Environmental Product Declaration

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

Insulating electrical conduits

from

PM FLEX S.R.L.

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-08255
Publication date:	2023-03-13
Valid until:	2028-02-12

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

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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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 the following products and provides potential environmental impact results of the worst-case product for each impact indicator and life cycle phase:

- Rigid polypropylene conduits: **IRLHF, IRSHF, xRigid**
- UV-resistant rigid polypropylene conduits: **IRLHFUV, IRSHFUV, xRigid**
- PVC rigid conduits: **IRL, IRS, xRigid**
- Corrugated polypropylene conduits: **ICTA, xSpeed, xHiSpeed, ICTAECO, ICTHX, OneBox, OneRing, ICHW, ICHWQ, ICTAAM, ICTAQ, ICTS, Colipro, Box**
- UV-resistant corrugated polypropylene conduits: **ICTAUV, xSpeedUV, ICHWUV, ICHWQUV, ICTAAMUV, ICTAQUV, ICTSUV**
- Corrugated PVC conduits: **ICE, IPS, IPC, ICA, xSpeed PVC**

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

	IRLHF	**ICTA**	**ICE**	**IRL**
Material	PP	PP	PVC	PVC
Compressive strength	MEDIUM 750N	MEDIUM 750N	MEDIUM 750N	MEDIUM 750N
Impact resistance	MEDIUM 2J	HEAVY 6J	MEDIUM 2J	MEDIUM 2J
Minimum operating temperature	-25°C	-5°C (also available -25°C)	-25°C	-5°C
Maximum operating	+105°C	+90°C	+60°C	+60°C

temperature				
Bending resistance	Rigid	Pliable self-recovering	Pliable	Rigid
Insulation resistance	>100MΩ	>100MΩ	>100MΩ	>100MΩ
Glow Wire Test (IEC EN 60695-2)	960°C	960°C	960°C	960°C
Standards	EN 61386.1, EN 61386.21	EN 61386.1, EN 61386.22	EN 61386.1, EN 61386.22	EN 61386.1, EN 61386.21

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)
ICE	16	0,046	0,071
	20	0,062	
	25	0,083	
	32	0,113	
	40	0,187	
	50	0,228	
	63	0,282	
ICTA / ICTAUV	16	0,048	0,068
	20	0,060	
	25	0,109	
	32	0,120	
	40	0,161	
	50	0,213	
	63	0,314	
IRL	16	0,076	0,119
	20	0,108	
	25	0,144	
	32	0,206	
	40	0,266	
	50	0,433	
	63	0,633	
IRLHF / IRLHFUV	12	0,038	0,087
	16	0,061	
	20	0,081	
	25	0,119	
	32	0,167	
	40	0,220	
	50	0,296	

Time representativeness

Data cover the year 2021.

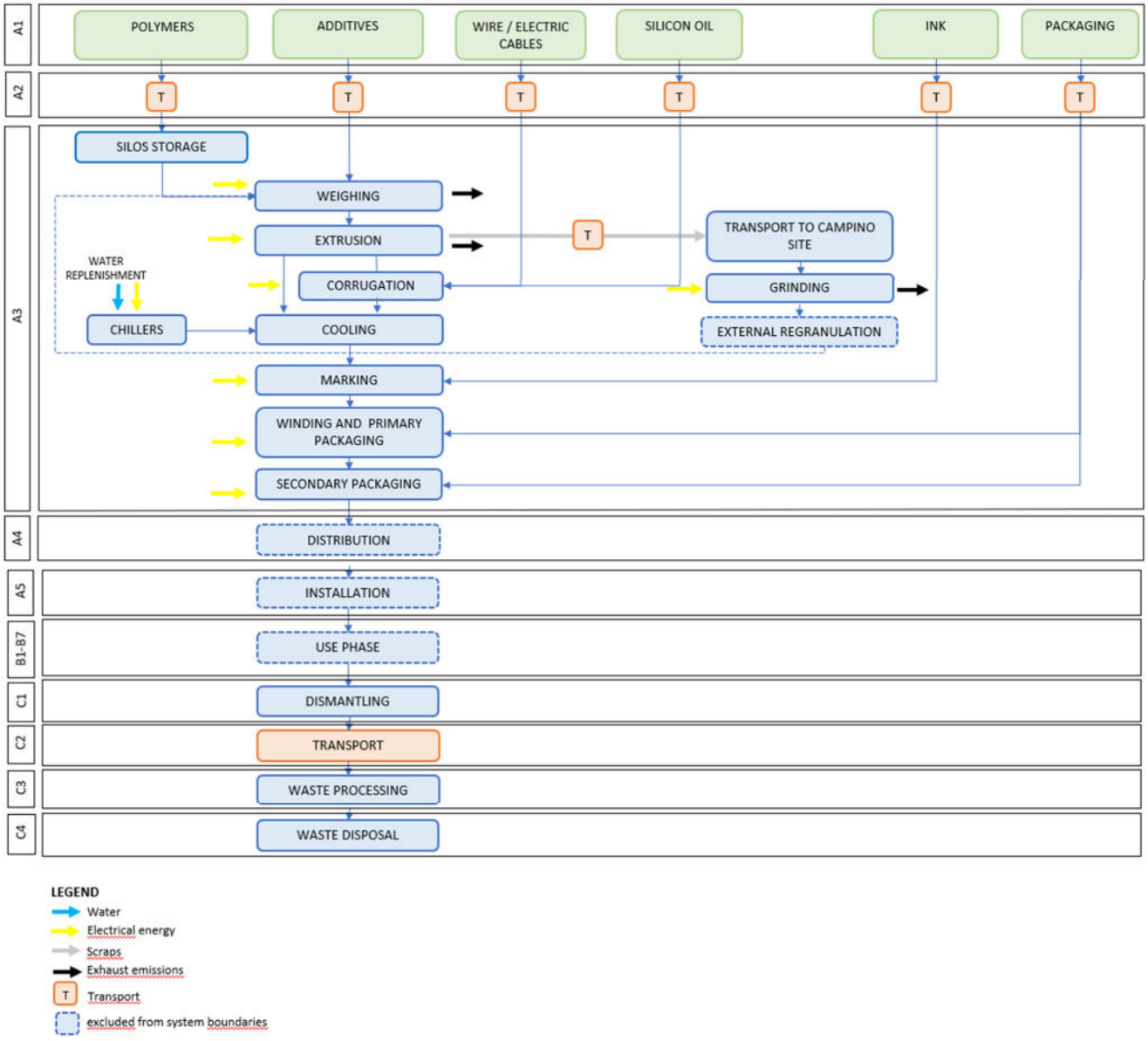
Database(s) and LCA software used

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: For the PP/PVC 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 30% of the PP/PVC conduit.

D: this module includes the benefits related to material recycling as well as energy production from material incineration. For the recycled polymers, 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	-7,7%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant					-	-	-	-	-	-	-	-	-	-	-	-

Content information

Product	ICTA	ICTAUV	IRLHF	IRLHFUV	IRL	ICE
Product components	**Weight, %**					
Polimer	94,33%	91,73%	96,15%	93,45%	100,00%	98,37%
Additive	3,77%	6,42%	3,85%	6,54%	-	-
Pulling wire	1,86%	1,81%	-	-	-	1,59%
Lubricant	0,04%	0,04%	-	-	-	0,04%
Ink and solvent	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%
TOTAL	100%					

Product	ICTA	ICTAUV	IRLHF	IRLHFUV	IRL	ICE	Weight biogenic carbon, kg C/kg
Packaging materials	**Weight, kg**						
Wood	0,097	0,097	0,097	0,097	0,097	0,097	0,048
Cardboard	0,007	0,007	0,000	0,000	0,000	0,000	0,001
Plastics	0,028	0,028	0,021	0,021	0,021	0,020	-
Metal	-	-	0,003	0,003	0,003	-	-
TOTAL	0,131	0,131	0,121	0,121	0,121	0,117	0,098

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 module chosen among those of the products studied in this document. This operation was carried out as it was not possible to consider an average product amongst the conduits, as not all environmental impact indicators show variations included in ± 10% compared to a selected model.

Mandatory impact category indicators according to EN 15804

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO_2 eq.	2,54E+00	0,00E+00	2,13E-02	1,24E+00	3,80E-02	-7,25E-01
GWP-biogenic	kg CO_2 eq.	2,07E-02	0,00E+00	1,95E-05	4,11E-03	3,19E-05	1,17E-02
GWP-luluc	kg CO_2 eq.	2,19E-03	0,00E+00	1,01E-05	1,39E-04	3,34E-06	-1,61E-04
GWP-total	kg CO_2 eq.	2,54E+00	0,00E+00	2,13E-02	1,24E+00	3,80E-02	-7,15E-01
ODP	kg CFC 11 eq.	8,63E-07	0,00E+00	4,82E-09	4,31E-08	9,63E-10	-3,37E-08
AP	mol H^+ eq.	1,06E-02	0,00E+00	1,04E-04	1,02E-03	2,76E-05	-2,54E-03
EP-freshwater	kg P eq.	6,82E-04	0,00E+00	1,61E-06	5,51E-05	4,68E-07	-9,69E-05
EP-marine	kg N eq.	2,12E-03	0,00E+00	3,45E-05	2,58E-04	1,22E-04	-4,51E-04
EP-terrestrial	mol N eq.	2,18E-02	0,00E+00	3,77E-04	2,44E-03	1,01E-04	-4,71E-03
POCP	kg NMVOC eq.	8,38E-03	0,00E+00	1,08E-04	6,90E-04	3,73E-05	-2,03E-03
ADP-minerals&metals*	kg Sb eq.	1,80E-03	0,00E+00	9,77E-08	1,20E-06	1,06E-08	-3,80E-06
ADP-fossil*	MJ	8,06E+01	0,00E+00	3,20E-01	2,76E+00	7,50E-02	-1,71E+01
WDP*	m^3	1,56E+00	0,00E+00	1,06E-03	1,40E+00	3,24E-03	-4,24E-01
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.	2,42E+00	0,00E+00	2,11E-02	1,23E+00	3,09E-02	-6,91E-01

Resource use indicators

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	2,92E+00	0,00E+00	5,40E-03	2,14E-01	1,36E-03	-8,07E-01
PERM	MJ	2,05E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	4,96E+00	0,00E+00	5,40E-03	2,14E-01	1,36E-03	-8,07E-01
PENRE	MJ	4,19E+01	0,00E+00	3,40E-01	2,96E+00	7,97E-02	-1,84E+01
PENRM	MJ	4,57E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	8,65E+01	0,00E+00	3,40E-01	2,96E+00	7,97E-02	-1,84E+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	2,86E-02	0,00E+00	4,05E-05	4,24E-02	7,89E-05	-7,05E-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	4,03E-05	0,00E+00	8,57E-07	4,72E-06	1,15E-07	-5,82E-06
Non-hazardous waste disposed	kg	3,13E-01	0,00E+00	1,36E-02	2,61E-01	3,01E-01	-2,34E-02
Radioactive waste disposed	kg	6,76E-05	0,00E+00	2,14E-06	9,96E-06	4,45E-07	-1,41E-05

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	5,42E-02	0,00E+00	0,00E+00	2,50E-01	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	4,50E-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

References

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