Environmental Product Declaration (EPD)

Declaration code: M-EPD-AZR-GB-101

Note: This EPD is based on the model EPD Electrical drives and pneumatic cylinders.

aumüller

AUMÜLLER AUMATIC GmbH

Building components for smoke and heat control systems

Electrical drives and pneumatic cylinders for SHEV and ventilation systems

Basis:

DIN EN ISO 14025
EN15804

Model-EPD
Environmental
Product **D**eclaration

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Environmental Product Declaration (EPD)

Declaration code: M-EPD-AZR-GB-101

Programme operator	ift Rosenheim GmbH Theodor-Gietl-Straße 7-9 83026 Rosenheim		
Practitioner of the LCA	LCEE Life Cycle Engineering Experts GmbH Berliner Allee 58 64295 Darmstadt		
Declaration holder	AUMÜLLER AUMATIC GmbH Gemeindewald 11 86672 Thierhaupten		
Declaration code	M-EPD-AZR-GB-101		
Designation of the declared product	Electrical drives and pneumatic cylinders for SHEV and ventilation systems		
Scope	Smoke and heat exhaust ventilation systems, or their components, which, through their interaction, exhaust smoke and heat from buildings. Smoke and heat control systems. Ventilation systems for maintaining specific air change rates.		
Basis	This model EPD was prepared on the basis of EN ISO 14025:2011 and EN 15804:2012+A1:2013. In addition, the “Allgemeiner Leitfaden zur Erstellung von Typ II Umweltproduktdeklarationen” (General guideline for elaboration of Type III Environmental Product Declarations) applies. The Declaration is based on the PCR Documents “Bauteile für Anlagen zur Rauch- und Wärmefreihaltung” (Building components for smoke and heat control systems) PCR-RW-2.1:2018 and “PCR Teil A” (Part A) PCR-A-0.2:2018.		
Validity	Publication date: 28.03.2019	Date of issue: 18.04.2019	Next revision: 28.07.2024
	This verified model Environmental Product Declaration applies solely to the specified products and is valid for all members of the association window automation and smoke axtraction e.V. (VFE). It has a validity of 5 years from the date of publication in accordance with DIN EN 15804.		
LCA basis	The LCA was prepared in accordance with EN ISO 14040 and DIN EN ISO 14044. The base data include both data collected the AUMÜLLER AUMATIC GmbH production sithe and the generic data derived from the "GaBi 8" database. LCA calculations were based on the "cradle to gate with options" life cycle including all upstream processes (e.g. raw materials extraction, etc.).		
Notes on publication	The "Conditions and Guidance on the Use of ift Test Documents" apply. The declaration holder assumes full liability for the underlying data, certificates and verifications. This document is currently being updated. The date for the next revision has been adjusted to 28.07.2024.		

Prof. Ulrich Sieberath
Director of Institute

Patrick Wortner
External Verifier

1 General product information

product definition

This EPD relates to the product group Building components for smoke and heat control systems and applies to the following products of the members of the VFE:

1 Watt (Power) electrical drive
1 mm (Diameter) pneumatic cylinder
of the company AUMÜLLER AUMATIC GmbH

The average unit is declared as follows:
The directly used material flows were divided by the number of considered products and assigned to the declared unit. All other inputs and outputs in the manufacture were scaled to the declared unit as a whole. The reference period is 2018.

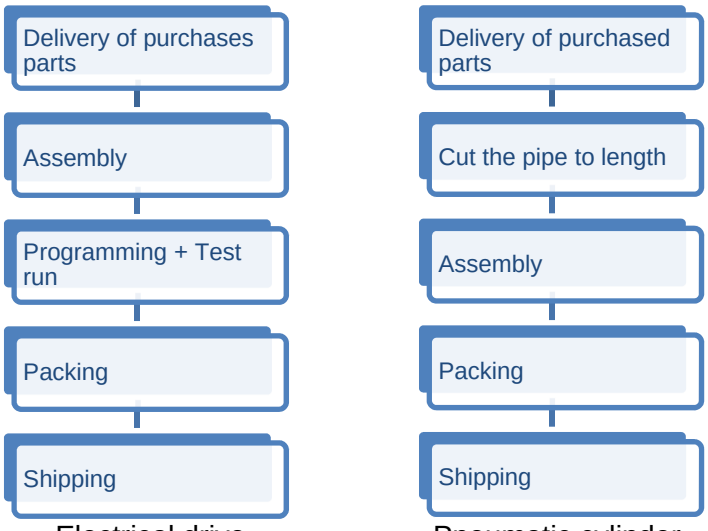
Product description

Drive:
The drive is an electrically-powered structural unit for moving power operated building openings (windows and roof lights) in the building envelope, e.g.: in facades as well as in the roof area.

Pneumatic cylinders:
The pneumatic cylinder is a working cylinder driven by compressed air. The cylinder is used to move power operated openings in the building envelope, e.g. windows or roof lights, linearly and to hold them in a defined position. The cylinder has two directions of movement.

For a detailed product description refer to the manufacturer specifications or the product specifications of the respective offer/quotation.

Product manufacture



Electrical drive | Pneumatic cylinder

Application

Smoke and heat exhaust ventilation systems, or their components, which, through their interaction, exhaust smoke and heat from buildings. Smoke and heat control systems. Ventilation systems for maintaining specific air change rates.

Management systems

The following management systems are held:

- Quality management system according to DIN EN ISO 9001:2015

Additional information

For additional proof of usability or conformity refer to the CE marking and the documents accompanying the product.

2 Materials used

Primary materials

The primary materials used can be found in the Life Cycle Assessment (LCA) (see chapter 6).

Declarable substances

The product contains no substances from the REACH candidate list (declaration dated 04. March 2019).
All relevant safety data sheets are available from AUMÜLLER AUMATIC GmbH.

3 Construction process stage

Processing recommendations, installation

The instructions for installation, operation, maintenance and disassembly must be noted.

4 Use stage

Emissions to the environment

There are no known emissions to indoor air, water and soil. There may be VOC emissions.

Reference service life (RSL)

RSL information to be declared in an EPD covering the use stage shall be provided by the manufacturer. The RSL shall refer to the declared technical and functional performance of the product within a building. It shall be established in accordance with any specific rules given in European product standards and shall take into account ISO 15686-1, -2, -7 and -8. Where European product standards provide guidance on deriving the RSL, such guidance shall have priority. If the reference service life can´t be determined according to ISO 15686, the BBSR table „Nutzungsdauern von Bauteilen zur Lebenszyklusanalyse nach BNB“ can be used. For further information visit www.nachhaltigesbauen.de

Relevant for this EPD is:
The reference service life (RSL) can be determined for a “cradle to gate – with options” EPD only if alle the modules A1-A3 and B1-B5 are specified;
The service life of Electrical drives and pneumatic cylinders for SHEV and ventilation systems from AUMÜLLER AUMATIC GmbH is optionally specified at 25 years according to the manufacturer.

The service life depends on the characteristics of the product and the terms of use. The features described in the EPD are applied, in particular the following:

- Outdoor conditions: There are no known impacts that have a negative effect on the service life.
- Indoor conditions: Atmospheric conditions can reduce the service life if applicable.

The reference service life is for the features, which are reported in this EPD or the relevant references for this purpose.
The RSL does not reflect the actual life time, which is usually determined by the service life and the redevolpement of a building. It represents no statement about service life, guarantee of performance or promise of guarantee.

5 End of life stage

Possible end-of-life stages

Electrical drives and pneumatic cylinders for SHEV and ventilation systems are shipped to the central collection points. There they are gennerally taken apart in their individual parts and separated. The end-of-life stage depends on the site where the products are used and is therefore subject to local regulations. Observe the locally applicable regulatory requirements.

In this EPD, the modules of the ned-of-life are represented according to the market situation.
Certain parts of metals, electro-components and plastic are recycled. Residual fractions are deposited or partly thermally recycled.

Disposal methods

The average disposal routes were taken into account in the LCA.

All life cycle scenarios are detailed in the Annex.

6 Life Cycle Assessment (LCA)

Environmental product declarations are based on life cycle analyses (LCAs) which use material and energy flows for the calculation and subsequent representation of environmental impacts.

As the basis for this, an LCA was prepared for Electrical drives and pneumatic cylinders for SHEV and ventilation systems The LCA was developed in accordance with EN 15804 and the requirements set out by the international standards DIN EN ISO 14040, DIN EN ISO 14044, ISO 21930 and EN ISO 14025.

The LCA is representative of the products presented in the declaration and the specified reference period.

6.1 Definition of goal and scope

Goal

The goal of the LCA is to demonstrate the environmental impacts of Electrical drives and pneumatic cylinders for SHEV and ventilation systems. In accordance with EN 15804, the environmental impacts covered by this Environmental Product Declaration are presented for

the entire product life cycle in the form of basic information. Apart from these, no other environmental impacts have been specified.

Data quality, data availability, and geographical and time-related system boundaries

The specific data originate exclusively from the fiscal year 2018 and results from interviews of various manufacturers. These were recorded f by on-site collection and originate partly from company records and partly from values directly obtained by measurement. The data were verified for validity by the **ift** Rosenheim.

The generic data originates from the "Professional Datenbank" and "Baustoff Datenbank" (professional database and building materials database) from the software "GaBi 8". The last update of both databases was in 2018. Data from before this date originate also from this databases and are not more than 4 years old. No other generic data were used for the calculation.

Data gaps were either filled with comparable data or conservative assumptions, or the data were cut off in compliance with the 1 % rule.

The life cycle was modelled using the sustainability software tool “GaBi 8” for the development of Life Cycle Assessments.

Scope / System boundaries

The system boundaries refer to the supply of raw materials and purchased parts, the manufacture, the use and the end-of-life stage of Electrical drives and pneumatic cylinders for SHEV and ventilation systems (cradle to gate with options).
No additional data from pre-suppliers / subcontractors or other sites were taken into consideration.

Cut-off criteria

All company data collected, i.e. all input and output materials used, the thermal energy and the electricity consumption were taken into consideration.

The boundaries cover only the production-relevant data. Building sections / parts of facilities that are not relevant to the manufacture of the products were excluded.

The transport distances of the pre-products were taken into consideration as a function of 100 per cent of the mass of Electrical drives and pneumatic cylinders for SHEV and ventilation systems.
The transport mix is consisted as follows and is derived from the research project "EPDs for transparent components":

- Lorry, 26 - 28 t gross weight / 18.4 t payload, Euro 6, freight, 85% utilization, 100 km;
- Road train, 28 - 34 t gross weight / 22 t payload, Euro 6, 50% utilization, 50 km;
- Freight train, electric and diesel-operated, D 60%, E 51% utilization, 50 km;
- Sea ship consumption mix, 50 km

The criteria for the exclusion of inputs and outputs as set out in EN 15804 are fulfilled. It can be assumed that the total negligible processes

per life cycle stage doesn´t exceed 1 per cent of the mass or the primary energy. This way the total of negligible processes does not exceed 5 per cent of the energy and mass input. The life cycle calculation also includes material and energy flows that account for less than 1 per cent.

6.2 Inventory analysis

Goal

All material and energy flows are described below. The processes covered are presented as input and output parameters and refer to the declared / functional units.

The models of the unit processes used for the LCA have been documented in a transparent manner.

Life cycle stages

The Annex shows the entire life cycle of Electrical drives and pneumatic cylinders for SHEV and ventilation systems. Product stage “A1 – A3”, construction stage “A4 – A5”, use stage “B2 – B4, B6, B7”, end-of-life stage “C1 – C4” and benefits and loads beyond the system boundaries “D” are considered.

Benefits

The below benefits have been defined as per EN 15804:

- Benefits from recycling
- Benefits from (thermal and electric) incineration

Allocation of co-products

During the manufacture of Electrical drives and pneumatic cylinders for SHEV and ventilation systems no allocations occur.

Allocations for reuse, recycling and recovery

If Electrical drives and pneumatic cylinders for SHEV and ventilation systems are reused / recycled during product stage (rejects), the elements are shredded, as necessary, and then sorted into original pure components. This is done by various process plants such as magnetic separators.

The system boundaries for Electrical drives and pneumatic cylinders for SHEV and ventilation systems were set following their disposal, with termination of their waste characteristics.

Allocations beyond life cycle boundaries

The use of recycled materials in the product stage is based on the current market-specific situation. In parallel to this, a recycling potential was taken into consideration that reflects the economic value of the product after processing (recyclate).

The system boundary of the recycled material was set during collection.

Secondary material

The use of secondary materials in the module A3 was not considered. Secondary material is not used.

Inputs

The LCA includes the following production-relevant inputs:

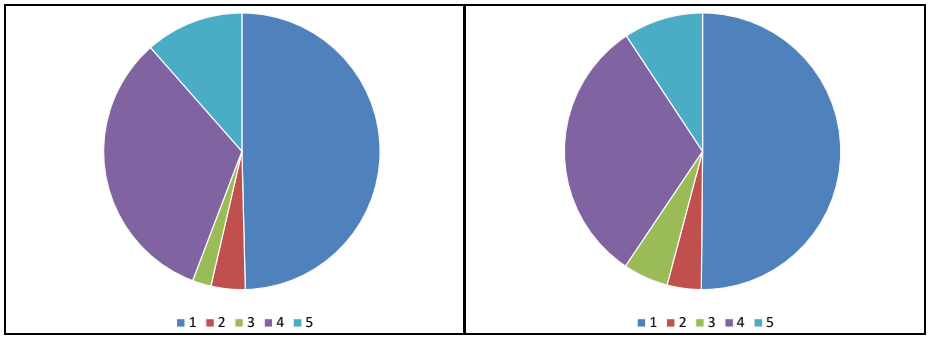
Energy

The electricity mix is based on “Strommix Germany” (German electricity mix). Fuel oil is based on “Heizöl S Deutschland” (Fuel Oil S Germany).

A portion of the process heat is used for space heating. This can however not be quantified, hence a “worst case” figure was taken into account for the product.

Water
The water consumed by the individual process steps for the manufacture of Electrical drives and pneumatic cylinders for SHEV and ventilation systems is 1.7E-4 l per W electrical drive and 2.6E-4 l per mm pneumatic cylinders.
The consumption of fresh water specified in Section 6.3 originates (among others) from the upstream processes of the pre-products.

Raw material / Pre-products:
The chart below shows the use of raw materials / pre-products per cent.



Electrical drive Pneumatic cylinder

No.	Material	Mass in %	
		Electrical drive	Pneumatic cylinder
1	Steel	49	50
2	Copper	4	4
3	Bass	2	6
4	Aluminium	33	31
5	Plastic	12	9

In addition, the electrical drive contains printed circuit boards that are not listed int the diagram due to the surface reference.

Operating supplies
Operating supplies for Electrical drives and pneumatic cylinders for SHEV and ventilation systems have not been included in the assessment, as their mass is < 1%.

Product package
The following quantities of product package accumulate:

No.	Material	Mass in kg

		Electrical drive	Pneumatic cylinder
1	Wood	9.0E-3	1.5E-4
2	Carton / paper	2.1E-2	1.7E-3
3	PE-Film	7.0E-4	1.1E-5

Outputs

The LCA includes the following production-relevant outputs per m² Electrical drives and pneumatic cylinders for SHEV and ventilation systems:

Waste
Secondary raw materials were considered in the benefits.
See Section 6.3 - Impact assessment.

Waste water
The manufacture of Electrical drives and pneumatic cylinders for SHEV and ventilation systems produces no waste water per W or mm.

6.3 Impact assessment

Goal

Impact assessment covers inputs and outputs. The impact categories applied named below:

Impact categories

The models for impact assessment were applied as described in EN 15804-A1.
The impact categories presented in the EPD are as follows:

- Depletion of abiotic resources (fossil fuels);
- Depletion of abiotic resources (elements);
- Acidification of soil and water;
- Ozone depletion;
- Global warming;
- Eutrophication;
- Photochemical ozone creation.

Waste

The waste generated during the production of 1 m² Electrical drives and pneumatic cylinders for SHEV and ventilation systems is evaluated and shown separately for each of the three main fractions, namely trade wastes, special wastes and radioactive wastes. Since waste handling is modelled within the system boundaries, the amounts shown refer to the deposited wastes. A portion of the waste indicated is generated during the manufacture of the pre-products.

Results per W Electrical drive														
Environmental impacts	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B4**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2-equiv.	0.30	2.62E-03	4.83E-02	0.00	0.00	0.30	0.33	0.00	7.03E-04	7.43E-04	6.28E-02	1.16E-02	-0.29
Depletion potential of stratospheric ozone layer	kg R11-equiv.	1.71E-09	8.65E-16	8.91E-15	0.00	0.00	1.71E-09	1.44E-11	0.00	3.12E-14	2.45E-16	2.79E-12	2.5E-16	-6.85E-12
Acidification potential of soil and water	kg SO_2-equiv.	1.46E-03	1.1E-05	7.90E-06	0.00	0.00	1.46E-03	9.30E-04	0.00	2.01E-06	2.25E-06	1.79E-04	8.83E-07	-1.32E-03
Eutrophication potential	kg PO_4^{3-}-equiv.	1.10E-04	2.75E-06	1.54E-06	0.00	0.00	1.10E-04	8.41E-05	0.00	1.82E-07	5.52E-07	1.62E-05	1.81E-07	-1.03E-04
Formation potential of tropospheric ozone	kg C_2H_4-equiv.	1.00E-04	-4.07E-06	5.55E-07	0.00	0.00	1.0E04	5.93E-05	0.00	1.28E-07	-6.38E-07	1.14E-05	8.82E-08	-8.66E-05
Depletion of abiotic resources (ADP elements)	kg Sb-equiv.	2.20E-04	2.07E-10	7.97E-10	0.00	0.00	2.20E-04	1.24E-07	0.00	2.69E-10	5.87E-11	2.40E-08	9.37E-11	-3.38E-04
Depletion of abiotic resources (ADP fossil fuels)	MJ	4.38	3.56E-02	1.13E-02	0.00	0.00	4.45	3.47	0.00	7.50E-3	1.01E-02	0.67	1.64E-03	-3.61
Use of resources	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B4**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Renewable primary energy as energy source	MJ	0.98	1.79E-03	2.06E-03	0.00	0.00	0.98	1.95	0.00	4.20E-03	5.08E-04	0.38	3.12E-04	-0.85
Renewable primary energy for material use	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total use of renewable primary energy	MJ	0.98	1.79E-03	2.06E-03	0.00	0.00	0.98	1.95	0.00	4.20E-03	5.08E-04	0.38	3.12E-04	-0.85
Non-renewable primary energy as energy source	MJ	4.40	3.57E-02	1.30E-02	0.00	0.00	4.40	5.71	0.00	1.23E-02	1.01E-02	1.10	1.79E-03	-4.18
Non-renewable primary energy for material use	MJ	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total use of non-renewable primary energy	MJ	4.54	3.57E-02	1.30E-02	0.00	0.00	4.40	5.71	0.00	1.23E-02	1.01E-02	1.10	1.79E-03	-4.18
Use of secondary materials	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Renewable secondary fuels	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-renewable secondary fuels	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Use of fresh water resources	m^3	2.33	1.48E-04	1.42E-03	0.00	0.00	2.33	1.48	0.00	3.20E-03	4.2E-05	0.29	1.73E-04	-1.34
Waste categories and output material flows	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B4**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Disposed hazardous waste	kg	6.79E-07	0.00	0.00	0.00	0.00	6.79E-07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Disposed non-hazardous waste	kg	11.60	1.29E-04	2.80E-03	0.00	0.00	11.60	1.40	0.00	3.03E-03	3.66E-05	0.27	2.32E-03	-6.57
Radioactive waste	kg	4.04E-04	4.87E-08	7.00E-07	0.00	0.00	4.04E-04	8.87E-04	0.00	1.92E-06	1.38E-08	1.71E-04	6.18E-08	-2.26E-04
Components for further use	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Materials for recycling	kg	3.50E-02	0.00	0.00	0.00	0.00	3.50E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Materials for energy recovery	kg	3.10E-03	0.00	0.00	0.00	0.00	3.10E.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported electrical energy	MJ	0.00	0.00	6.30E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-2.10E-02	0.00
Exported thermal energy	MJ	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5.08E-02	0.00

Results per mm Pneumatical cylinder														
Environmental impacts	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B4**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2-equiv.	0.39	6.11E-03	5.29E-02	0.00	0.00	0.39	2.76E-03	0.00	1.06E-03	1.13E-03	6.16E-02	1.64E-02	-0.21
Depletion potential of stratospheric ozone layer	kg R11-equiv.	2.43E-09	2.02E-15	9.05E-15	0.00	0.00	2.43E-09	1.22E-07	0.00	4.71E-14	3.72E-16	2.74E-12	3.55E-16	-2.47E-12
Acidification potential of soil and water	kg SO_2-equiv.	1.43E-03	2.58E-05	8.29E-06	0.00	0.00	1.43E-03	7.88	0.00	3.03E-06	3.42E-06	1.76E-04	1.25E-06	-7.02E-04
Eutrophication potential	kg PO_4^{3-}-equiv.	1.29E-04	6.42E-06	1.62E-06	0.00	0.00	1.29E-04	0.71	0.00	2.74E-07	8.38E-07	1.59E-05	2.57E-07	-5.18E-05
Formation potential of tropospheric ozone	kg C_2H_4-equiv.	1.01E-03	-9.51E-06	5.89E-07	0.00	0.00	9.64E-05	0.50	0.00	1.93E-07	-9.68E-07	1.12E-05	1.25E-07	-4.53E-05
Depletion of abiotic resources (ADP elements)	kg Sb-equiv.	1.68E-05	4.83E-10	8.47E-10	0.00	0.00	5.25E-05	1.05E-03	0.00	4.06E-10	8.9E-11	2.36E-08	1.33E-10	-2.49E-05
Depletion of abiotic resources (ADP fossil fuels)	MJ	5.38	8.32E-02	1.21E-02	0.00	0.00	5.95	2.94E-04	0.00	1.13E-02	1.53E-02	0.66	2.32E-03	-2.47
Use of resources	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B4**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Renewable primary energy as energy source	MJ	1.38	4.19E-03	2.23E-03	0.00	0.00	1.38	1.65E-04	0.00	6.34E-03	7.71E-04	0.37	4.42E-04	-0.77
Renewable primary energy for material use	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total use of renewable primary energy	MJ	1.38	4.19E-03	2.23E-03	0.00	0.00	1.38	1.65E-04	0.00	6.34E-03	7.71E-04	0.37	4.42E-04	-0.77
Non-renewable primary energy as energy source	MJ	5.36	8.35E-02	1.39E-02	0.00	0.00	5.36	4.84E-04	0.00	1.86E-02	1.54E-02	1.08	2.55E-03	-3.01
Non-renewable primary energy for material use	MJ	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total use of non-renewable primary energy	MJ	5.52	8.35E-02	1.39E-02	0.00	0.00	5.36	1.25E-04	0.00	1.86E-02	1.54E-02	1.08	2.55E-03	-3.01
Use of secondary materials	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Renewable secondary fuels	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-renewable secondary fuels	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Use of fresh water resources	m^3	2.57	3.46E-04	1.51E-03	0.00	0.00	2.57	4.33E-03	0.00	4.82E-03	6.37E-05	0.28	2.45E-04	-1.48
Waste categories and output material flows	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**B3**	**B4**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Disposed hazardous waste	kg	2.91E-05	0.00	0.00	0.00	0.00	2.91E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Disposed non-hazardous waste	kg	51.70	1.91E-04	1.75E-04	0.00	0.00	51.70	1.19E-04	0.00	4.57E-03	5.55E-05	0.27	3.33E-03	-1.11
Radioactive waste	kg	2.03E-02	7.2E-08	4.72E-08	0.00	0.00	2.03E-02	7.52	0.00	2.89E-06	2.10E-08	0.000168	8.75E-08	-2.14E-04
Components for further use	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Materials for recycling	kg	1.16E-02	0.00	0.00	0.00	0.00	1.16E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Materials for energy recovery	kg	3.50E-03	0.00	0.00	0.00	0.00	3.50E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exported electrical energy	MJ	0.00	0.00	6.90E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-3.02E-02	0.00
Exported thermal energy	MJ	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-7.30E-02	0.00

6.4 Interpretation, LCA presentation and critical verification

Evaluation

Environmental impacts of 1 W electical drive are determinated in almost all category by the aluminium used. The steel, plastic, copper and packaging used as well as the manufacture play a secondary role. Environmental impacts caused by transports are marginal.
Environmental impacts of 1 mm pneumatical cylinder are dominated in almost all categories by the aluminium and steel used as well as by the manufacture. The plastics used and packaging play a underpart. Impacts caused by transports are marginal.

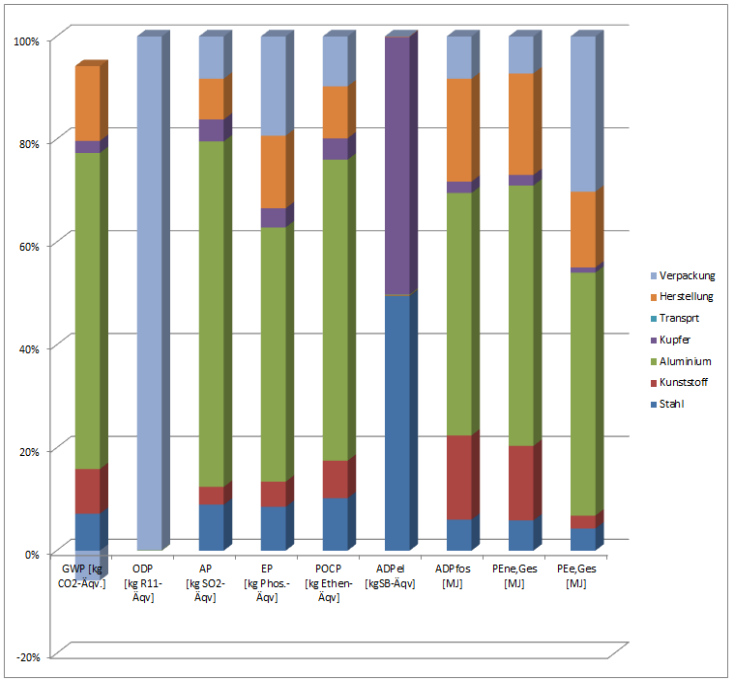
In the recycling of electrical drives and pneumatic cylinders, nearly 35 – 55 % of the environmental impacts that occur during the manufacture can be credited to Scenario D.

Compared to the EPD 5 years ago, LCA results only vary slightly.

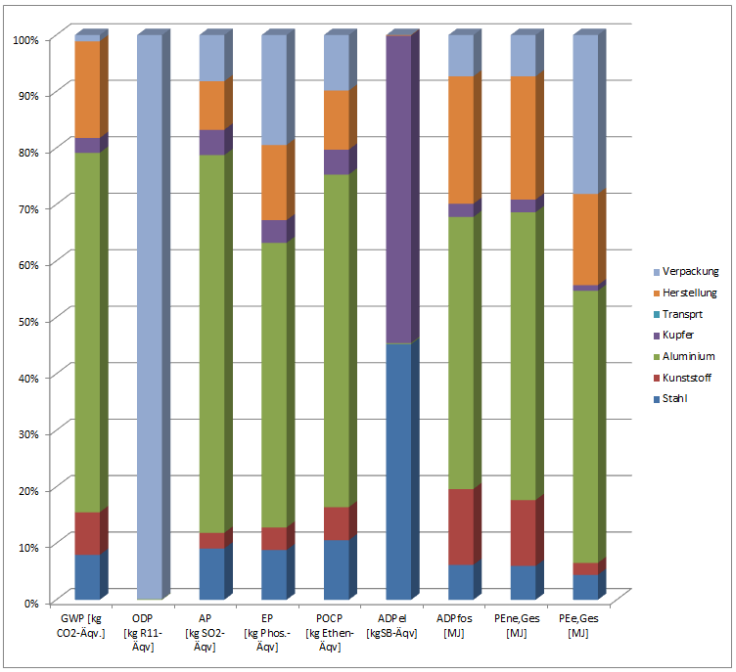
The breakdown of the major environmental impacts is shown in the diagram below.

The values obtained from the LCA calculation are suitable for the certification of buildings, as necessary.

Diagrams



Electrical drives



Pneumatical cylinders

Report

The LCA underlying this EPD was developed according to the requirements of DIN EN ISO 14040 and DIN EN ISO 14044 as well as EN 15804 and EN ISO 14025. It is not addressed to third parties for confidentiality reasons. It is deposited with the ift Rosenheim. The results and conclusions reported to the target group are complete, correct, without bias and transparent. The results of the study are not designed to be used for comparative statements intended for publication.

Critical review

The critical review of the LCA and the report took place in the course of verification of the EPD by the external verifier Patrick Wortner, MBA and Eng., Dipl.-Ing. (FH).

7 General information regarding the EPD

Comparability

This EPD was prepared in accordance with EN 15804 and is therefore only comparable to those EPDs that that also comply with the requirements set out in EN 15804.

Any comparison must refer to the building context and the same boundary conditions of the various life cycle stages.
For comparing EPDs of construction products, the rules set out in EN 15804 (Clause 5.3) apply.

The individual results of the products were summarized on the basis of conservative assumptions and differ from the average results. The determination of the product groups and the resulting variation is documented in the report.

Communication

The communications format of this EPD meets the requirements of EN 15942:2011 and is therefore the basis for B2B communication. Only the nomenclature has been changed according to EN 15804.

Verification

Verification of the Environmental Product Declaration is documented in accordance with the "Richtlinie zur Erstellung von Typ III Umweltproduktdeklarationen"

(Guidance on preparing Type III Environmental Product Declarations) in accordance with the requirements set out in ISO 14025.

This Declaration is based on the ift PCR documents “Bauteile für Anlagen zur Rauch- und Wärmefreihaltung” (Building components for smoke and heat control systems) PCR-RW-2.1:2018 and “PCR Teil A” (Part A) PCR-A-0.2:2018.

The European standard EN 15804 serves as the core PCR [a)]
Independent verification of the Declaration and statement according to EN ISO 14025:2010 ☐ internal ☒ external
Independent third party verifier: [b)] Patrick Wortner
[a)] Product category rules [b)] Optional for business-to-business communication, mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Revisions of this document

No.	Date	Note	Practitioner of the LCA	Verifier/s
1	18.12.2018	Initial creation	Zwick	Wortner
2	28.03.2019	External verificaton	Zwick	Wortner
3	18.01.2024	Date correction	Brechleiter	-
4	28.03.2024	Adjustment of date for next revision	Brechleiter	-

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9 Annex

Description of life cycle scenarios for Electrical drives and pneumatic cylinders for SHEV and ventilation systems

Product stage			Con-struction stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacture	Transport	Construction / Installation	Use	Inspection, maintenance, cleaning	Repair	Exchange / Replacement	Improvement / Modernisation	Operational energy use	Operational water use	Deconstruction	Transport	Waste management	Disposal	Re-use Recovery Recycling potential
✓	✓	✓	✓	✓	—	✓	✓	✓	—	✓	✓	✓	✓	✓	✓	✓

For the calculation of the scenarios a building life time of 50 years was considered (see RSL 4 Use stage).
The scenarios were based on information provided by the manufacturer. The scenarios were furthermore bases on the research project "EPDs for transparent building components" (1).

Note: The standard scenarios selected are presented in bold type. They were also used for calculating the indicators in the summary table.

✓ Included in the LCA
— Not included in the LCA

A4 Transport to construction site Electrical drives

No.	Usage scenario	Description
A4.1	**Direct delivery to cunstruction site / branch domestically**	**Small vehicle transporter (Euro 0-6 Mix), 95 per cent capacity used, approx. 50 km distance to sites**
A4.2	Direct delivery to construction site / branch abroad	7,5 t lorry (Euro 0-6 Mix), 95 per cent capacity used, approx. 800 km distance to sites

A4 transport to construction site			
Environmental impacts	**unit**	**A4.1**	A4.2
Global warming potential	kg CO_2-equiv.	**2.62E-03**	5.45E-03
Depletion potential of stratospheric ozone layer	kg R11-equiv.	**8.65E-16**	1.80E-15
Acidification potential of soil and water	kg SO_2-equiv.	**1.10E-05**	2.12E-05
Eutrophication potential	kg PO_4^{3-}-equiv.	**2.75E-06**	5.72E-06
Formation potential of tropospheric ozone	kg C_2H_4-equiv.	**-4.07E-06**	-7.65E-06
Depletion of abiotic resources (ADP elements)	kg Sb-equiv.	**2.07E-10**	4.31E-10
Depletion of abiotic resources (ADP fossil fuels)	MJ	**3.56E-02**	7.41E-02
Use of resources	**Unit**	**A4.1**	A4.2
Renewable primary energy as energy source	MJ	**1.79E-03**	3.73-E03
Renewable primary energy for material use	MJ	**0.00**	0.00
Total use of renewable primary energy	MJ	**1.79E-03**	3.73-E03
Non-renewable primary energy as energy source	MJ	**3.57E-02**	7.43E-02
Non-renewable primary energy for material use	MJ	**0.00**	0.00
Total use of non-renewable primary energy	MJ	**3.57E-02**	7.43E-02
Use of secondary materials	kg	**0.00**	0.00
Renewable secondary fuels	MJ	**0.00**	0.00
Non-renewable secondary fuels	MJ	**0.00**	0.00
Use of fresh water resources	m^3	**1.48E-04**	3.08E-04
Waste categories and output material flows	**Unit**	**A4.1**	A4.2
Disposed hazardous waste	kg	**0.00**	0.00
Disposed non-hazardous waste	kg	**1.29E-04**	2.68E-04
Radioactive waste	kg	**4.87E-08**	1.01E-07
Components for further use	kg	**0.00**	0.00
Materials for recycling	kg	**0.00**	0.00
Materials for energy recovery	kg	**0.00**	0.00
Exported electrical energy	MJ	**0.00**	0.00
Exported thermal energy	MJ	**0.00**	0.00

A4 Transport to construction site Pneumatic cylinders

No.	Usage scenario	Description
A4.1	**Direct delivery to cunstruction site / branch domestically**	**Small vehicle transporter (Euro 0-6 Mix), 95 per cent capacity used, approx. 50 km distance to sites**
A4.2	Direct delivery to construction site / branch abroad	7,5 t lorry (Euro 0-6 Mix), 95 per cent capacity used, approx. 800 km distance to sites

A4 transport to construction site			
Environmental impacts	**unit**	**A4.1**	A4.2
Global warming potential	kg CO_2-equiv.	**2.62E-03**	5.45E-03
Depletion potential of stratospheric ozone layer	kg R11-equiv.	**8.65E-16**	1.80E-15
Acidification potential of soil and water	kg SO_2-equiv.	**1.10E-05**	2.12E-05
Eutrophication potential	kg PO_4^{3-}-equiv.	**2.75E-06**	5.72E-06
Formation potential of tropospheric ozone	kg C_2H_4-equiv.	**-4.07E-06**	-7.65E-06
Depletion of abiotic resources (ADP elements)	kg Sb-equiv.	**2.07E-10**	4.31E-10
Depletion of abiotic resources (ADP fossil fuels)	MJ	**3.56E-02**	7.41E-02
Use of resources	**Unit**	**A4.1**	A4.2
Renewable primary energy as energy source	MJ	**1.79E-03**	3.73-E03
Renewable primary energy for material use	MJ	**0.00**	0.00
Total use of renewable primary energy	MJ	**1.79E-03**	3.73-E03
Non-renewable primary energy as energy source	MJ	**3.57E-02**	7.43E-02
Non-renewable primary energy for material use	MJ	**0.00**	0.00
Total use of non-renewable primary energy	MJ	**3.57E-02**	7.43E-02
Use of secondary materials	kg	**0.00**	0.00
Renewable secondary fuels	MJ	**0.00**	0.00
Non-renewable secondary fuels	MJ	**0.00**	0.00
Use of fresh water resources	m^3	**1.48E-04**	3.08E-04
Waste categories and output material flows	**Unit**	**A4.1**	A4.2
Disposed hazardous waste	kg	**0.00**	0.00
Disposed non-hazardous waste	kg	**1.29E-04**	2.68E-04
Radioactive waste	kg	**4.87E-08**	1.01E-07
Components for further use	kg	**0.00**	0.00
Materials for recycling	kg	**0.00**	0.00
Materials for energy recovery	kg	**0.00**	0.00
Exported electrical energy	MJ	**0.00**	0.00
Exported thermal energy	MJ	**0.00**	0.00

A5 Construction / Installation

No.	Usage scenario	Description
A5	manual	Electrical drives and pneumatic cylinders for SHEV and ventilation systems are installed without the need of additional lifting equipment means accoring to the manufacturer

In case of deviating consumption during the construction or installation of the products forms part of the site management and is covered at the building level.

Operating supplies, the use of water, losses of material and waste materials as well as transport distances during construction / installation can be neglected.

It is assumed that the packaging material is fed to the waste treatment in the module "construction / installation". Waste is thermally recycled.
Credits from A5 are shown in module D. Credits from waste incineration plant: electricity replaces electricity mix EU 28; Thermal energy replaces thermal energy from natural gas (EU 28).
The transport to the treatment plants is not taken into account.

Since this is the only scenario, the results are shown in the summary table.

B1 use of the installed product (not considered)

See chapter 4 Use stage - Emissions to the environment. Emissions can't be quantified.

B2 Inspection, maintenance, cleaning

B2.1 Cleaning

There is no cleaning required.

Operating supplies, the use of energy / water, losses of material and waste materials as well as transport distances during cleaning can be neglected.

Since this is the only scenario, the results are shown in the summary table.

B2.2 Inspection, maintenance

No.	Usage scenario	Description
B2.2	normal load	Annual functional testing, visual inspection and possibly mending

Operating supplies, the use of energy / water, losses of material and waste materials as well as transport distances during maintenance can be neglected.

Since this is the only scenario, the results are shown in the summary table.

B3 Repair

No.	Usage scenario	Description
B3	Normal load and high load	No replacement* required

* Assumptions for the assessment of possible environmental impacts; Statements do not constitute a promise of guarantee or warranty of any characteristics

Current information can be found in the respective instructions for installation, operation, maintenance and disassembly for Electrical drives and pneumatic cylinders for SHEV and ventilation systems.

The service life of the Electrical drives and pneumatic cylinders for SHEV and ventilation systems from the AUMÜLLER AUMATIC GmbH is declared with 25 years. For the scenario B3 the respective components of the parts are accounted, if their service life is less than the given period of 50 years.

Operating supplies, the use of energy / water, losses of material and waste materials as well as transport distances during repair can be neglected.

Since this is the only scenario, the results are shown in the summary table.

B4 Exchange / Replacement

No.	Usage scenario	Description
B4	Normal load and high load	1-time replacement* in 50 years: complete replacement

* Assumptions for the assessment of possible environmental impacts; Statements do not constitute a promise of guarantee or warranty of any characteristics

In this EPD, only informative information is given to allow consideration at building level.

With a service life of 25 years and the scheduled building service life of 50 years, 1-time replacements are planned.

Current information can be found in the respective instructions for installation, operation, maintenance and disassembly for Electrical drives and pneumatic cylinders for SHEV and ventilation systems.

In the chosen scenario, environmental impacts from the manufacture occur.
Operating supplies, the use of energy / water, losses of material and waste materials as well as transport distances during exchange / replacement are taken into account.

Since this is the only scenario, the results are shown in the summary table.

B6 Operational energy use

No.	Usage scenario	Description
B6	**power-operated, normal load**	**Electrical drives:** **0.733 kWh/50a electricity (22,000 cycles/50a; 2 minutes/cycle; 1 W/cycle)** **Pneumatic cylinder** **6.212 kWh/50a electricity (22,000 cycles/50a; 2 litre/cycle; 6 Wh/litre – 264.00 kWh per cylinder**

* Frequencies, service life, number of users, cycles, etc.

There are no transport efforts during the energy use in the building. Operating supplies, the use of water, waste materials and other scenarios can be neglected.

Since this is the only scenario, the results are shown in the summary table.

B7 Operational water use (not relevant)

No water consumption when used as intended. Water consumption for cleaning is specified in module B2.1.

There are no transport efforts during the water use in the building. Operating supplies, the use of energy, waste materials and other scenarios can be neglected.

Since this is the only scenario, the results are shown in the summary table.

C1 Deconstruction

No.	Usage scenario	Description
C1	Deconstruction	**99 % dismantling;** **Further dismantling rates possible, appropriately substantiates.**

In case of deviating consumption the removal of the products forms part of the site management and is covered at the building level.

Since this is the only scenario, the results are shown in the summary table.

C2 Transport

No.	Usage scenario	Description
C2	Transport	**Transport to the collecting point using a small vehicle transporter (Euro 0-6 Mix), 80 % capacity used, 50 km distance**

Since this is the only scenario, the results are shown in the summary table.

C3 Waste management

No.	Usage scenario	Description
C3	Disposal	Share for the return of materials: • **Steel 98% in melting** (UBA, "End-of-life vehicles recycling and vehicle disposition", 2017) • **Aluminium 95% in melting** (GDA, „Recycling from the beginning", 2018) • **Other metals 97% in melting** (UBA, "End-of-life vehicles recycling and vehicle disposition", 2017) • **Plastic materials 66% thermal recycling in WtE facilities** (Future Building, volume 6, 2017) • **Plastic materials 34% mechanically recycled** (Future Building, volume 6, 2017) • **Electrical components 87%** (on the basis of used electronic equipment 87%; UBA, „Analysis of the data collection according to ElektroG and UStatG for the reporting year 2016 in preparation of the EU reporting obligations", 2018) • **Rest in landfill sites**

The below table presents the disposal processes and their percentage by mass/weight. The calculation is based on the above mentioned shares in per cent related to the declared unit of the product system.

C3 disposal	Unit	Drive	Pneumatic cylinder
Collection process, collected separately	kg	5.60E-02	8.5E-02
Collection process, collected as mixed construction waste	kg	0.00	0.00
Recovery system, for re-use	kg	0.00	0.00
Recovery system, for recycling	kg	2.33E-02	7.47E-02
Recovery system, for energy recovery	kg	4.60E-02	5.22E-03
Disposal	kg	1.95E-03	2.80E-03

Since this is the only scenario, the results are shown in the overall table.

C4 Disposal

No.	Usage scenario	Description
C4	**Disposal**	**The non-measurable quantities and losses of the re-use/recycling chain (C1 and C3) are modelled as "disposed".**

The consumption of scenario C4 results from physical pre-treatment, waste recycling and operating of the disposal site. The benefits obtained here from the substitution of primary material production are allocated to module D, e.g. electricity and heat from waste incineration.

Since this is the only scenario, the results are shown in the overall table.

D Benefits and loads beyond the system boundaries		
No.	**Usage scenario**	**Description**
D	**Recycling potential**	**Aluminium recyclate from C3 excluding the recyclate used in A3 replaces 60 % of aluminium compound; Steel scrap from C3 excluding the recyclate used in A3 replaces 60 % of steel; Copper scrap from C3 excluding the recyclate used in A3 replaces 60 % of copper-mix; Brass scrap from C3 excluding the recyclate used in A3 replaces 60 % of brass; Plastic recyclate from C3 excluding the recyclate used in A3 replaces 60 % of plastic profile; Printed circuit board recyclate from C3 excluding the recyclate used in A3 replaces 60 % of printed circuit board; Credits from WtE facility: Electricity replaces EU-28 electricity mix; thermal energy replaces thermal energy out of EU-28 natural gas**
The values in module D results from both, the recycling of the packaging material in module A5 and the deconstruction at the end of the service life. Since this is the only scenario, the results are shown in the overall table.		

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Notes
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