Product Environmental Profile

Product line : TSLF 24-36kV tree core

Reference product : TSLF 24kV 3x1x240A M

EDS 1153

PEP ecopassport N°:	NXNS-00095-V01.01-EN	Product Category Rules:	**PEP-PCR-ed3-EN-2015 04 02**
		Product Specific Rules:	**PSR-0001-ed3-EN-2015 10 16**
Verifier accreditation n°:	VH18	Program information & documents:	**www.pep-ecopassport.org**
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Independent verification of the declaration and data, in accordance with ISO 14025 : 2010

Internal ☐ External ☒

The PCR critical review was conducted by a panel of experts chaired by Philippe Osset (Solinnen).

PEP are compliant with XP C08-100-1 :2016
The elements of the present PEP cannot be compared with elements from another program.

Compliant with ISO 14025: 2010 "Environmental labels and declarations - Type III environmental declarations".

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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

TSLF 24kV 3x1x240A M

TSLF is a longitudinally and radially waterblocked, XLPE -insulated, copper wire screened, PE sheathed core cable with circular aluminium conductor. Tree twisted cores. The outer conductive layer on the insulation is crosslinked vulcanized elastomer. The cable may be used for fixed installation outdoors in air, ground and water and is designed according to HD 620 10K.

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 TSLF 24-36kV tree core and the reference product of the PEP is the product TSLF 24kV 3x1x240A M.

Functional unit:

To transmit energy expressed for 1 A over a distance of 1 km during 40 years and a 100% 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 Infrastructure - Power networks 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 6339,56 kg/km. Constituent materials are distributed as follows:

- 33,6% Plastics including 1,2% of recycled plastic for the product (7% of recycled PE in the sheath)
- 39,2% Metals
- 27,2% Others

Manufacturing

- All the products in the range TSLF 24-36kV tree core are manufactured in France and in Norway.
- The electricity mix models for the manufacturing stage are France, >1 kV and Norway, >1 kV.
- All Nexans sites in Norway and 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 Wooden drum. It is considered to be used 1 time.
- The considered packaging is a PEFC™ (Programme for the Endorsement of Forest Certification) certified wooden drum, ensuring responsible sourcing and sustainable forests management.

In Norway, Nexans has developed a collecting system for NX drums type called Tromløp, a Nexans Trommelservice. Returning drums can be made by phone (64 86 19 00), by e-mail (norge.trommelretur@nexans.com) or by internet (www.nexans.no/eservice).

Distribution

The transportation scenario for the impact assessment of the distribution stage is local (Norway), considering:

- 1000 km covered by truck.

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 Infrastructure / Power networks, with:

- Reference Lifetime (RLT) = 40 years
- Use rate = 100 %
- Current intensity (A): 1
- Cable resistance* (ohm/km): 0,125 *(*According to standard IEC 60228)*
- Number of active conductor(s): 1

- **Considering the aforementioned hypotheses, the energy consumption over the RLT at use stage is 43,8 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 Norway, <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 Norway, >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.

Nexans has the know-how of cables recycling at their end-of-life through the structure named Nexans Recycling Services (recycling.services@nexans.com), to offer a complete solution for the recycling of polymers and metals.

The reference product TSLF 24kV 3x1x240A M 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-2021-02 database.

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

Impact results for 1000 m of TSLF 24kV 3x1x240A M

	Indicators/ Flows	Unit	Manufacturing	Distribution	Installation*	Use (for 1 A)	End-of-life	TOTAL (for 1 A)
Environmental impact indicators	Global Warming	kg CO_2 eq.	2,79E+04	3,15E+02	8,66E+01	1,03E+00	4,17E+02	2,87E+04
	Ozone Depletion	kg CFC-11 eq.	6,12E-03	6,39E-07	5,91E-07	2,02E-09	6,90E-06	6,13E-03
	Acidification of soils and water	kg SO_2 eq.	1,81E+02	1,42E+00	4,25E-01	1,18E-03	1,65E+00	1,84E+02
	Water Eutrophication	kg PO_4^{3-} eq.	1,14E+01	3,26E-01	4,58E-01	1,44E-04	1,35E+00	1,35E+01
	Photochemical Ozone formation	kg C_2H_4 eq.	9,82E+00	1,01E-01	3,00E-02	9,65E-05	1,24E-01	1,01E+01
	Depletion of abiotic resources (elements)	kg Sb eq.	6,80E-01	1,26E-05	3,76E-06	8,84E-06	1,76E-04	6,81E-01
Inventory flows	Total use of primary energy	MJ	5,12E+05	4,46E+03	1,19E+03	2,14E+02	8,53E+03	5,26E+05
	Net fresh water use	m^3	1,37E+04	2,82E-02	2,70E-02	4,12E+02	7,14E+03	2,13E+04

* 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 (for 1 A)	End-of-life	TOTAL (for 1 A)
Environmental impact indicators	Depletion of abiotic resources (fossil fuels)	MJ	2,95E+05	4,43E+03	1,16E+03	5,00E+00	4,58E+03	3,05E+05
	Water pollution	m^3	1,78E+06	5,19E+04	1,34E+04	1,62E+01	5,26E+04	1,90E+06
	Air pollution	m^3	5,42E+06	1,29E+04	1,09E+04	2,48E+01	3,84E+04	5,48E+06
Inventory flows - Use of primary resources	Use of renewable primary energy (excluding resources used as raw materials)	MJ	2,32E+04	5,95E+00	1,36E+01	2,06E+02	3,64E+03	2,71E+04
	Use of renewable primary energy resources used as raw materials	MJ	2,09E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,09E+04
	Total use of renewable primary energy resources	MJ	4,42E+04	5,95E+00	1,36E+01	2,06E+02	3,64E+03	4,80E+04
	Use of non-renewable primary energy (excluding resources used as raw materials)	MJ	3,77E+05	4,46E+03	1,18E+03	8,90E+00	4,89E+03	3,88E+05
	Use of non-renewable primary energy resources used as raw materials	MJ	9,03E+04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,03E+04
	Total use of non-renewable primary energy resources	MJ	4,67E+05	4,46E+03	1,18E+03	8,90E+00	4,89E+03	4,78E+05
Inventory flows - Second. 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
	Use of secondary materials	kg	2,60E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,60E+02
Inventory flows - Waste	Hazardous waste disposed	kg	6,48E+04	0,00E+00	3,16E-01	3,44E-02	1,80E+00	6,48E+04
	Non-hazardous waste disposed	kg	5,57E+04	1,12E+01	1,43E+03	2,75E+00	2,78E+03	5,99E+04
	Radioactive waste disposed	kg	5,63E+01	7,99E-03	7,37E-03	1,60E-03	1,12E-01	5,65E+01
Inventory flows - Output flows	Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	Materials for recycling	kg	6,30E+01	0,00E+00	0,00E+00	0,00E+00	2,48E+03	2,54E+03

General information

The extrapolation rules have been calculated based on the environment impact assessment results of 5 products in the range TSLF 24-36kV tree core. The reference product is TSLF 24kV 3x1x240A M.

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/a2) x Cable weight + (b1/b2)

N.B.: extrapolation coefficients are different depending on whether the product weight is higher or lower than 3230,5 kg/km.

Table to be used for manufacturing stage

	Weight>3230,5 kg/km		Weight<3230,5 kg/km	
	a1	b1	a2	b2
GWP	7,58E+00	-8,90E+03	5,84E+00	-2,87E+03
ODP	1,80E-06	-2,50E-03	1,24E-06	-5,28E-04
A	5,22E-02	-7,23E+01	3,91E-02	-2,75E+01
EP	3,06E-03	-3,55E+00	2,46E-03	-1,42E+00
POCP	2,74E-03	-3,48E+00	2,11E-03	-1,29E+00
ADPe	6,21E-05	2,99E-01	2,36E-04	-1,99E-01
TPE	1,34E+02	-1,35E+05	9,85E+01	-1,23E+04
FW	3,70E+00	-2,51E+03	1,42E+00	6,50E+03
ADPf	7,19E+01	-5,46E+04	5,73E+01	-4,24E+03
WP	4,97E+02	-6,30E+05	3,70E+02	-1,97E+05
AP	1,06E+03	-3,90E+04	1,49E+03	-1,15E+06
PERE	7,32E+00	-1,09E+04	5,81E+00	-4,31E+03
PERM	2,11E+00	7,35E+03	5,44E-01	9,70E+03
PERT	9,42E+00	-3,56E+03	6,35E+00	5,39E+03
PENRE	1,12E+02	-1,61E+05	7,92E+01	-4,43E+04
PENRM	1,24E+01	2,91E+04	1,30E+01	2,66E+04
PENRT	1,24E+02	-1,32E+05	9,22E+01	-1,77E+04
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	3,20E-02	9,12E+01	5,41E-02	2,71E+01
HWD	6,40E+00	2,64E+04	2,22E+01	-1,88E+04
NHWD	1,73E+01	-2,78E+04	1,20E+01	-9,91E+03
RWD	1,82E-02	-2,97E+01	1,13E-02	-4,61E+00
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	3,27E-02	-9,02E+01	1,64E-02	-1,20E+00

Example: If the product weight is 4955 kg/km, each indicator value shall be calculated with: 4955 x a1 + b1.

The reckoned mean and maximum deviations concerning manufacturing impact extrapolation rules are respectively 2,44% and 15,30%.

Distribution

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

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

Indicator = a x Cable weight + b

Table to be used for distribution stage

	a	b
GWP	5,78E-02	1,82E+01
ODP	1,17E-10	3,68E-08
A	2,60E-04	8,16E-02
EP	5,97E-05	1,88E-02
POCP	1,85E-05	5,80E-03
ADPe	2,31E-09	7,27E-07
TPE	8,18E-01	2,57E+02
FW	5,17E-06	1,63E-03
ADPf	8,12E-01	2,55E+02
WP	9,51E+00	2,99E+03
AP	2,37E+00	7,45E+02
PERE	1,09E-03	3,42E-01
PERM	0,00E+00	0,00E+00
PERT	1,09E-03	3,42E-01
PENRE	8,16E-01	2,57E+02
PENRM	0,00E+00	0,00E+00
PENRT	8,16E-01	2,57E+02
RSF	0,00E+00	0,00E+00
NRSF	0,00E+00	0,00E+00
SM	0,00E+00	0,00E+00
HWD	0,00E+00	0,00E+00
NHWD	2,05E-03	6,45E-01
RWD	1,46E-06	4,60E-04
CRU	0,00E+00	0,00E+00
EE	0,00E+00	0,00E+00
MER	0,00E+00	0,00E+00
MFR	0,00E+00	0,00E+00

Example:

If the product weight is 4955 kg/km, each indicator value shall be calculated with: 4955 x a + b.

The reckoned mean and maximum deviations concerning distribution impact extrapolation rules are respectively 1,90% and 3,64%.

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.

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

Indicator = a x product weight + b

Table to be used for installation phase

	Impact value
GWP	8,66E+01
ODP	5,91E-07
A	4,25E-01
EP	4,58E-01
POCP	3,00E-02
ADPe	3,76E-06
TPE	1,19E+03
FW	2,70E-02
ADPf	1,16E+03
WP	1,34E+04
AP	1,09E+04
PERE	1,36E+01
PERM	0,00E+00
PERT	1,36E+01
PENRE	1,18E+03
PENRM	0,00E+00
PENRT	1,18E+03
RSF	0,00E+00
NRSF	0,00E+00
SM	0,00E+00
HWD	3,16E-01
NHWD	1,43E+03
RWD	7,37E-03
CRU	0,00E+00
EE	0,00E+00
MER	0,00E+00
MFR	0,00E+00

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

Use

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

The reference product for resistivity ratio is TSLF 24kV 3x1x240A M with 1 active conductor(s) and a resistivity of 0,125 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: 1,2/0,125.

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.

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 Linear variation versus weight.

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

Indicator = a x Cable weight + b

Table to be used for end-of-life stage

	a	b
GWP	7,48E-02	4,62E+01
ODP	9,98E-10	1,92E-06
A	3,00E-04	1,59E-01
EP	2,03E-04	3,37E-01
POCP	2,23E-05	1,33E-02
ADPe	3,48E-08	3,73E-06
TPE	1,64E+00	4,04E+02
FW	1,44E+00	5,84E-02
ADPf	8,61E-01	3,15E+02
WP	9,90E+00	3,60E+03
AP	5,99E+00	8,56E+03
PERE	7,32E-01	2,15E+01
PERM	0,00E+00	0,00E+00
PERT	7,32E-01	2,15E+01
PENRE	9,09E-01	3,82E+02
PENRM	0,00E+00	0,00E+00
PENRT	9,09E-01	3,82E+02
RSF	0,00E+00	0,00E+00
NRSF	0,00E+00	0,00E+00
SM	0,00E+00	0,00E+00
HWD	2,88E-04	3,69E-01
NHWD	3,85E-01	8,57E+02
RWD	1,77E-05	2,40E-02
CRU	0,00E+00	0,00E+00
EE	0,00E+00	0,00E+00
MER	0,00E+00	0,00E+00
MFR	6,62E-01	-7,80E+02

Example:

If the product weight is 4955 kg/km, each indicator value shall be calculated with: 4955 x a + b.

The reckoned mean and maximum deviations concerning end-of-life impact extrapolation rules are respectively 0,55% and 3,44%.

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
A	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 materia
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

Annex: Products covered by the family range

Product	Reference	Number of active conductors	Weight (kg/km)	Resistivity (Ohm/km)
TSLF 24kV 3x1x50A	10166755	3	2062	0,641
TSLF 24kV 3x1x95A	10166756	3	2873	0,320
TSLF 24kV 3x1x150A	10166757	3	3588	0,206
TSLF 24kV 3x1x240A	10166758	3	4945	0,125
TSLF 24kV 3x1x400A	10265297	3	6723	0,0778
TSLF 24kV 3x1x50A M (with red marking stripe)	10547785	3	2062	0,641
TSLF 24kV 3x1x95A M (with red marking stripe)	10547786	3	2873	0,320
TSLF 24kV 3x1x150A M (with red marking stripe)	10547787	3	3588	0,206
TSLF 24kV 3x1x240A M (with red marking stripe)	10547788	3	4945	0,125
TSLF 24kV 3x1x400A M (with red marking stripe)	10550360	3	6723	0,0778

The technical datasheets of all products covered by this PEP are available on the internet link :
https://www.nexans.no/eservice/Norway-en/navigate_372885/TSLF_24_36kV_tree_core.html