NUPI INDUSTRIE ITALIANE S.p.A.

ENVIRONMENTAL PRODUCT DECLARATION

Product names:

POLYPROPYLENE ELECTROFUSION FITTINGS TYPE NIRON, NIRON BETA AND POLYSYSTEM

Site Plants:

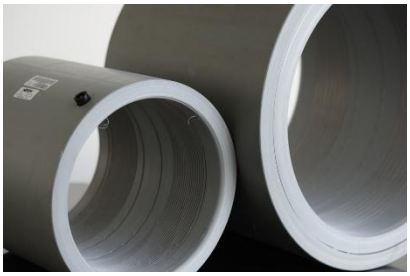
Busto Arsizio (VA)

in compliance with ISO 14025 and EN 15804+A2:2019

Program Operator	EPDItaly
Publisher	EPDItaly

Declaration Number	2026PCPPEF
Registration Number	EPDITALY1361

Issue Date	15/09/2026
Valid to	15/09/2031





General information

EPD OWNER:	Nupi Industrie Italiane S.p.A., Piazza San Marco n. 1, 20121 – Milano (MI) Italy
PLANT INVOLVED in the declaration:	Busto Arsizio: Via Stefano Ferrario n. 8 - 21052 Busto Arsizio (VA), Italy
SCOPE OF APPLICATION:	This Environmental Product Declaration (EPD) is valid for NIRON AND POLYSYSTEM electrofusion electrofusion fittings made of polypropylene. The production plant involved is the one located in Busto Arsizio (BA). The type of declaration is related to an average fitting product. The life cycle assessment is representative for the product introduced in the declaration for the given system boundaries.
PROGRAM OPERATOR:	EPDITALY, via Gaetano De Castillia 10, 20124 Milano, Italia.
INDIPENDENT CHECK:	This declaration has been developed referring to EPDItaly, following the General Programme Instruction; further information and the document itself are available at: www.epditaly.it. EPD document valid within the following geographical area: Italy and other countries according to sales market conditions. CEN standard EN 15804 served as the core PCR (PCR ICMQ-001/15 rev.3.2; 03/11/2025). PCR review was conducted by Daniele Pace. Contact via info@epditaly.it Independent verification of the declaration and data, according to EN ISO 14025:2010. Third party verifier: ICMQ SpA, via De Castillia, 10 20124 Milano (www.icmq.it) ☐EPD process certification (Internal)☑ EPD verification (External) ***Accredited by: Accredia***
CPC CODE:	3632 - Tubes, pipes and hoses, and fittings therefor, of plastics
CORPORATE CONTACT:	info@nupinet.com
TECHNICAL SUPPORT:	Sphera https://www.sphera.com
COMPARABILITY:	Environmental product declarations published within the same product category, but from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804+A2.

ACCOUNTABILITY:	Nupi Industrie Italiane S.p.A relieves EPDItaly from any non-compliance with environmental legislation. The EPD owner will be responsible for the information and supporting evidence; EPDItaly declines all responsibility for the manufacturer's information, data and results of the life cycle assessment.
REFERENCE DOCUMENT:	This declaration has been developed following the EPDItaly Program Regulations and Annexes of EPDItaly, available at www.epditaly.it.
PRODUCT CATEGORY RULES (PCR):	PCR ICMQ-001/15 rev.3.2 – 03/11/2025 EN 15804+A2:2019 is the framework reference for PCRs. EN 16904:2025
EPD PROJECT REPORT	2026_08_11_EF medio

Company

OUR MISSION – FOR OVER 50 YEARS

Cutting edge solutions for any kind of installation

The primary goal of Nupi Industrie Italiane S.p.A. corporate strategy is not only the production of systems that meet performance requirements and comply with the use for which they are intended, but above all general customer satisfaction. Producing better and faster are goals that technology makes more and more compatible.

In 2022, Nupi Industrie Italiane S.p.A. celebrated its 50th anniversary! In October 2015, it took over from Nupigeco S.p.A., founded in October 2008 from the merger of NUPI S.p.A. and GECO System S.p.A., to form a single large company. Combining their many years of experience and constant growth, the two firms decided to create a new flexible and advanced company, ready to play its role to satisfy the demands of the market whilst being environmentally astute.

The goal was to combine the expertise in the development and production of piping systems for plumbing, industrial applications, gas, irrigation and heating, with the experience in the production of polymer electrofusion fittings specifically dedicated to oil, chemical and petrochemical fields.







Management System and Certifications

Nupi Industrie Italiane S.p.A. submits its management and production systems to external audits performed by third party certification bodies.
Audit frequency depends on the procedure established by the specific standard and by each certification body. Nupi Industrie Italiane S.p.A. is certified in compliance with the standards for quality (EN ISO 9001), environment (EN ISO 14001) and Health and Safety of workers (ISO 45001).
Thanks to the synergy between the phases of research, production, quality control and after-sales service, the company obtained several international quality company and product certifications.

UNI EN ISO 9001
UNI EN ISO 14001
ISO 45001



Product Certifications

The company leadership is based on these solid foundations in a competitive and high technology industry such as plastics processing. A record that NUPI Industrie Italiane S.p.A. maintains thanks to high quality products and constant attention to customers' needs through an efficient after-sales service, a precise and timely technical assistance and installers' training.
NUPI products are of high quality, complying with regulations and conforming to the most stringent standards and certifications schemes. The full updated list is available on the website: www.nupiindustrieitaliane.com.

EPD Goal and scope

The entire life cycle of the product is considered (Type of EPD: cradle to grave and module D) and the modules described below are declared in this EPD:

*Modules **A1-A3** include those processes that provide energy and material input for the system (A1), transport up to the factory gate of the plant (A2), manufacturing processes as well as waste processing and emissions to air (A3).*

*Module **A4** includes the transport from the production site to the customer or to the point of installation of the products.*

*Module **A5** considers all fitting systems installation steps (negligible), the installation is done inside building mainly manually performed or with a minimum energy) plus packaging waste processing (recycling, incineration, disposal). Credits from energy substitution are declared in module D. During this phase, a specific leftover has been considered.*

*Module **B1** considers the use of the installed product. During the use of plastic piping systems, a scenario of zero impact is considered.*

*Module **B2** includes the maintenance of the product. A scenario of zero impact is considered.*

*Modules **B3-B4-B5** are related to the repair, replacement and refurbishment of the products. If the products are properly installed no repair, replacement or refurbishment processes are necessary. A scenario of zero impact is then considered.*

*Module **C1** considers deconstruction, including dismantling or demolition of the product from the building.*
For products installed inside buildings a scenario of zero impact is considered.

*Module **C2** considers transportation of the discarded piping system to a recycling or disposal process.*

*Module **C3** considers waste processing for products sorting, recycling and incineration.*

*Module **C4** includes all waste disposal processes, including pre-treatment and management of the disposal site.*

*Module **D** includes benefits from all net flows in the end-of-life stage that leave the product boundary system after having passed the end-of-waste stage. Benefits from packaging incineration (electricity and thermal energy) are declared within module D.*

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

X = modules included in the study

The emission factor for the electricity used in A3 is 0.199 KgCO2eq/kWh.

According to the PCR ICMQ-001/15 rev. 3.2 this EPD is a “cradle to grave and module D” Type. it is an average EPD for the product NIRON AND POLYSYSTEM electrofusion fittings produced in NUPI INDUSTRIE ITALIANE S.p.A. plant located in Busto Arsizio (VA). All data refer to the 2024 production and sales.

All manufacturing activities and packaging/auxiliary’s production are in module A3, while energy production and input materials are in A1. Transport to clients (A4) is included together with end-of-life scenarios (benefits and loads included according to D module).

The declaration is a Type 3 EPD (product EPD based on a qualified LCA-Tool) according to /REGULATIONS OF THE EPDItaly PROGRAMME 6/.

Geographical validity: EU+GLO

Time Representativeness: The primary data cover a period of 12 months, reference 2024.

Database: MLC Database 2024.2

NUPI LCA Tool v.5 25.01.2025: The LCA model is created using the Sphera LCA for Expert (previously GaBi Professional) Software system for life cycle engineering, developed by Sphera. The /MANAGED LCA CONTENT (GABI DATABASES)/ provides the life cycle inventory data for several of the raw and process materials obtained from the background system.

EPD realized by means of a validated algorithm:
In 2019 NUPI Industrie Italiane S.p.A. implemented and certified a Process for EPD generation by using an algorithm that has been validated and certified by ICMQ S.p.A., in agreement with EPDItaly’s requirements. The process is based on an automatic data collection from different manufacturing plants that have been integrated, verified and validated in compliance with internal procedures. The validated algorithm allows the automatic calculation of the indicators reported into the current EPD coming from an LCA model implemented into the NUPI LCA process tool.
In 2025, after the five years period of validity, the NUPI LCA tool has been updated and validated by ICMQ S.p.A. The LCA tool enables the creation of partly verified LCA results for electrofusion fittings, electrofusion fittings and piping systems produced by NUPI

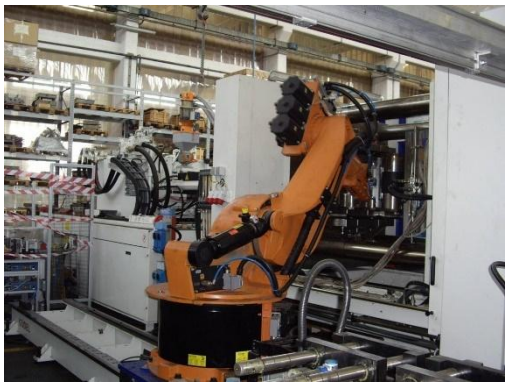
Product description

Detailed product description

POLYSYSTEM, NIRON and NIRON BETA electrofusion fittings are polypropylene random copolymer (PP-R and PP-RCT) products manufactured by Nupi Industrie Italiane S.p.A. for the conveyance of hot and cold water and other technical fluids in building services and industrial applications. The electrofusion fittings are produced in a range of diameters and pressure classes and are designed for use in plumbing, heating, cooling and HVAC systems. POLYPROPYLENE electrofusion fittings are joined by thermal fusion, creating homogeneous and leak-tight connections. The products are manufactured in accordance with the applicable requirements of EN ISO 15874 and related product specifications.

Production processes description

FITTINGS INJECTION MOULDING (Busto Arsizio)



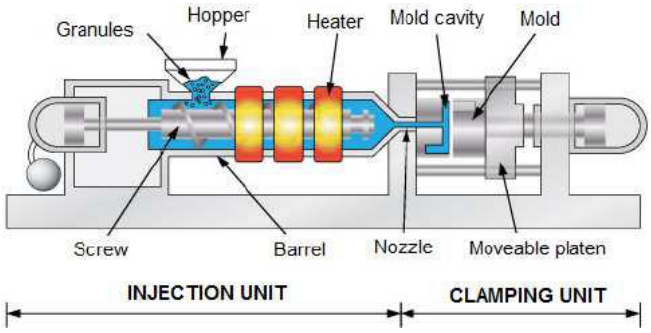


Figure 1 Injection Molding process

Equipment to mould fittings consists of a mould and an injection moulding press. The mould is a split metal block that is machined to form a part shaped cavity in the block. Hollows in the part are created by core pins shaped into the part cavity. The moulded part is created by filling the cavity in the mould block through a filling port, called a gate.

The injection moulding press has two parts; a press to open and close the mould block, and an injection extruder to inject material into the mould block cavity. The injection extruder is similar to a conventional extruder except that, in addition to rotating, the extruder screw also moves lengthwise in the barrel. Injection moulding is a cyclical process. The mould block is closed and the extruder barrel is moved into contact with the mould gate. The screw is rotated and then drawn back, filling the barrel ahead of the screw with material. Screw rotation is stopped, and the screw is rammed forward, injecting molten material into the mould cavity under high pressure. The part in the mould block is cooled by water circulating through the mould block. When the part has solidified, the extruder barrel and mould core pins are retracted, the mould is opened, and the part is ejected.

Niron&Polysystem electrofusion fittings are designed to fully exploit the characteristics of the materials used to make them and offer high performance standards that allow them to be used both for plumbing and heating systems. The table below, an excerpt from Standard EN ISO 15874, demonstrates the fields of use and the corresponding operating pressures and temperatures guaranteed for this system.

PP-R

	APPLICATION CLASSES								P_D					
	1	2	4	5	1	2	4	5			10	8	6	4
P_D	S				SDR				S	SDR	ALLOWABLE CLASSES			
4	5	5	5	3,2	11	11	11	7,4	2,5	6	1&4	2	5	5
6	5	3,2	5	3,2	11	7,4	11	7,4	3,2	7,4	2)	1&4	2	5
8	3,2	2,5	3,2	-	7,4	6	7,4	1)	5	11	2)	2)	1&4	1&2&4
10	2,5	-	2,5	-	6	1)	6	1)						

PP-RCT

	APPLICATION CLASSES								P_D					
	1	2	4	5	1	2	4	5			10	8	6	4
P_D	S				SDR				S	SDR	ALLOWABLE CLASSES			
4	8	8	8	5	17	17	17	11	3,2	7,4	1&2&4	5	5	5
6	5	5	5	4	11	11	11	9	4	9	2)	1,2,4	5	5
8	4	4	4	3,2	9	9	9	7,4	5	11	2)	2)	1&2&4	5
10	3,2	3,2	3,2	1)	7,4	7,4	7,4	1)	8	17	2)	2)	2)	1&2&4

1) Series/SDR not available in the NIRON piping range.

2) Application class not covered by this Series/SDR.

Example: A PP-RCT, SDR7,4, Series 3,2 pipe can be used in application classes 1,2 and 4 with a design pressure of 10 bar and in class 5 with a design pressure of 8 bar.

Service Conditions - Application classes as per EN ISO 15874 and ISO 10508

PROPERTIES	TEST METHOD	VALUES AT +23°C	UNIT OF MEASURE
Volumic mass	ISO 1183	**0,898**	g/cm^3
Yield strength	ISO 527	**23**	N/mm^2
Elongation at break	ISO 527	**> 50**	%
Modulus of elasticity	ISO 527	**850**	N/mm^2
Melt flow index MFI 190/5	ISO 1133	**0,5**	g/10 min
Heat conductivity (λ)	DIN 52612	**0,24**	W/mk
Linear thermal expansion coefficient	VDE 0304	**$1,5 \times 10^{-4}$**	K^{-1}
Melting point	DIN 53736b2	**150 - 154**	°C
Impact strength (Charpy)			
+23°C	ISO 179/1 e A	**no break**	KJ/m^2
-30°C	ISO 179/1 e A	**50**	KJ/m^2
Volumic strength	IEC 93	**$>10^{15}$**	Ω cm
Dielectric strength	IEC 243/1	**75**	KV/mm
Dielectric loss factor	DIN 53483	**$< 5 \times 10^{-4}$**	
Fire resistance	DIN 4102	**B2**	

Physical properties Niron and Polysystem PP material

Electrofusion fittings are classified as Class 1, 2 or 5 in compliance with EN ISO 15874 Table 1 in combination with the dedicated Design Pressure given by the fitting SDR.

Base materials/ancillary materials in the functional/declared unit

Material	Piping system
Polypropylene granulate	92,2 %
Pigments for Polypropylene	0,4 %
Brass	1,1 %
Copper alloy	6,3 %
TOTAL	100%

The product contains lead in the brass pins with a percentage of 2-2.5 % in weight. Lead is included in the “Candidate List of Substances of Very High Concern for Authorization" – SVHC – as per REACH regulation.

Description of functional/declared unit

In this EPD an average fitting is considered. The fitting diameters range considered in the data collection includes a size range from DN 20 to DN 355, type couplers, (90° and 45°) elbows, (equal and reduced) tees and reducers. The raw material used can be PP-R or PP-RCT.

It has been considered a declared unit of 1 kg of NIRON, NIRON BETA AND POLYSYSTEM electrofusion fittings.

The declared unit’s packaging includes 0,038 kg/kg of wooden pallets, 0,067 kg/kg card boxes and 0,0216 kg/kg of polyethylene bags and stretch films.

Reference service life (RSL)

NIRON AND POLYSYSTEM electrofusion fittings are regarded as having 50 years RSL independent of their material, according with EN 16904.

Products Distribution

Polypropylene electrofusion fittings the packaging consists in plastic bags, wooden pallets and cardboard boxes.

Installation

According to PCR EN 16904 installation of the product was considered to be negligible, as it is done manually in the building or with a minimum energy. Environmental impacts from waste packaging materials (A5) and release of biogenic carbon dioxide from wood pallets and cardboard boxes was considered. The impacts of material production, its processing and its disposal as installation waste are also included. Packaging treatment scenarios are based on Eurostat data for Europe.

No emissions are generated during installation and plastic electrofusion fittings installations do not cause health or environmental hazards.

End of Life

After the demolition and deconstruction phase, the EU EOL as per MFA JRC 2025 (2024 data) scenario for Polypropylene materials has been chosen (45.5 % incineration, 39.3% landfill and 15.2% recycling).

For transport from the installation site to the treatment site (C2), the considered distances (as per EN 16904) were:

- incineration = 150 km
- recycling = 500 km
- landfilling = 50 km

LCA results – Environmental impacts per declared unit

The tables below show the environmental impacts results of 1 kg of NIRON, NIRON BETA AND POLYSYSTEM electrofusion fittings.

Additional environmental impact indicators have been calculated and included in the project report but are not declared according to /EN 15804+A2:2019/ chapter 7.2.3.2.

CORE ENVIRONMENTAL IMPACT INDICATORS												
	A1	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP - total [kg CO_2 eq.]	2,55E+00	2,38E-01	9,37E-01	3,73E+00	2,75E-01	2,34E-01	0,00E+00	0,00E+00	1,77E-02	1,36E+00	1,06E-02	-1,12E+00
GWP- fossil [kg CO_2 eq.]	2,54E+00	2,33E-01	1,08E+00	3,85E+00	2,75E-01	3,30E-02	0,00E+00	0,00E+00	1,77E-02	1,36E+00	1,05E-02	-1,11E+00
GWP - biogenic [kg CO_2 eq.]	6,93E-03	6,55E-04	-1,48E-01	-1,40E-01	2,51E-04	2,01E-01	0,00E+00	0,00E+00	1,62E-05	2,37E-04	3,22E-05	-1,90E-03
GWP - LULUC [kg CO_2 eq.]	1,49E-03	3,76E-03	6,03E-04	5,85E-03	3,08E-05	3,72E-06	0,00E+00	0,00E+00	2,28E-06	9,29E-06	3,88E-05	-1,13E-03
ODP [kg CFC-11 eq.]	2,33E-11	3,44E-14	6,29E-13	2,40E-11	3,20E-14	3,10E-14	0,00E+00	0,00E+00	2,21E-15	4,94E-13	3,46E-14	-6,80E-12
AP [mol of H+ eq.]	8,79E-03	3,51E-04	5,73E-04	9,71E-03	2,34E-03	2,22E-05	0,00E+00	0,00E+00	2,39E-05	1,82E-04	6,29E-05	-5,10E-03
EP - freshwater [kg P eq.]	2,96E-06	9,57E-07	1,42E-06	5,34E-06	7,26E-08	1,87E-07	0,00E+00	0,00E+00	4,66E-09	1,57E-07	5,99E-06	-1,74E-06
EP - marine [kg N eq.]	1,64E-03	1,32E-04	2,47E-04	2,02E-03	1,01E-03	8,11E-06	0,00E+00	0,00E+00	9,43E-06	4,11E-05	1,36E-05	-5,80E-04
EP - terrestrial [mol of N eq.]	1,75E-02	1,56E-03	2,62E-03	2,17E-02	1,11E-02	8,87E-05	0,00E+00	0,00E+00	1,06E-04	7,59E-04	1,49E-04	-6,16E-03
POCP [kg NMVOC eq.]	6,63E-03	3,51E-04	7,54E-04	7,74E-03	2,33E-03	3,15E-05	0,00E+00	0,00E+00	2,58E-05	1,19E-04	4,34E-05	-2,03E-03
ADPe [kg Sb eq.]*	2,05E-04	1,98E-08	2,62E-07	2,05E-04	7,13E-09	6,45E-10	0,00E+00	0,00E+00	4,74E-10	8,62E-09	6,98E-10	-1,79E-04
ADPf [MJ]*	8,93E+01	3,11E+00	2,99E+00	9,54E+01	3,58E+00	8,48E-02	0,00E+00	0,00E+00	2,35E-01	6,58E-01	1,77E-01	-2,24E+01
WDP [m^3 world equiv.]*	5,12E-01	3,49E-03	2,05E-01	7,20E-01	6,56E-04	6,12E-03	0,00E+00	0,00E+00	4,44E-05	1,28E-01	1,36E-03	-2,50E-01

Caption: GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP- terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element), ADPF = abiotic depletion potential (fossil) WDP = water scarcity.

*The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator according to EN 15804+A2:2019 chapter 7.2.3.2.

LCA results – Resource use per declared unit

RESOURCE USE												
	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
PERE [MJ]	1,53E+01	2,55E-01	7,69E-01	1,63E+01	2,49E-02	3,13E-01	0,00E+00	0,00E+00	1,72E-03	3,03E-01	2,68E-02	-4,61E+00
PERM [MJ]	0,00E+00	0,00E+00	1,77E+00	1,77E+00	0,00E+00	-2,92E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT [MJ]	1,53E+01	2,55E-01	2,54E+00	1,81E+01	2,49E-02	2,09E-02	0,00E+00	0,00E+00	1,72E-03	3,03E-01	2,68E-02	-4,61E+00
PENRE [MJ]	4,77E+01	3,11E+00	2,00E+00	5,28E+01	3,58E+00	4,52E-01	0,00E+00	0,00E+00	2,35E-01	1,96E+01	1,77E-01	-2,24E+01
PENRM [MJ]	4,16E+01	0,00E+00	9,94E-01	4,26E+01	0,00E+00	-3,68E-01	0,00E+00	0,00E+00	0,00E+00	-1,89E+01	0,00E+00	0,00E+00
PENRT [MJ]	8,93E+01	3,11E+00	2,99E+00	9,54E+01	3,58E+00	8,48E-02	0,00E+00	0,00E+00	2,35E-01	6,58E-01	1,77E-01	-2,24E+01
SM [kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,97E-01
RSF [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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW [m³]	1,22E-02	2,84E-04	5,26E-03	1,77E-02	2,76E-05	1,50E-04	0,00E+00	0,00E+00	1,88E-06	3,09E-03	4,06E-05	-6,22E-03

Caption: 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 resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

LCA results – Output flows and waste categories per declared unit

WASTE CATEGORIES AND OUTPUT FLOWS												
	A1	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
HWD [kg]	6,53E-08	1,19E-10	4,69E-08	1,12E-07	1,27E-10	1,06E-09	0,00E+00	0,00E+00	8,55E-12	1,69E-08	4,38E-11	-8,48E-09
NHWD [kg]	1,28E-01	4,98E-04	1,88E-02	1,47E-01	3,68E-04	1,90E-02	0,00E+00	0,00E+00	2,45E-05	1,03E-02	3,58E-01	-9,52E-02
RWD [kg]	6,70E-04	5,62E-06	7,78E-05	7,53E-04	5,45E-06	4,23E-06	0,00E+00	0,00E+00	3,74E-07	7,44E-05	2,50E-06	-8,23E-04
EEE [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	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET [MJ]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,35E-02	0,00E+00	0,00E+00	0,00E+00	2,09E-01	0,00E+00	0,00E+00
CRU [kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER [kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,03E-01	0,00E+00	0,00E+00	0,00E+00	2,74E+00	0,00E+00	0,00E+00
MFR [kg]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,65E-01	0,00E+00	0,00E+00	0,00E+00	4,88E+00	0,00E+00	0,00E+00

.Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

LCA results – Biogenic carbon content of product and packaging per declared unit

Biogenic carbon content of product and packaging	
Biogenic carbon content in product [kg]	0,00E+00
Biogenic carbon content in packaging [kg]	4,28E-02

Assumptions and approximations

Where possible, a conservative approach has been adopted, overestimating burdens to prove irrelevance. In other cases, proxy data were selected based on scientific experience, in order to improve the accuracy of the model. Where it was not possible to know the precise composition of materials in the supply chain (due to commercial or industrial confidential suppliers' reasons or due to missing datasets), these have been approximated with LCIs of similar materials, estimated by the combination of available dataset or reconstructed with literature data.

1. Where potential benefits from energy recovery in A5 and C modules are considered, for rest of world countries (other than Europe) these are calculated based on the European grid mix.
2. Wastes deriving from extraordinary maintenance activities have not been considered.
3. Some components produced by third party companies come to NUPI with their own packaging. This packaging is not accounted for in this study.
4. In case of CCHP system in place as electricity is produced only for internal use, no electricity is sent to national grid.
5. Internal transports between production sites have not been considered
6. A European scenario has been considered for end of life scenarios.

Cut off criteria

EN 15804+A2:2019 requires that where there are data gaps or insufficient input data for a unit process the cut-off criteria shall be 1% of renewable and non-renewable primary energy usage and 1% of the total mass of this unit process. It can be concluded that the total sum of neglected material flows does not exceed 5% of mass, energy or environmental relevance. On the other hand, impacts generated from the machinery and facilities itself are neglected. This is in accordance with ISO14040/44 (2006).

In this study, the only aspects that have been omitted are the polyamide strips for packaging as they are <1% of their respective unit processes.

Data quality

The data quality can be considered as good. The LCA model has been checked and most relevant flows were considered. Technological, geographical and temporal representativeness is good.

Examination period

Primary data collected in the context of this study refer to 2024.

Allocation of background data

In general, the allocation principles used in standard Sphera LCA for Expert (previously GaBi Professional) datasets are explained within Sphera LCA for Expert (GaBi)-Documentation (MANAGED LCA CONTENT (GABI DATABASES)).

- **Module A1** includes the manufacture of primary materials which are required for the electrofusion fittings manufacturing. The datasets for the primary basic materials already include their upstream process. The energy demand is also considered.
- **Module A2** includes the transports of the basic materials to the electrofusion fittings producer. Fuel use is also included in the transport sub-plans. Truck-trailer, Euro 6 A-C, 20 - 28t gross weight / 12.4t payload capacity, Container ship, 5,000 to 200,000 dwt payload capacity, deep sea and Rail transport cargo - average, average train, gross tonne weight 1,000t / 726t payload capacity are used as standard processes in the model.
- **Module A3** includes the production of electrofusion fittings, auxiliaries and packaging materials. In this module are also considered emissions to air, production of wastes and their treatment (such activities refer to NUPI Industrie Italiane S.p.A. direct activities. Primary data have been used for (such as injection moulding for electrofusion fittings production and emissions/wastes).

- **Module A4** takes into account the transport to the final customer/distributor or construction site. The distribution scenario is taken from an internal survey and shown below:

Means of transport	GaBi transport dataset	Weighted Average distance [km]
Truck	Truck, Euro 5, > 32 t/ 27% utilization factor 26 t truck max load	900,58
Ship	Average ship, 5000-200000 dwt payload capacity/ deep sea	2267,10

- **Module C1** (Deconstruction / demolition)- As generic scenario for the demolition of piping system, it is considered that it is mainly demolished together with the construction of the building. During the demolition of a building a significant amount of energy is used. This energy is mainly used to break inert waste streams, such as concrete and brick, and only a very little, insignificant part could be allocated to the product. Therefore, the impact of the deconstruction/demolition stage allocated to the product can be considered as zero.
- **Module C2, C3** (sorting, recycling and incineration with energy recovery) and C4 (landfilling) consider the end of life scenarios of the product, considering all components. The percentages to the given scenarios have been taken from MFA JRC 2025 (2024 data) as shown below:

  - 45.5 % incineration, 39.3% landfill, 15,2% recycling typical for products made of PP.

  For transport from the installation site to the treatment site, reference can be made to the document /TEPPFA EOL SCENARIO/ where it is stated that:
  • incineration = 150 km
  • recycling = 500 km
  • landfilling = 50 km

Module D consists of loads and benefits beyond the system boundaries.

Other additional environmental information

Emissions to indoor air:

No direct emissions at the construction site. Nupi Industrie Italiane S.p.A confirms that the “NIRON, NIRON BETA and Polysystem” electrofusion fitting contains lead in its electrofusion brass pins in a percentage of 2-2.5 % w/w. Lead is a substance mentioned on the REACH SVHC list.

Emissions to soil and water:

No direct emissions at the construction site. Nupi Industrie Italiane S.p.A confirms that the ““NIRON, NIRON BETA and Polysystem” electrofusion fitting contains lead in its electrofusion brass pins in a percentage of 2-2.5 % w/w. Lead is a substance mentioned on the REACH SVHC list.

Annex I – Products specific weight table

Items Code	Description	weight (kg/piece)
03NCEM110	ELECTRIC 45° ELBOW ø110 (SDR11)	1,18
03NCEM125	ELECTRIC 45° ELBOW ø125 (SDR 11)	1,56
03NCEM160	ELECTRIC 45° ELBOW ø160 (SDR11)	2,30
03NCEM200	ELECTRIC 45° ELBOW ø200 (SDR11)	4,80
03NCEM32	ELECTRIC 45° ELBOW ø32 (SDR11)	0,09
03NCEM40	ELECTRIC 45° ELBOW ø40 (SDR 11)	0,14
03NCEM50	ELECTRIC 45° ELBOW ø50 (SDR 11)	0,17
03NCEM63	ELECTRIC 45° ELBOW ø63 (SDR 11)	0,36
03NCEM75	ELECTRIC 45° ELBOW ø75 (SDR 11)	0,44
03NCEM90	ELECTRIC 45° ELBOW ø90 (SDR 11)	0,91
03NGEM110	ELECTRIC 90° ELBOW ø110 (SDR11)	1,35
03NGEM125	ELECTRIC 90° ELBOW ø125 (SDR 11)	1,89
03NGEM160	ELECTRIC 90° ELBOW ø160 (SDR 11)	1,97
03NGEM200	ELECTRIC 90° ELBOW ø200 (SDR11)	6,12
03NGEM32	ELECTRIC 90° ELBOW ø32 (SDR11)	0,11
03NGEM40	ELECTRIC 90° ELBOW ø40 (SDR11)	0,16
03NGEM50	ELECTRIC 90° ELBOW ø50 (SDR 11)	0,22
03NGEM63	ELECTRIC 90° ELBOW ø63 (SDR 11)	0,42
03NGEM75	ELECTRIC 90° ELBOW ø75 (SDR 11)	0,67
03NGEM90	ELECTRIC 90° ELBOW ø90 (SDR 11)	1,00
03NME110	ELECTROFUSION COUPLER ø110 (SDR 11)	0,66
03NME125	ELECTROFUSION COUPLER ø125 (SDR 11)	1,16
03NME160	ELECTROFUSION COUPLER ø160 (SDR 11)	1,50
03NME20	ELECTROFUSION COUPLER ø20 (SDR 7,4)	0,05
03NME200	ELECTROFUSION COUPLER ø200 (SDR 11)	2,12
03NME25	ELECTROFUSION COUPLER ø25 (SDR 7,4)	0,06
03NME250	ELECTROFUSION COUPLER ø250 (SDR 11)	5,28
03NME315	ELECTROFUSION COUPLER ø315 (SDR 11)	7,89
03NME32	ELECTROFUSION COUPLER ø32 (SDR 7,4)	0,07
03NME40	ELECTROFUSION COUPLER ø40 (SDR 7,4)	0,11
03NME50	ELECTROFUSION COUPLER ø50 (SDR 7,4)	0,15

Items Code	Description	weight (kg/piece)
03NME63	ELECTROFUSION COUPLER ø63 (SDR 7,4)	0,22
03NME75	ELECTROFUSION COUPLER ø75 (SDR 7,4)	0,34
03NME90	ELECTROFUSION COUPLER ø90 (SDR 11)	0,50
27NCEM110	Electrofusion 45° Elbow ø110 - Single wire	1,19
27NCEM125	Electrofusion 45° Elbow ø125 - Single wire	1,86
27NCEM160	Electrofusion 45° Elbow ø160 - Single wire	2,93
27NCEM200	Electrofusion 45° Elbow ø200 - Single wire	5,40
27NCEM32	Electrofusion 45° Elbow ø32 - Single wire	0,08
27NCEM40	Electrofusion 45° Elbow ø40 - Single wire	0,14
27NCEM50	Electrofusion 45° Elbow ø50 - Single wire	0,17
27NCEM63	Electrofusion 45° Elbow ø63 - Single wire	0,36
27NCEM75	Electrofusion 45° Elbow ø75 - Single wire	0,44
27NCEM90	Electrofusion 45° Elbow ø90 - Single wire	0,90
27NGEM110	Electrofusion 90° Elbow ø110	1,35
27NGEM125	Electrofusion 90° Elbow ø125	1,90
27NGEM160	Electrofusion 90° Elbow ø160	5,50
27NGEM200	Electrofusion 90° Elbow ø200	5,96
27NGEM32	Electrofusion 90° Elbow ø32	0,10
27NGEM40	Electrofusion 90° Elbow ø40	0,15
27NGEM50	Electrofusion 90° Elbow ø50	0,19
27NGEM63	Electrofusion 90° Elbow ø63	0,42
27NGEM75	Electrofusion 90° Elbow ø75	0,60
27NGEM90	Electrofusion 90° Elbow ø90	1,00
27NME11011	SDR 11 - Electrofusion Coupling ø110	0,61
27NME11073	SDR 7,4 - Electrofusion Coupling ø110	0,97
27NME12511	SDR 11 - Electrofusion Coupling ø125	0,98
27NME12573	SDR 7,4 - Electrofusion Coupling ø125	1,00
27NME16011	SDR 11 - Electrofusion Coupling ø160	1,43
27NME16017	SDR 17 - Electrofusion Coupling ø160	1,50
27NME16073	SDR 7,4 - Electrofusion Coupling ø160	2,77
27NME20011	SDR 11 - Electrofusion Coupling ø200	1,97
27NME20017	SDR 17 - Electrofusion Coupling ø200	1,39
27NME20073	SDR 7,4 - Electrofusion Coupling ø200	4,55
27NME2073	SDR 7,4 - Electrofusion Coupling ø20	0,05
27NME25011	SDR 11 - Electrofusion Coupling ø250	3,88
27NME25017	SDR 17 - Electrofusion Coupling ø250	5,13
27NME25073	SDR 7,4 - Electrofusion Coupling ø250	7,16

Items Code	Description	weight (kg/piece)
27NME2573	SDR 7,4 - Electrofusion Coupling ø25	0,06
27NME31511	SDR 11 - Electrofusion Coupling ø315	7,89
27NME31517	SDR 17 - Electrofusion Coupling ø315	4,82
27NME31573	SDR 7,4 - Electrofusion Coupling ø315	11,00
27NME3273	SDR 7,4 - Electrofusion Coupling ø32	0,06
27NME35511	SDR 11 - Electrofusion Coupling ø355	12,00
27NME40011	SDR 11 - Electrofusion Coupling ø400	18,06
27NME4073	SDR 7,4 - Electrofusion Coupling ø40	0,11
27NME45011	SDR 11 - Electrofusion Coupling ø450	20,80
27NME50011	SDR 11 - Electrofusion Coupling ø500	37,50
27NME50017	SDR 17 - Electrofusion Coupling ø500	37,50
27NME5073	SDR 7,4 - Electrofusion Coupling ø50	0,15
27NME56017	SDR 17 - Electrofusion Coupling ø560	21,00
27NME63017	SDR 17 - Electrofusion Coupling ø630	36,50
27NME6373	SDR 7,4 - Electrofusion Coupling ø63	0,22
27NME7573	SDR 7,4 - Electrofusion Coupling ø75	0,34
27NME9011	SDR 11 - Electrofusion Coupling ø90	0,51
27NME9073	SDR 7,4 - Electrofusion Coupling ø90	0,48
27NMEUV11011	ELECTROFUSION COUPLER ø110	0,66
27NMEUV12511	ELECTROFUSION COUPLER ø125	1,00
27NMEUV16011	ELECTROFUSION COUPLER ø160	1,65
27NMEUV20011	ELECTROFUSION COUPLER ø200	2,17
27NMEUV25011	ELECTROFUSION COUPLER ø250	5,48
27NMEUV31511	ELECTROFUSION COUPLER ø315	9,35
27NMEUV3273	ELECTROFUSION COUPLER ø32	0,06
27NMEUV35511	ELECTROFUSION COUPLER ø355	13,78
27NMEUV4073	ELECTROFUSION COUPLER ø40	0,15
27NMEUV5073	ELECTROFUSION COUPLER ø50	0,15
27NMEUV6373	ELECTROFUSION COUPLER ø63	0,18
27NMEUV7573	ELECTROFUSION COUPLER ø75	0,34
27NMEUV9011	ELECTROFUSION COUPLER ø90	0,51
27NRDEUV4032	ELECTROFUSION REDUCING SOCKET ø40-32	0,12
27NRDEUV5032	ELECTROFUSION REDUCING SOCKET ø50-32	0,14
27NRDEUV5040	ELECTROFUSION REDUCING SOCKET ø50-40	0,17
27NRDEUV6332	ELECTROFUSION REDUCING SOCKET ø63-32	0,19
27NRDEUV6340	ELECTROFUSION REDUCING SOCKET ø63-40	0,21
27NRDEUV6350	ELECTROFUSION REDUCING SOCKET ø63-50	0,21

Items Code	Description	weight (kg/piece)
27NRDE1163	Electrofusion Reducer ø110-63	0,64
27NRDE1190	Electrofusion Reducer ø110-90	0,66
27NRDE1211	Electrofusion Reducer ø125-110	0,84
27NRDE1263	Electrofusion Reducer ø125-63	0,67
27NRDE1290	Electrofusion Reducer ø125-90	0,73
27NRDE1611	Electrofusion Reducer ø160-110	1,29
27NRDE1612	Electrofusion Reducer ø160-125	1,12
27NRDE1690	Electrofusion Reducer ø160-90	1,20
27NRDE2016	Electrofusion Reducer ø200-160	5,29
27NRDE250200	Electrofusion Reducer ø250-200	7,68
27NRDE3225	Electrofusion Reducer ø32-25	0,08
27NRDE4032	Electrofusion Reducer ø40-32	0,12
27NRDE5032	Electrofusion Reducer ø50-32	0,14
27NRDE5040	Electrofusion Reducer ø50-40	0,17
27NRDE6332	Electrofusion Reducer ø63-32	0,22
27NRDE6340	Electrofusion Reducer ø63-40	0,23
27NRDE6350	Electrofusion Reducer ø63-50	0,23
27NRDE7563	Electrofusion Reducer ø75-63	0,31
27NRDE9063	Electrofusion Reducer ø90-63	0,48
27NRDE9075	Electrofusion Reducer ø90-75	0,48
27NTCEUV032	ELECTROFUSION TEE ø32	0,10
27NTCEUV040	ELECTROFUSION TEE ø40	0,16
27NTCEUV050	ELECTROFUSION TEE ø50	0,27
27NTCEUV063	ELECTROFUSION TEE ø63	0,51
27NTCEUV075	ELECTROFUSION TEE ø75	0,73
27NTCEUV090	ELECTROFUSION TEE ø90	1,25
27NTCEUV110	ELECTROFUSION TEE ø110	1,86
27NTCEUV125	ELECTROFUSION TEE ø125	2,59
27NTCEUV160	ELECTROFUSION TEE ø160	3,56
27NTCE020	Electrofusion Equal Tee w/Spigot End ø20	0,06
27NTCE025	Electrofusion Equal Tee w/Spigot End ø25	0,08
27NTCE032	Electrofusion Equal Tee w/Spigot End ø32	0,10
27NTCE040	Electrofusion Equal Tee w/Spigot End ø40	0,17
27NTCE050	Electrofusion Equal Tee w/Spigot End ø50	0,27
27NTCE063	Electrofusion Equal Tee w/Spigot End ø63	0,53
27NTCE075	Electrofusion Equal Tee w/Spigot End ø75	0,75
27NTCE090	Electrofusion Equal Tee w/Spigot End ø90	1,27

Items Code	Description	weight (kg/piece)
27NTCE110	Electrofusion Equal Tee w/Spigot End ø110	1,86
27NTCE125	Electrofusion Equal Tee w/Spigot End ø125	2,59
27NTCE160	Electrofusion Equal Tee w/Spigot End ø160	3,56
27NTCE200	Electrofusion Equal Tee w/Spigot End ø200	8,25
27NTCE250	Electrofusion Equal Tee w/Spigot End ø250	18,50
03NTCE020	ELECTROFUSION TEE ø20 WITH SPIGOT END (SDR11)	0,06
03NTCE025	ELECTROFUSION TEE ø25 WITH SPIGOT END (SDR11)	0,08
03NTCE032	ELECTROFUSION TEE ø32 WITH SPIGOT END (SDR11)	0,11
03NTCE040	ELECTROFUSION TEE ø40 WITH SPIGOT END (SDR11)	0,17
03NTCE050	ELECTROFUSION TEE ø50 WITH SPIGOT END (SDR11)	0,27
03NTCE063	ELECTROFUSION TEE ø63 WITH SPIGOT END (SDR11)	0,51
03NTCE075	ELECTROFUSION TEE ø75 WITH SPIGOT END (SDR11)	0,75
03NTCE090	ELECTROFUSION TEE ø90 WITH SPIGOT END (SDR11)	1,27
03NTCE110	ELECTROFUSION TEE ø110 WITH SPIGOT END (SDR11)	1,86
03NTCE125	ELECTROFUSION TEE ø125 WITH SPIGOT END (SDR11)	2,59
03NTCE160	ELECTROFUSION TEE ø160 WITH SPIGOT END (SDR11)	3,56
16V6712	ELECTROFUSION COUPLER ø20 SDR 7.3	0,05
16V6713	ELECTROFUSION COUPLER ø25 SDR 7.3	0,06
16V6714	ELECTROFUSION COUPLER ø32 SDR 7.3	0,07
16V6715	ELECTROFUSION COUPLER ø40 SDR 7.3	0,11
16V6716	ELECTROFUSION COUPLER ø50 SDR 7.3	0,15
16V6717	ELECTROFUSION COUPLER ø63 SDR 7.3	0,16
16V6718	ELECTROFUSION COUPLER ø75 SDR 7.3	0,32
16V6719	ELECTROFUSION COUPLER ø90 SDR 7.3	0,46
16VME11011	ELECTROFUSION COUPLER ø110 SDR 11	0,61
16VME12511	ELECTROFUSION COUPLER ø125 SDR 11	0,99
16VME16011	ELECTROFUSION COUPLER ø160 SDR 11	1,52
16VME20011	ELECTROFUSION COUPLER ø200 SDR 11	2,17

Items Code	Description	weight (kg/piece)
16VME25011	ELECTROFUSION COUPLER ø250 SDR 11	5,28
16VTCE040	Electrofusion Equal Tee w/Spigot End ø40	0,18
16VTCE050	Electrofusion Equal Tee w/Spigot End ø50	0,42
16VTCE063	Electrofusion Equal Tee w/Spigot End ø63	0,58
16VTCE075	Electrofusion Equal Tee w/Spigot End ø75	0,68
16VTCE090	Electrofusion Equal Tee w/Spigot End ø90	1,28
16VTCE110	Electrofusion Equal Tee w/Spigot End ø110	1,60
16V7604	Electrofusion 90° Elbow ø40	0,14
16V7605	Electrofusion 90° Elbow ø50	0,17
16V7606	Electrofusion 90° Elbow ø63	0,36
16V7607	Electrofusion 90° Elbow ø75	0,44
16V7608	Electrofusion 90° Elbow ø90	0,91
16V7609	Electrofusion 90° Elbow ø110	1,35

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ISO 14044: Environmental Management – Life Cycle Assessment – Requirements and Guidelines.

ISO 14025: Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

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UNI EN 16904:2025 – Plastics piping systems inside the building structure - Environmental product.

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EN 15941 - Sustainability of construction works - Data quality for environmental assessment of products and construction work - Selection and use of data.

CEN/TR 16970:2016 - Sustainability of construction works - Guidance for the implementation of EN 15804.

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