OTIS GEN2 STREAM®

Environmental Product Declaration

In accordance with ISO 14025 for:

OTIS Gen2 Stream®
OTIS Elevator Company

Programme: The International EPD® System / www.environdec.com

Programme operator:
EPD International AB

EPD registration number: S-P-01068

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An EPD should provide current information, and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com.

Revision number: 2.0

Geographical scope: Europe

EPD®

OTIS

Made to move you

Founded more than 165 years ago by the inventor of the safety elevator, OTIS offers products and services through its companies in more than 200 countries and territories, and maintains more than 2 million elevators and escalators worldwide. Every day, OTIS moves more than 2 billion people through the world's urban landscape.

OTIS Elevator Company is the world's leading manufacturer and maintainer of elevators, escalators and moving walkways.

For more information about our company, visit https://www.OTIS.com

Gen2 Stream®

INTRODUCTION

The new Gen2 Stream® elevator has the style, comfort and speed needed to ensure passengers experience your building to the fullest. With space-saving architectural features that maximize design freedom and quiet rides that allow passengers to live in the moment, Gen2 helps your building stand out.

The Gen2 Stream® is designed to face so two challenges: more robustness and speed to handle the stream of passengers and connected solutions making every passenger unique.

The Gen2 technology replace conventional steel ropes with polyurethane coated flat steel belts that eliminates the noise-creating effects of metal-tometal contact.

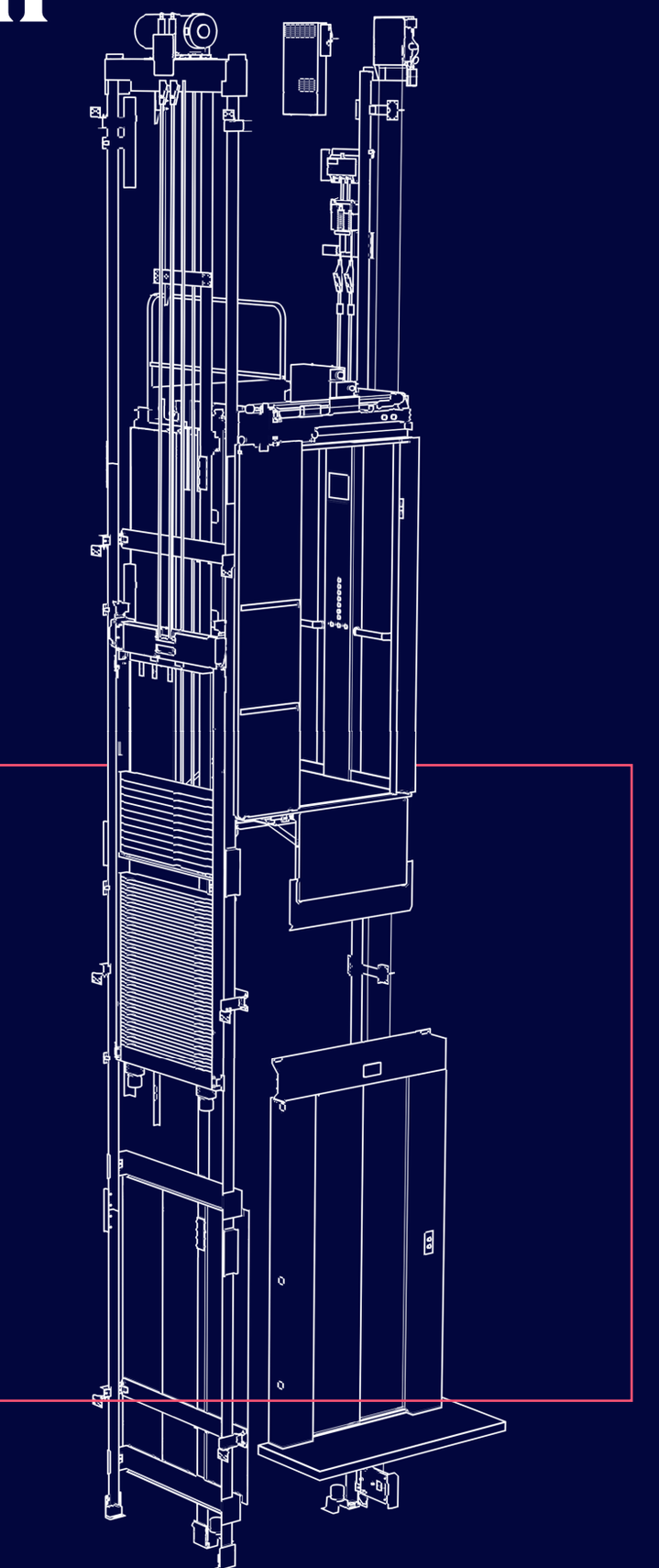
The Gen2 Stream® elevator can be fully customized (variable dimension, panoramic design, destination dispatch management…) to match the needs of most commercial building and premium residential ones.

MAIN CHARACTERISTICS

UP TO 2 500 KG

UP TO 2,5 M/S

UP TO 120 M / 24 STOPS



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SPECIFICATIONS

This Environmental Product Declaration for Gen2 Stream® elevators range has been created according to the ISO 14044 and it follows the calculation rules specified in the Product Category Rules (PCR for Lifts (Elevators) Product classification: UN CPC 4354) according to ISO 14025 (PCR 2015:05 Version 1.0). Also the General program Instructions of the International EPD® System applies. We covered the whole life cycle of the Gen2 Stream® elevator, manufactured in Gien (France), from the preparation of raw materials, its transport to manufacturing site and the manufacturing of the elevator's components, through its installation, maintenance and use until each component end-of-life treatment.

As specified in the PCR, the mandatory information of the Gen2 Stream® elevator is presented in the following table. The figures correspond to a typical configuration, being the representative unit of the complete range of the Gen2 Stream® elevators.

INDEX	VALUES	REPRESENTATIVE VALUES CHOSEN IN CASE OF DECLARATION OF RANGES
Commercial Name	Gen2 Stream®	
Segment	Commercial	
Type of installation	New generic lift	
Main purpose	Transport of passengers	
Type of lift	Electric	
Type of drive system	Gearless traction	
Capacity rated load (fixed or range)	630 - 2 500 kg	1 000 kg
Rated speed (fixed or range)	1.0 - 2.5 m/s	1.6 m/s
Number of stops (fixed or range)	Up to 24	12
Travelled height (fixed or range)	Up to 120 m	35 m
Number of operating days per year (fixed or range)	365	
Applied Usage Category (UC) according to ISO 25745-2	UC1…UC6	UC3
Designed Reference Service Life (RSL)	20 years	
Geographic region or intended installation region	Europe + Asia + Australia + Central and South America	Europe
Recommended application (main market) Building rise (typical) / Building type	Recommended building type in Table A.1, Annex A, ISO25745-2 Mainly dedicated to residential and small scale commercial buildings	

Table 1. *Gen2 Stream® elevators mandatory information required in the PCR.*

The LCA was conducted for an elevator with a lifetime of 20 years, without considering a modernization, installed in a 12 floors building, having a speed of 1.6 m/s and a travelling distance of 35 m.

The number of trips per day for an elevator with **Usage Category 3** is 300, which was obtained from ISO 25745-2.

The designed reference service life considered for the LCA study is a typical data. Depending on maintenance and modernization activities, the usage phase of an elevator can be up to 25-30 years.

A comparability of elevators is achievable, if the Functional Unit (FU) and the above performance characteristics are equivalent (UC, travelled height, stops, load, speed and geographical region). A European grid mix average (reference year 2013) was used to model power consumption by the elevator in the use phase.

Results Interpretation

The potential environmental impacts evaluated in this EPD are using the following impact assessment methods:

Impact Category	Abiotic Depletion Potential (elements)	Abiotic Depletion Potential (fossil fuels)	Acidification Potential	Eutropication Potential	Global Warming Potential (GWP100)	Photochemical Oxidation (high NOx)
Units	kg Sb eq.	MJ	kg SO2 eq.	kg PO4- eq.	kg CO2 eq.	kg ethylene eq.
Reference	ADP elements (Oers et al. 2002)	ADP fossil fuels (Oers et al. 2001)	AP (Huijbregts, 1999; average Europe total, A&B	EP (Heijungs et al. 1992)	GWP100 (IPCC, 2013)	POCP (Jenkin & Hayman, 1999; Derwent et al. 1998; high NOx)

54%
OF GWP DUE TO MATERIALS MANUFACTURING OF FERROUS & ELECTRONIC COMPONENTS

UPSTREAM +

The impacts for the Gen2 Stream® elevator are driven primarily by materials manufacturing of **ferrous and electronic components**, which created approx. 54% of GWP and ADP of fossil and 55-85% of AP, EP and POCP.

39%
OF GWP DUE TO ELECTRICITY CONSUMPTION DURING USE PHASE

DOWNSTREAM +

The impacts are driven primarily by the **electricity consumption** during use phase (20 years), creating approximately approx. 39% of GWP and ADP of fossil, and almost 30% of AP, EP and POCP. There is just an exception by the impact category ADP of elements. In that case the production of materials and manufacturing impacts totally the results, more than 99%, being the influence of downstream processes minimum. This is a normal fact since the highest consumption on material resources is during the manufacturing of the elevators' components, compared with the low material amount necessary for maintenance purposes downstream.

Core

IN ALL IMPACT CATEGORIES, THE CORE MODULE HAS A MINOR CONTRIBUTION TO THE IMPACT CATEGORIES.

This limited impact from the manufacturing part is widely due to the continuous efforts to reduce its environmental footprint over the year through multi-channel initiatives such as: considering reusable and recyclable package for the components, eliminating the painting and welding operations, having a positive impact on greenhouse gas emissions and wastes. From year 2010 till 2016, Gien and Madrid factories did a total reduction of 10% in Greenhouse gases emissions and almost 6% between 2015-2016. As well, energy consumption has been dramatically decreased by the use of LED lights and more effective boilers in OTIS facilities.

Transport

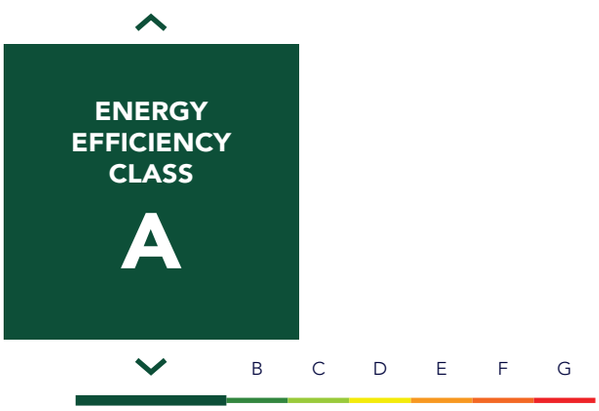
Last, the importance of the D-1 Transport from manufacturing to building site stage is minor, less than 1% of GWP and 3% of ADP of fossil. In terms of waste production, the amount of hazardous waste disposed is negligible and will occur during materials manufacturing.

ENERGY EFFICIENCY CLASS

The Use phase is the longest phase in the life-cycle of an elevator, 20 years for the Gen2 Stream® elevator, and the D-4 Energy Consumption module is one of the most relevant stages impacting the environment.

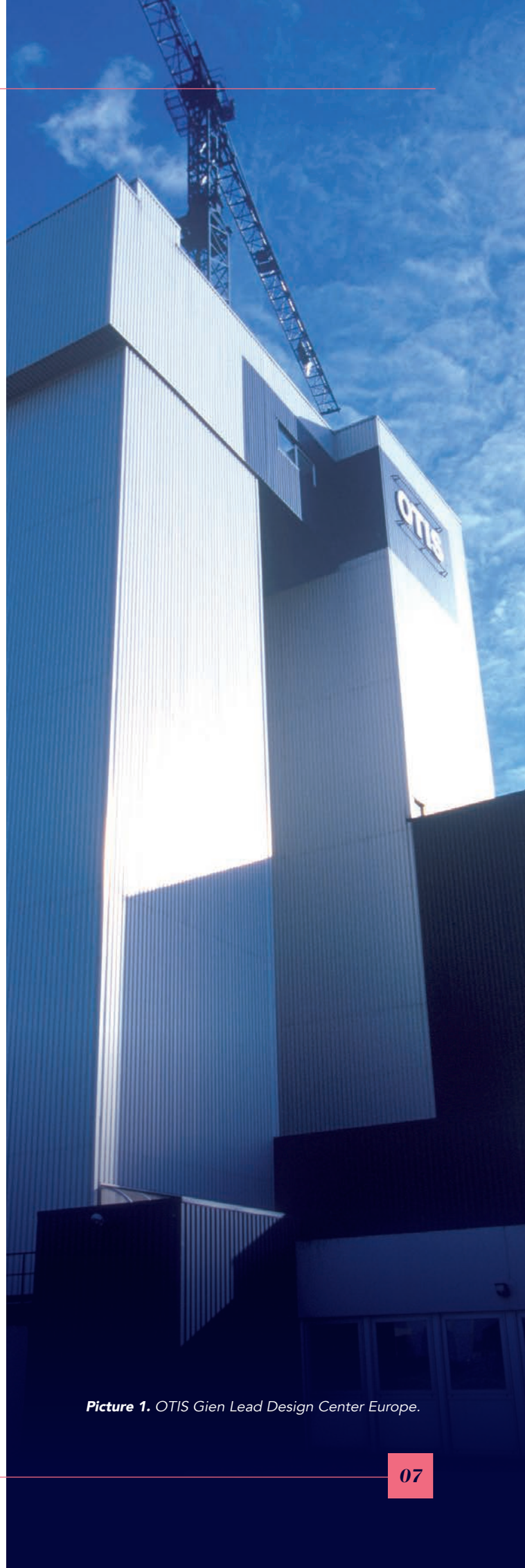
It's therefore important for OTIS to continuously improve the energy efficiency of the elevators, and help our customers reduce the amount of the electricity used.

Therefore, our elevators are designed to achieve an A-class energy efficiency classification, according to ISO 25745 standard.



THE ENERGY CONSUMPTION PER DAY OF THE DECLARED GEN2 STREAM® ELEVATOR IS **4,1 KWH**, CORRESPONDING TO **A CLASS EFFICIENCY** FROM ISO 25745-2

Table 2. *Energy Efficiency Class of the Gen2 Stream® elevator according to ISO 25745-2 (Table 7).*



Picture 1. *OTIS Gien Lead Design Center Europe.*

Life Cycle Approach

We design our elevators with a life-cycle approach and ensure continual improvements by reducing their potential environmental impacts at each life cycle stage.

The study scope is a typical "**cradle to grave**" assessment, from the raw material needed to build up the elevator up to its end of life where the elevator is removed and disposed. The elevator's life cycle has been staged into three life cycle stages:

1. Gathering the components that constitute the elevator or named **Upstream**, which includes raw material supply, transport to the manufacturing site, including the outsourced components.

2. When all materials and components are received, the in house manufacturing is hapenning.
This is the **Core** part of the life cycle

3. The **Downstream** process starts when the elevator leaves the manufacturing place and is used by the customers till it is replaced by a new one.

The table 3 and figure 1 illustrate these three life cycle stages and respective processes splitted into information modules:

UPSTREAM			CORE	DOWNSTREAM		
Raw Material Supply	Transport	Outsourced Manufacturing	In-house Manufacturing	Transport & Installation	Use (Operation)	End-of-life treatment
U-1 Materials manufacturing	U-2 Transport to manufacturing site	U-3 Outsourced manufacturing	C-1 Own materials manufacturing	D-1 Transport from manufacturing to building site	D-3 Maintenance	D-5 Waste Processing
			C-2 In-house manufacturing	D-2 Installation	D-4 Energy Consumption	D-6 Disposal

Table 3. *System boundaries of a lift system*

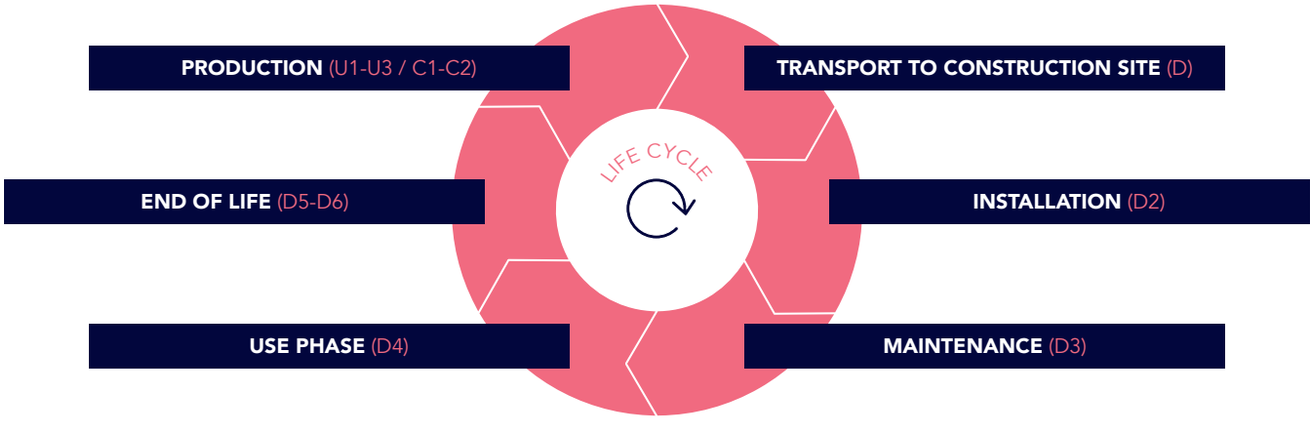
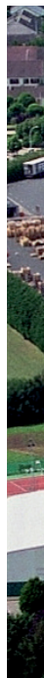


Figure 1. *Gen2 Stream® elevator Life Cycle.*



Elevator components are either manufactured at OTIS owned and operated sites in Germany, France and in Spain, or purchased from a Tier 1 supplier. Gen2 Stream® elevators are then assembled by OTIS manufacturing sites, packed and sent to installation sites around Europe.

In OTIS sites, it only takes place the manufacturing of components, no pure material production applies. Consequently no results for module C-1 are declared in the result's tables.

The Gen2 Stream® elevators can be installed in different locations around Europe. For this reason, the European grid mix (2013) has been used to simulate the energy associated to installation and maintenance works as well as for the energy used during the 20 years of service life considered.

In order to consider a general scenario possible for the end-of-life of the elevator's components, for the calculation of the results metals have been considered as "recycled" and landfilling or incineration for the rest of the materials.

The GaBi 2017 LCI database provides the life cycle inventory data for several of the raw and process materials obtained from the background system.

ISO Certified

OTIS sustainable development and environment strategy, leading to more and more energy efficient elevators, incorporates also the production. All our manufacturing plants and facilities in Europe have taken their commitment to continuously improve their environmental performance. They are all certified **ISO14001 Environmental Management** and **ISO 9001 Quality Management** and more importantly proactively working towards achieving next level with **ISO 50001 Energy management Systems certification**.

The standard specifies the requirements for establishing, implementing, maintaining and improving an energy management system, whose purpose is to enable an organization to follow a systematic approach in achieving continual improvement of energy performance, including energy efficiency, energy security, energy use and consumption. It establishes for OTIS a more systematic and sustainable approach to continually reduce energy within the facilities, and therefore the costs and the Greenhouse gases (GHG) emissions into the atmosphere.

In the case of Madrid factory the entire manufacturing roof area, some **12,500 square metres is covered in solar panels** which contributes more than 50% towards the energy consumed in the factory every day.

Picture 2. *Otis Gien - ISO certified.*

Our majour customers and as importantly Governments care about how the elevators are manufactured and are becoming more conscious about the energy performance and the environmental protection. The reduction of energy consumption during in-house manufacturing through **ISO 50001** is continuously supporting our energy efficiency during operations.

Within our european facilities we are also certified **OHSAS 18001 Occupational Health and Safety Management Standard**, to ensure our employee's health and safety, which is one of our core values at OTIS.

The implementation of the standard helps us to protect our employees against possible occupational risks and to reduce the likelihood of accidents in the workplace along with improving the safety performance of our products and protect all those that are using our equipment.

The certifications are publicly available on OTIS website.

FUNCTIONAL UNIT

According to the underlying PCR, the functional unit evaluated for this study is:

> **The transportation of a load over a distance, expressed in tonne [t] over a kilometer [tkm] travelled (i.e.tonne-kilometer [tkm])**

And should be calculated as the average car load %**Q** [tonnes] times the distance travelled by the lift during the service life $\mathbf{s}_{RSL}$ [km]

$$FU = \%Q \times s_{RSL}$$

The average car load was calculated for the Gen2 Stream® elevator using table 3 in ISO 25745-2:

$$\%Q = Q/1000 \times [\text{Percentage from Table 3 of ISO 25745} - 2] = 0{,}045\ [t]$$

where **Q** is the lift rated load, 1 000 [kg]

The distance travelled over the designed service life of 20 years (RSL) is:

$$s_{RSL} = sav/1000 \times nd \times dop \times RSL = 37\,559\ [km]$$

where $\mathbf{s}_{av}$ is the one-way average travel distance, 17,2 [m], $\mathbf{n}_{d}$ is the number of trips per day according to the selected usage category (defined in Table 1 of ISO 25745-2) and $\mathbf{d}_{op}$ is the number of operating days per year (see Table 1).

Therefore, the functional unit
FU OF THE GEN2 STREAM® ELEVATOR IS 1 690 TKM.

Content Declaration

The tables 4 & 5 show a material summary of the Gen2 Stream® elevator studied and its packaging, as delivered and installed in a building. Data are provided by OTIS according to the cut-off rules described in Section 6 of the PCR.

MATERIAL	MASS [kg]	MASS [%]
Ferrous metals (zinc coated steel, stainless steel, cast iron)	5 631,3	80,1
Inorganic materials (concrete, glass)	972,4	13,8
Non-ferrous metals (aluminum, copper)	186,3	2,6
Plastics & Rubbers	169,95	2,4
Electric & Electronic Equipment	49,4	0,7
Lubricants (oils, greases), **paintings, coatings, adhesives and fillers** (glues)	6,6	0,1
Batteries & Accumulators	5,4	0,1
Organic materials (paper, wood, cardboard)	5,0	0,1
Other materials	3,4	0,0
Total mass	**7 030**	
Mass per 1 tkm	**4,16**	

- **Ferrous metals**
- Inorganic materials
- Non-ferrous metals
- Plastic & Rubbers
- Electric & Electronic equipment
- Lubricants, paintings, coatings, adhesives and fillers
- Batteries & Accumulators
- Organic materials
- Other materials

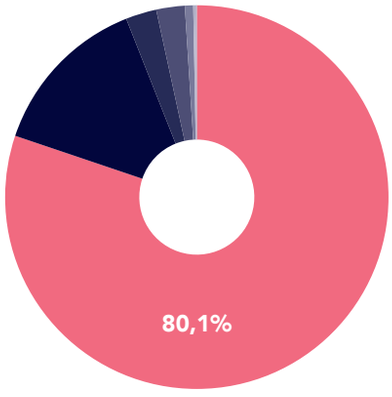
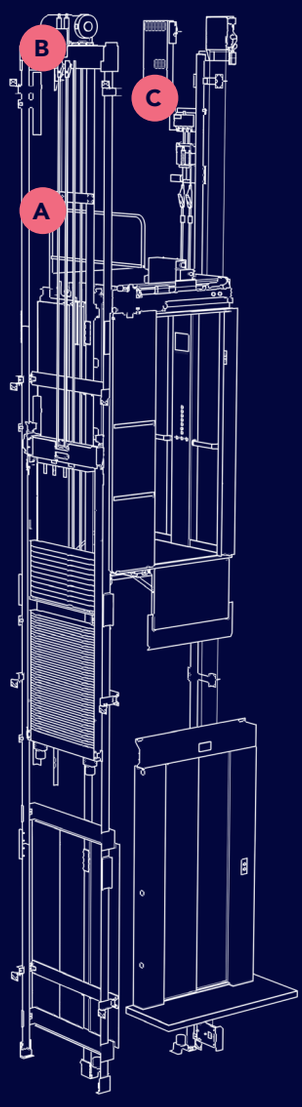


Table 4. *Gross weight of the Gen2 Stream® elevator material as one unit of product.*

ADVANCED TECHNOLOGY IS A STANDARD AT OTIS

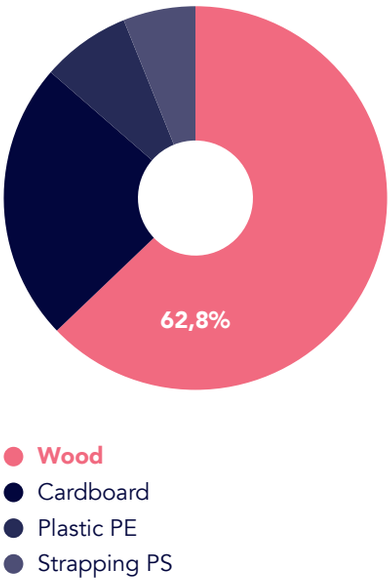


For illustration purpose only

- **A.** Polyurethane coated flat steel belts (no lubrificant)
- **B.** Gearless machine (energy efficient, no lubrificant, space-saver)
- **C.** Regen Drive technology (electricity generation)
- LED lighting: Car Operating Panel / Cabine ceiling

MATERIAL	**MASS** [kg]	**MASS** [%]
Wood	290,5	62,8
Cardboard	108,8	23,5
Plastic PE (Low-density)	34,7	7,5
Strapping PS	28,3	6,1
Total mass	**462,3**	
Mass per 1 tkm	**0,27**	

Table 5. *Gross weight of the Gen2 Stream® elevator packaging material for one unit of product.*



All Gen2 Stream® elevator is packed and delivered with:

- cardboard boxes having **FSC** labeling (Forest stewardship Council)
- wood made pallets having **PEFC** certification (Program for the Endorsement of Forest Certification)

Environmental Performance

The results for the complete service lifetime of the Gen2 Stream® elevator were calculated according to the PCR and presented per functional unit (tkm).

Assumptions are presented in the verified LCA Background report.

USE OF RESOURCES

The following environmental indicators describe the use of renewable and non-renewable material resources, renewable and non-renewable primary energy and water. Results are shown per tkm:

STAGE	U1	U2	C2	D1	D2	D3	D4	D5	D6
Primary energy (non-renewable) [MJ]	1,37E+02	1,50E+00	2,40E+00	7,95E+00	1,95E+00	4,36E+00	1,38E+02	8,54E-01	2,47E-01
Primary energy (renewable) [MJ]	1,53E+01	7,65E-02	6,46E-01	7,16E+00	1,61E-01	1,02E+00	4,70E+01	1,85E-02	1,49E-02
Non-renewable resources [kg]	7,35E+01	7,81E-03	3,24E-01	3,02E-01	9,02E-02	6,90E-01	3,41E+01	5,80E-02	8,40E-02
Renewable resources [kg]	3,92E-01	6,13E-03	1,33E-02	3,81E-01	8,95E-03	3,20E-02	1,27E+00	6,22E-04	8,96E-04
Secondary material resources [kg]	1,33E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Secondary energy resources [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	0,00E+00
Recovered energy flows [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	0,00E+00

Table 6. *Resource and energy use results for the Gen2 Stream® elevator per tkm.*

POTENTIAL ENVIRONMENTAL IMPACT

In the LCA, impact assessment method CML 2001 (January 2016) and its related characterization factors were employed at the midpoint level as requested in the PCR for Lifts version 1.0.
The table 7 displays the results of the environmental impact assessment per tkm.

STAGE	U1	U2	C2	D1	D2	D3	D4	D5	D6
Abiotic Depletion Potential elements [kg Sb-Equiv.]	9,15E-04	9,81E-09	5,18E-08	1,19E-07	3,77E-08	7,27E-08	3,15E-06	1,62E-08	3,55E-09
Abiotic Depletion Potential fossil [MJ]	1,28E+02	1,49E+00	8,08E-01	7,74E+00	1,85E+00	3,27E+00	8,39E+01	8,40E-01	2,43E-01
Acidification Potential [kg SO2-Equiv.]	5,15E-02	4,78E-04	1,63E-04	1,15E-03	3,92E-04	7,71E-04	2,25E-02	3,41E-04	1,01E-04
Eutrophiation Potential [kg Phosphate-Equiv.]	3,51E-03	1,15E-04	2,15E-05	2,57E-04	8,56E-05	1,19E-04	2,03E-03	7,32E-05	1,86E-05
Global Warming Potential [kg CO2-Equiv.]	1,08E+01	1,08E-01	1,06E-01	1,36E-01	3,16E-01	2,85E-01	7,89E+00	3,09E-01	1,82E-02
Ozone Depletion Potential [kg R11-Equiv.]	5,57E-10	8,76E-14	1,98E-10	7,98E-12	5,58E-13	7,04E-12	3,49E-10	6,52E-14	1,20E-14
Photochemical Ozone Creation Potential [kg Ethene-Equiv.]	4,33E-03	-1,62E-04	1,12E-05	-2,10E-04	-5,74E-05	-3,68E-05	1,43E-03	-1,22E-04	-1,58E-05

Table 7.
Impact category results for the Gen2 Stream® elevator per tkm.

And Figure 2 show the graphic results:

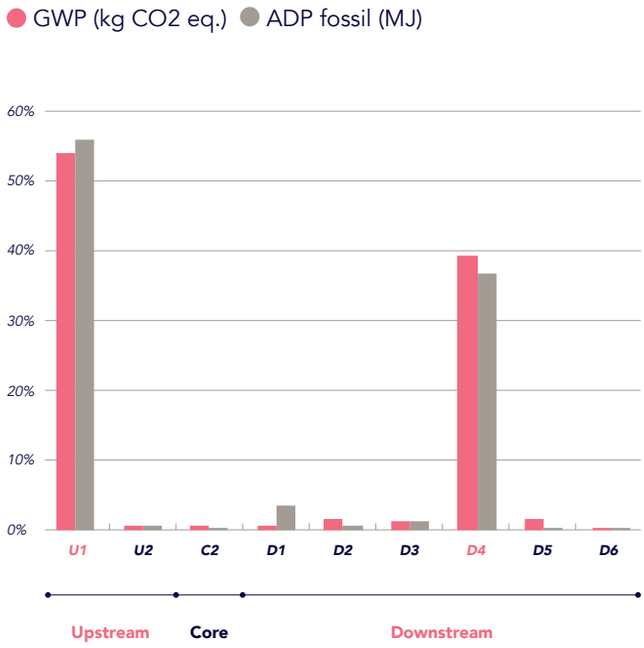


Figure 2.
GWP and ADP fossil results for the Gen2 Stream® elevator per tkm.

ADDITIONAL INFORMATION

Substances and emissions

During the development phase as well as for the industrialization, there is a high focus on the limited use of chemicals. Our engineers are referring to REACH, RoHS regulations to avoid substances which impact the environment and the human health (i.e. Methylene Chloride (Dichloromethane) use is eliminated at OTIS facilities). Additionally, we have published the first Health Product Declaration (HPD) for the Gen2 Stream® elevator, disclosing the ingredients in the product. The declaration can be accessed online at https://www.hpdcollaborative.org/ by employees and customers.
Furthermore, our car panels are tested for VOC emissions according to the requirements of the French legislation (order of April 2011) concerning the labelling of construction products or coverings of walls or floors and paint and varnishes on their emissions of volatile pollutants. Sampling, testing and evaluation are performed according to ISO 16000 (Part 11, 9 and 3) in its latest versions. Our suppliers are delivering the testing reports justifying products VOC emission class.

Picture 3. *Class A+ label on car panel*

French VOC label
Since January 1st 2012, construction products, decoration and furnishing products to be traded in France for the first time, are emission wise to be classified and labelled with the new French label. This is stated in the decree of the Ministry of Ecology, Sustainable Development, Transport and Housing.

* Statement on level of emission of volatile substances in indoor air posing a toxic threat during inhaling - on a scale from A+ (very low-emission) to C (high-emission).

WASTE PRODUCTION

The parameters decsribing waste categories are output flows derived from LCI. The amount per tkm during the life cycle is shown in Table 8.

STAGE	Hazardous waste (deposited)	Waste (deposited)
U1	6,33E-07	7,00E-01
U2	7,76E-08	1,18E-04
C2	8,16E-10	1,36E-02
D1	2,51E-07	2,84E-03
D2	3,02E-07	1,13E-02
D3	8,37E-08	3,51E-03
D4	5,59E-08	9,07E-02
D5	5,35E-10	2,35E-02
D6	1,99E-09	5,80E-01

Table 8. *Waste category results for the Gen2 Stream® elevator [kg/tkm].*

RECYCLING AND WASTE TREATMENT DECLARATION

The modules considered for the end-of-life scenario includes waste processing (D-5) and disposal (D-6).
The main materials used in the Gen2 Stream® elevator are metals (mainly steel) and inert materials (mainly concrete).
Due to this composition there is a high potential of recyclability at the elevator's end-of life for approximately 85% of the components.

Steel and non-ferrous metals as well as the electronic equipment - contributing approximately to **85% of the elevator's composition - can all be recycled.**

For the inert materials fraction (approx. **15%**) landfilling is assumed in this EPD as a realistic and conservative approach.

Incineration is considered for the minor proportion (**3%**) of combustible materials (e.g. plastic parts). For any of these waste treatment plants European average technologies are considered.

PROGRAMME-RELATED INFORMATION AND VERIFICATION

See PCR for detailed requirements.

Programme	The International EPD® System EPD International AB Box 210 60, SE-100 31 Stockholm, Sweden www.environdec.com
EPD registration number	S-P-01068
Published	2018-04-05
Revision date	2020-02-28
Valid until	2023-02-28
Revision number	2.0
Product Category Rules	PCR 2015:05 Environdec Product Category Rules (PCR) for Lifts (Elevators) according to ISO 14025. Version 1.0
Product group classification	UN CPC 4354 Lifts, skip hoists, escalators and moving walks
Reference year for data	2016
Geographical scope	Europe
Product category rules (PCR)	PCR 2015 Product Category Rules for Lifts (Elevators) according to ISO 14025.
Product Classification	UN CPC 4354. 2015:05. Version 1.0
PCR review was conducted by	The Technical Committee of the International EPD® System
Review chair	Maurizio Fieschi *Full List of TC members available on www.environdec.com/TC* *Contact via info@environdec.com*
Independent verification of the declaration and data, according to ISO 14025:2006	☐ EPD Process Certification (internal) ■ EPD Verification (external)
Third party verifier	Yannick Le Guern - ELYS Conseil S.A.S.U
Accredited by	"Approved by the International EPD System"
CONTACT INFORMATION:	
EPD owner	OTIS Elevator Company New Equipment Center Avenue des Montoires / 45504, Cedex, Gien, France *www.otis.com*
LCA author	thinkstep AG Hauptstraße 111-113 / 70771 Leinfelden-Echterdingen, Germany *www.thinkstep.com*
Programme operator	EPD International AB *info@environdec.com*

Results presented in this document do not constitute comparative assertions. EPDs within the same product category, but from different programmes may not be comparable.

However, these results can be used to compare with similar products presented in other EPDs that follow the same PCR and are according to the same functional unit and have equivalent performance characteristics (UC, travelled height, stops, load, speed and geographical region).

Renovate Europe

OTIS Elevator supports the European Union program Renovate Europe as part of the European effort to renovate buildings which represents the biggest potential of energy savings.

GLOSSARY

ABIOTIC DEPLETION POTENTIAL (ADP)
The abiotic depletion potential covers all natural resources as metal containing ores, crude oil and mineral raw materials. Abiotic resources include all raw materials from non-living resources that are non-renewable. This impact category describes the reduction of the global amount of non-renewable raw materials. Non-renewable means a time frame of at least 500 years. The abiotic depletion potential is split into two sub-categories.
Abiotic depletion potential (elements) covers an evaluation of the availability of natural elements like minerals and ores, incl. uranium ore. The reference substance for the characterization factors is antimony.
The second sub-category abiotic depletion potential (fossil) includes the fossil energy carriers (crude oil, natural gas, coal resources). The respective unit is the Mega Joule.

GLOBAL WARMING POTENTIAL (GWP)
As the name suggests, the mechanism of the greenhouse effect can be observed on a small scale in a greenhouse. These effects are also occurring on a global scale. The occurring short-wave radiation from the sun comes into contact with the earth's surface and is partly absorbed (leading to direct warming) and partly reflected as infrared radiation. The reflected part is absorbed by so-called Greenhouse gases (GHG) in the troposphere and is re-radiated in all directions, including back to earth. This results in a warming effect at the earth's surface. In addition to the natural mechanism, the greenhouse effect is enhanced by human activities. Greenhouse gases (GHG) that are considered to be caused, or increased, anthropogenically include carbon dioxide, methane and CFCs. Figure B-1 shows the main processes of the anthropogenic greenhouse effect. An analysis of the greenhouse effect should consider the possible long term global effects.
The global warming potential is calculated in carbon dioxide equivalents (CO2-Eq.). This means that the greenhouse potential of an emission is given in relation to CO2. Since the residence time of the gases in the atmosphere is incorporated into the calculation, a time range for the assessment must also be specified. A period of 100 years is customary.

ACIDIFICATION POTENTIAL (AP)
The acidification of soils and waters occurs predominantly through the transformation of air pollutants into acids. This leads to a decrease in the pH-value of rainwater and fog from 5.6 to 4 and below.
Sulphur dioxide and nitrogen oxide and their respective acids (H2SO4 and HNO3) produce relevant contributions. This damages ecosystems, whereby forest dieback is the most well-known impact. Acidification has direct and indirect damaging effects (such as nutrients being washed out of soils or an increased solubility of metals into soils). But even buildings and building materials can be damaged. Examples include metals and natural stones which are corroded or disintegrated at an increased rate.
When analyzing acidification, it should be considered that although it is a global problem, the regional effects of acidification can vary.
The acidification potential is given in sulphur dioxide equivalents (SO2-Eq.). The acidification potential is described as the ability of certain substances to build and release H+ - ions. Certain emissions can also be considered to have an acidification potential, if the given S-, N- and halogen atoms are set in proportion to the molecular mass of the emission. The reference substance is sulphur dioxide.

EUTROPHICATION POTENTIAL (EP)
Eutrophication is the enrichment of nutrients in a certain place. Eutrophication can be aquatic or terrestrial. Air pollutants, waste water and fertilization in agriculture all contribute to eutrophication.
The result in water is an accelerated algae growth, which in turn, prevents sunlight from reaching the lower depths. This leads to a decrease in photosynthesis and less oxygen production. In addition, oxygen is needed for the decomposition of dead algae. Both effects cause a decreased oxygen concentration in the water, which can eventually lead to fish dying and to anaerobic decomposition (decomposition without the presence of oxygen). Hydrogen sulphide and methane are thereby produced. This can lead, among others, to the destruction of the eco-system.
On overly nutrified soils, an increased susceptibility of plants to diseases and pests is often observed, as is a degradation of plant stability. If the nutrification level exceeds the amounts of nitrogen necessary for a maximum harvest, it can lead to an enrichment of nitrate. This can cause, by means of leaching, increased nitrate content in groundwater. Nitrate also ends up in drinking water.
Nitrate at low levels is harmless from a toxicological point of view. However, nitrite, a reaction product of nitrate, is toxic to humans. The eutrophication potential is calculated in phosphate equivalents (PO4Eq). As with acidification potential, it's important to remember that the effects of eutrophication potential differ regionally.

PHOTOCHEMICAL OZONE CREATION POTENTIAL (POCP)
Despite playing a protective role in the stratosphere, at ground-level ozone is classified as a damaging trace gas. Photochemical ozone production in the troposphere, also known as summer smog, is suspected to damage vegetation and material. High concentrations of ozone are toxic to humans.
Radiation from the sun and the presence of nitrogen oxides and hydrocarbons incur complex chemical reactions, producing aggressive reaction products, one of which is ozone. Nitrogen oxides alone do not cause high ozone concentration levels. Hydrocarbon emissions occur from incomplete combustion, in conjunction with petrol (storage, turnover, refuelling etc.) or from solvents. High concentrations of ozone arise when the temperature is high, humidity is low, when air is relatively static and when there are high concentrations of hydrocarbons. Today it is assumed that the existence of NO and CO reduces the accumulated ozone to NO2, CO2 and O2. This means, that high concentrations of ozone do not often occur near hydrocarbon emission sources. Higher ozone concentrations more commonly arise in areas of clean air, such as forests, where there is less NO and CO.
In Life Cycle Assessments, photochemical ozone creation potential (POCP) is referred to in etheneequivalents (C2H4-Eq.). When analyzing, it's important to remember that the actual ozone concentration is strongly influenced by the weather and by the characteristics of the local conditions.

OZONE DEPLETION POTENTIAL (ODP)
Ozone is created in the stratosphere by the disassociation of oxygen atoms that are exposed to shortwave UV light. This leads to the formation of the so-called ozone layer in the stratosphere (15 50 km high). About 10% of this ozone reaches the troposphere through mixing processes. In spite of its minimal concentration, the ozone layer is essential for life on earth. Ozone absorbs the shortwave UV radiation and releases it in longer wavelengths. As a result, only a small part of the UV radiation reaches the earth.
Anthropogenic emissions deplete ozone. This is well-known from reports on the hole in the ozone layer. The hole is currently confined to the region above Antarctica; however ozone depletion can be also identified, albeit not to the same extent, over the mid-latitudes (e.g. Europe). Substances that have a depleting effect on ozone can be divided into two groups; the fluorine-chlorine-hydrocarbons (CFCs) and the nitrogen oxides (NOX).
One effect of ozone depletion is the warming of the Earth's surface. The sensitivity of humans, animals and plants to UVB and UVA radiation is of particular importance. Possible effects are changes in growth or a decrease in harvest crops (disruption of photosynthesis), indications of tumors (skin cancer and eye diseases) and decrease of sea plankton, which would strongly affect the food chain. In calculating the ozone depletion potential, the anthropogenically released halogenated hydrocarbons, which can destroy many ozone molecules, are recorded first. The so-called Ozone Depletion Potential (ODP) results from the calculation of the potential of different ozone relevant substances. This is done by calculating, first of all, a scenario for a fixed quantity of emissions of a CFC reference (CFC 11). This results in an equilibrium state of total ozone reduction. The same scenario is considered for each substance under study whereby CFC 11 is replaced by the quantity of the substance. This leads to the ozone depletion potential for each respective substance, which is given in CFC 11 equivalents. An evaluation of the ozone depletion potential should take the long term, global and partly irreversible effects into consideration.

CML IMPACT ASSESSMENT METHOD
The CML methodology is based on midpoint modeling (problem-oriented method). Pollutants are allocated to impact categories.

ENVIRONMENTAL PRODUCT DECLARATION (EPD)
An EPD is a type III declaration, complying with ISO14025, which provides results about a product's environmental performance and facilitates comparison between different products with the same function (Functional Unit and Lift's characteristics). The results are based on the Life Cycle Analysis done in accordance with ISO 14040.

FUNCTIONAL UNIT (FU)
The quantified performance of a product system for use, as a reference unit.
For Lifts the FU corresponds to the transportation of 1 tonne of load over a distance of 1 kilometer, expressed in [tkm].

ISO 25745
ISO 25745-2:2015 specifies a method of estimating energy consumption based on measured values, calculation, or simulation on an annual basis for traction, hydraulic and positive drive elevators on a single-unit basis, and an energy classification system for new, existing, and modernized traction, hydraulic, and positive drive elevators on a single-unit basis.

LIFE CYCLE ASSESSMENT (LCA)
LCA is a method that quantifies the total environment impact of products or activities over their entire life cycle and life cycle thinking. Life cycle assessment is based on ISO 14040 and ISO 14044 standards and comprises four phases: goal and scope definition, inventory data collection and analysis, environmental impact assessment, and interpretation of results. The results of LCA are used in communication and product development purposes, for example.

LIFE CYCLE INVENTORY (LCI)
The phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product system throughout its life cycle.

LIFE CYCLE IMPACT ASSESSMENT (LCIA)
The phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts of a product system throughout the life cycle of the product.

PRODUCT CATEGORY RULES (PCR)
Product Category Rules (PCR) defines the rules and requirements for EPDs of a certain product category. They are a key part of ISO 14025 as they enable transparency and comparability between EPDs.

FOREST STEWARDSHIP COUNCIL (FSC)
International not for-profit, multi-stakeholder organization established in 1993 to promote responsible management of the world's forests.

PROGRAM FOR THE ENDORSEMENT OF FOREST CERTIFICATION (PEFC)
International, non-profit, non-governmental organization which promotes sustainable forest management through independent third party certification.

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ISO 14001:2004: Environmental management systems - Requirements with guidance for use.

ISO 9001:2015: Quality management systems - Requirements.

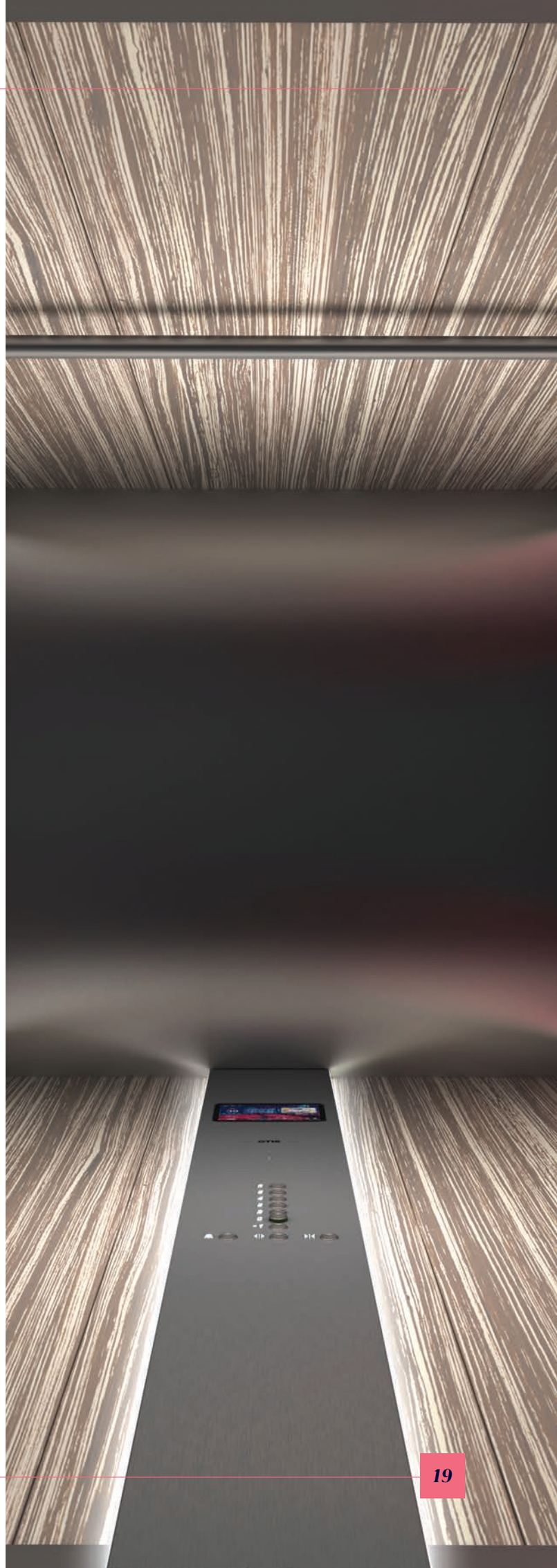
OHSAS 18001:2007: Occupational Health and Safety management systems - Requirements.

ISO 50001:2011: Energy management systems - Requirements with guidance for use.

REACH: Registration, Evaluation, Authorisation and restriction of Chemicals - European Union Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006

RoHS: Restriction of Hazardous Substances Directive - RoHS 1 Directive 2002/95/EC and RoHS 2 Directive 2011/65/EU.

WEEE: Waste Electrical and Electronic Equipment Directive - European Community Directive 2012/19/EU.



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