ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**Assa Abloy (HID Global)**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-ASA-20130280-IBC1-EN
Issue date	21.02.2014
Valid to	20.02.2019

iCLASS SE RK40 Reader

Assa Abloy (HID Global)

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com / https://epd-online.com

1. General Information

ASSA ABLOY (HID Global)

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

Declaration number
EPD-ASA-20130280-IBC1-EN

This Declaration is based on the Product Category Rules:
Electronic Access Control Systems, 11-2013
(PCR tested and approved by the independent expert committee)

Issue date
21.02.2014

Valid to
20.02.2019

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

Dr. Burkhart Lehmann
(Managing Director IBU)

iCLASS SE RK40 Reader

Owner of the Declaration
ASSA ABLOY (HID Global)
15370 Barranca Pkwy
Irvine, CA 92618-3106
USA

Declared product / Declared unit
This Declaration represents 1 card reader model iCLASS SE RK40, with terminal block, including all custom configurations.

Scope:
The Life Cycle Assessment is based on data collected by the contract manufacturer of the RK40 at their production facility located in the Philippines.
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 Norm EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025
☐ internally ☒ externally

Dr.-Ing. Wolfram Trinius
(Independent tester appointed by SVA)

2. Product

2.1 Product description

The iCLASS SE RK40 reader, produced by HID Global, an ASSA ABLOY Group brand, is a device that communicates with a personalized credential via radio frequency (RF) technology. The reader collects identity information from the credential and passes it on to a secured control unit via electrical cable. The control unit then grants or denies access to the credential holder. Also, integrated into the reader is a 12 digit keypad which can be used to enter a Personal Identity Number for an added level of security. The reader is capable of communications using a high frequency RF signal and is able to communicate with several credential formats. Also factory settings can be updated to various configurations allowing the reader flexibility in its function.

Supported credential formats:

- iCLASS SE (Cards/Tags/Fobs)
- SE for DESFire EV1 (Cards)
- SE for MIFARE Classic (Cards/Tags/Fobs)

Configurable functions:

- LED function
- Audible signal (Beep)
- Communication format

2.2 Application

The iCLASS SE RK40 reader 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.

2.3 Technical Data

The product has the following technical properties:

Constructional data

Name	Value	Unit
Mounting	Wall Switch Size	-
Operating Temperature	-35 to 65	°C
Operating Humidity	5 to 95	%
power consumption NSC - w/IPM	1.4	W
Peak Power Draw (During read)	5	W
Power supply	5-16	VDC
Transmit Frequency	13.56	MHz
Current Requirements	105	mA

NCS = Normal Standby Current
IPM = Intelligent Power Management Mode
Measured in accordance with /UL294/ standards

2.4 Placing on the market / Application rules

Compliance with US and Canadian Standards:

- /UL294/ US Standard for Safety Access Control System Units
- CSA C22.2 No. 205 Canada Signal Equipment

Compliance with the European Union R&TTE Directive and technical specifications:

- /EN60950-1: 2006/ All:/2009 +A1:2010 +A12:2011/ Information technology equipment - Safety - Part1: General requirements
- /EN 301 489-3 V1.4.1/ Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz
- /EN50130-4:1995 +A1:1998, +A2:2003/ Alarm systems - Electromagnetic compatibility and Environmental test methods
- /ETSI EN 300 330-2 V1.5.1/ Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the /R&TTE Directive/

FCC and Canada Radio Certification:

- /47 CFR §15.225: 2011/ Operation within the band 13.110-14.010 MHz
- /47 CFR §15.207: 2007/ Conducted Emission
- /47 CFR §15.209: 2007/ Radiated Emission
- /RSS-210 Issue 8: 2010/ License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment - Spectrum Management and Telecommunications Radio Standards Specification

Australia and New Zealand Radio Certification:

- /AS/NZ 4268: 2008/ Radio equipment and systems - Short range devices -Limits and methods of measurement

RoHS Conformity:

- /EN50581:2012/ Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

2.5 Delivery status

Each reader unit is delivered individually packaged with mounting plate, mounting hardware, and gasket.

Packaged reader dimensions: 3.3" x 4.8" x 1.1" (8.5cm x 12.2cm x 2.8cm).

2.6 Base materials / Ancillary materials

The composition of the card reader in percentages (%) of total mass per unit (excluding packaging) is as following:

Component	Percentage in mass (%)
Polycarbonate	30
Urethane	27
PCB (populated)	15
Silicone Rubber	10
Stainless steel	9
PA 66	3
Silicone RTV	2
Acrylic	2
Other (labels)	1
Polyurethane Foam	1
Total	**100**

2.7 Manufacture

The iCLASS SE RK40 is assembled at a contract manufacturer's production facility. The injection molded parts are purchased from an external supplier. The electronic components, including printed circuit board (PCB), are purchased externally and assembled at the contract manufacturer's production facility. During assembly the individual parts are assembled into the reader bezel and then potted into place. The assembled reader is then packaged with the mounting plate and hardware for shipment.

2.8 Environment and health during manufacturing

The Management System of the contract manufacturer has been assessed and certified as meeting the requirements of /ISO 14001:2004/. In addition, industrial safety is certified as compliant to /OHSAS 18001/.

2.9 Product processing/Installation

HID Readers are installed by trained product integrators or by the product end user. Installation instructions are included with each reader unit.

2.10 Packaging

The reader is wrapped in antistatic bubble wrap and packed in a cardboard box to avoid damage. Also included in the packaging are paper installation instructions, a plastic bag containing the gasket, and a plastic bag containing the connectors and mounting hardware. Packaging materials shall be collected separately for recycling.

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
The service life of the iCLASS SE RK40 is estimated to be 30 years. This number is based on the most conservative Mean Time Between Failure (MTBF) data available for the reader components at elevated operation temperatures. MTBF of 270110 hours at 65°C.

2.14 Extraordinary effects

Fire
The external housing of the RK40, consisting of the bezel and mounting plate, are constructed from polycarbonate resin thermoplastic. The housing material, and thus the reader as a whole unit, has been classified as having a /UL94 HB/ Flame Rating. A /UL94/ Flame Rating of HB indicates: slow burning on a horizontal specimen; burning rate < 76 mm/min for thickness < 3 mm and burning stops before 100 mm

Water
No substances are used which have a negative impact on ecological water quality on contact by the device with water.

Mechanical destruction
No impact on human health and environment is known or expected. Especially, no hazardous substance can be anticipated
during mechanical destruction.

2.15 Re-use phase
The following possibilities arise with reference to the material composition of the reader.

Re-use
During the reference service life the reader can be disconnected and dismounted then remounted and attached elsewhere.

Material Recycling
UK Recycling: HID provides arrangements for the collection, treatment, recycling and recovery of Waste of Electrical and Electronic Equipment (WEEE) sold inside the UK.

EU Recycling: HID distributors act as the importer of the equipment into their member state. Thus the distributor has the legal responsibility to:
• Register as the WEEE producer in their member state.
• Finance arrangements for collection and recycling of WEEE arising from HID products that the distributor sells in their member state.
In this instance please contact your distributor for recycling information.

2.16 Disposal
Packaging
Packaging components incurred during installation on their end-of-life are directed to energy recovery circuits.
• /EWC 15 01 01/ Paper and cardboard packaging
• /EWC 15 01 02/ Plastic packaging

End of Life
All materials can be directed to an energy recovery circuit.
• /EWC 16 02 14/ Discarded equipment other than those mentioned in /16 02 09/ to /16 02 13/
• /EWC 16 02 16/ Components removed from discarded equipment other than those mentioned in /16 02 15/

2.17 Further information
More information on ASSA ABLOY (HID Global) and iCLASS SE readers is available from:

ASSA ABLOY (HID Global)
15370 Barranca Parkway
Irvine, CA 92618
USA
Tel: 949-732-2000
Internet: www.hidglobal.com

3. LCA: Calculation rules

3.1 Declared Unit
The declaration refers to the functional unit of 1 piece of Card reader iclass-RK40 (including packaging) as specified in Part B requirements on the EPD for Doors, windows, shutters, and related products/IBU PCR Part B/.

Declared unit

Name	Value	Unit
Declared unit	1	piece of Card reader iclass-RK40
Mass (total system)	0.291	kg/piece
Conversion factor to 1 kg	3.44	

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

Construction phase:
- A5 – Packaging waste processing

Use phase related to the operation of the building includes:
- B6 – Operational energy use (Energy consumption for lock operation)

End-of-life phase:
- 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 end-of-waste status or disposal of final residues.

Module D:

- Declaration of all benefits or recycling potential from EOL and A5

3.3 Estimates and assumptions

Transport:
Real-world data on mode of transport and distances, as reported by suppliers, was considered for materials contributing more than 2% to the total product mass. For parts and materials, contributing less than 2% to the total product mass, transport by road over an average distance of 500km was considered.

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 phase. The operating hours of the reader are accounted for 8760 hours per year in on mode; power consumption per mode is 1.5 W.

EOL:
In the End-of-Life phase a recycling scenario with 100% collection rate was assumed.

3.4 Cut-off criteria

In the assessment, all available data from production process were 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).

For raw materials, contributing more than 2% to the total product mass, means of transportation and distances were modeled in more detail to better reflect reality; for materials or product parts, contributing less than 2% of total product mass, average distances and traditional means of transport were assumed. Average distance assumptions were based on following thoughts:
- within one country – max. transport distance of 500 km;
- between two countries/regions – average distance between these countries/regions.
- Several supplier countries – weighted average distances.

The overall contribution from these assumptions does not exceed 5% to the impact categories under consideration. Impacts relating to the production of machines and facilities required during production are not within 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 from packaging
- Waste incineration of paper from packaging
- Thermal treatment of plastic parts
- Waste incineration of electronic scraps (printed wiring boards)

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 each background dataset is available in the corresponding 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

In the EPD scenarios and/or technical information for modules A5, B6, C1-C4 and D are given.

Installation into the building (A5)

Name	Value	Unit
Output substances following waste treatment on site packaging (paper and plastic)	0.052	kg

Reference service life

Name	Value	Unit
Reference service life	30	a

Operational energy use (B6)

Name	Value	Unit
Electricity consumption	384	kWh

Total energy consumed during the whole product life was calculated using following formula:

(W_active_mode*h_active_mode+W_idle_mode*h_idle_mode+W_stand_by_mode*h_stand_by_mode)*Life_span*days_year*0.001

Where:
W_active_mode - Energy consumption in active mode in W
h_active_mode - Operation time in active mode in hours
W_idle_mode - Energy consumption in idle mode in W
h_idle_mode - Operation time in idle mode in hours
W_stand_by_mode - Energy consumption in stand-by mode in W
h_stand_by_mode - Operation time in stand-by mode in hours
Life_span - Reference service life of product
days_year - Operation days per year
0.001 - Conversion factor from Wh to kWh.

End of life (C1-C4)

Name	Value	Unit
Collected separately stainless steel, electronic, plastic parts	0.233	kg
Collected as mixed construction waste construction waste for landfilling	0.006	kg
Recycling stainless steel	0.016	kg
Thermal recovery plastic	0.172	kg
Recycling metals from electronic	0.0175	kg
Landfilling construction waste	0.006	kg

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

Name	Value	Unit
Collected separately waste card reader (including packaging)	0.291	kg
Recycling stainless steel	8	%
Recycling/Reuse electronic	16	%
Reuse plastic parts	60	%
Reuse paper packaging	17	%
Reuse plastic packaging	1	%
Construction waste going to landfill (no recycling potential)	2	%

5. LCA: Results

The table below shows the LCA results for the declared unit - 1 piece of reader - iCLASS SE RK40.

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 BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement[1)]	Refurbishment[1)]	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	MND	X	MND	MND	MND	MND	MND	X	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: declared unit and product

Parameter	Unit	A1 - A3	A5	B6	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	8.31E+0	7.86E-2	1.85E+2	6.9E-3	7.94E-3	4.34E-1	-9.78E-1
ODP	[kg CFC11-Eq.]	3.96E-7	2.07E-12	1.66E-7	1.21E-13	7.13E-12	6.31E-12	-1.66E-10
AP	[kg SO_2-Eq.]	5.24E-2	2.02E-5	8.77E-1	3.13E-5	3.76E-5	1.05E-4	-1.06E-2
EP	[kg $(PO_4)^{3-}$- Eq.]	4.06E-3	3.16E-6	4.62E-2	7.22E-6	1.98E-6	8.24E-6	-4.59E-4
POCP	[kg Ethen Eq.]	4.29E-3	1.97E-6	5.17E-2	-1.03E-5	2.22E-6	6.06E-6	-5.45E-4
ADPE	[kg Sb Eq.]	6.13E-4	2.06E-9	2.55E-5	2.58E-10	1.09E-9	6.21E-8	-4.88E-4
ADPF	[MJ]	9.54E+1	5.03E-2	2.1E+3	9.54E-2	9.03E-2	2.05E-1	-1.16E+1

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: declared unit and product

Parameter	Unit	A1 - A3	A5	B6	C2	C3	C4	D
PERE	[MJ]	9.73E+0	-	-	-	-	-	-
PERM	[MJ]	0.0E+0	-	-	-	-	-	-
PERT	[MJ]	9.73E+0	3.12E-3	5.44E+2	3.75E-3	2.33E-2	1.95E-2	-7.73E-1
PENRE	[MJ]	1.07E+2	-	-	-	-	-	-
PENRM	[MJ]	0.0E+0	-	-	-	-	-	-
PENRT	[MJ]	1.07E+2	5.58E-2	3.27E+3	9.57E-2	1.4E-1	2.32E-1	-1.27E+1
SM	[kg]	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	-
RSF	[MJ]	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
NRSF	[MJ]	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0
FW	[m^3]	1.04E+2	2.27E-1	1.46E+3	4.16E-3	6.28E-2	1.06E+0	-7.55E+0

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: declared unit and product

Parameter	Unit	A1 - A3	A5	B6	C2	C3	C4	D
HWD	[kg]	1.95E-2	1.57E-3	0.0E+0	0.0E+0	0.0E+0	4.37E-2	4.93E-3
NHWD	[kg]	4.61E-1	7.41E-4	1.42E+0	1.24E-5	6.11E-5	5.85E-3	-4.37E-2
RWD	[kg]	4.94E-3	2.28E-6	4.8E-1	1.33E-7	2.06E-5	1.12E-5	-4.6E-4
CRU	[kg]	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	-
MFR	[kg]	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	-
MER	[kg]	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	-
EEE	[MJ]	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	-
EET	[MJ]	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+0	0.0E+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

This chapter contains an interpretation of the Life Cycle Impact Assessment categories. When expressed as a percentage, the impact refers to its magnitude as a percentage of total product impact across all modules, with the exception of module D.

Production phase (module A1-A3) contributes 70% to total impact assessment for Depletion Potential of the Stratospheric Ozone Layer (ODP) category and almost 96% - for Abiotic Depletion Potential For Non Fossil Resources (ADPE). For all other categories this values

ranges between 4% and 8%. The environmental impacts for the transport (A2) have a negligible impact within this stage.

To reflect the use phase corresponding to the reference service life (RSL) stated in this EPD, energy consumption was considered and has a major contribution for each impact assessment category between 92% and 96%, with exception of ADPE (4%).

In module D the benefits (negative values) and loads beyond the system boundary are declared for the recycling potential of the metals and for the credits from the incineration process (energy substitution) within A5.

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
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ISO 14025
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EN 301 489-3 V1.4.1
EN 301 489-3 V1.4.1 Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz

EN50130-4:1995 +A1:1998, +A2:2003
EN50130-4:1995 +A1:1998, +A2:2003 Alarm systems - Electromagnetic compatibility and Environmental test methods

ETSI EN 300 330-2 V1.5.1
ETSI EN 300 330-2 V1.5.1 Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive

47 CFR §15.225: 2011
47 CFR §15.225: 2011 Operation within the band 13.110-14.010 MHz

RSS-210 Issue 8: 2010
RSS-210 Issue 8: 2010 License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment - Spectrum Management and Telecommunications Radio Standards Specification

RoHS Conformity:
RoHS Conformity: EN50581:2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

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

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

UL 2794
UL 2794: Standard for Sustainability for Disinfectants and Disinfectant Cleaners

OHSAS 18001
OHSAS 18001**:** Occupational health and safety management systems. Requirements

EWC 15 01 01:
EWC 15 01 01: Paper and Cardboard Packaging: European Waste Catalogue and Hazardous Waste List.Environmental Protection Agency. P.O. Box 3000, Johnstown Castle Estate, County Wexford, Ireland. http://www.epa.ie.

EWC 15 01 02:

EWC 15 01 02: Plastic Packaging: European Waste Catalogue and Hazardous Waste List.Environmental Protection Agency. P.O. Box 3000, Johnstown Castle Estate, County Wexford, Ireland. htthttp://www.epa.ie.

EWC 15 02 14:
EWC 15 02 14: Absorbents, Filter Materials, Wiping Cloths and Protective Clothing: European Waste Catalogue and Hazardous Waste List.Environmental Protection Agency. P.O. Box 3000, Johnstown Castle Estate, County Wexford, Ireland. http://www.epa.ie.

EWC 15 02 16:
EWC 15 02 14: Absorbents, Filter Materials, Wiping Cloths and Protective Clothing: European Waste Catalogue and Hazardous Waste List.Environmental Protection Agency. P.O. Box 3000, Johnstown Castle Estate, County Wexford, Ireland. http://www.epa.ie.

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

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