ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Würth Group / Adolf Würth GmbH & Co. KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-AWU-20230570-CBA1-EN
Issue date	21.03.2024
Valid to	20.03.2029

Steel Screws

Adolf Würth GmbH & Co. KG

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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General Information

Adolf Würth GmbH & Co. KG

Programme holder

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

Declaration number

EPD-AWU-20230570-CBA1-EN

This declaration is based on the product category rules:

Screws, 01.06.2023
(PCR checked and approved by the SVR)

Issue date

21.03.2024

Valid to

20.03.2029

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

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Steel Screws

Owner of the declaration

Würth Group / Adolf Würth GmbH & Co. KG
Reinhold-Würth Str. 12-17
74653 Künzelsau
Germany

Declared product / declared unit

1 kg weighted average of dowel-type fasteners with thread.

Scope:

This EPD relates to timber screws, chipboard screws, drilling and tapping screws, screws for plastics, metric screws and dowel-type fasteners with thread made of steel or stainless steel. Depending on the type of screw, these products are generally used for fastening two or more components made of wood, steel or plastic.

The declared environmental data related to 1 kg of steel are based on a weighted average of steel screws in a Würth manufacturing plant, SWG Schraubenwerk Gaisbach GmbH and internationalized with generic data. The holder of the declaration shall be liable for the underlying information and supporting documents; any liability of IBU (Institut Bauen und Umwelt e. V.) with regard to manufacturer information, life cycle assessment data and supporting documents is hereby excluded. The EPD (Environmental Product Declaration) was created in accordance with EN 15804 + A2: 2022-03. In the following, the standard is referred to in simplified form as EN 15804.

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

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

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

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

Product

Product description/Product definition
Dowel-type fasteners with thread, e.g. screws made of steel, are fasteners that can predominantly be used for fastening two or more components. The materials to be fastened or screw-in surfaces can be made of wood, wood materials, plastic, aluminium, steel, stainless steel or other metals.

Pin-shaped connectors, such as screws, are generally manufactured from a wire (steel) and provided with a head on one component side to be tightened. Depending on the application, it can have different shapes, e.g. countersunk head, round head, hexagon head or washer head. For anchoring the pin-shaped connectors, a thread is formed on the opposite side. The thread shape (e.g. wood thread or metric thread) is matched to the screw-in surface and can be designed differently in terms of thread height, thread angle or thread pitch. The point design of the dowel-type fasteners with thread is matched to the application, e.g. wooden tip, drill tip or blunt shape. For protection against corrosion or e.g. for setting a sliding friction, the pin-shaped connectors can be provided with different coatings, for example, zinc or anti-skid coating.

Depending on the application, the additional use of suitable steel or stainless steel seals as well as EPDM seals (ethylene-propylene-diene rubber), washers or nuts is provided. Depending on the application, the dowel-type fasteners with thread can be subject to legal national or European requirements such as the Construction Products Regulation. For example, the following documentation possibilities may be available:

Product according to CPR with hEN:
Regulation (EU) No 305/2011 (CPR) shall apply to the placing of the product on the market in the European Union/European Free Trade Association (EU/EFTA) states (with the exception of Switzerland). The product requires a declaration of performance taking into account the respective EN.

The CE marking shall be applied to the product in compliance with the proof of its conformity with the following harmonized standards based on the mentioned harmonization legislation:

- *EN 14592:2008-04*; timber structures - dowel-type fasteners

The use shall be subject to the respective national provisions.

Product according to CPR with ETA:
Regulation (EU) No 305/2011 (CPR) shall apply to the placing of the product on the market in the European Union/European Free Trade Association (EU/EFTA) states (with the exception of Switzerland). The product needs a declaration of performance taking into account the respective *ETA* such as *ETA-10/0184, ETA-13/0210 or ETA-11/0190* and CE marking.

The use shall be subject to the respective national provisions.

Product that is not subject to EU harmonization legislation:
The national regulations of the place of use apply to the use of the product. In Germany, for example, the building codes of the respective countries and the technical building regulations based on these codes apply.

Application
Timber screws, chipboard screws, drilling and tapping screws, plastic screws and dowel-type fasteners with thread made of steel are used when fastening two or more components.

Depending on the type of screw, these products are generally used for fastening components made of wood, steel or plastic. Possible application examples include timber construction, steel construction, indoor/outdoor use, furniture applications or window construction. Examples of Würth product groups are ASSY, Pias and Piasta screws.

Technical Data
Structural data for the respective dowel-type fasteners with thread are provided in the corresponding approvals and technical drawings, as shown below in an excerpt from *ETA 11/0190 (ASSY)* for wood screws.

Constructional data
Data based on ASSY plus VG:

Name	Value	Unit
Screw diameter	8	mm
Usage category as per ETA	11/0190	-
Characteristic tension resistance	20	kN
Screw length (+1.0/-0.5)	450 - 480	mm
Material	carbone steel	

Product according to CPR with hEN:

- Performance values of the product in accordance with the declaration of performance in relation to its essential characteristics according to applicable hEN such as *EN 15048-1:2016 and EN 14399-1:2015*.

Product according to CPR with ETA:

- Performance values of the product according to the declaration of performance with respect to its essential characteristics in accordance with applicable ETA.

Product that is not subject to EU harmonization legislation:

- Performance values of the product in relation to its characteristics according to the applicable technical regulation (no CE marking).

All approvals can be downloaded from the Würth Online Shop homepage under the Documents tab for the respective products.

Base materials/Ancillary materials
Dowel-type fasteners with thread are made of steel. As explained in the product description , depending on the type of application and material, the fasteners are provided with, for example, galvanic and/or mechanical galvanizing and, if appropriate, with anti-friction coating. Depending on the application, the fasteners are also equipped with a corresponding sealing washer made of steel, stainless steel or aluminum and EPDM sealing rubber.

Steel
Steel is an iron-carbon alloy, which is also referred to as a metallic alloy. It contains less than 2.06 % (by mass) carbon. *DIN EN 10020* also defines steels as materials in which the iron content is higher than that of any other element and the carbon content is generally below 2 % by weight. Steel is a chemical alloy of iron and iron carbide.

Compared to cast iron, which contains a higher carbon content and graphite as carbon form, steel can be processed by technical forming.

EPDM
EPDM is an abbreviation for ethylene-propylene diene

(monomer) rubber and is a terpolymer elastomer (rubber). It thus belongs to the group of synthetic rubbers. In the context of the rubber classification, seals made of this sealing material are therefore assigned to the group of non-polar saturated rubbers. This material is a high-quality rubber-elastic synthetic elastomer of ethylene, propylene and dienes of high-molecular weight. The saturated basic molecular base structure of EPDM offers properties such as high weathering resistance, ozone resistance and high heat resistance.

Electrogalvanizing
Galvanization (also electroplating technology) is a surface and coating technology process for the electrochemical separation of metals on metallic or metallized surfaces using an electrolyte and direct current. Functional electroplating protects against corrosion and wear, catalyzes, improves conductivity, and reduces frictional forces. The ductility and formability of workpieces can also be influenced by electroplating.

Anti-friction coating
Aqueous suspensions, emulsions and dispersions are used as lubricants. Depending on the application, these include kerosenes, polymers and waxes. A lubricious coating is applied to the screw by means of an immersion bath or drum coating. It lies on the screw as a dry transparent film. Some lubricating coatings contain small amounts of alcohol. Type 6 work clothing, safety goggles, face protection and chemical-resistant gloves are worn as safety measures to protect human contact during coating. An annual safety briefing is carried out and extraction systems are used.

Reference service life
Given the wide range of applications, no specific information on the recommended useful life is provided. The actual service life of screws generally depends on their intended use, installation environment and proper installation. External influences can have a significant impact on the useful life. According to the European Technical Approval, the average useful life of screws is > 25 years. The indication of the useful life cannot be understood as a guarantee by the manufacturer. It must be ensured that the use of the dowel-type fasteners with thread complies with the applicable technical regulations.

LCA: Calculation rules

Declared Unit
1 kg average self-tapping screws made of steel:

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	kg
Gross density	7900	kg/m^3

The exact weight of the screw is provided digitally.

System boundary
Type of the EPD: cradle-to-gate - with options, modules C1-C4 and module D (A1-A3 + C + D and additional modules: A4, A5).

Production Stage (A1-A3): The Product stage includes:
· A1 Raw material supply and processing (mainly steel),
· A2 Transport of raw materials to the manufacturer,
· A3 Production of Stainless steel screws (incl. energy provision, treatment of production waste, production of packaging materials).

Construction stage (A4-A5): The construction process stage includes:
· A4 transport to the construction site 100 km by truck,
· A5 Disposal of the packaging and installation of the Stainless steel screw.

End-of-life stage (C1-C4): The end-of-life stage includes:
· C1 machine-assisted de- construction (Hand-screwdriver; battery operated); Direct reuse would theoretically be possible, but is not recommended, as the slide coating can be destroyed by the initial screw-in process and the function of the fastener can no longer be guaranteed after repeated use.
· C2 transport to waste processing; 50 km with truck Transport distance can be adjusted at building level if necessary (e.g., for 100 km actual transport distance: multiply LCA values by factor 2)
· C3 waste processing for recycling of steel.
· C4 no components of the product are landfilled.

Benefits and loads beyond the System Boundary (D): Module D includes:
Material recovery potentials from metal recycling and energy recovery potentials from the
thermal recovery of Packaging.

Geographic Representativeness
Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Global

Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. The underlying database is *LCA FE (GaBi) 2023*, version 2023.1

LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

Information on describing the biogenic carbon content at factory gate
Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO2

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.023	kg C

Transport from the gate to the site (A4)

Name	Value	Unit
Litres of fuel (per kg transported goods)	0.0018	l/100km
Transport distance	100	km
Capacity utilisation (including empty runs)	61	%
Mass for transportation	1	kg

Assembly (A5)

Name	Value	Unit
Electricity consumption	0.0281	kWh
Material loss	-	kg
Output substances following waste treatment on site (Packaging)	0.053	kg

End of life (C1-C4)

Name	Value	Unit
Electricity consumption for dismantling	0.0281	kWh
Collected separately waste type waste type	1	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
Recycling	1	kg
Energy recovery	-	kg

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

Name	Value	Unit
collection rate	100	%

The results of the scenario (100%) can be scaled on building level according to the applied collection rate.

LCA: Results

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

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

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg Steel fasteners with thread

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	3.25E+00	6.69E-03	1.24E-01	4.26E-02	4.34E-03	0	0	-1.64E+00
GWP-fossil	kg CO_2 eq	3.32E+00	6.61E-03	4.5E-02	4.26E-02	4.29E-03	0	0	-1.65E+00
GWP-biogenic	kg CO_2 eq	-7.54E-02	1.95E-05	7.86E-02	2.12E-05	1.27E-05	0	0	3.04E-03
GWP-luluc	kg CO_2 eq	2.69E-03	6.13E-05	4.3E-06	3.9E-06	3.98E-05	0	0	-6.74E-04
ODP	kg CFC11 eq	3.17E-12	8.61E-16	4.28E-13	4.19E-13	5.59E-16	0	0	4.58E-12
AP	mol H^+ eq	1E+00	9.86E-06	8.45E-05	6.49E-05	6.4E-06	0	0	-3.68E-03
EP-freshwater	kg P eq	3.97E-06	2.42E-08	4.49E-08	4.21E-08	1.57E-08	0	0	-1.57E-07
EP-marine	kg N eq	1.06E-01	3.6E-06	2.54E-05	1.83E-05	2.34E-06	0	0	-8.85E-04
EP-terrestrial	mol N eq	1.16E+00	4.25E-05	2.82E-04	1.93E-04	2.76E-05	0	0	-9.58E-03
POCP	kg NMVOC eq	3.29E-01	8.66E-06	6.95E-05	5.06E-05	5.62E-06	0	0	-2.94E-03
ADPE	kg Sb eq	2.13E-05	4.36E-10	2.14E-09	2.06E-09	2.83E-10	0	0	-1.85E-08
ADPF	MJ	3.52E+01	9.01E-02	9.59E-01	9.36E-01	5.85E-02	0	0	-1.24E+01
WDP	m^3 world eq deprived	1.38E-01	7.99E-05	1.24E-02	3.58E-03	5.19E-05	0	0	-2.52E-02

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg Steel fasteners with thread

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	3.15E+00	6.56E-03	1.03E+00	1.28E-01	4.26E-03	0	0	1.87E+00
PERM	MJ	9E-01	0	-9E-01	0	0	0	0	0
PERT	MJ	4.05E+00	6.56E-03	1.34E-01	1.28E-01	4.26E-03	0	0	1.87E+00
PENRE	MJ	3.53E+01	9.05E-02	9.73E-01	9.36E-01	5.87E-02	0	0	-1.26E+01
PENRM	MJ	1.38E-02	0	-1.38E-02	0	0	0	0	0
PENRT	MJ	3.53E+01	9.05E-02	9.59E-01	9.36E-01	5.87E-02	0	0	-1.26E+01
SM	kg	2.03E-01	0	0	0	0	0	0	8.08E-01
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
FW	m^3	3.76E-03	7.18E-06	4.23E-04	2.15E-04	4.66E-06	0	0	-1.13E-03

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg Steel fasteners with thread

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	1.23E-08	2.8E-13	5.5E-11	5.43E-11	1.82E-13	0	0	-5.33E-11
NHWD	kg	3.76E-02	1.38E-05	2.5E-03	2.06E-04	8.95E-06	0	0	-2.43E-02
RWD	kg	4.98E-04	1.69E-07	1.47E-04	1.46E-04	1.1E-07	0	0	1.8E-04
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	1.01E-02	0	0	0	0	1E+00	0	0
MER	kg	0	0	0	0	0	0	0	0
EEE	MJ	0	0	1.09E-01	0	0	0	0	0

EET	MJ	0	0	1.97E-01	0	0	0	0	0

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 kg Steel fasteners with thread

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	5.43E-06	8.16E-11	6.95E-10	5.87E-10	5.3E-11	0	0	-5.36E-08
IR	kBq U235 eq	4.53E-02	2.52E-05	2.21E-02	2.19E-02	1.64E-05	0	0	1.81E-02
ETP-fw	CTUe	6.61E+00	6.4E-02	2.79E-01	2.68E-01	4.16E-02	0	0	-2.17E+00
HTP-c	CTUh	4.09E-09	1.31E-12	5.43E-12	4.84E-12	8.5E-13	0	0	-2.5E-09
HTP-nc	CTUh	1.57E-07	6.98E-11	2.72E-10	2.48E-10	4.54E-11	0	0	-9.82E-09
SQP	SQP	1.38E+01	3.77E-02	1.33E-01	1.27E-01	2.45E-02	0	0	1.05E+00

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

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

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

References

Standards

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ETA-11/0190 (ASSY)

ETA-10/0184

ETA-13/0210

Regulation (EU) No 305/2011 (CPR)

Publisher

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Programme holder

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

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Author of the Life Cycle Assessment

Sphera Solutions GmbH
Hauptstraße 111- 113
70771 Leinfelden-Echterdingen
Germany

+49 711 341817-0
info@sphera.com
www.sphera.com

Owner of the Declaration

Würth Group / Adolf Würth GmbH & Co. KG
Reinhold-Würth Str. 12-17
74653 Künzelsau
Germany

+49 7940 15-0
info@wuerth.com
www.wuerth.com

Adolf Würth GmbH & Co. KG
Reinhold-Würth-Str. 12-17
74653 Künzelsau
Germany

+49 7940/15-0
info@wuerth.com
www.wuerth.de

Würth Industrie Service GmbH & Co. KG
Industriepark Würth, Drillberg -
97980 Bad Mergentheim
Germany

+49 7931 91-0
info@wuerth-industrie.com
www.wuerth-industrie.com