

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

| | |
|--------------------------|--------------------------------------|
| Owner of the Declaration | INDURA |
| Publisher | Institut Bauen und Umwelt e.V. (IBU) |
| Programme holder | Institut Bauen und Umwelt e.V. (IBU) |
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| Valid to | 13/06/2028 |

Flanges and butt welded fittings INDURA

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ECO PLATFORM

EPD
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General Information

INDURA

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-IND-20230122-CBC1-EN

This declaration is based on the product category rules:

Steel pipes for pressure applications, 01/08/2021
(PCR checked and approved by the SVR)

Issue date

14/06/2023

Valid to

13/06/2028



Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)



Dipl.-Ing. Hans Peters
(Managing Director Institut Bauen und Umwelt e.V.)

Flanges and butt welded fittings

Owner of the declaration

INDURA
Grønlandsvej 1
7480 Vildbjerg
Denmark

Declared product / declared unit

1 kilogram of flange or butt welded fitting in carbon steel or galvanized steel

Scope:

A life cycle assessment according to *ISO 14040/44* has been conducted individually for 1 kg (worst-case product) of the three product groups:

- Flanges of carbon steel
- Flanges of galvanized steel
- Butt welded fittings of carbon steel

Due to the variations in products and production locations, the worst-case EPD approach has been applied and the highest environmental impacts have been declared.

The materials and metal shaping processes originate from a multitude of suppliers which INDURA is not in operational control over. The suppliers' locations are mainly China, but also Vietnam, Cambodia, Slovakia, Romania, and Germany. A conservative average approach has been applied to make the EPD representative for the many suppliers from different locations, thus Chinese and Asian representative data is applied to the calculation in terms of the energy mix and transport distances. INDURAs own facility is located in Vildbjerg, Denmark and emissions from that location are modelled with Danish energy mixes.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

| | |
|--|------------|
| The standard EN 15804 serves as the core PCR | |
| Independent verification of the declaration and data according to ISO 14025:2011 | |
| <input type="checkbox"/> | internally |
| <input checked="" type="checkbox"/> | externally |



Dr.-Ing. Nikolay Minkov,
(Independent verifier)

Product

Product description/Product definition

This EPD includes the following products depending on application for oil, gas and water pipe systems:

- flanges in carbon steel (also referred to as black steel) or galvanized steel (hot dip galvanized)
- butt welded fittings in carbon steel (also referred to as black steel)

The products covered in this EPD are classified and traded under the following TARif Intégré Communautaire (TARIC) codes: 7307931199, 7307931999, 7307939190, and 7307910090.

This EPD specifically excludes the following products:

- products in stainless steel
- flange gaskets
- threaded fittings
- valves.

For the placing on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) the following legal provisions apply: 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonization of the laws of the Member States relating to the making available on the market of pressure equipment and the harmonized standards based on these provisions:

- *EN 1092-1:2018, Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 1: Steel flanges*
- *EN 10253-1:2000, Butt-welding pipe fittings – Part 1: Wrought carbon steel for general use and without specific inspection requirements*
- *EN 10253-2:2021, Butt-welding pipe fittings – Part 2: Non alloy and ferritic alloy steels with specific inspection requirements*

The CE-marking takes into account the proof of conformity with the respective harmonized standards based on the legal provisions above. For the application and use the respective national provisions apply.

Application

Flanges and butt welded fittings are used to connect different pipes with each other and can be used both for transporting oils and in connection with water. The flanges are usually in the form of an annular disc and are attached to the end of a pipe, where screws and nuts are used to secure the flange and connect the pipes. The different types of flanges include threaded flanges, blind flanges, welding ring flanges, loose flanges, welding neck flanges, welding neck collars.

Butt welded fittings have no threads, which means that they can only be permanently connected by means of a weld. Butt welded fittings cover different types of fittings in various shapes and dimension, such as pipe bends, tees, crosses, welded elbows, saddle elbows, concentric reducers, and excentric reducers.

Technical Data

Flanges of carbon steel and galvanized steel follow a range of standards in relation to materials, production and technical properties, depending on the type of flanges. The following standards are relevant for Indura's flanges:

- EN1092-1
- ASME B16.5
- ASME B16.47
- JIS B2220
- EN10025-1

- EN10025-2
- BS EN 10025-2:2019
- EN10222-1
- EN10222-2
- EN10222-4
- EN10028-1
- EN10028-2
- EN10028-6
- DIN 2501
- DIN 2519
- DIN 2527
- DIN 2566
- DIN 2573
- DIN 2576
- DIN 2632
- DIN 2633
- DIN 2634
- DIN 2635
- DIN 2641
- DIN 2642
- DIN 2673
- DIN 28461
- DIN 86030
- DIN 86044
- ASTM A105/A105M

Butt welded fittings of carbon steel follow a range of standards in relation to materials, production and technical properties, depending on the type of fittings. The following standards are relevant for Indura's fittings:

- EN 10253-1
- EN 10253-2
- EN 10217-1
- EN 10217-2
- EN 10217-3
- EN 10217-4
- EN 10216-1
- EN 10216-2
- EN ISO 3183
- ASME B16.9
- ASTM A234
- DIN 2618
- DIN 2619
- DIN 2642
- DIN 28011

Constructional data

| Name | Value | Unit |
|--------------------------|--------------|-------------------|
| Yield strength | 235 - 355 | N/mm ² |
| Tensile strength | 360 - 655 | N/mm ² |
| Elongation | min. 14 - 30 | 1 |
| Hardness | 114-197 | HV |
| Notched-bar impact value | min. 20-27 | Joule |
| Ductility | min. 14-25 | % |

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to

- *EN 1092-1:2018, Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 1: Steel flanges.*
- *EN 10253-1:2000, Butt-welding pipe fittings – Part 1: Wrought carbon steel for general use and without specific inspection requirements.*

Base materials/Ancillary materials

Main material constituents per 1 kg of product in delivery status.

| Name | Value | Unit |
|-----------------------------|-------|------|
| Steel | 97.8 | % |
| Zinc for galvanization | 2.1 | % |
| Rust protection naphtha oil | 0.1 | % |

The flanges and butt welded fittings are produced in carbon steel, following the material norms *EN 10222-2* and *EN 10028-2*.

The main material constituents in the table above are based on the product in delivery status. However, the input of steel varies for the 3 different product groups that are declared. For flanges in carbon steel, the steel input is 1.80 kg, for galvanized flanges the steel input is 1.78 kg, for the fittings in carbon steel the material input is 1.08 kg steel. Additionally, various packaging materials are also calculated per declared unit. This includes 25*10⁻⁷ kg PVC tape, 0.15 kg cardboard, 0.0011 kg wood EUR pallet, and 0.0027 kg high density polyethylene (HDPE)

mesh.

This product/article/at least one partial article contains substances listed in the candidate list exceeding 0.1 percentage by mass: **no**.

This product/article/at least one partial article contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: **no**.

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): **no**.

Reference service life

The life cycle of steel flanges and butt welded fittings is dependent on the respective structural design, use and maintenance. The use phase for steel pipe for oil and gas pipelines is not depicted as they involve maintenance-free and generally durable products. The reference service life is not declared, as the use phase is not included in the scope.

LCA: Calculation rules

Declared Unit

The declared unit is 1 kg of flange or butt welded fitting in carbon steel or galvanized steel, where the highest of each LCIA result is declared on the final EPD.

Declared unit and mass reference

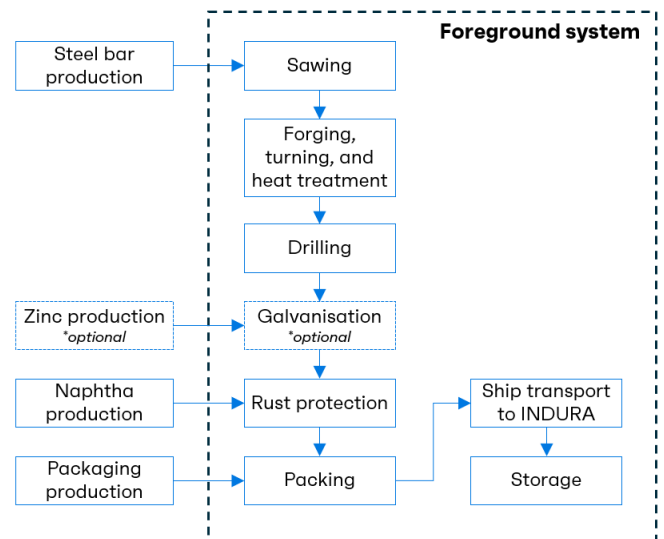
| Name | Value | Unit |
|-----------------------------------|-------|------|
| Declared unit | 1 | kg |
| Conversion factor to metric tonne | 1000 | - |

System boundary

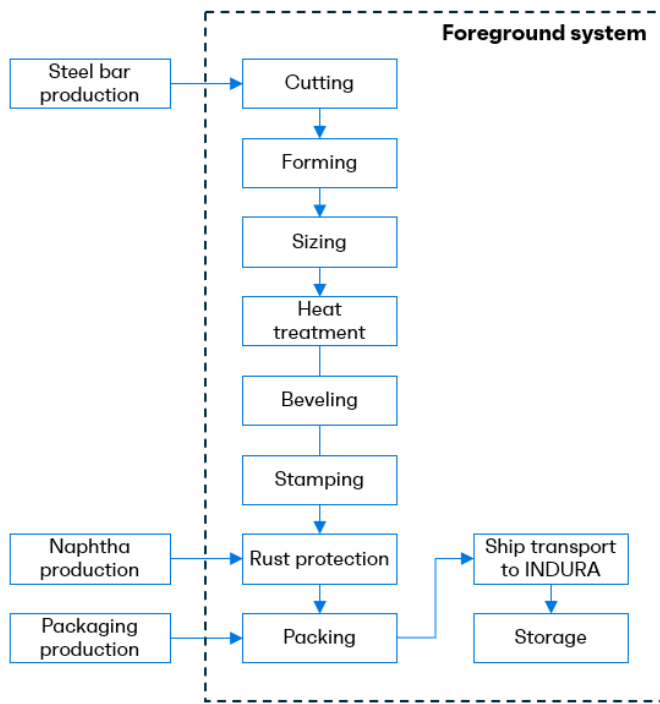
Type of EPD: cradle to gate with Modules C1–C4 and Module D.

The product stage (modules A1-A3) consists of raw material extraction and processing (A1) as well as the transport to the manufacturing location (A2) and activities at the manufacturing facility (A3). In this study, the processes A1-A3 are all included. Wastes and losses of manufacturing processes are included in the unit processes in which they occur according to the polluter pays principle and the modular approach of *EN 15804*.

Practically this means that the metal scrap is modelled so that its waste processing is included in A3 and credited by reducing the input in A1 to the net consumption of steel. However, this credit cannot exceed the input of secondary metals based on a market average. According to the American Iron and Steel Institute (American Iron and Steel Institute, 2012) the average recycled content of steel is 36.9 % when it originates from basic oxygen furnaces. However, for electric arc furnaces, the recycled content is 89.9 %. The sourced materials from Asia that INDURA purchases are most likely originating from basic oxygen furnaces, but the steel market is constrained (all available ferrous metal is generally recycled). For this reason, a total average of the steel recycled content should be applied. It is decided that a conservative approach is used in the calculation and the net input of steel is then modelled as primary (virgin) steel.



The product stages (A1 and A3) for flanges can be seen above.



The product stages (A1 and A3) for butt welded fittings can be seen above.

At the **end-of-life stage** (module C1-C4), INDURAs products are assumed to be manually disassembled from the piping system in which it has been installed. As a result, no processes have been added to the C1 module. Most customers (>93%) are located in Northern Europe (Scandinavia, Germany and Benelux), thus the transportation distances, technology and waste processing will be modelled accordingly. For the waste processing, it is assumed that the product itself will be recycled

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The biogenic carbon content in the flanges or fittings leaving the factory gate is 0 %.

The biogenic carbon content in the accompanying packaging is 46 %, as it mainly consists of cardboard and wood pallet.

Information on describing the biogenic Carbon Content at factory gate

| Name | Value | Unit |
|---|-------|------|
| Biogenic carbon content in product | 0 | kg C |
| Biogenic carbon content in accompanying packaging | 0.07 | kg C |

Packaging is included and declared in module A3. However, since module A5 is not declared in this EPD, the disposal of the packaging material on the construction site is shown below including waste amounts and the respective waste scenarios. Per declared unit (1 kg) the following packaging wastes occur:

- Tape of PVC: 0.00003 kg assumed for landfilling
- Cardboard box: 0.150 kg assumed for recycling
- EUR-pallet of wood: 0.0011 kg assumed for incineration
- Mesh netting of HDPE: 0.0027 kg assumed for recycling.

as metal. 5 % are considered lost during the recycling process and are modelled as inert material landfilling. End-of-life treatment of the packaging is not included in the study.

Benefits and loads beyond the system boundaries (module D) include the potential benefits from reuse, recycling and recovery potentials that are outside the scope of the study. This would include all the flows leaving the product system having passed the end-of-waste stage, thereby allowing the use of them as a substitution for primary material in another product system. Thus, the system will get credit for recycling the collected steel. 5 % are considered lost in the sorting process, thus 95 % of the product is credited in module D.

As the steel scrap from production processes is credited in the A1-A3 modules, only the end-of-life product will be credited in module D. The scrap should however first reach functional equivalence to steel, which requires it to be processed using an electric arc furnace (EAF) process. The system is then credited with the avoided production of virgin steel produced using the basic oxygen furnace (BOF) process.

Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: Denmark

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. Furthermore, in order to ensure comparability between EPDs background databases should be consistent. For this declaration, ecoinvent v3.9 has been used.

End of life (C1-C4)

| Name | Value | Unit |
|----------------------|-------|------|
| Collected separately | 1 | kg |
| Recycling | 0.95 | kg |
| Landfilling | 0.05 | kg |

Reuse, recovery and/or recycling potentials (D), relevant scenario information

| Name | Value | Unit |
|-----------------|-------|------|
| Collection rate | 95 | % |
| EoL amount | 0.590 | kg |

5 % losses are assumed in the sorting and recycling system. This study is a Model EPD where the worst-case scenarios are declared. As a result, module D declares the lowest possible recycling credit when compared across the three main product groups.

Only the net production of steel scrap is credited for, meaning that the consumption of secondary steel in A1 is subtracted before calculating the credit in module D. The loads associated with the processing of steel scrap must have functional equivalence with steel produced from virgin sources. This is done through an electric arc furnace process (EAF) process. The amount of steel produced from the collected scrap steel is then credited with the production of steel from virgin sources, using a basic oxygen furnace (BOF) process.

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

| Product stage | | | Construction process stage | | Use stage | | | | | | | End-of-life stage | | | | Benefits and loads beyond the system boundaries |
|---------------------|-----------|---------------|-------------------------------------|----------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|----------|---|
| Raw material supply | Transport | Manufacturing | Transport from the gate to the site | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling-potential |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| X | X | X | MND | MND | MND | MND | MNR | MNR | MNR | MND | MND | X | X | X | X | X |

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg flange or butt welded fitting of carbon steel or galvanized steel

| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|----------------------------------|----------|----|----------|-----------|----------|-----------|
| Global Warming Potential total (GWP-total) | kg CO ₂ eq | 5.69E+00 | 0 | 4.18E-03 | 2.21E-02 | 3.08E-04 | -1.11E+00 |
| Global Warming Potential fossil fuels (GWP-fossil) | kg CO ₂ eq | 5.66E+00 | 0 | 4.18E-03 | 2.25E-02 | 3.07E-04 | -1.11E+00 |
| Global Warming Potential biogenic (GWP-biogenic) | kg CO ₂ eq | 2.03E-02 | 0 | 3.31E-06 | -4.64E-04 | 1.61E-07 | 4.36E-03 |
| Global Warming Potential luluc (GWP-luluc) | kg CO ₂ eq | 1.47E-02 | 0 | 2.04E-06 | 2.72E-05 | 1.86E-07 | -2.06E-04 |
| Depletion potential of the stratospheric ozone layer (ODP) | kg CFC11 eq | 9.67E-08 | 0 | 9.16E-11 | 3.54E-10 | 8.9E-12 | -2.4E-08 |
| Acidification potential of land and water (AP) | mol H ⁺ eq | 3.07E-02 | 0 | 1.95E-05 | 2.72E-04 | 2.32E-06 | -4.65E-03 |
| Eutrophication potential aquatic freshwater (EP-freshwater) | kg P eq | 2.24E-03 | 0 | 3.01E-07 | 1.49E-05 | 2.56E-08 | -5.03E-04 |
| Eutrophication potential aquatic marine (EP-marine) | kg N eq | 8.12E-03 | 0 | 7.75E-06 | 6.07E-05 | 8.9E-07 | -1.05E-03 |
| Eutrophication potential terrestrial (EP-terrestrial) | mol N eq | 7.67E-02 | 0 | 8.29E-05 | 6.79E-04 | 9.53E-06 | -1.13E-02 |
| Formation potential of tropospheric ozone photochemical oxidants (POCP) | kg NMVOC eq | 2.88E-02 | 0 | 2.89E-05 | 2.01E-04 | 3.32E-06 | -5.96E-03 |
| Abiotic depletion potential for non fossil resources (ADPE) | kg Sb eq | 7.06E-05 | 0 | 1.33E-08 | 1.59E-06 | 4.33E-10 | -9.75E-06 |
| Abiotic depletion potential for fossil resources (ADPF) | MJ | 6.58E+01 | 0 | 6.07E-02 | 3.07E-01 | 7.71E-03 | -1.03E+01 |
| Water use (WDP) | m ³ world eq deprived | 2.14E+00 | 0 | 3.08E-04 | 5.46E-03 | 2.4E-05 | -1.86E-01 |

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg flange or butt welded fitting of carbon steel or galvanized steel

| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|----------------|----------|----|----------|----------|----------|-----------|
| Renewable primary energy as energy carrier (PERE) | MJ | 5E+00 | 0 | 9.53E-04 | 5.36E-02 | 6.48E-05 | -7.15E-01 |
| Renewable primary energy resources as material utilization (PERM) | MJ | 2.17E+00 | 0 | 0 | 0 | 0 | 0 |
| Total use of renewable primary energy resources (PERT) | MJ | 7.17E+00 | 0 | 9.53E-04 | 5.36E-02 | 6.48E-05 | -7.15E-01 |
| Non renewable primary energy as energy carrier (PENRE) | MJ | 6.55E+01 | 0 | 6.07E-02 | 3.07E-01 | 7.71E-03 | -1.03E+01 |
| Non renewable primary energy as material utilization (PENRM) | MJ | 3.28E-01 | 0 | 0 | 0 | 0 | 0 |
| Total use of non renewable primary energy resources (PENRT) | MJ | 6.58E+01 | 0 | 6.07E-02 | 3.07E-01 | 7.71E-03 | -1.03E+01 |
| Use of secondary material (SM) | kg | 7.96E-01 | 0 | 2.7E-05 | 3.42E-04 | 1.86E-06 | 7.82E-01 |
| Use of renewable secondary fuels (RSF) | MJ | 1.75E-02 | 0 | 3.34E-07 | 1.72E-05 | 3.99E-08 | -8.44E-05 |
| Use of non renewable secondary fuels (NRSF) | MJ | 0 | 0 | 0 | 0 | 0 | 0 |
| Use of net fresh water (FW) | m ³ | 2.32E-02 | 0 | 7.73E-06 | 1.56E-04 | 7.97E-06 | -2.01E-03 |

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg flange or butt welded fitting of carbon steel or galvanized steel

| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|-------------------------------------|------|----------|----|----------|----------|----------|-----------|
| Hazardous waste disposed (HWD) | kg | 6.23E-01 | 0 | 4.08E-05 | 8.24E-04 | 3.7E-06 | -1.64E-01 |
| Non hazardous waste disposed (NHWD) | kg | 8.04E+00 | 0 | 1.27E-03 | 5.85E-02 | 1.11E-04 | -1.98E+00 |
| Radioactive waste disposed (RWD) | kg | 1.77E-05 | 0 | 4.97E-09 | 1.66E-07 | 3.24E-10 | 2.49E-06 |
| Components for re-use (CRU) | kg | 0 | 0 | 0 | 0 | 0 | 0 |
| Materials for recycling (MFR) | kg | 5.14E-01 | 0 | 4.57E-07 | 1E+00 | 3.46E-08 | -6.79E-05 |
| Materials for energy recovery (MER) | kg | 5.56E-05 | 0 | 2.82E-09 | 4.63E-08 | 1.24E-10 | -5.95E-06 |
| Exported electrical energy (EEE) | MJ | 2.13E-02 | 0 | 1E-05 | 3.75E-04 | 4.24E-07 | 1.11E-02 |
| Exported thermal energy (EET) | MJ | 2.64E-02 | 0 | 2.37E-05 | 5.76E-05 | 2.64E-07 | -9.6E-03 |

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 kg flange or butt welded fitting of carbon steel or galvanized steel

| Parameter | Unit | A1-A3 | C1 | C2 | C3 | C4 | D |
|---|-------------------|----------|----|----------|----------|----------|-----------|
| Incidence of disease due to PM emissions (PM) | Disease incidence | 4.62E-07 | 0 | 4.11E-10 | 3.65E-09 | 5.07E-11 | -7.65E-08 |
| Human exposure efficiency relative to U235 (IR) | kBq U235 eq | 2.42E-01 | 0 | 8.34E-05 | 2.74E-03 | 4.85E-06 | 5.38E-02 |

| | | | | | | | |
|--|------|----------|---|----------|----------|----------|-----------|
| Comparative toxic unit for ecosystems (ETP-fw) | CTUe | 4.14E+01 | 0 | 2.95E-02 | 2.37E-01 | 3.58E-03 | -1.85E+00 |
| Comparative toxic unit for humans (carcinogenic) (HTP-c) | CTUh | 3.08E-08 | 0 | 2.33E-12 | 4.19E-11 | 1.38E-13 | 9.95E-09 |
| Comparative toxic unit for humans (noncarcinogenic) (HTP-nc) | CTUh | 1.16E-07 | 0 | 4.71E-11 | 1.75E-09 | 1.65E-12 | -8.18E-09 |
| Soil quality index (SQP) | SQP | 3.19E+01 | 0 | 4.53E-02 | 5.87E-01 | 1.52E-02 | -3.25E+00 |

Disclaimer 1 – for the indicator 'Potential Human exposure efficiency relative to U235'. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', 'potential comparative toxic unit for humans – cancerogenic', 'Potential comparative toxic unit for humans - not cancerogenic', 'potential soil quality index'. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

References

Standards

ASTM A234

ASTM A234/A234M - 22, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

ASME B16.47

B16.47 - 2020, Large Diameter Steel Flanges: NPS 26 through NPS 60, Metric/Inch Standard.

ASME B16.5

B16.5 - 2020, Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24, Metric/Inch Standard.

ASME B16.9

B16.9 - 2018, Factory-Made Wrought Buttwelding Fittings

BS EN 10025

BS EN 10025-2:2019, hot rolled products of structural steel.

Documents provided by IBU:

Product Category Rules for Building-Related Products and Services: Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019 version 1.3

Product Category Rules Part B: Requirements on the EPD for Steel pipes for pressure applications 01/08/2021 (version 1).

EN 15804

EN 15804+A2:2019, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

EN ISO 14040/44

EN ISO 14040:2006, Environmental management – Life cycle assessment - Principles and framework; English version EN ISO 14040:2006 EN ISO 14044:2006, Environment Management – Life Cycle Assessment – Requirements and Instructions; English version EN ISO 14044:2006.

EN 1092-1

Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 1: Steel flanges.

EN 10216-2

Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 2: Non-alloy and alloy steel tubes with specified elevated temperature properties.

EN 10217-1

Welded steel tubes for pressure purposes – Technical delivery conditions – Part 1: Electric welded and submerged arc welded non-alloy steel tubes with specified room temperature properties.

EN 10217-2

Welded steel tubes for pressure purposes – Technical delivery conditions – Part 2: Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties.

EN 10217-3

Welded steel tubes for pressure purposes – Technical delivery conditions – Part 3: Electric welded and submerged arc welded alloy fine grain steel tubes with specified room, elevated and

low temperature properties.

EN 10217-4

Welded steel tubes for pressure purposes – Technical delivery conditions – Part 4: Electric welded non-alloy steel tubes with specified low temperature properties.

EN 10253-1

Butt-welding pipe fittings – Part 1: Wrought carbon steel for general use and without specific inspection requirements.

EN 10253-2

Butt-welding pipe fittings – Part 2: Non alloy and ferritic alloy steels with specific inspection requirements.

EN ISO 3183

Petroleum and natural gas industries – Steel pipe for pipeline transportation systems (ISO 3183:2019).

ISO 14025

Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

JIS B 2220

JIS B 2220:2004, Steel pipe flanges.

Further references

American Iron and Steel Institute. (2012).

CSSBI. From

https://cssbi.ca/assets/resources/Enviro_Fact_Sheet/SRILEED_Recyclontent.pdf [access on 10-12-2022]

Candidate List of Substances of Very High Concern

<https://echa.europa.eu/candidate-list-table> [access on 12-06-23]

EcolInvent 3.9

EcolInvent database version 3.9, cut-off, EN15804 model. LCIA methodology EF v3.1 EN15804. Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. The ecolInvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment.

IBU 2021

Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V., Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021 www.ibu-epd.com

INDURA

<https://www.indura.com/products> [access on 10-12-22]

Ordinance on Biocide Products No. 528/2012

Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products Text with EEA relevance.

SimaPro 2023

LCA Software; PRé Sustainability, Version 9.5

TARIC

TARIC, the integrated Tariff of the European Union.

https://ec.europa.eu/taxation_customs/dds2/taric/taric_consultation.jsp?lang=en [access on 12-06-23]



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