Type III Environmental Product Declaration No. 661/2024

Issuance date: 30.08.2024
Validation: 20.09.2024
Validity date: 30.08.2029

HV and SB bolt sets

Owner of the EPD:

KOELNER RAWLPLUG IP Sp. z o. o.
Address: ul. Kwidzyńska 6,
51-416 Wrocław, Poland
Tel.: +48 46 814 58 92
Website: www.klfs.pl
Contact: lfs@rawlplug.com

EPD Program Operator:

Instytut Techniki Budowlanej (ITB)
Address: Filtrowa 1,
00-611 Warsaw, Poland
Website: www.itb.pl
Contact: Michał Piasecki
m.piasecki@itb.pl
energia@itb.pl

ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

Life cycle analysis (LCA): A1-A5, C1-C4 and D modules in accordance with EN 15804+A2
(Cradle-to-Gate with options)
Product standards: EN 14399-1: 2015, EN 15048-1:2007, EN 1090-2:2018
The year of preparing the EPD: 2024
Service Life: 50 years for standard product
PCR: ITB-PCR A v1.6. (PCR based on EN 15804+A2)
Declared unit: 1 ton
Reasons for performing LCA: B2B
Representativeness: Poland, European, 2023

MANUFACTURER

Koelner Rawlplug IP Sp. z o. o. is one of the leading manufacturers of fasteners in Europe. Over 60 years of experience means that the products they offer meet the highest requirements of customers from various industries. The implemented quality management system, obtained certificates and approvals and their own quality control department ensure high quality of manufactured products.

The company systematically rebuilds and modernizes its machinery park and technological processes, thanks to which they are a fully modern plant, employing highly qualified engineering and technical staff. Production of a HV and SB bolt sets is a line process conducted in the manufacturing plant located in Łańcut (Poland, Figure 1).

Figure 1. Manufacturing plant view

Company has their own, modern research and development facilities. Their team of laboratories consists of the Chemical, Length and Angle, Metallographic and Research and Simulation Laboratories.

The company's mission is to provide customers with the highest quality products and consistently implement both product and process innovations.

PRODUCTS DESCRIPTION AND APPLICATION

The manufactured high-strength HV sets for prestressed connections covered by this EPD comply with the requirements of the harmonized EN 14399 and EN 1090-2 standards. The highest quality of HV sets results, among others, from the implemented and rigorously observed production process. The ERP system adapted to the needs assigns a unique number to each production batch. This allows for 100% identification of HV sets and easy access to detailed test results. The system also collects complete information on individual operations, status and their start and end dates. Production is monitored on an ongoing basis and the data is archived. The high quality of the raw material results from the possibility of identifying the steel grade and the melt number used to produce HV sets. The suppliers of wire rod are only renowned steel mills from Europe, guaranteeing that our quality requirements are met. This allows for the flawless execution of the heat treatment process - one of the most important processes for mechanical properties in the entire production of high-strength HV screws. The process is carried out according to the CQI-9 standard, and the correctness of its application is confirmed by the admission of Koelner Rawlplug IP Sp. z o. o. to the elite group of suppliers of the Volkswagen group. The hot-dip galvanizing process is carried out according to the DSV-GAV standards and the ISO 10684 standard. HV sets are available for sale from stock in the range of M12 - M36 - EN, DE.SB screw sets for non-preloaded connections according to EN 15048. SB sets should be installed using controlled torques, the values of which are given in the installation instructions. Installation in accordance with the recommendations significantly increases the self-locking of the connection, thus reducing the risk of the sets unscrewing. Detailed installation guidelines improve work and increase the repeatability of installation, thus increasing the safety of the connection.

The recommended installation torques were determined by experts in the company's laboratory, using a Kistler type machine. The tests adopted rigorous requirements for the sets. Among other things, the yield strength and maximum clamping force of the screw connection were tested, as well as resistance to elongation by using a high value of the additional rotation angle. The products are available directly from stock in the M10-M30 range.

The factory's products meet the requirements of Regulation (EU) 305/2011 of the European Parliament and of the Council establishing harmonised conditions for the marketing of construction products.

All additional technical information about the product is available on the manufacturer's website.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 ton of HV and SB bolt sets (averaged).

System boundary

The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A3, A4-A5 installation stage, end of life – modules C1-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) in accordance with EN 15804+A2 and ITB PCR A . Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Allocation

The allocation rules used for this EPD are based on general ITB ’s document PCR A. Production of a HV and SB bolt sets is a line process (as presented in Figure 2) conducted in the manufacturing plant located in Łańcut (Poland). Input and output data from the production is inventoried and allocated to the production on the mass basis. The declaration covers all types of HV and SB Bolts produced in the plant. Their production resources and processing stages are basically similar, so it is possible to average the production by product weight.

System limits

In the assessment, all available data from production have been considered, i.e. all raw materials/elements used as per formulation process, utilized thermal energy for heating, and electric power consumption. Thus, material and energy flows contributing less than 1 % of mass or energy have been considered. It can be assumed that the total sum of neglected processes does not exceed 1 % of energy usage and mass per modules A or D. Machines and facilities required during production are neglected. The packaging products (cartoons, foils, wooden pallets, etc.) are included.

Modules A1 and A2: Raw materials supply and transport

Modules A1 and A2 represent the extraction and processing of raw materials (mainly steel wire) and transport to the production site. The manufacturing of a HV and SB bolt sets is carried out with the use of carbon steel. The main material used as an anti-corrosion coating is zinc. Galvanizing is done partly at the production plant and partly at nearby plants, packaging materials come from local Polish suppliers. The steel used comes from domestic suppliers producing steel. Data on the transport of various products to the production plants are collected and modelled for the factory by the assessor. Module A2 (transport) covers truck transport and uses Polish and European averages for fuel data.

Module A3: Production

95% of Steel comes from EAF manufacturing plant in Poland. At the beginning of the production process, the process of "etching the material" is carried out, which involves removing the oxide layer from the surface of the steel wire rod and cleaning it. Additionally, during this process, it is possible to apply a bonder, which is a sub-lubricant layer facilitating plastic processing. The next process is the annealing of the material, in which the aim is to change the mechanical properties of the steel wire in a controlled manner. Then the material is pulled to obtain diameters ranging from 3 mm to 25 mm.

The next production processes are cold forging and heat treatment. After completing these processes, we receive products that can be subjected to further processing - surface treatment, or dark products covered with an emulsion providing long-term corrosion resistance. Surface treatment in the form of alkaline galvanizing is performed in the plant. Other types of applied coatings are carried out by subcontractors. The finished products are subjected to quality control, then packed and stored in the plant's warehouse.
Production processes carried out at Koelner Rawlplug IP Sp. z o. o. is shown in Figure 2.

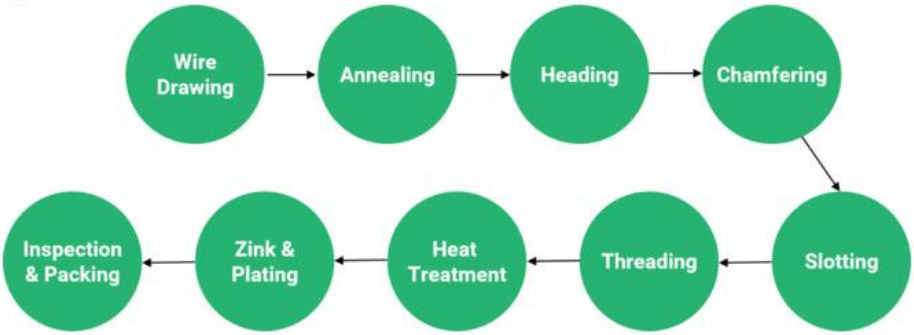

Figure 2. Diagram of the production process of a HV and SB bolt sets

Module A4 and A5: *Transport to consumer and installation*

Vehicle transport at distance 100 km is considered (emission standard: Euro 5) with 100% load capacity. The products are assembled manually using electrical devices (0.025 kWh/kg).

Modules *C and D: End-of-life (EOL)*

Module C1 is very generic based and on literature, in the adapted end-of-life scenario, the de-constructed steel products (crusher, magnetic separator) are transported to a steel mill distant by 100 km on > 16t lorry EURO 5 where are used as steel scrap to produce a new steel. The recycling potential of C3 module is 95% and it is assumed that only 5% of the products will end up in a landfill – C4 module (Table 1). Module D presents credits resulting from the recycling of the steel scrap (used for steel production), calculated in accordance with the approach developed by World Steel Association.

Table 1. End-of-life scenario for a HV and SB bolt sets

Material	Material recovery	Recycling	Landfilling
Steel scrap	100%	98%	2%

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2023 – 31.12.2023 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Data quality

The data selected for LCA originate from ITB-LCI questionnaires completed by Koelner Rawlplug IP Sp. z o. o. and verified during data audit. No data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency is judged as very good. The background data for the processes come from the following resources database Ecoinvent v.3.10. Specific (LCI) data quality analysis was a part of the input data verification.

Assumptions and estimates

The impacts of the representative products were aggregated using weighted average.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN 15804+A2. Emission of greenhouse gases was calculated using the IPCC 2013 GWP method with a 100-year horizon. Emission of acidifying substances, Emission of substances to water contributing to oxygen depletion, Emission of gases that contribute to the creation of ground-level ozone, Abiotic depletion, and ozone depletion emissions where all calculated with the CML-IA baseline method

Additional information

Polish electricity (Ecoinvent v 3.10 supplemented by actual national KOBiZE data) emission factor used is 0.685 kg CO_2/kWh. As a general rule, no particular environmental or health protection measures other than those specified by law are necessary.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 ton of a HV and SB bolt sets produced by Koelner Rawlplug IP Sp. z o. o. in Poland. The following life cycle modules (Table 2) were included in the analysis. The following tables 3-7 show the environmental impacts of the life cycle of selected modules (A1-A5+C1-C4+D).

Table 2 System boundaries for the environmental characteristic of the product.

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)															
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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**
MD	**MD**	**MD**	**MD**	**MD**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MD**	**MD**	**MD**	**MD**	**MD**

Table 3 Life cycle assessment (LCA) results of the product – environmental impacts (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO_2	7.19E+02	8.73E+01	4.76E+02	1.28E+03	1.67E+01	3.43E+00	1.37E+00	1.67E+01	5.18E+00	2.13E-01	-5.48E+02
Greenhouse potential - fossil	eq. kg CO_2	7.35E+02	8.69E+01	4.75E+02	1.30E+03	1.66E+01	3.43E+00	1.37E+00	1.66E+01	5.16E+00	2.10E-01	-5.50E+02
Greenhouse potential - biogenic	eq. kg CO_2	-1.78E+01	2.97E-01	1.17E+01	-5.78E+00	5.68E-02	1.00E-01	4.00E-02	5.68E-02	1.32E-02	2.12E-03	2.36E+00
Global warming potential - land use and land use change	eq. kg CO_2	1.69E+00	3.41E-02	1.44E-01	1.86E+00	6.52E-03	1.20E-03	4.80E-04	6.52E-03	4.87E-03	2.13E-04	-2.13E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	3.35E-05	2.01E-05	1.87E-05	7.23E-05	3.85E-06	7.00E-08	2.80E-08	3.85E-06	2.09E-06	6.40E-08	-1.90E-05
Soil and water acidification potential	eq. mol H+	4.86E+00	3.53E-01	4.32E+00	9.53E+00	6.75E-02	3.80E-02	1.52E-02	6.75E-02	4.85E-02	1.78E-03	-2.18E+00
Eutrophication potential - freshwater	eq. kg P	4.89E-01	5.84E-03	7.19E-01	1.21E+00	1.12E-03	6.50E-03	2.60E-03	1.12E-03	4.81E-04	6.11E-05	-2.32E-01
Eutrophication potential - seawater	eq. kg N	9.25E-01	1.07E-01	6.83E-01	1.71E+00	2.04E-02	5.50E-03	2.20E-03	2.04E-02	1.69E-02	6.13E-04	-4.78E-01
Eutrophication potential - terrestrial	eq. mol N	8.62E+00	1.16E+00	5.39E+00	1.52E+01	2.22E-01	4.65E-02	1.86E-02	2.22E-01	1.85E-01	6.66E-03	-5.22E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	2.98E+00	3.56E-01	1.55E+00	4.88E+00	6.80E-02	1.30E-02	5.20E-03	6.80E-02	5.37E-02	1.93E-03	-2.77E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	8.85E-02	3.08E-04	2.05E-03	9.09E-02	5.89E-05	1.67E-05	6.68E-06	5.89E-05	1.18E-05	7.13E-07	-1.09E-02
Abiotic depletion potential - fossil fuels	MJ	1.03E+04	1.29E+03	7.80E+03	1.94E+04	2.47E+02	5.80E+01	2.32E+01	2.47E+02	1.41E+02	4.86E+00	-4.44E+03
Water deprivation potential	eq. m^3	5.83E+02	5.97E+00	1.48E+02	7.37E+02	1.14E+00	1.20E+00	4.80E-01	1.14E+00	4.49E-01	2.82E-02	-6.43E+01

Table 4 Life cycle assessment (LCA) results of the product – additional impacts indicators (DU: 1 ton)

Indicator	Unit	A1-A4	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA

Table 5 Life cycle assessment (LCA) results of the product - the resource use (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	8.84E+02	1.85E+01	5.58E+02	1.46E+03	3.54E+00	4.30E+00	1.72E+00	3.54E+00	1.23E+00	8.54E-02	-3.76E+02
Consumption of renewable primary energy resources used as raw materials	MJ	7.31E+02	0.00E+00	3.41E+00	7.34E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.17E+03	1.85E+01	5.61E+02	3.75E+03	3.54E+00	4.30E+00	1.72E+00	3.54E+00	1.23E+00	8.54E-02	-3.76E+02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.02E+04	1.29E+03	6.44E+03	1.80E+04	2.47E+02	5.82E+01	2.33E+01	2.47E+02	1.41E+02	5.26E+00	-4.24E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	5.54E+01	0.00E+00	1.36E+03	1.42E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	1.03E+04	1.29E+03	7.80E+03	1.94E+04	2.47E+02	5.82E+01	2.33E+01	2.47E+02	1.41E+02	5.26E+00	-4.24E+03
Consumption of secondary materials	kg	1.12E+03	4.33E-01	8.54E-01	1.12E+03	8.27E-02	5.30E-03	2.12E-03	8.27E-02	2.97E-02	0.00E+00	-7.40E+01
Consumption of renew. secondary fuels	MJ	1.87E+01	4.77E-03	5.01E-03	1.87E+01	9.11E-04	2.95E-05	1.18E-05	9.11E-04	7.77E-04	0.00E+00	-1.01E-01
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	5.15E+00	5.15E+00	0.00E+00	4.70E-02	1.88E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m^3	8.84E+02	1.85E+01	5.58E+02	1.46E+03	3.10E-02	1.58E-02	6.30E-03	3.10E-02	1.55E-01	7.59E-04	-4.00E+00

Table 6 Life cycle assessment (LCA) results of the product – waste categories (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	kg	1.38E+01	1.62E-01	9.01E+00	2.30E+01	2.77E-01	6.00E-04	2.40E-04	2.77E-01	1.50E-01	7.66E-06	-5.62E-02
Non-hazardous waste	kg	4.88E+02	1.45E+00	3.55E+00	4.93E+02	4.92E+00	3.12E-02	1.25E-02	4.92E+00	2.12E+00	2.01E+01	9.47E+01
Radioactive waste	kg	1.98E+03	2.57E+01	1.76E+01	2.02E+03	1.84E-05	4.35E-05	1.74E-05	1.84E-05	9.39E-04	2.96E-05	1.06E-02
Components for re-use	kg	1.66E-02	9.63E-05	5.84E-03	2.26E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.64E-04	6.00E-05	2.40E-05	7.64E-04	2.83E-04	0.00E+00	0.00E+00
Materials for energy recovery	kg	2.48E+00	4.00E-03	1.30E+02	1.33E+02	6.18E-06	5.25E-07	2.10E-07	6.18E-06	3.35E-06	0.00E+00	0.00E+00
Exported Energy	MJ	4.14E-03	3.23E-05	4.00E-01	4.04E-01	0.00E+00	1.73E-01	6.92E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3.) ☒ external ☐ internal
External verification of EPD:. Halina Prejzner, PhD. Eng. LCI audit and verification: Filip Poznański, M.Sc. Eng. LCA, LCI audit and input data verification: Michał Piasecki, PhD., D.Sc., Eng.

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the information provided and contained in EPD. Declarations of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- EN 15048-1:2007 Non-preloaded structural bolting assemblies - Part 1: General requirements
- EN 14399-1: 2015 High-strength structural bolting assemblies for preloading - Part 1: General requirements
- EN 1090-2:2018 Execution of steel structures and aluminium structures - Part 2: Technical requirements for steel structures
- EN ISO 10684:2004 Fasteners - Hot dip galvanized coatings (ISO 10684:2004)
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- ISO 20915:2018 Life cycle inventory calculation methodology for steel products
- KOBiZE Wskaźniki emisyjności CO_2, SO_2, NO_x, CO i pyłu całkowitego dla energii elektrycznej. December 2021
- World Steel Association 2017 Life Cycle inventory methodology report for steel products
- https://ecoinvent.org/

LCA,LCI, input data verification
Michał Piasecki, PhD. D.Sc.

Qualified electronic signature

Head of Thermal Physic, Acoustic and Environment Department
Agnieszka Winkler-Skalna, PhD.

Qualified electronic signature

Instytut Techniki Budowlanej

Instytut Techniki Budowlanej
00-611 Warsaw, Filtrowa 1

Thermal Physics, Acoustics and Environment Department
02-656 Warsaw, Ksawerów 21

CERTIFICATE № 661/2024
of TYPE III ENVIRONMENTAL DECLARATION

Products:

HV and SB bolt sets

Manufacturer:

KOELNER RAWLPLUG IP Sp. z o.o.
ul. Kwidzyńska 6, 51-416 Wrocław, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued on 30th August 2024 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, August 2024