





Product Environmental Profile

Product line: TITANEX ® Mono (25mm² ≥ section ≤ 300mm²)

Reference product: TITANEX ® 1x70²

EDS 1029

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The PCR critical review was	The PCR critical review was conducted by a panel of experts chaired by Philippe Osset (Solinnen).								
PEP are compliant with XP (The elements of the present	PASS								
Compliant with ISO 14025: 2	PORT _®								

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Nexans Environmental commitments

Nexans integrates Sustainable Development in its strategy to meet stakeholders needs. Nexans has been supporting the United Nations Global Compact since December 2008 and has implemented internal action plans to integrate Sustainable Development at all levels: responsible governance, healthy and safe working environment for employees, setting up carbon footprint of Nexans sites, and designing high performance products.



Reference Product description

TITANEX ® 1x70²

TITANEX® is a range of flexible industrial cables with insulation and outer sheath in elastomer.

They are intended to be used in industrial environments such as construction sites, cranes, machines tools, factories, generators etc.

Products covered:

The aforementioned products belong to the category Wires, Cables and Accessories of the Product Category Rules (PCR) from the PEP ecopassport® program.

The PEP concern all the products in the range TITANEX ® Mono (25mm2 \geq section \leq 300mm2) and the reference product of the PEP is TITANEX ® 1x70².

Functional unit:

To transmit energy expressed for 1 A over a distance of 1 km during 30 years and a 70% use rate, in accordance with the relevant standards, detailed in the data sheet available on our website www.nexans.com.

Lifetime and use rate correspond to the Building - Residential / Tertiary / Industrial application as defined in the table given in Appendix 1 of the specific rules for wires, cables and accessories.

This PEP has been drawn up considering the following parameters:

- 1 km for manufacturing, distribution and end-of-life stages
- 1 km and 1 A for the use stage;

The potential impact of the use stage shall be calculated by the PEP user considering the real amperage through the product during the use by multiplying the impact by the square of the intensity. This PEP is valid in the intensity range taking into account the maximum allowable intensity.

Materials and substances

The total mass of the reference product and packaging is 994,12 kg/km. Constituent materials are distributed as follows:

7,3% Plastics including 0.22% of recycled plastic, for the product.

58,0% Metals34,7% Others

Nexans has implemented necessary procedures to ensure product compliance with the relevant standards when products are put on the market.

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Manufacturing



- All the products in the range TITANEX ® Mono (25mm2 ≥ section ≤ 300mm2) are manufactured in France.
- The electricity mix model for the manufacturing stage is France, >1 kV.
- All Nexans sites in France have implemented a certified Environmental Management System according to ISO14001 standard.

Packaging designed to reduce environmental impacts:

Packaging was designed according to the applicable standard (Directive 94/62/EC).

- The packaging considered to transport the reference product is a N120. It is considered to be used 1 time.
- The considered packaging is a PEFC™ certified wooden drum, ensuring responsible sourcing and sustainable forests management.

Nexans has developed a collecting system for drums with a dedicated team. Returning drums can be made by phone at 0810TOURET (phone number for France) or online: www.nexans.fr.

Distribution



The transportation scenario for the impact assessment of the distribution stage is worldwide, considering:

- 1000 km covered by truck.
- 19000 km covered by boat.

Installation



Installation processes for the reference product are considered out of the scope of the study, according to the Product Specific Rules document for "Wires, Cables and Accessories" from PEP ecopassport® program. Only packaging disposal is considered at this stage.

Use



- The use scenario considers the operation of the reference product in Building / Residential / Tertiary / Industrial, with:
- Reference Lifetime (RLT) = 30 years
- Use rate = 70 %

- Current intensity (A): 1
- Cable resistance* (ohm/km): 0,272
- Number of active conductor(s):
- (*According to standard IEC 60228) Considering the aforementioned hypotheses, the energy consumption over the RLT at use stage is 50,04 kWh/km.

This value is calculated for I=1 A. For the effective consumption of the cable installed, multiply the value given by the square intensity.

- The electricity mix considered at use stage is Europe, <1 kV.
- No maintenance is necessary to ensure the operation of the cable during the considered reference lifetime.

The reference lifetime mentioned in this PEP corresponds to an average data used for impact calculation, taking into account the average time a cable might be installed in a system before being disposed. It CANNOT BE considered as an equivalent to the guaranteed product technical lifetime.

End-of-life



- 🥏 The transportation scenario chosen for the impact analysis associated with end-of-life stage is 1000 km covered by truck.
- The assumed electricity mix model for end-of-life stage is Europe, >1 kV.

The cables are recycled through a grinding process for the separation of polymers and metal parts. It was considered that 100% of metals are recycled and 100% of other materials are landfilled.

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Nexans has the know-how of cables recycling at their end-of-life through the company named Recycables, created in partnership with Sita, a subsidiary of Suez Environment, to offer a complete solution for the recycling of polymers and metals.





The reference product TITANEX ® 1x702 belongs to the category Wires, Cables and Accessories of the Product Category Rules (PEP-PCR-ed3-EN-2015 04 02) from the PEP ecopassport® program. According to the PCR, the life cycle impact assessment of the reference product takes into account manufacturing, distribution, installation, use and end-of-life stages.

All the necessary hypotheses to evaluate the environmental impacts of the reference product lifecycle are presented in the previous sections (electricity mix models, use scenario, etc). The software used to perform the evaluation is EIME 5.9.1, with the Nexans-2020-01 database.

Representativeness: the study is representative of cable production in France with a worldwide scenario for distribution. The electricity model for use is Europe, <1 kV and the model for end-of-life is Europe, >1 kV.

Impact results for 1000 m of TITANEX ® 1x70²

	Indicators/ Flows	Unit	Manufacturing	Distribution	Installation*	Use	End-of-life	TOTAL
						(for 1 A)		(for 1 A)
ors	Global Warming	kg CO ₂ eq.	1,91E+03	2,97E+02	7,18E+00	2,45E+01	1,32E+02	2,37E+03
Indicat	Ozone Depletion	kg CFC- 11 eq.	4,50E-04	5,08E-07	4,85E-08	1,60E-06	2,06E-05	4,72E-04
npact i	Acidification of soils and water	kg SO ₂ eq.	8,13E+00	8,41E+00	3,52E-02	1,02E-01	8,14E-01	1,75E+01
ental ir	Water Eutrophication	kg PO ₄ ³⁻ eq.	1,24E+00	8,28E-01	3,75E-02	6,17E-03	1,66E-01	2,28E+00
Environmental impact indicators	Photochemical Ozone formation	kg C ₂ H ₄ eq.	6,36E-01	4,17E-01	2,48E-03	5,62E-03	4,43E-02	1,11E+00
Ē	Depletion of abiotic resources (elements)	kg Sb eq.	6,77E-01	1,07E-05	3,12E-07	2,13E-06	6,21E-06	6,77E-01
Inventory	Total use of primary energy	MJ	3,61E+04	3,79E+03	9,88E+01	4,90E+02	2,34E+03	4,28E+04
Invei	Net fresh water use	m ³	1,47E+03	2,29E-02	2,22E-03	8,89E+01	2,37E-01	1,56E+03

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^{*} Installation stage includes only packaging disposal. Impacts related to installation processes might be completed by the PEP user.



	Indicators/ Flows	Unit	Manufacturing	Distribution	Installation	Use	End-of-life	TOTAL
						(for 1 A)		(for 1 A)
ental	Depletion of abiotic resources (fossil fuels)	MJ	2,21E+04	3,77E+03	9,60E+01	2,78E+02	1,49E+03	2,78E+04
Environmental impact indicators	Water pollution	m ³	1,68E+05	4,41E+04	1,11E+03	1,01E+03	1,14E+04	2,26E+05
Env	Air pollution	m ³	2,63E+06	4,06E+04	8,99E+02	1,06E+03	7,50E+03	2,68E+06
6	Use of renewable primary energy (excluding resources used as raw materials)	MJ	2,13E+03	4,84E+00	1,11E+00	6,23E+01	1,24E+02	2,32E+03
y resources	Use of renewable primary energy resources used as raw materials	MJ	1,71E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,71E+03
of primar	Total use of renewable primary energy resources	MJ	3,83E+03	4,84E+00	1,11E+00	6,23E+01	1,24E+02	4,03E+03
Inventory flows - Use of primary resources	Use of non-renewable primary energy (excluding resources used as raw materials)	MJ	2,80E+04	3,79E+03	9,77E+01	4,27E+02	2,21E+03	3,45E+04
Inventory fl	Use of non-renewable primary energy resources used as raw materials	MJ	4,33E+03	0,00E+00	0,00E+00 0,00E+0		0,00E+00	4,33E+03
	Total use of non- renewable primary energy resources	MJ	3,23E+04	3,79E+03	9,77E+01	4,27E+02	2,21E+03	3,88E+04
y flows - materials	Use of renewable secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
_	Use of non-renewable secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Invento Second.	Use of secondary materials	kg	9,03E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,03E+01
lows -	Hazardous waste disposed	kg	6,24E+04	0,00E+00	2,58E-02	1,28E-02	9,17E-02	6,24E+04
Inventory flows Waste	Non-hazardous waste disposed	kg	3,14E+02	9,13E+00	1,17E+02	9,14E+01	6,64E+02	1,20E+03
	Radioactive waste disposed	kg	1,87E+00	6,35E-03	6,05E-04	6,10E-02	2,58E-01	2,20E+00
- Output	Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
flows - C	Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Inventory flows flows	Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Inven	Materials for recycling	kg	3,20E+01	0,00E+00	2,18E+00	0,00E+00	5,71E+02	6,05E+02

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General information

The extrapolation rules have been calculated based on the environment impact assessment results of 6 products in the range TITANEX ® Mono (25mm2 ≥ section ≤ 300mm2). The reference product is TITANEX ® 1x70².

The extrapolation rules below apply to 1000m of product. In the following sections, the product weight is expressed in kg for 1000m of cable, where applicable.

Manufacturing



The extrapolation principle applicable to manufacturing stage impacts is a Linear variation versus weight.

Each environmental indicator value shall be calculated using the following formula:

Indicator = (a1 or a2) x Cable weight + (b1 or b2)

N.B.: extrapolation coefficients are different depending on whether the product weight is higher or lower than 1006 kg/km.

Table to be used for manufacturing stage

	Weight>1	006 kg/km	Weight<1	006 kg/km
	a1	b1	a2	b2
GWP	2,26E+00	-6,48E+01	2,14E+00	3,17E+01
ODP	5,27E-07	-9,92E-06	5,04E-07	7,09E-06
Α	1,04E-02	-1,30E+00	9,67E-03	-4,18E-01
EP	1,57E-03	-1,70E-01	1,45E-03	-4,47E-02
POCP	7,89E-04	-6,79E-02	7,19E-04	-4,30E-04
ADPe	9,31E-04	-1,86E-01	8,50E-04	-7,73E-02
TPE	4,15E+01	1,73E+02	3,88E+01	2,09E+03
FW	1,59E+00	1,29E+02	1,43E+00	2,24E+02
ADPf	2,50E+01	6,66E+02	2,44E+01	7,27E+02
WP	1,85E+02	1,13E+04	1,85E+02	5,61E+03
AP	3,59E+03	-6,86E+05	3,28E+03	-2,76E+05
PERE	2,88E+00	-5,42E+02	3,33E+00	-8,06E+02
PERM	1,97E+00	2,77E+01	4,44E-01	1,35E+03
PERT	4,85E+00	-5,14E+02	3,77E+00	5,47E+02
PENRE	3,35E+01	-1,63E+03	3,11E+01	5,75E+02
PENRM	3,14E+00	2,32E+03	3,93E+00	9,68E+02
PENRT	3,67E+01	6,89E+02	3,50E+01	1,54E+03
RSF	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	0,00E+00	0,00E+00	0,00E+00	0,00E+00
SM	1,23E-01	-2,41E+01	8,57E-02	1,19E+01
HWD	8,58E+01	-1,71E+04	7,84E+01	-7,10E+03
NHWD	3,34E-01	4,22E+01	3,20E-01	3,59E+01
RWD	2,01E-03	1,86E-01	1,82E-03	2,98E-01
CRU	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EE	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	5,25E-02	-6,21E+00	3,96E-02	-3,18E+00

Example: If the product weight is 888 kg/km, each indicator value shall be calculated with: 888 x a1 + b1.

The reckoned mean and maximum deviations concerning manufacturing impact extrapolation rules are respectively 1,64% and 20,15%.

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Distribution



The extrapolation principle applicable to distribution stage impacts is a Variation versus weight ratio.

The reference product weight to be used for the weight ratio is: 878 kg/km

Each environmental indicator value shall be calculated using the following formula:

Indicator = (Product Weight / Reference product Weight) x Indicator value for Reference Product

Example:

If the product weight is 888 kg/km, the weight ratio is (888/878) and each indicator value shall be calculated with: (Product Weight / Reference product Weight) x Indicator value for Reference Product.

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The reckoned mean and maximum deviations concerning distribution impact extrapolation rules are respectively 3,39% and 13,86%.





Installation



The extrapolation principle applicable to installation stage impacts is a Maximum impact value.

The maximum impact values indicated in the table below are applicable to the whole range for installation stage impacts.

Table to be used for installation phase

	Impact
	value
GWP	2,83E+01
ODP	1,92E-07
Α	1,39E-01
EP	1,48E-01
POCP	9,77E-03
ADPe	1,23E-06
TPE	3,89E+02
FW	8,78E-03
ADPf	3,77E+02
WP	4,37E+03
AP	3,55E+03
PERE	4,41E+00
PERM	0,00E+00
PERT	4,41E+00
PENRE	3,84E+02
PENRM	0,00E+00
PENRT	3,84E+02
RSF	0,00E+00
NRSF	0,00E+00
SM	0,00E+00
HWD	1,02E-01
NHWD	4,64E+02
RWD	2,39E-03
CRU	0,00E+00
EE	0,00E+00
MER	0,00E+00
MFR	4,25E+00

N.B.: Installation stage represents only the disposal of the packaging of the products. Installation processes are excluded from the system boundaries.

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Use



The extrapolation principle applicable to use stage impacts is a Variation versus resistivity ratio.

The reference product for resistivity ratio is TITANEX ® 1x70² with 1 active conductor(s) and a resistivity of 0,272 ohm/km/active conductor.

Each environmental indicator value shall be calculated using the following formula:

Indicator = (Product Resistivity / Reference product Resistivity) x Indicator value for Reference Product x (Nb of active conductors / Nb of active conductors in the reference product)

Example:

If the product resistivity is 1,2 ohm/km, the resistivity ratio shall be calculated as: 1,2/0,272.

Then, to calculate the environmental impact of a product, each impact indicator value of the use stage of the reference product shall be multiplied by the resistivity ratio and by the ratio of active conductors.

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The reckoned mean and maximum deviations concerning use impact extrapolation rules are respectively 0,00% and 0,01%.





End-of-life



The extrapolation principle applicable to end-of-life stage impacts is a Variation versus weight ratio.

The reference product weight to be used for the weight ratio is: 878 kg/km

Each environmental indicator value shall be calculated using the following formula:

Indicator = (Product Weight / Reference product Weight) x Indicator value for Reference Product

Example:

If the product weight is 888 kg/km, the weight ratio is (888/878) and each indicator value shall be calculated with: (Product Weight / Reference product Weight) x Indicator value for Reference Product.

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The reckoned mean and maximum deviations concerning end-of-life impact extrapolation rules are respectively 2,42% and 32,19%.



Terms and abbreviations

The various abbreviations used in the PEP document are explained in the table below:

Abbreviations	Environmental indicator/flow complete name
GWP	Global Warming
ODP	Ozone Depletion
Α	Acidification of soil and water
EP	Eutrophication
POCP	Photochemical Ozone Creation
ADPe	Depletion of abiotic resources - elements
TPE	Total use of Primary Energy
FW	Net use of Freshwater
ADPf	Depletion of abiotic resources - fossil fuels
WP	Water Pollution
AP	Air Pollution
PERE	Use of renewable primary energy, excluding renewable primary energy resources used as raw materials
PERM	Use of renewable primary energy resources as raw materials
PERT	Total use of renewable primary energy resources (PERE+PERM)
PENRE	Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw material
PENRM	Use of non-renewable primary energy resources as raw materials
PENRT	Total use of non-renewable primary energy resources (PENRE+PENRM)
RSF	Use of renewable secondary fuels
NRSF	Use of non-renewable secondary fuels
SM	Use of secondary materials
HWD	Hazardous waste disposed
NHWD	Non-hazardous waste disposed
RWD	Radioactive waste disposed
CRU	Components for reuse
EE	Exported energy
MER	Materials for energy recovery
MFR	Materials for recycling

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The products covered by the given PEP are represented in the below table with a

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The below table also provides the maximun linear resistance (ohm/km) of core at 20°C in D.C for Copper wires according to the standard IEC 60228, which can be used to calculate environmental impacts of use phase.

Section	Resistance (ohm/km)						N° o	f CON	DUCTO	RS					
		1	2	3	4	5	6	7	8	10	12	14	19	27	37
0,5	39														
0,75	26														
1	19,5														
1,5	13,3														
2,5	7,98														
4	4,95														
6	3,3														
10	1,91														
16	1,21														
25	0,78	•													
35	0,554	•													
50	0,386	•													
70	0,272	•													
95	0,206	•													
120	0,161	•													
150	0,129	•													
185	0,106	•													
240	0,0801	•													
300	0,0641	•													
400	0,0486														
500	0,0384														
630	0,0287														

For all products covered by this PEP, weight (kg/km) of each product & number of active conductors* in the cable are mentioned in the technical datasheet, which can be obtained from the link below:

 $\underline{https://www.nexans.fr/eservice/Navigate.nx?CZ=France\&language=fr_FR\&navigationId=356008}$

*Number of active conductors = total number of coductors - neutral (if applicable). If there is no neutral in the cable, the number of active conductors = total number of conductors. The technical datasheet mentions if there is a neutral or not in a given cable.

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