ENVIRONMENTAL-PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	dormakaba International Holding GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-DOR-20210182-CBA3-EN
Issue date	01.10.2021
Valid to	30.09.2027

Reversible Double Cylinder - penta, quattro, gemini, expert, matrix

dormakaba

Institut Bauen und Umwelt e.V.

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General Information

dormakaba

Programme holder

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Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-DOR-20210182-CBA3-EN

This declaration is based on the product category rules:

Building Hardware products, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

01.10.2021

Valid to

30.09.2027

Dipl.-Ing Hans Peters
(chairman of Institut Bauen und Umwelt e.V.)

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Owner of the declaration

dormakaba International Holding GmbH
DORMA Platz 1
58256 Ennepetal
Germany

Declared product / declared unit

1 piece of the product: one (1) dormakaba expert mechanical key system, consisting of the following items:
- one (1) expert plus (K83) double cylinder
- three (3) expert plus (K83) reversible keys
- one (1) cylinder mounting screw
- one (1) security card
- one (1) user manual
- packaging material

Scope:

This EPD is a specific product declaration for the expert plus (K83) double cylinder including three keys. It is also representative for the systems penta,quattro, gemini and matrix. The underlying life cycle assessment is based on the entire life cycle of this specific mechanical key system. The products are manufactured at the dormakaba production facilities in Eggenburg (Austria). Green Electricity is beeing used at the production site.

Data represents the year 2021.
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.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804 bezeichnet*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Dr.-Ing. Wolfram Trinius,
(Independent verifier)

Product

Product description/Product definition

Information about the enterprise

dormakaba stands for a broad offering of products, solutions and services for smart and secure access to buildings and rooms from a single source.

Product description/ Product definition

penta cross (K90), penta (K84), quattro plus (K85), gemini plus (K87), expert cross (K89), expert plus (K83) and matrix plus (K86) are patented, reversible master key systems representing the premium segment. The patent offers legal protection against commercial imitation. Duplicate keys are only made by dormakaba itself or by authorized partners and require identification by means of a security card.

While penta, quattro and gemini are in-house systems that are exclusively manufactured in our factories, expert and matrix are partner systems that can also be assembled by authorized dealers.

For placing the mechanical key systems on the market in the European Union/European Free Trade Association (EU/EFTA, with the exception of Switzerland) the following legal provisions apply:

All systems are classified according to the European locking cylinder standards *EN1303* and *DIN18252*. While the basic cylinder configuration already fulfils the attack resistance class B, the highest protection grade D can be achieved with integrated carbide steel inserts.

Gebrauchs-klasse category of use	Dauerhaftig-keit durability	Türmasse door mass	Feuerwider-stand fire resistance	Betriebs-sicherheit safety	Korrosionsbest. + Temperatur corrosion resistance and temperature	Verschluss-sicherheit key related security	Angriffs-widerstand attack resistance
1	6	0	B	0	C	6	0/B/C/D

dormakaba mechanical cylinders fulfill the material requirements given within the Directive RoHS 2011/65/EU. In addition, cylinders are fire protection tested according to *EN 1634-1* and *EN 1634-2*.

One speciality about the penta, quattro gemini, expert and matrix design is the insert modularity. This guarantees a maximum on flexibility as the interchangeable inserts can be used in different housing length as well as in all cylinder types (e.g. double-, single-, thumbturn cylinders, rim, padlocks, camlocks etc.) For placing the mechanical key systems on the market in the European Union/European Free Trade Association (EU/EFTA, with the exception of Switzerland) the following legal provisions apply:

· *DIN EN 1303: 2015-08*
· *DIN 18252: 2018-05*
· *RoHS 2011/65/EU*

Application

The dormakaba reversible cylinder range with penta, quattro, gemini, expert and matrix can be used in both residential as well as in the commercial segment in small and simple as well as in large and complex applications, thanks to its versatility. Nearly limitless application options are possible.

Technical Data

- penta has 5 pin rows with up to 22 simultaneously used pin positions out of 85 positions in total
- quattro and expert have 4 pin rows with up to 22 simultaneously used pin positions out of 44 positions in total
- gemini and matrix have 3 pin rows with 16 simultaneously used pin positions out of 32 positions in total
- cylinder bodies are made of brass
- keys are made of nickel silver

Please list the Technical Data according to the
List in the chapter “Product group specific calculation rules”

Example:

Technical
Data for Locking Cylinders acc. to the classification in EN 1303: Delivery status:

One (1) serial standard double cylinder includes three (3) keys, a mounting-screw, a user-manual and a security card. Including the packaging the cylinder will be supplied with a weight of 0,270kg.

Base materials/Ancillary materials

The material composition
of the product is the following:

Name	Value	Unit
Brass	64	%
Steel	21	%
Nickel Silver	14	%
Plastic	1	%

These figures are also
representative for the systems penta, quattro, gemini and matrix.

The cylindersand keys contain partial articles which contain substances
listed in the Candidate List of *REACH Regulation 1907/2006/EC* (date:19.01.2021) exceeding 0.1 percentage by mass: yes

- Lead (Pb): 7439-92-1 (CAS-No.)
  is included in some of the alloys used. The concentration of lead in each
  individual alloy does not exceed 4.0% (by mass).

The candidate list can be found on the /*ECHA*/ website address: https://echa.europa.eu/de/home

Environment and health during use

Reference service life

The
life cycle (security and function) of a lock cylinder is about 10-15 years,
depending on the application and frequency of use. The cylinders are tested to 100,000
locking cycles minimum (EN1303:2015-08). This corresponds to approximately
15-18 locking cycles per day for 15 years.

LCA: Calculation rules

Declared Unit
The declared unit is 1 piece of the product: expert

Declared unit

Name	Value	Unit
Declared unit	1	piece/product
Conversion factor to 1 kg (kg/piece)	0.27	-
Mass of declared product including packaging	0.27	kg

For IBU core EPDs (where clause 3.6 is part of the EPD): for average EPDs, an estimate of the robustness of the LCA values must be made, e.g. concerning variability of the production process, geographical representativeness and the influence of background data and preliminary products compared to the environmental impacts caused by actual production.

System boundary
The type of EPD is according to EN 15804:
"cradle to gate with options, modules C1–C4, and module D". The
following modules are declared: A1-A3, C1-C4, D and additional modules: A4 + A5
Production - Module A1-A3
The product stage includes:
— A1, raw material extraction, processing and mechanical treatments, processing of secondary material input (e.g. recycling processes),
— A2, transport to the manufacturer,
— A3, manufacturing and assembly
including provision of all materials, products and energy, as well as waste processing up to the end-of waste state.

Construction stage - Modules A4-A5
The construction process stage includes:
— A4, transport to the building site;
— A5, installation into the building;
including provision of all materials, products and energy, as well as waste processing up to the end-ofwaste state or disposal of final residues during the construction process stage.

End-of-life stage– Modules C1-C4 and D
The end-of-life stage includes:
— C1, de-construction, demolition:
— C2, transport to waste processing;
— C3, waste processing for reuse, recovery and/or recycling;
— C4, disposal;
including provision and all transport, provision of all materials, products and related energy and water use.
Module D (Benefits and loads beyond the system boundary) includes:
— D, recycling potentials, expressed as net impacts and benefits.

Geographic Representativeness
Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Austria

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. Background database: *GaBi, SP40*.

LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic carbon

The biogenic carbon content quantifies the amount of biogenic carbon in a construction product leaving the factory gate, and it shall be separately declared for the product and for any accompanying packaging.
If the total mass of biogenic carbon containing materials is less than 5 % of the total mass of the product and accompanying packaging, the declaration of biogenic carbon content may be omitted. The mass of packaging containing biogenic carbon shall always be declared.

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO2.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in accompanying packaging	0.01	kg C

The following technical scenario information is required for the declared modules.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel (per piece)	0.0015	l/100km
Transport distance (plane)	80	km
Transport distance (truck)	909	km
Capacity utilisation (including empty runs) average	51	%

Numbers reflect the average transport distances per cylinder.

Installation into the building (A5)

Name	Value	Unit
Waste packaging (paper)	0,03328	kg

In case a **reference service life** according to applicable ISO standards is declared then the assumptions and in-use conditions underlying the determined RSL shall be declared. In addition, it shall be stated that the RSL applies for the reference conditions only.

The same holds for a service life declared by the manufacturer. Corresponding information related to in-use conditions needs not be provided if a service life taken from the list on service life by BNB is declared.

End of life (C1-C4)
C1: The product dismantling from the building is done manually without environmental burden.

Name	Value	Unit
Collected separately waste type	0.237	kg
Recycling	0.231	kg
Energy recovery	0.0062	kg

The product is disassembled in a recycling process. Material recycling is then assumed for the metals. The plastic components are assumed to be incinerated with energy recovery.

Reuse, recovery and/or recycling potentials (D), relevant scenario information
Collection rate is 100%.

LCA: Results

In Table 1 "Description of the system boundary", all declared modules shall be indicated with an "X"; all modules that are not declared shall be indicated with "MND" (As default the modules B3, B4, B5 are marked as MNR – module not relevant). In the following tables, columns can be deleted for modules that are not declared. Indicator values should be declared with three valid digits (eventually using exponential form (e.g. 1,23E-5 = 0,0000123). A uniform format should be used for all values of one indicator.
If several modules are not declared and therefore have been deleted from the table, the abbreviations for the indicators can be replaced by the complete names, while the readability and clear arrangement should be maintained; the legends can then be deleted.
If due to relevant data gaps, an indicator cannot be declared in a robust way, then the abbreviation “IND” (indicator not declared) should be used for this indicator.

- 0 - calculated value is 0
- 0 - value falls under the cut-off
- 0 - assumption which exclude any flows (e.g. exported electricity A1-A3)
- IND – in cases where the inventory does not support the methodological approach or the calculation of the specific indicator IND shall be used.

If no reference service life is declared (see chapter 2.13 "Reference Service Life"), the LCA results of the modules B1-B2 and B6-B7 shall refer to a period of one year. This shall then be indicated as an explanatory text below the tables. In addition, the formula for the quantification of such B-modules over the total life cycle shall be provided.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

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	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 piece, Double cylinder - penta, quattro, gemini, expert, matrix

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	3.89E-01	9.5E-02	4.7E-02	0	1E-03	1.6E-02	0	-1.01E-01
GWP-fossil	kg CO_2 eq	4.22E-01	9.4E-02	1E-03	0	1E-03	1.6E-02	0	-1.01E-01
GWP-biogenic	kg CO_2 eq	-3.48E-02	9.16E-04	4.6E-02	0	4.79E-05	3.65E-07	0	2.86E-04
GWP-luluc	kg CO_2 eq	6.23E-04	2.02E-06	7.76E-07	0	2.47E-08	8.85E-07	0	-1.48E-04
ODP	kg CFC11 eq	3.71E-13	7.39E-18	8.5E-18	0	1.09E-19	7.9E-18	0	-3.13E-16
AP	mol H^+ eq	3.12E-03	3.29E-04	1.32E-05	0	1.04E-06	2.79E-06	0	-6.09E-04
EP-freshwater	kg P eq	1.57E-06	1.62E-08	1.66E-09	0	2.22E-10	1.26E-09	0	-5.01E-08
EP-marine	kg N eq	3.05E-04	1.44E-04	4.77E-06	0	3.3E-07	6.29E-07	0	-6.2E-05
EP-terrestrial	mol N eq	3.42E-03	2E-03	5.95E-05	0	3.67E-06	1.27E-05	0	-6.66E-04
POCP	kg NMVOC eq	9.84E-04	4.14E-04	1.27E-05	0	9.33E-07	1.74E-06	0	-2.03E-04
ADPE	kg Sb eq	1.02E-04	2.69E-09	1.34E-10	0	3.11E-11	1.08E-10	0	-3.5E-06
ADPF	MJ	5.56E+00	1.29E+00	1.5E-02	0	1.5E-02	7E-03	0	-1.17E+00
WDP	m^3 world eq deprived	1.41E-01	1.5E-04	6E-03	0	2.03E-06	2E-03	0	-3.3E-02

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; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 piece, Double cylinder - penta, quattro, gemini, expert, matrix

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	4.36E+00	3E-03	4.02E-01	0	4.63E-05	2E-03	0	-1.73E-01
PERM	MJ	3.99E-01	0	-3.99E-01	0	0	0	0	0
PERT	MJ	4.76E+00	3E-03	3E-03	0	4.63E-05	2E-03	0	-1.73E-01
PENRE	MJ	5.47E+00	1.29E+00	1.5E-02	0	1.5E-02	1.05E-01	0	-1.18E+00

PENRM	MJ	9.8E-02	0	0	0	0	-9.8E-02	0	0
PENRT	MJ	5.56E+00	1.29E+00	1.5E-02	0	1.5E-02	7E-03	0	-1.18E+00
SM	kg	2.28E-01	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
FW	m^3	3.8E-03	6.25E-06	1.38E-04	0	8.31E-08	3.83E-05	0	-1E-03

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 – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2:
1 piece, Double cylinder - penta, quattro, gemini, expert, matrix

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	2.63E-08	1.23E-10	2.2E-11	0	1.43E-12	2.77E-11	0	-4.84E-09
NHWD	kg	7E-02	1.3E-04	1E-03	0	1.5E-06	2E-03	0	-1.5E-02
RWD	kg	2.7E-04	1.12E-06	7.83E-07	0	1.58E-08	2.69E-07	0	-2.05E-05
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	2.17E-01	0	0
MER	kg	0	0	0	0	0	0	0	0
EEE	MJ	2.6E-02	0	7.1E-02	0	0	0	0	0
EET	MJ	4.7E-02	0	1.29E-01	0	0	0	0	0

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 OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 piece, Double cylinder - penta, quattro, gemini, expert, matrix

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	1.4E-02	0	0	ND	ND	0	0	0
IR	kBq U235 eq	0	0	0	ND	ND	0	0	0
ETP-fw	CTUe	0	0	0	ND	ND	0	0	0
HTP-c	CTUh	0	0	0	ND	ND	0	0	0
HTP-nc	CTUh	0	0	0	ND	ND	0	0	0
SQP	SQP	0	0	0	ND	ND	0	0	0

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

References

DIN 18252
DIN 18252: 2018, Profile cylinders for door locks – Terminology, dimensions, requirements, test methods and marking

DIN EN 1303
DIN EN 1303:
2015, Building Hardware - Cylinders for locks - Requirements and test methods

DIN EN 1634-1
DIN EN 1634-1:2018, Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware

DIN EN 1634-2
DIN EN 1634-2:2009, Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware

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

EN 15804
EN 15804:2019+A2, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

REACH Regulation
REACH Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals.

RoHS 2011/65/EU
RoHS 2011/65/EU, Directive on the restriction of the use of certain

hazardous substances in electrical and electronic equipment.

European Chemicals Agency (ECHA)
https://echa.europa.eu/de/

Further References

IBU
Institut Bauen
und Umwelt e.V.: General Instructions for the EPD Programme of
Institut Bauen und Umwelt e.V. Version 2.0., Berlin: Institut Bauen
und Umwelt e.V., 2021. www.ibu-epd.com

GaBi ts software
Sphera Solutions GmbH
Gabi Software System and Database for Life Cycle Engineering 1992-2020
Version 10.0.0.71
University of Stuttgart, Leinfelden-Echterdingen

GaBi ts documentation
GaBi life cycle inventory data documentation (https://www.gabi-software.com/support/gabi/gabidatabase-2020-lci-documentation/).

LCA-tool dormakaba
LCA tool, version 1.0.
Developed by Sphera Solutions GmbH

PCR Part A
PCR – Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Re-port
according to EN 15804+A2:2019, Version 1.0, Institut Bauen und Umwelt e.V., www.ibu-epd.com.

PCR Part B
PCR – Part B: Requirements on the EPD for Electronic and physical Access Control Systems , version 1.2, Institut Bauen und
Umwelt e.V., www.ibu-epd.com, 2017.
The literature referred to in the Environmental Product Declaration must be listed in full.Standards already fully quoted in the EPD do not need to be listed here again.
The current version of PCR Part A and PCR Part B of the PCR document on which they are based must be referenced.

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