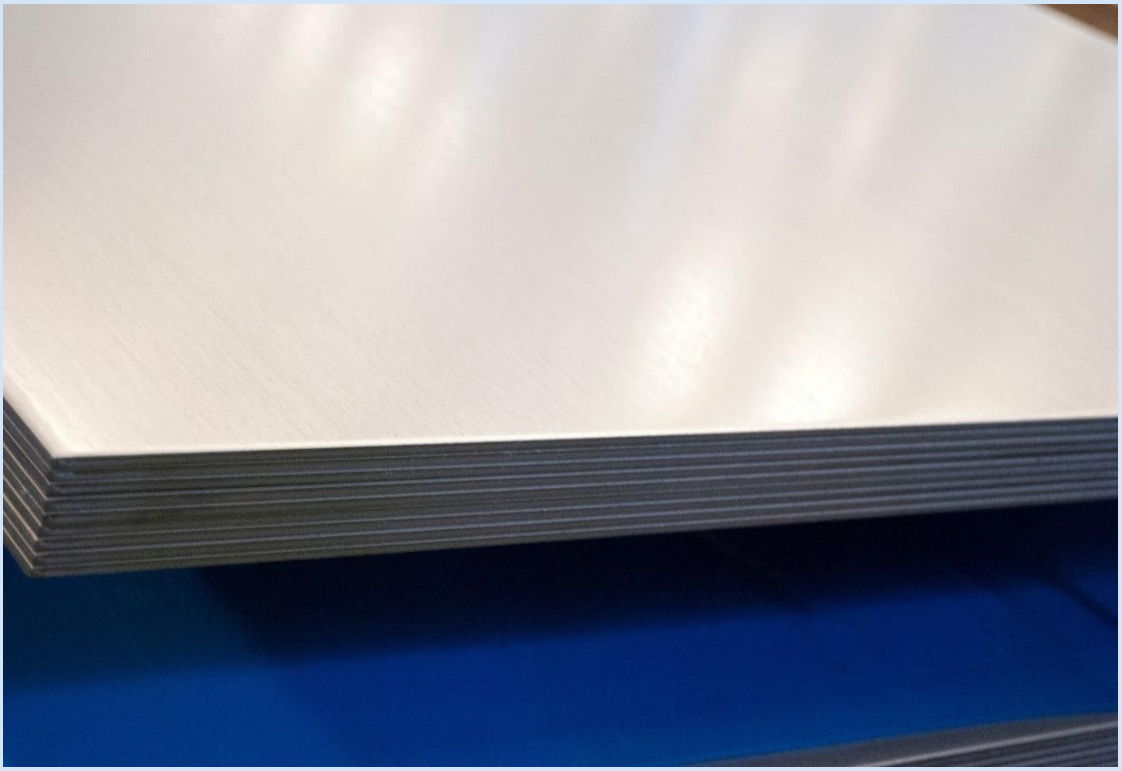
Environmental Product Disclosure

Conforms to UNE-EN ISO 14025:2010

HOT-ROLLED AUSTENITIC STAINLESS STEEL

ACERINOX EUROPA, S.A.U.

Program:	The International EPD® System, www.environdec.com
Program operator:	EPD International AB
EPD registration number:	S-P-08507
Added date:	2023-03-09
Valid until:	2028-03-08



This EPD should provide current information and may be updated if conditions change. Therefore, the stated validity is subject to its continued registration and publication on www.environdec.com

1 Programme information

Program:	The International EPD® System
Address	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website	www.environdec.com
Email:	info@environdec.com
Product category rules (PCR):	**PCR 2015:03 Basic iron or steel products & special steels, except construction steel products. Version 2.0**

The PCR review was performed by: The Technical Committee of the International EPD® System.
Members of the Committee were requested on *www.environdec.com (Members of the Committee were requested to state any potential conflict of interest with the PCR moderator or PCR committee and if so were excused from the review)*
Chair: Hudai Kara
Contact via *info@environdec.com*

Independent third-party verification of the DAP and data, according to ISO 14025:2006:

☐ EPD process certification ☒ EPD verification

Third Party Verifier: Verifier accredited by the International EPD® System.

Marcel Gómez Ferrer.

Marcel Gómez Consultoría Ambiental (www.marcelgomez.com)

Tlf: 0034 630 64 35 93

Email: info@marcelgomez.com

Approved by: The International EPD® System

The procedure for tracking data during the validity of the EPD involves a third-party verifier:

☒ Yes ☐ No

Manufacturer information:

Owner of the EPD: ACERINOX EUROPA, S.A.U.

Address: Industrial estate of Palomes. Acerinox avenue, s/n. 11379- BARRIOS (LOS) Cádiz
Contact: sustainability@acerinox.com

Website: www.acerinox.com

Development of the EPD: **SGS TECNOS S.A.U**

The owner of the EPD presents the exclusive ownership and responsibility of the EPD. EPDs within the same product category, but from different programs may not be comparable.

For more information on comparability, see ISO 14025.

2 ACERINOX Group

Acerinox is one of the most competitive companies in the world in the manufacture of stainless steels and nickel alloys. It is the most global company in the world with a presence on five continents, factories in four of them and supply to customers in 81 countries. Since its constitution, 50 years ago, it has been carrying out a continuous investment program with the development of its own technological innovations that, in some cases, they have been a real milestone in the technology of stainless steels.

In terms of production capacity, Acerinox is one of the largest manufacturers worldwide. It has three factories with an integral production process of flat products: the Campo de Gibraltar Factory (Spain, 1970), which in 2001 was the first to exceed one million tons per year; North American Stainless, N.A.S. (Kentucky, USA,), which was founded in 1990 and in 2002 became an integral plant and Columbus Stainless (Middelburg, South Africa), which became part of the Acerinox Group in 2002. In 2009 the construction of Bahru Stainless (Johor Bahru, Malaysia) which has cold rolling lines.

For the manufacture of long products, Acerinox has the plants of Roldán (Ponferrada, Spain) and Inoxfil (Igualada, Spain), in addition to workshops of this type of product in NAS.

In March 2020, Acerinox formalized the purchase of VDM Metals, thus becoming a new company of the Group. VDM Metals is a world leader in the development and manufacture of special nickel alloys, as well as high performance stainless steels and is recognized as a benchmark for H-D+i in the sector. VDM's production network, consisting of four factories in Germany and two in the United States, thus joins the Group's capacity.

The Acerinox Group sells these stainless steels worldwide through a marketing network present in 57 countries on five continents and made up of 35 commercial offices in 31 countries, 15 commercial agents serving 26 states, 18 service centers and 25 warehouses.

The manufacture of stainless steels of Acerinox in Spain is divided into three plants. ACERINOX EUROPA, S.A.U. manufactures flat stainless steels, the main products being: slabs, billets, black coil, plates (N1 finish), hot rolled coil (N1 finish), hot rolled sheet, tear plate/plate, plate (N1 finish), cold rolling coil, sheet cold rolled and discs.

Sustainability Strategy

Acerinox's strategic vision has always contributed to the sustainable development of the societies in which it has operated. This way of understanding the business from its origin, today materializes in a model based on the permanent search for economic, social and environmental balance generating real value to all stakeholders in the present while preserving the legacy of future generations.

This firm commitment that Senior Management has maintained to strive to maintain the achievement of economic objectives in the short term without neglecting the vocation of sustainability over time is being supported by the ambitious guidelines of the European Union related to its determination to bet on a Circular Industrialization that offers sustainable products such as stainless steel. In this line, it is worth highlighting the following European initiatives presented in 2020 with which Acerinox it comes out reinforced:

- Draft Sustainable Corporate Governance Directive aimed at integrating sustainability into its management at the highest level in order to promote responsible investments in the long term that improve productivity and efficiency.

- Circular Economy Action Plan that relates competitiveness with sustainability by betting on processes that feed on recycled materials and manufacture products durable, clean and recyclable at the end of their useful life. It puts in value the importance of circularity as a prerequisite for achieving the objective of climate neutrality.

Acerinox has also kept pace with the CNMV's new recommendations for listed companies on sustainability. Thus, the creation of a Sustainability Directorate, which is part of Senior Management, has been reinforced during 2020 with the creation of a Commission specific Sustainability within the Council.

Based on these principles, we have worked to develop a Sustainability Plan to support and reinforce the business strategy, respond to the company's social, environmental and good governance challenges, with a Global vision, reducing risks and developing opportunities. This Plan has been called, "Acerinox Positive Impact 360", which has been approved by the Board of Directors, defines a series of actions based on the five axes main ones that add value in the "Excellence 360" Plan that are summarized below:

- Ethical, accountable and transparent governance
- Eco-efficiency and the fight against climate change.
- Circular economy and sustainable product
- Committed team, culture, diversity and safety
- Supply chain and community impact

For each of the axes, lines of action and a number of actions have been established develop with a priority action plan 2021-2023 and another 2024-2025.

All this, ensuring the contribution to the Sustainable Development Goals of the 2030 Agenda and compliance with the 10 Principles of the United Nations Global Compact.

Management systems

Acerinox Europa, located in Los Barrios, in the Industrial estate of Palmones, Los Barrios (Cádiz), has ISO 14001:2015 certificates with registration numbercon 12 104 17958 TMS, ISO 50001:2018 with certificate registration number: 12 340 17958 TMS and ISO 9001:2015 with certificate registration number: 12 100 17958 TMS.

In addition, the Los Barrios factory has an ISO 45001:2018 management system certificate with certificate no. C548342 and healthy organisation ES-2019/0011.

Manufacturer

ACERINOX EUROPA, S.A.U.

Industrial estate of Palmones. Acerinox avenue, s/n.

11379- BARRIOS (LOS) Cádiz

Spain

Product categorie rules (PCR): PCR 2015:03 Basic iron or Steel products special steels, except construction steel products. Version 2.0

More information www.acerinox.com

3 Descripción del producto

Name of the product or product family:

This EPD describes the product of **one ton of hot-rolled austenitic stainless steel** manufactured at the Los Barrios Factory, with promoter Acerinox Europa S.A.U. located in Cadiz (Spain).

Description of the product and its use:

Austenitic stainless steels including those with Cr-Ni-Mo group to increase resistance to pitting corrosion, and also those of type L (low C content) having lower susceptibility to intergranular corrosion, because the precipitation of Cr carbides is avoided in applications that involve their use at sensitization temperatures, like welding.

Cold-rolled austenitic steel is available in a **wide range of typologies according to table 1:**

Table 1: Types of stainless steel

EN 10088	1.4372	1.4310	1.4310	1.4301	1.4301	1.4301 1.4307	1.4301 1.4307	1.4301	1.4307	1.4401 1.4404	1.4401	1.4432	1.4571	1.4541 1.4878	1.4833	1.4845
AISI	201	301	301	304	304	304L 304	304L 304	304DDQ 304	304L	316L 316	316	316L	316Ti	321	3095	3105

The coils have standard dimensions subject to international standards of tolerance shown in Table 2.

Table 2: Dimensions of hot-rolled coils

Thickness (mm)	Nominal width (mm)	Maximum weight (kg/mm width)
0,20 – 10,00	915,00 – 1524,00	19,00

Sheets have standard dimensions subject to international standards of tolerance shown in Table 3.

Table 3: Dimensions of hot-rolled sheets.

Thickness (mm)	Nominal width (mm)	Maximum weight (kg/mm width)
0,20 – 10,00	915,00 – 1524,00	2000,00 – 9000,00

The product in question is classified in UN CPC as 412.

3.1 Applicability

Both coils and sheets have different applicatons:

- Chemical and petrochemical industry
- Food, pharmaceutical and textile industry
- Architectural ornaments
- Applications with welding
- Pipes and boilers
- Vehicle tanks

3.2. Technical data

Austenitic stainless steel technical data is shown based on an example of a grade.

Parameter	Value	Unit
Density at 20ºC	8000,00	Kg/m^3
Modulus of elasticity at 20ºC	200,00	GPa
Average coefficient of thermal expansion between 20ºC y 500 ºC	16,00-18,00	10^{-6} K^{-1}
Thermal conductivity at 20ºC	15,00	W/mK
	0,75	Ω·mm^2 /m

AUSTNITIC STAINLESS STEEL Cr-Ni-Mo ACX 240	
Designation EN	**Designation ASTM**
1.4401	316
1.4404	316L
$X_2CrNiMo_{17-12-2}$	S31603

3.3 Mechanical properties in annealed condition

Rm N/mm^2	$Rp_{0,2}$ N/mm^2	Elongation %	Hardness HB
540-620	> 240	>45	< 200

Corrosion resistance

Austenitic stainless steels present in general good properties of resistance and the Cr-Ni-Mo even better properties of resistance to generalized and atmospheric corrosion than Cr-Ni stainless steels. They have a corrosion rate of less than 0,10 mm/year when in contact with following means:

- 20% phosphoric acid boiling.
-20% sulfuric acid at room temperature.
- Tartaric acid at 60% at 800°C.
- 50% acetic acid boiling.
- 100% formic acid at 600°C.
- Beer.
- Milk.
- 100% oleic acid at 180°C.
- Petrol.

Resistance to hot oxidation

The maximum service temperature for these types of steels in continuous applications is 9200°C. For intermittent thermal cycling, the maximum service temperature is 8700°C.

3.4 Especificaciones

The austenitic stainless steels are included in the main international standards. They can be supplied according to the requirements of EN, ASTM, ASME, AMS, QQS, MILS.

The stainless steels are approved according to:

- PED (Pressure Equipment Directive), DGRL 97/23/EG de acuerdo con EN 10028-7 y AD2000 Merkblatt W2 y W10.
- Lloyd´s Register of Shipping.

They comply with the requirements of the European directives of:

- Food industry, RE-1935/2004.
- Hexavalent chromium, ROHS.
- Electrical appliances, ROHS.

AUSTENITIC	Interval in %
Cr	16,00 – 26,00
Ni	3,50 – 26,00
Mo	0,00 – 3,00
Si	0,00 – 2,50
Mn	0 ,00 – 7,50
Fe	Resto

Tabla 4: Tabla de composición del producto.

During the life cycle of the product, no hazardous substances included in the "Candidate List for Authorisation (SVHC)" have been used in a percentage greater than 0.1% of the weight of the product. All quantities specified in the steel component description table together, unifying all stages of the life cycle.

3.5 Description of system components:

Table 5: Amount of biogenic carbon in the product.

Results per declared unit		
Contein of biogenic carbon	**Unit**	**Amount**
Biogenic carbon in the product	kg C	0
Biogenic carbon in the packaging	kg C	4,84E-02

4 LCA information

4.1 Declared Unit

The declared unit is **1 ton (1000 kg) of austenitic stainless steel hot rolling** at the gate of the Acerinox Europa factory, with promoter Acerinox Europa S.A.U. located in Cadiz.

NAME	VALUE	UNIT
Declared Unit	1	ton

4.2 Reference Service life

Both stainless steel sheets and coils are used in the main structure of the project, so the reference service life will be equal to the useful life of the project being, according to the International Forum of the Stainless Steel (International Stainless-Steel Forum, ISSF), from:

- 50 years for buildings and infrastructures.
- 14 years in passenger transport.
- 30 years for other types of transport.
- 25 years in industrial machinery.
- 15 years for household appliances and electronics
- 15 years in metal products.

4.3 Representativity

The specific data referring to the year 2021 have been used for the calculation of the LCA which is consider a representative year.

4.4 Geografical scope

Global

4.5 Database and LCA: software used

Ecoinvent 3.8 (allocation, cut-off by classification)) with Simapro 9.3.0.2 database used for LCS calculations. The LCA methods used are in accordance with the Standard UNE-EN ISO 14025:2010.

4.6 System limits

This environmental product declaration is from **"Cradle to gate"**

4.7 Data quality

The data collected regarding components and energy corresponds to the year 2021 and includes data on raw materials consumed and energy consumption. The plausibility and consistency of the data collected has been verified. Good data quality can therefore be considered. In the calculation of the LCA of the system, flows related to the construction of production plants, application machines and the staff transportation

4.8 Cutt-off rules

At least 99% of energy consumption is considered for manufacturing facilities It is considered 99% of the raw material by mass The following processes have been excluded:

- Manufacture of equipment used in the production, buildings or any other capital goods.

- Transportation of staff to the plant

- Transportation of staff to other work centers

- Transportation of staff within the plant

- Research and development activities including production and manufacture of laboratory equipment.

- Long term emissions.

- Packaging of raw materials used for steel manufacturing.

4.9 Allocation

Wherever possible, assignments have been avoided. For cases where this has not been possible, a mass-based physical allocation is made. The data referring to the composition of the system have been obtained directly and have been analyzed following the principles of *modularity* and *polluter pays.*

4.10 Other information

This LCA has been carried out by **SGS TECNOS S.A.U**. The invoices of material and energy consumption have been collected and tested. The study covers at least 95% of materials and energy per module and at least 99% of total use of materials and energy of each unit process.

4.11 Lifecycle and compliance

This EPD includes the steps shown in Figure 1. This statement is from cradle to gate.

This statement may not be comparable with those developed in other programmes or according to different reference documents; in particular it may not be comparable with Declarations not prepared in accordance with the UNE-EN ISO 14025:2010 Standard. Similarly, environmental claims may not be comparable if the source of the data is different, the same information modules are not included or are not based on the same data scenarios.

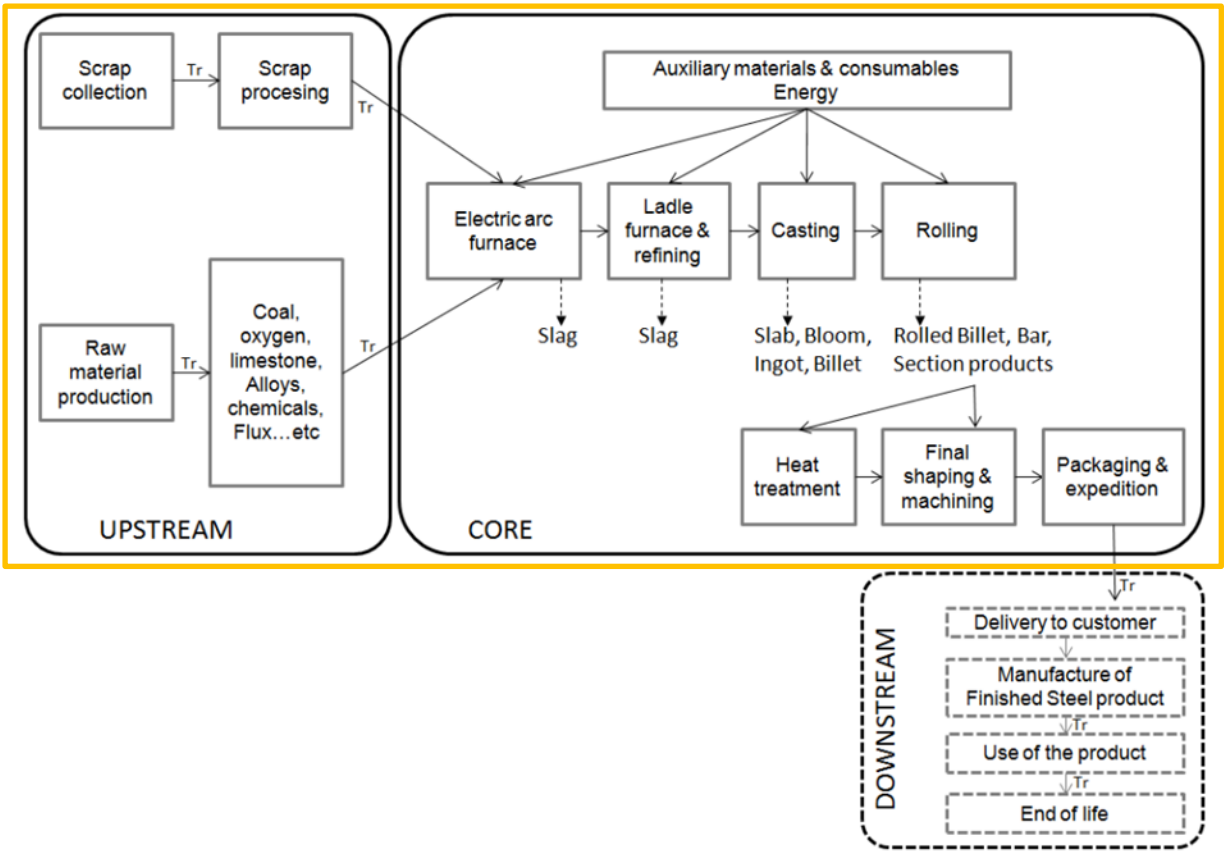


Figure 1: System limits.

5 Life cycle stages

UPSTREAM

Extraction and production of raw materials.

The main component of the product is what is known as scrap. This material is supplied to Acerinox Europa. This material is manufactured with a percentage of recycled steel (post-consumer scrap). This component is not classified as dangerous in the REACH regulation 1907/2006.

Transport of raw materials

All raw and secondary materials are transported by road in trucks with an average load of 16-32 with EURO 6 standard.

Manufacture of primary and secondary packaging

Packaging elements have been included at this stage. Waste produced by the packaging of the raw materials because it is considered not relevant.

CORE

The manufacture of hot-rolled austenitic steel begins in steel mill where scrap steel and other raw materials are melted in electric arc furnace. This process results in a liquid stainless steel that undergoes a refining process for the adjustment of its chemical composition in a converter.

After that, it is molded by casting semi-finished stainless steel products continue to be obtained: slabs (for flat products) and billets (for long product).

Then it is passed to the hot rolling process where the slabs are hot rolled reducing their thickness. Two semi-finished products are distinguished: black coil, which continues its processing in the factory, and plates (10-50 mm thick) that are intended for plates workshop.

Next, a thermal annealing and subsequent process is applied to the black coil pickling.

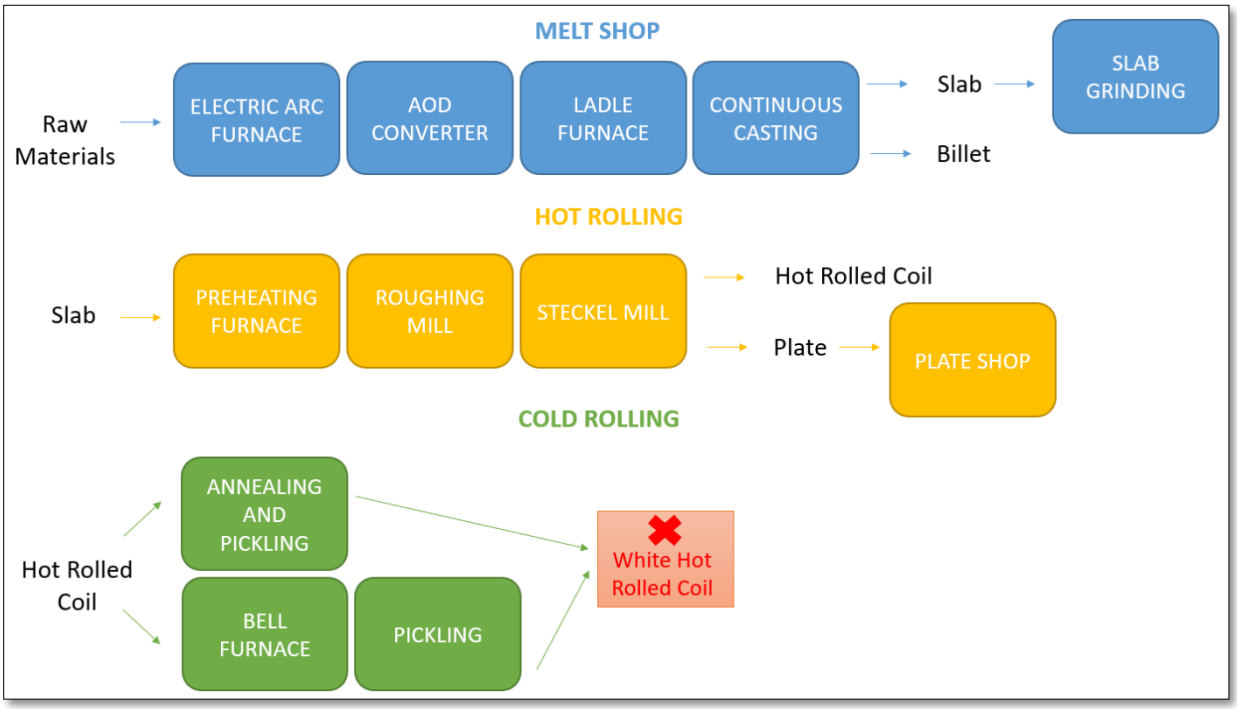


Figure 2: Hot rolling process.

ACERINOX EUROPE 2021 ELECTRICITY MIX	Contribution (%)
Renewable	16,70
Cogen. high efficiency	3,40
CC. Natural Gas	28,00
Coal	5,50
Fuel/Gas	1,60
Nuclear	33,60
Other non-renewable	11,10

For the production process is required, in addition, water and natural gas.

Packaging

	AUSTENITIC HOT ROLLED
Nece (m^3/tn packed)	0,02
Plastic (kg/tn packed)	0,20
Strapping (m/tn packed)	4,87

Recycled material content

Stainless steel is a completely recyclable material. Due to the high value of stainless-steel scrap, it makes it worthwhile for separate collection and sorting, which is therefore the main reason for its high recycling rates. High end-of-life recycling rate indicates how efficiently steel is recycled stainless products.

As indicated, the main component of steel is recycled steel or scrap which is composed of more than 70% of recycled steel.

6 Environmental information

The LCA results are detailed in the tables on the following pages together with interpretation of global impacts produced per declared unit (one tonne of ferritic steel semi-finished hot rolling).

The estimated impact results are only relative statements that do not indicate impact category endpoints, exceedance of threshold values, safety margins or risks.

Simapro 9.3.0.2 software was used to perform the LCA, together with the Ecoinvent 3.8 database.

The following impact models have been used:

- CML-IA baseline V3.07/ EU25.

- ReCiPe 2016 Midpoint (H) V1.06 / World (2010) H.

- EDIP 2003 V1.07 / Default.

- Cumulative Energy Demand V1.11

- EF 3.0 Method (adapted) V1.02 / EF 3.0 normalization and weighting set.

- IPCC 2021

HOT-ROLLED AUSTENITIC STEEL	Unit (EN)			
Core environmental impact indicators[1]		**Upstream**	**Core**	**Total**
Global Warming Potential - fossil fuels (GWP-fossil)	kg CO_2 Eq.	1,67E+03	1,14E+03	2,81E+03
Global Warming Potential - biogenic (GWP-biogenic)	kg CO_2 Eq.	3,00E+01	-1,11E+01	1,89E+01
Global Warming Potential - land use and land use change (GWP-luluc)	kg CO_2 Eq.	1,18E+00	2,27E+00	3,45E+00
Global Warming Potential - total (GWP-total)	kg CO_2 Eq.	1,70E+03	1,13E+03	2,83E+03
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq.	9,94E-05	1,12E-04	2,11E-04
Acidifcation potential, Accumulated Exceedance (AP)	mol H^+ Eq.	1,85E+01	3,48E+00	2,20E+01
Eutrophication potential - freshwater (EP-freshwater)	kg P eq.	7,09E-02	1,47E-02	8,56E-02
Eutrophication potential - marine (EP-marine)	kg N eq.	1,50E+00	5,82E-01	2,08E+00
Eutrophication potential - terrestrial (EP-terrestrial)	mol N eq.	1,77E+01	7,08E+00	2,48E+01
Photochemical Ozone Creation Potential (POCP)	kg NMVOC eq.	7,03E+00	1,96E+00	8,98E+00
Abiotic depletion potential - non-fossil resources (ADPE)	kg Sb eq.	5,22E-02	7,39E-04	5,29E-02
Abiotic depletion potential - fossil resources (ADPF)	MJ, net calorific value	1,81E+04	2,40E+04	4,22E+04
Water (user) deprivation potential (WDP)	m^3 depriv.	2,45E+02	3,41E+02	5,86E+02

[1] Downstream: ND (not declared)

HOT-ROLLED AUSTENITIC STEEL	Unit (EN)			
Indicators describing resource use [2]		Upstream	Core	Total
Use of renewable primary energy as energy carrier (PERE)	MJ, net calorific value	2,39E+03	2,46E+03	4,86E+03
Use of renewable primary energy resources used as raw materials (PERM)	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy (PERT)	MJ, net calorific value	2,39E+03	2,46E+03	4,86E+03
Use of non renewable primary energy as energy carrier (PENRE)	MJ, net calorific value	1,92E+04	2,55E+04	4,48E+04
Use of non renewable primary energy resources used as raw materials (PENRM)	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00
Total use of non renewable primary energy resource (PENRT)	MJ, net calorific value	1,92E+04	2,55E+04	4,48E+04
Use of secondary material (SM)	kg	0,00E+00	5,21E+02	5,21E+02
Use of renewable secondary fuels (RSF)	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00
Use of non renewable secondary fuels (NRSF)	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water (FW)	m^3	6,51E+00	5,42E+00	1,19E+01

[2] Downstream: ND (not declared)

HOT-ROLLED AUSTENITIC STEEL	Unit (EN)			
Environmental information describing waste categories [3]		**Upstream**	**Core**	**Total**
Hazardous waste disposed (HWD)	kg	4,57E-02	1,51E-02	6,08E-02
Non harzardous waste disposed (NHWD)	kg	9,84E+02	2,49E+01	1,01E+03
Radioactive waste disposed (RWD)	kg	5,12E-02	1,37E-01	1,88E-01

HOT-ROLLED AUSTENITIC STEEL	Unit (EN)			
Environmental information describing output flows [4]		**Upstream**	**Core**	**Total**
Hazardous waste disposed (HWD)	kg	1,87E+00	0,00E+00	1,87E+00
Non harzardous waste disposed (NHWD)	kg	0,00E+00	3,46E-01	3,46E-01
Radioactive waste disposed (RWD)	kg	0,00E+00	0,00E+00	0,00E+00
Hazardous waste disposed (HWD)	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00
Non harzardous waste disposed (NHWD)	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00

[3] Downstream: ND (not declared)
[4] Downstream: ND (not declared)

7 References

1. General Programme Instructions of the International EPD® System. Version 3.1.

2. ISO 14020:2000: Environmental labels and declarations — General principles

3. ISO 14025:2006, Environmental labels and declarations –Type III environmental declarations – Principles and procedures (2010).

4. ISO 14040, Gestión ambiental – Análisis del ciclo de vida – Principios y marco de referencia (2006).

5. ISO 14044:2006, Environmental management — Life cycle assessment — Principles and framework (2006).

6. LCA ACERINOX EUROPE (2022).

7.PCR 2015:03 Basic iron or steel products & special steels, except construction steel products. Version 2.0

8.ISSF, I. S. (2020). Retrieved from https: www.worldstainless.org/files/issf/non-image-files/PDF/Team_Stainless/The_Global_Life_Cycle_of_Stainless_Steels.pdf