ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	dormakaba International Holding AG
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-DOR-20160277-ICB1-EN
Issue date	24.04.2017
Valid to	23.04.2022

Automatic Revolving Door KTV A

dormakaba

Institut Bauen und Umwelt e.V.

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1. General Information

dormakaba	Automatic Revolving Door KTV A
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the Declaration** dormakaba International Holding AG Hofwisenstr. 24 CH-8153 Rümlang Switzerland
Declaration number EPD-DOR-20160277-ICB1-EN	**Declared product / Declared unit** The declaration represents one automatic revolving door, consisting of four (4) door leaves and with a diameter of 3000 mm and a height of 2200 mm.
This Declaration is based on the Product Category Rules: Automatic doors, automatic gates, and revolving door systems, 07.2014 (PCR tested and approved by the SVR)	**Scope:** The declaration and background LCA report represent dormakaba's KTV A automatic revolving doors. Raw materials and components are provided by suppliers and shipped to dormakaba's facilities in Sofia, Bulgaria and Dubai, United Arab Emirates. Doors are manufactured and assembled at the facilities before being shipped to job sites. The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.
Issue date 24.04.2017	**Verification** The CEN Norm /EN 15804/ serves as the core PCR Independent verification of the declaration according to /ISO 14025/ ☐ internally ☒ externally
Valid to 23.04.2022	
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	Dr.-Ing. Wolfram Trinius (Independent verifier appointed by SVR)
Dr. Burkhart Lehmann (Managing Director IBU)	

2. Product

2.1 Product description / Product definition

The KTV revolving door range is designed for installation in entrance areas where interior environmental control coupled with elegant aesthetics are desired.

dormakaba KTV revolving doors hold back noise, dust and dirt, reliably protect employees near the entrances from drafts, and help to keep heating cost down. They also allow for a smooth flow of traffic.

Revolving doors offer a number of benefits for installers, architects, specifiers and user among others:

- Extensive design flexibility in terms of planning and technical requirements
- Visually, technically and economically the ideal application
- Optimization of the building energy balance
- Efficient noise protection
- Tailored integrated application combining industrial engineering precision and assured quality.

For placing of the product on the market in the EU/EFTA (with the exception of Switzerland), the following legal provisions apply:

- /EMC Directive/ (2014/30/EU)
- /Machinery Directive/ (2006/42/EC)

as well as the harmonized norms based on these provisions:

- /DIN EN ISO 13849-1/: Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design.
- /DIN EN ISO 12100/: Safety of machinery - Basic concepts - Risk assessment and risk reduction.
- /DIN EN 16005/: Power operated pedestrian doorsets - Safety in use - Requirements and test methods.
- /DIN EN 61000 - 6 - 2/: Electromagnetic compatibility (EMC). Part 6-2: Generic

standards: Interference resistance for industrial environments.
- /DIN EN 61000 - 6 - 3/: Electromagnetic compatibility (EMC). Part 6-3: Generic standards: Emission standard for residential, commercial and light-industrial environments.
- /DIN EN 61000 - 3 - 2/: Electromagnetic compatibility-3-2: Limits - Limits for harmonic current emissions.
- /DIN EN 61000 - 3 - 3/: Electromagnetic compatibility-3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.
- /DIN EN 55022/: Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.
- /DIN EN ISO 9001/: Quality management systems.
- /DIN EN 60335 - 1/: Safety of household and similar electrical appliances. Part 1: General requirements.
- /EN 60335-2-103/: Household and similar electrical appliances. Safety. Particular requirements for drives for gates, doors and windows.
- /IEC 60335-2-103/: Household and similar electrical appliances. Safety. Part 2-103: Particular requirements for drives for gates, doors and windows.

The CE-marking takes into account the proof of conformity with the respective harmonized norms based on the legal provisions above. For the application and use, the respective national provisions apply.

In addition to the harmonized standards, the following national standards have also been applied and complied with:

- /DIN 18650-1/: Powered pedestrian doors. Part 1: Product requirements and test methods.
- /DIN 18650-2/: Powered pedestrian doors. Part 2: Safety at powered pedestrian doors.
- /AutSchR/.
- /ASR A1.7/: Technical rules for the workplace. Doors and gates.

2.2 Application

Automatic revolving doors may be used to provide a comfortable entry and exit in many applications in the facade of or within a building.

Typical applications include:

- Office / commercial buildings
- Airports
- Public buildings
- Hospitals
- Hotels

Automatic revolving doors are used to control the pedestrian flow in combination with an optimal thermal separation of the inside and outside climates during normal use.

KTV A revolving doors can optionally be equipped with:

- 3- or 4-wing design
- Glazed drum walls or with metal paneling
- Additional curved sliding doors in front of the entrance to act as night shields

Observance of the applicable regulations and standards guarantee the highest level of pedestrian safety.

2.3 Technical Data

Performance data of the product according to the harmonized norms, based on the harmonization provisions. The following technical data also apply:

Name	Value	Unit
Power input "Standby"*	4.8	W
Power input "Operation"*	57.8	W

**excludes lighting

2.4 Delivery status

A fully automatic revolving door with the following dimensions:

- Internal diameter: 3000 mm
- External Diameter: 3096 mm
- Clear passage height: 2100 mm
- Total height: 2300 mm

The unit is delivered ready for installation.

2.5 Base materials / Ancillary materials

The basic material composition of the door from Bulgaria / U.A.E. is given below. The door can be manufactured in both stainless steel and aluminum versions. Typically main components of doors produced in Bulgaria are manufactured from aluminum, whereas the same components for doors produced in U.A.E. are manufactured from stainless steel.

Name	Value	Unit
Glass	44	%
Aluminum	28	%
Stainless steel	12	%
Steel	6	%
Chipboard	3	%
Electronics & motor	5	%
Other (incl. plastic)	2	%

2.6 Manufacture

Materials such as aluminum sheet, steel bar, and tempered glass are shipped to dormakaba, where they are further processed into door leafs and other components. Depending on the component, some aluminum parts are powder coated. The door is then packaged in wooden crates and shipped to the job site for installation.

The plant in Sofia, Bulgaria is certified to the quality management system /ISO 9001/, which ensures consistent quality of dormakaba's products.

2.7 Environment and health during manufacturing

The manufacturing plant has an internal environmental, health and safety system according to national regulations and good European practices. The system ensures healthful and safe workplaces and good working conditions for each employee.

2.8 Product processing/Installation

Cutters, sanders, drills, and other standard equipment are used to manufacture the door. Ancillary materials include supplies for this equipment, as well as welding gases and electrodes.

Installation is done manually with simple tools.

2.9 Packaging

Packaging is intended to protect the product during distribution. Wood crates are used to package larger components, while corrugate is used for the accessories. Both cardboard and wood can be recycled or incinerated for energy recovery once the product is delivered and removed from the packaging.

2.10 Condition of use

Regular maintenance is advised to ensure the life expectancy of 20 years. Sensors and weather stripping are assumed to be replaced halfway through the service life.

2.11 Environment and health during use

No impacts on human health or the environment are expected during product use.

2.12 Reference service life

The reference service life of dormakaba's automatic revolving doors will ultimately depend on the traffic pattern and degree of usage of the doors. A reference service life of 20 years is assumed for calculation of the Use Stage impacts of the KTV A door. This is consistent with approximately 10 million cycles over the door's service life.

2.13 Extraordinary effects

Fire

Not applicable.

Water

Unforeseen contact with water may result in a malfunction of the electronic components if the IP rating of the components is exceeded.
Should contact with water occur, the unit is designed to remain in a fail-safe state and is not anticipated to cause impact to the environment.

Mechanical destruction

No impacts on human health or the environment are known or expected. No hazardous substance emissions are anticipated in case of mechanical destruction.

2.14 Re-use phase

Reuse of individual product components is not anticipated. The door, however, can be disassembled and individual materials such as aluminum, steel, and glass recycled. Plastic components can be combusted for energy recovery.

2.15 Disposal

Manufacturing

Scrap from production is collected separately by material type and disposed of.

- /EWC 12 01 01/ Ferrous metal filings and turnings
- /EWC 12 01 03/ Non-ferrous metal filings and turnings

Packaging

Packaging waste from installation is assumed to be sent to a facility for energy recovery.

- /EWC 15 01 01/ Paper and cardboard packaging
- /EWC 15 01 02/ Plastic packaging
- /EWC 15 01 03/ Wooden packaging

End-of-life

Door components at end-of-life can be either sent for material or energy recovery, or disposed to landfill. Recovery rates will depend on typical practices at the location in which the door is installed.

- /EWC 17 02 02/ Glass
- /EWC 17 03 03/ Plastic
- /EWC 17 04 01/ Copper, bronze, brass
- /EWC 17 04 02/ Aluminum
- /EWC 17 04 05/ Iron and steel
- /EWC 17 04 11/ Cables with the exception of those outlined in 17 04 10

2.16 Further information

Please refer to the last page of this declaration for contact details to obtain further information.

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit for this analysis is one (1) revolving door system.

Declared unit

Name	Value	Unit
Declared unit for revolving door system*	6.6	m^2
Mass of the entire system	925	kg
Conversion factor to 1 kg	0.0011	-
Grammage of the components	140	kg/m^2
Dimensions for revolving door, diameter	3000	mm
Dimensions for revolving door, height	2200	mm

* Area represents the cross-sectional area of the door, which is designed to fit in an opening of 3000-mm wide by 2200-mm high.

3.2 System boundary

Type of EPD: cradle-to-grave. The following modules were considered in this analysis:

Product stage

- Raw material supply (A1)
- Transport (A2)
- Manufacturing (A3)

Construction stage

- Transport to the building site (A4)
- Installation, including packaging disposal (A5)

Use stage

- Maintenance (B2)
- Operation energy use (B6)

End-of-life stage

- Transport to disposal (C2)
- Waste processing (C3)
- Disposal (C4)

Benefits and loads beyond the system boundary

- Reuse, recovery, and recycling potential (D)

Submodules that were not declared either do not apply and would therefore be zero, or are estimated to fall below the cut-off criteria.

3.3 Estimates and assumptions

The analysis represents a weighted average of doors produced at dormakaba's Bulgaria and U.A.E. facilities.

Door use stage energy consumption was calculated assuming that doors are in use 255 working days per year and switched off for the remaining 110 non-working days per year. Additionally, during each work day, doors were assumed to be actively working 6 hours per day, in idle mode 10 hours per day, and switched off 8 hours per day.

Revolving doors installation, maintenance, and deconstruction were assumed to be performed by hand with minimal additional electricity required to operate power tools.

3.4 Cut-off criteria

All available data from the production process are considered in the analysis. This includes raw materials used, thermal energy, electric power consumption, and ancillary materials.

3.5 Background data

The LCA model was created using the GaBi ts Software system for life cycle engineering, developed by thinkstep AG /thinkstep 2016/. The GaBi 2016 LCI database /thinkstep 2016b/ provides the life cycle inventory data for most of the raw and process materials obtained from the background system.

3.6 Data quality

Primary materials and production data were obtained directly from dormakaba's facilities that produce KTV A doors. Background data were sourced from the GaBi 2016 database /thinkstep 2016b/ and are representative of the years 2007 - 2015. European or global data were used as appropriate. As such, geographical and technological representativeness is warranted. Primary data were also evaluated for precision, completeness, and consistency, including cross-checks with other sources. Overall, data are considered to be of high quality.

3.7 Period under review

The period under review is the 2014 calendar year.

3.8 Allocation

Manufacturing inputs (e.g. ancillary materials, packaging, and energy) were allocated on a per-door basis.

Material credits attributed to Module D were calculated based on the net amount of scrap leaving the system boundary (i.e., the amount of scrap generated upon disposal, minus the amount of scrap consumed by raw material production).

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account. The used background database has to be mentioned.

4. LCA: Scenarios and additional technical information

Additional information is provided for the declared modules, including A4, A5, B2, B6, C2, C4, and D. In order to represent dormakaba's global distribution network, sales-weighted averages are used to model transport to the building sites and electricity consumption during product use.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	23	l/100km
Transport distance	4050	km
Capacity utilisation (including empty runs)	77	%

Installation into the building (A5)

Name	Value	Unit
Packaging waste for recovery (wood)	286	kg
Packaging waste for recovery (other)	1.7	kg
Packaging waste for disposal	34	kg

Maintenance (B2)

Name	Value	Unit
Maintenance cycle	1	Number/ RSL
Replacement components	20	kg

Reference service life

Name	Value	Unit
Reference service life	20	a

Operational energy use (B6) and Operational water use (B7)

Name	Value	Unit

Electricity consumption	2460	kWh

End of life (C1-C4)

Name	Value	Unit
Collected separately	370	kg
Collected as mixed construction waste	556	kg
Recycling	370	kg
Energy recovery	0	kg
Landfilling	556	kg

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

Name	Value	Unit
Collection rate, aluminum	90	%
Collection rate, steel	81	%

5. LCA: Results

The table below summarizes which modules are declared and which are not declared. Environmental performance results are shown for one (1) piece of revolving door and represent the average of KTV A doors produced at dormakaba's facilities.

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

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	X	MND	MND	MND	X	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: one revolving door system

Parameter	Unit	A1-A3	A4	A5	B2	B6	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	4.85E+3	3.68E+2	5.43E+2	3.50E+2	1.48E+3	1.27E+1	0.00E+0	1.61E+1	-2.48E+3
ODP	[kg CFC11-Eq.]	1.01E-6	2.41E-9	7.09E-7	4.03E-8	5.82E-7	9.14E-11	0.00E+0	1.25E-10	-2.35E-6
AP	[kg SO_2-Eq.]	2.68E+1	2.50E+0	1.99E-1	1.98E+0	1.27E+1	5.11E-2	0.00E+0	5.55E-2	-1.36E+1
EP	[kg $(PO_4)^{3-}$-Eq.]	2.06E+0	4.45E-1	1.43E-1	1.37E-1	4.59E-1	1.25E-2	0.00E+0	2.05E-2	-7.37E-1
POCP	[kg ethene-Eq.]	1.66E+0	-3.67E-1	3.69E-2	1.32E-1	6.43E-1	-1.67E-2	0.00E+0	6.93E-3	-7.65E-1
ADPE	[kg Sb-Eq.]	1.71E-1	2.68E-5	-1.07E-5	3.73E-2	2.69E-4	9.46E-7	0.00E+0	3.18E-6	-2.65E-2
ADPF	[MJ]	6.20E+4	5.01E+3	2.69E+2	5.00E+3	1.82E+4	1.74E+2	0.00E+0	1.25E+2	-2.67E+4

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

RESULTS OF THE LCA - RESOURCE USE: one revolving door system

Parameter	Unit	A1-A3	A4	A5	B2	B6	C2	C3	C4	D
PERE	[MJ]	2.52E+4	2.62E+2	1.32E+1	3.62E+2	4.08E+3	1.00E+1	0.00E+0	1.42E+1	-1.33E+4
PERM	[MJ]	5.33E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	2.57E+4	2.62E+2	1.32E+1	3.62E+2	4.08E+3	1.00E+1	0.00E+0	1.42E+1	-1.33E+4
PENRE	[MJ]	7.09E+4	5.04E+3	3.04E+2	5.37E+3	2.37E+4	1.75E+2	0.00E+0	1.30E+2	-3.22E+4
PENRM	[MJ]	2.82E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	7.12E+4	5.04E+3	3.04E+2	5.37E+3	2.37E+4	1.75E+2	0.00E+0	1.30E+2	-3.22E+4
SM	[kg]	1.41E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m^3]	5.01E+1	6.45E-1	6.57E-1	2.01E+0	7.43E+0	2.48E-2	0.00E+0	2.51E-2	-3.58E+1

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

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: one revolving door system

Parameter	Unit	A1-A3	A4	A5	B2	B6	C2	C3	C4	D
HWD	[kg]	2.66E-4	3.41E-4	5.03E-6	6.88E-5	1.10E-5	1.31E-5	0.00E+0	2.77E-6	-3.46E-5
NHWD	[kg]	1.02E+3	3.94E-1	4.66E+1	9.63E+0	9.28E+0	1.51E-2	0.00E+0	5.58E+2	-7.14E+2
RWD	[kg]	3.67E+0	1.01E-2	1.03E-2	1.44E-1	2.16E+0	3.74E-4	0.00E+0	1.83E-3	-2.18E+0
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.92E+2	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	5.23E+2	0.00E+0	0.00E+0	0.00E+0	2.59E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	1.45E+3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Caption	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; EEE = Exported thermal energy

6. LCA: Interpretation

The revolving door environmental footprint is dominated by materials production (Module A1), followed by electricity consumption during door operation (Module B6). Materials used during door maintenance also plays a notable role, in particular for abiotic depletion potential of elements.

At the end-of-life, the metal components of the

revolving door are modeled as being recycled. A portion of the aluminum and steel are recovered and the remainder landfilled. Glass, however, is assumed to be sent entirely to landfill as recycling this material from demolished buildings is not considered common practice.

7. Requisite evidence

Not applicable.

8. References

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin(pub.): Generation of Environmental Product Declarations (EPDs);
www.ibu-epd.de

ISO 14025
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804
EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

EMC Directive
Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 2004/108/EC.

Machinery Directive
Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC.

ISO 9001
Quality management systems - Requirements (ISO 9001:2008).

EWC
European Waste Catalogue.

thinkstep 2016
thinkstep; GaBi ts: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2016.

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ISO 14040
EN ISO 14040:2006, Environmental management - Life cycle assessment - Principles and framework.

ISO 14044
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PCR Part A
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