Environmental Product Declaration

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

Insulating electrical pre-wired conduits

from

PM FLEX S.R.L.

Programme:	The International EPD® System, www.environdec.com
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General information

Programme information

Programme:	The International EPD® System
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products (EN 15804:A2) (1.2.5) prepared by IVL Swedish Environmental Research Institute, EPD International Secretariat. UN CPC 36320 Tubes, pipes and hoses and fittings therefor, of plastics.
PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Life Cycle Assessment (LCA)
LCA accountability: Chiara Albini c.albini@greenwichsrl.it
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006 via: ☒ EPD verification Third-party verification: IMQ is an approved certification body accountable for third-party verification, Via Quintiliano, 43, 20138 - MILANO (MI), Italy Third-party verifier is accredited by: ACCREDIA, certificate n. 010H For details about third-party verification procedure of the EPDs, see GPI.
Procedure for follow-up of data during EPD validity involves third party verifier: ☒ Yes ☐ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply

identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Pmflex is a European company, leader in the design and production of conduit systems for cable management.

Since 1962, Pmflex offers a wide range of polypropylene corrugated conduits (LSF0H and halogen free), pre-wired polypropylene corrugated conduits, PVC corrugated conduits, rigid PVC conduits, rigid polypropylene halogen free conduits and other solutions for cable management. For each product family Pmflex also offers all relevant accessories.

For 60 years, Pmflex has been passionately committed to creating quality products that facilitate the work of the installers, maximize the safety level of electrical installations and reduce their environmental impact.

Owner of the EPD: PMflex S.r.l.
Contact: Nicholas Capelli; nicholas.capelli@pmflex.it
Name and location of production sites: Via XXV Aprile 15, 24030, Almenno San Bartolomeo (Italy); Via Campino 1, 24030, Almenno San Bartolomeo (Italy).
Geographical scope: Europe.
Management system-related certifications: ISO 9001.

Product information

The present EPD analyses different configurations of pre-wired ICTA corrugated PP conduits and provides potential environmental impact results of the worst-case product for each impact indicator and life cycle phase.

Pre-wired ICTA conduits may contain a different number of electrical cables, thus affecting the relative bill of materials. In order to understand which configurations to analyse, data on the conduits produced in 2021 and the weight of cables on the total weight of each conduit were extracted from the management system.

Configurations with the lowest % of cables (16%), the highest (88%) and intermediate % (40%, 50%, 60%, 70%) were studied. For this reason, there is a high variation in environmental impacts between the different configurations, especially between the conduit with the minimum and maximum amount of cables by weight. This variation has been studied for the phases A1-A3 for the GWP-GHG indicator and is presented in the next page. The table also lists the specific products that are part of ICTA conduits with different cable %.

PMflex markets this product under the names xFlexWire, ICTA, ICTAQ, ICHW, ICHWQ, ICTAAM, box, onecoil.

% cables weight/total conduit weight	<40%	40-50%	50-60%	60-65%	65-70%	70-80%	>80%
Pmflex 2021 pre-wired ICTA Production for each range	4%	5%	19%	21%	38%	12%	0%
% cables weight/total conduit weight analysed	**16%**	**40%**	**50%**	**60%**	**70%**	**70%**	**88%**
% Variation from the GWP-GHG A1-A3 impact of the conduit with 88% cables	**-47,70%**	**-31,70%**	**-25,04%**	**-18,37%**	**-11,81%**	**-11,81%**	**0,00%**
Conduit specification	-Ø16 with one 1,5 mmq cables -Ø16 with one 2,5 mmq cables -Ø20 with one 1,5 mmq cables -Ø20 with one 2,5 mmq cables -Ø25 with 2 or less 1,5 mmq cables -Ø25 with one 2,5 mmq cables -Ø25 with one 4 mmq cables	-Ø16 with two 1,5 mmq cables -Ø20 with two 1,5 mmq cables -Ø20 with one 4 mmq cables -Ø25 with three 1,5 mmq cables -Ø25 with two 2,5 mmq cables -Ø25 with one 6 mmq cables	-Ø16 with three 1,5 mmq cables -Ø16 with two 2,5 mmq cables -Ø16 with one 4 mmq cables -Ø20 with three 1,5 mmq cables -Ø20 with four 1,5 mmq cables -Ø20 with two 2,5 mmq cables -Ø20 with one 6 mmq cables -Ø25 with four 1,5 mmq cables -Ø25 with five 1,5 mmq cables -Ø25 with three 2,5 mmq cables -Ø25 with two 4 mmq cables -Ø25 with one 10 mmq cables	-Ø16 with four 1,5 mmq cables -Ø16 with one 6 mmq cables -Ø20 with five 1,5 mmq cables -Ø20 with three 2,5 mmq cables -Ø20 with two 4 mmq cables -Ø25 with six 1,5 mmq cables -Ø25 with seven 1,5 mmq cables -Ø25 with four 2,5 mmq cables -Ø25 with three 4 mmq cables -Ø25 with two 6 mmq cables	-Ø16 with five 1,5 mmq cables -Ø16 with three 2,5 mmq cables -Ø16 with two 4 mmq cables -Ø20 with six 1,5 mmq cables -Ø20 with four 2,5 mmq cables -Ø20 with three 4 mmq cables -Ø20 with one 10 mmq cables -Ø25 with eight 1,5 mmq cables -Ø25 with nine 1,5 mmq cables -Ø25 with five 2,5 mmq cables -Ø25 with six 2,5 mmq cables -Ø25 with four 4 mmq cables Ø25 with one 16 mmq cables/coaxial cable	-Ø16 with 6 or more 1,5 mmq cables -Ø16 with 4 or more 2,5 mmq cables -Ø16 with 3 or more 4 mmq cables -Ø16 with 2 or more 6 mmq cables -Ø16 with 1 or more 10 mmq cables -Ø16 with 1 or more 16 mmq cables/coaxial cable -Ø20 with 7 or more 1,5 mmq cables -Ø20 with 5 or more 2,5 mmq cables -Ø20 with 3 or more 4 mmq cables -Ø20 with 2 or more 6 mmq cables -Ø20 with 2 or more 10 mmq cables -Ø20 with 1 or more 16 mmq cable/coaxial cable -Ø25 with 10 or more 1,5 mmq cables -Ø25 with 7 or more 2,5 mmq cables -Ø25 with 5 or more 4 mmq cables -Ø25 with 3 or more 6 mmq cables -Ø25 with 2 or more 10 mmq cables -Ø25 with 2 or more 16 mmq cable/coaxial cable -Ø32 with cables	

The characteristics the analysed product are summarised in the following table:

	ICTA
Material	PP
Compressive strength	MEDIUM 750N
Impact resistance	HEAVY 6J
Minimum operating temperature	-5°C (also available -25°C)
Maximum operating temperature	+90°C
Bending resistance	Pliable self-recovering
Insulation resistance	>100MΩ
Glow Wire Test (IEC EN 60695-2)	960°C
Standards	EN 61386.1, EN 61386.22

Manufacturing

The conduits are produced in two plants located in Almenno San Bartolomeo, BG:

-corrugated polypropylene (PP) conduit at the site in Via XXV Aprile 15;

-corrugated PP and PVC conduits and rigid PP and PVC conduits at the site in Via Campino.

The production of the conduits involves the following steps:

-Weighing of raw materials, PP/PVC granules and additives (where present);

-Extrusion, the materials are melted and homogenised;

-Corrugation (corrugated conduits only), the homogenised material passes through a mould to obtain the desired shape;

-Cooling using chilled water (excluding PVC corrugated conduits);

-Marking;

-Wrapping and packaging of the conduit.

The waste produced in the extrusion phase is transported to the site in Via Campino, where the grinding phase takes place. Subsequently, these are regranulated at subcontractors and returned as regenerated material ready for a second use.

With regard to Reference Service Life, PM FLEX ducts are long-life products. If used and installed correctly, they can have a service life of more than 30 years. Insulation performance is almost completely maintained throughout the entire service life, and is only compromised by extraordinary shocks and damage during construction. According to the system boundaries analysed (from cradle to gate) and for the actual lifetime of the products themselves, this aspect was not taken into account.

LCA information

Declared unit

1 kg of conduit. The weight per meter of conduit is reported in the following table.

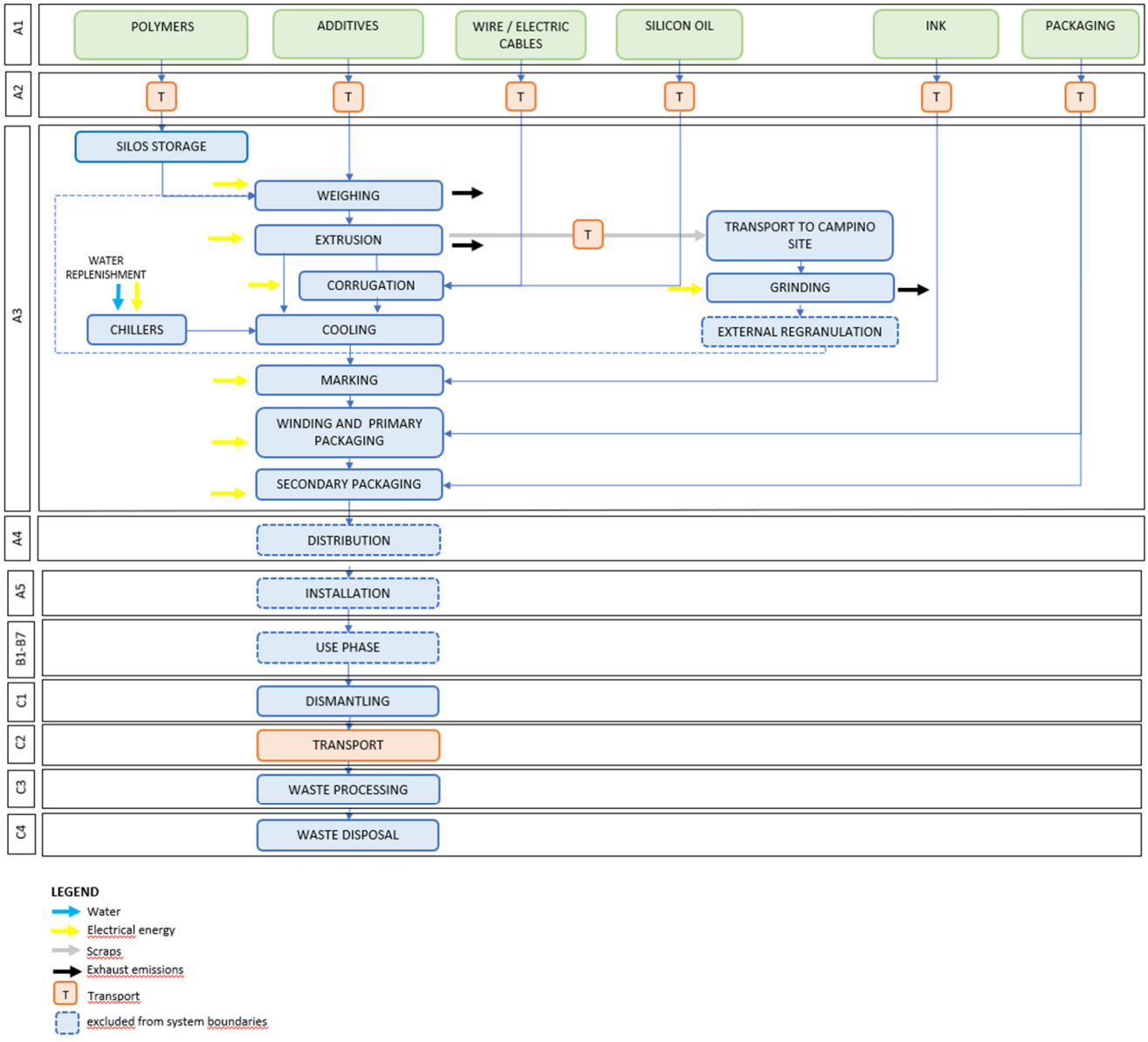
Product range	Outside diameter (mm)	Weight (kg/m)	Average weight of product range (kg/m)
ICTA prewired (88% cable weight)	16	0,370	0,541
	20	0,472	
	25	0,878	
	32	0,967	
	40	1,313	
	50	1,746	
	63	2,584	
ICTA prewired (70% cable weight)	16	0,150	0,228
	20	0,191	
	25	0,353	
	32	0,389	
	40	0,528	
	50	0,701	
	63	1,036	
ICTA prewired (60% cable weight)	16	0,114	0,101
	20	0,144	
	25	0,266	
	32	0,293	
	40	0,397	
	50	0,527	
	63	0,778	
ICTA prewired (50% cable weight)	16	0,092	0,068
	20	0,116	
	25	0,214	
	32	0,235	
	40	0,318	
	50	0,422	
	63	0,623	
ICTA prewired (40% cable weight)	16	0,077	0,047
	20	0,098	
	25	0,179	
	32	0,197	
	40	0,266	
	50	0,352	
	63	0,520	
ICTA prewired (16% cable weight)	16	0,056	0,016
	20	0,071	
	25	0,129	
	32	0,142	
	40	0,191	
	50	0,253	
	63	0,373	

Time representativeness
Data cover the year 2021.

Database(s) and LCA software used
Secondary data has been obtained from Ecoinvent v.3.8 using the software SimaPro 9.4.0.2 to carry out the assessment.

Description of system boundaries
The system boundaries include the modules A1-A3, C1-C4, D according to a type “Cradle to gate with modules C and D”.

System diagram:



Assumptions / Scenarios
C1: it was assumed that the dismantling activities for the conduits take place manually, so zero impacts were considered.

C2: the product at the end of its life is sent to selection centers, therefore a distance of 100 km is assumed. The transport was modelled using the dataset Transport, freight lorry, 7.5-16 metric ton EURO4 {RER}.
C3: a recycling scenario was assumed for the copper contained in the cables and 50% incineration for the polymeric part upon consultation of a Cordis Europa paper (2022), in which it is specified that the copper part is generally recovered while the plastic ends up in landfills. For the PP conduit, a 25% recycling and 45% incineration scenario was considered according to the report “The Circular Economy for Plastics – A European Overview” by Plastics Europe (2022). The recycling module includes an input of 0,6 kWh for the treatment process.
C4: waste to landfill constitutes 50% of the polymeric polymeric part of the cables and 30% of the PP conduit.
D: this module includes the benefits related to material recycling as well as energy production from material incineration. For the recycled copper and PP, substitution of virgin material has been considered.

Exclusions / Cut-off rules
The lifecycle elements excluded from the study are the packaging of auxiliary material, the transport of workers, and the methane gas used exclusively for space heating. Only the ink of the ICTA cardboard One Box packaging was considered in the cut-off.

Allocation
The allocation was performed on the basis of mass, namely the kilos of finished conduits produced.

Modelling of electrical energy
The modelling of electricity consumption in module A1 was carried out using the mix declared by PMflex energy supplier.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	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	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	X	X	X	X	X
Geography	GLO, EU, IT	GLO, EU, IT	IT										EU	EU	GLO, IT	GLO, IT	GL, EU, IT
Specific data used	> 90%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	-47,7%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant					-	-	-	-	-	-	-	-	-	-	-	-

Content information

Product	88%	70%	60%	50%	40%	16%
Product components	**Weight, %**					
Electrical Cables	88,00%	70,00%	60,00%	50,00	40,00%	16,00%
Polimer	11,32%	28,30%	37,73%	47,16%	56,60%	79,23%
Additive	0,45%	1,13%	1,51%	1,89%	2,26%	3,17%
Pulling wire	0,22%	0,56%	0,74%	0,93%	1,11%	1,56%
Lubricant	0,00%	0,01%	0,02%	0,02%	0,02%	0,03%
Ink and solvent	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
TOTAL	100%					

Packaging materials for all ICTAs	Weight, kg	Weight biogenic carbon, kg C/kg
Wood	0,097	0,048
Cardboard	0,007	0,003
Plastics	0,028	0,00
TOTAL	0,131	0,051

The consumption of post-consumer material is zero as well as the biogenic content in the product.

The materials used for the conduits under study have no hazardous characteristics.

Results of the environmental performance indicators

The following tables show the maximum values of the environmental indicators for each phase chosen among those of the products studied in this document. The results represent the “worst-case product” of the ICTA pre-wired conduits range.

Mandatory impact category indicators according to EN 15804

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq.	5,80E+00	0,00E+00	2,13E-02	1,18E+00	3,43E-02	-4,12E-02
GWP-biogenic	kg CO_2 eq.	-1,49E-03	0,00E+00	1,95E-05	1,91E-03	2,82E-05	1,52E-02
GWP-luluc	kg CO_2 eq.	9,52E-03	0,00E+00	1,01E-05	1,86E-04	3,06E-06	-8,68E-05
GWP-total	kg CO_2 eq.	5,81E+00	0,00E+00	2,13E-02	1,18E+00	3,44E-02	-2,61E-02
ODP	kg CFC 11 eq.	6,25E-07	0,00E+00	4,82E-09	1,38E-08	8,77E-10	-2,18E-09
AP	mol H^+ eq.	3,54E-01	0,00E+00	1,04E-04	7,37E-04	2,50E-05	-2,80E-03
EP-freshwater	kg P eq.	2,78E-02	0,00E+00	1,61E-06	5,05E-05	4,32E-07	-2,21E-04
EP-marine	kg N eq.	1,79E-02	0,00E+00	3,45E-05	2,03E-04	3,18E-04	-1,41E-04
EP-terrestrial	mol N eq.	2,46E-01	0,00E+00	3,77E-04	1,93E-03	9,23E-05	-1,94E-03
POCP	kg NMVOC eq.	6,94E-02	0,00E+00	1,08E-04	5,10E-04	3,40E-05	-5,54E-04
ADP-minerals&metals*	kg Sb eq.	8,51E-03	0,00E+00	9,77E-08	4,52E-07	9,68E-09	-6,70E-05
ADP-fossil*	MJ	8,50E+01	0,00E+00	3,20E-01	1,66E+00	6,84E-02	-5,88E-01
WDP*	m^3	6,36E+00	0,00E+00	1,06E-03	4,23E-01	2,95E-03	-4,85E-02
Acronyms	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; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Additional mandatory and voluntary impact category indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG[1]	kg CO_2 eq.	5,66E+00	0,00E+00	2,11E-02	1,17E+00	2,80E-02	-4,01E-02

Resource use indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	1,71E+01	0,00E+00	5,40E-03	1,65E-01	1,26E-03	-4,42E-01
PERM	MJ	2,21E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	1,93E+01	0,00E+00	5,40E-03	1,65E-01	1,26E-03	-4,42E-01
PENRE	MJ	8,44E+01	0,00E+00	3,40E-01	1,77E+00	7,27E-02	-6,27E-01
PENRM	MJ	1,86E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	9,09E+01	0,00E+00	3,40E-01	1,77E+00	7,27E-02	-6,27E-01
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	1,50E-01	0,00E+00	4,05E-05	1,31E-02	7,19E-05	-1,13E-03
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

[1] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Waste indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	9,37E-03	0,00E+00	8,57E-07	2,91E-06	1,05E-07	-1,05E-06
Non-hazardous waste disposed	kg	1,97E+00	0,00E+00	1,36E-02	9,08E-02	2,74E-01	-1,61E-02
Radioactive waste disposed	kg	2,21E-04	0,00E+00	2,14E-06	5,72E-06	4,06E-07	-1,68E-06

Output flow indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	3,30E-02	0,00E+00	0,00E+00	6,27E-01	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	1,70E-01	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

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