Environmental Product Declaration (EPD)

Declaration code EPD-ARS-GB-38.0

heroal

Heroal Johann Henkenjohann GmbH & Co. KG

ECO PLATFORM EPD VERIFIED

sun protection systems

Aluminum roller shutter elements

EPD © ift Rosenheim

Basis:

DIN EN ISO 14025
EN 15804 + A2

Company EPD **E**nvironmental **P**roduct **D**eclaration

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Declaration code	EPD-ARS-GB-38.0		
Designation of declared product	Aluminum roller shutter elements		
Scope	heroal roller shutters offer privacy, glare and light protection and can be used in all building classes.		
Basis	This EPD was prepared on the basis of EN ISO 14025:2011 and DIN EN 15804:2012+A2:2019. In addition, the "Allgemeiner Leitfaden zur Erstellung von Typ III Umweltproduktdeklarationen" (General guideline for preparation of Type III Environmental Product Declarations) applies. The declaration is based on PCR documents "PCR Part A" PCR-A-0.2:2018 and „Shading devices and closures“ PCR-SS-2.3:2018.		
Validity	Publication date: 13.02.2024	Last revision: 13.02.2024	Valid until: 13.02.2029
	This verified Company Environmental Product Declaration (company EPD) applies solely to the specified products and is valid for a period of five years from the date of publication in accordance with DIN EN 15804.		
LCA Basis	The LCA was prepared in accordance with DIN EN ISO 14040 and DIN EN ISO 14044. The data are based on both the data compiled from the production site of Heroal Johann Henkenjohann GmbH & Co. KG and the generic data derived from the “LCA for Experts 10” database. LCA calculations were carried out for the included “cradle to gate – with options” including all upstream chains (e.g. raw material extraction, etc.).		
Notes	The ift-Guidance Sheet “Conditions and Guidance for the Use of ift Test Documents” applies. The declaration holder assumes full liability for the underlying data, certificates and verifications.		

Christian Kehrer Head of Certification and Surveillance Body	Dr. Torsten Mielecke Chairman of Expert Committee ift-EPD and PCR	Susanne Volz External Verifier

1 General Product Information

Product definition

The EPD relates to the product group “sun protection systems” and applies to:

1 m² Aluminium roller shutter elements
of company Heroal Johann Henkenjohann GmbH & Co. KG

The declared unit is obtained by summing up:

Assessed product	Declared unit	Weight per unit area
RS42	1 m²	8.33 kg/m²
RS 37 SL	1 m²	9.75 kg/m²
RS 37 RC 3	1 m²	24.66 kg/m²

Table 1 Product groups

The average unit is declared as follows:
Directly used material flows are determined using average sizes (1.23 m x 1.48 m) and allocated to the declared unit. All other inputs and outputs in the manufacture were scaled to the declared unit as a whole, since no direct assignment to the average size is possible. The reference period is the year 2020.

The validity of the EPD is restricted to the following series:

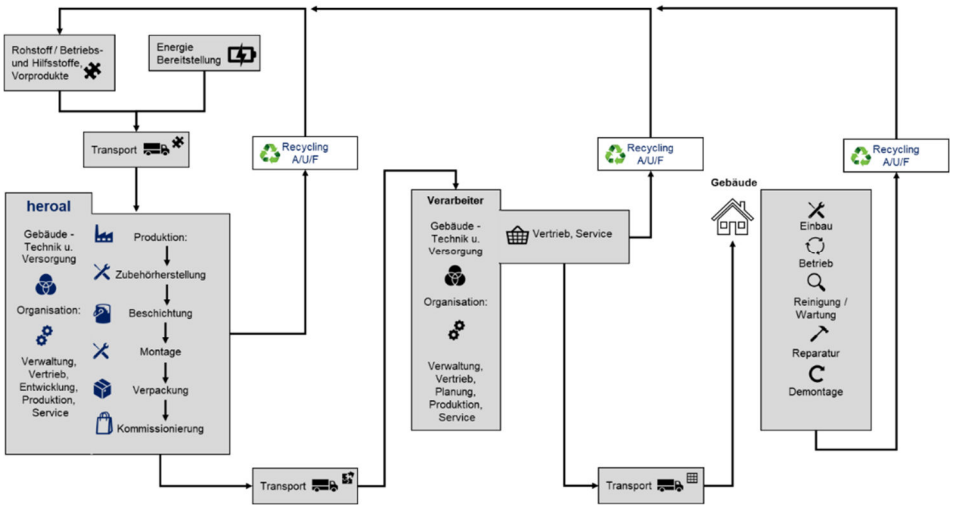
Product groups		
R1	**R2**	**R3**
RS 42	**RS 37 SL**	**RS 37 RC 3**
RS 41	RS 38	RS 37 RC 2
RS 41 SW	RS 52	RS 53 RC 2
RS 37	RS 54	
	RS 32	
	RS 55 SL	

Product description

heroal roller shutters are energy-efficient and increase both burglary protection and wind load resistance with class 3-6. In winter, heroal roller shutters contribute to thermal insulation, in summer they keep rooms cool. In combination with heroal windows, heat loss at night can be reduced by up to 44%. All heroal roller shutters are available in a comprehensive RAL color palette and various surfaces. heroal roller shutters can be installed as built-in, front-mounted, surface-mounted and flush-mounted roller shutters. There are various box sizes and shapes to choose from. A distinction is made between roll-formed (FMR) and extruded (FME) design variants. The heroal systems can also be realized with various rod systems. Motors from different manufacturers can be selected. Manual operation by strap or cord is also possible for selected rod variants. The RC 2 and RC 3 tested heroal security roller shutter systems offer certified burglary protection according to DIN EN 1627-1630. The tilt-lock end rail, reinforced guide tracks with safety catch, an integrated anti-lift device and roller shutter boxes with safety catches make the security roller shutters particularly robust. Depending on the desired resistance class, the slats are made of aluminum (up to RC 2) or stainless steel (RC 3).

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

Product manufacture



Application

Aluminium roller shutter systems for residential and commercial buildings, office and administrative buildings, industrial buildings, sports and cultural buildings, single-family houses and multiple dwelling units.

Test evidence / reports

The following verifications are held:

- Qualicoat, Zurich: Coating
- Aluminum and environment in window and facade engineering (A/U/F), Frankfurt: Sustainability and responsibility in ecology and economy
- Institut für geprüfte Sicherheit (IGS - Institute for Certified Safety) eGen, Linz: Hail protection roller shutters and roller shutter systems
- Seal of approval from the Quality Association for the Piece Coating of Components (GSB International e.V.), Düsseldorf: official GSB premium coater
- Certificate of Bundesverbands Rollladen + Sonnenschutz e.V. "RSQ-Siegel" (seal): "Einbruchhemmende Rolladen + Sonnenschutz" (burglar resistant roller shutter + shading device) for heroal Safe light

For information on further and updated verifications (including other national approvals) refer to www.heroal.de.

Management systems

The following management systems are held:

- Quality management system as per DIN EN ISO 9001:2015
- Energy management system as per DIN EN ISO 50001:2011
- Environmental management system as per DIN EN ISO 14001:2015

Additional information

For additional verifications of applicability or conformity refer to the CE marking and the documents accompanying the product, if applicable.

Aluminum roller shutter elements meet the following building-physical performance characteristics

- Wind load resistance class: 3-6
- Burglar resistance: up to RC 3
- Optimized sound insulation: +10 d
- Hail class: 3-7

2 Materials used

Primary materials

The raw materials used can be found in Section 6.2 Inventory analysis (Inputs).
The primary materials used are listed in the LCA (see Section 6).

Declarable substances

The product contains no substances from the REACH candidate list (declaration dated 23.10.2023).

All relevant safety data sheets are available from Heroal Johann Henkenjohann GmbH & Co. KG.

3 Construction process stage

Processing recommendations, installation

Observe the instructions for assembly/installation, operation, maintenance and disassembly, provided by the manufacturer. For this, see www.heroal.de

4 Use stage

Emissions to the environment

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

Reference service life (RSL)

The RSL information was provided by the manufacturer. The RSL must be established under specified reference conditions of use and relate to the declared technical and functional performance of the product within the building. It must be determined according to all specific rules given in European product standards or, if none are available, according to a c-PCR. It must also take into account ISO 15686-1, -2, -7 and -8. If there is guidance on deriving RSLs from European Product Standards or a c-PCR, then such guidance must take precedence.
If it is not possible to determine the service life as the RSL in accordance with ISO 15686, the BBSR table “Nutzungsdauer von Bauteilen zur Lebenszyklusanalyse nach BNB” (service life of building components for life cycle assessment in accordance with the sustainable construction evaluation system) can be used. For further information and explanations refer to www.nachhaltigesbauen.de.
For this EPD the following applies:
For an EPD "cradle to factory gate with options", with modules C1-C4 and module D (A1-A3 + C + D and one or more additional modules from

A4 to B7), the specification of a reference service life (RSL) is only possible if the reference service life conditions are specified.
The service life of aluminium roller shutter elements from heroal Johann Henkenjohann GmbH & Co. KG is optionally specified as 40 years according to the BBSR table.

The service life solely applies to the characteristics specified in this EPD or the corresponding references.
The RSL does not reflect the actual life time, which is usually determined by the service life and the redevelopment of a building. It does not give any information on the useful life, warranty referring to performance characteristics or guarantees.

5 End-of-life stage

Possible end-of-life stages

The Aluminum roller shutter elements are sent to central collection points. There the products are usually shredded and sorted into their constituents. The end-of-life stage depends on the site where the products are used and is therefore subject to the local regulations. Observe the locally applicable regulatory requirements.

In this EPD, the modules of after-use are presented according to the market situation.
Certain parts of metals and electronics are recycled. Plastics are thermally recycled. Residual fractions are sent to landfill.

Disposal routes

The LCA includes the average disposal routes.

All life cycle scenarios are detailed in the Annex.

6 Life Cycle Assessment (LCA)

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

Life cycle assessments have been developed as the basis for Aluminum roller shutter elements. These LCAs are in conformity with the requirements set out in DIN EN 15804 and 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

Aim

The goal of the LCA is to demonstrate the environmental impacts of the products. In accordance with DIN 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. No other additional environmental impacts are specified.

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

The specific data originate exclusively from the 2020 fiscal year. They were collected on-site at the plant located in Verl and originate in parts from company records and partly from values directly obtained by measurement. Validity of the data was checked by the ift Rosenheim.

The generic data originate from the “LCA for Experts 10” of Sphera professional and building materials databases. The last update of both databases was in 2023. Data from before this date originate also from these databases and are not more than five years old. No other generic data were used for the calculation.

Generic data are selected as accurately as possible in terms of geographic reference. If no country-specific data sets are available or if the regional reference cannot be determined, European or globally valid data sets are used.

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 “LCA for Experts” for the development of life cycle assessments.

The data quality complies with the requirements of prEN 15941:2022.

Scope / system boundaries

The system boundaries refer to the supply of raw materials and purchased parts, manufacture/production, use and end-of-life stage of Aluminum roller shutter elements.
No additional data from pre-suppliers/subcontractors or other sites were taken into consideration.

Cut-off criteria

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

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

The transportation route of the raw materials, ancillary materials and packaging was taken into account 100%.

In addition to the transport distances for pre-products, transport distances for waste were also taken into account. The transportation of waste generated in A3 was mapped using the following standard scenario:

- Transport to collection point using 40 t truck (Euro 0-6 Mix), Diesel, 27t payload, 50% capacity used (1)
  Transport distances according to manufacturer's specifications, specific per waste.

The criteria for the exclusion of inputs and outputs as set out in DIN EN 15804 are fulfilled. From the data analysis it can be assumed that the total of negligible processes per life cycle stage does not exceed 1% of the mass/primary energy. This way the total of negligible processes does not exceed 5% of the energy and mass input. The life cycle calculation also includes material and energy flows that account for less than 1%.

6.2 Inventory analysis

Aim

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

Life cycle stages

The complete life cycle of Aluminum roller shutter elements is shown in the annex. The product stage "A1 – A3", construction process stage "A4 – A5", use stage "B2 – B7", end-of-life stage "C1 – C4" and the benefits and loads beyond the system boundaries "D" are considered.

Benefits

The below benefits have been defined as per DIN EN 15804:

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

Allocation of co-products

No allocations occur during production.

Allocations for re-use, recycling and recovery

If the products are reused/recycled and recovered during the product stage (rejects), the elements are shredded, if necessary and then sorted into their constituents. This is done by various process plants, e.g. magnetic separators.
The system boundaries were set following their disposal, reaching the end-of-waste status.

Allocations beyond life cycle boundaries

The use of recycled materials in the manufacturing process was 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 recycling (recyclate).
Secondary materials that enter the production process as input are calculated in module A1 as input without loads. No benefits are assigned to Module D, but consumption to Modules C3 and C4 (worst case consideration).
The system boundary set for the recycled material refers to collection.

Secondary material

The use of secondary material by Heroal Johann Henkenjohann GmbH & Co. KG was considered in Module A3. Secondary materials are used.
The materials with secondary material and the corresponding proportion are shown in Table 2.

Material	Secondary material share in %		
	R1	R2	R3
Aluminium	33.8 %	29.4 %	56.9 %

Table 2 Secondary material share

Inputs

The following manufacturing-related inputs were included in the LCA per 1 m² Aluminium roller shutter elements:

Energy
For the input material gas, "natural gas Germany" was assumed. For the electricity mix, the "Electricity Mix Germany" was assumed.

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 amounts per m² of the element as follows:

- R1: 3.68 ml
- R2: 5.45 ml
- R3: 11.80 ml

The consumption of fresh water specified in Section 6.3 originates (among others) from the process chain of the pre-products and the process water used in the foam system.

Raw material / pre-products
The charts below show the share of raw materials/pre-products in percent.

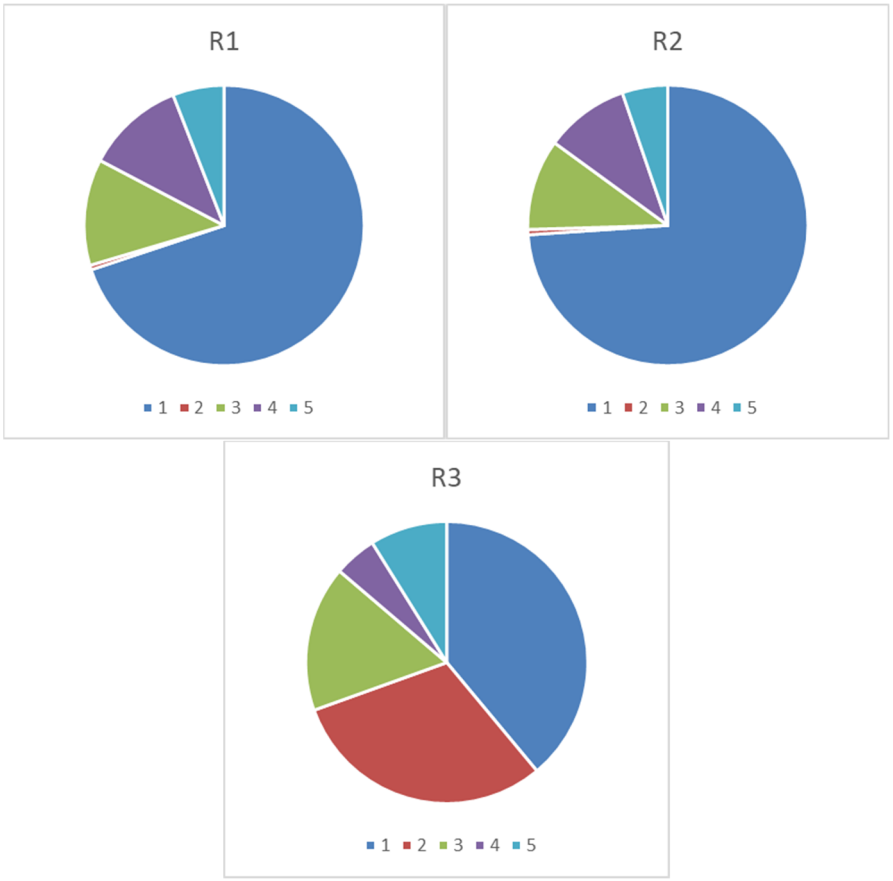


Illustration 1 Percentage of individual materials per declared unit

No.	Material	Mass in %		
1	Aluminium	70 %	74 %	39 %
2	Stainless steel	1 %	1 %	31 %
3	Other metals	12 %	10 %	17 %
4	Drive unit / Electronics	11 %	10 %	5 %
5	Plastics	6 %	5 %	9 %

Table 3 Percentage of individual materials per declared unit

Ancillary materials and consumables
The following quantities of ancillary materials and consumables are required per m² element:

- R1: 0.21 g
- R2: 0.16 g
- R3: 0.68 g

Product packaging
The amounts used for product packaging are as follows:

No.	Material	Mass in kg		
		R1	R2	R3
1	Film/foil	2.43E-02	2.65E-02	7.76E-02
2	Cardboard	1.24	1.24	1.97
3	Mat	-	-	1.65E-02

Table 4 Weight in kg of packaging per declared unit

Biogenic carbon content
Only the biogenic carbon content of the associated packaging is reported, as the total mass of biogenic carbon-containing materials is less than 5% of the total mass of the product and associated packaging. According to EN 16449, the following amounts of biogenic carbon are generated for packaging:

No.	Part	Content in kg C per m²	
		R1 / R2	R3
1	In the corresponding packaging	0.44	0.71

Table 5 Biogenic carbon content of the packaging at the factory gate

Outputs

The following manufacturing-related outputs were included in the LCA per 1 m² Aluminium roller shutter element:

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

Waste water
The following quantities of waste water are produced per m² of element during production:

- R1: 3.68 ml
- R2: 5.45 ml
- R3: 11.80 ml

6.3 Impact assessment

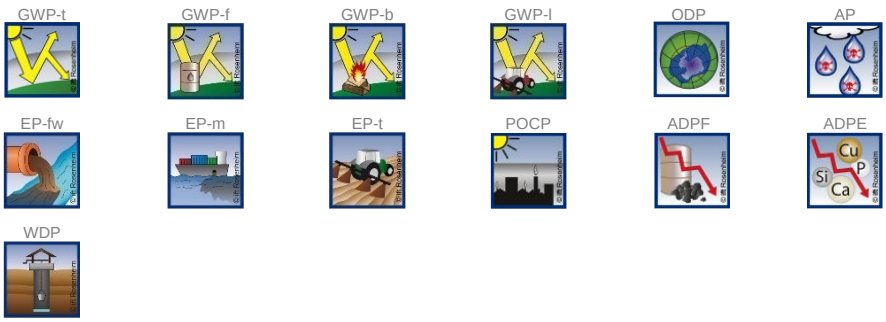
Aim

The impact assessment covers both inputs and outputs. The impact categories applied are stated below:

Core indicators

The models for impact assessment were applied as described in DIN EN 15804-A2. The impact categories presented for the core indicators in the EPD are as follows:

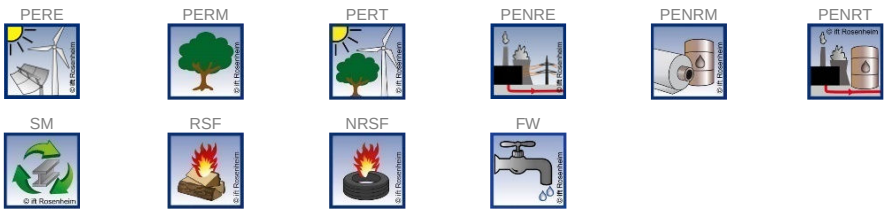
- Climate change - total (GWP-t)
- Climate change - fossil (GWP-f)
- Climate change - biogenic (GWP-b)
- Climate change - land use & land use change (GWP-l)
- Ozone depletion (ODP)
- Acidification (AP)
- Eutrophication freshwater (EP-fw)
- Eutrophication salt water (EP-m)
- Eutrophication land (EP-t)
- Photochemical ozone creation (POCP)
- Depletion of abiotic resources - fossil fuels (ADPF)
- Depletion of abiotic resources - minerals and metals (ADPE)
- Water use (WDP)



Resource management

The models for impact assessment were applied as described in DIN EN 15804-A2. The following resource use indicators are presented in the EPD:

- Renewable primary energy as energy source (PERE)
- Renewable primary energy for material use (PERM)
- Total use of renewable primary energy (PERT)
- Non-renewable primary energy as energy source (PENRE)
- Renewable primary energy for material use (PENRM)
- Total use of non-renewable primary energy (PENRT)
- Use of secondary materials (SM)
- Use of renewable secondary fuels (RSF)
- Use of non-renewable secondary fuels (NRSF)
- Net use of freshwater resources (FW)

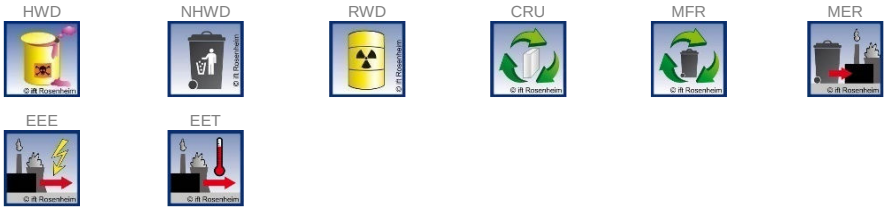


Waste

The waste generated during the production of 1 m² Aluminium roller shutter elements door is evaluated and shown separately for the fractions 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.

The models for impact assessment were applied as described in DIN EN 15804-A2.
The waste categories and indicators for output material flows presented in the EPD are as follows:

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



Additional environmental impact indicators

The models for impact assessment were applied as described in DIN EN 15804-A2.
The additional impact categories presented in the EPD are as follows:

- Particulate matter emissions (PM)
- Ionizing radiation, human health (IRP)
- Ecotoxicity – freshwater (ETP-fw)
- Human toxicity, carcinogenic effects (HTP-c)
- Human toxicity, non-carcinogenic effects (HTP-nc)
- Impacts associated with land use/soil quality (SQP)

Results per 1 m² Roller shutter RS 42																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core indicators																
GWP-t	kg CO_2 equivalent	48.11	1.85	1.82	ND	9.61E-02	0.00	0.42	0.00	0.14	0.00	0.00	0.49	1.02	6.61E-03	-38.30
GWP-f	kg CO_2 equivalent	50.00	1.85	0.10	ND	9.60E-02	0.00	0.43	0.00	0.14	0.00	0.00	0.49	1.02	6.81E-03	-38.30
GWP-b	kg CO_2 equivalent	-1.90	-2.57E-02	1.71	ND	-6.58E-05	0.00	-5.60E-03	0.00	1.49E-03	0.00	0.00	-6.80E-03	5.94E-04	-2.26E-04	-7.78E-04
GWP-l	kg CO_2 equivalent	1.48E-02	1.69E-02	1.11E-05	ND	9.69E-05	0.00	7.17E-04	0.00	1.48E-05	0.00	0.00	4.49E-03	7.12E-06	2.11E-05	-9.55E-03
ODP	kg CFC-11-eq.	3.23E-08	2.38E-13	2.36E-13	ND	7.60E-10	0.00	4.17E-10	0.00	2.51E-12	0.00	0.00	6.30E-14	9.26E-13	1.73E-14	-3.15E-08
AP	mol H^+-eq.	0.18	1.80E-03	4.94E-04	ND	7.37E-04	0.00	1.20E-03	0.00	2.91E-04	0.00	0.00	5.30E-04	1.38E-03	4.83E-05	-0.15
EP-fw	kg P-eq.	5.93E-05	6.69E-06	7.26E-08	ND	1.12E-07	0.00	1.22E-06	0.00	5.08E-07	0.00	0.00	1.77E-06	1.98E-07	1.37E-08	-2.16E-05
EP-m	kg N-eq.	3.21E-02	4.95E-04	1.79E-04	ND	6.62E-05	0.00	2.51E-04	0.00	6.96E-05	0.00	0.00	1.65E-04	6.77E-04	1.25E-05	-2.49E-02
EP-t	mol N-eq.	0.34	6.37E-03	2.25E-03	ND	6.96E-04	0.00	2.66E-03	0.00	7.27E-04	0.00	0.00	2.01E-03	7.52E-03	1.37E-04	-0.27
POCP	kg NMVOC-eq.	9.65E-02	1.48E-03	4.73E-04	ND	2.23E-04	0.00	7.52E-04	0.00	1.86E-04	0.00	0.00	4.50E-04	1.73E-03	3.76E-05	-7.51E-02
ADPF*²	MJ	693.20	24.90	0.59	ND	1.18	0.00	6.10	0.00	2.86	0.00	0.00	6.60	1.34	9.06E-02	-505.00
ADPE*²	kg Sb equivalent	9.26E-04	1.20E-07	2.12E-09	ND	1.85E-05	0.00	1.16E-05	0.00	2.11E-08	0.00	0.00	3.19E-08	7.91E-09	3.14E-10	-8.50E-04
WDP*²	m^3 world-eq. deprived	3.48	2.21E-02	0.22	ND	3.43E-02	0.00	3.26E-02	0.00	3.03E-02	0.00	0.00	5.85E-03	0.11	7.47E-04	-3.07
Resource management																
PERE	MJ	218.12	1.81	19.93	ND	0.28	0.00	2.24	0.00	1.71	0.00	0.00	0.48	0.62	1.48E-02	-157.00
PERM	MJ	19.79	0.00	-19.79	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	237.90	1.81	0.14	ND	0.28	0.00	2.24	0.00	1.71	0.00	0.00	0.48	0.62	1.48E-02	-157.00
PENRE	MJ	683.32	25.00	1.08	ND	1.19	0.00	6.10	0.00	2.87	0.00	0.00	6.62	11.53	0.19	-506.00
PENRM	MJ	10.79	0.00	-0.50	ND	0.00	0.00	-4.44E-17	0.00	0.00	0.00	0.00	0.00	-10.19	-0.10	0.00
PENRT	MJ	694.11	25.00	0.59	ND	1.19	0.00	6.10	0.00	2.87	0.00	0.00	6.62	1.34	9.07E-02	-506.00
SM	kg	2.33	0.00	0.00	ND	0.00	0.00	5.83E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.38	1.99E-03	5.26E-03	ND	1.10E-03	0.00	2.20E-03	0.00	1.38E-03	0.00	0.00	5.26E-04	2.81E-03	2.29E-05	-0.32
Categories of waste																
HWD	kg	1.23E-06	7.74E-11	1.69E-11	ND	8.04E-10	0.00	2.21E-08	0.00	-2.24E-10	0.00	0.00	2.05E-11	-2.28E-11	1.97E-12	-3.63E-07
NHWD	kg	9.75	3.81E-03	6.13E-02	ND	1.95E-02	0.00	7.17E-02	0.00	2.10E-03	0.00	0.00	1.01E-03	7.51E-03	0.45	-7.76
RWD	kg	4.17E-02	4.68E-05	3.04E-05	ND	3.84E-05	0.00	1.92E-04	0.00	4.56E-04	0.00	0.00	1.24E-05	1.61E-04	1.03E-06	-3.51E-02
Output material flows																
CRU	kg	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	1.03	0.00	0.00	ND	1.83E-02	0.00	0.21	0.00	0.00	0.00	0.00	0.00	7.44	0.00	0.00
MER	kg	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	4.23E-03	0.00	2.75	ND	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	1.89	0.00	0.00
EET	MJ	9.24E-03	0.00	5.04	ND	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	3.37	0.00	0.00

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - feutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*²** - abiotic depletion potential – fossil resources **ADPE*²** - abiotic depletion potential – minerals&metals **WDP*²** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **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** - net use of fresh water **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 per 1 m² Roller shutter RS 42																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	1.83E-06	1.38E-08	2.76E-09	ND	6.87E-09	0.00	1.15E-08	0.00	2.45E-09	0.00	0.00	3.89E-09	4.03E-09	5.94E-10	-1.54E-06
IRP*[1]	kBq U235-eq.	8.73	6.98E-03	4.77E-03	ND	6.42E-03	0.00	3.49E-02	0.00	7.58E-02	0.00	0.00	1.85E-03	2.67E-02	1.20E-04	-7.51
ETP-fw*[2]	CTUe	247.87	17.70	0.27	ND	0.66	0.00	2.43	0.00	1.26	0.00	0.00	4.69	0.53	4.95E-02	-187.00
HTP-c*[2]	CTUh	8.74E-08	3.62E-10	1.54E-11	ND	6.94E-11	0.00	1.76E-09	0.00	4.22E-11	0.00	0.00	9.59E-11	2.17E-11	7.61E-12	-1.89E-08
HTP-nc*[2]	CTUh	5.63E-07	1.91E-08	6.67E-10	ND	2.50E-09	0.00	5.39E-09	0.00	1.04E-09	0.00	0.00	5.09E-09	6.69E-10	8.37E-10	-4.25E-07
SQP*[2]	dimensionless	317.26	10.40	0.17	ND	0.33	0.00	7.31	0.00	1.12	0.00	0.00	2.76	0.43	2.20E-02	-45.60

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers:

*1 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 ionising radiation from the soil, from radon and from some building materials is also not measured by this indicator.

*2 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 experience with the indicator.

Results per 1 m² Roller shutter RS 37 SL																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core indicators																
GWP-t	kg CO_2 equivalent	60.05	2.12	1.82	ND	9.61E-02	0.00	0.54	0.00	0.14	0.00	0.00	0.57	1.11	7.40E-03	-48.30
GWP-f	kg CO_2 equivalent	61.94	2.13	0.11	ND	9.60E-02	0.00	0.55	0.00	0.14	0.00	0.00	0.58	1.11	7.63E-03	-48.30
GWP-b	kg CO_2 equivalent	-1.90	-2.95E-02	1.71	ND	-6.58E-05	0.00	-5.72E-03	0.00	1.49E-03	0.00	0.00	-7.97E-03	5.95E-04	-2.53E-04	-1.69E-03
GWP-l	kg CO_2 equivalent	1.64E-02	1.95E-02	1.12E-05	ND	9.69E-05	0.00	8.15E-04	0.00	1.48E-05	0.00	0.00	5.25E-03	7.07E-06	2.37E-05	-1.09E-02
ODP	kg CFC-11-eq.	3.25E-08	2.73E-13	2.38E-13	ND	7.60E-10	0.00	4.22E-10	0.00	2.51E-12	0.00	0.00	7.38E-14	9.28E-13	1.94E-14	-3.15E-08
AP	mol H^+-eq.	0.22	2.06E-03	4.96E-04	ND	7.37E-04	0.00	1.57E-03	0.00	2.91E-04	0.00	0.00	6.21E-04	1.33E-03	5.41E-05	-0.18
EP-fw	kg P-eq.	6.59E-05	7.68E-06	7.31E-08	ND	1.12E-07	0.00	1.32E-06	0.00	5.08E-07	0.00	0.00	2.07E-06	1.98E-07	1.54E-08	-2.65E-05
EP-m	kg N-eq.	3.97E-02	5.69E-04	1.79E-04	ND	6.62E-05	0.00	3.18E-04	0.00	6.96E-05	0.00	0.00	1.93E-04	6.49E-04	1.40E-05	-3.15E-02
EP-t	mol N-eq.	0.43	7.32E-03	2.25E-03	ND	6.96E-04	0.00	3.43E-03	0.00	7.27E-04	0.00	0.00	2.36E-03	7.25E-03	1.54E-04	-0.34
POCP	kg NMVOC-eq.	0.12	1.70E-03	4.74E-04	ND	2.23E-04	0.00	9.56E-04	0.00	1.86E-04	0.00	0.00	5.28E-04	1.66E-03	4.22E-05	-9.44E-02
ADPF*²	MJ	857.40	28.60	0.59	ND	1.18	0.00	7.78	0.00	2.86	0.00	0.00	7.73	1.34	0.10	-640.00
ADPE*²	kg Sb equivalent	9.29E-04	1.38E-07	2.14E-09	ND	1.85E-05	0.00	1.16E-05	0.00	2.11E-08	0.00	0.00	3.74E-08	7.93E-09	3.52E-10	-8.52E-04
WDP*²	m^3 world-eq. deprived	4.14	2.54E-02	0.22	ND	3.43E-02	0.00	3.83E-02	0.00	3.03E-02	0.00	0.00	6.86E-03	0.12	8.37E-04	-3.65
Resource management																
PERE	MJ	271.31	2.08	19.97	ND	0.28	0.00	2.71	0.00	1.71	0.00	0.00	0.56	0.62	1.66E-02	-203.00
PERM	MJ	19.82	0.00	-19.82	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	291.14	2.08	0.15	ND	0.28	0.00	2.71	0.00	1.71	0.00	0.00	0.56	0.62	1.66E-02	-203.00
PENRE	MJ	848.02	28.70	1.13	ND	1.19	0.00	7.81	0.00	2.87	0.00	0.00	7.76	11.97	0.21	-641.00
PENRM	MJ	11.29	0.00	-0.54	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-10.63	-0.11	0.00
PENRT	MJ	859.31	28.70	0.59	ND	1.19	0.00	7.81	0.00	2.87	0.00	0.00	7.76	1.34	0.10	-641.00
SM	kg	2.40	0.00	0.00	ND	0.00	0.00	6.00E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.48	2.28E-03	5.28E-03	ND	1.10E-03	0.00	3.07E-03	0.00	1.38E-03	0.00	0.00	6.16E-04	2.99E-03	2.57E-05	-0.41
Categories of waste																
HWD	kg	8.78E-07	8.90E-11	1.69E-11	ND	8.04E-10	0.00	1.32E-08	0.00	-2.24E-10	0.00	0.00	2.40E-11	-2.48E-11	2.21E-12	-3.68E-07
NHWD	kg	12.46	4.38E-03	6.19E-02	ND	1.95E-02	0.00	9.93E-02	0.00	2.10E-03	0.00	0.00	1.18E-03	7.14E-03	0.51	-9.96
RWD	kg	5.34E-02	5.38E-05	3.05E-05	ND	3.84E-05	0.00	2.90E-04	0.00	4.56E-04	0.00	0.00	1.45E-05	1.62E-04	1.16E-06	-4.54E-02
Output material flows																
CRU	kg	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	1.11	0.00	0.00	ND	1.83E-02	0.00	0.25	0.00	0.00	0.00	0.00	0.00	8.79	0.00	0.00
MER	kg	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	1.12E-02	0.00	2.76	ND	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	2.07	0.00	0.00
EET	MJ	2.45E-02	0.00	5.06	ND	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	3.70	0.00	0.00

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - feutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*²** - abiotic depletion potential – fossil resources **ADPE*²** - abiotic depletion potential – minerals&metals **WDP*²** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **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** - net use of fresh water **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 per 1 m² Roller shutter RS 37 SL															
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	2.25E-06	1.58E-08	2.78E-09	ND	6.87E-09	0.00	1.51E-08	0.00	2.45E-09	0.00	0.00	4.56E-09	3.94E-09	6.65E-10	-1.91E-06
IRP*[1]	kBq U235-eq.	11.23	8.02E-03	4.78E-03	ND	6.42E-03	0.00	5.51E-02	0.00	7.58E-02	0.00	0.00	2.17E-03	2.68E-02	1.34E-04	-9.74
ETP-fw*[2]	CTUe	304.53	20.30	0.27	ND	0.66	0.00	3.00	0.00	1.26	0.00	0.00	5.49	0.53	5.54E-02	-236.00
HTP-c*[2]	CTUh	1.15E-07	4.16E-10	1.55E-11	ND	6.94E-11	0.00	2.37E-09	0.00	4.22E-11	0.00	0.00	1.12E-10	2.23E-11	8.53E-12	-2.29E-08
HTP-nc*[2]	CTUh	6.75E-07	2.20E-08	6.75E-10	ND	2.50E-09	0.00	6.52E-09	0.00	1.04E-09	0.00	0.00	5.96E-09	6.69E-10	9.38E-10	-5.19E-07
SQP*[2]	dimensionless	329.31	12.00	0.17	ND	0.33	0.00	7.48	0.00	1.12	0.00	0.00	3.23	0.44	2.47E-02	-54.80

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers:

*1 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 ionising radiation from the soil, from radon and from some building materials is also not measured by this indicator.

*2 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 experience with the indicator.

Results per 1 m² Roller shutter RS 37 RC 3																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core indicators																
GWP-t	kg CO_2 equivalent	93.77	5.14	3.02	ND	0.13	0.00	0.56	0.00	0.19	0.00	0.00	1.45	5.48	1.76E-02	-69.70
GWP-f	kg CO_2 equivalent	96.73	5.17	0.30	ND	0.13	0.00	0.57	0.00	0.19	0.00	0.00	1.46	5.47	1.81E-02	-69.80
GWP-b	kg CO_2 equivalent	-2.96	-7.16E-02	2.72	ND	-9.94E-05	0.00	-5.39E-03	0.00	2.02E-03	0.00	0.00	-2.02E-02	1.23E-02	-6.02E-04	0.10
GWP-l	kg CO_2 equivalent	3.35E-02	4.72E-02	1.99E-05	ND	1.34E-04	0.00	1.46E-03	0.00	2.01E-05	0.00	0.00	1.33E-02	1.26E-04	5.63E-05	-3.39E-02
ODP	kg CFC-11-eq.	4.79E-08	6.63E-13	4.14E-13	ND	1.05E-09	0.00	2.15E-10	0.00	3.40E-12	0.00	0.00	1.87E-13	2.05E-11	4.61E-14	-4.33E-08
AP	mol H^+-eq.	0.41	5.01E-03	8.13E-04	ND	1.02E-03	0.00	1.40E-03	0.00	3.94E-04	0.00	0.00	1.57E-03	5.53E-03	1.29E-04	-0.31
EP-fw	kg P-eq.	1.50E-04	1.86E-05	1.25E-07	ND	1.52E-07	0.00	3.31E-06	0.00	6.88E-07	0.00	0.00	5.24E-06	4.18E-06	3.65E-08	-3.84E-05
EP-m	kg N-eq.	6.19E-02	1.38E-03	2.91E-04	ND	9.09E-05	0.00	2.55E-04	0.00	9.43E-05	0.00	0.00	4.88E-04	2.13E-03	3.32E-05	-4.50E-02
EP-t	mol N-eq.	0.67	1.78E-02	3.70E-03	ND	9.56E-04	0.00	2.73E-03	0.00	9.85E-04	0.00	0.00	5.96E-03	2.38E-02	3.65E-04	-0.49
POCP	kg NMVOC-eq.	0.19	4.11E-03	7.71E-04	ND	3.06E-04	0.00	8.43E-04	0.00	2.52E-04	0.00	0.00	1.33E-03	5.53E-03	1.00E-04	-0.14
ADPF*²	MJ	1341.66	69.40	0.99	ND	1.59	0.00	8.92	0.00	3.88	0.00	0.00	19.50	24.30	0.24	-871.00
ADPE*²	kg Sb equivalent	2.12E-03	3.36E-07	3.68E-09	ND	2.56E-05	0.00	1.57E-05	0.00	2.86E-08	0.00	0.00	9.45E-08	1.73E-07	8.36E-10	-1.60E-03
WDP*²	m^3 world-eq. deprived	8.91	6.16E-02	0.37	ND	4.39E-02	0.00	-3.60E-02	0.00	4.11E-02	0.00	0.00	1.73E-02	0.68	1.99E-03	-10.60
Resource management																
PERE	MJ	372.58	5.05	31.70	ND	0.38	0.00	3.02	0.00	2.32	0.00	0.00	1.42	14.00	3.93E-02	-220.00
PERM	MJ	31.45	0.00	-31.45	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	MJ	404.04	5.05	0.25	ND	0.38	0.00	3.02	0.00	2.32	0.00	0.00	1.42	14.00	3.93E-02	-220.00
PENRE	MJ	1294.72	69.70	2.92	ND	1.59	0.00	8.16	0.00	3.88	0.00	0.00	19.60	68.87	0.69	-872.00
PENRM	MJ	46.95	0.00	-1.93	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-44.57	-0.45	0.00
PENRT	MJ	1341.67	69.70	0.99	ND	1.59	0.00	8.16	0.00	3.88	0.00	0.00	19.60	24.30	0.24	-872.00
SM	kg	5.31	0.00	0.00	ND	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	m^3	0.60	5.53E-03	8.67E-03	ND	1.44E-03	0.00	-2.99E-03	0.00	1.87E-03	0.00	0.00	1.56E-03	2.12E-02	6.10E-05	-0.59
Categories of waste																
HWD	kg	5.53E-07	2.16E-10	2.61E-11	ND	1.11E-09	0.00	1.11E-08	0.00	-3.04E-10	0.00	0.00	6.07E-11	-1.67E-09	5.26E-12	-7.83E-08
NHWD	kg	14.25	1.06E-02	0.11	ND	2.69E-02	0.00	2.81E-02	0.00	2.84E-03	0.00	0.00	2.99E-03	3.87E-02	1.21	-10.30
RWD	kg	5.77E-02	1.30E-04	5.03E-05	ND	5.29E-05	0.00	3.22E-05	0.00	6.17E-04	0.00	0.00	3.67E-05	3.71E-03	2.75E-06	-4.17E-02
Output material flows																
CRU	kg	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.34	0.00	0.00	ND	2.52E-02	0.00	0.55	0.00	0.00	0.00	0.00	0.00	21.50	0.00	0.00
MER	kg	0.00	0.00	0.00	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	0.00	0.00	4.59	ND	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00	7.73	0.00	0.00
EET	MJ	0.00	0.00	8.50	ND	0.00	0.00	0.56	0.00	0.00	0.00	0.00	0.00	13.80	0.00	0.00

Key:
GWP-t – global warming potential - total **GWP-f** – global warming potential fossil fuels **GWP-b** – global warming potential - biogenic **GWP-l** – global warming potential - land use and land use change **ODP** – ozone depletion potential **AP** - acidification potential **EP-fw** - eutrophication potential - aquatic freshwater **EP-m** - eutrophication potential - aquatic marine **EP-t** - feutrophication potential - terrestrial **POCP** - photochemical ozone formation potential **ADPF*²** - abiotic depletion potential – fossil resources **ADPE*²** - abiotic depletion potential – minerals&metals **WDP*²** – Water (user) deprivation potential **PERE** - Use of renewable primary energy **PERM** - use of renewable primary energy resources **PERT** - total use of renewable primary energy resources **PENRE** - use of non-renewable primary energy **PENRM** - use of non-renewable primary energy resources **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** - net use of fresh water **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 per 1 m² Roller shutter RS 37 RC 3																
	Unit	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Additional environmental impact indicators																
PM	Disease incidence	5.36E-06	3.83E-08	4.64E-09	ND	9.48E-09	0.00	1.94E-08	0.00	3.32E-09	0.00	0.00	1.15E-08	2.82E-08	1.58E-09	-3.87E-06
IRP*[1]	kBq U235-eq.	10.86	1.94E-02	7.79E-03	ND	8.86E-03	0.00	-3.23E-02	0.00	0.10	0.00	0.00	5.47E-03	0.62	3.18E-04	-8.84
ETP-fw*[2]	CTUe	496.62	49.30	0.45	ND	0.90	0.00	1.53	0.00	1.71	0.00	0.00	13.90	10.60	0.13	-412.00
HTP-c*[2]	CTUh	1.12E-05	1.01E-09	2.64E-11	ND	9.54E-11	0.00	2.78E-07	0.00	5.71E-11	0.00	0.00	2.84E-10	3.70E-10	2.03E-11	-6.43E-08
HTP-nc*[2]	CTUh	1.28E-06	5.33E-08	1.22E-09	ND	3.44E-09	0.00	1.24E-08	0.00	1.41E-09	0.00	0.00	1.51E-08	9.40E-09	2.23E-09	-6.45E-07
SQP*[2]	dimensionless	568.80	29.00	0.29	ND	0.45	0.00	12.81	0.00	1.52	0.00	0.00	8.16	9.29	5.86E-02	-79.40

Key:
PM – particulate matter emissions potential **IRP*[1]** – ionizing radiation potential – human health **ETP-fw*[2]** - Eco-toxicity potential – freshwater **HTP-c*[2]** - Human toxicity potential – cancer effects **HTP-nc*[2]** - Human toxicity potential – non-cancer effects **SQP*[2]** – soil quality potential

Disclaimers:

*1 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 ionising radiation from the soil, from radon and from some building materials is also not measured by this indicator.

*2 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 experience with the indicator.

6.4 Interpretation, LCA presentation and critical review

Evaluation

The environmental impacts of

- RS42 (R1)
- RS 37 SL (R2)
- RS 37 RC 3 (R3)

differ considerably in some cases, whereby the differences between product group R1 and R2 are rather small and R3 differs considerably. The differences lie in the various pre-products and raw materials used (aluminum, steel and stainless steel) and, in particular, in the mass of the respective pre-products and raw materials used. In case of roller shutters, product group 3 (R3) in particular differs greatly from the other two product groups. This can be explained by the fact that it is a burglar-resistant product and therefore the amount of material used is considerably higher. In general, the products with the lowest material usage per 1 m² of product also have the lowest environmental impact.

In the area of production, the environmental impacts arise primarily from the use of primary aluminum and its upstream chains. Stainless steel and PU foam also play an important role in the environmental impact of product group R3. Further environmental impacts are caused by the drive unit. The other metals and plastics used play a subordinate role in production.

Furthermore, the one-off replacement of the drive during the 50-year utilisation phase plays an important role in terms of environmental impact.

In scenario C4, only marginal expenditures for the physical pretreatment and the landfill operation are to be expected. Allocation to individual products is almost impossible for site disposal.
When recycling roller shutters, around 35% of the environmental impacts of the core indicators (excluding WDP, as not supported by the software) occurring during the life cycle can be credited in scenario D for aluminium and around 7% for drive units. In product group R3, approx. 15% of the environmental impacts in module D are also credited for stainless steel.

The diagrams below shows the allocation of the main environmental impacts.

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

Diagrams

The diagrams below show the B modules with reference to the specified RSL within the building service life of 50 years.

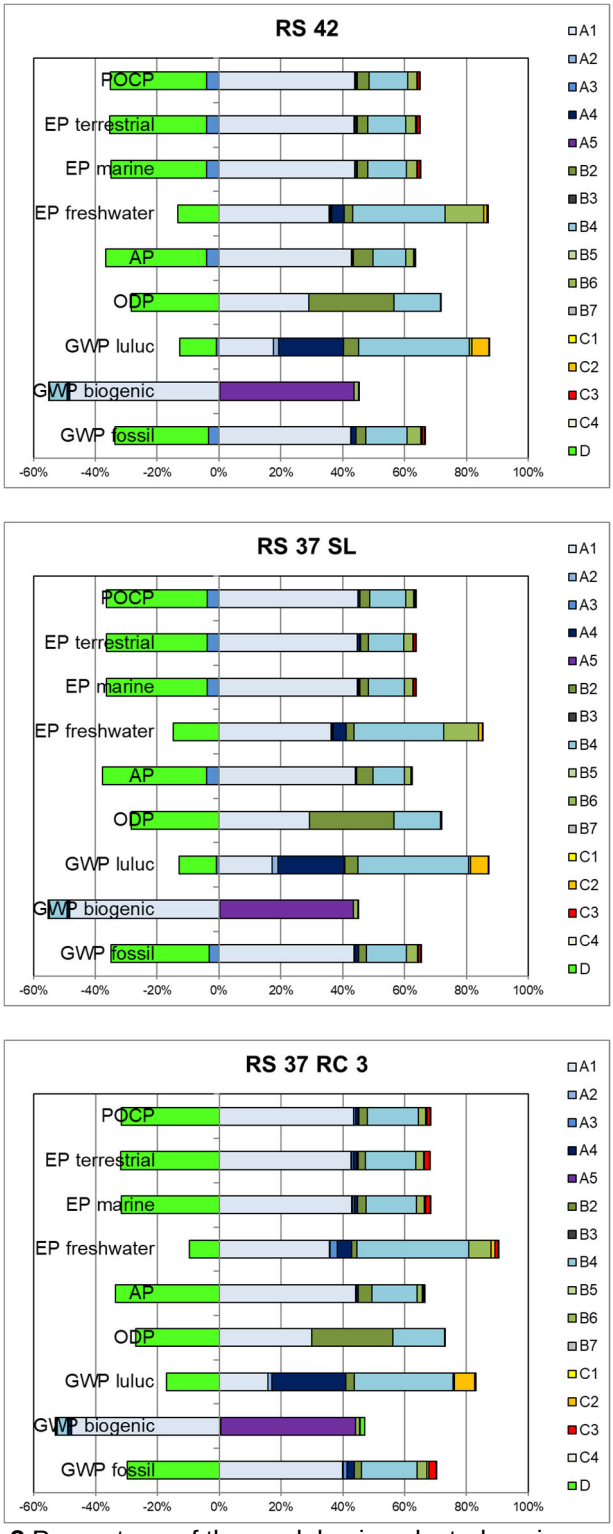


Illustration 2 Percentage of the modules in selected environmental impact indicators

Report

The LCA report underlying this EPD was developed according to the requirements of DIN EN ISO 14040 and DIN EN ISO 14044 as well as DIN EN 15804 and DIN EN ISO 14025. It is deposited with 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 and was carried out by the external verifier Susanne Volz, M.Sc. (Graduate Business Lawyer).

7 General information regarding the EPD

Comparability

This EPD was prepared in accordance with DIN EN 15804 and is therefore only comparable to those EPDs that also comply with the requirements set out in DIN 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 DIN EN 15804, Clause 5.3, apply.

The detailed individual results of the products were summarised on the basis of conservative assumptions and differ from the average results. Identification of the product groups and the resulting variations are documented in the background report.

Communication

The communications format of this EPD meets the requirements of EN 15942:2012 and is therefore the basis for B2B communication. Only the nomenclature has been changed according to DIN EN 15804.

Verification

Verification of the Environmental Product Declaration is documented in accordance with the ift "Richtlinie zur Erstellung von Typ III Umweltproduktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) in accordance with the requirements set out in DIN EN ISO 14025.
This declaration is based on the PCR documents "PCR Part A" PCR-A-0.2:2018 and "Shading device and closures" PCR-SS-2.3:2020.

The European standard EN 15804 serves as the core PCR [a)]
Independent verification of the declaration and statement according to EN ISO 14025:2010
Independent third party verifier: [b)] Susanne Volz
[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	Person in charge	Testing personnel
1	12.02.2024	External verification	Dellawalle	Volz

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9 Annex

Description of life cycle scenarios for Aluminum roller shutter elements

Product stage			Con-struction process stage		Use stage*							End-of-life stage				Benefits and loads beyond system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	production	Transport	Construction/installation process	Use	maintenance	Repair	replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/demolition	Transport	Waste processing	Disposal	Reuse Recovery Recycling potential
✓	✓	✓	✓	✓	—	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

* For declared B-modules, the calculation of the results is performed taking into account the specified RSL related to one year

Table 6 Overview of applied life cycle stages

The scenarios were calculated taking into account the defined RSL (see Point 4 Use stage).

The scenarios were based on information provided by the manufacturer. The scenarios were furthermore based on the research project “EPDs for transparent building components” (1) as well as EN 17213.

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

No.	Scenario	Description
A4	Small series via local manufacturers	According to the manufacturer: Small series via local manufacturers: 7.5 t truck (Euro 0-6 mix), 2.7 t payload, full capacity, approx. 50 km to site and empty return trip as well as 7.5 t truck (Euro 0-6 mix), 2.7 t payload, 20% load, approx. 50 km to site and empty return trip

[1] Capacity used: utilized loading capacity of the truck

A4 Transport to construction site	Transport weight [kg/m²]	Density [kg/m³]	Capacity load factor[2]
R1	9.59	433.14	< 1
R2	11.02	507.43	< 1
R3	26.72	831.30	< 1

[2] Capacity load factor:
= 1 Product completely fills the packaging (without air inclusion)
< 1 Packaging contains unused volume (e.g.: air, filling material)
> 1 Product is packed in compressed form

Since this is a single scenario, the results are shown in the relevant summary table.

A5 Construction/Installation

No.	Scenario	Description
A5	Manual	According to the manufacturer, the products are installed without additional lifting and auxiliary devices

In case of deviating consumption during installation/assembly of the products which forms part of the site management, they are covered at the building level.

Ancillary materials, consumables, use of energy and water, other resource use, material losses, direct emissions as well as waste during construction / installation are negligible.

It is assumed that the packaging material in the Module A5 is sent to waste handling. Waste is only thermally recycled in line with the conservative approach: Films/casings, wood and carton in incineration plants. Benefits from A5 are specified in module D. Benefits from waste incineration: Benefits from waste incineration: electricity replaces electricity mix (RER); thermal energy replaces thermal energy from European natural gas (RER).
Transport to the recycling plants is not taken into account.

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

B2 Cleaning, maintenance and repair

Since this is a single scenario, the results are shown in the relevant summary table.

B2.1 Cleaning

No.	Scenario	Description
B2.1	**Rarely, manual**	**Manual using suitable cleaning agents: as specified by the manufacturer, yearly. 0.2 l water and 0.01 l detergent per cleaning (based on EN 17074); 8.4 l Cleaner/ RSL**

Ancillary materials, use of energy, material losses and waste as well as transport distances during cleaning are negligible.

B2.2 Maintenance and repair

No.	Scenario	Description
B2.2	**Normal use**	**According to the manufacturer: Annual functional test, visual inspection. Roller shutters: One-time replacement*: Motor and control unit**

* Assumptions for evaluation of possible environmental impacts; statements made do not constitute any guaranty or warranty of performance.

For updated information refer to the relevant instructions for assembly/installation, operation and maintenance from Heroal Johann Henkenjohann GmbH & Co. KG .

The service life of the Aluminum roller shutter elements of company Heroal Johann Henkenjohann GmbH & Co. KG is specified as 40 years. For scenario B2, the respective components of the building elements whose useful life is less than the specified RSL are accounted for. The results were based on one year, taking into account the RSL.

It is assumed that the replaced components in the repair module will be sent for recycling. 87% of electrical components are recycled, rest to landfill (based on waste electrical equipment 87%; UBA, 2018).
Transport to the recycling plants is not taken into account.

Ancillary materials, consumables, use of energy and water, waste, material losses and transport distances during repair are negligible.

B3 Repair

No.	Scenario	Description
B3	**Normal use and heavy use**	**Based on EN 17213:** **The repair of accidental damage (e.g. broken windows or damaged building hardware) may only be taken into account if the installation site is known and reasons are given as to why this accidental damage is to be expected (e.g. schools).** **According to EN 15804:** **The "Repair" module covers the combination of all planned technical and related administrative activities [...].**

Ancillary materials, consumables, use of energy and water, waste, material losses and transport distances during repair are negligible.

Since this is a single scenario, the results are shown in the relevant summary table.

B4 Exchange / Replacement

No.	Scenario	Description
B4.1	**Normal use and heavy use**	**One-time replacement after 40 years (RSL)***

*Assumptions for evaluation of possible environmental impacts; statements made do not constitute any guaranty or warranty of performance.

The statements made in this EPD are only informative to allow evaluation at the building level.

It is assumed that a 1-time replacement will be necessary during the 40-year reference service life and the 50-year building service life. The results were based on one year, taking into account the RSL.

For updated information refer to the relevant instructions for assembly/installation, operation and maintenance from Heroal Johann Henkenjohann GmbH & Co. KG .

The environmental impacts of the selected scenario originate from the product, construction and disposal phases.

Since this is a single scenario, the results are shown in the relevant summary table.

B5 Improvement / Modernisation

According to the manufacturer, the elements are not included in the improvement / modernisation activities for buildings.

For updated information refer to the relevant instructions for assembly/installation, operation and maintenance from Heroal Johann Henkenjohann GmbH & Co. KG.

Ancillary materials, consumables, use of energy and water, material losses, waste as well as transport distances during installation are negligible.

Since this is a single scenario, the results are shown in the relevant summary table.

B6 Operational energy use

No.	Scenario	Description
B6.1	**Power-operated normal use**	**Roller shutters:** • **R1 / R2: 0.58 Wh/cycle, 2 cycles per day (16.88 kWh/RSL) electricity (including standby mode)** • **R3: 0.78 Wh/cycle, 2 cycles per day (22.89 kWh/RSL) electricity (including standby mode)**
B6.2	Manual normal use	No energy consumption

* Frequencies, usage times, number of users, cycles, etc.

In the following table, the results were based on one year, taking into account the RSL.

B6 Operational energy use	Unit	R1 / R2	R3	R1 / R2 / R3
		B6.1		B6.2
Core indicators				
GWP-t	kg CO_2 equivalent	**0.14**	**0.19**	0.00
GWP-f	kg CO_2 equivalent	**0.14**	**0.19**	0.00
GWP-b	kg CO_2 equivalent	**1.49E-03**	**2.02E-03**	0.00
GWP-l	kg CO_2 equivalent	**1.47E-05**	**2.00E-05**	0.00
ODP	kg CFC-11-eq.	**2.50E-12**	**3.39E-12**	0.00
AP	mol H^+-eq.	**2.89E-04**	**3.93E-04**	0.00
EP-fw	kg P-eq.	**5.05E-07**	**6.86E-07**	0.00
EP-m	kg N-eq.	**6.92E-05**	**9.40E-05**	0.00
EP-t	mol N-eq.	**7.23E-04**	**9.82E-04**	0.00
POCP	kg NMVOC-eq.	**1.85E-04**	**2.51E-04**	0.00
ADPF	MJ	**2.85**	**3.87**	0.00
ADPE	kg Sb equivalent	**2.10E-08**	**2.85E-08**	0.00
WDP	m^3 world-eq. deprived	**3.02E-02**	**4.10E-02**	0.00
Resource management				
PERE	MJ	**1.70**	**2.31**	0.00
PERM	MJ	**0.00**	**0.00**	0.00
PERT	MJ	**1.70**	**2.31**	0.00
PENRE	MJ	**2.85**	**3.87**	0.00
PENRM	MJ	**0.00**	**0.00**	0.00
PENRT	MJ	**2.85**	**3.87**	0.00
SM	kg	**0.00**	**0.00**	0.00
RSF	MJ	**0.00**	**0.00**	0.00
NRSF	MJ	**0.00**	**0.00**	0.00

FW	m³	**1.38E-03**	**1.87E-03**	0.00
Categories of waste				
HWD	kg	**-2.23E-10**	**-3.03E-10**	0.00
NHWD	kg	**2.09E-03**	**2.83E-03**	0.00
RWD	kg	**4.53E-04**	**6.15E-04**	0.00
Output material flows				
CRU	kg	**0.00**	**0.00**	0.00
MFR	kg	**0.00**	**0.00**	0.00
MER	kg	**0.00**	**0.00**	0.00
EEE	MJ	**0.00**	**0.00**	0.00
EET	MJ	**0.00**	**0.00**	0.00
Additional environmental impact indicators				
PM	Disease incidence	**2.44E-09**	**3.31E-09**	0.00
IRP	kBq U235-eq.	**7.54E-02**	**0.10**	0.00
ETPfw	CTUe	**1.26**	**1.71**	0.00
HTPc	CTUh	**4.20E-11**	**5.69E-11**	0.00
HTPnc	CTUh	**1.03E-09**	**1.40E-09**	0.00
SQP	dimensionless	**1.12**	**1.52**	0.00

B7 Operational water use

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

There is no transport consumption for water use in buildings. Ancillary materials, consumables, waste materials and other scenarios are negligible.

Since this is a single scenario, the results are shown in the relevant summary table.

C1 Deconstruction

No.	Scenario	Description
C1	**Deconstruction**	**Roller shutters and external shading device:** **99 % deconstruction;** **1 % residues.** **Further deconstruction rates are possible, give adequate reasons.**

No relevant inputs or outputs apply to the scenario selected. The energy consumed for deconstruction is negligible. Any arising consumption is marginal.

Since this is a single scenario, the results are shown in the relevant summary table.

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

C2 Transport

No.	Scenario	Description
C2	Transport	**According to the manufacturer:** **Transport to collection point using 7.5 t truck (Euro 0-6 mix), full capacity, approx. 50 km to collection point and empty return trip. From collection point to recycling plant using 34 - 40 t truck (Euro 0-6 mix), 27 t payload, full capacity, approx. 150 km and empty return trip.**
Since this is a single scenario, the results are shown in the relevant summary table.		

C3 Waste management

No.	Scenario	Description
C3	Current market situation	**According to the manufacturer:** **After shredding the profiles, the steel parts are removed by magnetic sorting with an efficiency of 100%. Plastics are separated from aluminum parts with an efficiency of 90% (eddy current method). Plastics are disposed of in an incinerator, where the energy is recovered.** **The aluminum residues (97%) are remelted and extruded into ingots. It is assumed that the ingots have the same properties as those from which the profiles were manufactured.** **This figure includes metal losses during shredding, sorting and remelting.** **Share for recirculation of materials:** • **98% steel in melt** (UBA, 2017) • **97% aluminium in melt** (GDA, 2018) • **97% remaining metals in melt** (UBA, 2017) • **Plastics 100 % thermal recycling in incineration plants** (Zukunft Bauen, 2017) • **Electrical components 87%** (based on waste electrical equipment 87%; UBA, 2018) • **Remainder to landfill/disposal,**
Electricity consumption of recycling plant: 0.5 MJ/kg. As the products are placed on the European market, the disposal scenario is based on average European data sets. Where no European data sets were available, German data sets were used. The below table presents the disposal processes and their percentage by mass/weight. The calculation is based on the above mentioned shares in percent related to the declared unit of the product system.		

C3 Disposal	Unit	C3		
Collection process, collected separately	kg	8.24	9.66	24.41
Collection process, collected as mixed construction waste	kg	0.08	0.10	0.25
Recovery system, for re-use	kg	0.00	0.00	0.00
Recovery system, for recycling	kg	7.44	8.79	21.50
Recovery system, for energy recovery	kg	0.44	0.46	1.95
Disposal	kg	0.45	0.51	1.21

C4 Disposal

No.	Scenario	Description
C4	**Disposal**	**The non-recordable amounts and losses within the re-use/recycling chain (C1 and C3) are modelled as "disposed" (RER).**

The consumption in scenario C4 results from physical pre-treatment, waste recycling and management 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 a single scenario, the results are shown in the summary table.

D Benefits and loads from beyond the system boundaries

No.	Scenario	Description
D	**Recycling potential**	**Aluminium recyclate from C3 excluding the recyclate used in A3 replaces 70.2% of aluminium compound; Steel scrap from C3 excluding the scrap used in A3 replaces 70.2% of steel; Stainless steel scrap from C3 excluding the scrap used in A3 replaces 70.2% of stainless steel; Die cast recyclate from C3 excluding the scrap used in A3 replaces 60% of die cast; Electronics scrap from C3 excluding the scrap used in A3 replaces 60% of drive unit; Benefits from incineration plant: Benefits from waste incineration: electricity replaces electricity mix (RER); thermal energy replaces thermal energy from European natural gas (RER).**

The values in module "D" result from recycling of the packaging material in module A5, the recycling of the replaced components in module B2 and from deconstruction at the end of service life.

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

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Notes
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