

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-201600248-IBA1-EN
Issue date	26.01.2017
Valid to	25.01.2022

AR040 APERIO reader ASSA ABLOY



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



1. General Information

<p>ASSA ABLOY</p> <p>Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-ASA-201600248-IBA1-EN</p> <hr/> <p>This Declaration is based on the Product Category Rules - PCR: Electronic Access Control Systems, 07.2014 (PCR tested and approved by the independent expert committee (SVR))</p> <hr/> <p>Issue date 26.01.2017</p> <hr/> <p>Valid to 25.01.2022</p> <hr/> <p> Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p> Dr.-Ing. Burkhard Lehmann (Managing Director IBU)</p>	<p>AR040 APERIO reader</p> <p>Owner of the Declaration Abloy Oy Wahlforssinkatu 20, 80100 Joensuu, Finland</p> <hr/> <p>Declared product / Declared unit The declaration represents 1 AR040 APERIO reader for APERIO AL460 and AL560 (APERIO L100) lock packages consisting of: - inside unit and outside unit</p> <hr/> <p>Scope: This EPD is based on the full life cycle of AR040 Aperio reader. Data collected from reader packaging at Joensuu, Finland. 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.</p> <hr/> <p>Verification</p> <div style="border: 1px solid black; padding: 5px;"> <p>The CEN Standard EN 15804 serves as the core PCR</p> <p>Independent verification of the declaration according to ISO 14025</p> <p><input type="checkbox"/> internally <input checked="" type="checkbox"/> externally</p> </div> <hr/> <p> Dr. Wolfram Timius (Independent verifier appointed by SVR)</p>
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2. Product

2.1 Product description

Product name:

The APERIO card reader, AR040 for APERIO AL460 and AL560 lock packages (under APERIO L100 family)

Product characteristics:

- Reader unit outside gives authorized opening input to the lock and door can be opened by using the handle when the electrical control is on; opening by tag or pin code;
- Reader unit inside contains batteries and electronic components.

2.2 Application

AR040 APERIO reader is designed:

- To be used in APERIO AL460 and AL560 lock packages (APERIO L100) in wooden or metal doors requiring access control
- For wireless door environment;
- Entrance doors, corridor doors;
- Medium traffic exit doors with access control and fire rated doors.

2.3 Technical Data

The product has the following technical properties:

Technical data

Item	Value
Dimensions (H x D x W)	reader outside: 102 x 15 x 44 mm reader inside: 168 x 20 x 48 mm
Battery type	2 x Energizer lithium AA size, L91, FR6, 1,5V
Battery Lifetime	3.5 years / Max. 70.000 cycles
Operating temperature (Peak)	inside: 0°C - +40 °C humidity <85% outside: -40°C - +65 °C humidity <85%
IP-degree	inside unit: IP44 outside unit: IP54

2.4 Placing on the market / Application rules

For the placing of the product on the market in the EU/EFTA (with the exception of Switzerland) the Regulation (EU) No. 305/2011/ (CPR) and the following other harmonisation provisions apply:

- RoHS II directive (2011/65/EU) - restriction of the use of certain hazardous substances in electrical and electronic equipment
- R&TTE Directive 1999/5/EC

The products are subject to CE marking according to the relevant harmonization legislation.

The following standards apply:

R&TTE Directive:

/IEC 60950-1:2005+A11:2009+A1:2010+A12:2011/
 /EN 301 489-1 V1.9.2 (2011-09)/
 /EN 301 489-3 V1.6.1 (2002-08)/
 /EN 50 130-4:2011/
 /EN 61 000-6-2:2005/
 /EN 61 000-6-3:2007+A1/
 /EN 300 328 V1.8.1 (2012-06)/
 /EN 300 330-2 V1.5.1 (2010-02)/
 /EN 300 330-1 V1.7.1 (2010-02)/

For the application and use of the products the respective national provisions apply.

2.5 Delivery status

Delivered in a set with lock case, reader units and connection cables, or separately. Lock case and readers are delivered in a box size 363mm x 215mm x 80mm. Striking plates, spindle and fittings are ordered separately.

2.6 Base materials / Ancillary materials

The composition of the APERIO AR040 lock in percentages (%) of total mass per unit is, as follows:

Component	Percentage in mass (%)
Plastics	56.90
Steel	7.78
Electronic	14.30
Electro-mechanics	3.26
AA-Battery	17.76
Total	100.00

2.7 Manufacture

The product is assembled and main parts manufactured by Tier-1 supplier in Finland. Electronics are provided by Tier-1 supplier in Finland, and cable from Tier-1 supplier in India. The main components are plastics and electronics.

2.8 Environment and health during manufacturing

Abloy Oy routinely monitors the environmental operations, GHG, energy, water, waste, VOC, surface treatment and H&S; conducts periodic inspections, audits, and reviews to ensure that applicable standards are met and to evaluate the effectiveness of the Environmental Management program.

Abloy Oy strictly follows the waste hierarchy:

- Prevention
- Minimization
- Reuse
- Recycling
- Energy recovery
- Disposal

The production site meets OHSAS 18001 and ISO 14001.

2.9 Product processing/Installation

APERIO AL460 and AL560 locks including readers AR040, are distributed through, and installed by trained technicians, such as locksmiths or security technicians. Preparation of doors and frames are mainly conducted at the door manufacturer's production site.

2.10 Packaging

All packaging is fully recyclable. The packaging material is composed of cardboard and polyethylene film, 61% of cardboard is made from recycled material.

Material	Percentage in mass (%)
Cardboard/paper	98.59
Plastics	1.41
Total	100.0

2.11 Condition of use

Annual maintenance consists of checking the battery status and overall function and cleanliness of the readers. The product consumes 0.0364 Watt while on on-mode (Mifare classic data) and 0.000106 Watt on standby mode (UHFpoll (10s), status, Diag test, battery check).

2.12 Environment and health during use

There is no harmful emissive potential. No damage to health or impairment is expected under normal use corresponding to the intended use of the product.

2.13 Reference service life

The reference service life 10 years is based on a typical installation of an AL560 (lock package). Computational battery lifetime is max 70.000 opening cycles.

2.14 Extraordinary effects

Fire

The reader itself is not fire proof, but it is suitable for use in fire and smoke doors (EN 1634) when used with APERIO L100 fire door assembly plate set (953032).

Water

Contains no substances that have an impact on water in case of flooding. Electric components and functionality may be jeopardized in the event of flooding.

Mechanical destruction

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

2.15 Re-use stage

The product can be re-used during the reference service life and be moved from one door to another.

2.16 Disposal

The product can be mechanically disassembled to separate different materials which are then directed to the possible options offered by municipalities, electronics recyclers or garbage haulers.

It is assumed that the majority (approximately 90%) of the product is recycled or valued through energy recovery.
Packaging materials are directed to local recyclers.

2.17 Further information

Abloy Oy
Wahlforssinkatu 20,
80100 Joensuu, Finland

3. LCA: Calculation rules

3.1 Declared Unit

The declaration refers to the functional unit of 1 piece of ARO40 Aperio reader as specified in Part B requirements on the EPD for PCR Locks and fittings: (mechanical & electromechanical locks & fittings).

Declared unit

Name	Value	Unit
Declared unit	0.1747 kg	1 piece of card reader
Conversion factor to 1 kg	5.724	-

3.2 System boundary

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

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

The use stage:

- B6 – Operational energy use

End-of-life stage:

- C2 – Transport to waste processing
- C3 – Waste processing
- C4 – Disposal (landfill)

This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues.

- D – Declaration of all benefits and loads

3.3 Estimates and assumptions

Transportation: Data on mode of transport and distances, as reported by suppliers were used for those materials and parts contributing more than 2% of total product mass. In case of unknown transport distances for parts and materials, contributing less than 2% to the total product mass, transport by road over an average distance of 500 km and transport by ship of 1000 km were assumed.

Use phase: For the use phase, it is assumed that the reader is used in the European Union, thus a European electricity grid mix is considered within this phase. According to the most representative scenario, the operating hours of the product are accounted for 919.8 hours on on-mode and 8721.6 hours on stand-by mode per year; the power consumption throughout 10 years of use is 0.002 kWh

EoL: In the End-of-Life stage, 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 modelling of the considered products, the GaBi 6 Software System for Life Cycle Engineering, developed by thinkstep 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/. thinkstep 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 2013/14 (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. In this EPD, the following specific life cycle inventories for the WIP are considered for:

- Waste incineration of plastic
- Waste incineration of paper

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

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 the 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).

Installation into the building (A5)

Name	Value	Unit
Output substances following waste treatment on site (Paper packaging)	0.1185	kg
Output substances following waste treatment on site (Plastics packaging)	0.0017	kg

Operational energy use (B6)

Name	Value	Unit
Electricity consumption*	0.0232	kWh
Days per year in use (for 10 years)	365	d
Hours per day in on mode (54 openings/day, ~7 seconds for an opening sequence)	0.105	h
Hours per day in stand-by mode	23.8	h
Power consumption on mode	0.0364	W
Power consumption stand-by mode	0.00010	W

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

$$(W_{active_mode} \cdot h_{active_mode} + W_{idle_mode} \cdot h_{idle_mode} + W_{stand_by_mode} \cdot h_{stand_by_mode}) \cdot Life_span \cdot days_year \cdot 0.001$$

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

Reference service life

Name	Value	Unit
Reference service life	10	a

End of life (C2-C4)

Name	Value	Unit
Collected separately Steel, Electronics, Electro mechanics, Plastic	0.1437	kg
Collected as mixed construction waste – construction waste for landfilling	0.031	kg
Recycling Electronics	0.025	kg
Recycling Electro-mechanics	0.0057	kg
Recycling Steel	0.0136	kg
Reuse Plastic Parts	0.1011	kg
Reuse Paper	0.1185	kg

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

Name	Value	Unit
Collected separately waste type (including packaging)	0.2639	kg
Recycling Electronics	8.48	%
Recycling Electro-mechanics	1.93	%
Recycling Steel	4.61	%
Reuse Plastic Parts	34.28	%
Reuse Paper	40.18	%
Collected as mixed construction waste – construction waste for landfilling	10.52	%

5. LCA: Results

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

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 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	X	X	MND	MND	MND	MND	MND	X	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: One piece AR040 APERIO reader

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
GWP	Global warming potential	[kg CO ₂ -Eq.]	5.32E+00	1.09E-02	1.68E-01	1.10E-02	6.82E-03	0.00E+00	2.37E-01	-2.45E-01
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.39E-10	4.71E-14	7.69E-13	7.56E-12	3.27E-14	0.00E+00	7.19E-13	-6.31E-11
AP	Acidification potential of land and water	[kg SO ₂ -Eq.]	3.24E-02	1.56E-04	3.84E-05	5.21E-05	3.12E-05	0.00E+00	5.89E-05	-6.31E-04
EP	Eutrophication potential	[kg (PO ₄) ³⁻ -Eq.]	2.94E-03	1.97E-05	6.69E-06	2.93E-06	7.13E-06	0.00E+00	3.53E-06	-4.56E-05
POCP	Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Eq.]	2.32E-03	-2.69E-06	2.72E-06	3.09E-06	-1.01E-05	0.00E+00	2.76E-06	-5.81E-05
ADPE	Abiotic depletion potential for non-fossil resources	[kg Sb Eq.]	5.04E-04	3.62E-10	3.06E-09	1.53E-09	2.57E-10	0.00E+00	1.25E-08	-1.27E-05
ADPF	Abiotic depletion potential for fossil resources	[MJ]	6.97E+01	1.44E-01	4.72E-02	1.25E-01	9.42E-02	0.00E+00	9.84E-02	-3.39E+00

RESULTS OF THE LCA - RESOURCE USE: One piece AR040 APERIO reader

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	[MJ]	7.45E+00	-	-	-	-	-	-	-
PERM	Renewable primary energy resources as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-	-
PERT	Total use of renewable primary energy resources	[MJ]	7.45E+00	3.80E-03	4.40E-03	3.59E-02	3.71E-03	0.00E+00	6.61E-03	-3.03E-01
PENRE	Non-renewable primary energy as energy carrier	[MJ]	7.75E+01	-	-	-	-	-	-	-
PENRM	Non-renewable primary energy as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-	-
PENRT	Total use of non-renewable primary energy resources	[MJ]	7.75E+01	1.45E-01	5.53E-02	1.96E-01	9.45E-02	0.00E+00	1.08E-01	-3.97E+00
SM	Use of secondary material	[kg]	3.93E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	[m ³]	2.85E-02	2.92E-06	4.90E-04	8.87E-05	2.62E-06	0.00E+00	5.32E-04	-8.13E-04

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: One piece AR040 APERIO reader

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
HWD	Hazardous waste disposed	[kg]	3.89E-03	2.72E-07	3.81E-06	2.72E-05	2.15E-07	0.00E+00	6.18E-06	-2.16E-04
NHWD	Non-hazardous waste disposed	[kg]	1.14E-01	1.21E-05	4.26E-03	6.34E-05	1.19E-05	0.00E+00	3.85E-02	-4.00E-03
RWD	Radioactive waste disposed	[kg]	3.04E-03	1.86E-07	3.23E-06	2.83E-05	1.24E-07	0.00E+00	3.91E-06	-2.33E-04
CRU	Components for re-use	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	Materials for recycling	[kg]	0.00E+00	0.00E+00	1.19E-01	0.00E+00	0.00E+00	1.36E-02	0.00E+00	2.20E-03
MER	Materials for energy recovery	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	Exported electrical energy	[MJ]	0.00E+00	0.00E+00	2.13E-01	0.00E+00	0.00E+00	0.00E+00	4.77E-01	0.00E+00
EET	Exported thermal energy	[MJ]	0.00E+00	0.00E+00	6.02E-01	0.00E+00	0.00E+00	0.00E+00	1.31E+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 stage (modules A1-A3) contributes between 93% and 100% to the overall results for all the environmental impact assessment categories hereby considered. Within the production stage, the main contribution for all the impact categories is the production of plastic, electronics and steel, with approx. 99%, mainly due to the energy consumption

on this process. Plastics account for the majority of the overall mass of the product, therefore, the impacts are in line with the mass composition of the product. The environmental impacts for the transport (A2) have a negligible impact within this stage

In the end-of-life stage, 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 substitution).

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

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

Directive 2011/65/EU (RoHS II Directive)

Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment Text with EEA relevance

Directive 1999/5/EC (R&TTE Directive)

Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity

EN 15804

EN 15804: 2012+A1:2014: Sustainability of construction works — Environmental Product EMC directive (2004/108/EC) - electromagnetic compatibility Declarations — Core rules for the product category of construction products

EN 1634

Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware

EN 301489-1

Electromagnetic compatibility and Radio spectrum Matters (ERM) - ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 1: Common technical requirement

EN 301489-3

Electromagnetic compatibility and Radio spectrum Matters (ERM) - ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz

EN 50130-4

Alarm systems - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder, hold up, CCTV, access control and social alarm systems

EN 61000-6-2

Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments

EN 61000-6-3

Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments

EN 300330-1

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 1: Technical characteristics and test method

EN 300330-2

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

ISO 14001

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

ISO 14025

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

IEC 60950-1

Information technology equipment - Safety - Part 1: General requirements

GaBi 6 2013

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

OHSAS 18001:2007

Occupational Health and Safety Assessment Series

9. Annex

Results shown below were calculated using TRACI Methodology.

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	X	X	MND	MND	MND	MND	MND	X	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: One piece AR040 APERIO reader

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
GWP	Global warming potential	[kg CO ₂ -Eq.]	5.32E+00	1.09E-02	1.68E-01	1.10E-02	6.82E-03	0.00E+00	2.37E-01	-2.45E-01
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.86E-10	5.01E-14	8.18E-13	8.04E-12	3.48E-14	0.00E+00	7.64E-13	-6.71E-11
AP	Acidification potential of land and water	[kg SO ₂ -Eq.]	3.29E-02	1.72E-04	4.65E-05	4.93E-05	4.08E-05	0.00E+00	6.83E-05	-6.19E-04
EP	Eutrophication potential	[kg N-eq.]	2.50E-03	7.19E-06	2.68E-06	2.10E-06	2.88E-06	0.00E+00	1.76E-06	-2.99E-05
Smog	Ground-level smog formation potential	[kg O ₃ -eq.]	4.69E-01	3.24E-03	1.08E-03	4.46E-04	8.40E-04	0.00E+00	3.64E-04	-7.48E-03
Resources	Resources – resources fossil	[MJ]	5.87E+00	2.08E-02	5.54E-03	8.93E-03	1.35E-02	0.00E+00	1.03E-02	-3.93E-01

RESULTS OF THE LCA - RESOURCE USE: One piece AR040 APERIO reader

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	[MJ]	7.45E+00	-	-	-	-	-	-	-
PERM	Renewable primary energy resources as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-	-
PERT	Total use of renewable primary energy resources	[MJ]	7.45E+00	3.80E-03	4.40E-03	3.59E-02	3.71E-03	0.00E+00	6.61E-03	-3.03E-01
PENRE	Non-renewable primary energy as energy carrier	[MJ]	7.75E+01	-	-	-	-	-	-	-
PENRM	Non-renewable primary energy as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-	-
PENRT	Total use of non-renewable primary energy resources	[MJ]	7.75E+01	1.45E-01	5.53E-02	1.96E-01	9.45E-02	0.00E+00	1E-01	-3.97E+00
SM	Use of secondary material	[kg]	3.93E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	[m ³]	2.85E-02	2.92E-06	4.90E-04	8.87E-05	2.62E-06	0.00E+00	5.32E-04	-8.13E-04

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: One piece AR040 APERIO reader

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
HWD	Hazardous waste disposed	[kg]	3.89E-03	2.72E-07	3.81E-06	2.72E-05	2.15E-07	0.00E+00	6.18E-06	-2.16E-04
NHWD	Non-hazardous waste disposed	[kg]	1.14E-01	1.21E-05	4.26E-03	6.34E-05	1.19E-05	0.00E+00	3.85E-02	-4.00E-03
RWD	Radioactive waste disposed	[kg]	3.04E-03	1.86E-07	3.23E-06	2.83E-05	1.24E-07	0.00E+00	3.91E-06	-2.33E-04
CRU	Components for re-use	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
MFR	Materials for recycling	[kg]	0.00E+00	0.00E+00	1.19E-01	0.00E+00	0.00E+00	1.36E-02	0.00E+00	-
MER	Materials for energy recovery	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
EEE	Exported electrical energy	[MJ]	0.00E+00	0.00E+00	2.13E-01	0.00E+00	0.00E+00	0.00E+00	4.77E-01	-
EET	Exported thermal energy	[MJ]	0.00E+00	0.00E+00	6.02E-01	0.00E+00	0.00E+00	0.00E+00	1.31E+00	-



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