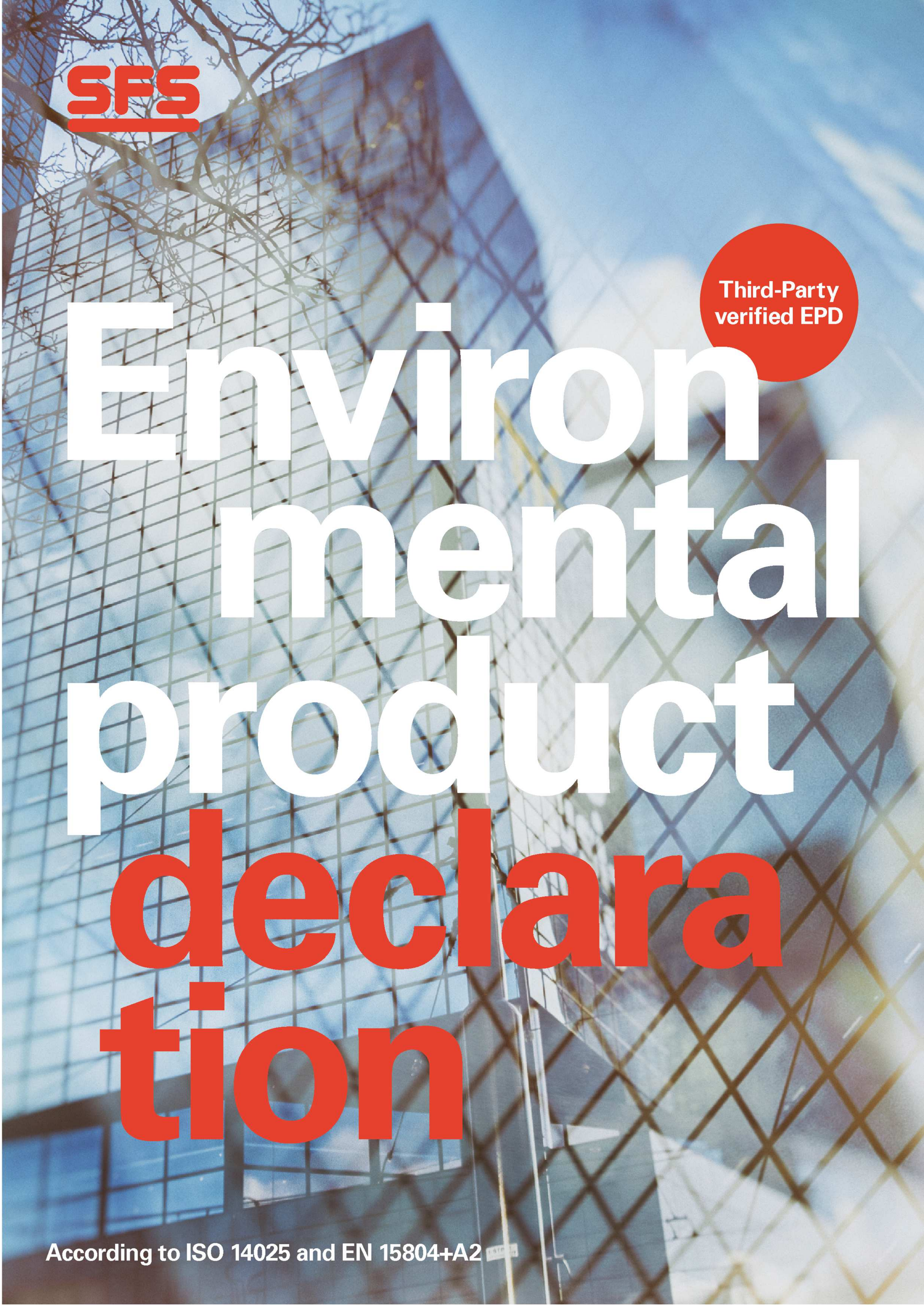


Third-Party verified EPD

Environmental product declaration

According to ISO 14025 and EN 15804+A2

isoweld®
flat roof fastening system

Verification and validity

Programme holder:	SFS Group Schweiz AG	Date of issuance:	14.03.2024
Declaration owner:	SFS Group Schweiz AG	Validity:	13.03.2029
Declaration number:	SFS-24-03		

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+A2 and the building context, respectively the product-specific characteristics of performance, are taken into account.

The standard EN 15804+A2 serves as the core PCR

Independent verification of the declaration and data according to ISO 14025:2010	
Internally ☐	Externally ☒

Name and signature of the verifier

Matthias Klingler, Büro für Umweltchemie, Zürich

1. Product

1.1. Product definition

isoweld®: penetration-free flat roof field fastening system consisting of a combination of a metal screw with a metal plate or a combination of a metal screw, a plastic sleeve and a metal plate, using induction technology.

The isoweld® field fastening system is unrivalled on the market. isoweld® uses induction technology to weld single-ply membrane to dedicated stress plates, ensuring a secure and durable bond on flat roofs. Unlike overlapping systems, isoweld® is a non-penetrating field fastening solution that maintains the integrity of the membrane and minimizes the risk of leaks. The system has proven to be an economically sound choice, potentially saving up to 20% on the total installed cost compared to other attachment methods. Due to the regular pattern, the reduced membrane overlaps by using widest possible membranes it needs up to 30% less installed fasteners than any overlap system. It can be used with roofing membrane types based on PVC, FPO/TPO and EPDM. Simple operation and process reliability are guaranteed thanks to numerous safety functions. A wide range of accessories is also available.

With this type of fastening, the roofing membrane is permanently and securely welded to the substrate with special load distribution plates. This system is available both as a full metallic system and as a sleeve system. This EPD covers all products from ETA-23/0859, valid for the system isoweld®.

A European Assessment Document, or EAD for short, is a harmonised technical specification developed by EOTA as the basis for European Technical Assessments (ETAs).

ETAs represent evidence of the technical suitability of a construction product in line with the EU member states' Construction Products Directive (CPD). An ETA is issued for a construction product which is not covered by a harmonised EU standard for the application concerned. The issue of such an approval allows the product manufacturer to use the CE mark on construction products and free access to all contracting states within the European marketplace.

Table 1: Technical properties of the declared products

Property	Value	Unit	Reference
Screw diameter	4.8–8.0	mm	–
Length spectrum	40–730		
Head diameter	80		
Anchoring depths	20–60		
Characteristic tensile load capacities	0.35–2.10	kN	EAD 030351-00-0402
Resistance to: unwinding	Pass	–	
Corrosion resistance of metal fasteners	Pass, ≤ 15% surface corrosion		
Impact resistance and brittleness of plastic fasteners (before and after heat ageing)	Pass, drop height > 1,0 m		
Requirements for the results of Charpy tests and plastic samples (before and after heat ageing)	Pass, no significant deviations compared to the results before heat ageing		

1.2. Product definition

The components of the fasteners are produced in plants owned by SFS Group Schweiz AG in Turkey, Netherlands, Sweden, France, Taiwan, Germany, USA and Greece.

1.3. Application of the product

Flat roof fastening systems from SFS are used for the mechanical fastening of vapor barriers, insulation materials and roofing membranes against dynamic wind forces on steel sheet, concrete, aerated concrete, Pumice Panel and timber-based materials.

1.4. Composition of the product

An isoweld® system consists of:

- 1 screw made from carbon steel/stainless steel
- 1 sleeve made from polyamide PA6
- 1 plate made from galvanized steel

The product does not contain any substances included in the "Candidate List of Substances of Very High Concern for Authorisation" if their content exceeds the limits for registration by the European Chemicals Agency (ECHA) (accessed 20.12.2023).

The products are delivered packed in cardboard boxes on reusable pallets and secured with polyethylene film.

1.5. Production

The fastening systems consist of up to three different components, which produced in different production sites around the globe.

Screws

The core of screw production is a reciprocating die in which the screw is rolled at extremely high pressure between two flat dies – one of which remains stationary. This process embosses the thread onto the screw and can produce hundreds of screws per minute.

After production, the screws are case hardened. Case hardening is the carburizing, hardening and tempering of a steel workpiece. The aim of case hardening is to achieve a soft and tough core with a hard surface of the material. The surface layer of the workpiece is enriched with carbon in a suitable carburizing medium (mix of gases) and then quenched. This improves the mechanical properties of the component surface layer (e.g. wear).

Alternatively, screws can be made from stainless steel.

Sleeves

The sleeves are made from polyamide (PA6) and are injection-moulded.

Plates

The plates are produced from galvanized coils and are essentially pressed into shape and punched.

1.6. Additional information on the release of hazardous substances into indoor air, soil and water during the use phase

There are no horizontal standards on the measurement of the release of regulated substances from construction products with harmonised test methods for the effects on indoor air, soil and water during the use phase.

2. Calculation rules for the life cycle assessment

2.1 Declared unit

The declared unit is the fixation of 1 m^2 of roofing membrane on 190 mm insulation layer over the product-specific reference service lives as stated below. The corresponding reference flows are:

- 2.5 systems per m^2
- Screws: diameter 4,8 mm, 0.0190 kg/m^2
- Sleeve: head diameter 20 mm, length 160 mm, polyamide PA6, 0.024 kg/m^2
- Plate: FI-P-16,0, galvanized steel, 0.0775 kg/m^2
- Total weight: 0.121 kg/m^2

Hence, LCA results refer to products with specific dimensions and that the actual dimensions and LCA results may differ depending on the roof structure.

2.2 Reference service life

Based on historical experience and based on the warranties provided by SFS Group Schweiz AG, the following reference service life can be assumed under the conditions outlined in Table 2:

- Carbon steel fasteners: > 15 years
- Stainless steel fasteners: > 20 years
- Plastic sleeves: > 20 years

Table 2: Product properties and in-use conditions underlying the declared reference service life

Parameter	Parameter unit expressed per functional/declared unit
Reference Service Life	• Carbon steel fasteners: > 15 y • Stainless steel fasteners: > 20 y • Plastic sleeves: > 20 y
Declared product properties (at the gate) and finishes, etc.;	Produced in conformity with EAD 030351-00-0402, complying with ETA-23/0859
Design application parameters (if instructed by the manufacturer), including the references to the appropriate practices;	Compliance with ETA-23/0859
An assumed quality of work, when installed in accordance with the manufacturer’s instructions;	Installed according manufacturer’s instructions
Outdoor environment, (for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature;	Pass, ≤ 15% surface corrosion acc. to EAD 030351-00-0402
Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure;	Not applicable
Usage conditions, e.g. frequency of use, mechanical exposure;	Static use
Maintenance, e.g. required frequency, type and quality and replacement of replaceable components.	No maintenance required

2.3 Biogenic carbon

Table 3 contains the information on biogenic carbon content of the product and the packaging material at factory gate.

Table 3: Information describing the biogenic carbon content at the factory gate

Name	Value	Unit
Biogenic carbon content in product	0	kg C
Biogenic carbon content in accompanying packaging	Not relevant	

2.4 System boundary

A life cycle assessment type „cradle to gate with options, with modules C1–C4, and module D (A1–A3, C1–C4, D and additional modules. The additional modules may be A4 and/or A5)" is calculated.

The system boundary of the EPD follows the modular approach according to EN 15804+A2. The modules covered in this EPD can be identified in Table 4.

Table 4: Information on the system boundary

Information on system boundary
(X = covered in LCA; MND = module not declared; MNR = module not relevant)

Raw material supply	Transport	Production	Transport	Construction/ Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction	Transport	Waste treatment	Disposal	Reuse, recycling, recovery potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	(X)	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

(X) for module A5: only the disposal of packaging is considered, not the installation as such
(X) for module C1: in analogy to module A5, inputs and outputs related to de-installation are disregarded.

Production stages A1 to A3 include the extraction of raw materials and the provision of energy for the manufacture of the declared products. For recycled scrap as the main input for production, the system boundary is defined where the steel scrap from the upstream product system is available as sorted steel scrap (see also COUNCIL REGULATION (EU) No 333/2011).

The products are delivered to the construction site ready to be installed. In Modul A5, manual installation with setting machines is assumed; electricity consumption related to electric drilling and setting machines are neglected.

The combustible packaging material (PE-foil, wood) is assumed to be transported 31 km with a lorry with a payload of 16–32 metric tons to an incineration plant with an efficiency R1 < 0.6 (according to the UVEK DQRv2:2022 dataset used); the recovered energy is declared as exported energy; for its quantification (according to CEWEP energy report III) an efficiency of 25.6% is assumed for the production of heat and 13.0% for the production of electricity (always referring to the lower heating value of the waste).

Paper and cardboard are recycled; it is assumed that these fractions reach end-of-waste state after having been sorted and transported (as a conservative choice) to a recycler over 15 km with a lorry with a payload of 16–32 metric tons.

Modules B1 to B7 are not relevant for the declared products. The indicator values of Modules B1 to B7 are thus 0 and not declared specifically in the EPD.

In the end-of-life, two scenarios are declared:
1. (Crushing of supporting materials allowing:) Recycling of steel parts and combustion with energy re-covery for the plastic sleeves.
2. Landfilling of the fastener (together with other demolition waste)

In Module C2, in the recycling scenario, the fasteners (together with other demolition waste) are transported km with a lorry with a payload of 16–32 metric tons to a sorting plant over 21.7 km; the recovered plastic parts are then transported to a MWIP over 31 km.

In the landfilling scenario, the fasteners (together with other demolition waste) are transported km with a lorry with a payload of 16–32 metric tons to a landfill for inert construction materials over 15 km.

Module C3 is not relevant for the landfilling scenario.

In the recycling scenario, in Module C3 the mixed demolition waste is sorted in a sorting plant. The recovered metal parts reach the end-of-waste state here; the recovered plastic sleeves are incine-rated in an incineration plant with an efficiency R1 < 0.6 (according to the UVEK DQRv2:2022 data-set used); the recovered energy is declared as exported energy; for its quantification (according to CEWEP energy report III) an effi-ciency of 25.6% is assumed for the production of heat and 13.0% for the production of electricity (always referring to the lower heating value of the waste).

In module C4 of the landfilling scenario, the fasteners are disposed of in a landfill for inert construction materials (together with other demolition waste). The disposal processes are modelled specifically for each material.

Module C4 is not relevant for the recycling scenario.

Module D contains the benefits and loads beyond the system boundary related to the recycling of metals, which result from the treatment of recycled materials from the point of end-of-waste status to the point of substitution (as loads) and the substitution of primary resources (as benefits).

It also includes the benefits and loads related to the energy recovery from plastic wastes in a municipal waste incineration plant (MWIP) as modelled in Modules A5 and C3.

Only net flows leaving the product system are considered in module D. The recycled content and the assumed processing losses are documented in the tables containing the modelling of module D. These parameters are used to estimate the input of secondary material and compare it with the output flows of the corresponding material.

The following Table 5 summarises the end-of-life scenario.

Table 5: Information on declared end-of-life scenarios

Processes	Parameter unit expressed per functional/declared unit of components, products or materials (specified by type of material)
Collection process specified by type	0 kg collected separately
	0.121 kg collected with mixed construction waste
Recovery system specified by type	0 kg for re-use
	In the recycling scenario: 0.0965 kg of steel for recycling 0.024 kg for energy recovery from waste
	0 kg for energy recovery (from secondary material)
Disposal specified by type	In the landfilling scenario: 0.121 kg of steel for landfilling
Assumptions for scenario development, (e.g. transportation)	Transport to sorting plant: lorry with a payload of 16–32 metric tons over 21.7 km; Transport of recovered plastic parts to a MWIP: lorry with a payload of 16–32 metric tons over 31 km. Direct transport to landfill: lorry with a payload of 16–32 metric tons over 15 km

2.5 Further assumptions and remarks

The production data covers the production year 2022. Data sets from the UVEC life cycle assessment data-base DQRv2:2022 (KBOB et al. 2022) were used as background data for the life cycle assessment.

2.6 Cut-off rules

All data from the detailed data collection from the production sites was taken into account in the life cycle assessment. With this approach, material and energy flows with a share of less than 1 per cent of the total material and energy flows used in production were also included in the assessment.

In addition, no material or energy flows were neglected in the LCA that would have been known to the project managers and that could be expected to have a significant environmental impact with regard to the indicators shown. It can therefore also be assumed that the sum of the neglected processes does not exceed 5% of the impact categories.

The criteria for the exclusion of inputs and outputs in accordance with EN 15804 are therefore fulfilled.

3. Results of the life cycle assessment

The following table summarises the results of the life cycle assessment for the declared unit of 1 m^2 of the fastening system isoweld®.
Note: all the indicator values for modules C1, C3_1 and C4_2 are "zero" and are not displayed in the following table for readability.

		A1-A3 isoweld®	A5 isoweld®	C2_1 isoweld® landfill	C2_2 isoweld® recycling	C3_2 isoweld® recycling	C4_1 isoweld® landfill	D_1 isoweld® landfill	D_2 isoweld® recycling
Parameters describing environmental impacts									
Global warming potential – total (GWP-total)	kg CO_2 eq	6.97E–01	6.98E–06	3.38E–04	3.38E–04	6.77E–02	3.51E–03	8.71E–02	–1.48E–01
Global warming potential – fossil fuels (GWP-fossil)		7.01E–01	3.80E–06	3.35E–04	3.35E–04			8.73E–02	
Global warming potential – biogenic (GWP-biogenic)		–4.41E–03	3.18E–06	1.11E–06	1.11E–06	1.31E–05	3.59E–06	–1.90E–04	2.82E–04
GWP from land use and land use change (GWP-luluc)		3.62E–04	2.02E–10	1.37E–06	1.37E–06	5.61E–07	9.18E–07	3.81E–06	–1.08E–05
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	1.40E–06	8.26E–15	1.05E–11	1.05E–11	1.30E–10	1.52E–11	7.88E–10	–3.78E–09
Acidification potential, accumulated exceedance (AP)	mol H^+ eq	4.48E–03	9.80E–10	1.25E–06	1.25E–06	1.51E–05	2.37E–06	2.86E–04	–4.55E–04
Eutrophication, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	kg P eq	4.97E–05	2.34E–12	6.56E–09	6.56E–09	3.52E–08	1.38E–08	1.35E–05	–2.10E–05
Eutrophication, fraction of nutrients reaching marine end compartment (EP-marine)	kg N eq	5.41E–04	4.44E–10	4.06E–07	4.06E–07	7.12E–06	4.06E–06	5.45E–05	–8.53E–05
Eutrophication, accumulated exceedance (EP-terrestrial)	mol N eq	1.44E–02	4.73E–09	4.10E–06	4.10E–06	7.32E–05	7.43E–06	6.33E–04	–9.87E–04
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg NMVOC eq	2.00E–03	1.24E–09	1.53E–06	1.53E–06	1.83E–05	3.49E–06	2.54E–04	–4.01E–04
Abiotic depletion potential for non-fossil resources (ADPE)	kg Sb eq	6.70E–06	2.06E–13	8.25E–10	8.25E–10	1.92E–09	7.97E–10	9.46E–07	–1.32E–06
Abiotic depletion potential for fossil resources (ADPF)	MJ	7.40E+00	1.44E–06	4.65E–03	4.65E–03	1.94E–02	1.01E–02	5.48E–01	–1.28E+00
Water (user) deprivation	m^3 depriv.	1.25E+02	6.79E–06	1.88E–02	1.88E–02	2.88E–01	5.92E–02	2.08E+01	–3.07E+01

		A1-A3 isoweld®	A5 isoweld®	C2_1 isoweld® landfill	C2_2 isoweld® recycling	C3_2 isoweld® recycling	C4_1 isoweld® landfill	D_1 isoweld® landfill	D_2 isoweld® recycling
Parameters describing resource use									
Renewable primary energy as energy carrier (PERE)	MJ (Hu)	1.03E+00	1.85E–05	2.29E–04	2.29E–04	1.45E–03	3.84E–04	4.01E–02	–7.30E–02
Renewable primary energy resources as material utilization (PERM)		1.85E–05	–1.85E–05	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT)		1.03E+00	4.97E–08	2.29E–04	2.29E–04	1.45E–03	3.84E–04	4.01E–02	–7.30E–02
Non-renewable primary energy as energy carrier (PENRE)		7.93E+00	5.36E–05	4.81E–03	4.81E–03	7.24E–01	1.04E–02	7.71E–01	–1.64E+00
Non-renewable primary energy as material uti. (PENRM)		7.03E–01	–5.21E–05	0	0	–7.03E–01	0	0	0
Total use of non-renewable primary energy resources (PENRT)		8.63E+00	1.53E–06	4.81E–03	4.81E–03	2.10E–02	1.04E–02	7.71E–01	–1.64E+00
Use of secondary material (SM)	Kg	3.92E–02	0	0	0	0	0	–3.92E–02	5.73E–02
Use of renewable secondary fuels (RSF)	MJ (Hu)	0						0	0
Use of non-renewable secondary fuels (NRSF)									
Use of net fresh water (FW)	m^3	1.57E–02	1.81E–09	1.84E–06	1.84E–06	1.23E–04	1.83E–05	9.60E–04	–1.69E–03
Other environmental information describing waste flows									
Hazardous waste disposed (HWD)	kg	8.28E–06	4.62E–12	5.00E–09	5.00E–09	4.38E–08	5.97E–09	3.40E–07	–1.04E–06
Non-hazardous waste disposed (NHWD)		1.39E–01	1.06E–07	3.84E–05	3.84E–05	1.89E–03	1.32E–01	3.50E–02	–4.89E–02
Radioactive waste disposed (RWD)		1.67E–05	1.77E–12	6.07E–09	6.07E–09	8.53E–08	1.84E–08	3.58E–07	–5.12E–06
Other environmental information describing output flows									
Components for re-use (CRU)	kg	0	0	0	0	0	0	0	0
Materials for recycling (MFR)						9.65E–02			
Materials for energy recovery (MER)						0			
Exported electrical energy (EEE)	MJ		1.96E–05						
Exported thermal energy (EET)			3.38E–04						
Additional optional indicators describing environmental impacts)									
Potential incidence of disease due to PM emissions (PM)	disease inc.	4.39E–08	9.31E–15	2.78E–11	2.78E–11	6.48E–11	2.77E–11	5.58E–09	–8.09E–09
Potential Human exposure efficiency relative to U235 (IRP)	kBq U-235 eq	2.49E–02	2.79E–09	9.76E–06	9.76E–06	1.40E–04	3.02E–05	1.74E–04	–6.99E–03

		A1-A3 isoweld®	A5 isoweld®	C2_1 isoweld® landfill	C2_2 isoweld® recycling	C3_2 isoweld® recycling	C4_1 isoweld® landfill	D_1 isoweld® landfill	D_2 isoweld® recycling
Potential comparative toxic unit for ecosystems (ETP-fw)	CTUe	1.20E+01	1.84E–06	5.12E–03	5.12E–03	1.36E–01	3.75E–02	2.70E+00	–4.10E+00
Potential comparative toxic unit for humans – cancerogenic (HTP-c)	CTUh	1.08E–09	2.07E–16	1.05E–13	1.05E–13	5.64E–12	3.90E–13	3.19E–10	–4.23E–10
Potential comparative toxic unit for humans – not cancerogenic (HTP-nc)		1.82E–08	1.05E–14	5.73E–12	5.73E–12	2.32E–10	1.22E–11	1.90E–09	–1.26E–09
Potential soil quality index (SQP)	–	1.18E+00	–2.66E-08	–7.28E–04	–7.28E–04	3.99E–03	2.29E–02	9.10E–02	–1.34E–01

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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from 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 or as there is limited experienced with the indicator.

4. Interpretation

Figure 1: Relative contributions of the different life cycle modules for isoweld® for the end-of-life scenario "recycling" (modules A1–C4 = 100%)

Figure 1 illustrates the relative contributions of the different life cycle modules to selected impact categories for the end-of-life scenario "recycling". The contributions are scaled to the sum of modules A1-C4 as 100%.

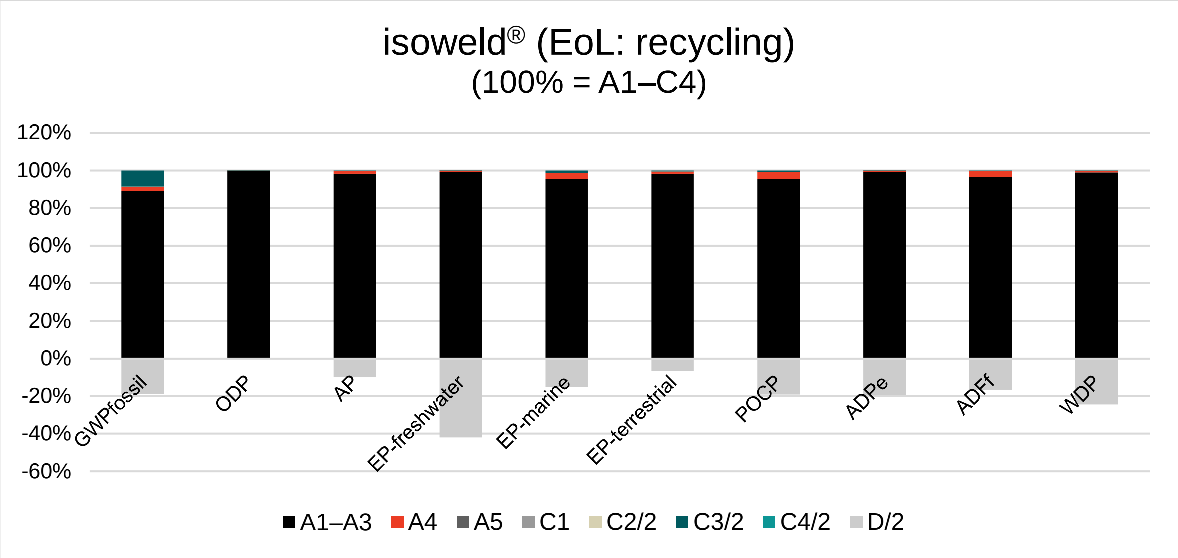
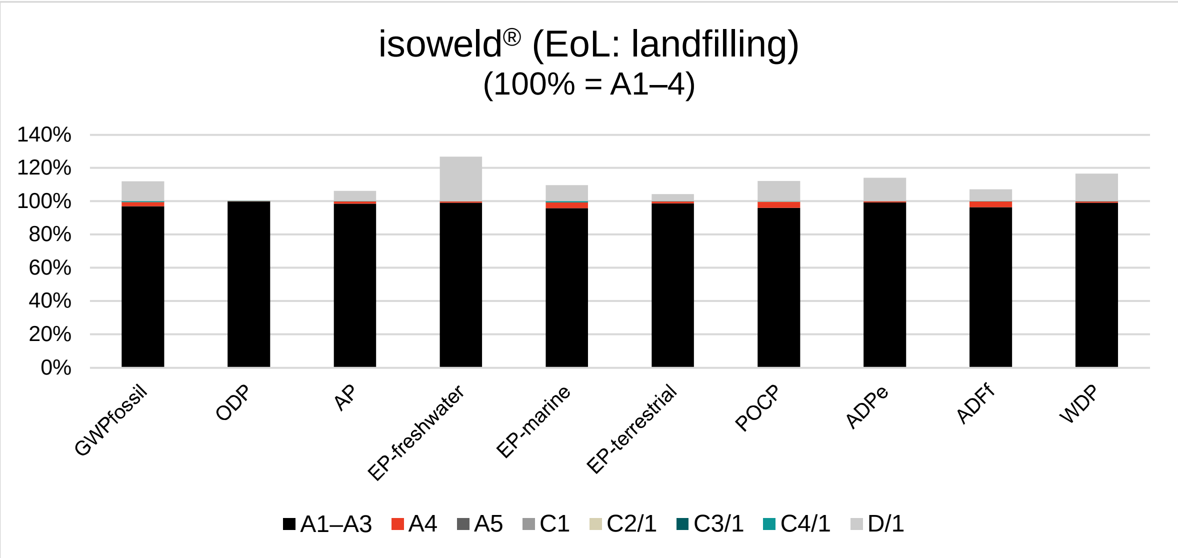


Figure 2: Relative contributions of the different life cycle modules for isoweld® for the end-of-life scenario "landfill" (modules A1–C4 = 100%)

Figure 2 illustrates the relative contributions of the different life cycle modules to selected impact categories for the end-of-life scenario "landfill".



These two figures show that the environmental profile is dominated by the production phase (modules A1–A3), contributing more than 90% to the total impacts over the life cycle for most indicators; in the recycling scenario, relevant contributions to the global warming potential (GWP) are caused by the combustion of the plastic sleeves for energy recovery. Further comparably minor impacts stem from the transport of the different components to Europe from the production sites spread around the globe, as quantified in module A4 (values for module A4 are not provided in the EPD). Other mandatory modules, notable the modules C1 to C4 describing the end-of-life are not relevant for this environmental analysis (except for the GWP, see above).

The loads and benefits beyond the system boundary declared in module D differ fundamentally depending on the end-of-life scenario. In the case of recycling, the recycling of the net amount of steel scrap, equalling the amount of primary material brought into technosphere, is assumed to substitute for the production of primary steel again and leads to benefits between 10% to 40% of the impacts over the life cycle. Energy recovery from the plastic sleeves, substituting the combustion of fossil fuels and production and electricity generation, add additional benefits to module D.

In the case of landfilling, the same amount of primary material is assumed to be lost again from technosphere and needs be replaced, leading to an additional production of primary material. In addition, in this scenario, there are no benefits associated with energy recovery from the plastic sleeves.

To assess the variance of results, the values for the average build-up were compared to a minimum build-up and to a maximum build-up, depending on the minimum and maximum thickness of the insulation layer. The variance within the isoweld® system between the minimum version and the maximum version is around –20% and +17% of the declared values.

As the composition of the system does not scale linearly with increased/decreased length of the system, scaling of indicator values is not recommended.

5. Comments

isoweld® has a few technical advantages over common fixations of roofing membranes, among them:

- No penetration of the roofing membrane
- Free choice of installation direction of the membrane
- On average 20% fewer fixing points
- Minimal overlaps of the roofing membrane
- Fastening independent of the roofing membrane edge
- Welding in a matter of seconds
- Roof structure completely adhesive- and solvent-free

In consequence, this leads to savings of about 10% of roofing membrane as compared to common fixation systems.

The savings do not only depend on the type of roofing membrane (e.g. EPDM, FPO or PVC) but also on the fixation system. A saving of –0.383 kg CO_2eq/m^2 and a maximum of –0.854 kg CO_2eq/m^2 can be achieved over the total life cycle when using isoweld® instead of another fixation system; this compares to greenhouse gas emissions of 0.328 CO_2eq/m^2 to 0.782 CO_2eq/m^2 for the production and disposal (land-filling) of the fixation systems.

6. References

6.1 Standards and legal documents

EAD 030351-00-0402
European Assessment Document EAD 030351-00-0402: Systems of mechanically fastened flexible roof waterproofing sheets. February 2019, EOTA.

ETA-23/0859
European Technical Assessment ETA-23/0859, für SFS Flachdachbefestigungselemente, ausgestellt am 01.06.2022, Deutsches Institut für Bautechnik (DIBt), Berlin.

EN 15804
SN EN 15804+A2:2022-03, sustainability of construction works – Environmental product declarations – Core rules for the product category construction products; German version EN 15804: 2012+A2:2019 + AC:2021.

ISO 14025
ISO 14025:2006-07, Environmental labels and declarations – Type III Environmental declarations – Principles and procedures.

ISO 14044
EN ISO 14044:2006-07, Environmental management – Life cycle assessment – Requirements and guidance (ISO 14044:2006); German and English versions EN ISO 14044:2006.

ECHA candidate list
The Candidate List of substances of very high concern, available via https://echa.europa.eu/nl/-/four-newsubstances-added-to-the-candidate-list.

COUNCIL REGULATION (EU) No 333/2011 of 31 March 2011
COUNCIL REGULATION (EU) No 333/2011 of 31 March 2011 establishing criteria for determining when cer-tain types of scrap metal cease to be waste within the meaning of Directive 2008/98/EC of the European Parliament and of the Council.

6.2 Additional references

CEWEP Energy Report III (2013)
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