Pre-Certified Environmental Product Declaration for PGS300 Gauge Pressure Transmitter

In accordance with ISO 14025:2006

Programme	The International EPD® System, www.environdec.com
Programme operator	EPD International AB
EPD registration number	S-P-12481
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This is a Pre-Certified EPD	EPD of multiple products (216 products represented by 13 configuration groups: PGS300 LS9 H1A AY A HD1, PGS300 LS9 A1A AY A HD1, PGS300 LS9 H1H AY A HD1, PGS300 LS9 A1A AY S HD1, PGS300 LS9 H1A AY S HD1, PGS300 LS9 H1H AY S HD1, PGS300 RS9 A1A AY A HD1, PGS300 RS9 H1A AY A HD1, PGS300 RS9 H1H AY A HD1, PGS300 RS9 A1A AY S HD1, PGS300 RS9 H1A AY S HD1, PGS300 RS9 H1H AY S HD1, PGS300 VS9 H1A AY A HD1; see Annex I for more information), based on the worst-case results. An EPD should provide current information, and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com.

Programme information

Programme	The International EPD System
Address of Program Operator	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website	www.environdec.com
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Accountabilities for PCR, LCA and independent, third-party verification		
Product Category Rules (PCR)	General Programme Instructions (GPI)	
Life cycle assessment (LCA)	LCA accountability: 2B Srl	
Third-party verification	Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: • Pre-certified EPD verification by accredited certification body • Third party verification: RINA Services is an approved certification body accountable for the third-party verification • The certification body is accredited by: ACCREDIA	
Procedure for follow-up of data during EPD validity involves third party verifier:	☐ YES	☒ NO

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EPDs within the same product category but from different programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.

Company information

ABB is a leading global technology company that energizes the transformation of society and industry to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels. With a history of excellence stretching back more than 140 years, ABB's success is driven by about 105,000 talented employees in over 100 countries.

At the heart of industrial digital transformation, our smart instrumentation, analyzers and digital solutions are trusted to tackle some of the world's toughest measurement challenges, supporting sustainability goals through measurement.

Owner of the EPD	ABB S.p.A., Via Luigi Vaccani, 4, 22010 Tremezzina CO (Italy) | Nunzio Bonavita: nunzio.bonavita@it.abb.com
The production facilities are certified according to the following management systems	ISO 9001, ISO 14001 and ISO 45001
Name and location of production sites	• ABB S.p.A. Tremezzina, Via Luigi Vaccani, 4, 22010 – Ossuccio, Tremezzina (CO) – Italy; • ABB India Limited, Plot No. 4A 5 & 6, 2nd Phase – Bangalore - Karnataka - India • ABB Engineering (Shanghai) Ltd., No. 4528, Kangxin Highway, - Shanghai - P.R. China • ABB Inc., 125 E. COUNTY LINE ROAD - Warminster – Pennsylvania (PA) - U.S.A. • ABB Inc., 7051 Industrial Boulevard – Bartlesville – Oklahoma (OK) – U.S.A.

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ABB Sustainability

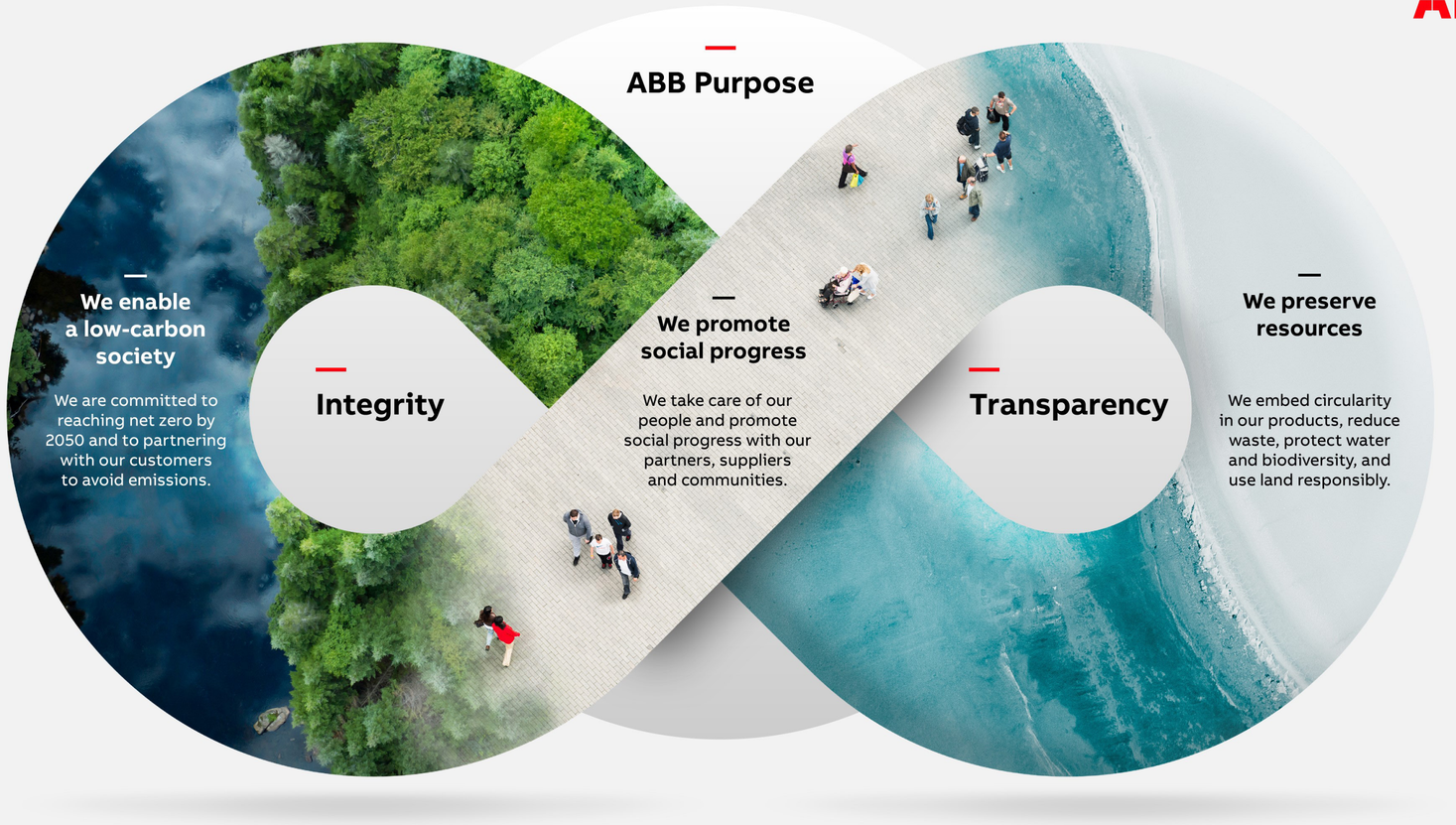
ABB is at the core of accelerating the energy transition. Every day, we empower customers across the globe to optimize, electrify and decarbonize their operations.

Our Sustainability Agenda is fully in line with this mission. Guided by recognized best-practice standards and guidance, and embedded across our business, it aims to enable a low-carbon society, preserve resources and promote social progress for a net-zero future. Our actions are underpinned by our culture of integrity and transparency, extending across our value chain.

We believe in an inclusive energy transition to a net-zero future, with lifted-up communities, workers and societies. We respect and promote human rights and dignity, and strive to create safe, fair, and inclusive working environments where our people can thrive.

To preserve the earth's resources for future generations, we are moving to circular business models that eliminate waste and keep products and materials in use. Our Circularity Approach covers all stages of the product life cycle, from design and sourcing, through production and use, all the way to responsible end-of-life services.

To enable a low-carbon society, we are taking action across our value chain. With our technologies, we empower customers to avoid emissions and ramp up renewables. To cut our own greenhouse gas emissions, we follow targets that are aligned with the Net-Zero Standard of the Science Based Targets initiative (SBTi).



Product information

PGS300 Gauge Pressure Transmitter

ABB PGS300 is the all-rounder gauge pressure transmitter suitable for measuring liquid, gas or steam pressure as well as liquid level in an open tank.

The pressure transmitter with piezoresistive technology has a top work and a bottom work. The bottom work consists of a transducer (made of a decoupled transducer and a front-end p-piezo) and a process connection. The top work can be made of aluminium or stainless steel. The product has been launched on the market in February 2024. From a component perspective, the 266GST gauge pressure transmitter has been considered as a representative product for this LCA study.

Description of the product system: All mechanical components for top and bottom works are purchased, but the most critical parts of the bottom work are processed in the ABB production site in Ossuccio (Italy). The bottom work is subsequently sold to five Assembly-To-Order (ATO) factories worldwide for the assembly with the top work. In turn, ATO factories deliver the product to ABB local Sales Units, trade partners or end customers location. The ATO factories are: Ossuccio (IT), Bangalore (IN), Shanghai (CN), Warminster (US), and Bartlesville (US). ATO factories only seel within their respective countries except for ATO in Ossuccio which sells worldwide.

Product identification:	**PGS300**
UN CPC code	4825 (instruments for measuring the pressure of liquids or gases)
Geographical scope	Global
Upper current range limit	20 mA
Lower current range limit	4 mA

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LCA Methodology

Declared unit, Lifespan & Reference Service Life (RSL) and System boundaries

Declared unit

The declared unit is 1 item of PGS300 pressure transmitter with a lifespan of 15 years including its packaging. The PGS300 configuration group n. 3 (which has the highest results for most of the declared environmental impact indicators) and its packaging have a weight of 1,82 kg and 0,922 kg, respectively. During the entire lifespan, the lower and upper current limit values are 4 and 20 mA.

Lifespan and Reference Service Life (RSL)

The lifespan of the product is equal to 15 years. During the entire lifespan, the lower and upper current limit values are 4 and 20 mA. No RSL has been defined because a declared unit has been considered for the LCA study and there is no PCR with defined RSL for the product category under study.

System boundaries

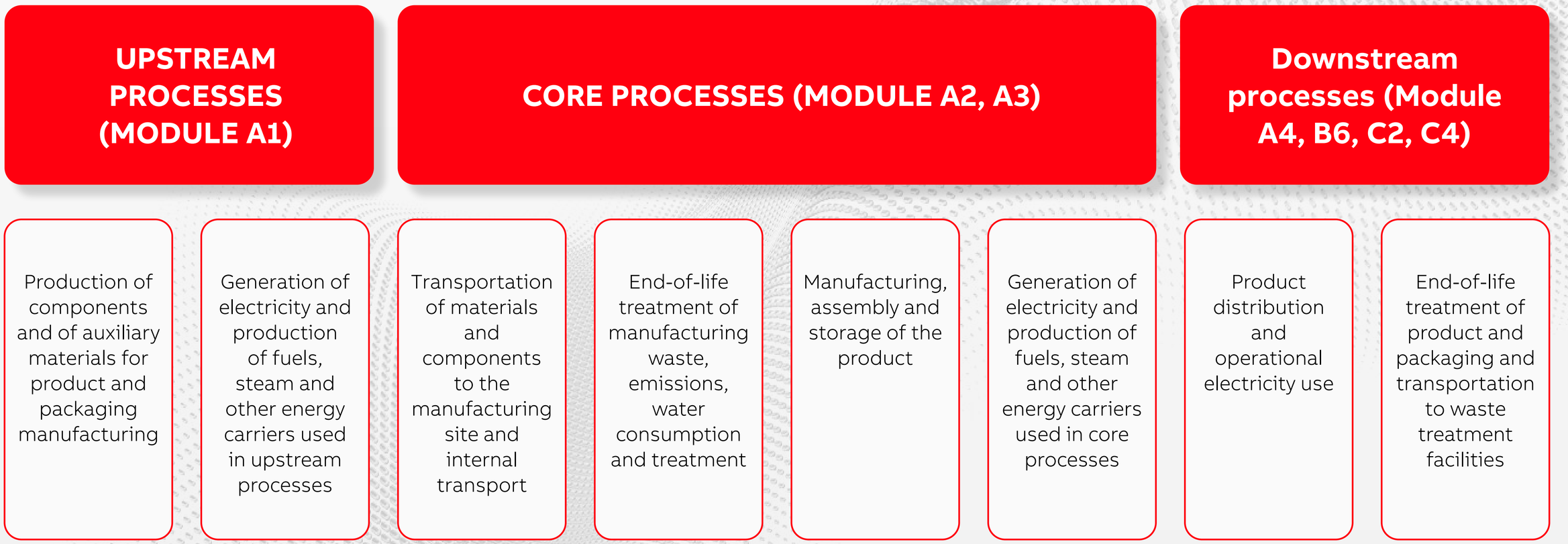
System boundaries are “cradle to grave”. This means that all processes from raw materials extraction to the product and packaging end-of-life are included. The following life cycle stages and corresponding information modules (A1-C4) are considered:

- Upstream processes (from cradle-to-gate): material and components supply (A1)
- Core processes (from gate-to-gate): transport of raw materials and components to manufacturing site and to assembly sites (A2) and manufacturing/assembly of the product (A3)
- Downstream processes (from gate-to-grave): transport from gate to site/point of sale (A4), installation at point of use (A5), use (B1), maintenance (B2), repair (B3), reuse (B4), refurbishment (B5), operational energy use (B6), operational water use (B7), de-installation at point of use (C1), transport (C2), waste processing (C3), and disposal (C4). It is noted that information module B1 (use) does not refer to the whole use phase but it specifically includes: direct emissions, production and use of consumables, and waste treatment of consumables during the use phase.

Information modules A5 (installation at point of use), B1 (use), B2 (maintenance), B3 (repair), B4 (reuse), B5 (refurbishment), B7 (operational water use) and C1 (de-installation at point of use) are considered equal to 0 as product installation and de-installation is manual and direct emissions, use of consumables, maintenance, repair, reuse and refurbishments operations are not foreseen during the use stage. No water is consumed in the use stage. Additionally, no dismantling and any physical pre-treatment has been considered for C3. Module D is not included.

Production and end-of-life processes of infrastructure or capital goods used in the product system have not been included within the system boundaries because they are not considered relevant in terms of their environmental impact. However, data on infrastructure and capital goods have not been subtracted from the used LCI database (i.e. ecoinvent v3.9).

Fig 01: PGS300 System boundaries



Cut-off rules

No cut-off criteria have been applied.

Time-related coverage
All primary data collected from ABB are from 2022. Secondary data refer to the ecoinvent database v3.9 published in 2023.

Geographical coverage
The transducer manufacturing site is in Ossuccio (Italy). Transmitter assembly takes place in five ATO facilities located in Italy, China, India, and USA. Material supply, distribution and disposal is worldwide.

Technological coverage
Technological representativeness refers to the specific production process for primary data. For secondary data, it refers to the ecoinvent database v3.9 published in 2023.

Database for generic data and LCA software
Ecoinvent v3.9 allocation, cut-off by classification (released in 2022) and SimaPro v9.5 (released in 2023).

Allocation criteria
There are no co-products in this product system, so no multi-output allocation is necessary. In case of end-of-life allocation, the “cut-off” approach, also called the “recycled content” approach, has been applied as a default for the allocation of environmental loads. With this approach, outputs subject to recycling are considered as inputs to the next life cycle, and neither environmental burdens nor environmental gains deriving from the recycling process are allocated to the waste stream.

Data and data quality requirements
Foreground data (e.g. on bill of materials of product and packaging, suppliers’ location, company consumption, distribution, electricity consumption during the use phase) have been considered. Input-output mass balance has been checked for all life cycle stages. Background data (e.g. raw materials extraction, transport and processing; transports, waste treatment processes) have been taken from the ecoinvent v3.9 database from the Swiss Centre for Life Cycle Inventories.

The environmental impact associated with proxy data does not exceed the limit of 10% of the default impact categories.

Assumptions and limitations

Main assumptions and limitations in the LCA study have been the following:
- Since PGS300 has been launched on the market in February 2024, data from 266 family have been considered for missing product specific data;
- Primary data for PGS300 configuration group n. 1 (corresponding to the bestseller configuration) have been considered representative for all configuration groups (e.g. for distribution data);
- For all processes for which no primary data were available (e.g. raw materials processing, electricity mixes during use phase) reference has been made to the LCA ecoinvent v3.9 database, allocation, cut off by classification.

Units and quantities
The International System (SI) style, French version (i.e. 1 000,00) is used for thousand separator and decimal mark.

Geographical scope
Global.

Electricity mix during use phase
The use stage of the product only implies operational electricity use, which is the same for all 13 configuration groups as the electricity consumption is related to the output signal which is common to all of them.

For the use phase, the electricity consumption mixes have been modelled based on the distribution scenarios. Table 1 summarizes the electricity consumption process selected for each distribution country:

Table 1: Modelling of electricity mixes during the use phase.

ATO facility	Distribution country	%	Ecoinvent process
Ossuccio (IT)	America	22,5	Electricity, low voltage {AR}| market for electricity, low voltage | Cut-off, S
	Korea	16,0	Electricity, low voltage {KR}| market for electricity, low voltage | Cut-off, S
	Canada	13,1	Electricity, low voltage {CA}| market group for electricity, low voltage | Cut-off, S
	Europe	27,8	Electricity, low voltage {RER}| market group for electricity, low voltage | Cut-off, S
	Asia Oceania	20,6	Electricity, low voltage {EG}| market for electricity, low voltage | Cut-off, S
Bangalore (IN)	India	100	Electricity, low voltage {IN}| market group for electricity, low voltage | Cut-off, S
Bartlesville (USA)	USA	100	Electricity, low voltage {US}| market group for electricity, low voltage | Cut-off, S
Shanghai (CN)	China	100	Electricity, low voltage {SGCC}| market group for electricity, low voltage | Cut-off, S
Warminster (USA)	USA	87,3	Electricity, low voltage {US}| market group for electricity, low voltage | Cut-off, S
	Canada	12,7	

The total energy consumption (TEC) for the equipment during the entire reference service life has been calculated with the following equation:

$$\text{TEC [kWh]} = \frac{P_{on} * T_{om} * 365\ \text{days} * \text{Lifespan}}{10^6} = 37{,}8$$

Where:
- P_{on} [mW] is the power consumed by the device in standard operating on-mode, equal to 288 mW;
- T_{on} is the time spent by the device in standard operating on-mode, equal to 24 h;
- Lifespan is the service life of the product, equal to 15 years;
- 10^6 is the conversion factor that allows the energy consumed in kWh over the product's service life to be expressed.

End-of-Life

The end-of-life processes have been modelled based on the distribution scenarios. A 100% collection rate has been assumed for both product and packaging disposal. Additionally, as most of the distribution takes place outside of Europe, all waste treatments have been modelled as {RoW} ecoinvent processes. Incineration with energy (electricity and thermal energy) recovery has been assumed in all countries and for all materials with a low heating value (LHV) higher than zero (e.g. plastics, rubber, cardboard, paper). Transport by lorry (Transport, freight, lorry 3.5-7.5 metric ton, EURO3 {RoW}| transport, freight, lorry 3.5-7.5 metric ton, EURO3 | Cut-off, S) of 100 km has been considered for product and packaging disposal.

No primary end-of-life information are available. For packaging disposal, the statistical average data from OECD database were considered, relating to landfill, incineration and recycling rates for America, Asia Oceania, Canada, Europe, Korea, and United States (which have been selected based on distribution data).

The end-of-life scenario provided by the IEC/TR 62635 document has been adopted as it is a sector-specific guideline with end-of-life data for electric and electronic equipment. Table D.4 “Recycling and recovery rate of product parts which go to separation process” from the document with data from Korea has been considered for the {RoW} end-of-life scenario under study.

Further information

The Life Cycle Assessment (LCA) study and the EPD have been carried out by 2B Srl (www.to-be.it) and ABB SpA. More information about the product is available at new.abb.com/products/measurement-products/pressure.

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Content declaration

The analysed 13 configuration groups represent a total of 216 configurations and they have been grouped in one single pre-certified EPD as they belong to the same PGS300 family. The complete list of included 216 configurations is reported in Annex I. A weighted average based on distribution data has been considered for packaging as ATO facilities have different packaging composition and weight. Packaging is classified as distribution packaging.

Since the declared environmental impact indicators differ by more than 10% between the included products, the worst-case results of the included products have been declared. In this case, one unit of product and packaging has been identified for the content declaration (including information on product weight and composition). For this purpose, the configuration group n. 3 has been selected since it has the highest results for most of the declared environmental impact indicators, whereas the reported recycled content of product and biogenic carbon content of packaging correspond to the lowest amounts of any of the included products (Table 2). Recycled content for steel and copper have been assumed based on ecoinvent database v3.9.

Included products contain no SVHC (substances of very high concern) on the Candidate List published by ECHA (European Chemicals Agency) in a concentration more than 0,1 % (w/w).

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Table 2: Product and packaging composition of PGS300 configuration group n. 3 with the recycled content of product and biogenic carbon content of packaging corresponding to the lowest amounts of any of the included products.

Product composition of PGS300 configuration group n. 3 with the recycled content corresponding to the lowest amounts of any of the included products				
Material	**Weight (kg)**	**Percentage (%)**	**Pre-consumer recycled content (kg)**	**Pre-consumer recycled content (%)**
Aluminium	1,00E+00	55,0	0	0
Steel	6,12E-01	33,5	2,86E-01	15,7
Polycarbonate (PC)	7,45E-02	4,08	0	0
Polyamide (PA)	4,12E-02	2,26	0	0
Copper	1,76E-02	0,97	3,53E-03	0,19
Rubber	1,62E-02	0,89	0	0
Lubricants	1,20E-02	0,66	0	0
Polyethylene (PE)	1,00E-02	0,55	0	0
Chemicals, organic	9,25E-03	0,51	0	0
Plastics	7,55E-03	0,41	0	0
Printed wiring board (PWB)	6,63E-03	0,36	0	0
Polyvinylchloride (PVC)	5,83E-03	0,32	0	0
Ceramics	5,17E-03	0,28	0	0
Tin	1,00E-03	0,05	0	0
Glass	9,45E-04	0,05	0	0
Polyurethane (PUR)	8,60E-04	0,05	0	0
Polypropylene (PP)	3,56E-04	0,02	0	0
Other	1,59E-04	0,01	0	0
Total product weight	1,82E+00			

Packaging composition of PGS300 configuration group n. 3 with the biogenic carbon content of packaging corresponding to the lowest amounts of any of the included products				
Material	**Weight (kg)**	**Percentage (%)**	**Pre-consumer recycled content (kg)**	**Pre-consumer recycled content (%)**
Cardboard	5,82E-01	63,1	2,50E-01	27,1%
Paper	1,98E-01	21,5	5,95E-02	6,45%
PP	9,58E-02	10,4	0	0
Others	3,70E-02	4,01	0	0
Steel	4,89E-03	0,53	0	0
PUR	2,76E-03	0,30	0	0
Chemicals, organic	9,78E-04	0,11	0	0
PE	4,45E-05	0,00	0	0
Total packaging weight	9,22E-01			

Table 3: Technical characteristics of PGS300 pressure transmitter are presented in Table 3. The lifespan of the product is equal to 15 years. During the entire lifespan, the lower and upper current limit values are 4 and 20 mA.

Technical characteristics	**PGS300**
Upper current range limit	20 mA
Lower current range limit	4 mA

Environmental performance indicators

Life Cycle Impact Assessment aims at describing the environmental consequences of the environmental loads quantified with the inventory data. The impact assessment is achieved by translating the environmental loads from the inventory results into potential environmental impacts, such as global warming potential, acidification, ozone depletion, etc. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

For this pre-certified EPD, the total worst-case results of all configurations groups for each environmental indicator have been identified. Worst-case results are reported in the following Tables per declared unit, life cycle stage, information module and aggregated form (total).

Environmental impact indicators

The environmental impact indicators are reported per declared unit, per life-cycle stage (i.e. upstream, core and downstream) and in aggregated form (i.e. total), as well as the information modules (i.e. A1-A5, B1-B7, C1-C4), using the default impact categories, impact assessments methods and characterisation factors available at www.environdec.com. Characterization models applied in the LCA study are reported in Annex II.

The impact categories of "abiotic depletion of minerals and metals" may be invalid in LCAs that include capital goods and infrastructure based generic datasets. This is because the LCI data of infrastructure and capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes.

Table 4: Worst-case environmental impact indicators per life cycle stages.

Impact category	Unit	Upstream (A1)	Core (A2-A3)	Downstream (A4-C4)	Total
GWP - Total	kg CO2 eq	4,44E+01	1,84E+01	4,57E+01	1,09E+02
GWP - Fossil	kg CO2 eq	4,46E+01	1,39E+01	4,47E+01	1,03E+02
GWP - Biogenic	kg CO2 eq	2,49E-01	4,48E+00	9,59E-01	5,69E+00
GWP - LULUC	kg CO2 eq	4,94E-02	1,19E-02	6,94E-02	1,31E-01
AP	mol H+ eq	2,86E-01	6,76E-02	2,23E-01	5,77E-01
EP, freshwater	kg P eq	1,59E-02	1,50E-03	2,24E-02	3,98E-02
EP, marine	kg N eq	5,19E-02	1,94E-02	5,14E-02	1,23E-01
EP, terrestrial	mol N eq	5,36E-01	2,55E-01	5,19E-01	1,31E+00
POCP	kg NMVOC eq	1,65E-01	6,47E-02	1,45E-01	3,75E-01
ODP	kg CFC-11 eq	1,35E-05	1,06E-05	2,65E-07	2,43E-05
ADP for minerals and metals (*)	kg Sb eq	2,26E-03	9,81E-05	1,67E-04	2,53E-03
ADP for fossil resources (*)	MJ	4,70E+02	1,30E+02	5,01E+02	1,10E+03
WDP (*)	m3 world eq. deprived	8,85E+00	1,14E+00	5,93E+00	1,59E+01

GWP: Global Warming Potential; LULUC: Land Use and Land Use Change; AP: Acidification Potential; EP: Eutrophication Potential; POCP: Photochemical Ozone Creation Potential; ODP: Ozone Depletion Potential; ADP: Abiotic Depletion Potential; WDP: Water Deprivation Potential

(*)The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.

Table 5: Worst-case environmental impact indicators per information modules.

Impact category	Unit	A1	A2	A3	A4	A5, B1-B5	B6	B7, C1	C2	C3	C4
GWP - Total	kg CO2 eq	4,44E+01	5,91E+00	1,25E+01	3,97E+00	0	4,04E+01	0	1,61E-01	0	1,17E+00
GWP - Fossil	kg CO2 eq	4,46E+01	5,91E+00	8,00E+00	3,96E+00	0	4,03E+01	0	1,61E-01	0	3,00E-01
GWP - Biogenic	kg CO2 eq	2,49E-01	1,74E-03	4,48E+00	2,21E-03	0	7,98E-02	0	1,42E-04	0	8,77E-01
GWP - LULUC	kg CO2 eq	4,94E-02	1,16E-03	1,07E-02	1,81E-03	0	6,74E-02	0	1,54E-04	0	1,79E-05
AP	mol H+ eq	2,86E-01	2,67E-02	4,09E-02	1,93E-02	0	2,03E-01	0	8,92E-04	0	2,45E-04
EP, freshwater	kg P eq	1,59E-02	1,78E-04	1,32E-03	2,76E-04	0	2,21E-02	0	2,32E-05	0	8,27E-06
EP, marine	kg N eq	5,19E-02	1,08E-02	8,60E-03	7,73E-03	0	4,27E-02	0	3,46E-04	0	6,18E-04
EP, terrestrial	mol N eq	5,36E-01	1,16E-01	1,38E-01	8,30E-02	0	4,31E-01	0	3,72E-03	0	9,68E-04
POCP	kg NMVOC eq	1,65E-01	3,63E-02	2,85E-02	2,61E-02	0	1,17E-01	0	1,18E-03	0	3,61E-04
ODP	kg CFC-11 eq	1,35E-05	1,20E-07	1,05E-05	9,51E-08	0	1,66E-07	0	3,51E-09	0	1,09E-09
ADP for minerals and metals (*)	kg Sb eq	2,26E-03	5,42E-06	9,27E-05	1,12E-05	0	1,54E-04	0	1,02E-06	0	6,68E-08
ADP for fossil resources (*)	MJ	4,70E+02	7,86E+01	5,14E+01	5,35E+01	0	4,45E+02	0	2,22E+00	0	3,29E-01
WDP (*)	m3 world eq. deprived	8,85E+00	2,08E-01	9,33E-01	2,29E-01	0	5,65E+00	0	1,50E-02	0	3,75E-02

GWP: Global Warming Potential; LULUC: Land Use and Land Use Change; AP: Acidification Potential; EP: Eutrophication Potential; POCP: Photochemical Ozone Creation Potential; ODP: Ozone Depletion Potential; ADP: Abiotic Depletion Potential; WDP: Water Deprivation Potential

(*)The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.

Environmental performance

Use of resources

The indicators for resource use listed at www.environdec.com/indicators are declared per declared unit, per life-cycle stage and in aggregated form.
For the calculation of Primary energy use indicators, the PCR Construction products v1.3.3 has been taken as reference. This is the only PCR describing how indicators shall be determined and presents three possible options, together with numerical examples for each of them.
Option A has been selected for this study; it states that the energy used as raw materials shall be declared as input to the module/lifecycle step, where it enters in the product system (in this case the Upstream one, with positive value) and the same quantity as output of the module/lifecycle step from which it goes out to be used in another product system or waste (in this case the Downstream phase with negative value).
As explained in the Construction products PCR, the indicator for energy used as raw materials shall reflect the energy input that becomes part of the product and packaging as well as the energy output of the product system independently from how it goes out of the product. In the Downstream, there is no more energy stored in the product and packaging, so the energy used as raw materials considering the overall lifecycle is zero (as per table below).

Table 6: Worst-case mandatory and optional indicators for resource use.

Parameter (mandatory)		**Unit**	**Upstream**	**Core**	**Downstream**	**Total**
Primary energy resources - Renewable	Use as energy carrier	MJ	7,44E+01	1,98E+02	5,58E+01	3,28E+02
	Used as raw materials	MJ	1,08E+01	0,00E+00	-1,08E+01	0,00E+00
	TOTAL	MJ	8,52E+01	1,98E+02	4,50E+01	3,28E+02
Primary energy resources – Non-renewable	Use as energy carrier	MJ	4,62E+02	1,30E+02	5,10E+02	1,10E+03
	Used as raw materials	MJ	8,39E+00	1,96E-02	-8,33E+00	0,00E+00
	TOTAL	MJ	4,70E+02	1,30E+02	5,01E+02	1,10E+03
Parameter (optional)		**Unit**	**Upstream**	**Core**	**Downstream**	**Total**
Secondary material		kg	6,55E-01	0,00E+00	0,00E+00	6,55E-01
Renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Non-renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water		m3	2,66E-01	2,95E-01	2,00E-01	7,60E-01

Environmental performance

Waste production and output flows

The indicators for waste production and output flows as listed at www.environdec.com/indicators are declared per declared unit, per life-cycle stage and in aggregated form.

Table 7: Worst-case optional waste indicators.

Parameter (optional)	Unit	Upstream	Core	Downstream	Total
Hazardous waste disposed	kg	1,20E-03	1,54E-03	9,93E-04	3,74E-03
Non-hazardous waste disposed	kg	2,54E+01	1,41E+00	5,59E+00	3,24E+01
Radioactive waste disposed	kg	3,46E-04	1,65E-04	1,61E-03	2,12E-03

Table 8: Worst-case optional output flow indicators.

Parameter (optional)	Unit	Upstream	Core	Downstream	Total
Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	5,12E-01	1,82E+00	1,50E+00	3,82E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	3,78E-01	3,78E-01
Exported energy, thermal	MJ	0,00E+00	0,00E+00	6,80E-01	6,80E-01

Programme information and references

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Annex I: PGS300 configurations

The 13 PGS300 configuration groups (Table 9) represent a total of 216 configurations included in this pre-certified EPD. Legend of configuration digits is reported in Table 10.

Table 9: Product code of the 13 configuration groups of PGS300 pressure transmitter.

Configuration group n.	Position: 1-16; zd (1-6: Base model; 7: Upper Range Limit; 8-9: Max Working Pressure; 10: Diaphragm Material; 11: Fill fluid; 12: Process Connection material; 13: Process Connection Size; 14: Bolts&Gaskets; 15: Housing material; 16: Communication; zd: Display)										
	1-6	7	8-9	10	11	12	13	14	15	16	zd
1	PGS300	L	S9	A	1	A	A	Y	A	H	D1
2		L		H		A			A		
3		L		H		H			A		
4		L		A		A			S		
5		L		H		A			S		
6		L		H		H			S		
7		R		A		A			A		
8		R		H		A			A		
9		R		H		H			A		
10		R		A		A			S		
11		R		H		A			S		
12		R		H		H			S		
13		V		H		A			A		

Annex I: PGS300 configurations

Table 10 Legend of PGS300 configuration digits

Position	Description	Code	
1-6	Base model	PGS300	All-Rounder gauge pressure transmitter
7	Upper Range Limit	L/D/K	2,5/10/40 bar
		R/T/V	100/413,68/600 bar
8-9	Max Working Pressure	S9	standard by Standard by design according to sensor range
10	Diaphragm Material	AISI 316L	A
		Hastelloy C276	H
11	Fill Fluid	1	Silicone oil
12	Process Connection Material	AISI 316 L	A
		Hastelloy C276	H
13	Process Connection Size	A/B/C	1/2 in -14 NPT female/ 1/2 in -14 NPT male + 1/4 in -18 NPT female (adapter-compatible)/ DIN EN 837-1 G 1/2 in Type B
14	Bolts & Gaskets	Y	None (pressure)
15	Housing material	A/B	Aluminium alloy (Barrel type) / 1/2-14 NPT/ Aluminium alloy (Barrel type) / M20 x 1.5
		S/T	AISI 316L SST (Barrel type) / 1/2-14 NPT/ AISI 316L SST (Bwarrel type) / M20 x 1.5
16	Communication	H	4 - 20 mA + Hart (Including Easy Set up)
zd	Display	D1	Integrated digital LCD display / 2-button keypad - basic

Annex I: PGS300 configurations

Each configuration group represents 18 PGS300 configurations except for configuration groups n. 8 and 13 as the latter represents a single product (which has been considered separately from configuration group n. 8 due to its specific market). A total of 216 configurations have been included and identified with the specific product codes (Tables 11-16).

The configurations grouping was possible considering that the differences among configurations within the same configuration group do not affect the product components in terms of material composition and weight.

Table 11 PGS300 configurations included in configuration groups n. 1 and 2.

Configuration group n. 1	L	S9	A	1	A	A	Y	A	H	D1
	D	S9	A	1	A	A	Y	A	H	D1
	K	S9	A	1	A	A	Y	A	H	D1
	L	S9	A	1	A	A	Y	B	H	D1
	D	S9	A	1	A	A	Y	B	H	D1
	K	S9	A	1	A	A	Y	B	H	D1
	L	S9	A	1	A	B	Y	A	H	D1
	D	S9	A	1	A	B	Y	A	H	D1
	K	S9	A	1	A	B	Y	A	H	D1
	L	S9	A	1	A	B	Y	B	H	D1
	D	S9	A	1	A	B	Y	B	H	D1
	K	S9	A	1	A	B	Y	B	H	D1
	L	S9	A	1	A	C	Y	A	H	D1
	D	S9	A	1	A	C	Y	A	H	D1
	K	S9	A	1	A	C	Y	A	H	D1
	L	S9	A	1	A	C	Y	B	H	D1
	D	S9	A	1	A	C	Y	B	H	D1
	K	S9	A	1	A	C	Y	B	H	D1
Configuration group n. 2	L	S9	H	1	A	A	Y	A	H	D1
	D	S9	H	1	A	A	Y	A	H	D1
	K	S9	H	1	A	A	Y	A	H	D1
	L	S9	H	1	A	A	Y	B	H	D1
	D	S9	H	1	A	A	Y	B	H	D1
	K	S9	H	1	A	A	Y	B	H	D1
	L	S9	H	1	A	B	Y	A	H	D1
	D	S9	H	1	A	B	Y	A	H	D1
	K	S9	H	1	A	B	Y	A	H	D1
	L	S9	H	1	A	B	Y	B	H	D1
	D	S9	H	1	A	B	Y	B	H	D1
	K	S9	H	1	A	B	Y	B	H	D1
	L	S9	H	1	A	C	Y	A	H	D1
	D	S9	H	1	A	C	Y	A	H	D1
	K	S9	H	1	A	C	Y	A	H	D1
	L	S9	H	1	A	C	Y	B	H	D1
	D	S9	H	1	A	C	Y	B	H	D1
	K	S9	H	1	A	C	Y	B	H	D1

Annex I: PGS300 configurations

Table 12 PGS300 configurations included in configuration groups n. 3 - 6

Configuration group n. 3	Configuration group n. 4	Configuration group n. 5	Configuration group n. 6
L S9 H 1 H A Y A H D1	L S9 A 1 A A Y S H D1	L S9 H 1 A A Y S H D1	L S9 H 1 H A Y S H D1
D S9 H 1 H A Y A H D1	D S9 A 1 A A Y S H D1	D S9 H 1 A A Y S H D1	D S9 H 1 H A Y S H D1
K S9 H 1 H A Y A H D1	K S9 A 1 A A Y S H D1	K S9 H 1 A A Y S H D1	K S9 H 1 H A Y S H D1
L S9 H 1 H A Y B H D1	L S9 A 1 A A Y T H D1	L S9 H 1 A A Y T H D1	L S9 H 1 H A Y T H D1
D S9 H 1 H A Y B H D1	D S9 A 1 A A Y T H D1	D S9 H 1 A A Y T H D1	D S9 H 1 H A Y T H D1
K S9 H 1 H A Y B H D1	K S9 A 1 A A Y T H D1	K S9 H 1 A A Y T H D1	K S9 H 1 H A Y T H D1
L S9 H 1 H B Y A H D1	L S9 A 1 A B Y S H D1	L S9 H 1 A B Y S H D1	L S9 H 1 H B Y S H D1
D S9 H 1 H B Y A H D1	D S9 A 1 A B Y S H D1	D S9 H 1 A B Y S H D1	D S9 H 1 H B Y S H D1
K S9 H 1 H B Y A H D1	K S9 A 1 A B Y S H D1	K S9 H 1 A B Y S H D1	K S9 H 1 H B Y S H D1
L S9 H 1 H B Y B H D1	L S9 A 1 A B Y T H D1	L S9 H 1 A B Y T H D1	L S9 H 1 H B Y T H D1
D S9 H 1 H B Y B H D1	D S9 A 1 A B Y T H D1	D S9 H 1 A B Y T H D1	D S9 H 1 H B Y T H D1
K S9 H 1 H B Y B H D1	K S9 A 1 A B Y T H D1	K S9 H 1 A B Y T H D1	K S9 H 1 H B Y T H D1
L S9 H 1 H C Y A H D1	L S9 A 1 A C Y S H D1	L S9 H 1 A C Y S H D1	L S9 H 1 H C Y S H D1
D S9 H 1 H C Y A H D1	D S9 A 1 A C Y S H D1	D S9 H 1 A C Y S H D1	D S9 H 1 H C Y S H D1
K S9 H 1 H C Y A H D1	K S9 A 1 A C Y S H D1	K S9 H 1 A C Y S H D1	K S9 H 1 H C Y S H D1
L S9 H 1 H C Y B H D1	L S9 A 1 A C Y T H D1	L S9 H 1 A C Y T H D1	L S9 H 1 H C Y T H D1
D S9 H 1 H C Y B H D1	D S9 A 1 A C Y T H D1	D S9 H 1 A C Y T H D1	D S9 H 1 H C Y T H D1
K S9 H 1 H C Y B H D1	K S9 A 1 A C Y T H D1	K S9 H 1 A C Y T H D1	K S9 H 1 H C Y T H D1

Annex I: PGS300 configurations

Table 13 PGS300 configurations included in configuration groups n. 7 - 10

Configuration group n. 7	Configuration group n. 8	Configuration group n. 9	Configuration group n. 10
R S9 A 1 A A Y A H D1	R S9 H 1 A A Y A H D1	R S9 H 1 H A Y A H D1	R S9 A 1 A A Y S H D1
T S9 A 1 A A Y A H D1	T S9 H 1 A A Y A H D1	T S9 H 1 H A Y A H D1	T S9 A 1 A A Y S H D1
V S9 A 1 A A Y A H D1	R S9 H 1 A A Y B H D1	V S9 H 1 H A Y A H D1	V S9 A 1 A A Y S H D1
R S9 A 1 A A Y B H D1	T S9 H 1 A A Y B H D1	R S9 H 1 H A Y B H D1	R S9 A 1 A A Y T H D1
T S9 A 1 A A Y B H D1	V S9 H 1 A A Y B H D1	T S9 H 1 H A Y B H D1	T S9 A 1 A A Y T H D1
V S9 A 1 A A Y B H D1	R S9 H 1 A B Y A H D1	V S9 H 1 H A Y B H D1	V S9 A 1 A A Y T H D1
R S9 A 1 A B Y A H D1	T S9 H 1 A B Y A H D1	R S9 H 1 H B Y A H D1	R S9 A 1 A B Y S H D1
T S9 A 1 A B Y A H D1	V S9 H 1 A B Y A H D1	T S9 H 1 H B Y A H D1	T S9 A 1 A B Y S H D1
V S9 A 1 A B Y A H D1	R S9 H 1 A B Y B H D1	V S9 H 1 H B Y A H D1	V S9 A 1 A B Y S H D1
R S9 A 1 A B Y B H D1	T S9 H 1 A B Y B H D1	R S9 H 1 H B Y B H D1	R S9 A 1 A B Y T H D1
T S9 A 1 A B Y B H D1	V S9 H 1 A B Y B H D1	T S9 H 1 H B Y B H D1	T S9 A 1 A B Y T H D1
V S9 A 1 A B Y B H D1	R S9 H 1 A C Y A H D1	V S9 H 1 H B Y B H D1	V S9 A 1 A B Y T H D1
R S9 A 1 A C Y A H D1	T S9 H 1 A C Y A H D1	R S9 H 1 H C Y A H D1	R S9 A 1 A C Y S H D1
T S9 A 1 A C Y A H D1	V S9 H 1 A C Y A H D1	T S9 H 1 H C Y A H D1	T S9 A 1 A C Y S H D1
V S9 A 1 A C Y A H D1	R S9 H 1 A C Y B H D1	V S9 H 1 H C Y A H D1	V S9 A 1 A C Y S H D1
R S9 A 1 A C Y B H D1	T S9 H 1 A C Y B H D1	R S9 H 1 H C Y B H D1	R S9 A 1 A C Y T H D1
T S9 A 1 A C Y B H D1	V S9 H 1 A C Y B H D1	T S9 H 1 H C Y B H D1	T S9 A 1 A C Y T H D1
V S9 A 1 A C Y B H D1		V S9 H 1 H C Y B H D1	V S9 A 1 A C Y T H D1

Annex I: PGS300 configurations

Table 14 PGS300 configurations included in configuration groups n. 11,12 and 13

Configuration group n. 11	R	S9	H	1	A	A	Y	S	H	D1
	T	S9	H	1	A	A	Y	S	H	D1
	V	S9	H	1	A	A	Y	S	H	D1
	R	S9	H	1	A	A	Y	T	H	D1
	T	S9	H	1	A	A	Y	T	H	D1
	V	S9	H	1	A	A	Y	T	H	D1
	R	S9	H	1	A	B	Y	S	H	D1
	T	S9	H	1	A	B	Y	S	H	D1
	V	S9	H	1	A	B	Y	S	H	D1
	R	S9	H	1	A	B	Y	T	H	D1
	T	S9	H	1	A	B	Y	T	H	D1
	V	S9	H	1	A	B	Y	T	H	D1
	R	S9	H	1	A	C	Y	S	H	D1
	T	S9	H	1	A	C	Y	S	H	D1
	V	S9	H	1	A	C	Y	S	H	D1
	R	S9	H	1	A	C	Y	T	H	D1
	T	S9	H	1	A	C	Y	T	H	D1
	V	S9	H	1	A	C	Y	T	H	D1
Configuration group n. 12	R	S9	H	1	H	A	Y	S	H	D1
	T	S9	H	1	H	A	Y	S	H	D1
	V	S9	H	1	H	A	Y	S	H	D1
	R	S9	H	1	H	A	Y	T	H	D1
	T	S9	H	1	H	A	Y	T	H	D1
	V	S9	H	1	H	A	Y	T	H	D1
	R	S9	H	1	H	B	Y	S	H	D1
	T	S9	H	1	H	B	Y	S	H	D1
	V	S9	H	1	H	B	Y	S	H	D1
	R	S9	H	1	H	B	Y	T	H	D1
	T	S9	H	1	H	B	Y	T	H	D1
	V	S9	H	1	H	B	Y	T	H	D1
	R	S9	H	1	H	C	Y	S	H	D1
	T	S9	H	1	H	C	Y	S	H	D1
	V	S9	H	1	H	C	Y	S	H	D1
	R	S9	H	1	H	C	Y	T	H	D1
	T	S9	H	1	H	C	Y	T	H	D1
	V	S9	H	1	H	C	Y	T	H	D1
Configuration group n. 13	V	S9	H	1	A	A	Y	A	H	D1

Annex II: Impact assessment methods

The environmental performance indicators for this pre-certified EPD have been calculated according to the default environmental performance indicators and their methods as described at the website (www.environdec.com/indicators). The source and version of the impact assessment method has been specified in Table 17.

Table 17 - List of impact categories, category indicators, impact assessment method and characterization models used for the pre-certified EPD.

Impact category	Category indicator	Impact assessment method	Characterization model
Climate change	Radiative forcing as Global Warming Potential (GWP100)	EN 15804 + A2 (adapted), Version: February 2023	Bern model - Global warming potential (GWP) over a 100-year time horizon based on IPCC 2021 (Forster et al., 2021).
Acidification	Accumulated Exceedance (AE)	EN 15804 + A2 (adapted), Version: February 2023	Accumulated Exceedance (Seppälä et al. 2006, Posch et al., 2008)
Eutrophication, freshwater	Fraction of nutrients reaching freshwater end compartment (P)	EN 15804 + A2 (adapted), Version: February 2023	EUTREND model (Struijs et al., 2009) as implemented in ReCiPe 2008
Eutrophication, marine	Fraction of nutrients reaching marine end compartment (N)	EN 15804 + A2 (adapted), Version: February 2023	EUTREND model (Struijs et al., 2009) as implemented in ReCiPe 2008
Eutrophication, terrestrial	Accumulated Exceedance (AE)	EN 15804 + A2 (adapted), Version: February 2023	Accumulated Exceedance (Seppälä et al. 2006, Posch et al., 2008)
Photochemical ozone formation	Tropospheric ozone concentration increase	EN 15804 + A2 (adapted), Version: February 2023	LOTOS-EUROS model (Van Zelm et al., 2008) as applied in ReCiPe 2008.
Ozone depletion	Ozone Depletion Potential (ODP)	EN 15804 + A2 (adapted), Version: February 2023	EDIP model based on the ODPs of the World Meteorological Organisation (WMO) over an infinite time horizon (WMO 2014 + integrations)
Resource use, minerals and metals	Abiotic resource depletion (ADP ultimate reserves)	EN 15804 + A2 (adapted), Version: February 2023	van Oers et al., 2002 as in CML 2002 method, v.4.8
Resource use, fossil	Abiotic resource depletion – fossil fuels (ADP-fossil)	EN 15804 + A2 (adapted), Version: February 2023	van Oers et al., 2002 as in CML 2002 method, v.4.8
Water use	User deprivation potential (deprivation-weighted water consumption)	AWARE, Version: 1.2c	Available WAter REmaining (AWARE) model (Boulay et al., 2018; UNEP 2016)