



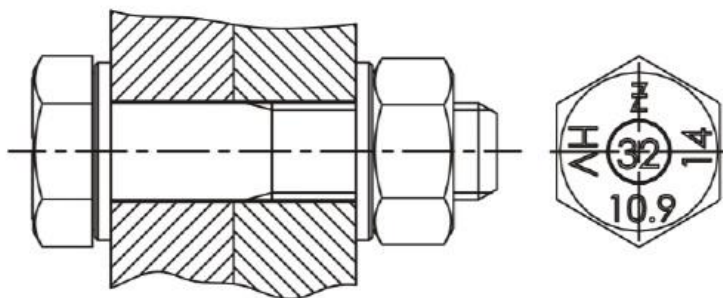
SRUBENA UNIA
1832 r.



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Prestressed joint kits according to EN 14399



Owner of the EPD:

ŚRUBENA UNIA Sp. z o.o.

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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-A3, A4-A5 and D modules in accordance with EN 15804

(Cradle-to-Gate with options)

The year of preparing the EPD: 2023

Product standard: PN EN 1090-2

Service Life: 50 years

PCR: ITB-PCR A

Declared unit: 1 kg

Reasons for performing LCA: B2B

Representativeness: Poland, European, 2022

MANUFACTURER

ŚRUBENA UNIA Sp. z o.o. is one of the largest manufacturers of fasteners in Poland and Europe. Thanks to the use of hot and cold technology, it produces bolts, nuts, screws and drawing products in a very wide range of dimensions and assortments. Currently, in diameters from M5 to M56, it offers products in all



Figure 1 The view of ŚRUBENA UNIA Sp. z o.o. manufactory

classes of mechanical properties made both according to standards and individual requirements. It has been on the market since 1832, and throughout this time it has continuously improved its technological processes to offer even better, more durable and more precise solutions. It supplies the construction, automotive, energy, mining, railroad industries, as well as dealers, distributors and wholesalers throughout the European Union and in many countries outside the EU. A wide range of products, a modern production hall and experience gained over 180 years of activity make ŚRUBENA UNIA Sp. z o.o. a valued exporter, and the quality of our products is known throughout Europe. ŚRUBENA UNIA Sp. z o.o. is part of the Mangata Holding capital group.

ŚRUBENA UNIA Sp. z o.o. has been supplying Polish and European construction companies for several decades. It is a manufacturer and exporter of fasteners used in construction structures. Manufacturer specializes in the production of HV bolts, HV nuts, for the construction of bridges, halls, buildings and supporting structures. In addition: hexagonal bolts and nuts, manufactured according to DIN 7990 for power pole construction, as well as bolts for road construction and scaffolding. Bolts, nuts, rivets, washers, rods and many other fasteners are widely used in the construction industry. They are used in the construction of bridges, halls, buildings, load-bearing structures, power poles, balustrades, guardrails and wherever strong connection of structural elements is required.

PRODUCTS DESCRIPTION

The HV system consists of: HV screws acc. PN EN 14399-4 (DIN 6914) in class 10.9; Nuts according to PN EN 14399-4 (DIN 6915) in class 10; Two washers according to PN EN 14399-6 (DIN 6916).

The HV system consists of: HVP screws acc. PN EN 14399-8 in class 10.9; Nuts according to PN EN 14399-8 in class 10; Two washers according to PN EN 14399-6.

The HR system consists of: HV screws acc. PN EN 14399-3 in class 8.8/10.9; Nuts according to PN EN 14399-3 in class 8/10; Two washers according to PN EN 14399-6.

<p>M12÷M36* Grade: HV - 10.9 HR - 8.8, 10.9</p> <p>* M39÷M56 acc. to DAST- Richtlinie 021</p>	EN	DIN
	EN-14399-3 – Bolt and Nut Assemblies, type HR	DIN 6914 - Bolts
	EN-14399-4 – Bolt and Nut Assemblies, type HV	DIN 6915 - Nuts
	EN-14399-5, 6 – Washers	DIN 6916 - Washers
	EN-14399-8 – Fitted Bolts and Nut Assemblies, type HV	

Figure 2 Prestressed joint kits according to EN 14399 characteristics and product standards

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

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 kg of product.

System boundary

The life cycle analysis of the declared products covers “Product Stage” A1-A3, A4-A5, C1-C4+D modules in accordance with EN 15804 and ITB PCR A (cradle to gate with options). Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculation. 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 the covered steel products is a line process (as presented in Figure 1) conducted in the manufacturing plant located in Żywiec (Poland). Input and output data from the production is inventoried and allocated to the production on the mass basis. The declaration covers a wide range of steel products. Their production resources and processing stages are basically similar, so it is possible to average the production by product weight.

System limits

Minimum 99.0% input materials and 100% energy consumption (electricity, gas, LPG, other) were inventoried in a processing plant and were included in the calculation. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation, utilized thermal energy, and electric power consumption, direct production waste and available emission measurements. Tires consumption for transport was not considered. Substances with a percentage share of less than 0.1% of total mass were excluded from the calculations. The packaging products (wooden pallets) are included.

Modules A1 and A2: *Raw materials supply and transport*

The modules A1 and A2 represent the extraction and processing of raw materials (steel elements) and transport to the production site. The wire rods and bars are semi-products commonly used to produce prefabricated elements and steel structures. Steel used come from a specific suppliers producing steel with EAF technology. For A2 module (transport) European averages for fuel data are applied.

Module A3: *Production*

The product specific manufacturing process line is presented in Figure 3, Figure 4 and Figure 5, an input steel/semi-product is processed to a dedicated shape. Electricity are consumed in the process. The products, after undergoing shaping processes and additional technological operations (like coating) and finally tested for product quality. In the production process, technical gases are used. The production process is depicted schematically as can be seen below (Figures 3-5).

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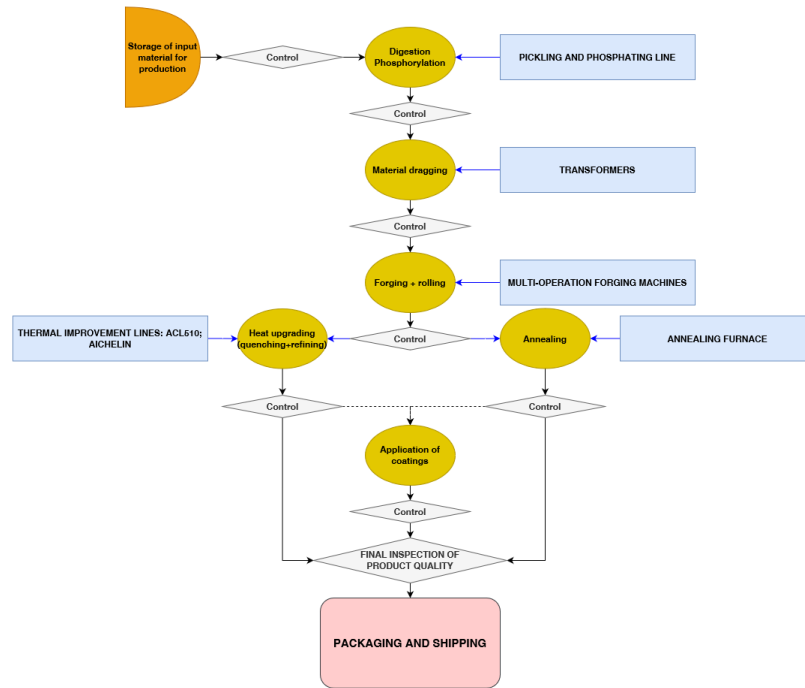


Figure 3 Manufacturing process scheme for forging bolts with cold technology (A3)

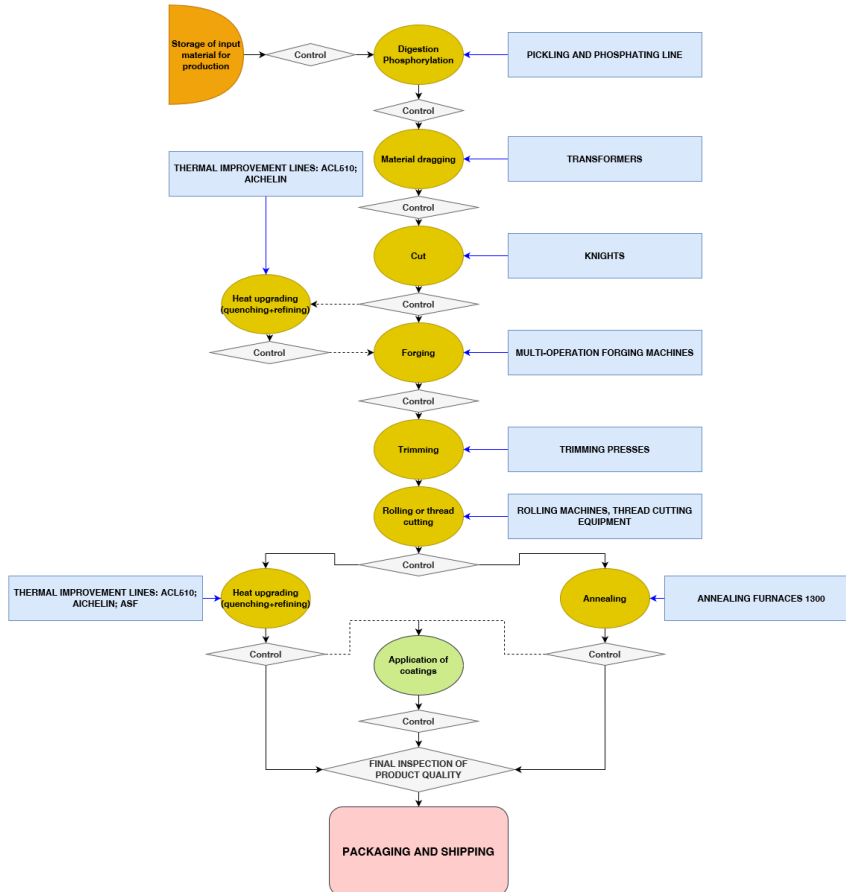


Figure 4 Manufacturing process scheme for forging screws with hot technology (A3)

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Figure 5 Manufacturing process scheme for forging nuts with hot technology (A3)

Module A4: transport to consumer

Vehicle transport at distance 500 km is considered (emission standard: Euro 5) with 100% load capacity.

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

Due to the fact that the declaration covers a wide range of steel products for various purposes and usage scenarios, it is not possible to directly specify the de-construction technology and the amount of energy for disassembly in C1 module (so this module is very generic based on literature). In the adapted end-of-life scenario, the de-constructed steel products 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 98% and it is assumed that only 2% of the products will end up in a landfill – C4 module (Table 2). 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 the steel products

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

Electricity at end-of-life (module C) has been modelled using an average Polish electricity mix as the location where the product reaches end-of-life is unknown.

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2022 – 31.12.2022 (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 ŚRUBENA UNIA 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 good. The background data for the processes come from specific EPD

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(Steel) and the following resources database Ecoinvent v.3.9.1 (other steel inputs, oil, hydrochloric acid, nitrogen, liquefied petroleum gas, foil, paper and carton, EUR-flat pallet, structural timber). Specific (LCI) data quality analysis was a part of the input data verification. Where no background data was available, data gaps were complemented by manufacturer information and literature research.

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

Specific electricity emission factor used is 0.528 kg CO₂/kWh (delivered by supplier). 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 kg of Prestressed joint kits according to EN 14399 produced in Europe. The following life cycle modules (Table 2) were included in the analysis. The following tables 3-6 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

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Table 3 Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	8.26E-01	2.67E-02	8.39E-01	1.69E+00	8.34E-02	3.52E-05	5.28E-03	1.10E-02	1.04E-02	1.06E-04	-4.41E-02
Greenhouse potential - fossil	eq. kg CO ₂	8.56E-01	2.66E-02	8.10E-01	1.69E+00	8.31E-02	3.52E-05	5.28E-03	1.10E-02	1.03E-02	1.05E-04	-4.30E-02
Greenhouse potential - biogenic	eq. kg CO ₂	-3.15E-02	9.08E-05	2.88E-02	-2.54E-03	2.84E-04	1.33E-06	2.00E-04	3.76E-05	1.04E-04	2.68E-07	-1.04E-03
Global warming potential - land use and land use change	eq. kg CO ₂	9.12E-04	1.04E-05	3.47E-04	1.27E-03	3.26E-05	1.60E-08	2.40E-06	4.32E-06	1.05E-05	9.94E-08	-5.50E-05
Stratospheric ozone depletion potential	eq. kg CFC 11	1.88E-08	6.15E-09	2.63E-08	5.13E-08	1.92E-08	9.33E-13	1.40E-10	2.55E-09	3.14E-09	4.26E-11	-3.08E-09
Soil and water acidification potential	eq. mol H+	3.43E-03	1.08E-04	1.10E-02	1.45E-02	3.37E-04	5.07E-07	7.60E-05	4.47E-05	8.70E-05	9.90E-07	-1.63E-04
Eutrophication potential - freshwater	eq. kg P	1.44E-04	1.79E-06	1.86E-03	2.01E-03	5.59E-06	8.67E-08	1.30E-05	7.40E-07	2.99E-06	9.81E-09	2.69E-05
Eutrophication potential - seawater	eq. kg N	9.43E-04	3.26E-05	1.61E-03	2.59E-03	1.02E-04	7.33E-08	1.10E-05	1.35E-05	3.00E-05	3.45E-07	-3.89E-05
Eutrophication potential - terrestrial	eq. mol N	1.01E-02	3.55E-04	1.35E-02	2.40E-02	1.11E-03	6.20E-07	9.30E-05	1.47E-04	3.27E-04	3.77E-06	-3.85E-04
Potential for photochemical ozone synthesis	eq. kg NMVOC	3.46E-03	1.09E-04	3.80E-03	7.37E-03	3.40E-04	1.73E-07	2.60E-05	4.50E-05	9.45E-05	1.10E-06	-1.61E-04
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	3.92E-06	9.42E-08	4.82E-06	8.84E-06	2.95E-07	2.23E-10	3.34E-08	3.90E-08	3.49E-08	2.42E-10	-6.17E-07
Abiotic depletion potential - fossil fuels	MJ	1.29E+01	3.94E-01	1.73E+01	3.06E+01	1.23E+00	7.73E-04	1.16E-01	1.63E-01	2.38E-01	2.89E-03	-6.46E-01
Water deprivation potential	eq. m ³	1.21E-01	1.82E-03	3.48E-01	4.71E-01	5.70E-03	1.60E-05	2.40E-03	7.55E-04	1.38E-03	9.16E-06	-4.40E-02

Table 4 Life cycle assessment (LCA) results for specific product – additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1-A3	A4-A5	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA

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Table 5 Life cycle assessment (LCA) results for specific product - the resource use (DU: 1 kg)

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	2.12E+00	5.66E-03	1.23E+00	3.36E+00	1.77E-02	5.73E-05	8.60E-03	2.34E-03	0.00E+00	0.00E+00	0.00E+00
Consumption of renewable primary energy resources used as raw materials	MJ	2.57E-01	0.00E+00	0.00E+00	2.57E-01	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	2.38E+00	5.66E-03	1.23E+00	3.62E+00	1.77E-02	5.73E-05	8.60E-03	2.34E-03	0.00E+00	0.00E+00	0.00E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	7.94E+00	3.94E-01	1.67E+01	2.50E+01	1.23E+00	7.76E-04	1.16E-01	1.63E-01	0.00E+00	0.00E+00	0.00E+00
Consumption of non-renewable primary energy resources used as raw materials	MJ	2.37E+00	0.00E+00	0.00E+00	2.37E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-6.88E-01
Total consumption of non-renewable primary energy resources	MJ	1.33E+01	3.94E-01	1.75E+01	3.11E+01	1.23E+00	7.76E-04	1.16E-01	1.63E-01	2.58E-01	2.89E-03	-6.88E-01
Consumption of secondary materials	kg	9.80E-01	1.32E-04	1.60E-03	9.82E-01	4.14E-04	7.07E-08	1.06E-05	5.48E-05	0.00E+00	6.07E-07	-1.75E-03
Consumption of renew. secondary fuels	MJ	5.55E-03	1.46E-06	8.61E-06	5.56E-03	4.56E-06	3.94E-10	5.91E-08	6.03E-07	0.00E+00	1.59E-08	-7.97E-06
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	1.34E-02	1.34E-02	0.00E+00	6.26E-07	9.39E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m ³	3.99E-03	4.96E-05	6.27E-03	1.03E-02	1.55E-04	2.10E-07	3.15E-05	2.05E-05	3.72E-05	3.16E-06	-1.11E-04

Table 6 Life cycle assessment (LCA) results for specific product – waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	kg	1.27E-03	4.43E-04	3.63E-04	2.07E-03	1.38E-03	8.00E-09	1.20E-06	1.83E-04	3.75E-07	3.07E-06	-1.55E-06
Non-hazardous waste	kg	1.98E-01	7.86E-03	1.13E-02	2.17E-01	2.46E-02	4.16E-07	6.24E-05	3.25E-03	9.82E-01	4.32E-05	-3.45E-02
Radioactive waste	kg	5.21E-05	2.94E-08	1.34E-05	6.55E-05	9.21E-08	5.80E-10	8.70E-08	1.22E-08	1.45E-06	1.92E-08	-4.15E-06
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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	1.83E-01	1.22E-06	8.47E-03	1.91E-01	3.82E-06	8.00E-10	1.20E-07	5.06E-07	0.00E+00	5.78E-09	0.00E+00
Materials for energy recovery	kg	4.97E-02	9.88E-09	1.55E-07	4.97E-02	3.09E-08	7.00E-12	1.05E-09	4.09E-09	0.00E+00	6.85E-11	0.00E+00
Exported Energy	MJ	2.87E-01	0.00E+00	5.00E-02	3.37E-01	0.00E+00	2.31E-06	3.46E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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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 (sub clause 8.1.3.)	
<input checked="" type="checkbox"/> external	<input type="checkbox"/> internal
External verification of EPD: Halina Prejzner, PhD. Eng.	
LCI audit and verification: Michał Chwedaczuk, 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 for the information provided and contained I 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: Note: 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
- PN-EN 14399-4:2015-04 Zestawy śrubowe wysokiej wytrzymałości do połączeń sprężanych - Część 4: System HV - Zestawy śruby z łbem sześciokątnym i nakrętki sześciokątnej
- PN-EN 14399-3: 2015-04 Zestawy śrubowe wysokiej wytrzymałości do połączeń sprężanych - Część 3: System HR -- Zestawy śruby z łbem sześciokątnym i nakrętki sześciokątnej
- PN-EN 14399-8:2018-10 Zestawy śrubowe wysokiej wytrzymałości do połączeń sprężanych - Część 8: System HV - Zestawy śruby pasowanej z łbem sześciokątnym i nakrętki sześciokątnej
- 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
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- 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 CO₂, SO₂, NO_x, CO i pyłu całkowitego dla energii elektrycznej. December 2021



Instytut Techniki Budowlanej

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Thermal Physics, Acoustics and Environment Department

02-656 Warsaw, Ksawerów 21

CERTIFICATE No 516/2023 of TYPE III ENVIRONMENTAL DECLARATION

Products:

Prestressed joint kits according to EN 14399

Manufacturer:

ŚRUBENA UNIA Sp. z o.o.

ul. Grunwaldzka 5, 34-300 Żywiec, 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.

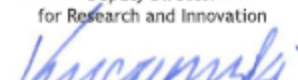
This certificate, issued on 6th September 2023 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics
and Environment Department


Agnieszka Winkler-Skalna, PhD



Deputy Director
for Research and Innovation


Krzysztof Kuczyński, PhD

Warsaw, September 2023