



ENVIRONMENTAL PRODUCT DECLARATION (EPD) FOR
THE ALUMINIUM EXTRUSION BILLET
PRODUCED BY HYDRO EXTRUSION ITALY SRL



We are aluminium

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1 PROGRAMME RELATED INFORMATION

This EPD is developed under the program The International EPD[®] System, in compliance with the General Program Instruction version 3.1 for the EPD development and the Product Category Rules PCR “Construction products” 2019:14 version 1.1.

More information about the International EPD[®] System is available on the website:

<https://www.environdec.com/>

2 PRODUCT RELATED INFORMATION

2.1 THE COMPANY

Hydro Extrusion Italy S.r.l. is a company of Hydro group manufacturing aluminium billets from remelting and aluminium profiles. The Feltre casthouse produces billets in the family of 6000 (namely 6005, 6060 and 6082) and in 7, 8, 10, 11-inch diameter, with a capability serving the Hydro plants in Italy and the clients in Europe. Moreover, Feltre is one of Hydro primary Italian extrusion plants with two presses, an in-house die correction facility.

2.2 THE PRODUCT

The studied aluminium billets are intermediate products which feed other processing steps for the production of other products, mainly profiles for the building sector. Aluminium scrap and primary ingots are melted, with the eventual addition of alloying elements, and billets produced through a casting process.

The production process, represented in Figure 1, includes the remelting of aluminium scrap and primary ingots and the following casting process. During the process, impurities are removed, and alloys are added, if needed, to adjust the chemical composition and to reach the quality standard. Casted billets are bound together by means of plastic straps and wood bars and are stored to be sold externally or to be used internally as input in the extrusion process (profiles production).

The reference CPC code is 415 “Semi-finished products of copper, nickel, aluminium, lead, zinc and tin or their alloys”.

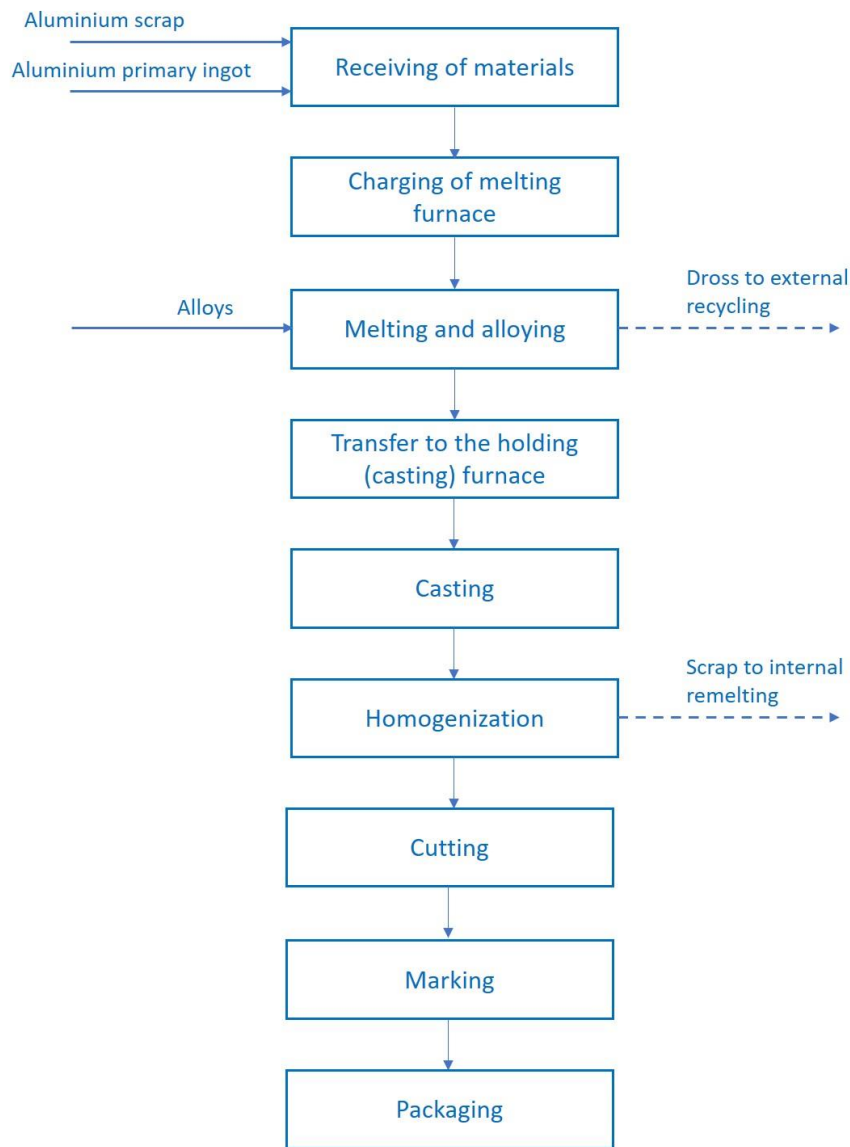


Figure 1: Production process of the aluminium billet occurring in Feltre's site.

2.2.1 TECHNICAL CHARACTERISTICS OF THE PRODUCT

All products are produced according to European standards specific for each casthouse products. The products are variants within the 6000 alloys. For more detailed information about shapes, dimensions and tolerances: www.hydro.com/en/products/casthouse-products/.

2.2.2 PRODUCT COMPOSITION

The composition of the product is reported in Table 1. The content of SVHC does not exceed 0.1 % of the total weight.

Table 1: BoM of the aluminium billet produced in Feltre by Hydro Extrusion Italy S.r.l

BoM of the aluminium billet		
Material contribution (% in weight) to 1 kg of aluminium billet*		
		Variation range
Aluminium scrap, of which	84,05	53 - 99
<i>Process scrap</i>	<i>55,54</i>	<i>25 - 70,7</i>
<i>Post-consumer</i>	<i>28,51</i>	<i>19 - 37</i>
Primary aluminium ingot	15,59	12 - 29
Alloys, of which	0,36	0,13 - 0,99
<i>Silicon</i>	<i>0,11</i>	
<i>Manganese</i>	<i>0,09</i>	
<i>Magnesium</i>	<i>0,11</i>	
<i>Boron-titanium</i>	<i>0,04</i>	
<i>Copper</i>	<i>0,0034</i>	
<i>Iron</i>	<i>0,0013</i>	
Packaging per kg of aluminium billet		
Plastic strap	0,0046	
Wood	0,0023	

* the reported recipe is a weighted average BoM covering the chemical compositions produced in Feltre (6005, 6060 and 6082) in the reference period and depending on the scrap availability.

2.2.3 PRODUCT REFERENCE SERVICE LIFE

Product Reference Service Life is dependent on product application. Aluminium itself has an infinite lifetime.

2.2.4 MARKET

The reference market is Europe. Application sectors include Building and Construction, but also Automotive and Transport, Consumer Goods, General Engineering.

3 ENVIRONMENTAL PRODUCT DECLARATION

3.1 METHODOLOGY

The study behind the present EPD has been performed according to the state of art of the LCA methodology, with specific reference to the construction sector, in accordance with the following standard and guidelines:

- EN ISO 14040: 2006 Environmental management -- Life cycle assessment -- Principles and framework
- EN ISO 14044:2006 Environmental management -- Life cycle assessment -- Requirements and guidelines
- EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
- EN 15804:2012+A1:2013 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
- General Programme Instructions (GPI) for the International EPD® VERSION 3.1
- The International EPD® System Product Category Rules (PCRs) for construction products version 2019:14, 1.1.

The goal of the study is the evaluation of the potential environmental impacts of the aluminium billet.

The EPD is mainly addressed to the business-to-business communication. The data elaboration has been performed with the Gabi software, version 10.5.1.124. The database used are the most updated ones implemented in Gabi software. More in detail, main database used is Sphera, European Aluminium and IAI. The LCIA method used is the method 15804:2012+A2:2019.

3.2 DECLARED UNIT

The declared unit is 1 kg of aluminium billet, plus its packaging.

3.3 SYSTEM BOUNDARY

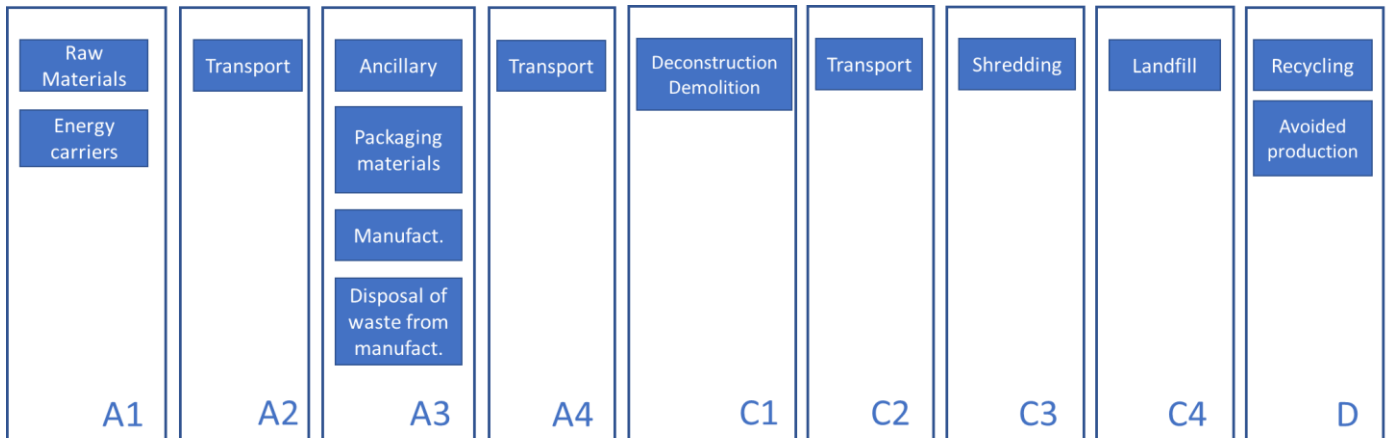
The EPD is a “Cradle to Gate with modules C1-C4 and D and optional modules” as represented in Table 2 and showed in Modules A5 and B1 to B7 are excluded as they are strongly dependent on the specific application within the reference market.

Table 2: Life cycle stages included in the study for the aluminium billet produced in Feltre by Hydro Extrusion Italy S.r.l.

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE	END-OF-LIFE STAGE				BENEFITS and LOADS BEYOND SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1 to B7	C1	C2	C3	C4	D
	Raw Material Supply	Transport	Manufacturing	Transport	Construction/Installation	Use, Maintenance, Repair, Replacement, Refurbishment, Operational energy use, Operational water use	De-construction/Demolition	Transport	Waste processing	Disposal	Reuse, Recycling potential
	X	X	X	X	NA	NA	X	X	X	X	X
Geography	EU, extra-EU, GLO	EU, extra-EU, GLO	EU, IT	GLO, EU	-	-	EU	GLO, EU	EU	EU	EU, GLO
Specific data*	>90%			-	-	-	-	-	-	-	-
Variation – products	Not relevant					-	-	-	-	-	-
Variation – sites	Not relevant					-	-	-	-	-	-

*The share of the GWP-GHG indicator results in A1-A3 is coming from product-specific LCI data.

Figure 2: System boundaries for the study of the innovative aluminium billet by Hydro Extrusion Italy S.r.l



The following stages are included in the study:

Raw Materials supply (A1). Production of raw materials used in the products, of as well as the production of energy carriers used in the production process.

Transport of raw materials to the factory (A2)

Manufacturing of the Hydro aluminium billet (A3). It includes the following production phases:

- Remelting, alloying and casting
- Cutting and homogenization
- Cooling and binding (packaging) for final storage

Moreover, in module A3, the production of primary packaging and of the ancillary materials and the treatment of waste generated from the manufacturing processes are accounted for.

Transport to the user (A4)

De-construction, demolition processes (C1): deconstruction and demolition

Transport from collection to waste processing and disposal site (C2)

Waste processing (C3): shredding and sorting

Disposal (C4): landfill of material fractions not entering the recycling treatment

Module D: transport to recycling treatment site (remelter), remelting process and benefit due to the avoided production of primary aluminium.

The reference year of the study is May 2020 – February 2021 (10 months in total).

3.4 MAIN ASSUMPTIONS, CUT-OFFS, BACKGROUND DATA INFORMATION AND SCENARIOS

3.4.1 DATA QUALITY

Specific data are used for all of Hydro's processes based on the reference production period from May 2020 to February 2021. All background data used in the study are from LCI database and are not older than 5 years. Background data, for instance, transport and energy production, are from Sphera. In addition, with specific reference to the electricity used in the manufacturing processes, the Italian residual electricity mix is used.

3.4.2 ALLOCATION

The allocation is made in accordance with the provisions of EN 15804. Energy and resources (water and ancillary) in input and waste and emissions in output from the foundry are allocated to the billet production based on the mass. The production of aluminium included in process scrap is allocated to the main product in which the material is used. The recycling process and transportation of the material is allocated to this analysis.

3.4.3 CUT-OFFS CRITERIA

Raw and packaging materials are fully included as well as the energy for manufacturing. In the same way, all manufacturing waste (including hazardous waste) and air emissions are accounted for.

The construction of the manufacturing site (capital goods) is not included. Minor auxiliaries (e.g. filter nettings), offices paper, single use plastic, office equipment are not considered, having marginal impacts and accounting for <0,01% in terms of mass compared to the total amount of raw materials used in the process.

3.4.4 BACKGROUND DATA INFORMATION

For most of the raw materials as well as for the packaging of the finished products a European production is considered. Process scrap in input to the production is given the impact of average aluminium consumed in Europe, if coming from the European market, and as global aluminium primary production mix, if coming from extra-Europe market.

Raw materials road transport is assumed on a truck Euro 4 (> 32 t) with a utilisation ratio of 0,61.

3.4.5 SCENARIOS FOR OPTIONAL MODULES

For the transport towards clients an average distance, based on Hydro's client's location, is considered (Table 3).

Table 3: Distance and transport mean considered for module A4.

Transport information for module A4		
Transport mean	Utilisation ratio - %	Distance travelled - km
Diesel truck, Euro IV, > 32 t	61	440

As one of the main reference markets, building sector is considered for the End-of-life modules. The end-of-life scenario is Europe based. Profiles are assumed to be manually dismantled. Considering this, no impacts are accounted for in module C1.

After collection, aluminium is shredded, sorted, and sent to remelting. Material lost at the collection and waste treatment sites is sent to landfill. Collection and waste processing efficiency are reported in Table 4, whereas Table 5 reports transport information.

Table 4: Applied collection and waste processing efficiency for the End-of-life.

End-of-life - collection and processing efficiency	
Collection efficiency - %	
Aluminium collected	96
Aluminium lost at the collection site	4
Processing efficiency (shredding) - %	
Aluminium sent to recycling after shredding	95
Aluminium lost in the shredding	5

Table 5: Distance and transport means applied for the End-of-life.

End-of-life - transport information for modules C and D		
Transport mean	Utilisation ratio - %	Distance travelled - km
Materials not collected and sent to landfill (module C2)		
Diesel truck, Euro IV, > 32 t	61	200
Material collected and sent to waste processing (module C2)		
Diesel truck, Euro IV, > 32 t	61	200*
Materials from waste processing to remelter (module D)		
Diesel truck, Euro IV, > 32 t	61	200

*no additional transport is assumed for material which is landfilled after waste processing.

Module D environmental impacts address burden and benefit from net output flows leaving the product system, i.e. from flows leaving the product system, lowered of the recycled content % initially included in the product. The primary aluminium ingot consumed in Europe is considered for the accounting of benefits from remelted aluminium.

3.5 PARAMETERS DESCRIBING THE ENVIRONMENTAL IMPACT

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

Table 6: Environmental profile of the aluminium billet per declared unit (1 kg) produced in Feltre by Hydro according to EN 15804:2012+A2:2019 plus additional GWP-GHG Indicator required by PCRs.

Results according EN 15804:2012+A2:2019 - Aluminium billet							
Impact category – core indicators	A1-A3	A4	C1	C2	C3	C4	D
Climate Change (GWPtot) [kg CO2 eq.]	6,55E+00	2,95E-02	0,00E+00	1,34E-02	2,06E-02	1,30E-03	-4,93E+00
Climate Change (fossil) (GWPf) [kg CO2 eq.]	6,53E+00	2,93E-02	0,00E+00	1,33E-02	2,03E-02	1,33E-03	-4,92E+00
Climate Change (biogenic) (GWPb) [kg CO2 eq.]	1,00E-02	-3,78E-05	0,00E+00	-1,72E-05	1,73E-04	-3,87E-05	-1,02E-02
Climate Change (land use change) (GWPluc) [kg CO2 eq.]	1,01E-03	2,42E-04	0,00E+00	1,10E-04	2,90E-05	3,91E-06	-8,44E-04
Ozone depletion (ODP) [kg CFC-11 eq.]	1,32E-10	3,78E-18	0,00E+00	1,72E-18	4,88E-16	5,18E-18	-3,70E-11
Acidification terrestrial and freshwater (AP) [Mole of H+ eq.]	3,79E-02	1,73E-04	0,00E+00	7,88E-05	4,23E-05	9,48E-06	-2,86E-02
Eutrophication freshwater (EPfr) [kg P eq.]*	7,25E-06	8,79E-08	0,00E+00	4,00E-08	5,49E-08	2,23E-09	-2,19E-06
Eutrophication marine (EPmar) [kg N eq.]	7,25E-03	8,51E-05	0,00E+00	3,87E-05	1,00E-05	2,46E-06	-4,12E-03
Eutrophication terrestrial (EPter) [Mole of N eq.]	7,92E-02	9,41E-04	0,00E+00	4,28E-04	1,05E-04	2,70E-05	-4,50E-02
Photochemical ozone formation - human health (POCP) [kg NMVOC eq.]	2,10E-02	1,64E-04	0,00E+00	7,43E-05	2,73E-05	7,46E-06	-1,24E-02
Resource use, mineral and metals (ADPe) [kg Sb eq.] **	1,30E-06	2,25E-09	0,00E+00	1,02E-09	6,00E-09	1,26E-10	-1,11E-06
Resource use, energy carriers (ADPf) [MJ] **	8,22E+01	3,94E-01	0,00E+00	1,79E-01	3,61E-01	1,77E-02	-6,04E+01
Water scarcity (WS) [m ³ world equiv.] **	5,71E-01	2,57E-04	0,00E+00	1,17E-04	3,23E-03	1,43E-04	-7,30E-01
Additional GWP-GHG indicator required by PCRs							
Climate change - GWP-GHG [kg CO2 eq.] – Aluminium billet***	6,47E+00	2,90E-02	0,00E+00	1,32E-02	2,02E-02	1,31E-03	-4,89E+00
Climate change - GWP-GHG [kg CO2 eq.] – Worst case***, ****	6,99E+00	-	-	-	-	-	-

* The results in kg P eq. can be obtained by dividing the results in kg PO4 eq. by a factor of 3,07.

**The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

***The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product.

**** Worst case: pre-consumer scrap 56%, post-consumer scrap 19%, primary ingot 25%, alloys 0,21%.

Table 7: Environmental profile of the aluminium billet per declared unit (1 kg) produced in Feltre by Hydro EN 15804:2012+A1:2013.

Results according EN 15804:2012+A1:2013							
Impact category	A1-A3	A4	C1	C2	C3	C4	D
Global warming potential (GWP) [kg CO2 eq.]	6,45E+00	2,87E-02	0,00E+00	1,31E-02	2,01E-02	1,26E-03	-4,89E+00
Ozone Depletion Potential (ODP) [kg R11 eq.]	1,08E-10	5,04E-18	0,00E+00	2,29E-18	6,51E-16	6,90E-18	-6,80E-11
Acidification potential (AP) [kg SO2 eq.]	3,14E-02	1,18E-04	0,00E+00	5,37E-05	3,40E-05	7,54E-06	-2,43E-02
Eutrophication potential (EP) [kg Phosphate eq.]	2,49E-03	2,97E-05	0,00E+00	1,35E-05	4,49E-06	8,55E-07	-1,43E-03
Photochemical Ozone Creation Potential (POCP) [kg Ethene eq.]*	1,86E-03	-4,56E-05	0,00E+00	-2,07E-05	2,86E-06	5,79E-07	-1,33E-03
Abiotic depletion potential for non fossil resources (ADPe) [kg Sb eq.]	1,31E-06	2,26E-09	0,00E+00	1,03E-09	6,33E-09	1,27E-10	-1,13E-06
Abiotic depletion potential for fossil resources (ADPe) [MJ]	7,48E+01	3,92E-01	0,00E+00	1,78E-01	2,24E-01	1,71E-02	-5,09E+01

*Negative impact for Photochemical Ozone Creation Potential (POCP) in modules A4 and C2, D is due to the NO emissions from truck.

3.6 INDICATORS OF RESOURCES USE

Table 8: Indicators of resources of the aluminium billet per declared unit (1 kg) produced in Feltre by Hydro Extrusion Italy S.r.l

Indicators on resources use	A1-A3	A4	C1	C2	C3	C4	D
Use of renewable primary energy resources excluding renewable primary energy resources used as raw materials (PERE) [MJ]	1,94E+01	2,20E-02	0,00E+00	1,00E-02	1,67E-01	2,38E-03	-2,74E+01
Use of renewable primary energy resources used as raw materials (PERM) [MJ]*	2,81E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources (PERT) [MJ]	1,94E+01	2,20E-02	0,00E+00	1,00E-02	1,67E-01	2,38E-03	-2,74E+01
Use of non-renewable primary energy resources excluding non-renewable primary energy resources used as raw materials (PENRE) [MJ]	8,24E+01	3,95E-01	0,00E+00	1,79E-01	3,61E-01	1,77E-02	-6,04E+01
Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	7,68E-09	3,00E-15	0,00E+00	9,99E-16	1,40E-14	2,98E-16	0,00E+00
Total use of non-renewable primary energy resources (PENRT) [MJ]	8,24E+01	3,95E-01	0,00E+00	1,79E-01	3,61E-01	1,77E-02	-6,04E+01
Use of secondary materials (SM) [kg]	8,41E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels (RSF) [MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels (NRSF) [MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water (FW) [m3]	5,42E-02	2,52E-05	0,00E+00	1,14E-05	1,62E-04	4,36E-06	-6,94E-02

* The calorific value of the wood bar used for the packaging was considered as 12,2 MJ/kg (AIEL 2009)

3.7 INDICATORS OF WASTE AND OUTPUT FLOWS

Table 9: Indicators on output flows and waste of the aluminium billet per declared unit (1 kg) produced in Sjunnen by Hydro Extrusion Italy S.r.l

Indicators on output flows and waste categories	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste disposed (HWD) [kg]	5,77E-07	1,99E-11	0,00E+00	9,04E-12	9,59E-11	1,88E-12	-4,26E-08
Non-hazardous waste disposed (NHWD) [kg]	2,17E+00	5,86E-05	0,00E+00	2,67E-05	2,57E-04	8,81E-02	-1,48E+00
Radioactive waste disposed (RWD) [kg]	1,41E-03	4,77E-07	0,00E+00	2,17E-07	5,37E-05	1,86E-07	-3,60E-03
Materials for Recycling (MFR) [kg]	3,86E-02	0,00E+00	0,00E+00	0,00E+00	9,12E-01	0,00E+00	0,00E+00
Material for Energy Recovery (MER) [kg]	5,44E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported electrical energy (EEE) [MJ]	5,59E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported thermal energy (EET) [MJ]	1,04E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Components for reuse [kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

3.8 INFORMATION ON BIOGENIC CARBON CONTENT

The mass of biogenic carbon containing materials in the products is less than 5%.

Table 10: Information on biogenic carbon content for the packaging of the aluminium billet per declared unit (1 kg) produced by Hydro Extrusion Italy S.r.l

Information on biogenic content	A1-A3	A4	C1	C2	C3	C4	D
Biogenic carbon content in packaging [kg]*	1,40E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

*1 kg biogenic carbon is equivalent to 44/12 kg CO₂

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5 ADDITIONAL INFORMATION

5.1 ADDITIONAL INFORMATION CONCERNING THE PROGRAMME AND THE EPD

EPDs within the same product category but from different program may not be comparable.



EPDs of construction products may not be comparable if they do not comply with EN 15804. Environmental product declarations within the same product category from different programs may not be comparable. This EPD and the PCR 2019:14 “Construction products” are available on the website of The International EPD® System (www.environdec.com).

The verifier and the Programme Operator do not make any claim nor have any responsibility of the legality of the products included in the present EPD. The LCA study and the present EPD have been issued with the technical scientific support of Ecoinnovazione S.r.l., spin-off ENEA (<http://ecoinnovazione.it/?lang=en>).

5.2 ADDITIONAL INFORMATION ON THE PRODUCT AND ON THE COMPANY

Aluminium billet covered by the present EPD are produced in Feltre.

For further information on product characteristics, typical applications, technical datasheet and case histories, please visit our website www.hydro.com or contact us to Alessandro.Chiovaro@hydro.com.

CEN standard EN 15804 served as core PCR	
EPD Programme:	The International EPD® System For more information – www.environdec.it
PCR:	PCR 2019:14 Construction products version 1.1
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair of the TC: Massimo Marino Contact: info@environdec.com
EPD Registration n°:	S-P-05427
EPD validity:	5 years (2017-01-06)
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Technical support:	Ecoinnovazione S.r.l. – spin-off ENEA Via della Liberazione 6, 40128 Bologna  ecoinnovazione spin off ENEA www.ecoinnovazione.it
Independent verification of the declaration and data according to ISO 14025:	EPD verification (external)
Third party verifier:	DNV Business Assurance Italia S.r.l.  https://www.dnv.it/assurance/index.html
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