fitt bluforce
fitt bluforce rj

a technology
worth spreading

Environmental Product Declaration

In accordance with
ISO 14025 and EN 15804:2012+A2:2019

EPD®

ECO PLATFORM EPD EN 15804 VERIFIED

CPC Code: 36320

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The International EPD® System,
www.environdec.com

Programme operator:
EPD International AB

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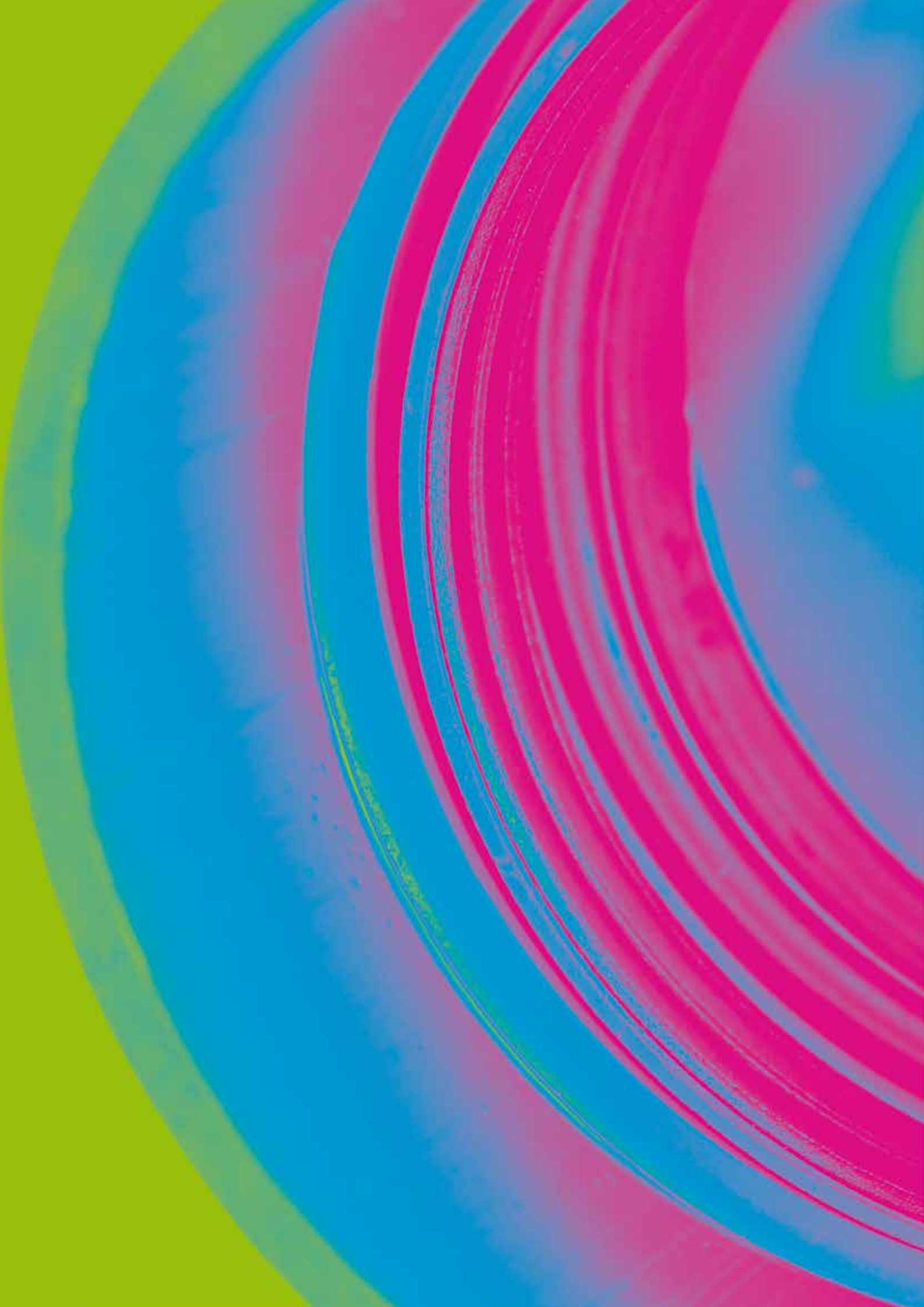
FITT INFRASTRUCTURE SOLUTIONS



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Environmental Product Declaration

EPD®

contents


fitt bluforce

1. programme information

An Environmental Product Declaration, or EPD®, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules). Environmental product declarations within the same product category from different programmes may not be comparable. EPD® of construction products may not be comparable if they do not comply with EN 15804. This version of the EPD® has been updated to clarify which pipe dimensions the installation results refer to.

Programme	The International EPD® System EPD® International AB, Box 210 60 SE-100 31 Stockholm - Sweden www.environdec.com / info@environdec.com
Product category rules (PCR):	PCR 2019:14 Construction Products (v1.11), CPC 36320
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.
Independent third-party verification of the declaration and data, according to: ISO 14025:2006:	EPD® process certification ☐ EPD® verification ☑
Third party verifier:	SGS Italia S.p.A. via Caldera, 21, 20153 – Milano T +39 02 73 931 - F +39 02 70 12 46 30 / www.it.sgs.com
In case of accredited certification bodies:	
Accredited by:	Accredia, certification n.006H
In case of recognised individual verifiers:	
Approved by:	The International EPD® System
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®.

2. company information

FITT is an international leader and a company specialised in the creation of complete fluid transfer systems made of thermoplastic materials, both for the industrial and the building sectors – at infrastructural and civil engineering level – and also for the home, gardening and hobby markets.

Established in 1969, for 50 years FITT has been developing technologically advanced solutions that offer reliability, safety, extremely high performance levels and ease of use. With headquarters in Sandrigo (Vicenza), FITT exports to 87 countries, has a total staff of 950 employees, 9 production sites (5 in Italy and 4 in other countries), 13 logistic sites all over the world and 5 subsidiaries. In 2020 FITT had a turnover of 233 M Euros.

Export
Export countries
87

Production plants
5 in Italy, 3 in France
and 1 in Poland
9

Logistic centres
6 in Italy, 3 in France,
1 in Spain, 1 in China,
1 in Poland and 1 in USA
13

Commercial branches
1 in France, 1 in Monaco,
1 in Spain, 1 in China
and 1 in USA
5

Technological partner
In Japan
1

Owner of the EPD: **FITT S.p.A.**
Contact: Francesco Negrin, francesco.negrin@fitt.com
Technical support: Department of Industrial Engineering, University of Padua
Name and location of the production site:
FITT S.p.A., Fara Vicentino (Italy)

2.1 / TALES OF CONTINUOUS INNOVATION

FITT is the creator of technologies that have revolutionised the markets in which it operates: a digital Concept Lab, fully dedicated to the development of new products and process technologies, is supported by the continuous and consistent innovation capabilities of the company. Open innovation and the collaboration with a network of international partners and research bodies, allows FITT to be always up to date with the latest generation materials, the most recent technologies and current regulations. External certifying bodies validate protocols and quality tests.

2.2 / ENVIRONMENTAL SUSTAINABILITY, A STRATEGIC DRIVER

For FITT, environmental sustainability is the result of a balance among respect for the environment and people, social advancement and industrial development, with the aim of creating advantageous conditions for all the stakeholders, and of granting the same rights to future generations.
According to these principles FITT has made several efforts in the design of its products by considering the destination of the products after the end of their useful life in terms of recycling and final reuse, the re-use of PVC scraps within its facilities, as well as the reduction of the quantity of materials used guaranteeing the same final product performances (e.g. in the case of PVC-A, -25% compared to a standard PVC-U product realized according to ISO 1452-2:2009), both for the products themselves and their packaging, the reduction of the energy consumed in its production facilities.

3. product information

3.1 / FITT PVC-A PIPES

The experience acquired in recent years with the production and promotion of the polymer alloy technology has confirmed the need to supply market players with a premium-quality product in both the integrated water resources management market, sewerage networks under pressure and the irrigation sector. The overall expenditure for these types of projects depends on the initial costs, but above all on the management and maintenance costs throughout the entire service life of the infrastructure, which should be as durable as possible and trouble-free.
To satisfy these needs, FITT has developed FITT Bluforce, a pipe system made of thermoplastic material with an integrated and immovable mechanical sealing technology. FITT Bluforce pipe system is produced in the RAL 5010 blue.
All product codes covered by this EPD® are listed in attachment "A"

3.1.1 / Certified product

The regulatory path of the FITT Bluforce pipe system started with the technical specification issued in 1995 by North West Water named "CPE/PVCU Alloy pressure pipes, integral joints, and post-formed bends for cold potable water and for sewerage, drainage and industrial applications". The second step was the issuing by the British Standard Institution, in 1999, of the BS PAS 27 standard "Unplasticized polyvinyl chloride alloy (PVC-A) pipes and bends for water under pressure". That standard prescribes the characteristics of the new generation of polymer alloy pipes, combining high mechanical resistance and high ductility. Lastly, in 2015 the Istituto Italiano dei Plastici - on FITT's indication - issued the IIP 1.1/19 technical specification "Modified polyvinyl chloride (PVC-A) pipes for water supply piping systems", which transposes the contents of Italian Ministerial Decree 174/2004 "Water for human consumption" and of the above mentioned BS PAS 27/1999 standard.
FITT Bluforce pipe system also conforms to the UNI EN 1622 standard "Water analysis - determination of the threshold odour number (TON) and the threshold flavour number (TFN)".
Finally, in 2020 FITT Bluforce obtains certification **Kiwa Quality** thanks to which, based on type tests and on the periodic inspections conducted by **Kiwa**,

is deemed compliant with the requirements of the **Technical Document Ki-0410 Rev.11, Attachment K75 Rev.02** and therefore marked **KQ**.
Kiwa certification was issued in agreement to the Kiwa Cement Italia Regulations for Certification of product.

3.1.2 / The polymer alloy
The technology used to manufacture FITT Bluforce is based on the PVC-A polymer alloy, where "A" refers to "alloy", made up of two main compounds: unplasticized polyvinyl chloride (PVC-U) and chlorinated polyethylene (CPE).

PVC-A, is used by FITT to manufacture FITT Bluforce. According to BS PAS 27/1999 standard and thus in the IIP 1.1/19 Technical Specification, the product is recognized to have:

- absence of brittle fracture during C-Ring Test;
- considerable resistance to impacts and point loads even at low temperatures (+100% impact energy if compared to ISO 1452 requirements – test method EN 744 and ISO 3127);
- high resistance to crack propagation (9.1.10 resistance of notched pipe to sustained hydrostatic pressure PAS 27/1999)
- excellent tolerance to chemical aggression (the chemical resistance of PVC materials guidance is given in ISO/TR 10358).

Moreover FITT Bluforce is designed to guarantee lower weight and advantageous hydraulic section- with diameter being equal - compared to traditional PVC-U hoses (e.g. in the case of PVC-A, -25% in weight when compared to a standard PVC-U product realized according to ISO 1452-2:2009).

FITT Bluforce is made with virgin polymers and exclusively incorporates organic-based stabilisers (OBS), which makes it lead-free.
With FITT Bluforce it is possible to create large-radius bends by exploiting the flexibility of polymer alloy.

3.2 / PVC-A FEATURES

3.2.1 / The ductility

FITT Bluforce is subjected to the C-ring rest, a specific destructive test that allows for assessing toughness (Kc value), namely resistance to crack growth over time. The test, prescribed in the BS PAS 27/1999 standard and thus in the IIP 1.1/19 Technical Specification, reveals the high ductility of the material, which withstands brittle fractures.
It is decidedly daring to assume that a pipe on-site and one in the laboratory are in the same condition. In actual fact, poor handling of the pipes or non-optimal laying can lead to imperfections (cracks) which, if they reach considerable dimensions, can jeopardise the stability of the pipe under pressure. This phenomenon is normally not detected through standard laboratory tests, which are conducted on perfectly intact samples.
To thoroughly analyse how the crack propagates and assess its potential impact on the pipe's fracture mechanism (ductile or brittle), the PVC-A developers have devised the C-RING TEST, conducted on pipe portions cut in advance to adequately simulate the presence of the crack on-site.
The C-RING TEST highlights the always ductile behaviour of FITT Bluforce, confirming the product's reliability over time and the lower maintenance requirements of the completed work.
Its high resistance to crack propagation enables the material to reach the yield phase before the crack degenerates, causing the pipe's brittle fracture.
The FITT Bluforce sample on which a fracture was triggered contains a white-coloured zone which signals that the expected yield phase has occurred.
The results of the C-RING TEST perfectly match the results of the pressure test conducted on a sample cracked beforehand. Every fracture that appears is checked to ascertain whether it is ductile (with the white zone forming near the swollen part) or brittle. The times and corresponding tensile strengths can be plotted on a graph to predict the tensile strength at 50 or 100 years.

3.3 / FITT BLUFORCE FEATURES

3.3.1 / Power Lock®: seal technical specifications

FITT Bluforce implements the socket-based jointing system with the seal mechanically hot-inserted in advance during the socket forming phase.
The Power Lock® seal consists of an EPD®M elastomer sealing element conforming to the UNI EN 681 standard, comoulded with a fibre-reinforced polypropylene stiffening ring.

This jointing system guarantees a high degree of seal stability, resulting in easy assembly, functionality and hydraulic tightness of the pipes over time. The full socketing process entails the formation of the socket on the chuck and on the seal, thus fully eliminating any irregularities commonly found on products with removable gasket. The existing clearances between the seal and its housing are eliminated, guaranteeing a stable ring. (according to ISO 13844, ISO 13845, ISO 13846 test methods).

3.4 / FITT BLUFORCE RJ FEATURES

3.4.1 / Bulldog® restraint joint system

FITT Bluforce RJ uses the socket-based jointing system with the seal mechanically hot-inserted in advance during the socket forming phase.
The restraint joint system is characterised by a rapid installation, high hydraulic tightness certified by tests conducted in pressurised and depressurised conditions and high mechanical tightness with both static and dynamic pressure loads (according to ISO 13844, ISO 13845, ISO 13846 and ISO 12842 test methods, endcap type A and thus axial thrust entirely supported by the restraint joint).

The entire FITT Bluforce RJ restrained pipe range has been subjected to a 1000-hour internal pressure test according to PIIP Mod.1.1-19 (test method acc. to EN-ISO 1167) where the test pressure is a function of the design hoop stress of the pipe with NO leakage or failure (endcap type A and thus axial thrust entirely supported by the restraint joint).

Thanks to the data obtained from above mentioned test it is possible to determine the axial strength of the restrained joint embedded on FITT Bluforce RJ with values ranging between a minimum of approx. 20 kN for DN90 PN16 and a maximum of more than 440 kN for DN400 PN20 pipes.

3.5 / FITT PVC-A PIPE MANUFACTURING

FITT PVC-A pipes are manufactured primarily from PVC resin along with additives, including: calcium carbonate, titanium dioxide, calcium based stabiliser, lubricants, processing aids and pigments.
The PVC resin is the main ingredient in all PVC pressure pipes, and is manufactured in Europe primarily from imported vinyl chloride monomer.
Internal PVC pipe scrap from production is fed back into the feed mix and utilised in new pipe.
The feed mix is heated and mixed prior to extrusion and then water cooled to form the pipe structure.
One end of the pipe is then re-heated after cutting and expanded to allow for pipe jointing.
Finally, the lengths of pipe are palletised, packaged with a softwood timber frame, steel and PET strapping.
FITT PVC-A pipe manufacturing sites are shown in Figure 2. PVC-A pipes are only manufactured in Fara, Northern Italy.
Geographical scope: Italy
CPC Code: 36320

Table 1 / Product characteristics of PVC-A pipes

Product names/application	**FITT Bluforce - pressure pipe FITT Bluforce RJ - pressure pipe (with restrained gasket)**	Test Methods
Density	**1350÷1400 kg/m^3**	ISO 1183-1: 2004
Shore D hardness	**75**	ISO 868: 2005
Coefficient of linear thermal expansion	**7 x 10^{-5}/°C**	ISO 11359-2: 1999
Maximum working temperature	**40°C**	BSI PAS27: 1999
Specific heat	**1045 J/kg*K**	ISO 11357-4: 2014
Poisson's ratio	**0,4**	ISO 527-1: 2019
Tensile yeld stress	**≥40 Mpa**	ISO 6259-2: 1997

4. lca information

4.1 / LIFE CYCLE ASSESSMENT

Life Cycle Assessment (LCA) is an analytical tool that captures the overall environmental impacts of a product, process or human activity from raw material acquisition, through production and use, to waste management.

LCA studies are structured in 4 phases. The goal and scope definition is implemented to clarify the objective of the study, to determine the main methodological boundaries as well as the life cycle processes to be included in the analysis (also referred as system boundaries). Another fundamental step of this phase is the definition of the so called functional unit which is the measuring unit that quantify the function of the product under study. The inventory analysis phase includes the data collection and modelling of all of the input and outputs of material, energy and other elementary flows that can cause potential environmental impacts. In this study, the inventory phase is supported by the collection of primary data related to the production of PVC-A piping system occurring in the FITT's plant located in Fara Vicentino (Italy). In the impact assessment phase inventory data are characterized into potential environmental impacts. Finally, the interpretation phase is applied to discuss the validity of the results concerning the goal and scope of the study and to identify the most impacting life cycle stage.

Figure 2

4.2 / DECLARED UNIT

One kilogram of piping system (the weight per meter of pipe are reported in the following tables).

Table 2 / FITT Bluforce weights the different diameters and different working pressures per meter

DN [mm]	Weight [kg/m] PN10	Weight [kg/m] PN16	Weight [kg/m] PN20
90	-	1.584	1.955
110	1.593	2.417	2.914
125	2.024	3.088	3.752
140	2.507	3.897	4.704
160	3.307	4.955	6.331
200	5.116	7.835	9.571
225	6.475	9.899	12.069
250	7.943	12.205	14.911
280	9.912	15.312	18.674
315	12.562	19.277	25.619
355	15.900	24.548	29.863
400	20.300	31.022	37.956
500	31.373	48.347	-
630	49.950	76.648	-

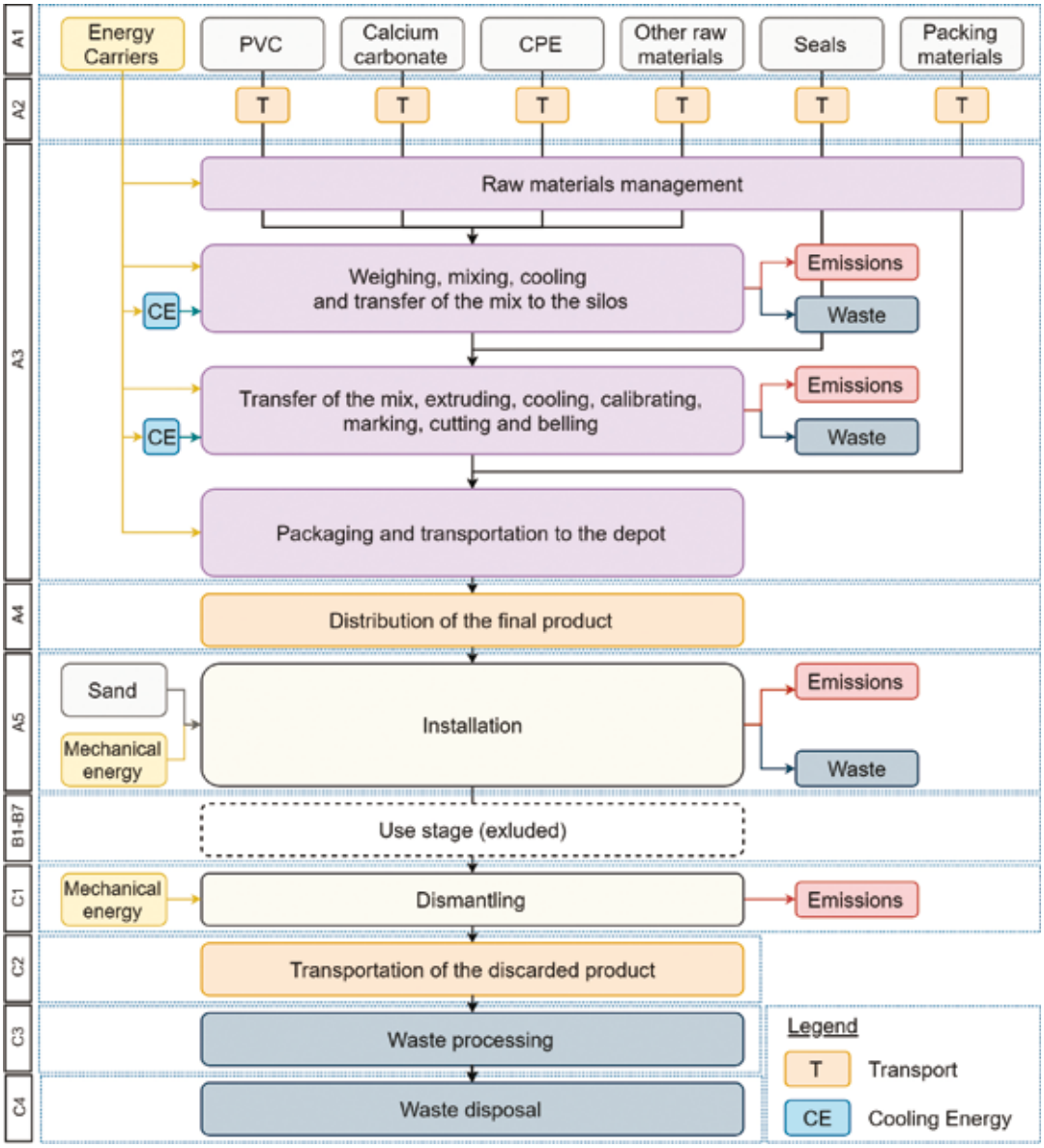
Table 3 / FITT Bluforce RJ weights the different diameters and different working pressures per meter

DN [mm]	Weight [kg/m] PN10	Weight [kg/m] PN16	Weight [kg/m] PN20
90	-	1.698	2.017
110	1.703	2.527	3.025
160	3.508	4.995	6.331
200	5.432	8.152	9.885
225	6.957	10.383	12.554
250	8.47	12.744	15.452
315	13.385	20.104	24.448
400	21.616	32.342	39.280

4.3 / TIME REPRESENTATIVENESS
Data cover the year 2019

4.4 / DATABASE(S) AND LCA SOFTWARE USED
Secondary data has been obtained from Ecoinvent v.3.6 and Industry Data v2.0 databases, using the software SimaPro 9.1.1 to carry out the assessment.

4.5 / SYSTEM DIAGRAM



X=module included in EPD® / ND= not declared

	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	X	x	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GLO, EU, IT	GLO, EU, IT	IT	IT	IT								IT	IT	IT	IT	IT
Specific data used	> 90%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	< 3%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant					-	-	-	-	-	-	-	-	-	-	-	-

4.6 / DESCRIPTION OF SYSTEM BOUNDARIES

The system boundaries include the modules A1-A3, A4, A5, C1, C2, C3, C4 and D provided by the Standard EN 15804, as shown in the following table according to an application of type "Cradle to gate with options, modules C1-C4, module D and with optional modules".

The construction, maintenance, and disposal of the infrastructures, intended as building, and the occupation of industrial land were not considered, due to the negligible contribution to the environmental impact. The use phase is not included in the study.

The parameter chosen for the initial inclusion of input and output elements is based on the definition of a cut-off level of 1%, in terms of mass, energy and environmental relevance. This means that a process has been neglected if it is responsible for less than 1% of the total mass, primary energy and total impact. In Accordance with this criterion, the consumption of lubricants for the PVC compounds and the nails for the packaging of the pipes (both less than 0.01% by weight) were excluded.

The following table shows the scenarios adopted for the modeling of the modules A4, A5, C1-C4 and D.

Modules	Scenarios
A4	The product distribution scenario was defined based on a sampling of the sites in which FITT Bluforce and FITT Bluforce RJ were installed. The transport was modeled using the datasetTransport, freight lorry, 16-32 EUR 3.
A5	The impacts associated with the installation and the pipeline were modeled considering the activity of the operating machines (0.02233 hours / kg of pipe), the consumption of sand for backfilling the pipe (assuming the transport for a distance of 10 km), the transport towards a deposit of excess land (10km), the management of the waste generated. An average laying depth of 2.07 m is considered. It is considered that 1% of the pipe becomes waste during installation operations. The generated waste was modeled considering the scenarios indicated by EN 15804 and a transport of 100 km.
C1	The impacts associated with the dismantling of the pipeline have been modeled as the activity of the operating machines, assuming the same consumption calculated for the installation phase, equal to 0.02233 hours of activity of an operating machine per kg of pipe removed from the ground. It is assumed that 100% of the laid pipe is removed.
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 modeled using the dataset Transport, freight lorry, 16-32 EUR 3.
C3	A fraction of the materials (intended as both pipe and gasket) is sent for recycling, and then subjected to specific processes, depending on the material. The recycling percentages of PVC, Cast Iron, PP and Rubber were assumed in line with Annex C of the PEFCR Guidance v6.3.
C4	The fraction not sent to recycling activities is destined for disposal in landfills or for incineration. Also in this case the percentages for the breakdown between landfill and incineration were derived from Annex C, referring to the Italian scenario.
D	Benefits related to material recycling as well as heat and power production from materials sent for incineration are part of this module. The recycling and incineration scenarios have been defined in accordance with Annex C of the PEFCR Guidance (for PVC 32% recycling and 24% incineration). For PVC, substitution of virgin polymer has been considered. An efficiency of 85,5% has been considered for the PVC's recycling process. The energy recovery scenario considered foresees an efficiency of 17% for electrical energy and 4% for thermal energy.

4.7 / DEFINITION OF REPRESENTATIVE PRODUCTS

The aim of this LCA is to provide clear and reliable information for costumers regarding the environmental impact linked to the production of two families of piping system: FITT Bluforce and FITT Bluforce RJ. The background LCA report tested the variation in results between different diameters. The composition of the FITT PVC-A pipes varies as a function of the diameter and the nominal pressure. The configurations differ in the type of compound, the contribution of the gasket to the total weight, energy and material consumption during construction site operations.

The representative product for FITT Bluforce is composed of a mix (50% -50%) of the two configurations characterized by the lowest and highest weight per meter (respectively, DN 90 PN 16 and DN 630 PN 16). The variability in terms of environmental indicators was found to be less than 6%.

The representative product for FITT Bluforce RJ is composed of a mix (50% -50%) of the two configurations characterized by the lowest and highest weight per meter (respectively, DN 90 PN 16 and DN 400 PN 20). The variability in terms of environmental indicators was found to be less than 5%.

4.8 / MODELING OF ELECTRICAL ENERGY (MODULE A3)

The modeling of electricity consumption in Module A3 was carried out using the Italian national residual mix, using as a source of data from the latest AIB report (AIB, 2020). The breakdown of the energy sources used is given. The emission factor obtained is equal to 602 gCO_2eq/kWh.

Source	Residual Mix 2019
Renewables Unspecified	0.80%
Solar	4.36%
Wind	1.10%
Hydro&Marine	2.05%
Geothermal	0.01%
Biomass	1.17%
Nuclear	9.02%
Fossil Unspecified	5.65%
Lignite	0.50%
Hard Coal	17.75%
Gas	55.89%
Oil	1.70%
TOTALE	100.00%

4.9 / DIFFERENCES VERSUS PREVIOUS VERSIONS

Compared to the previous version of the EPD, the main changes are due to the transition to the latest version of the PCR, which incorporates the EN 15804:2012+A2:2019 standard, and the expansion of the system boundaries. Modules C1-C4 and D, as well as the optional modules A4 and A5 have been taken into account.

The adoption of the new impact assessment methodologies does not allow a direct comparison with the results of the previous EPD.

Information on company and Kiwa certification has respectively been updated and added.

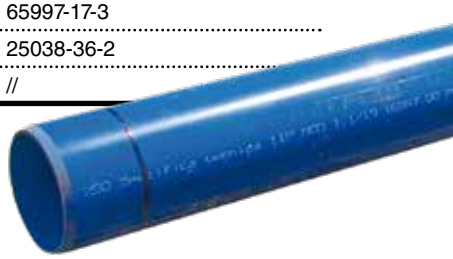
5. content declaration

5.1 / PRODUCT
No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in FITT PVC-A Pipes, either above the threshold for registration with the European Chemicals Agency or above 0.1 % (wt/wt).

5.2 / PACKAGING
FITT Bluforce and FITT Bluforce RJ are packaged using PE caps, wood, nails and metallic strips.

5.3 / RECYCLED MATERIAL
In the FITT Bluforce and FITT Bluforce production systems, no external recycled material is used as raw material.

Materials/chemical substances	FITT Bluforce	FITT Bluforce RJ	CAS No.
Polyvinyl chloride resin K65-68	89,5%	86,3%	9002-86-2
Chlorinated polyethylene	4,9%	4,7%	64754-90-1
Stabilizers based on Organic Calcium	3,7%	3,5%	Confidential (nothing hazardous)
Calcium carbonate	< 1%	< 1%	471-34-1
Dyes	< 1%	< 1%	Confidential (nothing hazardous)
Polypropylene	< 1%	0,0%	9003-07-0
Glass fiber	< 1%	0,0%	65997-17-3
EPDM 50	< 1%	1,4%	25038-36-2
Ductile iron	0,0%	2,5%	//



6. environmental information

6.1 / POTENTIAL ENVIRONMENTAL IMPACT

To present a clear and complete view of the environmental impacts associated with the two families FITT Bluforce and FITT Bluforce RJ, these are proposed disaggregated into modules for all the considered impact categories:

Climate change.

Global Warming Potential (GWP) expressed as kgCO2eq. This category quantifies how the process contributes to the release of greenhouse gases, based on the model developed by IPCC. Results are presented thorough the following indicators: GWP-total, GWP-fossil, GWP-biogenic, GWP-luluc (land use and land use change). According to the used PCR, the additional indicator GWP-GHG will be presented. The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product

Ozone Depletion.

Ozone Depletion Potential (ODP) expressed as kgCFC11eq. This category refers to the degradation of stratospheric ozone layer, reducing its ability to prevent UV light entering the earth's atmosphere.

Acidification.

Acidification Potential (AP) expressed as mol H+eq. This category quantifies the impact of the release of oxides of nitrogen and sulphur in the atmosphere, soil and water, where the acidity can be modified, affecting the flora and fauna, as well as human health and construction materials.

Eutrophication.

Eutrophication potential (EP) refers the nutrient enrichment, which determines unbalance in ecosystems causing negative effects on flora and fauna. It considers: EP-freshwater (expressed as kg PO4eq and kg Peq), EP-marine (expressed as kg Neq) and EP-terrestrial (mol N eq).

Photochemical Ozone Formation.

Formation potential of tropospheric ozone (POCP) expressed as kg NMVOC eq. Photochemical ozone formation takes place in the atmosphere by the degradation of volatile organic compounds in presence of lights and nitrogen oxides. This phenomenon is harmful to both plants and humans, causing irritation, respiratory problems and damage to the respiratory system.

Depletion of abiotic resources.

Abiotic depletion potential (ADP) evaluates the impact of the activity on different non-renewable natural resources, such as ores containing metals, petroleum, mineral raw materials etc. It considers two indicators: ADP-mineral&metals (expressed as kg Sb eq.) and ADP-fossil (expressed as MJ, net calorific value).

Water use.

Water (user) deprivation potential (WDP) expressed as m3 world eq. deprived. This indicator evaluates the potential for deprivation of water resources, both for humans and ecosystems, starting from the assumption that the less water is available, the more likely it is that a further user, human or ecosystem, will be deprived of it.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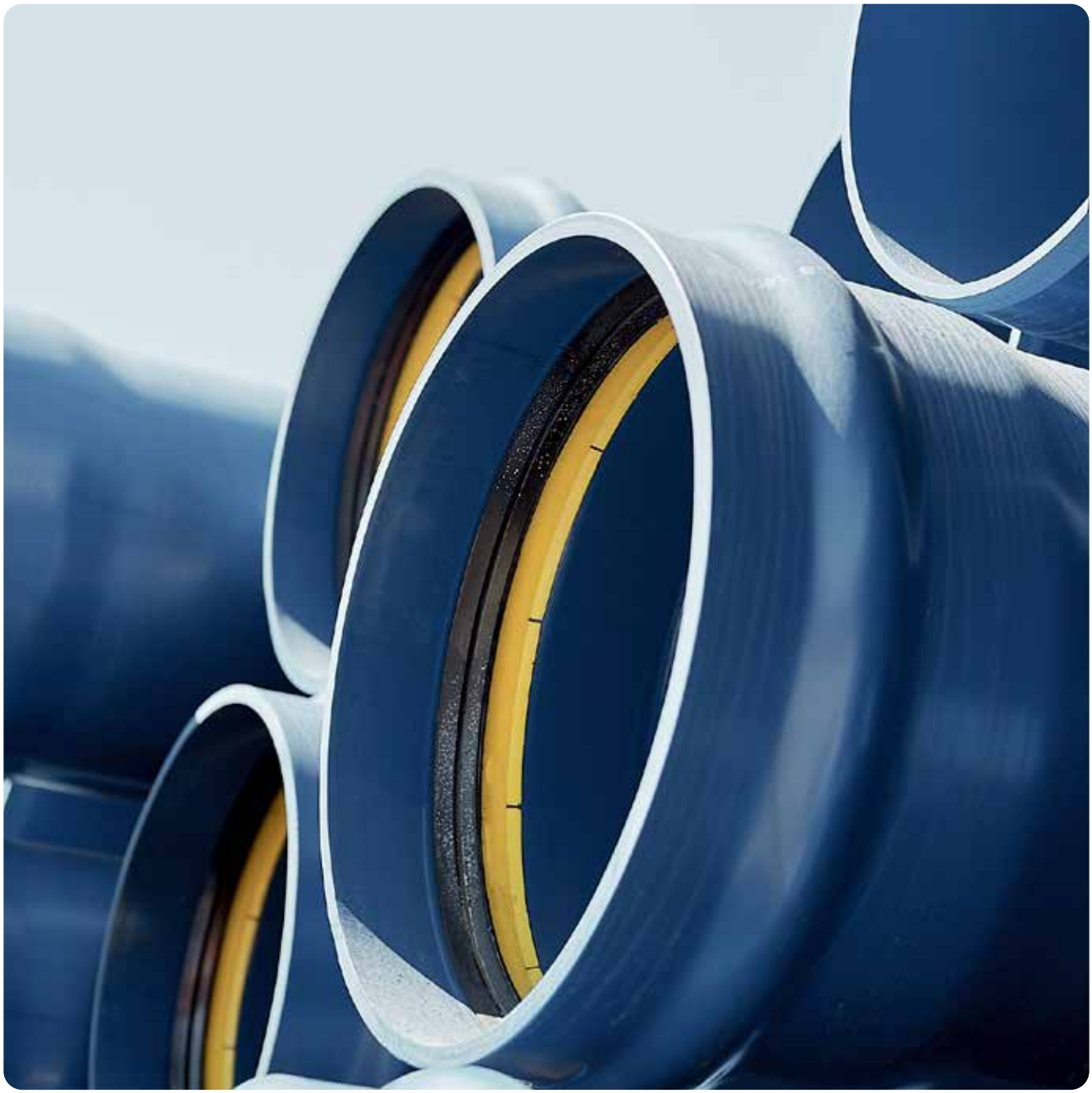
7. results fitt bluforce



Potential environmental impact

Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	C4	D	Total (D excluded)
GWP -fossil	kg CO_2 eq.	2,46E+00	1,37E-01	1,91E-01	2,79E+00	6,01E-02	2,05E+00	1,81E+00	1,03E-02	2,07E-01	6,05E-01	-6,13E-01	7,53E+00
GWP-biogenic	kg CO_2 eq.	2,03E-02	1,80E-04	-3,60E-01	-3,40E-01	3,20E-05	1,30E-01	4,99E-04	7,50E-06	2,20E-02	4,98E-04	6,31E-02	-1,86E-01
GWP-luluc	kg CO_2 eq.	1,75E-04	6,94E-05	2,95E-04	5,39E-04	2,12E-05	2,04E-04	1,41E-04	3,00E-06	2,32E-04	2,28E-04	-9,14E-05	1,37E-03
GWP-total	kg CO_2 eq.	2,48E+00	1,37E-01	-1,69E-01	2,45E+00	6,01E-02	2,18E+00	1,81E+00	1,03E-02	2,29E-01	6,06E-01	-5,50E-01	7,34E+00
ODP	kg CFC 11 eq.	1,00E-06	2,90E-08	2,59E-08	1,06E-06	1,38E-08	4,31E-07	3,87E-07	2,45E-09	1,59E-08	9,07E-08	-2,43E-07	2,00E-06
AP	mol H^+ eq.	7,13E-03	1,21E-03	4,94E-04	8,84E-03	4,20E-04	1,16E-02	9,83E-03	7,21E-05	7,96E-04	9,90E-04	-1,83E-03	3,25E-02
EP-reshwater	kg PO_4^{3-} eq.	4,79E-04	5,21E-05	4,36E-05	5,75E-04	1,35E-05	3,10E-04	1,98E-04	2,23E-06	2,74E-04	2,36E-04	-1,32E-04	1,61E-03
EP-reshwater	kg P eq	1,56E-04	1,70E-05	1,42E-05	1,87E-04	4,40E-06	1,01E-04	6,44E-05	7,28E-07	8,94E-05	7,68E-05	-4,30E-05	5,24E-04
EP-marine	kg N eq.	1,53E-03	4,22E-04	1,74E-04	2,13E-03	1,62E-04	4,52E-03	3,90E-03	2,82E-05	2,28E-04	1,16E-03	-3,61E-04	1,21E-02
EP-terrestrial	mol N eq.	1,63E-02	4,62E-03	1,90E-03	2,28E-02	1,77E-03	4,95E-02	4,28E-02	3,09E-04	1,80E-03	2,32E-03	-4,14E-03	1,21E-01
POCP	kg NMVOC eq.	5,96E-03	1,26E-03	6,22E-04	7,84E-03	4,87E-04	1,36E-02	1,18E-02	8,68E-05	5,36E-04	6,33E-04	-1,42E-03	3,50E-02
ADP-minerals & metals*	kg Sb eq.	4,80E-06	3,10E-06	1,23E-06	9,13E-06	1,62E-06	5,03E-06	2,75E-06	1,75E-07	2,69E-06	3,50E-06	-2,43E-07	2,49E-05
ADP-fossil*	MJ	5,96E+01	2,05E+00	1,94E+00	6,36E+01	9,13E-01	2,80E+01	2,47E+01	1,62E-01	2,73E+00	2,07E+00	-1,42E+01	1,22E+02
WDP*	m^3	8,96E+00	7,46E-03	5,35E-03	8,97E+00	2,52E-03	1,04E-01	3,31E-02	5,18E-04	4,26E-02	1,46E-01	-2,15E+00	9,30E+00
GWP-GHG	kg CO_2 eq.	2,44E+00	1,36E-01	1,85E-01	2,76E+00	5,98E-02	2,04E+00	1,80E+00	1,03E-02	2,13E-01	5,96E-01	-6,10E-01	7,48E+00
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												

***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.**

7. results fitt bluforce

Use of resources

Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	C4	D	Total (D excluded)
PERE	MJ	3,25E+00	3,56E-02	1,65E-02	3,30E+00	8,74E-03	3,09E-01	1,00E-01	1,46E-03	2,49E-01	1,74E-01	-1,01E+00	4,14E+00
PERM	MJ	9,31E-01	1,55E-02	3,96E+00	4,91E+00	4,03E-03	8,70E-02	3,31E-02	5,50E-04	8,00E-02	5,12E-02	-1,10E+00	5,17E+00
PERT	MJ	4,18E+00	5,11E-02	3,98E+00	8,21E+00	1,28E-02	3,96E-01	1,34E-01	2,01E-03	3,29E-01	2,25E-01	-2,11E+00	9,31E+00
PENRE	MJ	3,93E+01	2,05E+00	1,94E+00	4,32E+01	9,13E-01	2,80E+01	2,47E+01	1,62E-01	2,73E+00	2,07E+00	-9,61E+00	1,02E+02
PENRM	MJ.	2,03E+01	0,00E+00	6,73E-03	2,03E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-4,56E+00	2,03E+01
PENRT	MJ	5,96E+01	2,05E+00	1,94E+00	6,36E+01	9,13E-01	2,80E+01	2,47E+01	1,62E-01	2,73E+00	2,07E+00	-1,42E+01	1,22E+02
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	0,00E+00
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	2,09E-01	3,26E-04	1,76E-04	2,09E-01	9,53E-05	3,16E-03	1,27E-03	1,82E-05	1,91E-03	4,06E-03	-5,04E-02	2,20E-01
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												

Waste production

Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	C4	D	Total (D excluded)
Hazardous waste disposed	kg	4,49E-01	4,94E-06	5,24E-06	4,49E-01	2,39E-06	7,42E-05	6,72E-05	3,93E-07	3,15E-06	3,34E-06	-1,07E-01	4,50E-01
Non-hazardous waste disposed	kg	3,61E-02	8,08E-02	1,25E-02	1,29E-01	4,32E-02	1,86E-01	2,99E-02	1,39E-02	7,66E-02	4,86E-01	-4,77E-03	9,65E-01
Radioactive waste disposed	kg	1,28E-05	1,37E-05	2,45E-06	2,90E-05	6,23E-06	1,89E-04	1,71E-04	1,11E-06	1,47E-05	7,74E-06	-5,00E-06	4,19E-04

Output flows

Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	C4	D	Total (D excluded)
Components for re-use	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
Material for recycling	kg	0,00E+00	0,00E+00	1,75E-03	1,75E-03	0,00E+00	4,93E-02	0,00E+00	0,00E+00	3,20E-01	0,00E+00	0,00E+00	3,71E-01
Materials for energy recovery	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
Exported energy, electricity	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
Exported energy, thermal	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

Information on biogenic carbon content

BIOGENIC CARBON CONTENT	Unit	Quantity
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in packaging	kg C	5,81E-02

8. results fitt bluforce rj

Potential environmental impact

Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	C4	D	Total (D excluded)
GWP-fossil	kg CO_2 eq.	2,43E+00	1,41E-01	1,89E-01	2,76E+00	6,20E-02	2,04E+00	1,81E+00	1,03E-02	2,00E-01	5,96E-01	-6,26E-01	7,48E+00
GWP-biogenic	kg CO_2 eq.	1,76E-02	1,75E-04	-3,60E-01	-3,42E-01	3,30E-05	1,30E-01	4,99E-04	7,51E-06	2,12E-02	5,60E-04	6,45E-02	-1,90E-01
GWP-luluc	kg CO_2 eq.	2,15E-04	7,18E-05	2,99E-04	5,86E-04	2,18E-05	2,01E-04	1,41E-04	3,00E-06	2,24E-04	2,20E-04	-1,07E-04	1,40E-03
GWP-total	kg CO_2 eq.	2,45E+00	1,41E-01	-1,70E-01	2,42E+00	6,21E-02	2,17E+00	1,81E+00	1,03E-02	2,22E-01	5,96E-01	-5,62E-01	7,29E+00
ODP	kg CFC 11 eq.	9,78E-07	3,00E-08	2,53E-08	1,03E-06	1,42E-08	4,29E-07	3,87E-07	2,45E-09	1,54E-08	8,76E-08	-2,37E-07	1,97E-06
AP	mol H^+ eq.	7,20E-03	1,35E-03	5,01E-04	9,05E-03	4,33E-04	1,15E-02	9,83E-03	7,21E-05	7,73E-04	9,58E-04	-1,93E-03	3,26E-02
EP-freshwater	kg PO_4^{3-} eq.	5,27E-04	5,19E-05	4,58E-05	6,24E-04	1,39E-05	3,06E-04	1,98E-04	2,24E-06	2,66E-04	2,28E-04	-1,73E-04	1,64E-03
EP-freshwater	kg P eq	1,72E-04	1,69E-05	1,49E-05	2,03E-04	4,54E-06	9,98E-05	6,44E-05	7,28E-07	8,66E-05	7,41E-05	-5,64E-05	5,33E-04
EP-marine	kg N eq.	1,53E-03	4,57E-04	1,73E-04	2,16E-03	1,67E-04	4,49E-03	3,90E-03	2,82E-05	2,21E-04	1,13E-03	-3,83E-04	1,21E-02
EP-terrestrial	mol N eq.	1,63E-02	5,01E-03	1,89E-03	2,32E-02	1,83E-03	4,92E-02	4,28E-02	3,09E-04	1,75E-03	2,25E-03	-4,35E-03	1,21E-01
POCP	kg NMVOC eq.	6,07E-03	1,36E-03	6,22E-04	8,05E-03	5,03E-04	1,36E-02	1,18E-02	8,69E-05	5,21E-04	6,15E-04	-1,53E-03	3,51E-02
ADP-minerals & metals*	kg Sb eq.	1,81E-05	3,15E-06	1,22E-06	2,25E-05	1,67E-06	4,93E-06	2,75E-06	1,75E-07	2,62E-06	3,37E-06	-4,01E-07	3,80E-05
ADP-fossil*	MJ	5,86E+01	2,10E+00	2,00E+00	6,27E+01	9,43E-01	2,79E+01	2,47E+01	1,62E-01	2,64E+00	2,00E+00	-1,41E+01	1,21E+02
WDP*	m^3	8,67E+00	7,48E-03	6,88E-03	8,68E+00	2,60E-03	1,01E-01	3,31E-02	5,18E-04	4,11E-02	1,41E-01	-2,08E+00	9,00E+00
GWP-GHG	kg CO_2 eq.	2,41E+00	1,41E-01	1,84E-01	2,74E+00	6,18E-02	2,03E+00	1,80E+00	1,03E-02	2,06E-01	5,86E-01	-6,22E-01	7,43E+00
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												

***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.**

8. results fitt bluforce rj

Use of resources

Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	C4	D	Total (D excluded)
PERE	MJ	3,20E+00	3,53E-02	1,97E-02	3,25E+00	9,02E-03	3,01E-01	1,00E-01	1,46E-03	2,40E-01	1,68E-01	-9,95E-01	4,07E+00
PERM	MJ	9,29E-01	1,54E-02	3,97E+00	4,91E+00	4,16E-03	8,49E-02	3,31E-02	5,51E-04	7,78E-02	4,94E-02	-1,12E+00	5,16E+00
PERT	MJ	4,13E+00	5,07E-02	3,99E+00	8,16E+00	1,32E-02	3,86E-01	1,34E-01	2,01E-03	3,18E-01	2,17E-01	-2,12E+00	9,23E+00
PENRE	MJ	3,88E+01	2,10E+00	1,95E+00	4,29E+01	9,43E-01	2,79E+01	2,47E+01	1,62E-01	2,64E+00	2,00E+00	-9,71E+00	1,01E+02
PENRM	MJ.	1,98E+01	0,00E+00	5,01E-02	1,98E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-4,41E+00	1,98E+01
PENRT	MJ	5,86E+01	2,10E+00	2,00E+00	6,27E+01	9,43E-01	2,79E+01	2,47E+01	1,62E-01	2,64E+00	2,00E+00	-1,41E+01	1,21E+02
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	0,00E+00
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	2,02E-01	3,25E-04	2,23E-04	2,02E-01	9,84E-05	3,09E-03	1,27E-03	1,82E-05	1,84E-03	3,94E-03	-4,88E-02	2,13E-01
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												

Waste production

Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	C4	D	Total (D excluded)
Hazardous waste disposed	kg	4,33E-01	5,01E-06	5,17E-06	4,33E-01	2,46E-06	7,39E-05	6,72E-05	3,94E-07	3,06E-06	3,24E-06	-1,03E-01	4,34E-01
Non-hazardous waste disposed	kg	4,29E-02	8,15E-02	1,27E-02	1,37E-01	4,45E-02	1,82E-01	2,99E-02	1,39E-02	7,41E-02	4,81E-01	-9,81E-03	9,63E-01
Radioactive waste disposed	kg	1,64E-05	1,42E-05	2,58E-06	3,31E-05	6,43E-06	1,88E-04	1,71E-04	1,11E-06	1,42E-05	7,49E-06	-5,94E-06	4,22E-04

Output flows

Indicator	Unit	A1	A2	A3	Tot.A1-A3	A4	A5	C1	C2	C3	C4	D	Total (D excluded)
Components for re-use	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
Material for recycling	kg	0,00E+00	0,00E+00	2,99E-03	2,99E-03	0,00E+00	4,96E-02	0,00E+00	0,00E+00	3,28E-01	0,00E+00	0,00E+00	3,80E-01
Materials for energy recovery	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
Exported energy, electricity	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
Exported energy, thermal	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

Information on biogenic carbon content

BIOGENIC CARBON CONTENT	Unit	Quantity
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in packaging	kg C	5,81E-02

9. additional environmental information

FITT recognises the importance of incorporating environmental sustainability into our business strategies. Environmental issues are now the subject of greater community awareness.
FITT has long been mindful of these issues, demonstrated by our achievements in minimising waste, postindustrial and post-consumer recycling, minimising energy use on production as well as minimising embodied energy in our products.

The characteristics of the special sealing system with which FITT Bluforce RJ is equipped allow it to be installed using the HDD (Horizontal Directional Drilling) mode.

HDD is a trenchless technology suitable for the installation of new pipelines without having to carry out open-cut excavations, capable of considerably reducing the inconvenience of a traditional type of construction site and, sometimes, is the only solution for getting around obstacles that are insuperable for normal trenching.

An assessment of the environmental impacts associated with the pipe-laying phase is therefore reported. This analysis was carried out on the basis of primary data collected by the company relating to a site where 1200 metres of FITT Bluforce RJ DN 200 PN 20 were laid. Data relating to the type and time of use of machinery and information on laying speed were collected and processed.

Table 1 Considered scenario for the HDD installation of FITT Bluforce RJ

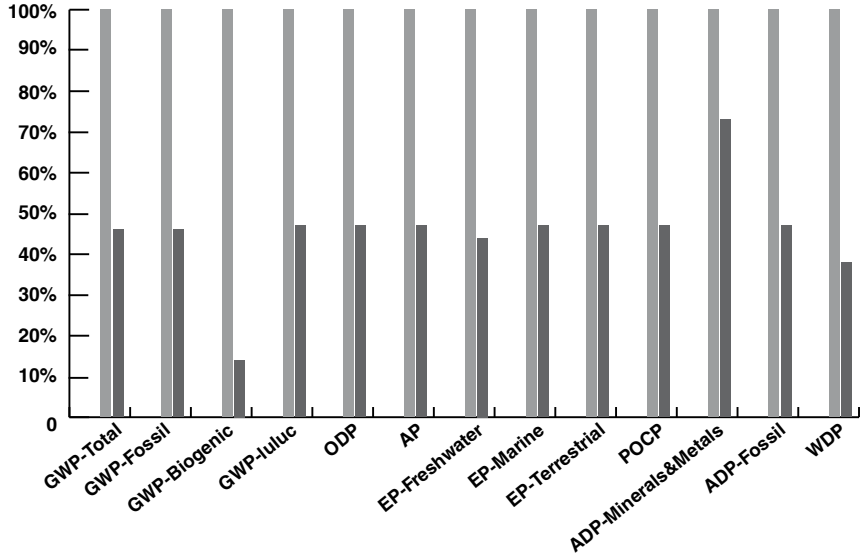
Laying speed	**200 meters/day**
Use of machinary	• Excavator (16,5 kW) used for 4 hours/day; • Rig Ditchwitch (110 kW) used for 10 hours/day; • Truck with sludge group (41 kW) used for 6 hours/day Total mechanical energy for laying 1 kg of pipe DN 200: 0,714 kWh/kg pipe
Bentonite muds	Mud made up of 90% water and the remaining 10% bentonite. The sludge is pumped into the hole via the drill rods. The sludge is then recovered and pumped to the blasting unit (sludging group) where the separation from debris takes place. The sludge is then reused and the resulting material sent for disposal. Therefore, a precautionary consumption value of bentonite is considered equal to 3,1 kg/meter.
Disposal for resulting material	A 50 km transport scenario and (cautiously) landfill disposal for inert materials is considered § *(Inert waste, for final disposal {CH}| treatment of inert waste, inert material landfill | Cut-off, U).*
Waters cycle	Considering that the water is withdrawn and introduced into the same basin, it is not counted within the model.

Are shown below the potential environmental impacts associate with the installation of 1 kg of FITT Bluforce RJ DN200 PN 20 according to traditional methods (base case considered in this study) and in HDD mode.

From contribution analysis emerges that for the HDD installation more of 90% of the impact in almost all the categories is connected at the use of machinery

Table 49 Results of impact assessment for the two installation scenarios

Indicator	Unit	Traditional pose	H.D.D. pose
GWP-total	kg CO2 eq	1,90E+0	8,71E-1
GWP-fossil	kg CO2 eq	1,90E+0	8,70E-1
GWP-biogenic	kg CO2 eq	3,11E-3	4,46E-4
GWP-luluc	kg CO2 eq	1,64E-4	7,77E-5
ODP	kg CFC11 eq	4,04E-7	1,92E-7
AP	mol H+ eq	1,05E-2	4,89E-3
EP-freshwater	kg P eq	7,81E-5	3,45E-5
EP-marine	kg N eq	4,13E-3	1,92E-3
EP-terrestrial	mol N eq	4,54E-2	2,12E-2
POCP	kg NMVOC eq	1,25E-2	5,82E-3
ADP-minerals&metals	kg Sb eq	3,64E-6	2,66E-6
ADP-fossil	MJ	2,60E+1	1,23E+1
WDP	m3 depriv.	5,96E-2	2,25E-2
PM	disease inc.	1,28E-7	6,09E-8
IRP	kBq U-235 eq	1,20E-1	5,62E-2
ETP-fw	CTUe	1,61E+1	7,82E+0
HTP-c	CTUh	1,53E-9	6,94E-10
HTP-nc	CTUh	1,24E-8	5,62E-9
SQP	Pt	3,79E+0	3,55E+0
GWP-GHG	kg CO2 eq	1,89E+0	8,66E-1



9. additional environmental information

9.1 / GUIDANCE FOR PVC-A PIPES RECYCLING
Due to PVC-A pipes being installed in the ground, it is economically unfeasible to excavate at end of life for the purpose of recycling. However, PVC-A pipe excavated for other reasons (e.g. new construction) has a high recyclability and can be mechanically recycled back into a pipe product performing the same structural function as one made only from virgin material. Due to the long life of rigid PVC-A products and low volume in waste streams, there is also no current limitation for the amount of recycled PVC-A that can be utilised. The following key properties of FITT PVC-A pipe aid recyclability:

- FITT PVC-A pipe contains no plasticiser – so no phthalates
- There are no dioxins in FITT PVC-A pipe
- FITT PVC-A pipe contains no heavy metal additives – so no lead and no cadmium.

9.2 / THE PRODUCTION PLANT AND TRIGENERATION

FITT Bluforce and FITT Bluforce RJ is produced in the Fara Vicentino facilities, powered by a trigeneration plant. Trigeneration is a process that allows the production of electricity and heat from the same energy source. Through absorption refrigerators, it also allows to use heat to obtain refrigerated water for conditioning and industrial process purposes. The trigeneration plant can adjust the production of hot and cold water and electricity on the basis of production needs. It also makes it possible to eliminate any natural losses normally incurred during the transport of energy, therefore improving energy efficiency and reducing carbon dioxide emissions.

9.3 / END OF LIFE

PVC pressure pipes are generally installed underground and are assumed to remain underground at end of life. PVC-A is 100% recyclable and can be reintroduced in the production cycle of other PVC-U pipes.

10. references

ISO 2020a, ISO 14040:2006/Amd 1:2020 Environmental management – Life cycle assessment – Principles and framework – Amendment 1, International Organization for Standardisation (ISO), Ginevra

ISO 2020b, ISO 14044:2006/Amd 2:2020 Environmental management — Life cycle assessment — Requirements and guidelines — Amendment 2, International Organization for Standardisation (ISO), Ginevra

PRé, 2016. SimaPro Database Manual Methods Library. © 2002-2016 PRé. Some rights reserved.

IIP 1.1/19 Technical Specification: "Unplasticized polyvinyl chloride alloy (PVC-A) pipes for water conveying."

M.D. 174, 06/04/2004: "Water for human consumption."
UNI EN 1622 standard – "Water analysis – determination of the threshold odour number (TON) and the threshold flavour number (TFN).

UNI EN ISO 1167-1:2006 - Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressureBS PAS 27:1999 - Unplasticized poly(vinyl chloride) alloy (PVC-A) pipes and bends for water under pressure.

UNI EN 681-1:2006 - Elastomeric seals - Materials requirements for pipe joint seals used in water and drainage applications - Part 1: Vulcanized rubber.

CEN, 2019, EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction works, European Committee for Standardization (CEN), Brussels
FITT, 2021 Studio di Life Cycle Assessment FITT Bluforce e FITT Bluforce RJ. Third Party Report rev.0 12/02/2021

11. attachement "a" products codes

Code	Description	Diameter	PN	RJ
32710.11060.45943	FITT Bluforce PN10 Ø 110 M.6 AF	Ø 110	PN10	
32710.11060.45944	FITT Bluforce RJ PN10 Ø 110 M.6 AH	Ø 110	PN10	YES
32710.12560.45943	FITT Bluforce PN10 Ø 125 M.6 AF	Ø 125	PN10	
32710.14060.45943	FITT Bluforce PN10 Ø 140 M.6 AF	Ø 140	PN10	
32710.16060.45943	FITT Bluforce PN10 Ø 160 M.6 AF	Ø 160	PN10	
32710.16060.45944	FITT Bluforce RJ PN10 Ø 160 M.6 AH	Ø 160	PN10	YES
32710.20060.45943	FITT Bluforce PN10 Ø 200 M.6 AF	Ø 200	PN10	
32710.20060.45944	FITT Bluforce RJ PN10 Ø 200 M.6 AH	Ø 200	PN10	YES
32710.22560.45943	FITT Bluforce PN10 Ø 225 M.6 AF	Ø 225	PN10	
32710.22560.45944	FITT Bluforce RJ PN10 Ø 225 M.6 AH	Ø 225	PN10	YES
32710.25060.45943	FITT Bluforce PN10 Ø 250 M.6 AF	Ø 250	PN10	
32710.25060.45944	FITT Bluforce RJ PN10 Ø 250 M.6 AH	Ø 250	PN10	YES
32710.28060.45943	FITT Bluforce PN10 Ø 280 M.6 AF	Ø 280	PN10	
32710.31560.45943	FITT Bluforce PN10 Ø 315 M.6 AF	Ø 315	PN10	
32710.31560.45944	FITT Bluforce RJ PN10 Ø 315 M.6 AH	Ø 315	PN10	YES
32710.35560.45943	FITT Bluforce PN10 Ø 355 M.6 AF	Ø 355	PN10	
32710.40060.45943	FITT Bluforce PN10 Ø 400 M.6 AF	Ø 400	PN10	
32710.40060.45944	FITT Bluforce RJ PN10 Ø 400 M.6 AH	Ø 400	PN10	YES
32710.50060.45943	FITT Bluforce PN10 Ø 500 M.6 AF	Ø 500	PN10	
32710.63060.45943	FITT Bluforce PN10 Ø 630 M.6 AF	Ø 630	PN10	
32716.90604.45943	FITT Bluforce PN16 Ø 90 M.6 AF	Ø 90	PN16	
32716.90604.45944	FITT Bluforce RJ PN16 Ø 90 M.6 AH	Ø 90	PN16	YES
32716.11060.45943	FITT Bluforce PN16 Ø 110 M.6 AF	Ø 110	PN16	
32716.11060.45944	FITT Bluforce RJ PN16 Ø 110 M.6 AH	Ø 110	PN16	YES
32716.12560.45943	FITT Bluforce PN16 Ø 125 M.6 AF	Ø 125	PN16	
32716.14060.45943	FITT Bluforce PN16 Ø 140 M.6 AF	Ø 140	PN16	
32716.16060.45943	FITT Bluforce PN16 Ø 160 M.6 AF	Ø 160	PN16	
32716.16060.45944	FITT Bluforce RJ PN16 Ø 160 M.6 AH	Ø 160	PN16	YES
32716.20060.45943	FITT Bluforce PN16 Ø 200 M.6 AF	Ø 200	PN16	
32716.20060.45944	FITT Bluforce RJ PN16 Ø 200 M.6 AH	Ø 200	PN16	YES
32716.22560.45943	FITT Bluforce PN16 Ø 225 M.6 AF	Ø 225	PN16	
32716.22560.45944	FITT Bluforce RJ PN16 Ø 225 M.6 AH	Ø 225	PN16	YES

Code	Description	Diameter	PN	RJ
32716.25060.45943	FITT Bluforce PN16 Ø 250 M.6 AF	Ø 250	PN16	
32716.25060.45944	FITT Bluforce RJ PN16 Ø 250 M.6 AH	Ø 250	PN16	YES
32716.28060.45943	FITT Bluforce PN16 Ø 280 M.6 AF	Ø 280	PN16	
32716.31560.45943	FITT Bluforce PN16 Ø 315 M.6 AF	Ø 315	PN16	
32716.31560.45944	FITT Bluforce RJ PN16 Ø 315 M.6 AH	Ø 315	PN16	YES
32716.35560.45943	FITT Bluforce PN16 Ø 355 M.6 AF	Ø 355	PN16	
32716.40060.45943	FITT Bluforce PN16 Ø 400 M.6 AF	Ø 400	PN16	
32716.40060.45944	FITT Bluforce RJ PN16 Ø 400 M.6 AH	Ø 400	PN16	YES
32716.50060.45943	FITT Bluforce PN16 Ø 500 M.6 AF	Ø 500	PN16	
32716.63060.45943	FITT Bluforce PN16 Ø 630 M.6 AF	Ø 630	PN16	
32720.90604.45943	FITT Bluforce PN20 Ø 90 M.6 AF	Ø 90	PN20	
32720.90604.45944	FITT Bluforce RJ PN20 Ø 90 M.6 AH	Ø 90	PN20	YES
32720.11030.45943	FITT Bluforce PN20 Ø 110 M.3 AF	Ø 110	PN20	
32720.11060.45943	FITT Bluforce PN20 Ø 110 M.6 AF	Ø 110	PN20	
32720.11060.45944	FITT Bluforce RJ PN20 Ø 110 M.6 AH	Ø 110	PN20	YES
32720.12560.45943	FITT Bluforce PN20 Ø 125 M.6 AF	Ø 125	PN20	
32720.14060.45943	FITT Bluforce PN20 Ø 140 M.6 AF	Ø 140	PN20	
32720.16060.45943	FITT Bluforce PN20 Ø 160 M.6 AF	Ø 160	PN20	
32720.16060.45944	FITT Bluforce RJ PN20 Ø 160 M.6 AH	Ø 160	PN20	YES
32720.20060.45943	FITT Bluforce PN20 Ø 200 M.6 AF	Ø 200	PN20	
32720.20060.45944	FITT Bluforce RJ PN20 Ø 200 M.6 AH	Ø 200	PN20	YES
32720.22560.45943	FITT Bluforce PN20 Ø 225 M.6 AF	Ø 225	PN20	
32720.22560.45944	FITT Bluforce RJ PN20 Ø 225 M.6 AH	Ø 225	PN20	YES
32720.25060.45943	FITT Bluforce PN20 Ø 250 M.6 AF	Ø 250	PN20	
32720.25060.45944	FITT Bluforce RJ PN20 Ø 250 M.6 AH	Ø 250	PN20	YES
32720.28060.45943	FITT Bluforce PN20 Ø 280 M.6 AF	Ø 280	PN20	
32720.31560.45943	FITT Bluforce PN20 Ø 315 M.6 AF	Ø 315	PN20	
32720.31560.45944	FITT Bluforce RJ PN20 Ø 315 M.6 AH	Ø 315	PN20	YES
32720.35560.45943	FITT Bluforce PN20 Ø 355 M.6 AF	Ø 355	PN20	
32720.40060.45943	FITT Bluforce PN20 Ø 400 M.6 AF	Ø 400	PN20	
32720.40060.45944	FITT Bluforce RJ PN20 Ø 400 M.6 AH	Ø 400	PN20	YES

12. attachement "b" fitt bluforce specification item

Supply, transport and laying of PVC-A polymer alloy piping conforming to the IIP 1.1/19 technical specification that fully transposes the BS PAS 27/1999 standard, (Italian) Ministerial Decree no. 174/2004 (former circular letter of the Minster of Health no. 102 of 02/12/1978) and the UNI EN 1622 standard – "Water analysis – determination of the threshold odour number (TON) and the threshold flavour number (TFN)", manufactured by ISO 9001-certified companies without any addition of regenerated material and free of leadbased stabilisers.

Socket jointing system with "Power Lock"-type seal, hot-assembled in advance and immovable. The seal is made up of an elastomer element conforming to the UNI EN 681-1 standard, co-moulded with a fibre-reinforced polypropylene element that ensures perfect stability in the seal housing.
The joining system must be capable of withstand the test conditions required by the standards UNI EN 13844-13845-13846.

Such performances must be proven by tests report, issued by a certified laboratory.
The pipes must be manufactured by companies operating under the Company Quality System compliant with UNI EN ISO 9001, issued according to UNI CEI EN 45012 by third parties or companies recognized and accredited by Accredia. The entire supply must be supported by a suitable certificate of conformity product according to the IIP technical specification 1.1 / 19 and according to BS PAS 27/1999, issued according to UNI CEI EN 45011 by third parties or recognized companies and accredited by Accredia, and by environmental declaration of product in accordance with ISO 14025 Type III, with specific calculation rules for the category of produced according to EN 15804:2012+A2:2019.
The pipes, supplied in 6-metre elements including socket and equipped with protective end caps, will be RAL 5010-coloured and must contain the following information printed on one of the crowns: name or trademark of manufacturer, nominal diameter and thickness, IIP 1.1 / 19 (alternatively BS PAS 27/1999 and date of issue) date with production shift and nominal pressure.

13. attachement "c" fitt bluforce rj specification item

Supply, transport and laying of PVC-A polymer alloy piping conforming to the IIP 1.1/19 technical specification that fully transposes the BS PAS 27/1999 standard, (Italian) Ministerial Decree no. 174/2004 (former circular letter of the Minster of Health no. 102 of 02/12/1978) and the UNI EN 1622 standard – "Water analysis – determination of the threshold odour number (TON) and the threshold flavour number (TFN)", manufactured by ISO 9001-certified companies without any addition of regenerated material and free of leadbased stabilisers.

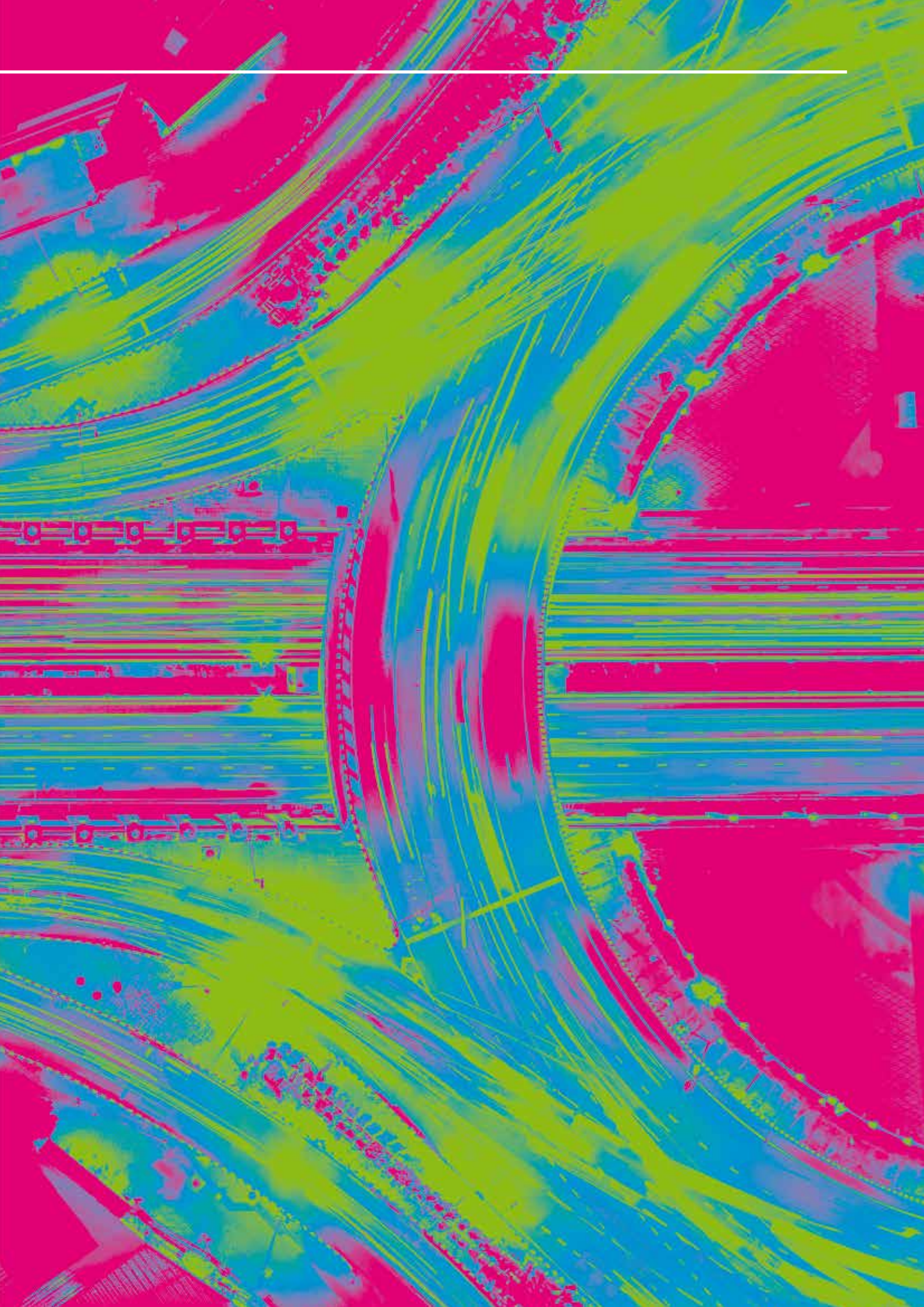
Socket jointing system with "Bulldog®"-type restraint seal hot-assembled in advance and immovable.
The seal consists of an elastomer element conforming to the UNI EN 681-1 standard co-moulded with a GJS 450-10 ductile iron element protected by epoxy resins applied through cataphoresis, which can house a GJS 450-10 mechanical sealing ring protected by epoxy resins applied through cataphoresis.
The joining system must be capable of withstand the test conditions required by the standards UNI EN 13844-13845-13846.

Such performances must be proven by tests report, issued by a certified laboratory.
The pipes must be manufactured by companies operating under the Company Quality System compliant with UNI EN ISO 9001, issued according to UNI CEI EN 45012 by third parties or companies recognized and accredited by Accredia. The entire supply must be supported by a suitable certificate of conformity product according to the IIP technical specification 1.1 / 19 and according to BS PAS 27/1999, issued according to UNI CEI EN 45011 by third parties or recognized companies and accredited by Accredia, and by environmental declaration of product in accordance with ISO 14025 Type III, with specific calculation rules for the category of produced according to EN 15804:2012+A2:2019.
The pipes, supplied in 6-metre elements including socket and equipped with protective end caps, will be RAL 5010-coloured and must contain the following information printed on one of the crowns: name or trademark of manufacturer, nominal diameter and thickness, IIP 1.1 / 19 (alternatively BS PAS 27/1999 and date of issue) date with production shift and nominal pressure.

fitt®

INFRASTRUCTURE
SOLUTIONS

This is the business area of the FITT Group that produces and develops complete piping, hose and fitting solutions for the pressure and gravity flow of fluids intended for the integrated water service management utilities, such as drinking water and sewerage networks



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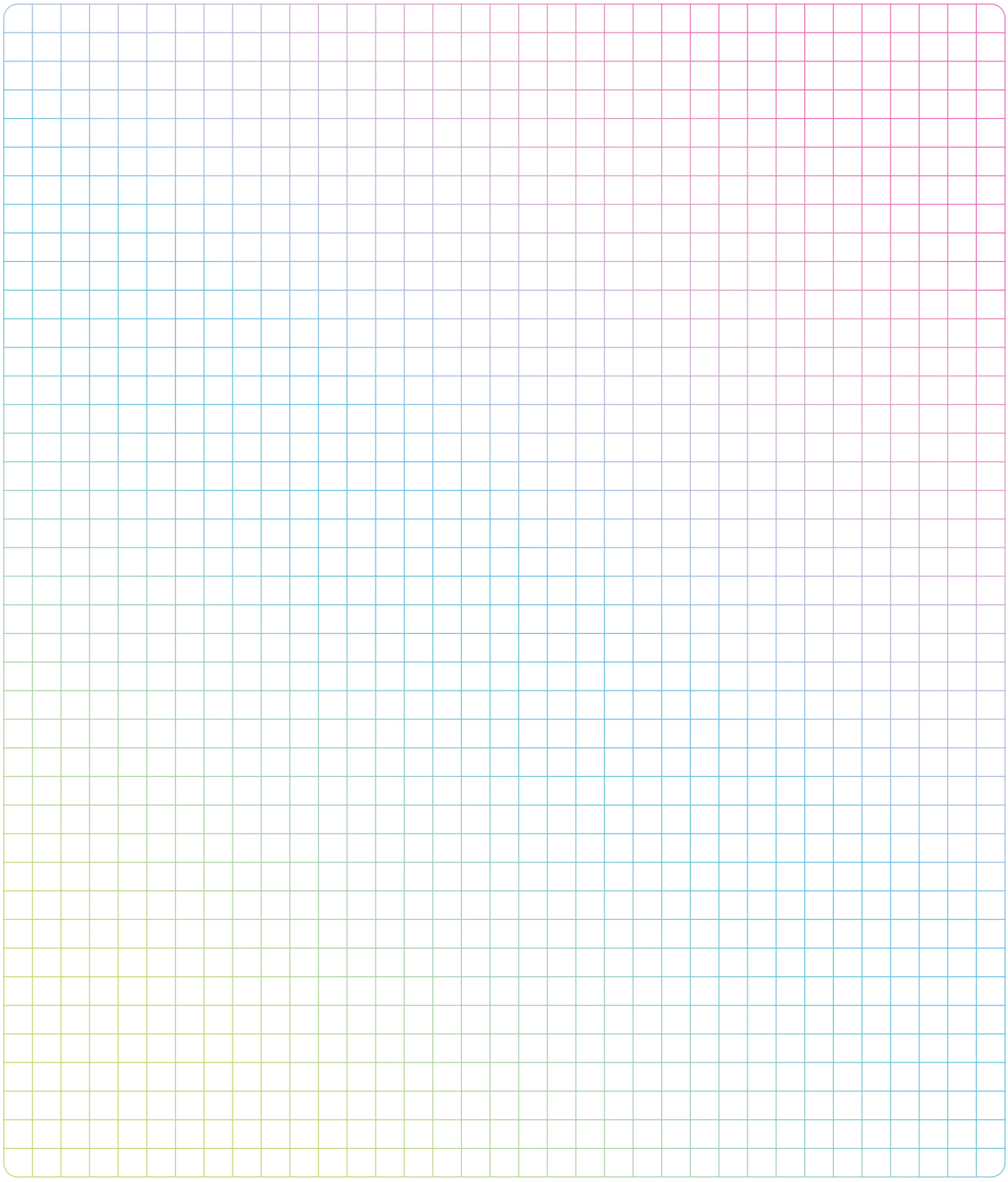

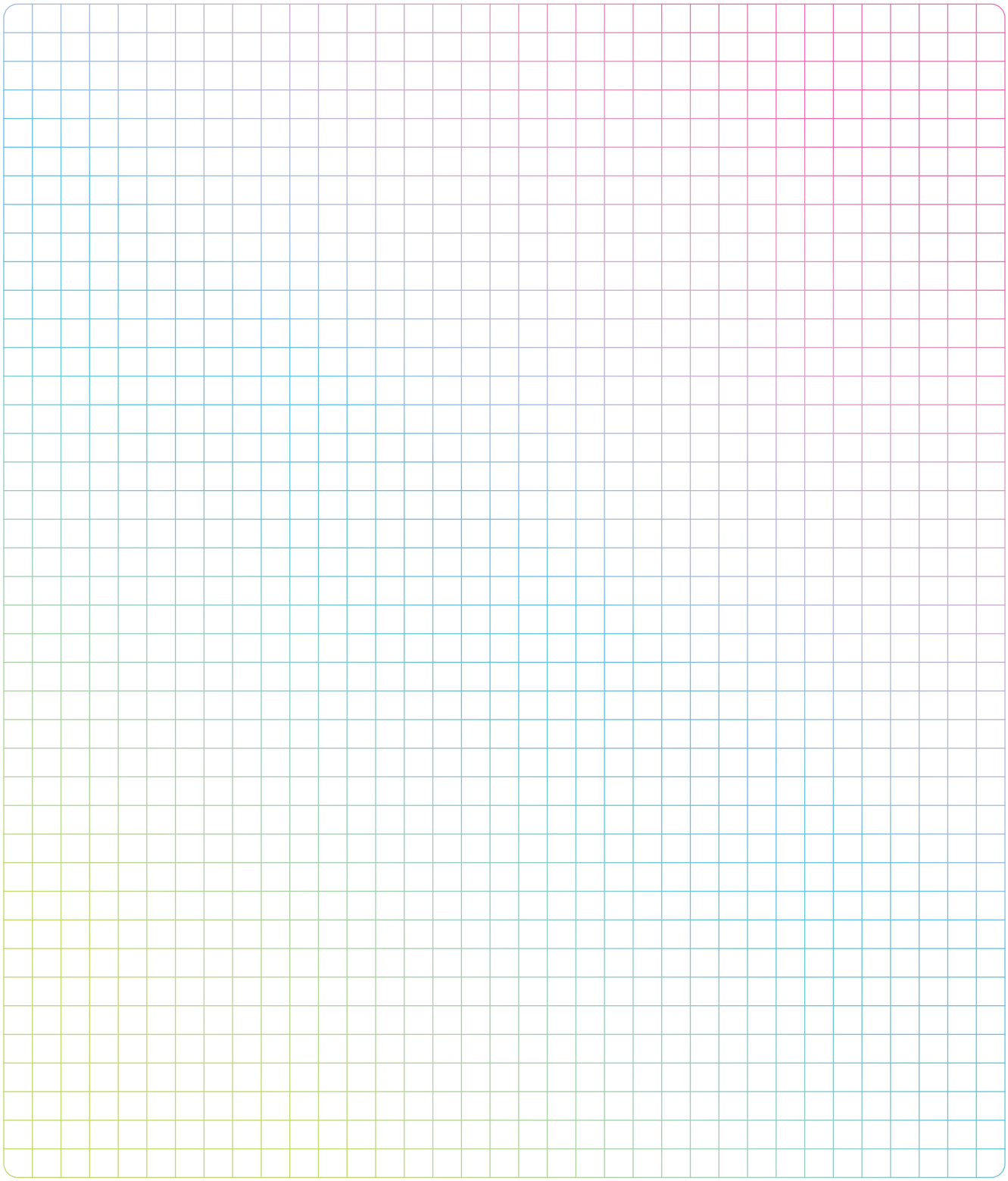

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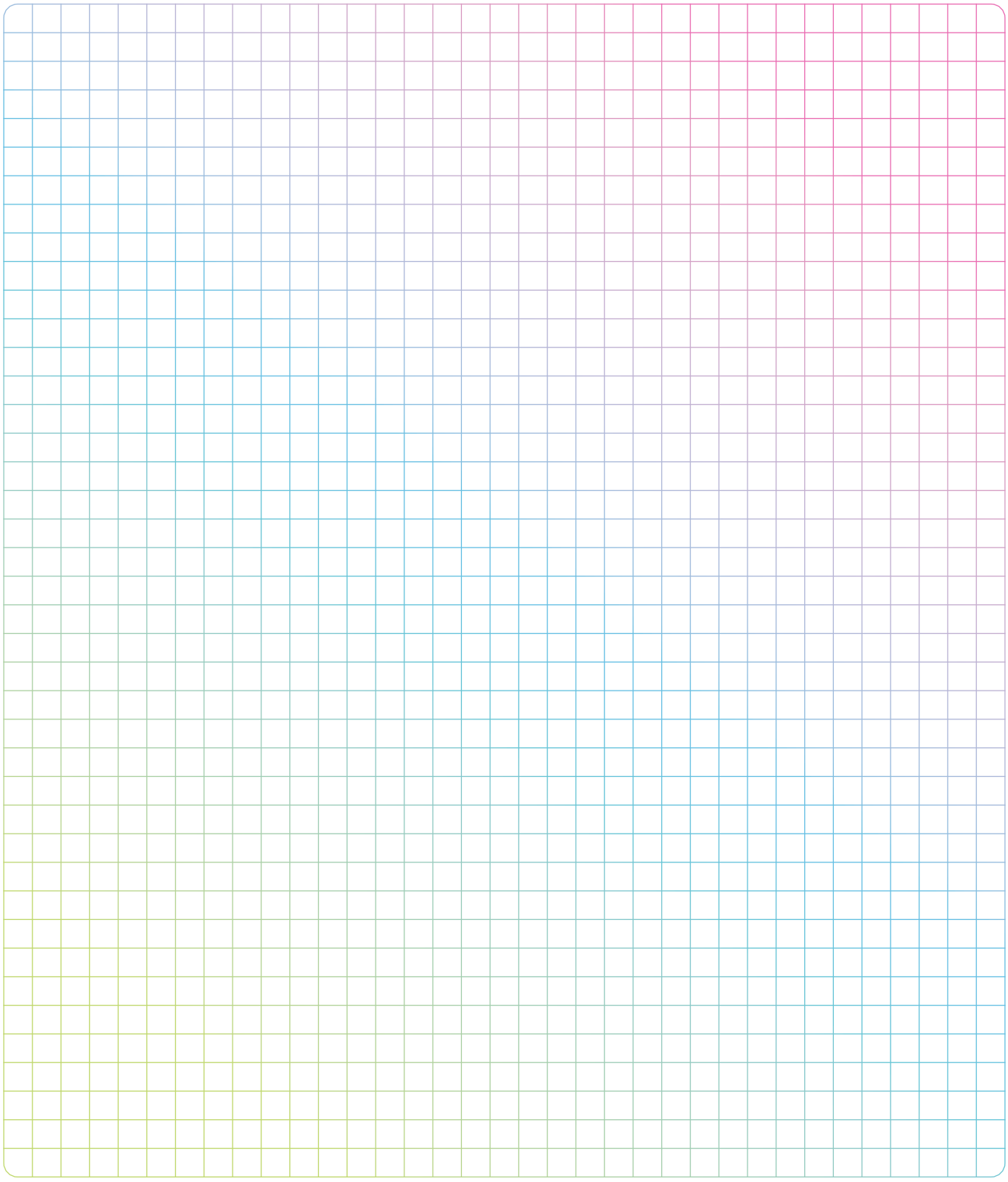

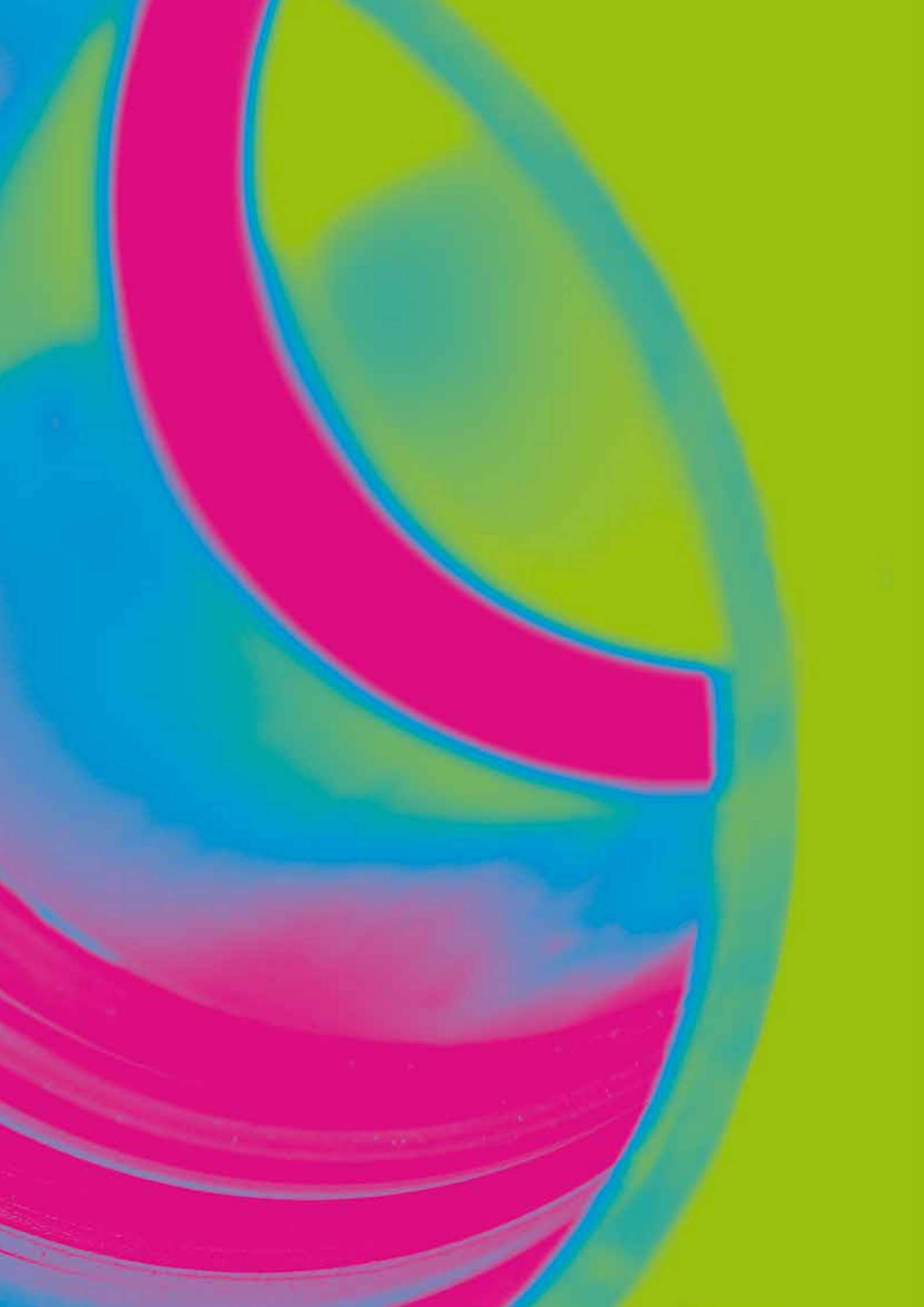

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FITT Bluforce and FITT Bluforce RJ
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