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-20150273-IAB1-EN
Issue date	29.09.2015
Valid to	28.09.2020

Access control systems – LCU9016III for the ARX system

ASSA ABLOY

Institut Bauen und Umwelt e.V.

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

1. General Information

ASSA AB

Programme holder

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

Declaration number

EPD-ASA-20150273-IAB1-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 (SVR))

Issue date

29.09.2015

Valid to

28.09.2020

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

Dr.-Ing. Burkhart Lehmann
(Managing Director IBU)

ARX LCU 9016III

Owner of the Declaration

ASSA AB
Förmansvägen 11
117 43 Stockholm
Sweden

Declared product / Declared unit

This Declaration represents controller unit LCU9016III S5590163164 that is a main system component in the ARX security system:

Scope:

The Life Cycle Assessment is based on data collected from the production facility. The LCU is assembled at the production facilities in Sweden and Malaysia. The primary manufacturing processes are made by external suppliers in Malaysia and the final manufacturing processes and assembly occur at the manufacturing factory in Pajala in Sweden. 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
☐ internally ☒ externally

Dr Wolfram Trinius
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

LCU9016III is a central unit for the ARX system that can be connected directly to existing TCP / IP network. The central unit can handle up to 16 door environments with up to 32 card readers, and also 16 up to 32 SIO units, depending on number of doors being used LCU9016III uses dynamic IP address; it communicates with the protocol SSL / TLS and switches automatically to the customer's unique encryption keys associated with the installation. LCU9016III has an enclosure that can be easily fitted with ARX alarm components, such as master and slave cards, which creates conditions for building an alarm system in the ARX. LCU9016III with attached master card 9016III MIO, can directly manage six alarm zones and control sounders. When 9016III MIO is supplemented with alarm interface (LIF01) can alarms be sent to alarm transmitters.
To increase the number of alarm zones and alarm areas more alarm units and add-on cards can be connected to the alarm system on the unique AES 128-bit encrypted bus (ASSA-SIO bus).
LCU can handle over 100,000 cards and practically unlimited number of schedules, calendars, day types etc. More than 30,000 log events can be saved locally before they need to be transferred to the ARX server. LCU9016III also has a separate event log file for alarm related events.
The LCU works autonomously, that is, it works even if the network is down or the server is not running. The software is stored in flash memory and can be updated from the server ARX.

2.2 Application

LCU 9016III is a controller that can be used for both access control and intrusion alarm. In principle the controller handles access control and with the 9016MIO add-on card the controller also work as an alarm central unit. The product is suitable for all kind of customers/segments and gives the possibility to build a security system with both access control and intrusion, with the same hardware and software in conjunction.

2.3 Technical Data

The product has the following technical properties:

Technical data

Name	Value	Unit
Power supply	17-40 VDC	V
Current Requirements	50	mA
Operating Temperature	+5 to 65	°C
Operating Humidity	20% to 70%	%
Weight	3	kg
Memory size program	16	MB
Memory size data	16	MB

2.4 Placing on the market / Application rules

The LCU9016III is suitable as a part of ARX security system on almost all segments on the market and for both small/medium-sized systems and for larger advanced global system.
The LCU9016III is a central unit and fulfills the environmental class II, defined in standard EN 50131-1, which means that installation demands for this product is in-house with temperature above + 5 Celsius.
LCU9016III is certified for security grade 4 (for intrusion) and meets the requirements in the standard for access control system IEC 60839-11-1.

For the placing on the market of the products in the EU/EFTA (with the exception of Switzerland) the following harmonization legislation of the European Union applies:
- Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC (EMC 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 (RoHS directive).

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

a) EMC directive: Affixing the CE marking to the products means the compliance of products with the EMC directive.
b) RoHS directive: Affixing the CE marking to the products means the compliance of the products with the RoHS directive.

The following standards apply:

EMC:

- EN 61000-6-3:2006+A1:2010: Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3:2006 + A1:2010)
- EN 61000-6-2:2005: Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments (IEC 61000-6-2:2005)

RoHS:

- EN 50581:2012: Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

2.5 Delivery status

Each LCU unit is individually packaged and delivered with mounting hardware. Packaged LCU dimensions: 8.5cm x 50cm x 21.5cm.

2.6 Base materials / Ancillary materials

The composition of the LCU in percentages (%) of total mass per unit is as follows:

Component	Percentage in mass (%)
Brass	0.09
Plastics	73.1
Steel	0.04
Electronic	25.87
Electro-mechanics	0.9
Total	**100.0**

Packaging components incurred during installation are directed to energy recovery systems:

- EWC 15 01 01 Paper and cardboard packaging.

2.7 Manufacture

The LCU is assembled at the production facility in Pajala in Sweden. The parts are purchased from external suppliers in Malaysia. The final assembly take place in Pajala in Sweden. During assembly the individual parts are put together. The assembled LCU is then pack for shipment.

2.8 Environment and health during manufacturing

ASSA AB is committed to producing and distributing door opening solutions, where health & safety and environment are 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 the effectiveness of the environmental management program is evaluated.
- Code of Conduct covers human rights, labor practices and decent work. The management of ASSA AB is aware of their roles and responsibilities, providing appropriate training, supporting accountability and recognizing outstanding performance.
- The factory of Mikromakarna AB has certification of Environmental Management to ISO 14001:2004 standard.

2.9 Product processing/Installation

The Controller units LCU9016III with additional add-on cards 9016MIO, LIF01, 9016SLIO, loopcard 4014LC are installed by trained product installers / integrators. Installation instructions are included with each LCU and add-on card units.

2.10 Packaging

The LCU is packed in a cardboard box. Also included in the packaging are paper installation instructions

Packaging materials shall be collected separately for recycling.

Material	Percentage in mass (%)
Cardboard/paper	100.0
Total	**100.0**

2.11 Condition of use
No auxiliary or consumable materials are incurred for maintenance and usage of the LCU. 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 LCU is estimated to be 15 years.

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

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

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

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

Material Recycling
All materials are directed to recycling / energy recovery system:

- 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.

EU Recycling: ASSA 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 ASSA products that the distributor sells in their member state.
- In this instance, please contact your distributor for recycling information.

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

2.17 Further information
More information on ASSA AB the LCU9016 is available by:

ASSA AB
Förmansvägen 11
117 43 Stockholm
Sweden
Internet: www.assa.se

3. LCA: Calculation rules

3.1 Declared Unit
The declaration refers to the functional unit of 1 piece of control unit LCU9016III as specified in Part B requirements on the EPD for Electronic Access Control Systems /IBU Product Category Rules (PCR) Part B/.

Declared unit

Name	Value	Unit
Declared unit	1	piece of LCU9016
Conversion factor to 1 kg	0.512	-

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

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 end-of-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 stage:
For the use stage, 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 stage, 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 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 AG 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
- Thermal treatment of plastic parts
- 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).

Installation into the building (A5)

Name	Value	Unit
Output substances following waste treatment on site: paper packaging	0.026	kg

Reference service life

Name	Value	Unit
Reference service life	15	a

Operational energy use (B6)

Name	Value	Unit
Electricity consumption	1024.92	kWh
Years of use	15	a
Days per year in use	365	d
Hours per day in on mode	24	h
Hours per day in stand-by mode	-	h
Power consumption on mode	0.0078	kW
Power consumption stand-by mode	-	kW

End of life (C2-C4)

Name	Value	Unit
Collected separately Aluminum, Plastic Parts, Stainless Steel, Steel, Zinc, Electronic and Electro Mechanic Parts	1.9517	kg
Collected as mixed construction waste construction waste for landfilling	0.00	kg
Recycling Aluminum	0.00	kg
Incineration of plastic parts	1.4217	kg
Recycling stainless steel	0.0074	kg
Recycling steel	0.00078	kg
Recycling brass	0.0018	kg
Recycling metals from electronic	0.503	kg
Recycling metals from electro mechanic	0.017	kg
Construction waste for landfill	0.00	kg

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

Name	Value	Unit
Collected separately waste Card reader (including packaging)	1.97	kg
Recycling brass	0.09	%
Reuse plastic parts	72.16	%
Recycling Steel	0.04	%
Recycling/Reuse Electronic	25.53	%
Recycling/Reuse Electro mechanics	0.86	%
Reuse Paper packaging (from module A5)	1.32	%

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 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 of Control unit LCU9016III

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
GWP	Global warming potential	[kg CO_2-Eq.]	7.72E+01	6.69E-01	3.68E-02	4.87E+02	3.62E-01	3.44E-02	3.63E+00	-1.45E+01
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	9.38E-09	2.42E-12	1.68E-13	3.33E-07	1.34E-12	2.35E-11	1.09E-11	-9.95E-10
AP	Acidification potential of land and water	[kg SO_2-Eq.]	4.66E-01	1.91E-02	8.40E-06	2.30E+00	9.76E-03	1.62E-04	9.43E-04	-1.49E-01
EP	Eutrophication potential	[kg $(PO_4)^{3-}$- Eq.]	3.73E-02	1.96E-03	1.47E-06	1.29E-01	1.01E-03	9.12E-06	7.76E-05	-8.85E-03
POCP	Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Eq.]	3.15E-02	1.05E-03	5.96E-07	1.36E-01	4.96E-04	9.63E-06	4.68E-05	-7.85E-03
ADPE	Abiotic depletion potential for non fossil resources	[kg Sb Eq.]	7.55E-03	1.77E-08	6.65E-10	6.74E-05	9.82E-09	4.76E-09	2.59E-07	-1.01E-02
ADPF	Abiotic depletion potential for fossil resources	[MJ]	9.98E+02	8.27E+00	1.03E-02	5.53E+03	4.50E+00	3.90E-01	1.57E+00	-1.56E+02

RESULTS OF THE LCA - RESOURCE USE: One piece of Control unit LCU9016III

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	[MJ]	5.75E+01	-	-	-	-	-	-	-
PERM	Renewable primary energy resources as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-	-
PERT	Total use of renewable primary energy resources	[MJ]	5.75E+01	3.94E-02	9.62E-04	1.58E+03	3.26E-02	1.12E-01	1.19E-01	-7.38E+00
PENRE	Non renewable primary energy as energy carrier	[MJ]	1.12E+03	-	-	-	-	-	-	-
PENRM	Non renewable primary energy as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-	-
PENRT	Total use of non renewable primary energy resources	[MJ]	1.12E+03	8.30E+00	1.21E-02	8.66E+03	4.52E+00	6.11E-01	1.75E+00	-1.67E+02
SM	Use of secondary material	[kg]	9.35E-03	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]	3.74E-01	6.44E-05	1.07E-04	3.91E+00	4.15E-05	2.76E-04	9.09E-03	-8.60E-02

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: One piece of Control unit LCU9016III

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
HWD	Hazardous waste disposed	[kg]	5.19E-02	1.01E-05	8.31E-07	1.20E+00	5.83E-06	8.47E-05	1.30E-04	-2.93E-03
NHWD	Non hazardous waste disposed	[kg]	1.11E+00	1.10E-04	9.25E-04	2.80E+00	9.59E-05	1.97E-04	3.48E-01	-1.34E-01
RWD	Radioactive waste disposed	[kg]	4.81E-02	1.02E-05	7.07E-07	1.25E+00	5.60E-06	8.81E-05	7.15E-05	-4.17E-03
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	2.60E-02	0.00E+00	0.00E+00	9.99E-03	0.00E+00	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	0.00E+00
EEE	Exported electrical energy	[MJ]	0.00E+00	0.00E+00	4.66E-02	0.00E+00	0.00E+00	0.00E+00	6.79E+00	0.00E+00
EET	Exported thermal energy	[MJ]	0.00E+00	0.00E+00	1.32E-01	0.00E+00	0.00E+00	0.00E+00	1.86E+01	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 2% and 22% to the overall results for all the environmental impact assessment categories hereby considered, except for the abiotic depletion potential (ADPE), for which the contribution from the production phase accounts for app. 99% - this impact category describes the reduction of the global amount of non-renewable raw materials, therefore, as expected, it is mainly related with the extraction of raw materials (A1).

Within the production phase, the main contribution for all the impact categories is the production of plastic and electronic parts mainly due to the energy consumption on this process. Plastic accounts with app. 73% and electronics with app. 26% to the overall mass of the product. Plastic production contributes between 0.2% (Abiotic depletion potential for non-fossil resources) and 13.7% (Abiotic depletion potential for fossil resources) to the impact categories. Electronic parts contribute between 68 % (POCP) and 94 % (ODP). The environmental impacts for the transport (A2) have a negligible impact within this stage.

To reflect the use phase (module B6), the energy consumption was included and it has a major contribution for all the impact assessment categories considered - between 75% and 99%, with the exception of ADPE (0.8%). This is a result of 24 hours of operation in on mode per day and per 365 days in a year.

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 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

IEC 60839-11-1
Meets the requirements in the Access control system standard IEC 60839-11-1.

ISO 9001:1994
Quality systems – Model for quality assurance in design, development, production, installation and servicing

ISO 14001:1999
Environmental Management System Certificate

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

EN 15804
EN 15804:2012+A1:2014: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

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

EMC directive
EMC directive (2004/108/EC) immunity to, and emission of electromagnetic disturbance.

EN 50131-3
EN 50131-3:2009, central unit, Intrusion system, security grade 4, environmental class II

EN 50130
EN 50130-5:2011: Environmental resistance fire, intruder, hold up, CCTV, access control and social alarm systems

EN 50130-4
EN 50130-4:2011+ A1:2014: 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

EN61000-6-2
EN61000-6-2:2005: Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments (IEC 61000-6-2:2005

EN 61000-6-3
EN 61000-6-3:2007, A1:2011: Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments

EN 55022
EN 55022: Electromagnetic compatibility, Class B

IEC 60839-11-1
IEC 60839-11-1: Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware

EN 50581
EN 50581:2012: Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

RoHS 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

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 of Control unit LCU9016III

Parameter	Parameter	Unit	A1-3	A4	A5	B6	C2	C3	C4	D
GWP	Global warming potential	[kg CO_2-Eq.]	7.72E+01	6.69E-01	3.68E-02	4.87E+02	3.62E-01	3.44E-02	3.63E+00	-1.45E+01
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.02E-08	2.57E-12	1.79E-13	3.54E-07	1.42E-12	2.50E-11	1.16E-11	-1.39E-09
AP	Acidification potential of land and water	[kg SO_2-Eq.]	4.68E-01	2.01E-02	1.02E-05	2.17E+00	1.03E-02	1.53E-04	1.11E-03	-1.43E-01
EP	Eutrophication potential	[kg N-eq.]	3.15E-02	6.73E-04	5.86E-07	9.25E-02	3.50E-04	6.53E-06	3.64E-05	-3.80E-03
Smog	Ground-level smog formation potential	[kg O_3-eq.]	6.20E+00	3.69E-01	2.37E-04	1.97E+01	1.90E-01	1.39E-03	9.90E-03	-1.63E+00
Resources	Resources – fossil resources	[MJ]	8.90E+01	1.19E+00	1.21E-03	3.94E+02	6.48E-01	2.78E-02	1.61E-01	-8.24E+00

RESULTS OF THE LCA - RESOURCE USE: One piece of Control unit LCU9016III

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
PERE	Renewable primary energy as energy carrier	[MJ]	5.75E+01	-	-	-	-	-	-	-
PERM	Renewable primary energy resources as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-	-
PERT	Total use of renewable primary energy resources	[MJ]	5.75E+01	3.94E-02	9.62E-04	1.58E+03	3.26E-02	1.12E-01	1.19E-01	-7.38E+00
PENRE	Non renewable primary energy as energy carrier	[MJ]	1.12E+03	-	-	-	-	-	-	-
PENRM	Non renewable primary energy as material utilization	[MJ]	0.00E+00	-	-	-	-	-	-	-
PENRT	Total use of non renewable primary energy resources	[MJ]	1.12E+03	8.30E+00	1.21E-02	8.66E+03	4.52E+00	6.11E-01	1.75E+00	-1.67E+02
SM	Use of secondary material	[kg]	9.35E-03	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]	3.74E-01	6.44E-05	1.07E-04	3.91E+00	4.15E-05	2.76E-04	9.09E-03	-8.60E-02

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: One piece of Control unit LCU9016III

Parameter	Parameter	Unit	A1 - A3	A4	A5	B6	C2	C3	C4	D
HWD	Hazardous waste disposed	[kg]	5.19E-02	1.01E-05	8.31E-07	1.20E+00	5.83E-06	8.47E-05	1.30E-04	-2.93E-03
NHWD	Non hazardous waste disposed	[kg]	1.11E+00	1.10E-04	9.25E-04	2.80E+00	9.59E-05	1.97E-04	3.48E-01	-1.34E-01
RWD	Radioactive waste disposed	[kg]	4.81E-02	1.02E-05	7.07E-07	1.25E+00	5.60E-06	8.81E-05	7.15E-05	-4.17E-03
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	2.60E-02	0.00E+00	0.00E+00	9.99E-03	0.00E+00	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	0.00E+00
EEE	Exported electrical energy	[MJ]	0.00E+00	0.00E+00	4.66E-02	0.00E+00	0.00E+00	0.00E+00	6.79E+00	0.00E+00
EET	Exported thermal energy	[MJ]	0.00E+00	0.00E+00	1.32E-01	0.00E+00	0.00E+00	0.00E+00	1.86E+01	0.00E+00

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