ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	dormakaba International Holding GmbH
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-DOR-20160278-ICA1-EN
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Valid to	23.04.2023

Automatic Revolving Door KTC 3/4

dormakaba

Institut Bauen und Umwelt e.V.

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1. General Information

dormakaba	Automatic Revolving Door KTC 3/4
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the Declaration** dormakaba International Holding GmbH DORMA Platz 1 58256 Ennepetal Deutschland
Declaration number EPD-DOR-20160278-ICA1-EN	**Declared product / Declared unit** The declaration represents one automatic revolving door, consisting of four (4) door leaves and with a diameter of 6200 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 KTC 3/4 automatic revolving doors. Raw materials and components are provided by suppliers and shipped to dormakaba's facility in Suzhou, China. Doors are manufactured and assembled at the facility 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 23.04.2023	
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 revolving doors of the COMFORTLINE (KTC) series combine safety and comfort in a sophisticated entrance system.

KTC series doors help to protect building interiors from drafts, noise and dirt. In minimizing airflow between the outside and inside, a revolving door will usually pay for itself in energy savings. KTC series revolving doors help pedestrians move in and out of the building and manage high traffic volumes without difficulty. And all KTC series doors offer modern safety and security systems. In addition, the pivot-mounted wings will fold out in any position to provide a clear escape route. The KTC is also the perfect solution for high user convenience.

KTC 3/4 revolving doors are characterized by their especially generous diameters. They are the optimal solution for heavy-duty applications.

Further benefits are:

- Comprehensive range that also includes applications suitable for sophisticated and prestigious entrances
- Trouble-free installation and commissioning
- Guaranteed advanced technology conforming to all relevant national and international standards
- The sheer range of KTC system components ensures a high degree of design flexibility
- Hassle-free adaptability to individual requirements
- Visually, technically and economically convincing application
- Outstanding safety features
- Tailored integrated application of industrial engineering precision and assured manufacturing quality
- Optimization of building energy balance and workplace environment

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:

- Hotels
- Healthcare settings
- Airports and transportation facilities
- Commercial office buildings
- Institutional and educational buildings
- Retail stores

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"*	40	W
Power input "Operation"*	154	W

**excludes lighting

2.4 Delivery status

A fully automatic revolving door with the following dimensions:

- Internal diameter: 6200 mm
- External diameter: 6428 mm
- Clear passage height: 2200 mm

The unit is delivered ready for installation.

2.5 Base materials / Ancillary materials

The basic material composition of the door is given below. The door includes both aluminum and steel components.

Name	Value	Unit
Stainless & carbon steel	29	%
Glass	25	%
Aluminum	22	%
Chipboard	12	%
Wood	5	%
Plastic	3	%
Electronics	2	%
Other	2	%

2.6 Manufacture

Materials such as aluminum sheet, steel bar, and tempered glass are shipped to dormakaba in Suzhou, China, 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 Suzhou, China 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 engineer and an integrated system according to national regulations and good European practices. The system ensures healthful and safe workplaces and good working conditions for each employee.

The dormakaba environmental management system at the Suzhou, China facility is certified to /ISO 14001/.

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.

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.

2.10 Condition of use

Regular maintenance is advised to ensure the life expectancy of 15 years. Sensors, weather stripping, and other components 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 lives 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 15 years is assumed to calculate Use Stage impacts of the KTC 3/4 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 disposed to landfill.

- /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*	13.6	m^2
Mass of the entire system	3467	kg
Conversion factor to 1 kg	0.00029	-
Grammage of the components	254	kg/m^2
Dimensions for revolving door, diameter	6200	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 6200-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 be zero, or are estimated to fall below the cut-off criteria.

3.3 Estimates and assumptions
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 KTC 3/4 doors. Background data were sourced from the GaBi 2016 database /thinkstep 2016b/ and are representative of the years 2007 - 2015. Chinese or global data were used as appropriate. Where Chinese data were not available, proxy data representing the same technology from another country or region were used. In general, 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 2014/2015 fiscal 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.
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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	8580	km
Capacity utilisation (including empty runs)	51	%

Installation into the building (A5)

Name	Value	Unit
Packaging waste for disposal (wood)	173	kg
Packaging waste for disposal (other)	0.6	kg

Maintenance (B2)

Name	Value	Unit
Maintenance cycle	1	Number/RSL
Replacement components	81	kg

Reference service life

Name	Value	Unit
Reference service life	15	a

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

Name	Value	Unit
Electricity consumption	7900	kWh

End of life (C1-C4)

Name	Value	Unit
Collected separately	1570	kg
Collected as mixed construction waste	1900	kg
Recycling	1570	kg
Landfilling	1900	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 KTC 3/4 doors produced at dormakaba's facility.

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	MNR	MNR	MNR	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.]	2.54E+4	7.22E+2	2.96E+2	1.23E+3	6.59E+3	4.93E+1	0.00E+0	2.23E+2	-1.31E+4
ODP	[kg CFC11-Eq.]	6.05E-7	5.11E-11	4.65E-10	1.17E-7	6.14E-7	3.75E-12	0.00E+0	7.91E-10	2.60E-5
AP	[kg SO_2-Eq.]	1.22E+2	1.38E+1	7.22E-2	7.69E+0	2.78E+1	1.92E-1	0.00E+0	1.93E-1	-1.04E+2
EP	[kg $(PO_4)^{3-}$-Eq.]	9.76E+0	1.55E+0	2.36E-1	5.04E-1	1.97E+0	4.29E-2	0.00E+0	3.03E-1	-8.53E+0
POCP	[kg ethene-Eq.]	9.67E+0	3.37E-1	7.03E-2	5.07E-1	2.47E+0	-6.39E-2	0.00E+0	6.36E-2	-6.94E+0
ADPE	[kg Sb-Eq.]	2.66E-1	2.52E-5	2.52E-6	1.20E-1	5.81E-4	1.84E-6	0.00E+0	1.08E-5	-3.75E-2
ADPF	[MJ]	3.03E+5	9.62E+3	2.12E+2	1.47E+4	6.83E+4	6.78E+2	0.00E+0	5.25E+2	-1.25E+5

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]	1.21E+4	3.29E+1	1.28E+1	1.52E+3	1.08E+4	3.22E+0	0.00E+0	4.66E+1	-2.06E+4
PERM	[MJ]	1.11E+4	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]	2.31E+4	3.29E+1	1.28E+1	1.52E+3	1.08E+4	3.22E+0	0.00E+0	4.66E+1	-2.06E+4
PENRE	[MJ]	3.04E+5	9.62E+3	2.19E+2	1.58E+4	7.60E+4	6.79E+2	0.00E+0	5.44E+2	-1.27E+5
PENRM	[MJ]	5.15E+3	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]	3.09E+5	9.62E+3	2.19E+2	1.58E+4	7.60E+4	6.79E+2	0.00E+0	5.44E+2	-1.27E+5
SM	[kg]	2.46E+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	-6.54E+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	-6.34E+1
FW	[m^3]	7.28E+1	9.78E-2	3.79E-2	7.40E+0	4.98E+1	9.12E-3	0.00E+0	7.14E-2	-8.44E+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]	8.41E-2	4.45E-6	1.07E-6	1.61E-4	7.58E-5	3.15E-7	0.00E+0	2.29E-6	-1.34E+0
NHWD	[kg]	1.78E+3	8.05E-2	1.03E+2	1.15E+2	2.87E+1	6.59E-3	0.00E+0	1.59E+3	-2.08E+3
RWD	[kg]	2.50E+0	2.32E-3	2.83E-3	4.39E-1	3.06E+0	1.81E-4	0.00E+0	7.70E-3	-8.46E-1
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	1.38E+3	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	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[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

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 play a notable role, in particular for abiotic depletion potential of elements. Module D is associated with a net positive ozone depletion potential (i.e., an environmental burden) due to differences in

furnace technologies used to produce primary and secondary steel.

At the end-of-life, the metal components of the revolving door are modeled as being recycled. A portion of the aluminum, steel, and bronze 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).

ISO 14001
Environmental management system (ISO 14001:2015).

EWC
European Waste Catalogue.

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

thinkstep 2016b
GaBi ts: Documentation of GaBi ts: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2016. http://www.gabi-software.com/international/databases/gabi-databases/.

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

ISO 14044
EN ISO 14044:2006, Environmental management - Life cycle assessment - Requirements and guidelines.

PCR Part A
Institut Bauen und Umwelt e.V., Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. 2013. www.ibu-epd.com.

PCR Part B
PCR Guidance-Texts for Building-Related Products and Services. From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU). Part B: Requirements on the EPD for automatic doors, automatic gates, and revolving door systems. 2012. www.ibu-epd.com.

Publisher
Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastr 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Author of the Life Cycle Assessment
thinkstep, Inc.
Milk Street 170
02109 Boston, MA
United States

Tel +1 617 247 4477
Fax +1 857 400 9454
Mail info@thinkstep.com
Web **www.thinkstep.com**

Owner of the Declaration
dormakaba International Holding GmbH
DORMA Platz 1
58256 Ennepetal
Germany

Tel +49 2333 793-0
Fax +49 2333 793-4950
Mail info.de@dormakaba.com
Web **www.dormakaba.com**