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INVEST

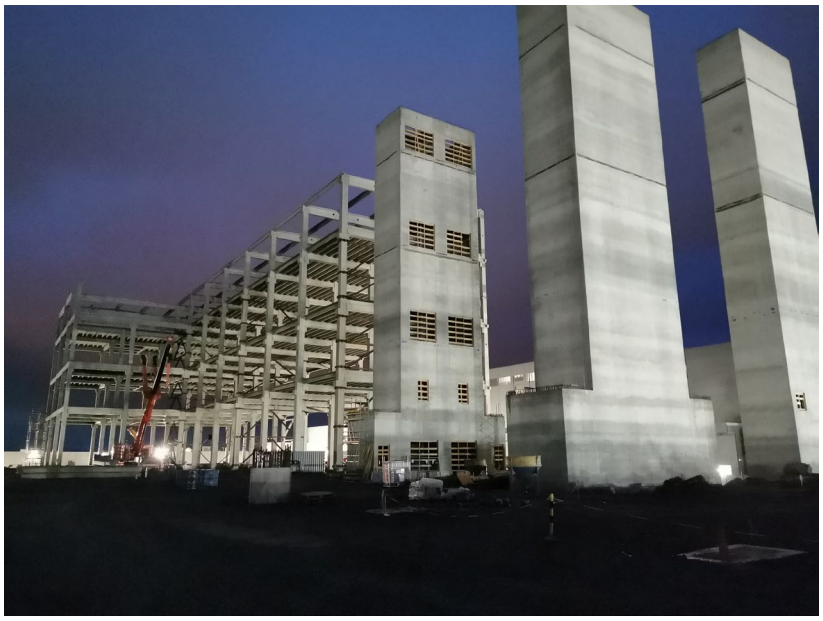
Environmental Product Declaration

Specific EPD

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021

Precast reinforced concrete product

IN VEST s.r.o.



Programme
EPD Square | www.epdsquare.com

Programme operator
EPD Square, s.r.o.

EPD Registration number
SQ 00-009

Publication date
23.08.2024

Valid until
22.08.2029

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INVEST

General information

Product
Precast reinforced concrete product

Program operator
EPD Square, s.r.o.
Karadžičova 16, 811 09, Bratislava, Slovakia

Email: info@epdsquare.com

Registration number
SQ 00-009

Publication date
23.08.2024

Valid until date
22.08.2029

Owner of the declaration
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Manufacturer
IN VEST s.r.o.
Areál IN VEST 1015, 927 01 Šaľa
Telephone: +421 918 827 360
Email: sek3@invest-in.sk

Place of production
IN VEST 1015, PREFA plant, Šaľa, Slovakia

Product Category Rules (PCR)
The CEN standard EN 15804+A2 serves as the core PCR.
In addition, EPD Square PCR v1.0, 2024 is used.

Declared unit
1 m^3

Mass per DU
2645.22 kg

UN CPC code
37550

Geographical scope
Slovakia, Hungary

Year of study
2023

Comparability
EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in the context of the building.

EPD author
Ľudmila Vaculová Mečiarová, Silvia Vilčeková, EPD Clarity, s.r.o.

Verification type
Independent verification of the declaration and data, according to ISO14025:2006
Internal: ☐
External: ☒

Verified by
Daniel Satola, Daniel Satola Consulting

Satola Daniel

The owner of the declaration shall be liable for the underlying information and evidence.
EPD Square shall not be liable with respect to manufacturer, life cycle assessment data and evidence.

System boundaries

This EPD is based on system boundary cradle to gate (A1-A3) with modules C1-C4, module D and optional modules A4 and A5.

Modules declared and geographical scope

	Product stage			Construction process stage		Use stage							End of life stage				Beyond the system boundary
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	x	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x
Geography	EU	EU	SK	SK HU	SK HU	-	-	-	-	-	-	-	SK HU	SK HU	SK HU	SK HU	SK HU

MND = Modules not declared.

Description of Organization

IN VEST s.r.o. has been on the market since 1997 and ranks among the top ten construction companies in Slovakia based on production volume. It is also the largest producer of prefabricated products in Slovakia. The primary business activity of IN VEST s.r.o. is the provision of comprehensive construction services in building and civil engineering. In the field of building engineering, we focus on industrial constructions, civic amenities, and residential buildings. In civil engineering, we specialize in the manufacture and assembly of prefabricated elements for bridges and the production of elements for roads and highways. We offer a wide range of solutions for building reinforced concrete structures for complex variable prefabricated buildings and we also offer urban furniture products made of concrete.

Product information

Product name
Precast reinforced concrete product

Product description
Precast concrete elements are made from concrete (composed of aggregate, cement, water, and admixtures) and reinforced with steel bars and ropes. These elements also incorporate components for transportation and assembly. Prefabs are structural static elements produced in production halls and then transported to the construction site, where they are assembled into buildings or civil engineering structures such as highways and bridges. These elements can be reinforced with traditional reinforced steel bars or steel pre-tensioned ropes. The concrete is produced in an on-site concrete plant and is processed into the forms with reinforcement and embedded elements through vibration.

Physical properties
Precast concrete elements are placed on the market according to Regulation (EU) No. 305/2011 of the European Parliament and of the Council /CPR - Construction Products Regulation/ and the related technical standards:
- foundation elements according to EN 14991
- foundation piles according to EN 12794
- bar bearing elements according to EN 13225
- ceiling slabs for filigree ceilings according to EN 13747
- wall elements according to EN 14992
- staircases according to EN 14843
- bridge elements according to EN 15050
- road and bridge barriers according to EN 1317-5

Geometric data, details, mechanical strength, fire resistance, acoustic insulation parameters, and service life are provided in the design specifications. Concrete is specified in accordance with EN 206. All other materials and products comply with European legislation and relevant construction regulations. The dimensions of the elements follow the structural engineer's design. The maximum length of elements is 45 meters and the maximum weight of elements is 70 tons.

The compressive strength is 60 MPa (average, according to the designed class of concrete).
The flexural tensile strength is 550 MPa (characteristic strength according to steel).

Product application
Precast reinforced concrete is used in buildings or transport structures for load-bearing and non-load-bearing parts. Precast concrete products referred to in this EPD include the following types of precast products - footings and piles, bar elements - columns, beams, trusses, floor slabs for filigree ceilings, wall elements, staircases, bridge girders, road and highway barriers. The elements are designed and manufactured as custom components specifically for the designated building and its installation location. Exceptions include bridge girders, road and bridge barriers, which are produced as type products. The design and static assessments comply with European standards for structural concrete design.

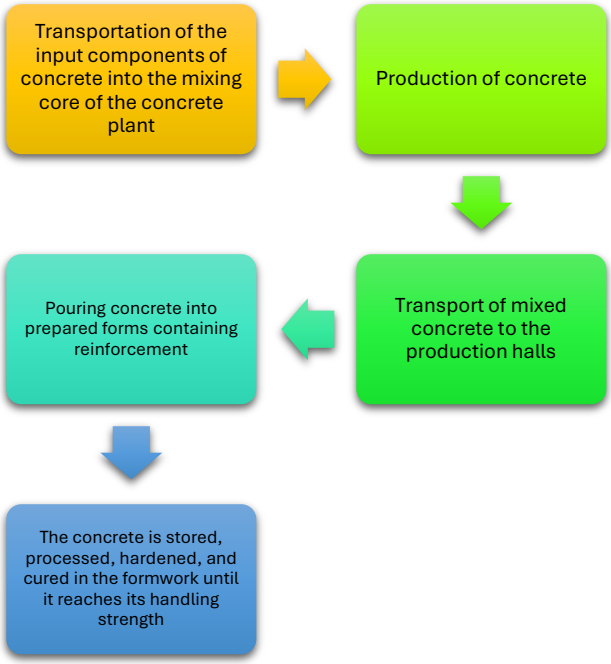
Concrete prefabs are a universal and effective solution in modern construction, taking into account the needs of quality, speed of construction, long life of buildings and environmental protection.

Geographical scope
Slovakia, Hungary

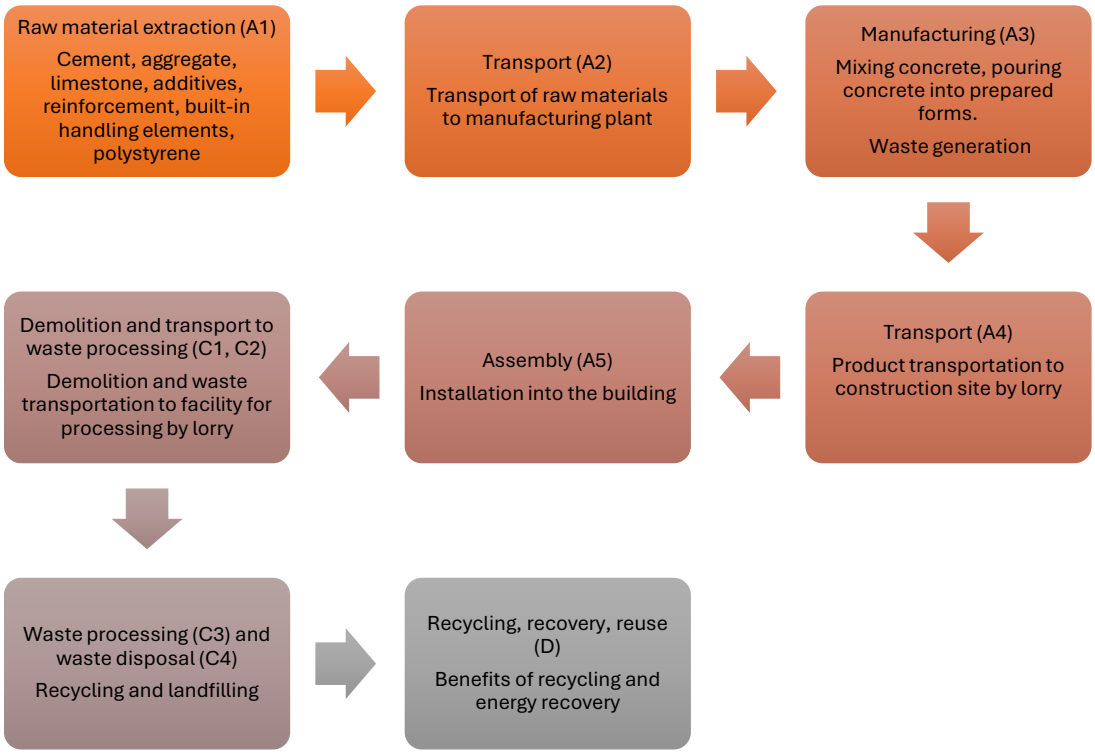
Product contents information

Product components	Weight, kg	Post-consumer material, weight-%	Renewable material, weight-%
Cement CEM I 52,5R	430	0	0
Aggregate	1800	0	0
Water	150	0	0
Additives	3.60	0	0
Limestone	50	0	0
Steel reinforcement	200	23	0
Built-in steel handling elements	10	23	0
Extruded polystyrene	1.62	0	0
TOTAL	2645.22	1.83	0
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	
Wooden lath	1.85	0.07	
TOTAL	1.85	0.07	

Manufacturing process



Manufacturing process



System diagram

Life cycle assessment

Cut-off criteria

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

Allocation, estimations, and assumptions

Allocation is based on annual production rate and made with high accuracy and precision. The values for 1 m^3 of the product which is used within this study are calculated by considering the total product weight per annual production. The product output is fixed to 1 m^3 and the corresponding amount of product is used in the calculations.

In the production plant only, precast concrete is produced. The annual production percentages are taken into consideration for allocation. According to the annual production of the declared product, the annual total energy consumption and the generated waste per the declared product are allocated.

Module A1: This stage considers the extraction and processing of all raw materials. Within the product stage accurate data has been used. In the case of absence in the database, it was modelled as close to reality as possible using proxy, representative datapoint.

Module A3: In the plant, electricity, LPG, and diesel are allocated on yearly consumption.

Module A2, A4 & C2: These stages account for transport activities. Vehicle capacity utilization volume factor is assumed to be 1 which means full load. It may vary but as the role of transportation emission in total results is small and so the variety in load assumed to be negligible. Empty returns are considered.

Module A4: Transportation doesn't cause losses as products are packaged properly. Also, volume capacity utilization factor is assumed to be 1 for the nested packaged products. Additionally, transportation distances and vehicle types are assumed according to the delivery in the last year.

Module A5: It is assumed that wooden laths are incinerated in the households for energy recovery. The distance is assumed as 20 km and the transportation method assumed to be lorry.

Module C1: The impacts of the disassembly stage are assumed to take 0.01 kWh / kg of the product. The source of energy is diesel fuel used by work machines.

Module C2: It is estimated that there is no mass loss during the use of the product, therefore the end-of-life product is assumed that it has the same weight with the declared product. All the end-of-life product is assumed to be sent to the closest facilities such as recycling and landfill. Transportation distance to the closest disposal area is estimated as 50 km and the transportation method is assumed as lorry which is the most common.

Module C3, C4: In the case of selective demolition of buildings, the product can be recovered and sent to companies specialized in recovery. It is assumed that 80% of the concrete waste and 95% of the reinforcement will be recycled and 20% of the concrete waste and 5% of the reinforcement will be taken to landfill for final disposal.

Module D: There are declared benefits and loads of recycling and energy recovery.

Database(s) and LCA software

This EPD has been created using One Click LCA Pre-Verified EPD Generator. Ecoinvent v3.8 and One Click LCA databases were used as sources of environmental data.

LCA scenarios and additional environmental information

Manufacturing energy scenario

Electricity data source and quality	Electricity, Slovak Republic, residual mix	LCA study for country specific residual electricity mixes based on AIB 2022 and calculated by One Click LCA, OneClickLCA 2023
Electricity CO2e / kWh	0.23	
Energy data source and quality	Propane, burned in building machine	Ecoinvent 3.8
Heating CO2e / MJ	0.0898	
Energy data source and quality	Market for diesel	Ecoinvent 3.8
Energy for forklift CO2e / kg	0.49	

Transportation scenario (A4)

Vehicle type used for transport	Transport, freight, lorry 16-32 metric tonne, Euro 6
Distance to the construction site	136
Capacity utilization	100
Capacity utilization factor	1

End of Life (C1, C3, C4)

	Value	Unit
Collected separately	2645.22	Kg
Collected as mixed construction waste	-	Kg
Reuse	-	Kg
Recycling	2 146.176	Kg
Energy recovery	-	Kg
To landfill	499.044	Kg

Additional environmental information

Declared unit is 1 m^3 of precast reinforced concrete. If it is necessary to quantify the results to a product weight of 1 kg, the results are divided by 2645.22 (conversion factor is $3{,}78.10^{-4}$).

LCA results

Core environmental impact indicators – EN 15804+A2, PEF

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	7,63E+02	5,82E+01	5,88E+00	8,76E+00	2,16E+01	1,93E+01	3,26E+00	-1,98E+02
GWP-fossil	kg CO2 eq.	7,68E+02	5,87E+01	3,63E-02	8,75E+00	2,15E+01	1,93E+01	3,26E+00	-1,99E+02
GWP-biogenic	kg CO2 eq.	-5,80E+00	0,00E+00	5,84E+00	1,60E-03	0,00E+00	3,54E-03	1,84E-03	1,01E-01
GWP-LULUC	kg CO2 eq.	3,47E-01	2,35E-02	1,30E-05	8,72E-04	8,61E-03	1,92E-03	2,70E-03	-7,12E-03
ODP	kg CFC11 eq.	3,83E-05	1,36E-05	3,75E-09	1,87E-06	4,99E-06	4,13E-06	1,20E-06	-7,82E-06
AP	mol H^+ eq.	2,52E+00	1,67E-01	3,26E-04	9,10E-02	6,12E-02	2,01E-01	3,11E-02	-6,86E-01
EP-freshwater	kg P eq.	2,08E-02	4,19E-04	4,50E-07	2,90E-05	1,54E-04	6,40E-05	2,99E-05	-8,53E-03
EP-marine	kg N eq.	5,85E-01	3,33E-02	1,48E-04	4,03E-02	1,22E-02	8,88E-02	1,14E-02	-1,60E-01
EP-terrestrial	mol N eq.	6,58E+00	3,70E-01	1,58E-03	4,42E-01	1,36E-01	9,74E-01	1,25E-01	-1,91E+00
POCP	kg NMVOC eq.	2,45E+00	1,42E-01	3,95E-04	1,21E-01	5,21E-02	2,68E-01	3,59E-02	-1,09E+00
ADP-M&M	kg Sb eq.	3,54E-03	2,12E-04	1,15E-07	4,44E-06	7,79E-05	9,80E-06	6,45E-06	-1,77E-04
ADP-fossil	MJ	5,88E+03	8,74E+02	3,59E-01	1,18E+02	3,21E+02	2,60E+02	8,04E+01	-1,67E+03
WDP	m^3	2,54E+02	4,09E+00	1,24E-01	3,17E-01	1,50E+00	6,98E-01	2,55E-01	-5,80E+01

GWP-total: Global Warming Potential; GWP-fossil: Global Warming Potential fossil fuels; GWP-biogenic: Global Warming Potential biogenic; GWP-LULUC: Global Warming Potential land use and land use change; ODP: Depletion potential of the stratospheric ozone layer; AP: Acidification potential, Accumulated Exceedance; EP-freshwater: Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See "additional requirements" for indicator given as PO4 eq. EP-marine: Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-terrestrial: Eutrophication potential, Accumulated Exceedance; POCP: Formation potential of tropospheric ozone; ADP-M&M: Abiotic depletion potential for non-fossil resources (minerals and metals); ADP-fossil: Abiotic depletion potential for fossil resources; WDP: Water deprivation potential, deprivation weighted water consumption

Additional environmental impact indicators – EN 15804+A2, PEF

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	3,57E-05	4,73E-06	3,78E-09	2,44E-06	1,74E-06	1,99E-05	6,68E-07	-1,14E-05
IRP	kBq U235 eq.	5,08E+01	4,59E+00	1,15E-03	5,41E-01	1,68E+00	1,19E+00	3,65E-01	9,14E+00
ETP-fw	CTUe	1,34E+04	7,29E+02	5,49E-01	7,08E+01	2,68E+02	1,56E+02	5,22E+01	-6,18E+03
HTP-c	CTUh	2,33E-06	2,24E-08	8,38E-11	2,71E-09	8,23E-09	5,98E-09	1,38E-09	2,51E-06
HTP-nc	CTUh	1,22E-05	7,14E-07	3,97E-09	5,12E-08	2,62E-07	1,13E-07	3,47E-08	-3,93E-06
SQP	Dimensionless	1,93E+03	6,21E+02	1,48E-01	1,53E+01	2,28E+02	3,38E+01	1,55E+02	-5,03E+02

PM: Particulate matter emissions; IRP: Ionising radiation, human health; ETP-fw: Ecotoxicity (freshwater); ETP-c: Human toxicity, cancer effects; HTP-nc: Human toxicity, non-cancer effects; SQP: Land use related impacts / soil quality

Resource use indicators

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
RPEE	MJ	3,75E+02	1,27E+01	7,91E-03	6,73E-01	4,66E+00	1,48E+00	6,81E-01	4,11E+01
RPEM	MJ	5,22E+01	0,00E+00	-1,04E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	4,28E+02	1,27E+01	-1,04E+02	6,73E-01	4,66E+00	1,48E+00	6,81E-01	4,11E+01
NRPE	MJ	6,10E+03	8,74E+02	3,59E-01	1,18E+02	3,21E+02	2,60E+02	8,04E+01	-1,67E+03
NRPM	MJ	1,20E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-6,74E+01	-1,68E+01	0,00E+00
TRPE	MJ	6,22E+03	8,74E+02	3,59E-01	1,18E+02	3,21E+02	1,92E+02	6,36E+01	-1,67E+03
SM	kg	9,72E+01	2,98E-01	6,29E-04	4,61E-02	1,09E-01	1,02E-01	1,87E-02	1,38E+02
RSF	MJ	3,08E-02	3,27E-03	1,92E-06	1,51E-04	1,20E-03	3,32E-04	4,07E-04	4,67E-03
NRSF	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
W	m^3	5,14E+00	1,11E-01	-3,74E-04	7,15E-03	4,09E-02	1,58E-02	7,92E-02	-7,92E-01

RPEE: Renewable primary energy resources used as energy carrier; RPEM: Renewable primary energy resources used as raw materials; TPE: Total use of renewable primary energy resources; NRPE: Non-renewable primary energy resources used as energy carrier; NRPM: Non-renewable primary energy resources used as materials; TRPE: Total use of non-renewable primary energy resources; SM: Use of secondary materials; RSF: Use of renewable secondary fuels; NRSF: Use of non-renewable secondary fuels; W: Use of net fresh water

Waste indicators

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HW	KG	1,02E+02	9,94E-01	1,51E-04	1,58E-01	3,65E-01	0,00E+00	1,35E-02	8,58E+00
NHW	KG	8,31E+02	1,77E+01	1,85E+00	1,11E+00	6,48E+00	0,00E+00	4,87E+02	-3,10E+02
RW	KG	2,50E-02	6,01E-03	7,92E-07	8,29E-04	2,21E-03	0,00E+00	7,05E-05	1,13E-03

HW: Hazardous waste disposed; NHW: Non-hazardous waste disposed; RW: Radioactive waste disposed

Output flow indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
CR	kg	5,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	1,60E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,15E+03	0,00E+00	0,00E+00
MER	kg	3,70E-01	0,00E+00	1,85E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	3,24E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	5,00E+00	0,00E+00	1,82E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

CR: Components for reuse; MR: Materials for recycling; MER: Materials for energy recovery; EEE: Exported electric energy; ETE: Exported thermal energy

Information describing biogenic carbon content at factory gate

Biogenic carbon content	Value	Unit
Biogenic carbon content in product	0	kg C
Biogenic carbon content in the accompanying packaging	1.5939	kg C

Specific data (GWP-GHG) and data variation for A1-A3

Specific data and data variation	
Specific data	>90%
Variation - product	0%
Variation - site	0%

Hazardous substances

☒ The product does not contain any REACH SVHC substances in amounts greater than 0.1 %.

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ISO 14025:2010
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Annex

Environmental impacts – EN 15804+A1, CML/ISO 21930

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO2 eq.	7,50E+02	5,82E+01	3,48E-02	8,66E+00	2,14E+01	1,91E+01	3,20E+00	-1,87E+02
ODP	kg CFC11 eq.	3,42E-05	1,08E-05	3,11E-09	1,48E-06	3,96E-06	3,27E-06	9,46E-07	-9,24E-06
AP	kg SO_2 eq.	2,01E+00	1,37E-01	2,31E-04	6,48E-02	5,02E-02	1,43E-01	2,32E-02	-5,41E-01
EP	kg PO_4 eq.	9,06E-01	2,95E-02	2,49E-04	1,50E-02	1,08E-02	3,32E-02	5,09E-03	-3,32E-01
POCP	kg C_2H_4 eq.	1,99E-01	6,91E-03	7,94E-06	1,42E-03	2,54E-03	3,13E-03	8,84E-04	-1,30E-01
ADP-M&M	kg Sb eq.	2,79E-03	2,07E-04	1,04E-07	4,37E-06	7,61E-05	9,63E-06	6,35E-06	-1,77E-04
ADP-fossil	MJ	6,22E+03	8,74E+02	3,59E-01	1,18E+02	3,21E+02	2,60E+02	8,04E+01	-1,67E+03

Environmental impacts – GWP-GHG

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - GHG	kg CO2e	7,68E+02	5,87E+01	3,63E-02	8,75E+00	2,15E+01	1,93E+01	3,26E+00	-1,99E+02

GWP- GHG: Global Warming Potential, greenhouse gases