Steel Handrail	G2 1200	G2 900	G2 3000	G2 3500 VV	800W	2000W	3000 FVfV	A1200	3500 FVfV	2000W WITH STAINLESS STEEL BRACKET/ALUMINUM BRACKET 940	Unit
Ancillary materials	<i>excluded</i>											kg
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	<i>excluded</i>											m ³
Other resources	<i>excluded</i>											kg
Electricity consumption	<i>excluded</i>											kWh
Other energy carriers	<i>excluded</i>											MJ
Product loss per functional unit	<i>excluded</i>											kg
Waste materials at the construction site before waste processing, generated by product installation	1.58E-05	1.09E-01	2.90E-02	1.13E-01	1.05E-01	9.47E-02	4.19E-02	5.96E-02	1.11E-01	1.04E-01	3.10E-02	kg

Output materials resulting from on-site waste processing (specified by route; e.g. for recycling, energy recovery and/or disposal)	Landfill	3.16E-06	2.18E-02	5.80E-03	2.26E-02	2.10E-02	1.89E-02	8.38E-03	1.19E-02	2.22E-02	2.08E-02	6.20E-03	kg
	Incineration	7.90E-07	5.45E-03	1.45E-03	5.65E-03	5.25E-03	4.74E-03	2.10E-03	2.98E-03	5.55E-03	5.20E-03	1.55E-03	kg
	Recycling	1.19E-05	8.18E-02	2.18E-02	8.48E-02	7.88E-02	7.10E-02	3.14E-02	4.47E-02	8.33E-02	7.80E-02	2.33E-02	kg
Biogenic carbon contained in packaging		2.49E-05	1.71E-01	4.57E-02	1.78E-01	1.65E-01	1.49E-01	6.61E-02	9.39E-02	1.75E-01	1.64E-01	4.89E-02	kg CO ₂
Direct emissions to ambient air, soil and water							excluded						kg
VOC content							excluded						µg/m ³

Table 7. End of life (C1-C4)

NAME		PLASTICS	METALS	UNIT
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)				
Collection process (specified by type)	Collected separately	0	100	%
	Collected with mixed construction waste	100	0	%
Recovery (specified by type)	Reuse	0	0	%
	Recycling	0	90 (Aluminum) 92 (Steel, Stainless steel)	%
	Incineration with energy recovery	0	0	%
	Energy conversion efficiency rate	0	0	%
Disposal (specified by type)	Landfill	100	10 (Aluminum) 8 (Steel, Stainless steel)	%
	Incineration	0	0	%
Removals of biogenic carbon (excluding packaging)		See relevant tables in section 4		0 kg CO ₂

Table 8. Reuse, recovery and/or recycling potentials (D)

NAME	METALS	UNIT
Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6)	100	%
Net energy benefit from thermal energy due to treatment of waste declared as exported energy in C4 (R>0.6)	0	%
Net energy benefit from material flow declared in C3 for energy recovery	10 (Aluminum) 8 (Steel, Stainless steel)	%
Process and conversion efficiencies		
Further		

4. Life Cycle Assessment Results

This is a “cradle-to-gate with options” EPD. Manufacturing (A1-A3), packaging (A3, A5), installation materials (A1-A3) transport of the finished product (A4), end-of-life transport, disposal, and recycling processes (C2 -C4) and credits (D) are included within the scope of the EPD. The scope excludes installation requirements, the use stage (B1-7), and deconstruction and demolition (C1) because they are case-dependent.

Table 9. Description of the system boundary modules. X = included in EPD scope; MND = module not declared (i.e., excluded from EPD scope)

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X

Notes:

- A5: limited to disposal of packaging materials. Production of installation materials such as adhesives and brackets are accounted for in A1-A3.

4.1. Life Cycle Impact Assessment and Inventory Results: Stainless Steel Handrail

Table 10. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	7.15E+00	1.22E-01	1.66E-06	3.68E-03	0.00E+00	6.75E-03	-1.01E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	1.16E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-4.10E-09
Acidification potential, AP [kg SO ₂ eq]	3.44E-02	6.09E-04	8.64E-09	1.14E-05	0.00E+00	3.69E-05	-7.64E-03
Eutrophication potential, EP [kg N eq]	1.31E-03	5.04E-05	1.73E-09	1.07E-06	0.00E+00	4.15E-06	-2.18E-04
Smog formation potential, SFP [kg O ₃ eq]	3.90E-01	1.39E-02	4.19E-08	2.55E-04	0.00E+00	6.11E-04	-7.34E-02
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	6.53E+00	2.40E-01	3.55E-07	7.28E-03	0.00E+00	1.33E-02	-1.31E+00

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 11. Resource Use

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	1.72E+01	5.58E-02	2.02E-07	1.69E-03	0.00E+00	8.08E-03	-4.12E+00
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	2.37E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	9.54E+01	1.80E+00	2.88E-06	5.47E-02	0.00E+00	1.06E-01	-1.45E+01
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	1.43E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	4.18E-02	2.16E-04	2.92E-09	6.56E-06	0.00E+00	1.26E-05	-2.81E-02

Table 121. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	2.89E-07	1.46E-08	9.93E-15	4.43E-10	0.00E+00	3.71E-10	-1.83E-04
Non-hazardous waste disposed, NHWD [kg]	8.11E-01	6.80E-05	2.49E-06	2.06E-06	0.00E+00	1.51E-01	-4.47E-02
High-level radioactive waste, HLRW [kg]	2.98E-03	3.87E-06	3.51E-11	1.17E-07	0.00E+00	9.96E-07	-1.27E-04
Intermediate- & low-level radioactive waste, ILLRW [kg]	9.18E-05	1.30E-07	1.13E-12	3.94E-09	0.00E+00	3.10E-08	-3.65E-06
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	3.32E-01	0.00E+00	0.00E+00	0.00E+00	1.36E+00	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 132. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	2.49E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	0.00E+00	0.00E+00	2.05E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.2. Life Cycle Impact Assessment and Inventory Results: G2 1200

Table 143. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	1.64E+01	1.75E-01	1.14E-02	5.04E-03	4.31E-01	3.55E-02	-5.72E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	8.01E-06	0.00E+00	0.00E+00	0.00E+00	5.78E-11	0.00E+00	-2.98E-10
Acidification potential, AP [kg SO ₂ eq]	7.88E-02	8.77E-04	5.94E-05	1.56E-05	1.34E-03	4.80E-04	-3.62E-02
Eutrophication potential, EP [kg N eq]	5.36E-03	7.26E-05	1.19E-05	1.47E-06	3.69E-05	1.74E-04	-5.96E-04
Smog formation potential, SFP [kg O ₃ eq]	7.83E-01	2.00E-02	2.88E-04	3.48E-04	1.60E-02	4.37E-03	-2.85E-01
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	2.32E+01	3.46E-01	2.44E-03	9.95E-03	7.70E-01	6.99E-02	-3.99E+00

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 154. Resource Use

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	6.68E+01	8.04E-02	1.39E-03	2.31E-03	5.75E-01	4.24E-02	-3.19E+01
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	2.90E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	2.36E+02	2.60E+00	1.98E-02	7.48E-02	6.53E+00	5.56E-01	-5.65E+01
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	2.78E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	6.04E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	2.51E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	3.84E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	4.24E-01	3.11E-04	2.01E-05	8.97E-06	3.06E-03	6.61E-05	-1.49E-01

Table 165. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	1.70E-02	2.11E-08	6.83E-11	6.06E-10	2.58E-05	1.95E-09	-5.26E-04
Non-hazardous waste disposed, NHWD [kg]	3.57E+00	9.79E-05	1.72E-02	2.82E-06	8.44E-02	7.91E-01	-1.77E+00
High-level radioactive waste, HLRW [kg]	4.61E-03	5.57E-06	2.41E-07	1.60E-07	1.39E-04	5.23E-06	-6.49E-04
Intermediate- & low-level radioactive waste, ILLRW [kg]	1.41E-04	1.87E-07	7.76E-09	5.39E-09	4.64E-06	1.63E-07	-2.09E-05
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E+00	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 176. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	7.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	1.22E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	1.71E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.3. Life Cycle Impact Assessment and Inventory Results: G2 900

Table 187. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	5.52E+00	5.90E-02	3.04E-03	1.71E-03	1.54E-01	1.11E-02	-2.04E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	2.42E-06	0.00E+00	0.00E+00	0.00E+00	2.07E-11	0.00E+00	-1.06E-10
Acidification potential, AP [kg SO ₂ eq]	2.68E-02	2.95E-04	1.58E-05	5.29E-06	4.77E-04	1.47E-04	-1.29E-02
Eutrophication potential, EP [kg N eq]	1.68E-03	2.44E-05	3.18E-06	5.00E-07	1.32E-05	5.29E-05	-2.13E-04
Smog formation potential, SFP [kg O ₃ eq]	2.64E-01	6.74E-03	7.69E-05	1.18E-04	5.73E-03	1.35E-03	-1.02E-01
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	7.56E+00	1.16E-01	6.52E-04	3.38E-03	2.75E-01	2.18E-02	-1.42E+00

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 198. Resource Use

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	2.29E+01	2.70E-02	3.71E-04	7.86E-04	2.05E-01	1.33E-02	-1.14E+01
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	8.17E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	7.79E+01	8.73E-01	5.28E-03	2.54E-02	2.33E+00	1.74E-01	-2.02E+01
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	8.40E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	2.15E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	7.60E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	1.16E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	1.33E-01	1.05E-04	5.35E-06	3.05E-06	1.09E-03	2.06E-05	-5.30E-02

Table 209. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	6.05E-03	7.08E-09	1.82E-11	2.06E-10	9.22E-06	6.09E-10	-1.88E-04
Non-hazardous waste disposed, NHWD [kg]	1.23E+00	3.29E-05	4.57E-03	9.58E-07	3.01E-02	2.47E-01	-6.33E-01
High-level radioactive waste, HLRW [kg]	1.56E-03	1.87E-06	6.43E-08	5.45E-08	4.95E-05	1.63E-06	-2.32E-04
Intermediate- & low-level radioactive waste, ILLRW [kg]	4.77E-05	6.29E-08	2.07E-09	1.83E-09	1.66E-06	5.08E-08	-7.45E-06
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.54E-01	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 2110. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	3.69E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	4.57E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	0.00E+00	0.00E+00	3.75E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.4. Life Cycle Impact Assessment and Inventory Results: G2 3000

Table 2211. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	1.79E+01	1.92E-01	1.19E-02	5.51E-03	4.42E-01	4.27E-02	-5.87E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	9.67E-06	0.00E+00	0.00E+00	0.00E+00	5.94E-11	0.00E+00	-3.06E-10
Acidification potential, AP [kg SO ₂ eq]	8.50E-02	9.58E-04	6.18E-05	1.70E-05	1.37E-03	5.80E-04	-3.71E-02
Eutrophication potential, EP [kg N eq]	6.26E-03	7.93E-05	1.24E-05	1.61E-06	3.78E-05	2.11E-04	-6.12E-04
Smog formation potential, SFP [kg O ₃ eq]	8.55E-01	2.19E-02	3.00E-04	3.81E-04	1.65E-02	5.27E-03	-2.93E-01
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	2.64E+01	3.77E-01	2.54E-03	1.09E-02	7.91E-01	8.42E-02	-4.10E+00

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 2312. Resource Use

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	7.20E+01	8.77E-02	1.45E-03	2.53E-03	5.90E-01	5.11E-02	-3.28E+01
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	3.22E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	2.65E+02	2.84E+00	2.06E-02	8.18E-02	6.70E+00	6.70E-01	-5.80E+01
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	3.35E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	1.01E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	3.03E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	4.64E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	4.42E-01	3.40E-04	2.09E-05	9.82E-06	3.14E-03	7.96E-05	-1.52E-01

Table 2413. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	1.74E-02	2.30E-08	7.10E-11	6.63E-10	2.65E-05	2.35E-09	-5.40E-04
Non-hazardous waste disposed, NHWD [kg]	3.81E+00	1.07E-04	1.78E-02	3.08E-06	8.66E-02	9.53E-01	-1.82E+00
High-level radioactive waste, HLRW [kg]	5.03E-03	6.08E-06	2.51E-07	1.75E-07	1.42E-04	6.30E-06	-6.66E-04
Intermediate- & low-level radioactive waste, ILLRW [kg]	1.54E-04	2.04E-07	8.07E-09	5.90E-09	4.76E-06	1.96E-07	-2.14E-05
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.31E+00	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 2514. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	1.47E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	1.78E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	0.00E+00	0.00E+00	1.46E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	1.10E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	1.17E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.5. Life Cycle Impact Assessment and Inventory Results: G2 3500VV

Table 2615. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	1.15E+01	1.35E-01	1.10E-02	3.83E-03	1.54E-01	3.50E-02	-1.25E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	8.53E-06	0.00E+00	0.00E+00	0.00E+00	2.07E-11	0.00E+00	3.01E-09
Acidification potential, AP [kg SO ₂ eq]	5.14E-02	6.76E-04	5.72E-05	1.18E-05	4.77E-04	5.01E-04	-6.95E-03
Eutrophication potential, EP [kg N eq]	5.12E-03	5.60E-05	1.15E-05	1.12E-06	1.32E-05	1.86E-04	-4.22E-05
Smog formation potential, SFP [kg O ₃ eq]	5.51E-01	1.55E-02	2.78E-04	2.65E-04	5.73E-03	4.40E-03	-4.45E-02
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	1.88E+01	2.67E-01	2.35E-03	7.57E-03	2.75E-01	6.89E-02	-4.06E-01

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 2716. Resource Use

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	3.97E+01	6.20E-02	1.34E-03	1.76E-03	2.05E-01	4.18E-02	-8.20E+00
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	2.92E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	1.84E+02	2.00E+00	1.91E-02	5.69E-02	2.33E+00	5.48E-01	-8.79E+00
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	2.96E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	7.86E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	2.67E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	4.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	2.90E-01	2.40E-04	1.93E-05	6.82E-06	1.09E-03	6.51E-05	-3.12E-02

Table 2817. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	6.07E-03	1.62E-08	6.57E-11	4.61E-10	9.22E-06	1.92E-09	-4.58E-05
Non-hazardous waste disposed, NHWD [kg]	2.01E+00	7.55E-05	1.65E-02	2.14E-06	3.01E-02	7.80E-01	-5.99E-01
High-level radioactive waste, HLRW [kg]	3.28E-03	4.29E-06	2.32E-07	1.22E-07	4.95E-05	5.16E-06	-1.33E-04
Intermediate- & low-level radioactive waste, ILLRW [kg]	1.00E-04	1.44E-07	7.47E-09	4.10E-09	1.66E-06	1.60E-07	-4.61E-06
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.90E-01	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 2918. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	1.30E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	1.65E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	0.00E+00	0.00E+00	1.35E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	1.30E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	1.65E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.6. Life Cycle Impact Assessment and Inventory Results: 800W

Table 3019. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	1.37E+01	1.76E-01	9.95E-03	5.07E-03	4.31E-01	3.61E-02	-6.35E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	7.28E-09	0.00E+00	0.00E+00	0.00E+00	5.78E-11	0.00E+00	-3.41E-10
Acidification potential, AP [kg SO ₂ eq]	6.32E-02	8.78E-04	5.18E-05	1.57E-05	1.34E-03	4.91E-04	-3.74E-02
Eutrophication potential, EP [kg N eq]	1.79E-03	7.26E-05	1.04E-05	1.48E-06	3.69E-05	1.78E-04	-6.86E-04
Smog formation potential, SFP [kg O ₃ eq]	6.37E-01	2.00E-02	2.51E-04	3.51E-04	1.60E-02	4.46E-03	-3.10E-01
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	1.81E+01	3.46E-01	2.13E-03	1.00E-02	7.70E-01	7.12E-02	-5.84E+00

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 3120. Resource Use

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	5.16E+01	8.04E-02	1.21E-03	2.33E-03	5.75E-01	4.32E-02	-3.23E+01
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	1.42E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	1.91E+02	2.60E+00	1.73E-02	7.53E-02	6.53E+00	5.67E-01	-7.10E+01
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	1.57E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	6.04E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	3.88E-01	3.12E-04	1.75E-05	9.03E-06	3.06E-03	6.73E-05	-1.51E-01

Table 3221. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	1.70E-02	2.11E-08	5.95E-11	6.10E-10	2.58E-05	1.99E-09	-5.26E-04
Non-hazardous waste disposed, NHWD [kg]	2.89E+00	9.79E-05	1.49E-02	2.84E-06	8.44E-02	8.06E-01	-1.78E+00
High-level radioactive waste, HLRW [kg]	4.96E-03	5.57E-06	2.10E-07	1.61E-07	1.39E-04	5.33E-06	-8.94E-04
Intermediate- & low-level radioactive waste, ILLRW [kg]	1.57E-04	1.87E-07	6.76E-09	5.43E-09	4.64E-06	1.66E-07	-2.92E-05
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	2.69E-01	0.00E+00	0.00E+00	0.00E+00	1.27E+00	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 3322. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	1.49E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	0.00E+00	0.00E+00	1.23E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.7. Life Cycle Impact Assessment and Inventory Results: 2000W

Table 3423. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	7.16E+00	8.99E-02	4.40E-03	2.62E-03	2.33E-01	1.72E-02	-3.38E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	3.28E-09	0.00E+00	0.00E+00	0.00E+00	3.13E-11	0.00E+00	-1.81E-10
Acidification potential, AP [kg SO ₂ eq]	3.35E-02	4.50E-04	2.29E-05	8.08E-06	7.23E-04	2.28E-04	-2.01E-02
Eutrophication potential, EP [kg N eq]	9.19E-04	3.72E-05	4.60E-06	7.63E-07	2.00E-05	8.23E-05	-3.64E-04
Smog formation potential, SFP [kg O ₃ eq]	3.33E-01	1.03E-02	1.11E-04	1.81E-04	8.69E-03	2.10E-03	-1.66E-01
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	9.15E+00	1.77E-01	9.42E-04	5.17E-03	4.17E-01	3.38E-02	-3.01E+00

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 3524. Resource Use

Handrails

According to ISO 14025,
EN 15804 and ISO 21930:2017

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	2.77E+01	4.12E-02	5.36E-04	1.20E-03	3.11E-01	2.05E-02	-1.75E+01
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	6.29E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	9.74E+01	1.33E+00	7.64E-03	3.88E-02	3.53E+00	2.69E-01	-3.73E+01
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	7.23E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	3.27E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	1.93E-01	1.60E-04	7.73E-06	4.66E-06	1.66E-03	3.20E-05	-8.16E-02

Table 3625. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	9.17E-03	1.08E-08	2.63E-11	3.15E-10	1.40E-05	9.43E-10	-2.85E-04
Non-hazardous waste disposed, NHWD [kg]	1.55E+00	5.02E-05	6.61E-03	1.46E-06	4.57E-02	3.83E-01	-9.62E-01
High-level radioactive waste, HLRW [kg]	2.53E-03	2.85E-06	9.30E-08	8.32E-08	7.51E-05	2.53E-06	-4.64E-04
Intermediate- & low-level radioactive waste, ILLRW [kg]	7.94E-05	9.59E-08	2.99E-09	2.80E-09	2.51E-06	7.87E-08	-1.52E-05
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	1.24E-01	0.00E+00	0.00E+00	0.00E+00	6.89E-01	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 3726. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	6.61E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	0.00E+00	0.00E+00	5.42E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.8. Life Cycle Impact Assessment and Inventory Results: 3000FVfV

Table 3827. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	1.33E+01	1.67E-01	6.25E-03	4.89E-03	4.42E-01	3.13E-02	-6.37E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	4.85E-09	0.00E+00	0.00E+00	0.00E+00	5.94E-11	0.00E+00	-3.40E-10
Acidification potential, AP [kg SO ₂ eq]	6.30E-02	8.34E-04	3.25E-05	1.51E-05	1.37E-03	4.03E-04	-3.81E-02
Eutrophication potential, EP [kg N eq]	1.70E-03	6.90E-05	6.53E-06	1.43E-06	3.78E-05	1.43E-04	-6.83E-04
Smog formation potential, SFP [kg O ₃ eq]	6.23E-01	1.90E-02	1.58E-04	3.38E-04	1.65E-02	3.78E-03	-3.13E-01
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	1.68E+01	3.28E-01	1.34E-03	9.67E-03	7.91E-01	6.17E-02	-5.57E+00

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 3928. Resource Use

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	5.27E+01	7.64E-02	7.62E-04	2.25E-03	5.90E-01	3.75E-02	-3.31E+01
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	8.93E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	1.81E+02	2.47E+00	1.09E-02	7.26E-02	6.70E+00	4.91E-01	-6.96E+01
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	1.25E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	9.33E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	3.31E-01	2.96E-04	1.10E-05	8.71E-06	3.14E-03	5.84E-05	-1.55E-01

Table 4029. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	1.74E-02	2.00E-08	3.74E-11	5.89E-10	2.65E-05	1.72E-09	-5.40E-04
Non-hazardous waste disposed, NHWD [kg]	2.94E+00	9.30E-05	9.39E-03	2.74E-06	8.66E-02	6.99E-01	-1.82E+00
High-level radioactive waste, HLRW [kg]	4.69E-03	5.29E-06	1.32E-07	1.56E-07	1.42E-04	4.62E-06	-8.62E-04
Intermediate- & low-level radioactive waste, ILLRW [kg]	1.47E-04	1.78E-07	4.25E-09	5.24E-09	4.76E-06	1.44E-07	-2.81E-05
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	2.15E-01	0.00E+00	0.00E+00	0.00E+00	1.31E+00	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 4130. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	9.39E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	0.00E+00	0.00E+00	7.71E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.9. Life Cycle Impact Assessment and Inventory Results: A1200

Table 4231. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	1.52E+01	2.01E-01	1.17E-02	5.81E-03	4.31E-01	4.96E-02	-6.63E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	8.48E-09	0.00E+00	0.00E+00	0.00E+00	5.78E-11	0.00E+00	-3.60E-10
Acidification potential, AP [kg SO ₂ eq]	6.62E-02	1.01E-03	6.08E-05	1.80E-05	1.34E-03	7.01E-04	-3.79E-02
Eutrophication potential, EP [kg N eq]	2.06E-03	8.33E-05	1.22E-05	1.70E-06	3.69E-05	2.59E-04	-7.26E-04
Smog formation potential, SFP [kg O ₃ eq]	6.94E-01	2.30E-02	2.95E-04	4.02E-04	1.60E-02	6.22E-03	-3.21E-01
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	2.19E+01	3.97E-01	2.50E-03	1.15E-02	7.70E-01	9.79E-02	-6.68E+00

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 4332. Resource Use

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	5.28E+01	9.22E-02	1.42E-03	2.67E-03	5.75E-01	5.94E-02	-3.25E+01
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	1.67E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	2.23E+02	2.98E+00	2.03E-02	8.63E-02	6.53E+00	7.79E-01	-7.76E+01
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	2.28E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	6.04E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	4.23E-01	3.57E-04	2.05E-05	1.03E-05	3.06E-03	9.25E-05	-1.52E-01

Table 4433. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	1.70E-02	2.41E-08	6.98E-11	6.99E-10	2.58E-05	2.73E-09	-5.27E-04
Non-hazardous waste disposed, NHWD [kg]	2.94E+00	1.12E-04	1.75E-02	3.25E-06	8.44E-02	1.11E+00	-1.78E+00
High-level radioactive waste, HLRW [kg]	5.81E-03	6.39E-06	2.47E-07	1.85E-07	1.39E-04	7.32E-06	-1.01E-03
Intermediate- & low-level radioactive waste, ILLRW [kg]	1.85E-04	2.15E-07	7.94E-09	6.22E-09	4.64E-06	2.28E-07	-3.30E-05
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	3.92E-01	0.00E+00	0.00E+00	0.00E+00	1.27E+00	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 4534. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	1.75E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	0.00E+00	0.00E+00	1.44E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.10. Life Cycle Impact Assessment and Inventory Results: 3500FVfV

Table 4635. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	1.40E+01	2.02E-01	1.09E-02	5.86E-03	3.33E-01	4.85E-02	-4.50E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	7.84E-09	0.00E+00	0.00E+00	0.00E+00	4.47E-11	0.00E+00	2.82E-09
Acidification potential, AP [kg SO ₂ eq]	6.01E-02	1.01E-03	5.69E-05	1.81E-05	1.03E-03	6.82E-04	-2.37E-02
Eutrophication potential, EP [kg N eq]	1.99E-03	8.37E-05	1.14E-05	1.71E-06	2.85E-05	2.51E-04	-4.16E-04
Smog formation potential, SFP [kg O ₃ eq]	6.48E-01	2.31E-02	2.76E-04	4.05E-04	1.24E-02	6.06E-03	-1.98E-01
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	2.03E+01	3.99E-01	2.34E-03	1.16E-02	5.95E-01	9.56E-02	-4.67E+00

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 4736. Resource Use

ENVIRONMENTAL PRODUCT DECLARATION



Handrails

According to ISO 14025,
EN 15804 and ISO 21930:2017

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	4.48E+01	9.27E-02	1.33E-03	2.69E-03	4.45E-01	5.80E-02	-2.21E+01
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	1.56E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	2.09E+02	3.00E+00	1.90E-02	8.70E-02	5.04E+00	7.61E-01	-5.27E+01
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	2.21E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	9.82E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	3.70E-01	3.59E-04	1.92E-05	1.04E-05	2.37E-03	9.04E-05	-9.68E-02

Table 4837. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	1.31E-02	2.43E-08	6.53E-11	7.05E-10	2.00E-05	2.67E-09	-2.65E-04
Non-hazardous waste disposed, NHWD [kg]	2.47E+00	1.13E-04	1.64E-02	3.28E-06	6.52E-02	1.08E+00	-1.34E+00
High-level radioactive waste, HLRW [kg]	5.58E-03	6.42E-06	2.31E-07	1.87E-07	1.07E-04	7.15E-06	-7.48E-04
Intermediate- & low-level radioactive waste, ILLRW [kg]	1.77E-04	2.16E-07	7.43E-09	6.27E-09	3.59E-06	2.22E-07	-2.51E-05
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	3.79E-01	0.00E+00	0.00E+00	0.00E+00	1.32E+00	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 4938. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	1.64E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	0.00E+00	0.00E+00	1.35E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



4.11. Life Cycle Impact Assessment and Inventory Results: 2000W w/ Stainless steel bracket

Table 5039. Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	C2	C3	C4	D
Global warming potential, GWP 100 [kg CO ₂ eq]	9.21E+00	1.37E-01	3.26E-03	4.07E-03	2.33E-01	1.93E-02	-2.07E+00
Ozone depletion potential, ODP [kg CFC-11 eq]*	2.53E-09	0.00E+00	0.00E+00	0.00E+00	3.13E-11	0.00E+00	4.91E-09
Acidification potential, AP [kg SO ₂ eq]	4.45E-02	6.86E-04	1.69E-05	1.26E-05	7.23E-04	2.35E-04	-1.04E-02
Eutrophication potential, EP [kg N eq]	1.29E-03	5.68E-05	3.40E-06	1.19E-06	2.00E-05	8.07E-05	-8.33E-05
Smog formation potential, SFP [kg O ₃ eq]	4.49E-01	1.57E-02	8.22E-05	2.81E-04	8.69E-03	2.28E-03	-7.15E-02
Abiotic depletion potential (fossil), ADP _{fossil} [MJ, surplus]	1.07E+01	2.70E-01	6.97E-04	8.04E-03	4.17E-01	3.81E-02	-1.31E+00

*ODP values for A4-A5, C2, and C4 are originally in the order of magnitude between negative 10⁻¹⁶ - 10⁻¹⁸. The negative values are a result of credits given in the background systems of various GaBi datasets. Since the magnitude of these ODP results is extremely low, the values are read and interpreted as zero.

Table 5140. Resource Use

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Renewable primary resources used as energy carrier (fuel) RPR _E [MJ, LHV]	3.31E+01	6.29E-02	3.97E-04	1.87E-03	3.11E-01	2.31E-02	-1.22E+01
Renewable primary resources with energy content used as material, RPR _M [MJ, LHV]	4.65E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources used as energy carrier (fuel), NRPR _E [MJ, LHV]	1.23E+02	2.03E+00	5.65E-03	6.04E-02	3.53E+00	3.03E-01	-1.84E+01
Non-renewable primary resources with energy content used as material, NRPR _M [MJ, LHV]	6.94E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary materials, SM [kg]	7.94E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels, NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy, RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fresh water, FW [m ³]	1.87E-01	2.44E-04	5.72E-06	7.25E-06	1.66E-03	3.60E-05	-4.59E-02

Table 5241. Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Hazardous waste disposed, HWD [kg]	9.17E-03	1.65E-08	1.95E-11	4.90E-10	1.40E-05	1.06E-09	-5.26E-05
Non-hazardous waste disposed, NHWD [kg]	1.83E+00	7.66E-05	4.89E-03	2.28E-06	4.57E-02	4.32E-01	-9.07E-01
High-level radioactive waste, HLRW [kg]	3.40E-03	4.36E-06	6.88E-08	1.30E-07	7.51E-05	2.85E-06	-2.99E-04
Intermediate- & low-level radioactive waste, ILLRW [kg]	1.05E-04	1.46E-07	2.21E-09	4.36E-09	2.51E-06	8.87E-08	-1.04E-05
Components for reuse, CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, MR [kg]	1.19E-01	0.00E+00	0.00E+00	0.00E+00	1.24E+00	0.00E+00	0.00E+00
Materials for energy recovery, MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electrical EEE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal EET [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 5342. Biogenic Carbon Removals and Emissions

PARAMETER	A1-A3	A4	A5	C2	C3	C4	D
Biogenic carbon removal from product, BCRP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from product, BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon removal from packaging, BCRK [kg CO ₂]	4.89E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon emission from packaging, BCEK [kg CO ₂]	0.00E+00	0.00E+00	4.01E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon emissions, CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcination carbon removals, CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon emissions from combustion of waste from non-renew. sources used in production, CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

5. LCA Interpretation

For the majority of impact categories, the raw materials supply (A1), which includes the plastic, aluminum, electricity, and other flows, is the highest source of impact across all impact categories. Manufacturing (A3) has a significant impact when the plastic represents a large proportion of the product weight due to the extrusion, injection molding, and other processing occurring at the Inpro facility. For aluminum present in the product, the onsite manufacturing processes are small compared to the impacts from aluminum manufacturing, which occurs offsite and thus is represented in the raw material supply module (A1). Credits for the recycling potential of aluminum and steel are represented in module D.

6. Additional Environmental Information

6.1. Mandatory Environmental Information

There is no mandatory environmental information on these products.

6.2. Environment and Health During Manufacturing

Inpro is ISO 14001 Certified and maintains an Environmental Management System with a core committee of employee members creating and tracking relevant environmental metrics in company manufacturing. Inpro creates and works towards goals of reducing waste, energy, and water during the manufacturing of all of our products.

Inpro also maintains a safety committee who completes all the necessary safety drills, mitigation, and reporting procedures, and engages employees in safety trainings and disseminating information.

There are no direct health risks associated with manufacturing this product.

6.3. Environment and Health During Installation

These products require minimal changes or modifications in the field and as such do not have any environmental or health risks during installation. Products must be installed in an interior climate-controlled environment.

6.4. Extraordinary Effects

Fire

All handrails are UL Classified, conforming with NFPA Class A fire rating. Surface burning characteristics, as determined by UL-723 (ASTM E-84), shall be flame spread of 10 and smoke development of 350 - 450. Provide ULC (Canada) listed handrails conforming to the requirements of the National Building Code of Canada 2010, Subsection 3.1.13. Surface burning characteristics, as determined by CAN/ULC-S102.2, shall be flame spread of 15 and smoke developed of 35

6.5. Delayed Emissions

These products have been certified GREENGUARD Gold verifying minimal delayed emissions.

6.6. Environmental Activities and Certifications

Inpro encourages employees to be a part of the Six Sigma program where projects are brought forward and completed that reduce material or resource usage and cost. Each year there are a handful of employees who participate in the program and graduate as a six sigma green belt. These continuous improvements save the company time, money, and resources while making products better. Inpro also encourages efficiency improvement suggestions from all levels of employees, from floor workers to senior management.

7. References

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Handrails



According to ISO 14025,
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8. Contact Information

8.1. Study Commissioner



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