# **ENVIRONMENTAL PRODUCT DECLARATION**

as per ISO 14025 and EN 15804

Owner of the Declaration	ASSA ABLOY
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-ASA-20150164-IBA1-EN
Issue date	10.06.2015
Valid to	09.06.2020

# Access control systems – SMARTair Cylinder ASSA AB



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### 1. General Information

# ASSA ABLOY

#### **Programme holder**

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

#### **Declaration number**

EPD-ASA-20150164-IBA1-EN

# This Declaration is based on the Product Category Rules:

IBU: PCR Electronic Access Control Systems, 11-2013 (PCR tested and approved by the independent expert committee (SVA))

#### Issue date

10.06.2015

#### Valid to

09.06.2020

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Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)

INMAN Dr.-Ing. Burkhart Lehman

(Managing Director IBU)

# 2. Product

#### 2.1 Product description

The SMARTair Cylinder is a device that communicates with a personalized credential via RF technology. It collects identity information from the credential and passes it along to a secured control unit. The control unit then grants or denies access to the credential holder engaging the clutch of the cylinder allowing it to open the door. It is capable of communications using a high frequency RF signal and able to communicate with several credential formats.

Supported credential formats:

- iCLASS SE (Cards/Tags/Fobs)
- SE for DESFire EV1 (Cards)
- SE for MIFARE Classic (Cards/Tags/Fobs)
- NFC compatible
- ISO/IEC 15693

#### 2.2 Application

The SMARTair Cylinder is suitable for indoor and outdoor use, where ID authentication is required. Common applications include: Commercial buildings, Industrial buildings, Government buildings, Military installations, Education establishments, Healthcare buildings.

### **SMARTair Cylinder**

ASSA AB

P.O. Box 371 SE-631 05 Eskilstuna Sweden

#### Declared product / Declared unit

This Declaration represents 1 piece of SMARTair Cylinder

#### Scope:

This declaration and its LCA study are relevant to SMARTair Cylinder

Main primary manufacturing processes are made by external suppliers and the final manufacturing processes and assembly occur at our manufacturing factory in Irun, Spain. 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.

### Verification

The CEN Standard EN 15804 serves as the core PCR

Independent verification of the declaration and data according to ISO 14025

externally

internally



(Independent verifier appointed by SVA)

#### 2.3 Technical Data

The table presents the technical properties of SMARTair Cylinder:

#### Technical data

Name	Value	Unit
Power supply	3VDC	V
Current Requirements	100mA	A
Operating Temperature	-20 to 70	°C
Operating Humidity	up to 85	%
Power consumption (standby)	3	μW
Peak Power Draw (During read)	100	mW

#### 2.4 Placing on the market / Application rules

EMC Directive 2004/108/CE LV Directive 2006/95/CE R&TTE Directive 1999/05/CE ROHS Directive 2011/65/CE

IP 56 Certified

Fire resistance /UNE-EN 1634:2000/ 30' - 60'

#### 2.5 Delivery status

Each knob unit is delivered individually packaged with mounting hardware, and gasket. Packing dimensions: 120mm x 90mm x 50mm



#### 2.6 Base materials / Ancillary materials

The average composition of the SMARTair Cylinder is as following:

Component	Percentage in mass
Brass	33.14
Plastic Parts	5.12
Stainless Steel	15.29
Steel	26.42
Electronic	0.61
Electro mechanics	18.74
Total	100.0

#### 2.7 Manufacture

The SMARTair Cylinder is assembled at the production facility in Irun. The electronics are produced in China/Malaysia and the mechanics in Germany. The components come from processes like stamped steel, turning, zinc and steel casting.

The factory in Irun has a certification of Quality Management system in accordance with /ISO 9001:1994/.

# 2.8 Environment and health during manufacturing

ASSA ABLOY is committed to producing and distributing door opening solutions with minimal environmental impact, where health & safety is the primary focus for all employees and associates. • Environmental operations, GHG, energy, water, waste, VOC, surface treatment and H&S are being routinely monitored. Inspections, audits, and reviews are conducted periodically to ensure that applicable standards are met and environmental management program effectiveness is evaluated.

• Code of Conduct covers human rights, labor practices and decent work. Management of ASSA ABLOY is aware of their environmental roles and responsibilities, providing appropriate training, supporting accountability and recognizing outstanding performance.

• The factory in Irun has certification of Environmental Management to /ISO 14001:1999/.

• Any waste metals during machining are separated and recycled. The waste from the water-based painting process is delivered to waste treatment plant.

#### 2.9 Product processing/Installation

SMARTair Cylinders are installed by trained product integrators or by the product end user. Installation instructions are included with each unit.

#### 2.10 Packaging

The cylinder is packed in a carton box with foam spacers to avoid damage. Also included in the packaging are paper installation instructions, the gasket, and a plastic bag containing the connectors and mounting hardware. Packaging materials shall be collected separately for recycling.

Material	Value (%)
Cardboard/paper	28.3
Plastic	71.7
Total	100.0

#### 2.11 Condition of use

No auxiliary or consumable materials are incurred for maintenance and usage of the reader. Repairs or replacement are not usually necessary. No cleaning efforts need to be taken into consideration.

#### 2.12 Environment and health during use

There are no interactions between products, the environment and health.

#### 2.13 Reference service life

Approved for a conservative value of 400.000 cycles under normal working conditions, that means 15 years depending on cycle frequency.

# 2.14 Extraordinary effects Fire

Suitable for use in fire and smoke doors /EN 1634:2000/.

#### Water

Contain no substances that have any impact on water in case of flood. Electric operation of the device will be influenced negative.

#### **Mechanical destruction**

No danger to the environment can be anticipated during mechanical destruction.

#### 2.15 Re-use phase

The product is possible to re-use during the reference service life and be moved to one door to another. Waste codes according to European Waste Catalogue /EWC/ and Hazardous Waste List -Valid from 1 January 2002;

/EWC/ 16 02 13\* discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12 /EWC/ 17 02 03 plastic /EWC/ 17 04 01 copper, bronze, brass

/EWC/ 17 04 05 iron and steel /EWC/ 17 04 11 Cables with the exception of those outlined in 17 04 10 Disposal of the product is subject to the /WEEE/

Directive within Europe, Directive 2012/19/EU.

#### 2.16 Disposal

No disposal is foreseen for the product nor for the corresponding packaging.

#### 2.17 Further information

More information on ASSA AB SMARTair Cylinders are available from:

#### ASSA AB

P.O. Box 371 SE-631 05 Eskilstuna Sweden Tel: +46 (0)16 17 70 00 Internet: www.assa.se



# 3. LCA: Calculation rules

#### 3.1 Declared Unit

The declaration refers to the functional unit of 1 piece of SMARTair Cylinder as specified in Part B requirements on the EPD for Electronic Access Control Systems /IBU PCR Part B/.

#### **Declared unit**

Name	Value	Unit
Declared unit	1	piece of SMARTair Cylinder
Mass of product (without packaging)	0.293	kg
Conversion factor to 1 kg	3.413	-

#### 3.2 System boundary

Type of the EPD: cradle to gate - with options The following life cycle phases were considered for Reader:

A1-A3 Production stage:

- A1 Raw material extraction and processing
- A2 Transport to the manufacturer and
- A3 Manufacturing.

Construction stage:

- A4 Transport from the gate to the site
- A5 Packaging waste processing

Use stage related to the operation of the building includes:

• B6 – Operational energy use (Energy consumption for lock operation)

End-of-life stage:

- C2 Transport to waste processing,
- C3 Waste processing for recycling and
- C4 Disposal (landfill).

These information modules include provision and transport of all materials, products, as well as energy and water provisions, waste processing up to the endof-waste state or disposal of final residues.

Module D:

 Declaration of all benefits or recycling potential from EoL and A5

#### 3.3 Estimates and assumptions

#### Use phase:

For the use phase, it is assumed that the lock is used in the European Union, thus an European electricity grid mix is considered within this stage.

EoL:

In the End-of-Life phase, for all the materials which can be recycled, a recycling scenario with 100% collection rate was assumed.

#### 3.4 Cut-off criteria

In the assessment, all available data from the production process are considered, i.e. all raw materials used, auxiliary materials (e.g. lubricants), thermal energy consumption and electric power consumption - including material and energy flows contributing less than 1% of mass or energy (if available). In case a specific flow contributing less than 1% in mass or energy is not available, worst case assumption proxies are selected to represent the respective environmental impacts.

Impacts relating to the production of machines and facilities required during production are out of the scope of this assessment.

#### 3.5 Background data

For life cycle modeling of the considered products, the GaBi 6 Software System for Life Cycle Engineering, developed by PE INTERNATIONAL AG, is used /GaBi 6 2013/. The GaBi-database contains consistent and documented datasets which are documented in the online

GaBi-documentation /GaBi 6 2013D/.

To ensure comparability of results in the LCA, the basic data of GaBi database were used for energy, transportation and auxiliary materials.

#### 3.6 Data quality

The requirements for data quality and background data correspond to the specifications of the /IBU PCR Part A/.

PE INTERNATIONAL performed a variety of tests and checks during the entire project to ensure high quality of the completed project. This obviously includes an extensive review of project-specific LCA models as well as the background data used.

The technological background of the collected data reflects the physical reality of the declared products. The datasets are complete and conform to the system boundaries and the criteria for the exclusion of inputs and outputs.

All relevant background datasets are taken from the GaBi 6 software database. The last revision of the used background data has taken place not longer than 10 years ago.

#### 3.7 Period under review

The period under review is 2012/13 (12 month average).

#### 3.8 Allocation

Regarding incineration, the software model for the waste incineration plant (WIP) is adapted according to the material composition and heating value of the combusted material. Following specific life cycle inventories for the WIP are considered:

- Waste incineration of plastic
- Waste incineration of paper
- Waste incineration of electronic scraps (PWB)

Regarding the recycling material of metals, the metal parts in the EoL are declared as end-of-waste status. Thus, these materials are considered in module D.



Specific information on allocation within the background data is given in the GaBi dataset documentation.

#### 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.

# 4. LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).

#### Transport to the building site (A4)

Name	Value	Unit							
Truck transport									
Litres of fuel diesel with maximum	39.4	l/100 km							
load (27 t payload)	39.4	1/100 Km							
Transport distance truck	500	km							
Capacity utilization (incl. empty	85	%							
runs) of truck	- 00	/0							

#### Installation into the building (A5)

Name	Value	Unit
Output substances following waste treatment on site: paper packaging	0.0083	kg
Output substances following waste treatment on site: plastic packaging	0.021	kg

#### **Reference service life**

Name	Value	Unit
Reference service life	15	а

#### **Operational energy use (B6)**

Name	Value	Unit
Electricity consumption	0.113	kWh
Days per year in use	365	d
Hours per day in different modes	24	h
Power consumption on mode	0.1	W
Power consumption stand-by mode	0.00003	W

#### End of life (C1-C4)

Name	Value	Unit
Collected separately Brass, Copper, Plastic Parts, Stainless Steel, Steel, Electronic, Electro mechanics	0.293	kg
Reuse plastic parts	0.015	kg
Recycling metals from electronic	0.0567	kg
Recycling Brass	0.0971	kg
Recycling Copper	0.002	kg
Recycling Stainless Steel	0.0448	kg
Recycling Steel	0.0774	kg

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

Name	Value	Unit
Collected separately waste Card reader (including packaging)	0.293	kg
Recycling Brass	30.13	%
Recycling Copper	0.62	%
Recycling/Reuse Electronic	17.59	%
Recycling Stainless Steel	13.9	%
Recycling Steel	24.01	%
Reuse Plastic parts	4.65	%
Reuse Paper packaging	2.58	%
Reuse Plastic packaging	6.52	%



# 5. LCA: Results

Results shown below were calculated using CML 2000 - Apr. 2013 Methodology

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Parame PERM PERT PENRI PENRI PENRI SM RSF NRSF FW RESU	ter R R R Nor E Nor M Nor T T T Use Use Use Use	OF TH enewab sources otal use of ene n renewa mat al use of ene Use of s e of rene e of non Use o OF TH	IE LCA Paramet le primar nergy cal ble prima as mater of renewa rgy reso able prim nergy cal able prim erial utiliz non rene rergy reso secondar wable se renewab fuels f net freso	er y energ rrier ary ener ial utiliz able prir urces ary ene rrier ary ene rrier ary ener trier ary ener trier trier ary ener tri	y as gy ation mary rgy as rgy as orimary ial y fuels ndary JTPUT	CE US Unit [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	E: On A1 - A 1.06E+ 0.00E+ 8.13E+ 0.00E+ 8.13E+ 2.21E- 0.00E+ 0.00E+ 4.64E-	ie         pie           3		EMAR           2         1           2         1           1         2           0         0           00         0           00         0           5         1	Tair C           A5           -           -           .93E-03           -           -           .85E-02           .00E+00           .00E+00           .62E-04           GORIE	ylinde B6 - 1.75E - 9.58E 0.00E- 0.00E- 0.00E- 4.32E	-01 1 +00 0 +00 0	C2 - - 1.10E-0. - - 1.50E-0 0.00E+0 0.00E+0	2 3.16E - - 1 1.73E 00.00E 00.00E	E-02 E-01 E+000 E+000	- 2.37E-0 - 3.11E-0 0.00E+0 0.00E+0	- - 3 -2.52E-01 - 2 -5.87E+00 0 0.00E+00 0 0.00E+00 0 0.00E+00
Parame PERE PERM PERT PENRI PENRI PENRI SM RSF NRSF FW RESU One p	ter R Nor Nor T Tota Use Use Use	CFTH tenewable er Renewas sources otal use of ene n renewa mata al use of e of rene e of rene e of rene of SM	IE LCA Paramet le primar nergy cal ble prima as mater of renewa rgy reso able prim nergy cal able prim erial utiliz non rene rergy reso secondar wable se renewab fuels f net fres IE LCA ARTai	er y energ rrier ary ener ial utiliz able prir urces ary ene zation wable p urces y mater condary ble seco th water <b>Cylin</b> <b>neter</b>	y as rgy ation mary rgy as orimary ial y fuels ndary	CE US Unit [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	E: On A1 - A 1.06E+ 0.00E+ 1.06E+ 8.13E+ 0.00E+ 8.13E+ 2.21E-0 0.00E+ 4.64E- /S AN	ie         pie           3		2 1 2 1 1 2 0 0 0 0 5 1 CATEC	Tair C A5 - .93E-03 - .85E-02 .00E+00 .00E+00 .00E+00 .00E+00 .00E+00	ylinde B6 - - 1.75E - 9.58E 0.00E- 0.00E- 0.00E- 4.32E S:	-01 1 -01 1 +00 0 +00 0 -04 1	C2 - - 1.10E-0. - - 1.50E-0 0.00E+0 0.00E+0 0.00E+0 1.94E-0	2 3.16E 2 3.16E 0.00E 0.00E 0.00E 5 7.80E	E-02 E-01 E+000 E+000 E+000 E+000	- 2.37E-0 - 3.11E-0 0.00E+0 0.00E+0 0.00E+0 7.84E-0	- 3 -2.52E-01 - 2 -5.87E+00 0 0.00E+00 0 0.00E+00 0 0.00E+00 5 -3.32E-03
Parame PERE PERM PENRI PENRI PENRI SM RSF NRSF FW RESU One p	ter R Nor Nor T Tota Use Use Use	OF TH tenewable er Renewa sources otal use of en n renewa mat al use of en use of en of renewa al use of ene of so OF TH of SM Hazar	IE LCA Paramet le primar hergy cal ble prima as mater of renewa able prim hergy caso able prim hergy caso able prim erial utiliz non rene ergy reso secondar wable se renewab fuels f net fres IE LCA ARTai Param	er y energ rrier ary ener ial utiliz able prir urces ary ene zation wable p urces y mater condary ble seco bh water <b>Cylin</b> <b>neter</b> ste disp	y as 'gy ation mary rgy as orimary ial y fuels ndary	CE US Unit [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	E: On A1 - A 1.06E+ 0.00E+ 1.06E+ 8.13E+ 0.00E+ 8.13E+ 2.21E- 0.00E+ 4.64E- (S AN A1 -	ie         pie           3	Ce of S A4 - - 1.10E-0 - 1.50E-0 0.00E+0 0.00E+0 0.00E+0 0.00E+0 1.94E-0 ASTE C A4	2 1 2 1 1 2 0 0 0 0 5 1 <b>CATEC</b>	Tair C           A5           - </td <td>ylinde B6 - 1.75E - 9.58E 0.00E- 0.00E- 0.00E- 4.32E S: B6</td> <td>-01 1 -01 1 +00 0 +00 0 -04 1</td> <td>C2 - - 1.10E-0. - - 1.50E-0 0.00E+0 0.00E+0 0.00E+0 1.94E-0 0 22 4E-06</td> <td>2 3.16E 2 3.16E 0 0.00E 0 0.00E 5 7.80E</td> <td>E-02 : E-01 : E+000 :</td> <td>- 2.37E-0 - 3.11E-0 0.00E+0 0.00E+0 0.00E+0 7.84E-0</td> <td>-         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         0         0.00E+00         0         0         0.00E+00         0         -3.32E-03</td>	ylinde B6 - 1.75E - 9.58E 0.00E- 0.00E- 0.00E- 4.32E S: B6	-01 1 -01 1 +00 0 +00 0 -04 1	C2 - - 1.10E-0. - - 1.50E-0 0.00E+0 0.00E+0 0.00E+0 1.94E-0 0 22 4E-06	2 3.16E 2 3.16E 0 0.00E 0 0.00E 5 7.80E	E-02 : E-01 : E+000 :	- 2.37E-0 - 3.11E-0 0.00E+0 0.00E+0 0.00E+0 7.84E-0	-         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         0         0.00E+00         0         0         0.00E+00         0         -3.32E-03
Parame PERE PERM PENRI PENRI PENRI SM RSF NRSF FW RESU One p Parame	ter R R Nor Nor T Tota Use Use Use C D	OF TH enewab er Renewa sources otal use of enewa an renewa al use of ene Use of se of rene e of non Use o OF TH of SM Hazar Non haz	IE LCA Paramet le primar hergy can ble prima as mater of renewa as mater of renewa bable prim hergy can able prim hergy can be prim hergy can able prim hergy can able prim hergy can able prim hergy can be prim hergy can able p	er y energ rier ary ener ial utiliz able prir urces ary ene zation wable p urces y mater condary ble seco bh water - OU r Cylir beter ste disp waste disp	y as 'gy ation mary rgy as orimary ial y fuels ndary	CE US Unit [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	E: On A1 - A 1.06E+ 0.00E+ 1.06E+ 8.13E+ 0.00E+ 8.13E+ 2.21E-1 0.00E+ 4.64E-1 (S AN A1 - 7.54E	Image: relation of the second secon		2 1 2 1 1 2 0 0 0 0 5 1 <b>ATEC</b> <b>A5</b> 1.99E	Tair C           A5           - </td <td>ylinde B6 - 1.75E - 9.58E 0.00E- 0.00E- 0.00E- 4.32E S: B6 33E-04 9E-04 8E-04</td> <td>-01 1 -01 1 +00 0 +00 0 -04 1</td> <td>C2 - - 1.10E-0 - 1.50E-0 0.00E+0 0.00E+0 0.00E+0 1.94E-0 0 0.00E+0 1.94E-0 0 0.00E+0 1.94E-0 0</td> <td>2 3.16E 2 3.16E 2 3.16E 0 0.00E 0 0.00E 5 7.80E C3 2.40E-</td> <td>E-02 : E-01 : E+000 : E+000 : E-05 : : 05 : 2 : 05 :</td> <td>- 2.37E-0 - 3.11E-0 0.00E+0 0.00E+0 0.00E+0 7.84E-0 <b>C4</b> 2.26E-0</td> <td>-         -    /</td>	ylinde B6 - 1.75E - 9.58E 0.00E- 0.00E- 0.00E- 4.32E S: B6 33E-04 9E-04 8E-04	-01 1 -01 1 +00 0 +00 0 -04 1	C2 - - 1.10E-0 - 1.50E-0 0.00E+0 0.00E+0 0.00E+0 1.94E-0 0 0.00E+0 1.94E-0 0 0.00E+0 1.94E-0 0	2 3.16E 2 3.16E 2 3.16E 0 0.00E 0 0.00E 5 7.80E C3 2.40E-	E-02 : E-01 : E+000 : E+000 : E-05 : : 05 : 2 : 05 :	- 2.37E-0 - 3.11E-0 0.00E+0 0.00E+0 0.00E+0 7.84E-0 <b>C4</b> 2.26E-0	-         -    /
Parame PERM PERT PENRI PENRI PENRI PENRI SM RSF NRSF FW <b>RESU</b> One p Parame HWI NHW	ter R R Nor Nor T Use Use Use Use C D C J	OF TH enewab sourcess otal use of ene n renewa mat al use of ene Use of s e of rene e of non Use o OF TH of SM Hazal Non haz Radio Cor	IE LCA Paramet le primar nergy cal ble prima as mater of renewa regy reso able prim erial utiliz non rene regy reso secondar wable se renewab fuels f net fres IE LCA ARTai Paran rdous wa zardous va	er y energ rrier ary ener ial utiliz able prir urces ary ene zation wwable p urces y mater condary ole seco th water <b>Cylin</b> neter ste disp s for re-	y as gy ation mary rgy as orimary ial y fuels ndary TPUT nder Dosed isposed posed use	CEUS Unit [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ] [MJ]	E: On A1 - A 1.06E+ 0.00E+ 1.06E+ 8.13E+ 0.00E+ 8.13E+ 2.21E- 0.00E+ 4.64E- /S AN A1 - 7.54E 2.71E 7.52E 0.00E	Image: book state	A4	2 1 2 1 1 2 0 0 0 0 5 1 3 1 2 1 2 1 2 1 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Tair C           A5           - </td <td>ylinde B6 - 1.75E - 9.58E 0.00E 0.00E 0.00E 4.32E S: B6 33E-04 9E-04 8E-04 0E+00</td> <td>-01 1 -01 1 +00 0 +00 0 -04 1 5.24 2.55 5.33 0.00</td> <td>C2 - - 1.10E-0 - 1.50E-0 0.00E+00E+0000000000</td> <td>2 3.16E 2 3.16E 2 3.16E 0 0.00E 0 0.00E 0 0.00E 5 7.80E 2.40E-1 5.58E-1 2.49E-1 0.00E+</td> <td>E-02 : E+000 E</td> <td>- 2.37E-0 - 3.11E-0 0.00E+0 0.00E+0 0.00E+0 0.00E+0 2.26E-00 5.92E-00 1.10E-00 0.00E+0</td> <td>-         <td< td=""></td<></td>	ylinde B6 - 1.75E - 9.58E 0.00E 0.00E 0.00E 4.32E S: B6 33E-04 9E-04 8E-04 0E+00	-01 1 -01 1 +00 0 +00 0 -04 1 5.24 2.55 5.33 0.00	C2 - - 1.10E-0 - 1.50E-0 0.00E+00E+0000000000	2 3.16E 2 3.16E 2 3.16E 0 0.00E 0 0.00E 0 0.00E 5 7.80E 2.40E-1 5.58E-1 2.49E-1 0.00E+	E-02 : E+000 E	- 2.37E-0 - 3.11E-0 0.00E+0 0.00E+0 0.00E+0 0.00E+0 2.26E-00 5.92E-00 1.10E-00 0.00E+0	-         - <td< td=""></td<>
Parame PERE PERM PENRI PENRI PENRI PENRI SM RSF FW RESU One p Paramo NHW RWI CRU	ter  ter  ter  ker  ker  ker  ker  ker	OF TH enewable gr Renewa sources total use of ene use of se of rene e of non Use of OF TH of SM Hazar Non haz Radio: Cor Ma	IE LCA Paramet le primar hergy cal ble prima as mater of renews regy reso able prim hergy cal bable prim erial utiliz non rene regy reso secondar wable se renewab f net fres IE LCA ARTai Paran rdous wa zardous va terials fo	er y energ rier ary ener ial utiliz able prir urces ary ene rier ary ene zation wable p urces y mater condary le seco th water <b>Cylir</b> <b>Ste disp</b> waste disp ste disp waste disp ste disp tr recycli	y as gy ation mary rgy as rgy as orimary ial y fuels ndary ial <b>ITPUT</b> nder oosed isposed oosed use ing	Unit           [MJ]           [Kg]           [MJ]           [MJ]           [MJ]           [Kg]           [M]           [Kg]           [Kg]           [Kg]           [Kg]           [Kg]           [Kg]           [Kg]           [Kg]	E: On A1 - A 1.06E+ 0.00E+ 1.06E+ 8.13E+ 0.00E+ 8.13E+ 2.21E- 0.00E+ 4.64E- (S AN A1 - 7.54E 2.71E 7.52E 0.00E 0.00E	Image: relation of the second secon	Ce of S A4 - - 1.10E-0 - 1.50E-0 0.00E+0 0.00E+0 0.00E+0 0.00E+0 0.00E+00 0.00E+00 0.00E+00	MAR       2     1       2     1       1     2       0     0       0     0       0     0       5     1       5.18E       1.21E       0.00E-       8.30E	Tair C           A5           - </td <td>ylinde B6 - 1.75E - 9.58E 0.00E 0.00E 0.00E 4.32E S: B6 3E-04 9E-04 8E-04 0E+00 0E+00</td> <td>-01 1 +00 0 +00 0 +00 0 -04 1 5.224 2.55 5.33 0.00 0.00</td> <td>C2 - - 1.10E-0 - 1.50E-0 0.00E+0000000000</td> <td>2 3.16E 2 3.16E 2 3.16E 0 0.00E 0 0.00E 0 0.00E 5 7.80E C3 2.40E- 5.58E- 2.49E- 0.00E+ 2.21E-</td> <td>E-02 = =-01 = =+000 = =+000 = =+000 = =-05 =</td> <td>- - - - - - - - - - - - - - - - - - -</td> <td></td>	ylinde B6 - 1.75E - 9.58E 0.00E 0.00E 0.00E 4.32E S: B6 3E-04 9E-04 8E-04 0E+00 0E+00	-01 1 +00 0 +00 0 +00 0 -04 1 5.224 2.55 5.33 0.00 0.00	C2 - - 1.10E-0 - 1.50E-0 0.00E+0000000000	2 3.16E 2 3.16E 2 3.16E 0 0.00E 0 0.00E 0 0.00E 5 7.80E C3 2.40E- 5.58E- 2.49E- 0.00E+ 2.21E-	E-02 = =-01 = =+000 = =+000 = =+000 = =-05 =	- - - - - - - - - - - - - - - - - - -	
Parame PERE PERM PENRI PENRI PENRI PENRI SM RSF FW RESU One p Paramo HWI NHW RWI CRL MFF MEF	ter ter	OF TH enewable en Renewa sourcess otal use of ene n renewa mat al use of ene Use of of rene e of non Use o OF TH of SM Hazar Non haz Radio Cor Ma	IE LCA Paramet le primar hergy cal ble prima as mater of renews regy reso able prim hergy cal bable prim hergy cal bable prim erial utiliz non rene regy reso secondar wable se renewals f net fress IE LCA ARTai Paran rdous wa zardous va active wa nponents terials for en	er y energ rrier ary energ rary ener tial utiliz able prir urces ary ene zation wable p urces y mater condary ole seco th water <b>Cylin</b> <b>Neter</b> ste disp waste disp ster disp waste disp ster disp r recycli ergy rec	y as gy ation mary rgy as primary ial y fuels ndary ial y fuels ndary <b>TPUT</b> nder posed isposed posed posed posed posed posed posed posed posed posed posed	Unit           [MJ]           [MJ]	E: On A1 - A 1.06E+ 0.00E+ 1.06E+ 8.13E+ 0.00E+ 8.13E+ 2.21E- 0.00E+ 4.64E- VS AN A1 - 7.54E 2.71E 7.52E 0.00E 0.00E 0.00E	Image: relation of the second secon	Ce of S A4 - - 1.10E-0 - 1.50E-0 0.00E+0 0.00E+0 0.00E+0 0.00E+00	2 1 2 1 2 1 1 2 0 0 0 0 5 1 2	Tair C           A5           - </td <td>ylinde B6 - 1.75E 9.58E 0.00E 0.00E 0.00E 4.32E S: B6 3E-04 9E-04 9E-04 0E+00 0E+00</td> <td>-01 1 +00 0 +00 0 +00 0 -04 1 5.24 2.55 5.33 0.00 0.00 0.000</td> <td>C2 - - 1.10E-0 - 1.50E-0 0.00E+0000E+0 0.00E+0000E+0000E+0000E+0000E+0000E+0000E+0000E+000E+000E+0000E+000000</td> <td>2 3.16E 2 3.16E 2 3.16E 0 0.00E 0 0.00E 0 0.00E 5 7.80E C3 2.40E- 5.58E- 2.49E- 0.00E+ 2.21E- 0.00E+ 2.21E- 0.00E+</td> <td>E-02 = E-01 = E+000 =</td> <td>- - - - - - - - - - - - - - - - - - -</td> <td>-         0         0         0         0         0         0         -         <td< td=""></td<></td>	ylinde B6 - 1.75E 9.58E 0.00E 0.00E 0.00E 4.32E S: B6 3E-04 9E-04 9E-04 0E+00 0E+00	-01 1 +00 0 +00 0 +00 0 -04 1 5.24 2.55 5.33 0.00 0.00 0.000	C2 - - 1.10E-0 - 1.50E-0 0.00E+0000E+0 0.00E+0000E+0000E+0000E+0000E+0000E+0000E+0000E+000E+000E+0000E+000000	2 3.16E 2 3.16E 2 3.16E 0 0.00E 0 0.00E 0 0.00E 5 7.80E C3 2.40E- 5.58E- 2.49E- 0.00E+ 2.21E- 0.00E+ 2.21E- 0.00E+	E-02 = E-01 = E+000 =	- - - - - - - - - - - - - - - - - - -	-         0         0         0         0         0         0         - <td< td=""></td<>
Parame PERE PERM PERT PENRI PENRI PENRI PENRI SM RSF FW RESU One p Parame HWI NHW RWI CRL MFF	ter R R Nor Nor T Tota Use Use C D C D C C C C C C C C C C C C C	OF TH enewable en Renewa sourcess otal use of ene n renewa mat al use of ene Use of se e of rene e of non Use o OF TH of SM Hazan Non haz Radio Cor Ma terria	IE LCA Paramet le primar hergy cal ble prima as mater of renews regy reso able prim hergy cal bable prim erial utiliz non rene regy reso secondar wable se renewab f net fres IE LCA ARTai Paran rdous wa zardous va terials fo	er y energ rrier ary energ rary ener tial utiliz able prirur ary ene zation wable prirur ary ene zation wable prirur wable prirur ary energy resources y mater trices th water <b>t</b> Cylin <b>t</b>	y as gy ation mary rgy as orimary ial y fuels ndary ial y fuels ndary ial <b>DTPUT</b> nder <b>DOSE</b> isposed po	Unit           [MJ]           [Kg]           [MJ]           [MJ]           [MJ]           [Kg]           [M]           [Kg]           [Kg]           [Kg]           [Kg]           [Kg]           [Kg]           [Kg]           [Kg]	E: On A1 - A 1.06E+ 0.00E+ 1.06E+ 8.13E+ 0.00E+ 8.13E+ 2.21E- 0.00E+ 4.64E- (S AN A1 - 7.54E 2.71E 7.52E 0.00E 0.00E	Image: second	Ce of S A4 - - 1.10E-0 - 1.50E-0 0.00E+0 0.00E+0 0.00E+0 0.00E+0 0.00E+00 0.00E+00 0.00E+00	2 1 2 1 2 1 1 2 0 0 0 0 5 1 2	Tair C           A5           -           -           -           -           -           .93E-03           -           .93E-03           -           .85E-02           .00E+00           .00E+00           .00E+00           .62E-04           ORIE           -06           -03           .006           .006           .000           .00           .00           .00           .00           .00           .00	ylinde B6 - 1.75E - 9.58E 0.00E 0.00E 0.00E 4.32E S: B6 3E-04 9E-04 8E-04 0E+00 0E+00	-01 1 +00 0 +00 0 +00 0 -04 1 5.24 2.55 5.33 0.00 0.00 0.00 0.00 0.00	C2 - - 1.10E-0 - 1.50E-0 0.00E+00 0.00E+00E+00 0.00E+00 0	2 3.16E 2 3.16E 2 3.16E 0 0.00E 0 0.00E 0 0.00E 5 7.80E C3 2.40E- 5.58E- 2.49E- 0.00E+ 2.21E-	E-02 = = = = = = = = = = = = = = = = = = =	- - - - - - - - - - - - - - - - - - -	-         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         0.00E+00         0.00E+00



# 6. LCA: Interpretation

This chapter contains an interpretation of the Life Cycle Impact Assessment categories. Stated percentages in the whole interpretation are related to the overall life cycle, excluding credits (module D).

The production phase (modules A1-A3) contributes between 96% and 100% to the overall results for all the environmental impact assessment categories hereby considered. Within the production phase, the main contribution for all the impact categories is the production of steel, with app. 99%, mainly due to the energy consumption on this process. Brass, steel and

### 7. Requisite evidence

Not applicable in this EPD.

#### 8. References

#### Institut Bauen und Umwelt

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

#### **General principles**

For the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013-04 www.bau-umwelt.de

#### PCR Part A

Institut Bauen und Umwelt e.V., Berlin (pub.): 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. April 2013 www.bau-umwelt.de

#### **IBU PCR Part B**

IBU 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 Electronic Access Control Systems. www.bau-umwelt.com

#### ISO 14025

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

#### ISO 14001:1999

Environmental Management System Certificate

#### ISO 9001:1994

Quality systems – Model for quality assurance in design, development, production, installation and servicing

#### ISO 14001:2004

Environmental management systems - Requirements with guidance for use (ISO 14001:2004 + Cor. 1:2009)

#### EN 15804

substitution).

EN 15804:2012+A1:2014: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

stainless steel account with app. 74% to the overall

with the mass composition of the product. The environmental impacts for the transport (A2) have a

negligible impact within this stage.

mass of the product, therefore, the impacts are in line

In the end-of-life phase, there are loads and benefits

(module D, negative values) considered. The benefits

are considered beyond the system boundaries and are

declared for the recycling potential of the metals and

for the credits from the incineration process (energy

#### EN 1634: 2000

Fire resistance tests for door and shutter assemblies

#### GaBi 6 2013

GaBi 6 2013: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, PE INTERNATIONAL AG, Leinfelden-Echterdingen, 1992-2013.

#### GaBi 6 2013D

GaBi 6 2013D: Documentation of GaBi 6: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, PE INTERNATIONAL AG, Leinfelden-Echterdingen, 1992-2013. http://documentation.gabi-software.com/

#### UNE-EN 1634:2000

Ensayos de resistencia al fuego y de control de humo de puertas y elementos de cerramiento de huecos, ventanas practicables y herrajes para la edificación. Parte 1: Ensayos de resistencia al fuego de puertas y elementos de cerramiento de huecos y ventanas practicables

#### EWC

European Waste Catalog

#### WEEE

Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE)

### 9. Annex



Results shown below were calculated using TRACI Methodology.

DESCR	пртіо		Е ТНЕ	ever				( – IN	CLU								
			r inc	5151		JUNL			CLU		LUA,					1	EFITS AND
PRODUCT STAGE			CONSTRUCTI ON PROCESS STAGE		USE STAGE						END OF LIFE STAGE				L BEY S	OADS OND THE YSTEM JNDARYS	
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement <sup>1)</sup>	Refurbishment <sup>1)</sup>	Operational energy use	Operational water use	De-construction demolition	Transport	Maste processing		Disposal Reuse-	Recovery- Recycling- potential
A1 A	A2 /	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	С	3 (	24	D
X	Х	Х	Х	Х	MND	MND	MND	MND	MNE	о х	MND	MND	Х	X	(	х	Х
RESUL	TS OF	- TH	E LCA	- EN	VIRON	MEN	TAL IMI	РАСТ	: dec	clared ι	init an	d proc	luct				
Parameter					Unit		A1 - A	A1 - A3 A4		A5	В	6	C2	C3	C4	D	
GWP		Globa	al warmin	g potenti	ial	[kg C	O <sub>2</sub> -Eq.]	5.16E+	+00 9	.73E-03	6.42E-0	2 5.39	-029.7	3E-03	9.72E-(	034.16E-0	2-5.26E-01
ODP	Depleti	ion po	tential of ozone la		tospheric	[kg CF	C11-Eq.]	2.88E-	-09 1	.51E-12	2.25E-1	3 3.92	-111.5	1E-12	7.08E-	121.41E-1	3-3.81E-11
AP	Acidific	ation			and water	[kg S	O <sub>2</sub> -Eq.]	3.21E-	-02 5	.54E-05	1.89E-0	5 2.40	-045.5	4E-05	4.34E-0	051.85E-0	5-4.26E-03
EP		Eutro	phicatior	n potentia	al		N-eq.]	1.48E-	-03 3	.68E-06	6.65E-0	7 1.02	-053.6	8E-06	1.85E-(	069.66E-0	7-1.31E-04
Smog			el smog fo				D₃-eq.]	3.24E-		.03E-03							4-4.91E-02
Resources			ces – res				MJ]	5.13E+		.79E-02			-021.7	9E-02	7.86E-0	03 <mark>3.13E-0</mark>	3-2.60E-01
RESUL	15 OF	- I H		- RE	SOURI	EUS	SE: One	e piec	eor	SMART	air Cy	linder	-			1	
Parameter	Deserve		Parame			Unit	A1 -	A3	A4		A5	<b>B</b> 6	С	2	C3	C4	D
PERE		-	carrie	r	s energy	[MJ]	1.06E	E+01	-		-	-	-		-	-	-
PERM	Renewa				esources	[MJ]	0.00E	=+00	-		-	-	-		-	-	-
PERT	as material utilization Total use of renewable primary energy resources				[MJ]	] 1.06E+01		1.10E	0E-02 1.93E-0		.75E-01	1.10	E-02 3	.16E-02	2 2.37E-03	-2.52E-01	
PENRE	Non r	Non renewable primary energy as energy carrier			[MJ]	[MJ] 8.13E		+01 -		-	-			-	-	-	
PENRM	Non r	enew	able prin	nary ene	ergy as	[MJ]	0.00	=+00			-				-	_	_
	Total ı	material utilization Total use of non renewable primary								_			_				
PENRT		ene	ergy reso	ources		[MJ]	8.13E		1.50E			9.58E-01					2-5.87E+00
SM			seconda			[kg]	2.21		0.00E			.00E+00					0.00E+00
RSF			ewable s		•	[MJ]	0.00E	=+00	0.00E	+00 0.00	E+00 0	.00E+00	0.00E	+000.	00E+0	00.00E+00	0.00E+00
NRSF			fuels			[MJ]	0.00E	=+00	0.00E	+00 0.00							0.00E+00
FW		Use o	of net fre	sh wate	er	[m³]	4.64	E-02	1.94E	-05 1.62	2E-04 4	.32E-04	1.94	E-05 7	.80E-05	5 7.84E-05	-3.32E-03
RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: One piece of SMARTair Cylinder																	
Parameter			Param			Unit	A1 - A3	A		A5	B6		C2	с	3	C4	D
HWD			dous wa				7.54E-03			1.99E-06	1.33E-		4E-06	2.40		2.26E-06	-2.35E-05
NHWD			zardous waste disposed			2.71E-01	2.59E		5.18E-03			9E-05	5.58		5.92E-02	-1.75E-02	
·	R R		lioactive waste disposed			7.52E-03			1.21E-06				2.49		1.10E-06	-9.90E-05	
RWD		Components for re-use				0.00E+00			0.00E+00	-		0E+00	0.00E		0.00E+00	-	
CRU		Materials for recycling Materials for energy recovery			[kg] (	0.00E+00	0.00E	:+00	8.30E-03	0.00E+	·uu   u.0	0E+00	2.21	=-01 [(	0.00E+00	-	
CRU MFR	M				•									0.005			
CRU MFR MER		ateria	ls for en	ergy rec	covery	[kg] (	0.00E+00	0.00E		0.00E+00	0.00E+	-00 0.0	0E+00	0.00E		0.00E+00	-
CRU MFR	I	ateria Expor		ergy rec trical en	covery ergy	[kg] ( [MJ] (		0.00E	+00			·00 0.0	0E+00 0E+00 0E+00	0.00E 0.00E 0.00E	+00		-

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