Environmental Product Declaration

In accordance with ISO 14025 for:

Wheel sensor RSR123 & Outdoor equipment

from

Frauscher Sensortechnik GmbH

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Programme information

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com

Product category rules (PCR): Railways, 2013:19, Version 2.11, UN CPC 53212 (Railways)
PCR review was conducted by: Chair: Maurizio Fieschi, The Technical Committee of the International EPD® System Contact via email: info@environdec.com
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: Dr. Niels Jungbluth, ESU-services Ltd., Schaffhausen, Switzerland, www.esu-serivces.ch      Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable.

Company information

Owner of the EPD:
Frauscher Sensortechnik GmbH
+43 7711 2920-0
office@frauscher.com
Gewerbestraße 1 | 4774 St. Marienkirchen | Austria

Description of the organisation: Frauscher Sensortechnik GmbH (Frauscher) is an Austrian company for sensor development based in St. Marienkirchen, Austria. Founded in 1987, the company has expanded to 15 locations worldwide, currently employing a staff of 450 people. Since 2019, Frauscher is part of the Delachaux Group. Frauscher develops and manufactures sensor technology for railways, including wheel sensors, wheel detection systems, axle counters as well as other equipment and solutions to ensure safe and reliable railway operations. Customers include global railway operators, both on a national, regional and local level.

Product-related or management system-related certifications: Since 2006 Frauscher holds an ISO 14001 certification, and the company has been awarded a gold medal in the EcoVadis sustainability rating in May 2021, recognizing its CSR and sustainability agenda. Frauscher follows a regional supply chain strategy, with main suppliers based around the head office in St. Marienkirchen.

Name and location of production site:
Frauscher Sensortechnik GmbH
Gewerbestraße 1 | 4774 St. Marienkirchen | Austria.

Product information

Product name: Wheel sensor RSR123
Product identification: Wheel sensor RSR123 & Outdoor equipment
Product description: The Outdoor unit is a wheel detection system in railway operations, composed of three main parts. (1) The wheel sensor RSR123 is the electrical sensor in the system is based on an inductive principle for wheel detection. The wheel sensor RSR123 is fixed at the rails by means of the rail claw SK150 (2) and bound to a connection cable (3).
The total weight of one Outdoor unit is 10,16 kg. The wheel sensor RSR123 has a weight of 1,22 kg; the rail claw SK150 has a weight of 6,64 kg; and the connection cable has a weight of 2,3 kg.

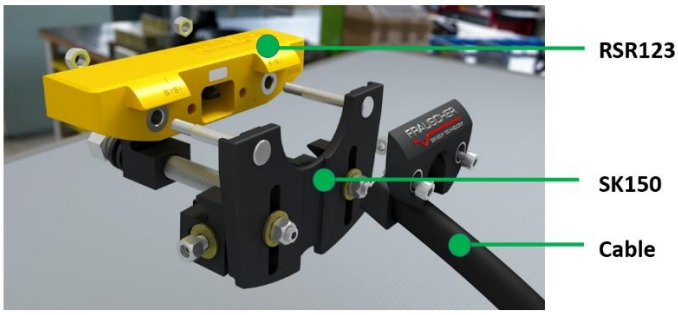

Figure 1: Outdoor unit, including wheel sensor RSR123, rail claw SK150, and connection cable.

The three components of the Outdoor unit are included in this EPD and in the performed Life Cycle Assessment (LCA). They can be described as follows:

(1) The electronic and its inductive coils of the wheel sensor RSR123 are enclosed in a housing, sealed with a PU potting compound, and protected against harsh ambient conditions with an IP rating (protection class IP65 and IP68). It is UV resistant, temperature resistant from -40°C to +85°C, and complies with

electromagnetic compatibility according to EN 50121-4. Due to this robust design, the use time is likely to achieve 30 years or more.

(2) The rail claw is a metal fixing clamp, which allows the sensor to be fixed on a wide variety of rail profiles.

(3) The cable connects the wheel sensor to the track connection box *(GAK – Gleisanschlusskasten)* and has a length of 5 m. It is protected by a 4,8 m long EPDM halogen-free, weather and ozone-resistant hose. The cable is connected to the wheel sensor by means of a connector which is sealed with a PU potting compound.
The track connection box *(GAK – Gleisanschlusskasten) is not included in this EPD.*

UN CPC code: UN CPC 53212 (Railways)
Geographical scope: Europe

LCA information

Functional unit / declared unit: According to the PCR Railways (2019), the declared unit is defined as Outdoor installation for 1 km of railway. For the installation scenario chosen, 2,3 Outdoor units are used per km railway.

Reference service life: Not applicable.

Time representativeness: The data used in the LCA calculation cover the year 2020.

Database(s) and LCA software used: The data used for the LCA was sourced from the database **Ecoinvent v3.6**, system approach cut off by classification**.** The LCA was performed using the software **SimaPro v9.1.1.7**. The LCA followed an attributional approach.
System diagram: The performed LCA covers the upstream (1) and core (2) process in line with the PCR Railways (2019).

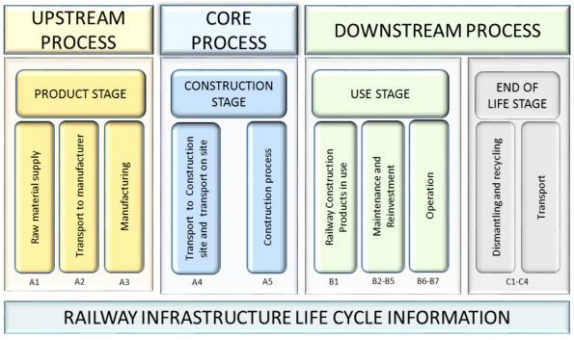

Figure 2: System diagram illustrating the processes included in the product system.

These processes translate to the following lifecycle stages:

(1) Upstream process – product stage: includes the raw material supply (A1), transport to manufacturer (A2), manufacturing (A3).

(2) Core process – construction stage: includes the transport to the construction site (railway location) (A4) and construction process (installation of the outdoor installation at the railways) (A5).

Description of system boundaries: Following the PCR Railways (2019), the LCA included all processes from **cradle-to-gate with options**, from the raw material supply over the manufacturing up to the installation of the outdoor installations at the railways.

Excluded lifecycle stages: This LCA does not consider the life cycle stages beyond the construction process, namely Downstream. Processes B1 to C4 are excluded for the Use stage and End of Life.

More information:
For the LCA, a representative scenario from real life was considered, corresponding to the railway line Poznan - Stettin in Poland. This railway line covers 205 km and has two tracks for placing the wheel sensor RSR123 and its equipment. In total, 941 Outdoor installations are placed in this railway line.

The LCA was performed by the ECODESIGN company engineering & management consultancy GmbH based in Vienna: https://www.ecodesign-company.com.
The contact person for this EPD is Dr. Adriana Díaz.

Content declaration

Product

Materials / chemical substances	Mass, g	%	Environmental / hazardous properties
Wheel sensor RSR123 (including connection cable and protection hose)			
EPDM - Ethylene propylene diene monomer	1 871,07	51,57	
PU - Polyurethane	673,40	18,56	
PPE - Polyphenyl ether	478,42	13,19	
Copper	164,59	4,54	
PA - Polyamide	111,11	3,06	
Stainless Steel	104,70	2,89	
Silicone	56,00	1,54	
TPE-E - Thermoplastic copolyester	55,60	1,53	
Electronic	46,41	1,28	
Epoxy	41,00	1,13	
Steel	20,78	0,57	
Residual	5,26	0,14	
Total wheel sensor RSR123	**3 628,34**	**100,00**	
Rail claw SK150			
Steel	5 575,22	84,02	
Stainless steel	1 059,00	15,96	
Electronic	0,00	0,00	
Residual	1,00	0,02	
Total rail claw SK150	**6 635,22**	**100,00**	

Packaging

The packaging information presented in this EPD follows the LCA considering a European scenario, in which the final product (the wheel sensor RSR123, the cable and the rail claw SK150) is packed at the manufacturing site in St. Marienkirchen (Austria), and further delivered for a reference installation in Poland. The final product is transported from Frauscher Sensortechnik GmbH (St. Marienkirchen, Austria) to Olomouc (428 km); and from Olomouc to Poznan (396 km). As Frauscher delivers their products to business partners (B2B), both the *distribution packaging* as well as the *consumer packaging* arrive at the consumers site. Distribution packaging therefore relates to the outer, robust packaging (secondary packaging) to enable a safe transport, whereas the consumer packaging relates to the primary packaging of the product.

Distribution packaging: The distribution packaging is a plywood box, enabling a safe and robust transport of the final product to be delivered to Frauschers customers. The weight of the wooden box is 1 300g.

Consumer packaging: To secure the product inside the wooden box, cardboard (650g) is used. The products are placed inside a parchment paper (0,60g), together with an instruction guide (2,50g).
For the distribution of one Outdoor installation to a European (construction) railways site, in total 1,96kg packaging are used. The table below shows the materials and weight of the packaging:

Packaging material	Mass, g
Wooden box	1 300
Cardboard	650
Paper	6,20
Plastic strap (*not considered in the LCA due to its minor share of weight*)	3,00

Recycled material

Provenience of recycled materials (pre-consumer or post-consumer) in the product: There are no materials identified or certified as recycled for the declared unit, therefore, recycled materials were not considered in the LCA.

Environmental performance

Potential environmental impact

As indicated in the LCA information section, this EPD is based on an LCA conducted with a systems boundary **cradle to gate with options.**

Following the PCR Railways (2019), the life cycle stages upstream and core were considered, corresponding to the following processes:

Upstream: Raw material supply (A1), Transport the manufacture (A2), Manufacturing (A3);

Core: Transport to the construction site (A4), Construction process (A5).

The following table presents the results for the potential environment impact for the wheel sensor RSR123, the cable, and the rail claw SK150 according to the life cycle stages and processes:

PARAMETER		UNIT	Total	Upstream			Core	
				A1	A2	A3	A4	A5
Global warming potential (GWP)	Fossil	kg CO_2 eq.	1,44E+02	1,30E+02	8,29E-01	9,23E+00	3,83E+00	5,13E-02
	Biogenic	kg CO_2 eq.	3,58E+00	4,17E-01	-3,76E-03	1,09E+00	2,04E-03	2,08E+00
	Land use and land trans-formation	kg CO_2 eq.	1,86E-01	1,21E-01	3,34E-04	6,34E-02	1,34E-03	5,75E-05
	TOTAL	kg CO_2 eq.	1,48E+02	1,31E+02	8,25E-01	1,04E+01	3,83E+00	2,13E+00
Acidification potential (AP)		kg SO_2 eq.	6,96E-01	6,46E-01	3,22E-03	3,20E-02	1,36E-02	9,82E-04
Eutrophication potential (EP)		kg PO_4^{3-} eq.	9,74E-02	8,72E-02	4,70E-04	7,14E-03	1,97E-03	6,55E-04
Formation potential of tropospheric ozone photochemical oxidants (POCP)		kg ethene-eq.	7,78E-02	7,49E-02	1,20E-04	2,01E-03	5,11E-04	3,16E-04
Abiotic depletion potential for non fossil resources (ADPE)		kg Sb eq.	1,43E-02	1,40E-02	2,43E-05	9,17E-05	1,04E-04	1,46E-06
Abiotic depletion potential for Fossil resources (ADPF)		MJ, net calorific value	1,81E+03	1,64E+03	1,21E+01	9,74E+01	5,66E+01	9,98E-01
Water scarcity potential		m^3 eq.	4,53E+01	4,37E+01	3,77E-02	1,42E+00	1,63E-01	1,60E-02

Use of resources

PARAMETER		UNIT	Total	Upstream			Core	
				A1	A2	A3	A4	A5
PERE - Primary energy resources - Renewable	Use as energy carrier	MJ, net calorific value	3,12E+02	2,05E+02	2,48E-01	1,07E+02	8,15E-01	5,16E-02
	Used as raw materials	MJ, net calorific value	0,00[1]	0,00	0,00	0,00	0,00	0,00
	TOTAL	MJ, net calorific value	3,12E+02	2,05E+02	2,48E-01	1,07E+02	8,15E-01	5,16E-02
PENRE - Primary energy resources	Use as energy carrier	MJ, net calorific value	2,18E+03	1,97E+03	1,31E+01	1,36E+02	6,13E+01	1,12E+00
	Used as raw materials	MJ, net calorific value	0,00[2]	0,00	0,00	0,00	0,00	0,00
	TOTAL	MJ, net calorific value	2,18E+03	1,97E+03	1,31E+01	1,36E+02	6,13E+01	1,12E+00
SM - Use of secondary materials		kg	0,00[3]	0,00	0,00	0,00	0,00	0,00
RSF - Use of renewable secondary fuels		MJ, net calorific value	0,00[4]	0,00	0,00	0,00	0,00	0,00
NRSF - Use of Non-renewable secondary fuels		MJ, net calorific value	0,00[5]	0,00	0,00	0,00	0,00	0,00
FW - Net use of fresh water		m^3	1,62E+00	1,39E+00	1,39E-03	2,18E-01	6,08E-03	1,22E-03

[1] No renewable primary energy resources are used *as material* within the outdoor unit.
[2] No non-renewable primary energy resources are used as material within the outdoor unit.
[3] No materials, declared as secondary materials, are used in the system investigated.
[4] No renewable secondary fuels are used in the system investigated.
[5] Non-renewable secondary fuels are not used in the system investigated.

Waste production and output flows

Waste production

PARAMETER	UNIT	TOTAL	Upstream			Core	
			A1	A2	A3	A4	A5
Hazardous waste disposed	kg	1,07E-02	1,04E-02	3,31E-05	1,18E-04	1,51E-04	1,38E-06
Non-hazardous waste disposed	kg	4,10E+01	3,29E+01	5,53E-01	1,01E+00	2,76E+00	3,70E+00
Radioactive waste disposed	kg	6,11E-03	5,18E-03	8,32E-05	4,51E-04	3,94E-04	6,08E-06

Output flows

PARAMETER	UNIT	TOTAL	Upstream			Core	
			A1	A2	A3	A4	A5
Components for reuse	kg	0,00[6]	0,00	0,00	0,00	0,00	0,00
Material for recycling	kg	0,00[7]	0,00	0,00	0,00	0,00	0,00
Materials for energy recovery	kg	0,00[8]	0,00	0,00	0,00	0,00	0,00
Exported energy	MJ	0,00[9]	0,00	0,00	0,00	0,00	0,00

[6] There are no components certified as reused or refurbished in the declared unit.
[7] There are no material flows expressly identified/certified for material recycling for the declared unit.
[8] There are no material flows identified/certified for energy recovery in the declared unit. According to the PCR Railways (2019): "…*the parameter "Materials for energy recovery"* ***does not include materials for waste incineration****. Waste incineration is a method of waste processing, when R1<60% (European Guideline on R1 energy interpretation), and is allocated within the system boundary"*.
[9] When there is no gross amount of "exported energy, electricity" leaving the system boundary, this indicator is set to zero according to the PCR Railways (2019). Moreover, there is no certified export of energy from the system investigated.

Additional information

The wheel sensor RSR123 has proven to be extremely resilient to water ingress and other environmental influences, with a use life of over 30 years. The wheel sensor conforms to protection classes IP65 and IP68 in accordance with EN 60529. This means that it is dustproof and is protected against spray water and prolonged submersion (8 kPa/60 min). The wheel sensor is resistant to UV radiation in accordance with EN 50125-3.

The impact that the installation and operation of the wheel sensor RSR123 and outdoor equipment has on biodiversity and water management has not been analysed in this LCA, as the modules covered are A1 to A5. The outdoor installations are placed and maintained by the railways line operators. It was not possible to assess these impacts for the individual railway infrastructure elements covered in this EPD.

The main parts of the Outdoor unit that are relevant with respect to waste management and recycling are the wheel sensor RSR123 and the rail claw SK150, which become property of the B2B customer at the time of installation. Faulty wheel sensors that are not returned to Frauscher must be disposed of in accordance with country-specific regulations. The disposal of wheel sensors is the responsibility of the respective railway authority according to the regulatory provisions in the jurisdiction and the categories of wastes.

The components with specific declaration of substances is documented in the LCA with information provided by Frauscher as follows: The connection cable for the wheel sensor RSR123 is halogen-free, according to IEC 60754-1 and EN 50267-2-1. The protection hose of this cable is declared as non-halogenated (less than 0,02% halogen content) and compliant with REACH, SVHC and RoHS. According to the technical datasheet available, the production of the hose does not involve nitrosamine.

References

General Programme Instructions of the International EPD® System. Version 3.0.
PCR 2013:19. Railways. Version 2.11
ECODESIGN company GmbH (2021), Life Cycle Assessment - Wheel sensor RSR123 & Outdoor equipment. Frauscher Sensortechnik GmbH. (Internal report).
Frauscher Sensortechnik GmbH (2021), Official homepage: https://www.frauscher.com/de; and https://www.frauscher.com/en.

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