
ECOTECH


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pipes

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GENERAL INTRODUCTION
OUR HISTORY

ECOLINE has been manufacturing pre-insulated pipelines since 1980, becoming now one of the most experienced European manufacturers. Each of our Clients, for almost forty years, has been sure to find in our company the maximum reliability and expertise, which are part of our history.
Owners and staff are committed to pass on to new generations the same values at the origins of our company: we are willing to demonstrate our Customers they can trust on us as we always aim to providing a service beyond their expectations.

Reliability, short delivery times, flexibility and innovation are our strengths to solve quickly unforeseen events in the building site. As a matter of fact, we can rely on a well-stocked warehouse, high skilled staff able to quickly realize customized fittings and a technical team able to develop appropriate designing solutions according to every single problem to solve.
Our main achievement is to keep on providing support to our customers with the reliability we are known for almost forty years.

GENERAL INTRODUCTION
OUR PRODUCTION SITES

In the current site of Vescovato near Cremona, 100km from Milan, covering an area of 60,000m² [10,000 of which are roofed], are manufactured all types of accessories for building district heating networks.
Every year more than 300,000m of piping and 50,000 accessories are produced. In the new site of Casalromano, near Mantua, about 100km from Milan, on an area of 50,000m² [5,000 of which are roofed], are manufactured PE, PEX, stainless steel flexible pre-insulated pipes in rolls, both in UNO or DUO version, using latest technology systems, thus ensuring the best performances as required by our Customers.

ECOLINE and **ECOTECH** sites and their warehouses

GENERAL INTRODUCTION
MAIN FEATURES OF THE SYSTEM

In the future, district heating systems will be more and more competitive as their global efficiency will be increased. One of the main actions to be taken in order to obtain that efficiency increasing by the decreasing the operating temperature. In literature, this is traditionally considered **the fourth generation of district heating systems** the ones characterized by limited operating temperature ($T_{delivery}$ < 60°C) and therefore elevated operating efficiency.

In order to reduce the operating temperatures in the district heating systems there will be a greater use of pipelines with a plastic service pipe.

ECOPEX® pre-insulated flexible pipelines represent the ideal solution for the installation of small and medium district heating networks characterized by limited operating temperatures, for industrial and civil applications.

ECOPEX® pipelines, according to the European standard EN 15632-1/2, are pre-insulated pipelines with service pipe in PE-Xa crosslinked polyethylene, thermal insulation formed by PUR rigid polyurethane foam with blowing agent based on a mixture of cyclopentane (without CFCs, HCFCs o CO2) and LD-PE outer casing. The three materials (PE-Xa, PUR foam, LD-PE) are connected to each other in order to form a unique body. The manufacturing process of **ECOPEX®** pipelines ensures that the entire length is waterproof. The service pipe material (PE-Xa) has been chosen because of the special thermal and mechanical properties and due to its resistance to corrosion and chemicals.

GENERAL INTRODUCTION:
MAIN FEATURES OF THE SYSTEM

Furthermore the pipe material does not contain damaging substances, thus respecting the environment.
PE-Xa pipeline, in the heating series, is manufactured using placing also a barrier avoiding the diffusion of the oxygen (EVOH).
ECOPEX®, pre-insulated flexible pipeline with plastic service pipe, is manufactured in accordance with the existing legislation (EN 15632-1/-2).
Thanks to the combination between the elastic modulus and the linear expansion coefficient of the polyethylene, there are limited stresses that occur and therefore it is not necessary to include for specific compensation devices to absorb the stresses and expansion, plus avoiding the installation of expensive and invasive route deviations. Pipelines are therefore also particularly appropriate for all situations where installations are not easy because of the existence of interferences with other services, artefacts, trees, etc. Flexible pipelines are supplied to the client in rolls, cut-to-measure, in a unique element, therefore significantly reducing the number of joints to required during installation.
This results in the installation being much easier and faster, as well as providing important advantages with regards to a decrease in the number of possible mistakes during installation.
Thanks to the abovementioned reduction of joints to perform on site: which usually represent a weakness in district heating networks, representing the main points of failure.
If the length of the network to be installed using **ECOPEX®** flexible pipelines exceeds the maximum realisable length of a single roll, it will be necessary to perform on site the joint between two contiguous rolls; the connection can be carried out and it does not require the use of special equipment. Indeed, the application of the fittings is easy and reliable both with the use of the screw, press or welding (polyfusion) type. The wide selection of equipment guarantees a proper solution for every possible operational situation.

ECOPEX® SYSTEM

Products

ECOPEX® PREINSULATED FLEXIBLE PIPELINE DESCRIPTION

Pre-insulated flexible pipelines with PE-Xa service pipe are mainly used on small and medium district heating networks and for civil and industrial use characterized by limited operating temperatures.

There are two types of **ECOPEX®** pipelines manufactured for different applications; each with differing thicknesses of the PE-Xa service pipe.
The operating limit conditions of use are shown in the following tables:

1. PIPELINE FOR HEATING USE (SDR 11)

PHYSICAL PARAMETER	SYMBOL	LIMIT VALUE
Permanent operating temperature	T_{es}	80°C
Maximum peak temperature	T_{max}	95°C
Maximum operating pressure	P_{max}	PN 6

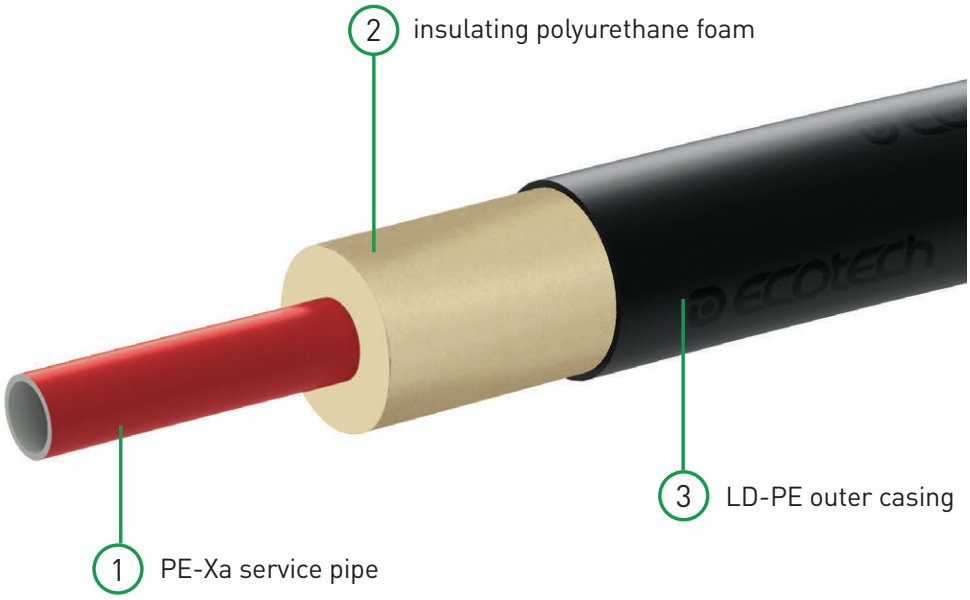
2. PIPELINE FOR SANITARY USE (SDR 7.4)

PHYSICAL PARAMETER	SYMBOL	LIMIT VALUE
Permanent operating temperature	T_{es}	80°C
Maximum peak temperature	T_{max}	95°C
Maximum operating pressure	P_{max}	PN 10

ECOPEX® PRE-INSULATED FLEXIBLE PIPELINE DESCRIPTION

ECOPEX® pipelines are bonded type: that means the three elements (service pipe, PUR foam and PE outer casing) are closely bound to each other and create a compact and very efficient system.
Primarily:

- no air and gaps. Expensive and damaging heat losses are avoided;
- PUR insulating foam is of the best type by today's standards;
- all the components are watertight and provide protection against any outer ingresses.



PIPELINE COMPOSITION

PE-XA SERVICE PIPE	
MATERIAL	HD-PE high density polyethylene, PE-Xa peroxide crosslinking, natural color
OXYGEN DIFFUSION BARRIER	EVOH vinyl ethylene/alcohol, thermally stabilised, natural colour
BONDING AGENT	modified PE, hot stabilised, red (heating) and silver colour (hygienic-sanitary)
REQUISITES	in accordance with DIN 16892/DIN 16893 and DIN EN 12318-2, 3.2 series pipelines according to technical datasheet DVGW W 544
PERMEABILITY TO OXYGEN	in accordance with DIN 4729 a 40°C, permeability to oxygen relating the inner volume of the pipe according to DIN 4726 ≤ 0,10g / (m3xd)
SERIES OF PIPELINES ACCORDING TO DIN 16893	series 5: SDR 11 for heating (with oxygen barrier) series 3.2: SDR 7.4 for sanitary installations

In the following table are shown the detailed features of the PE-Xa service pipe.

FEATURES OF THE PE-XA SERVICE PIPE	REFERENCE TEMPERATURE [°C]	VALUE	STANDARD
DENSITY	-	932-935 kg/m^3	ISO 1183
THERMAL CONDUCTIVITY	-	0,38 W/mK	according to ASTM C 1113
FRICTION RESISTANCE	20	min. 18 N/mm^2	ISO 6259
	80	min. 8 N/mm^2	
MODULUS OF ELASTICITY	20	min. 600 N/mm^2	ISO 527
	80	min. 200 N/mm^2	
COEFFICIENT OF LINEAR EXPANSION	20	1,4*10$^{(-4)}$ K$^{(-1)}$	-
	100	2,0*10$^{(-4)}$ K$^{(-1)}$	
CRISTALLITE MELTING RANGE	-	128-134°C	-
SURFACE RESISTANCE		10^{12} Ω	
REACTION TO FIRE CLASSIFICATION (DIN 4102		B2 (normal flammability)	DIN 4102
ROUGHNESS OF PIPES		0,007mm	

PIPELINE COMPOSITION

POLYURETHANE INSULATING FOAM	
MATERIAL	Polyurethane foam obtained by mixing polyol and isocyanate with Cyclopentane blowing agent (HEATING)
REFERENCE STANDARD	Minimum features according to EN 253
THERMAL CONDUCTIVITY	λ(50°C) ≤ 0,023 W/mK (0,032 W/mK in the pipelines for sanitary use)
DENSITY	≥ 50 kg/m^3
COMPRESSIVE STRENGTH	≥ 0,2 MPa
LONG-TERM TEMPERATURE RESISTANCE	100°C
AXIAL SHEAR STRENGTH (EN 253)	≥ 0,12 MPa

LD-PE OUTER CASING	
MATERIAL	Continuously extruded low-density polyethylene (LD-PE) minimum quality PE 80 according to ISO 12162 Variation di MFI < = 0,5 g/10m
REFERENCE STANDARD	Minimum features according to EN 253
SPECIAL TREATMENT	Corona treatment
DENSITY	0,92 g/cm^3
MODULUS OF ELASTICITY	325 N/mm^2
REACTION TO FIRE CLASSIFICATION (DIN 4102)	B2 (normal flammability)

PRESSURE AND TEMPERATURE LIMITS

Temperature and pressure limits, shown in the following table, can be applied according to the standard DIN 16892/93 to the pipelines with constant operating temperatures (application case: water, safety sector 1,25).

PIPELINES FOR HEATING USE		
Temperature limits [°C]	Pressure limits [bar]	Service life [years]
40	11,9	50
50	10,6	50
60	9,5	50
70	8,5	50
80	7,6	25
90	6,9	15
95	6,6	10

PIPELINES FOR SANITARY USE		
Temperature limits [°C]	Pressure limits [bar]	Service life [years]
40	18,9	50
50	16,8	50
60	15	50
70	13,4	50
80	12,1	25
90	11	15
95	10,5	5

In the event of variable temperatures and pressures it is possible to obtain the service life using the Miner's rule, according to the standard DIN 13760.
Although designed for maximum operating temperatures of 95°C, the pipelines can withstand for short periods also temperature peaks of 110°C. Temperature and pressure limits, shown in the above tables, can be applied according to the standard DIN 16892/93 to the pipelines with constant operating temperatures (case of application: water; safety factor 1,25)

PRODUCTS: PIPELINES

As already mentioned above, **ECOPEX®** pipelines are available in two types, according to the necessity of application, these have differing thicknesses of the PE-Xa service pipe.
The intended uses are for heating and sanitary uses. Furthermore, the pipelines are produced in two versions:

- UNO: pre-insulated flexible pipeline with a PEXa service pipe blocked in the insulating polyurethane foam.
- DUO: pre-insulated flexible pipeline with 2 PEXa service pipes blocked in the insulating polyurethane foam.

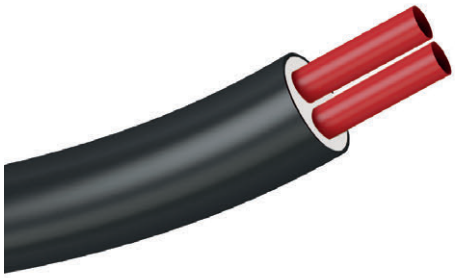
Finally, for all the pipelines there are two available insulating series. In the following tables, as regards to the picture below, are shown the specific features of the **ECOPEX®**, pipelines, where:

d_{int}: inner diameter of the PE-Xa pipeline;
d_{ext}: outer diameter of the PE-Xa pipeline;
s: thickness of the PE-Xa pipeline;
D_E: outer diameter of the PE outer casing;
s_P: thickness of the PE outer casing.

UNO HEATING 6BAR

UNO SANITARY 10 BAR

DUO HEATING 6 BAR



DUO SANITARY 10 BAR

PIPELINES PN 6 - UNO

ECOPEX® UNO - HEATING PN 6 – STANDARD INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Minimum bend radius [m]	Pipe length [kg/m]	Fluid content [l/m]	Maximum length of the roll (*) [m]
	DN/ inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]				
25/75	20 - 3/4"	20,4	2,3	25	75	3,0	0,80	0,90	0,33	1000
32/75	25 - 1"	26,2	2,9	32	75	3,0	0,80	1,00	0,54	1000
40/90	32 - 1" 1/4	32,6	3,7	40	90	3,0	0,80	1,50	0,83	715
50/110	40 - 1" 1/2	40,8	4,6	50	110	3,0	0,85	1,80	1,31	375
63/125	50 - 2"	51,4	5,8	63	125	3,0	0,90	2,60	2,07	340
75/140	65 - 2" 1/2	61,4	6,8	75	140	3,0	1,00	3,30	2,96	225
90/160	80 - 3"	73,6	8,2	90	160	3,0	1,00	4,56	4,25	149
110/160	100 - 4"	90	10	110	160	3,0	1,20	6,40	6,36	149
125/180	125 - 5"	102,2	11,4	125	180	3,0	1,40	7,50	8,20	86
140/200	140	114,6	12,7	140	200	3,2	-	8,40	10,31	12**
160/250	150 - 6"	130,8	14,6	160	250	3,6	-	12,30	13,44	12**

* Production tolerance +/- 5%. The maximum length corresponding to a roll with a width of 1,2m and outer diameter of 2,8m.
** bars

HEAT LOSSES OF THE ECOPEX® UNO PIPELINES – HEATING USE PN6 – STANDARD INSULATION

DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20	0,122	3,66	4,88	6,09	7,31	8,53
25	0,154	4,62	6,16	7,70	9,24	10,78
32	0,160	4,79	6,38	7,98	9,58	11,17
40	0,163	4,88	6,51	8,13	9,76	11,39
50	0,184	5,51	7,34	9,18	11,01	12,85
65	0,199	5,96	7,95	9,93	11,92	13,91
80	0,213	6,38	8,51	10,63	12,76	14,89
100	0,302	9,06	12,07	15,09	18,11	21,13
125	0,308	9,24	12,32	15,40	18,48	21,56
140	0,315	9,45	12,60	15,75	18,90	22,05
150	0,266	7,98	10,64	13,30	15,96	18,62

PIPELINES PN 6 - UNO SERIES

ECOPEX® UNO - HEATING PN 6 – PLUS INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Minimum bending radius [m]	Pipe Weight [kg/m]	Fluid content [l/m]	Roll maximum Length (*) [m]
	DN/ pollici	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]				
25/90	20 - 3/4"	20,4	2,3	25	90	3,0	0,80	1,00	0,33	715
32/90	25 - 1"	26,2	2,9	32	90	3,0	0,80	1,38	0,54	715
40/110	32 - 1" 1/4	32,6	3,7	40	110	3,0	0,90	1,98	0,83	375
50/125	40 - 1" 1/2	40,8	4,6	50	125	3,0	1,00	2,20	1,31	192
63/140	50 - 2"	51,4	5,8	63	140	3,0	1,10	3,49	2,07	225
75/160	65 - 2" 1/2	61,4	6,8	75	160	3,0	1,20	4,35	2,96	149
90/180	80 - 3"	73,6	8,2	90	180	3,0	1,40	4,90	4,25	86
110/180	100 - 4"	90	10	110	180	3,0	1,60	7,00	6,36	86
125/200	125 - 5"	102,2	11,4	125	200	3,2	1,60	8,00	8,20	75

Nota (*): Production tolerance +/- 5%. The maximum length corresponding to a roll with a width of 1,5m and outer diameter of 2,8m.

HEAT LOSSES OF THE ECOPEX® UNO PIPELINES – HEATING USE PN 6 – PLUS INSULATION

DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20	0,105	3,15	4,20	5,25	6,30	7,35
25	0,128	3,84	5,12	6,40	7,68	8,96
32	0,130	3,90	5,20	6,50	7,80	9,10
40	0,142	4,26	5,68	7,10	8,52	9,94
50	0,160	4,80	6,40	8,00	9,60	11,20
65	0,168	5,04	6,72	8,40	10,08	11,76
80	0,181	5,43	7,24	9,05	10,86	12,67
100	0,242	7,26	9,68	12,10	14,52	16,94

PIPELINES PN 10 - UNO

ECOPEX® UNO - SANITARY PN 10 – STANDARD INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Minimum bending radius [m]	Pipe weight [kg/m]	Fluid Content [l/m]	Roll maximum length (*) [m]
	DN/ inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]				
20/75	15 - 5/8"	14,4	2,8	20	75	3,0	0,80	0,96	0,16	1000
*25/75	20 - 3/4"	18	3,5	25	75	3,0	0,80	1,00	0,25	1000
32/75	25 - 1"	23,2	4,4	32	75	3,0	0,80	1,10	0,42	1000
40/90	32 - 1" 1/4	29	5,5	40	90	3,0	0,80	1,80	0,66	715
50/110	40 - 1" 1/2	36,2	6,9	50	110	3,0	0,85	2,20	1,03	715
63/125	50 - 2"	45,6	8,7	63	125	3,0	0,90	3,00	1,63	340

* The diameter is approximate. Alternatively Ø 22x3,0 o 28x4,0
Note (*): Production tolerance +/- 5%. The maximum length corresponding to a roll with a width of 1,2m and outer diameter of 2,8m.

HEAT LOSSES OF ECOPEX® UNO PIPELINES - SANITARY USE PN 10 – STANDARD INSULATION

DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
15	0,138	4,14	5,52	6,90	8,28	9,66
20	0,163	4,89	6,52	8,15	9,77	11,40
25	0,204	6,11	8,15	10,19	12,23	14,26
32	0,211	6,34	8,46	10,57	12,68	14,80
40	0,216	6,47	8,63	10,79	12,95	15,11
50	0,243	7,28	9,70	12,13	14,55	16,98

PIPELINES PN 10 - UNO

ECOPEX® UNO - SANITARY PN 10 – PLUS INSULATION

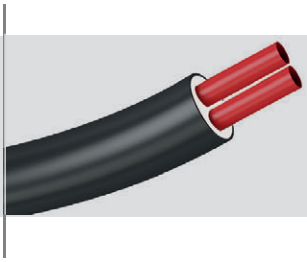
Type [mm]	PE-Xa Pipe				PE Casing		Minimum bending radius [m]	Pipe weight [kg/m]	Fluid Content [l/m]	Roll maximum length (*) [m]
	DN/ inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]				
20/90	15 - 5/8"	14,4	2,8	20	90	3,0	0,80	1,10	0,16	715
*25/90	20 - 3/4"	18	3,5	25	90	3,0	0,80	1,15	0,25	715
32/90	25 - 1"	23,2	4,4	32	90	3,0	0,80	1,19	0,42	715
40/110	32 - 1" 1/4	29	5,5	40	110	3,0	0,85	1,76	0,66	375
50/125	40 - 1" 1/2	36,2	6,9	50	125	3,0	0,90	2,41	1,03	340
63/140	50 - 2"	45,6	8,7	63	140	3,0	1,00	3,25	1,63	225

* The diameter is approximate. Alternatively, Ø 22x3,0 o 28x4,0
Nota (*): Production tolerance +/- 5%. The maximum length corresponding to a roll with a width of 1,2m and outer diameter of 2,8m.

HEAT LOSSES OF THE ECOPEX® UNO PIPELINES - SANITARY USE PN 10 – PLUS INSULATION

DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
15	0,122	3,67	4,89	6,11	7,33	8,56
20	0,141	4,24	5,66	7,07	8,49	9,90
25	0,171	5,14	6,85	8,56	10,27	11,99
32	0,174	5,22	6,96	8,71	10,45	12,19
40	0,190	5,69	7,59	9,48	11,38	13,28
50	0,213	6,40	8,53	10,67	12,80	14,94

PIPELINES PN 6 – DUO



ECOPEX® DUO - HEATING PN 6 – STANDARD INSULATION

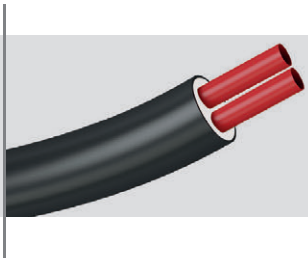
Type [mm]	PE-Xa Pipe				PE Casing		Minimum bending radius [m]	Pipe weight [kg/m]	Fluid Content [l/m]	Roll maximum length (*) [m]
	DN/ inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]				
25+25/90	20+20 - 2x3/4"	20,4	2,3	25	90	3,0	0,80	1,40	0,65	715
32+32/110	25+25 - 2x1"	26,2	2,9	32	110	3,0	0,85	1,90	1,08	375
40+40/125	32+32 - 2x1" 1/4	32,6	3,7	40	125	3,0	0,90	2,40	1,67	340
50+50/160	40+40 - 2x1" 1/2	40,8	4,6	50	160	3,0	1,00	3,80	2,61	149
63+63/180	50+50 - 2x2"	51,4	5,8	63	180	3,0	1,20	4,80	4,15	86
75+75/200	65+65 - 2x2" 1/2	61,4	6,8	75	200	3,0	1,30	6,25	5,92	75

Note (*): Production tolerance +/- 5%. The maximum length corresponding to a roll with a width of 1,2m and outer diameter of 2,8m.

HEAT LOSSES ECOPEX® DUO PIPELINES - HEATING USE PN 6 – STANDARD INSULATION

DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20	0,191	5,74	7,66	9,57	11,49	13,40
25	0,197	5,92	7,89	9,86	11,83	13,80
32	0,224	6,72	8,95	11,19	13,43	15,67
40	0,209	6,28	8,37	10,46	12,56	14,65
50	0,251	7,54	10,06	12,57	15,09	17,60
65	0,290	8,69	11,59	14,49	17,39	20,28

PIPELINES PN 6 - DUO



ECOPEX® DUO - HEATING PN 6 - PLUS INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Minimum bending radius [m]	Pipe weight [kg/m]	Fluid Content [l/m]	Roll maximum length (*) [m]
	DN/ inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]				
25+25/110	20+20 - 2x3/4"	20,4	2,3	25	110	3,0	0,75	1,91	0,65	375
32+32/125	25+25 - 2x1"	26,2	2,9	32	125	3,0	1,20	2,49	1,08	340
40+40/140	32+32 - 2x1" 1/4	32,6	3,7	40	140	3,0	1,20	3,28	1,67	225
50+50/180	40+40 - 2x1" 1/2	40,8	4,6	50	180	3,0	1,30	5,05	2,61	86
63+63/200	50+50 - 2x2"	51,4	5,8	63	200	3,0	1,40	5,90	4,15	75

Note (*): Production tolerance +/- 5%. The maximum length corresponding to a roll with a width of 1,2m and outer diameter of 2,8m.

HEAT LOSSES ECOPEX® DUO PIPELINES - HEATING USE PN 6 – STANDARD INSULATION

DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20	0,148	4,44	5,92	7,39	8,87	10,35
25	0,165	4,96	6,61	8,26	9,91	11,57
32	0,187	5,60	7,47	9,33	11,20	13,07
40	0,176	5,29	7,05	8,81	10,57	12,34
50	0,220	6,60	8,80	11,00	13,20	15,40

PIPELINES PN 10 - DUO

ECOPEX® DUO - SANITARY PN 10 – STANDARD INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Minimum bending radius [m]	Pipe weight [kg/m]	Fluid Content [l/m]	Roll maximum length (*) [m]
	DN/ inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]				
*25+20/90	20+15 - 3/4"+5/8"	18 - 14,4	3,5-2,8	25 - 20	90	3,0	0,80	1,40	0,42	715
32+20/110	25+15 - 1"+5/8"	23,2 -14,4	4,4-2,8	32 - 20	110	3,0	0,85	2,00	0,59	375
40+25/125	32+20 - 1"1/4+3/4"	29 -18	5,5-3,5	40 - 25	125	3,0	0,90	2,60	0,91	340
50+32/125	40+25 - 1"1/2+1"	36,2 - 23,2	6,9-4,4	50 - 32	125	3,0	0,90	3,50	1,45	340

* The diameter is approximate. Alternatively, Ø 22x3,0 or28x4,0
Note (*): Production tolerance +/- 5%. The maximum length corresponding to a roll with a width of 1,2m and outer diameter of 2,8m.

HEAT LOSSES OF ECOPEX® DUO PIPELINES – SANITARY USE PN 10 – STANDARD INSULATION

DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20+15	0,229	6,86	9,15	11,43	13,72	16,00
25+15	0,210	6,30	8,40	10,50	12,60	14,70
32+20	0,229	6,88	9,17	11,47	13,76	16,06
40+25	0,316	9,47	12,63	15,79	18,95	22,11

PIPELINES PN 10 - DUO

ECOPEX® DUO - SANITARY PN 10 – PLUS INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Minimum bending radius [m]	Pipe weight [kg/m]	Fluid Content [l/m]	Roll maximum length (*) [m]
	DN/ inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]				
*25+20/110	20+15 - 3/4"+5/8"	18 - 14,4	3,5 - 2,8	25 - 20	110	3,0	0,85	1,00	0,42	375
32+20/125	25+15 - 1"+5/8"	23,2 - 14,4	4,4 - 2,8	32 - 20	125	3,0	0,90	2,20	0,59	340
40+25/140	32+20 - 1"1/4+3/4"	29 -18	5,5 - 3,5	40 - 25	140	3,0	1,00	2,80	0,91	225
50+32/160	40+25 - 1"1/2+1"	36,2 - 23,2	6,9 - 4,4	50 - 32	160	3,0	1,20	4,00	1,45	149

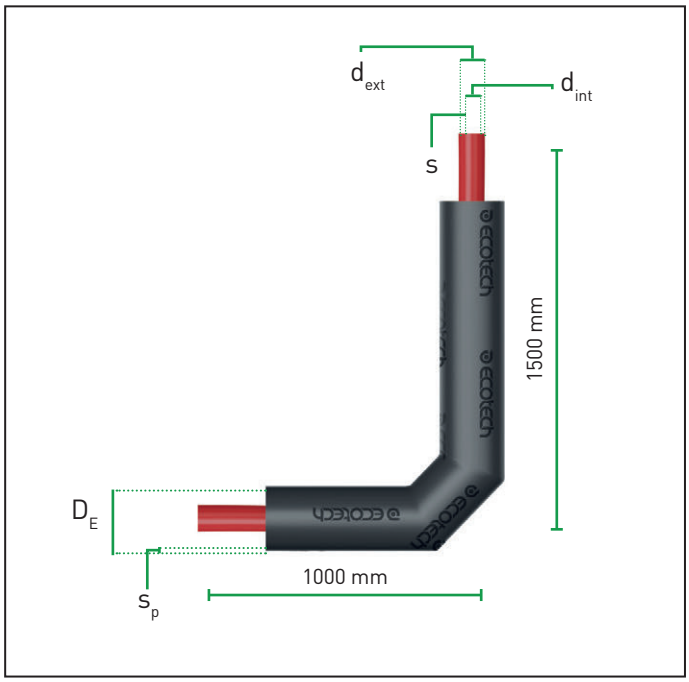
* The diameter is approximate. Alternatively, Ø 22x3,0 or28x4,0
Note (*): Production tolerance +/- 5%. The maximum length corresponding to a roll with a width of 1,2m and outer diameter of 2,8m.

HEAT LOSSES OF THE ECOPEX® DUO PIPELINES – SANITARY USE PN 10 – PLUS INSULATION

DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20+15	0,184	5,51	7,34	9,18	11,01	12,85
25+15	0,184	5,52	7,36	9,20	11,04	12,88
32+20	0,202	6,05	8,07	10,08	12,10	14,11
40+25	0,221	6,63	8,85	11,06	13,27	15,48

PREINSULATED 90° BENDS FOR BUILDING ENTRIES

At the entry positions of a boiler room of a building, according to the specific connection to be performed, it can be useful to install pre-insulated bends, as shown in the following picture.



The specific dimensions, according to the type of use and the insulating series, are listed in the following tables, where:

d_{int}: inner diameter of the PE-Xa pipeline;
d_{out}: outer diameter of the PE-Xa pipeline;
s: thickness of the PE-Xa pipeline;
D_E: outer diameter of the PE outer casing;
s_p: thickness of the PE outer casing.

90° BENDS PN 6 - UNO

ECOPEX® UNO - HEATING PN 6 – STANDARD INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Bend weight [kg]
	DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]	
25/75	20 - 3/4"	20,4	2,3	25	75	3,0	2,30
32/75	25 - 1"	26,2	2,9	32	75	3,0	2,50
40/90	32 - 1" 1/4	32,6	3,7	40	90	3,0	3,47
50/110	40 - 1" 1/2	40,8	4,6	50	110	3,0	4,92
63/125	50 - 2"	51,4	5,8	63	125	3,0	6,50
75/140	65 - 2" 1/2	61,4	6,8	75	140	3,0	8,47
90/160	80 - 3"	73,6	8,2	90	160	3,0	11,40
110/160	100 - 4"	90	10	110	160	3,0	14,23
125/180	125 - 5"	102,2	11,4	125	180	3,0	18,75
140/200	140	114,6	12,7	140	200	3,2	21,00
160/250	150 - 6"	130,8	14,6	160	250	3,6	30,75

ECOPEX® UNO - HEATING PN 6 – PLUS INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Bend weight [kg]
	DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]	
25/90	20 - 3/4"	20,4	2,3	25	90	3,0	2,50
32/90	25 - 1"	26,2	2,9	32	90	3,0	2,80
40/110	32 - 1" 1/4	32,6	3,7	40	110	3,0	3,80
50/125	40 - 1" 1/2	40,8	4,6	50	125	3,0	5,50
63/140	50 - 2"	51,4	5,8	63	140	3,0	7,20
75/160	65 - 2" 1/2	61,4	6,8	75	160	3,0	9,90
90/180	80 - 3"	73,6	8,2	90	180	3,0	13,00
110/180	100 - 4"	90	10	110	180 (200)	3,0	16,50
125/200	125 - 5"	102,2	11,4	125	200	3,2	22,00

90° BENDS PN 10 - UNO

ECOPEX® UNO - SANITARY PN 10 – STANDARD INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Bend weight [kg]
	DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]	
20/75	15 - 1/2"	14,4	2,8	20	75	3,0	2,40
25/75*	20 - 3/4"	18	3,5	25	75	3,0	2,65
40/90	32 - 1" 1/4	29	5,5	40	90	3,0	3,90
50/110	40 - 1" 1/2	36,2	6,9	50	110	3,0	5,62
63/125	50 - 2"	45,6	8,7	63	125	3,0	7,65

* = approximate diameter; alternatively, Ø 22 or Ø 28mm.

ECOPEX® UNO - SANITARY PN 10 - STANDARD INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Bend weight [kg]
	DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]	
20/90	15 - 1/2"	14,4	2,8	20	90	3,0	2,60
25/90*	20 - 3/4"	18	3,5	25	90	3,0	3,00
40/110	32 - 1" 1/4	29	5,5	40	110	3,0	4,40
50/125	40 - 1" 1/2	36,2	6,9	50	125	3,0	6,60
63/140	50 - 2"	45,6	8,7	63	140	3,0	8,80

* = approximate diameter; alternatively, Ø 22 or Ø 28mm.

90° BENDS PN 6 – DUO

ECOPEX® DUO - HEATING PN 6 – STANDARD INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Bend weight [kg]
	DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]	
25+25/90	20+20 - 2x3/4"	20,4	2,3	25	90	3,0	4,67
32+32/110	25+25 - 2x1"	26,2	2,9	32	110	3,0	4,71
40+40/125	32+32 - 2x1" 1/4	32,6	3,7	40	125	3,0	7,42
50+50/160	40+40 - 2x1" 1/2	40,8	4,6	50	160	3,0	9,90
63+63/180	50+50 - 2x2"	51,4	5,8	63	180	3,0	13,20
75+75/200	65+65 - 2x2" 1/2	61,4	6,8	75	200	3,0	15,00

ECOPEX® DUO - HEATING PN 6 - PLUS INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Bend weight [kg]
	DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]	
25+25/110	20+20 - 2x3/4"	20,4	2,3	25	110	3,0	5,67
32+32/125	25+25 - 2x1"	26,2	2,9	32	125	3,0	5,71
40+40/140	32+32 - 2x1" 1/4	32,6	3,7	40	140	3,0	8,42
50+50/180	40+40 - 2x1" 1/2	40,8	4,6	50	180	3,0	10,90
63+63/200	50+50 - 2x2"	51,4	5,8	63	200	3,0	14,20

90° BENDS PN 10 – DUO

ECOPEX® DUO - SANITARY PN 10 - STANDARD INSULATION

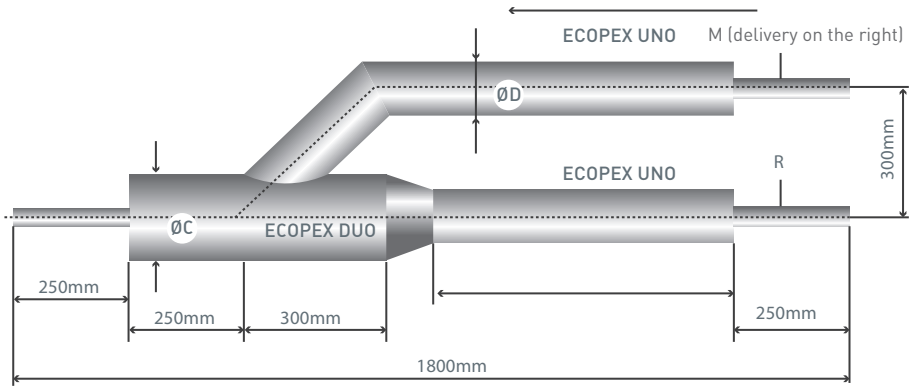
Type [mm]	PE-Xa Pipe				PE Casing		Bend weight [kg]
	DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]	
*25+20/90	20+15 - 3/4" + 5,8"	18 - 14,4	3,5 - 2,8	25 - 20	90	3,0	3,50
32+20/110	25+15 - 1"+5/8"	23,2 - 14,4	4,4 - 2,8	32 - 20	110	3,0	5,00
40+25/125	32+20 - 1"1/4+3/4"	29 - 18	5,5 - 3,5	40 - 25	125	3,0	6,50
50+32/125	40+25 - 1"1/2+1"	36,2 - 23,2	6,9 - 4,4	50 - 32	125	3,0	7,30

* = diametro indicativo; in alternativa Ø 22 o Ø 28mm.

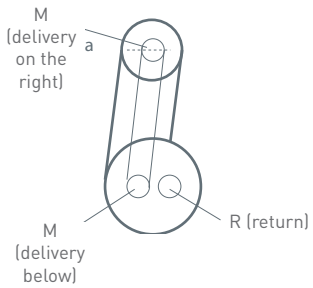
ECOPEX® DUO - SANITARY PN 10 - STANDARD INSULATION

Type [mm]	PE-Xa Pipe				PE Casing		Bend weight [kg]
	DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	D_e [mm]	s_p [mm]	
25+20/110	20+15 - 3/4" + 5,8"	18 - 14,4	3,5 - 2,8	25 - 20	110	3,0	4,50
32+20/125	25+15 - 1"+5/8"	23,2 - 14,4	4,4 - 2,8	32 - 20	125	3,0	6,00
40+25/140	32+20 - 1"1/4+3/4"	29 - 18	5,5 - 3,5	40 - 25	140	3,0	7,80
50+32/160	40+25 - 1"1/2+1"	36,2 - 23,2	6,9 - 4,4	50 - 32	160	3,0	8,80

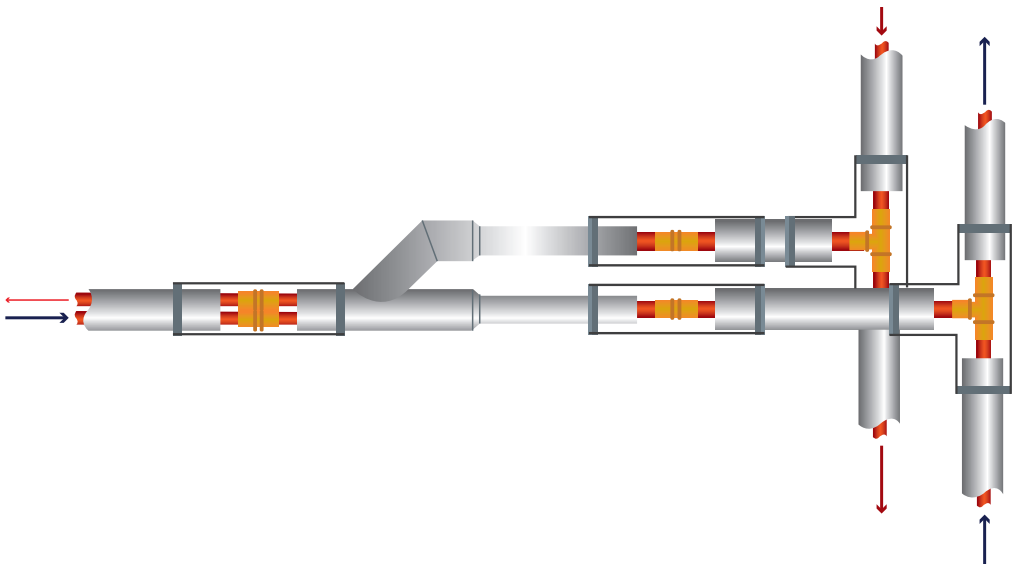
Y BRANCH - HEATING 6 BAR



Note: with UNO pipe the direction of the delivery flow (M) is always on the right, with DUO pipe is always below.

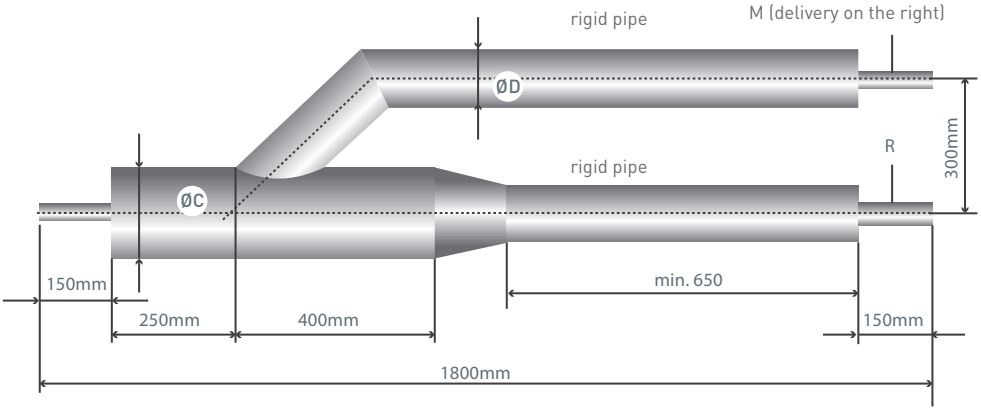


ECOPEX® DUO - **ECOPEX®** UNO				
Pipe UNO **ECOPEX®** [mm]	DN [mm]	ø D [mm]	Pipe DUO **ECOPEX®** [mm]	ø C [mm]
2 x 25/75 2 x 32/75	20 25	75 75	25+25/90 32+32/110	90 110
2x40/90	32	90	40+40/125	125
2x50/110	40	110	50+50/160	160
2x63/125	50	125	63+63/180	180
2x75/140	65	140	75+75/200	200

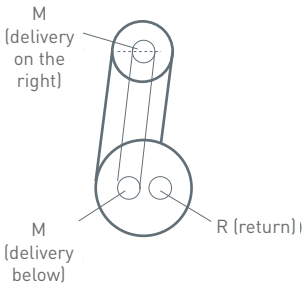


Note: with UNO pipe the direction of the delivery flow (M) is always on the right, with DUO pipe always below.

Y BRANCH - HEATING 6 BAR



Note: with UNO pipe the direction of the delivery flow (M) is always on the right, with DUO pipe is always below.



ECOPEX® DUO - 2 steel UNO pipes				
Stainless UNO pipeline [mm]	**DN [mm]**	**ø D [mm]**	**pipeline DUO ECOPEX® [mm]**	**ø C [mm]**
26,9 - 90 33,7 - 90	20 25	90 90	25 + 25/90 32 + 32/110	90 110
42,4 - 110 48,3 - 110	32 40	110 110	40+40/125 50+50/160	125 160
60,3 - 125	50	125	63+63/180	180
76,1 - 140	65	140	75+75/200	200

Nota: with UNO pipe the direction of the delivery flow (M) is always on the right, with DUO pipe is always below.

VALVES

Pre-insulated valves can be installed at any point of the buried network and they are applicable to all installation methods.
All the valves in this catalogue are reduced bore valves, with floating ball.

- **stem:** coated stainless steel;
- **steel body:** min. P235GH;
- **seals:**
  1. for the stem, PTFE reinforced carbon and FPM;
  2. for the ball, PTFE reinforced carbon;
- **max. axial loading** = 300 N/mm^2 (DN < 300 and high axial stress conditions);
- **operating pressure** = PN 25;
- **available from DN 25 to DN 300** (for different dimensions, please contact our Sales Department);
- **insulation,** outer casing as for the previous products.

Assembled valve.

- **pre-insulated reduced bore valves** in accordance with EN448, with handling stem. Reduction gear with 90° gearbox for DN>15;
- **ends without insulation** for 150/200mm;
- **max. operating temperature** = 155°C;
- they can also have n. 1 or 2 air vents/drains equipped with stainless steel valves, with sealing water stop.

WARNINGS: valve dimensions and features can be slightly modified by the production standard improvement. Tolerances are in accordance with the reference standards. If necessary, contact our TECHNICAL DEPARTMENT for data confirmation.

1.

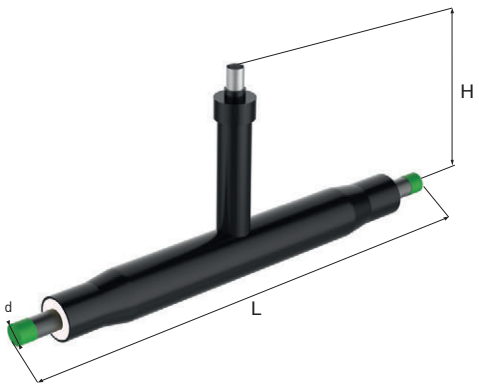
2.

3.

[1] Valve
[2] Valve with nr. 1 vent/drain
[3] Valve with nr. 2 vents/drains

VALVES

Steel pipe		Pipe PE-Xa		NB mm	H	L
DN	d [mm]	DN	De	DN	[mm]	[mm]
25	33,7	25	32	20	620	1500
32	42,4	32	40	25	630	1500
40	48,3	40	50	32	650	1500
50	60,3	50	63	40	650	1500
65	76,1	65	75	50	650	1500
80	88,9	80	90	65	650	1500
100	114,3	100	110	80	650	1500
125	139,7	125	125	100	650	1500
150	168,3	150	160	125	700	1500



For valves of different types and dimensions please contact our Sales Department.
Valves can be supplied in the different insulation solutions.

TEE BRANCH KIT

The installation of a tee branch can be performed only with the specific branch KIT or with the Tee PE-Xa sleeves to insulate on site, therefore refer to the following paragraphs of this catalogue.

ECOTECH Tee branch kits include the following materials:
- press Tee fitting (ref. following paragraphs;
- PEAD shaped Tee for the insulation joint;
- Sealing bends for the HDPE sheet;
- polyurethane foam in vials.

Kit composition and the necessary materials to perform the joint (supplied only on request) are represented in the following pictures.

COMPONENTS OF THE KIT:
1) Bonding patch
2) Holed heat-shrinkable sheet
3) Heat-shrinkable overcasing TEE
4) Heat-shrinkable ring
5) Venting plug
6) Welding closing plug
7) Heat bonding patch or "FOPS"
8) Polyurethane pre-dosed components POLYOL(A), ISOCYANATE(B)
9) Press Tee

REQUIRED EQUIPMENT (Operating and with the legal safety requirements):
a) Gas cylinder
b) Propane gas torch with outlet diameter Ø 30-50mm.
c) Pressure regulator
d) Equipment for pressure test (0,2 bar)
e) Power drill
f) Hole cutter Ø24mm.
g) Sandpaper grain 60-80 in rolls of a width of 50mm.
h) Different hand tools (hammer, screwdriver, chisel, etc.)
i) Solvent ("Tangit" type) and rags
l) Plug welder with tapered thermo element (if closing cups are provided)

The Kit is available in all the dimensions of the press Tee fittings (ref. following paragraphs).

KIT JOINT FOR ECOPEX®
UNO & DUO FLEXIBLE PREINSULATED PIPELINES

Installation of insulation at the joints is carried out using a double seal joint which includes: pre-dosed polyurethane in vials, heat-shrinkable sheets and heat-shrinkable HDPE overcasing (fittings for PEX pipe excluded). The table below lists the available dimensions of the kit joints.

1.

2.

ECOPEX® UNO & DUO	
DE_1 PE	DE_2 PE
75	75
90	75
90	90
110	90
110	110
125	110
125	125
140	125
140	140
160	140
160	160
180	160
180	180

1. Kit Joint
2. Composition of the Double Seal joint

INSTALLATION OF JOINT INSULATION AT THE WELDING POSITIONS

ECOTECH installation of joint insulation at the welding positions includes the suppling of two vials containing chemical components that are mixed to produce polyurethane foam. The containers, if stored in accordance with the supplied rules, have three-month validity from the manufacturing date. Foam pack materials comply with the European Standard EN 253. Component products [A = polyol + cyclopentane, B=isocyanate] are predosed according to each pipe diameter, inside special plastic containers supplied in a polystyrene box in order to limit heat exchange with the outside temperature.

WARNING!

The vials containing the components for polyurethane foam must be stored at temperatures between 15°C and 35°C and have three month validity from the manufacturing date indicated on the package.

Once the components have been mixed, a small part of the mixture must be poured in the second vial, so that the reacted product is present in both the vials. This operation prevents from having vials containing toxic products, which are difficult to eliminate.

JOINT FITTINGS

At the positions where it is necessary to perform the connection between two rolls of PE-Xa pipeline (intermediate joint) or between a PE-Xa pipeline roll and a different material pipeline (end fitting), specific joint fittings must be used.

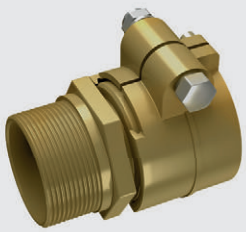
There are different types of fittings must be used, according to the features of the pipelines which have to be connected and the connection methods, in particular:

FITTING	TYPE OF JOINT
End	Screw
	Press
Intermediate	Screw
	Press
	Welding – heating use

The different types of available fittings are represented below, with the related dimensions.

SCREW END FITTINGS

Screw fittings
Screw end fittings are available with different features according to the diameter and the type of pipeline fitting to be jointed to the PE-Xa pipe, which can be threaded or welding. The following pictures represent the different available types:

Type	Image	Material
Threaded end DN 20-DN 100 (type 2)		Brass
Welding end		Brass –Steel

SCREW END FITTINGS PN 6 - THREADED TYPE 2

THREADED SCREW END FITTINGS - TYPE 2

Pipeline 1 - PE-Xa			Pipeline 2
DN/inches	s [mm]	d_{ext} [mm]	Diameter [pollici]
25 - 1"	2,9	32	1"
32 - 1" 1/4	3,7	40	1" 1/4
40 - 1" 1/2	4,6	50	1" 1/2
50 - 2"	5,8	63	2"
65 - 2" 1/2	6,8	75	2" 1/2
80 - 3"	8,2	90	3"
100 - 4"	10	110	4"

THREADED SCREW END FITTINGS - TYPE 2

SCREW END FITTINGS PN 10 - THREADED TYPE 2

Pipeline 1 - PE-Xa			Pipeline 2
DN/inches	s [mm]	d_{ext} [mm]	Diameter [inches]
25 - 1"	4,4	32	1"
32 - 1" 1/4	5,5	40	1" 1/4
40 - 1" 1/2	6,9	50	1" 1/2
50 - 2"	8,7	63	2"

SCREW END FITTINGS - WELDING END

Screw end fittings with welding end are available only for heating use with a pressure PN 6.

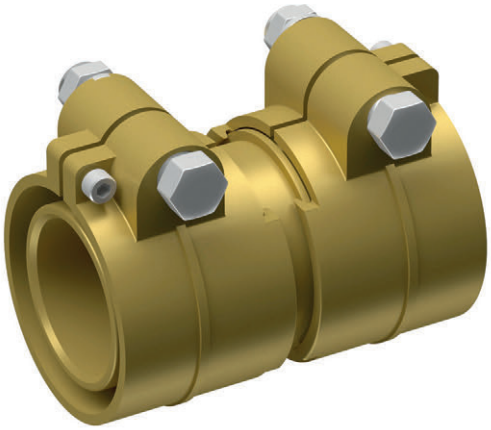
The dimensions of those fittings are shown in the following table.

SCREW END FITTINGS PN 6 – WELDING END

Pipeline 1 - PE-Xa			Pipeline 2 steel
DN/inches	s [mm]	d_{ext} [mm]	D_{ext} [mm]
20 - 3/4"	2,3	25	26,9
25 - 1"	2,9	32	33,7
32 - 1" 1/4	3,7	40	42,4
40 - 1" 1/2	4,6	50	48,3
50 - 2"	5,8	63	60,3
65 - 2" 1/2	6,8	75	76,1
80 - 3"	8,2	90	88,9
100 - 4"	10	110	114,3
125 - 5"	11,4	125	114,3
140 - 5"	12,7	140	139,7
160 - 6"	14,6	160	168,3

SCREW INTERMEDIATE FITTINGS PN6

Screw fittings
Screw intermediate fittings are represented in the following picture.



MATERIAL: BRASS
These fittings are available in the dimensions shown in the following tables, according to the operating maximum pressure.

SCREW INTERMEDIATE FITTINGS PN 6

DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]
20 - 3/4"	20,4	2,3	25
25 -1"	26,2	2,9	32
32 - 1" 1/4	32,6	3,7	40
40 - 1" 1/2	40,8	4,6	50
50 - 2"	51,4	5,8	63
65 - 2" 1/2	61,4	6,8	75
80 - 3"	73,6	8,2	90
100 - 4"	90	10	110
125 - 5"	102,2	11,4	125
140 - 5"	116,6	12,7	140
160 - 6"	130,8	14,6	160

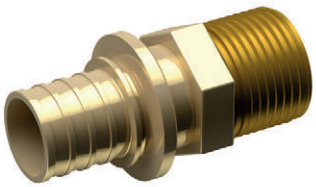
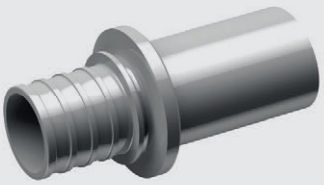
SCREW INTERMEDIATE FITTINGS PN10

SCREW INTERMEDIATE FITTINGS PN 10

DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]
20 - 3/4"	18	3,5	25
25 - 1"	23,2	4,4	32
32 - 1" 1/4	29	5,5	40
40 - 1" 1/2	36,2	6,9	50
50 - 2"	45,6	8,7	63

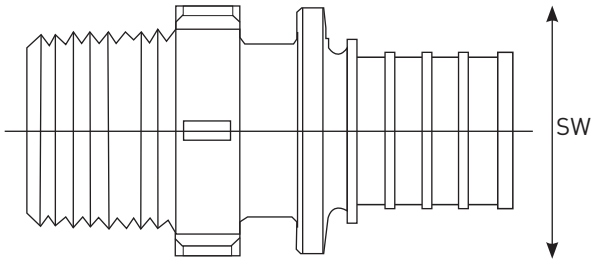
PRESS END FITTINGS

Press end fittings are available with different features according to the type of fitting of the pipeline to be jointed with the PE-Xa pipe, which can be threaded or welding. The following pictures represent the different available types:

Type	Image	Material
Threaded end		Brass
Welding end		Steel St.37

THREADED PRESS END FITTINGS PN6

Press end fittings with threaded end are available in the dimensions shown in the following tables, with measurements as detailed in the pictures.



PRESS END FITTINGS PN 6 – THREADED END (MALE)

Pipeline 1			Pipeline 2	a	SW	Weight
DN/inches	s [mm]	d_{ext} [mm]	DN/inches	[mm]	[mm]	[kg]
20 - 3/4"	2,3	25	3/4"	63	32	0,185
25 - 1"	2,9	32	1"	69	42	0,232
32 - 1" 1/4	3,7	40	1" 1/4	82	42	0,360
40 - 1" 1/2	4,6	50	1" 1/2	89	41	0,480
50 - 2"	5,8	63	2"	105	51	0,818
65 - 2" 1/2	6,8	75	2" 1/2	110	74	1,200
80 - 3"	8,2	90	3"	111	95	1,433
100 - 4"	10	110	4"	119	122	2,345

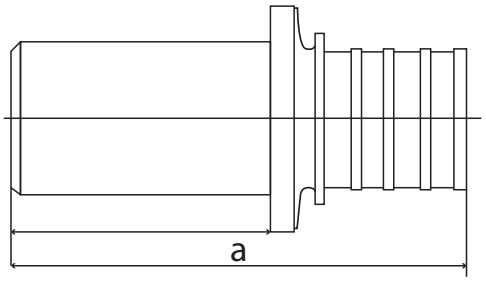
THREADED PRESS END FITTINGS PN10

PRESS END FITTINGS PN 10 - THREADED END (MALE)

Pipeline 1			Pipeline 2
DN/inches	s [mm]	d_{ext} [mm]	DN/inches
15 - 5/8"	2,8	20	1/2"
20 - 3/4"	3,5	25	3/4"
25 - 1"	4,4	32	1"
32 - 1" 1/4	5,5	40	1" 1/4
40 - 1" 1/2	6,9	50	1" 1/2
50 - 2"	8,7	63	2"

PRESS END FITTINGS PN6
WELDING END

Press end fittings with welding ends are available only for heating use with pressure PN 6. The dimensions of those fittings are shown in the following table.



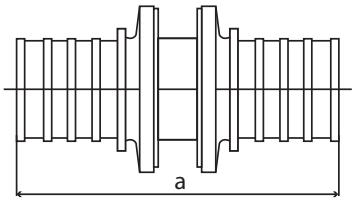
PRESS END FITTINGS PN6 - WELDING END

Pipeline 1		Pipeline 2				
DN/inches	s [mm]	d_{ext} [mm]	s [mm]	d_{ext} [mm]	a [mm]	Weight [kg]
20 - 3/4"	2,3	25	2,3	26,9	54	0,077
25 -1"	2,9	32	2,6	33,7	62	0,140
32 - 1" 1/4	3,7	40	2,6	42,4	70	0,311
40 - 1" 1/2	4,6	50	2,6	48,3	85	0,393
50 - 2"	5,8	63	2,9	60,3	85	0,575
65 - 2" 1/2	6,8	75	2,9	76,1	94	0,830
80 - 3"	8,2	90	3,2	88,9	93	1,077
100 - 4"	10	110	3,6	114,3	88	1,634
125 - 4"	11,4	125	3,6	139,7	108	2,480
140 -5"	12,7	140	3,6	132,5	112,5	4,116
160 - 6"	14,6	160	4,0	168,3	112,5	5,010

PRESS INTERMEDIATE FITTINGS PN6

Press fittings
Press intermediate fittings PN6 are available both for jointing pipelines of the same diameter, and as reduction joints. The intermediate fittings for jointing pipelines of the same diameters are represented in the following picture:

MATERIAL: DN 25 – DN 50: BRASS
DN 65 – DN 80 – DN 100: CUPPER RG7
Those fittings are available in the dimensions shown in the following table.



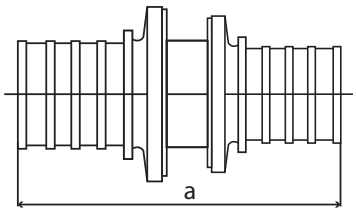
PRESS INTERMEDIATE FITTINGS PN 6

DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]	a [mm]	Weight [kg]
20 - 3/4"	20,4	2,3	25	74,5	0,096
25 -1"	26,2	2,9	32	85	0,194
32 - 1" 1/4	32,6	3,7	40	94	0,430
40 - 1" 1/2	40,8	4,6	50	106	0,608
50 - 2"	51,4	5,8	63	126	0,998
65 - 2" 1/2	61,4	6,8	75	129	1,356
80 - 3"	73,6	8,2	90	128	1,665
100 - 4"	90	10	110	130	2,733
125 - 4"	102,2	11,4	125	133	3,576
140 - 5"	114,6	12,7	140	139	5,830
160 - 6"	130,8	14,6	160	140	7,78

PRESS INTERMEDIATE FITTINGS PN6

The reduction press intermediate fittings for jointing pipelines of different diameters (reduction joints) are represented in the following picture.

MATERIAL: DN 25 – DN 50: BRASS
DN 65 – DN 80 – DN 100: CUPPER RG7
Those fittings are available in the dimensions shown in the following table.



REDUCTION PRESS INTERMEDIATE FITTINGS PN 6

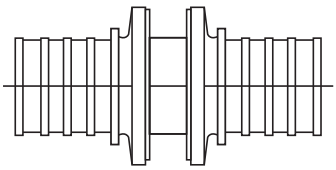
Pipeline 1			Pipeline 2			a [mm]	Weight [kg]
DN/inches	s [mm]	d_{ext} [mm]	DN/pollici	s [mm]	d_{ext} [mm]		
25 - 1"	2,9	32	20 - 3/4"	2,3	25	73	0,128
32 - 1" 1/4	3,7	40	25 - 1"	2,9	32	88	0,286
40 - 1" 1/2	4,6	50	32 -1" 1/4	3,7	40	101	0,538
50 - 2"	5,8	63	40 - 1" 1/2	4,6	50	117	0,795
65 - 2" 1/2	6,8	75	50 - 2"	5,8	63	128	0,191
80 - 3"	8,2	90	65 - 2" 1/2	6,8	75	129	1,632
100 - 4"	10	110	80 - 3"	8,2	90	130	2,375

PRESS INTERMEDIATE FITTINGS PN10

Press fittings
As for the pipelines for heating use, also for the pipelines for sanitary-hygienic use the press intermediate fittings are available for both jointing pipelines of the same diameter, and as reduction joints. The intermediate fittings for jointing pipelines of the same diameter are represented in the following picture.

MATERIAL: BRASS ACCORDING TO THE STANDARDS DIN EN 12164, DIN EN 12165, DIN EN 12168

Those fittings are available in the dimensions shown in the following table



PRESS INTERMEDIATE FITTINGS PN 10

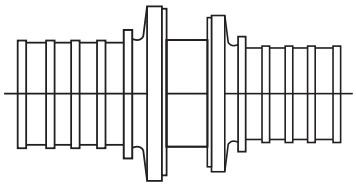
DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]
20 - 3/4"	18,0	3,5	25
25 - 1"	23,2	4,4	32
32 - 1" 1/4	29,0	5,5	40
40 - 1" 1/2	36,2	6,9	50
50 - 2"	45,6	8,7	63

REDUCTION PRESS INTERMEDIATE FITTINGS PN10

Press intermediate fittings for jointing pipelines of different diameters (reduction joints) are represented in the following picture.

MATERIAL: BRASS ACCORDING TO THE STANDARDS DIN EN 12164, DIN EN 12165, DIN EN 12168

The typical dimensions of those sleeves are shown in the following table:



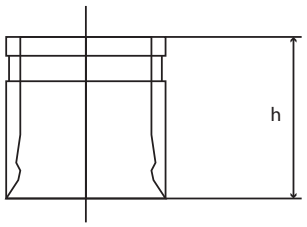
REDUCTION PRESS INTERMEDIATE FITTINGS PN 10

Pipeline 1			Pipeline 2		
DN/inches	s [mm]	d_{ext} [mm]	DN/inches	s [mm]	d_{ext} [mm]
25 - 1"	4,4	32	20 - 3/4"	3,5	25
32 - 1" 1/4	5,5	40	20 - 3/4"	3,5	25
32 - 1" 1/4	5,5	40	25 - 1"	4,4	32
40 - 1" 1/2	6,9	50	25 - 1"	4,4	32
40 - 1" 1/2	6,9	50	32 - 1" 1/4	5,5	40
50 - 2"	8,7	63	40 - 1" 1/2	6,9	50

PRESS SLEEVES PN6

Independently of the press fitting installed, an compression sleeve must be installed, represented in the following picture:

MATERIAL: DN 25 – DN 50: BRASS
DN 65 – DN 80 – DN 100: CUPPER RG7
The typical dimensions of those sleeves are shown in the following table:



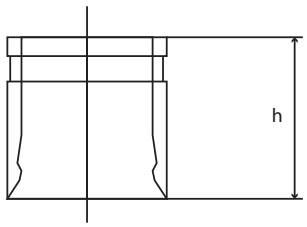
SLEEVES PN6

DN/inches	s [mm]	d_{ext} [mm]	h [mm]	Weight [kg]
20 - 3/4"	2,3	25	29	0,042
25 -1"	2,9	32	34	0,096
32 - 1" 1/4	3,7	40	37	0,134
40 - 1" 1/2	4,6	50	44	0,258
50 - 2"	5,8	63	53	0,405
65 - 2" 1/2	6,8	75	53	0,664
80 - 3"	8,2	90	53	0,854
100 - 4"	10	110	53	1,110
125 - 4"	11,4	125	53	1,528
140 - 5"	12,7	140	53	1,870
160 - 6"	14,6	160	53	2,319

PRESS SLEEVES PN10

Independently of the type of press fitting installed, an expansion sleeve must be installed, as represented in the following picture:

MATERIAL: BRASS
Fittings are available in the dimensions shown in the following table.



SLEEVE PN 10

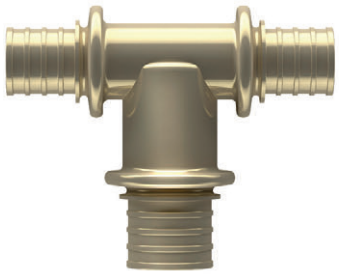
DN/inches	s [mm]	d_{ext} [mm]	h [mm]	Weight [kg]
20 - 3/4"	3,5	28	26	0,059
25 - 1"	4,4	32	34	0,090
32 - 1" 1/4	5,5	40	37	0,145
40 - 1" 1/2	6,9	50	44	0,277
50 - 2"	8,6	63	53	0,408

PRESS TEE FITTINGS

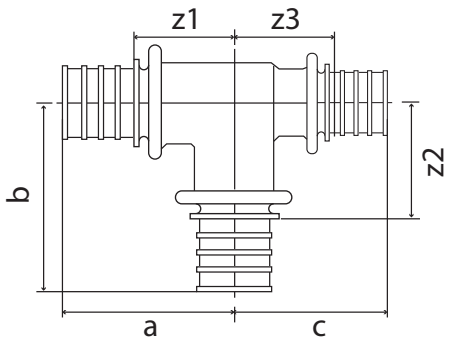
PRESS TEE FITTINGS
Two types of press TEE are available according to the material used for the construction.

TEE FITTINGS
The standard TEE is represented in the following picture. These fittings must be used in combination with the expansion sleeves already presented above.

MATERIAL: DN 25 – DN 50: BRASS
DN 65 – DN 100: COPPER (RG) 5

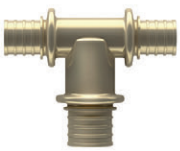


Dimensions of the Tee fittings are shown in the table below.



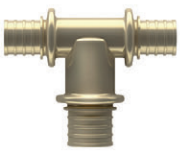
PRESS TEE FITTINGS - PN6

PRESS TEE FITTINGS - PN6				
Dimension	a [mm]	b [mm]	c [mm]	Weight [kg]
EQUAL TEE				
25 X 2,3	48,4	52	48,4	0,164
32 X 2,9	60,3	64	60,3	0,346
40 X 3,7	71,5	76	71,5	0,822
50 X 4,6	84,5	89	84,5	1,160
63 X 5,8	100	105	100	2,002
75 X 6,8	115	115	115	2,950
90 X 8,2	124	124	124	4,000
110 X 10,0	135	120	135	6,750
REDUCED TEE (on the branch and at one end)				
32 - 25 -25	56	58	50	0,288
40 - 32 - 32	63	71	60	0,576
50 - 25 - 40	71	70	64	0,723
50 - 32 -40	73	77	66	0,793
63 - 32 - 50	82	83	73	1,140
63 - 40 - 40	88	89	73	1,289
63 - 40 - 50	86	89	77	1,365
63 - 50 - 50	90	96	81	1,469
75 - 32 -63	84	92	83	1,611
75 - 50 - 63	91	105	90	1,974
75 - 63 - 63	97	114	96	2,276



PRESS TEE FITTINGS PN6

PRESS TEE FITTINGS - PN6				
Dimension	a [mm]	b [mm]	c [mm]	Weight [kg]
REDUCED TEE ON THE BRANCH				
32 - 25 - 32	56	58	56	0,335
40 - 25 - 40	63	64	63	0,610
40 - 32 - 40	65	71	65	0,690
50 - 25 - 50	70	70	70	0,865
50 - 32 - 50	72	77	72	0,891
50 - 4o - 50	76	82	76	1,021
63 - 25 - 63	79	77	79	1,308
63 - 32 - 63	81	83	81	1,396
63 - 40 - 63	85	89	85	1,535
63 - 50 - 63	89	96	89	1,657
75 - 25 - 75	81	86	81	1,731
75 - 32 - 75	83	92	83	1,832
75 - 40 - 75	87	98	87	1,970
75 - 50 - 75	91	105	91	2,114
75 - 63 - 75	97	114	97	2,438
90 - 32 - 90	83	102	83	2,316
90 - 40 - 90	87	108	87	2,474
90 - 63 - 90	97	124	97	3,988
110 - 32 - 110	85	116	85	3,660
110 - 50 - 110	93	128	93	4,128
110 - 63 - 110	99	137	99	4,575



PRESS TEE FITTINGS - PN6

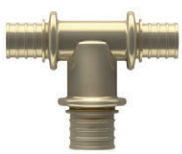
PRESS STANDARD TEE FITTINGS – PN 6				
Dimensione	a [mm]	b [mm]	c [mm]	Peso [kg]
REDUCED TEE ON BOTH THE ENDS				
63 - 75 - 63	161	131	161	10,340
REDUCED TEE AT ONE END				
32 - 32 - 25	104,4	81	104,4	2,530

PRESS TEE FITTINGS - PN 10

PRESS TEE FITTINGS - PN 10				
Dimension	a [mm]	b [mm]	c [mm]	Weight [kg]
EQUAL TEE				
20 x 2,8	44	47	44	0,123
25 x 3,5	53	57	53	0,213
32 x 4,4	61	66	61	0,377
40 x 5,5	67	66	67	0,684
50 x 6,9	80	87	80	1,262
63 x 8,6	98	106	98	1,980
REDUCED TEE ON THE BRANCH AND AT ONE END				
25 - 20 - 20	51	51	44	0,159
32 - 20 - 25	57	55	52	0,688
32 - 25 - 25	76	101	76	0,780
50 - 32 - 40	100	111	100	2,476

PRESS TEE FITTINGS - PN10

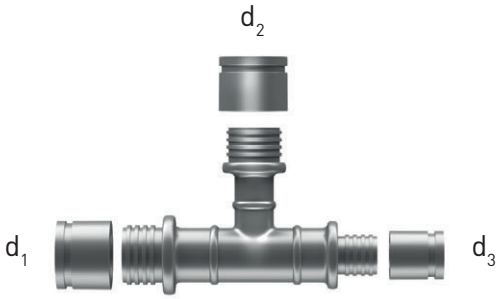
PRESS TEE FITTINGS - PN 10				
Dimension	a [mm]	b [mm]	c [mm]	Weight [kg]
REDUCED TEE ON THE BRANCH				
25 - 20 - 25	52	52	52	0.196
32 - 20 - 32	56	56	56	0.283
32 - 25 - 32	79	101	79	0,848
40 - 25 - 40	98	105	98	2,155
40 - 32 - 40	98	111	98	2,223
50 - 25 - 50	103	105	103	2,661
50 - 32 - 50	103	111	103	2,729
50 - 40 - 50	120	163	120	3,645
63 - 32 - 63	106	111	106	3,319
63 - 50 - 63	124	167	124	4,488
REDUCED TEE AT BOTH THE ENDS				
20 - 25 - 20	45	54	45	0,161
REDUCED TEE AT ONE END				
25 - 25 - 20	53	57	56	0,196
32 - 32 - 25	76	107	76	0,848



STEEL PRESS TEE FITTINGS

STEEL TEE FITTINGS
Steel press TEE's are also available. These TEES are supplied in combination with the previously mentioned expansion sleeves.

MATERIAL:
STEEL ST.37



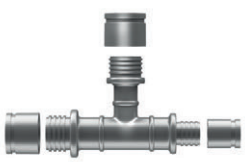
Dimensions o the steel Tee's are shown in the table below.

STEEL TEE FITTINGS – HEATING

d_1 [mm]	d_2 [mm]	d_3 [mm]	Weight [kg]
40	25	32	1,50
50	40	40	2,00
63	25	50	2,50
75	25	63	2,53
75	40	63	2,82
90	25	75	3,84
90	32	75	4,05

STEEL PRESS TEE FITTINGS

STEEL TEE FITTINGS – HEATING			
d_1 [mm]	d_2 [mm]	d_3 [mm]	Weight [kg]
90	40	75	4,23
90	50	75	4,57
90	63	75	5,09
90	75	75	4,47
110	25	90	5,00
110	32	90	5,25
110	40	90	5,43
110	50	90	5,77
110	63	90	5,77
110	75	90	6,29
110	90	90	7,00
90	25	90	4,55
90	50	90	5,28
90	75	90	6,51
110	25	110	5,53
110	40	110	6,26
110	75	110	6,78
110	90	110	7,49



ELECTROFUSION WELD INTERMEDIATE FITTINGS - PN6

Electrofusion weld intermediate fittings are available for both jointing pipelines of the same diameter and for reduction joints.
These fittings have an integrated electrical resistance which is heated through the passage of electric current at the necessary temperature to perform the welding; all the joints are equipped with a system allowing the recognition and automatic setting of the welding parameters.
The intermediate fittings for jointing pipelines of the same diameter are represented in the following picture:

Measurements for this fitting are shown in the table below:

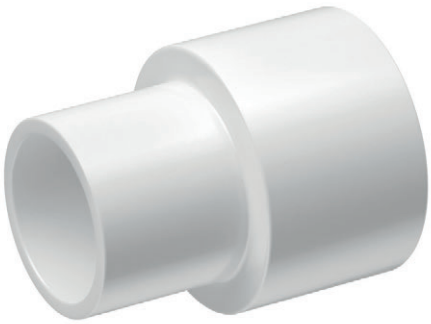
ELECTROFUSION WELD INTERMEDIATE FITTINGS

DN/inches	d_{int} [mm]	s [mm]	d_{ext} [mm]
40 - 1" 1/2	40,8	4,6	50
50 - 2"	51,4	5,8	63
65 - 2" 1/2	61,4	6,8	75
80 - 3"	73,6	8,2	90
100 - 4"	90	10	110
125 - 5"	102,2	11,4	125

ELECTROFUSION WELD INTERMEDIATE FITTINGS - PN6

Intermediate fittings for jointing pipelines of different diameters (reduction joints) are represented in the following picture:

NOTE: The reduction joints need the weld intermediate fittings of the previous page.



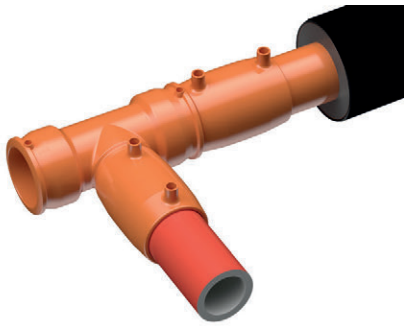
In the following table are shown the available measures for this fitting:

REDUCTION INTERMEDIATE FITTINGS

Pipeline 1			Pipeline 2		
DN/inches	s [mm]	d_{ext} [mm]	DN/inches	s [mm]	d_{ext} [mm]
50 - 2"	5,8	63	40 - 1" 1/2	4,6	50
65 - 2" 1/2	6,8	75	50 - 2"	5,8	63
80 - 3"	8,2	90	50 - 2"	5,8	63
80 - 3"	8,2	90	65 - 2" 1/2	6,8	75
100 - 4"	10	110	40 - 1" 1/2	4,6	50
100 - 4"	10	110	50 - 2"	5,8	63
100 - 4"	10	110	65 - 2" 1/2	6,8	75
100 - 4"	10	110	80 - 3"	8,2	90
125 - 5"	11,4	125	80 - 3"	8,2	90
125 - 5"	11,4	125	100 - 4"	10	110

ELECTROFUSION WELD TEE FITTINGS

ELECTROFUSION WELD TEE FITTINGS
Furthermore, pipelines for heating use the crosslinked polyethylene electrofusion weld TEE fittings are available, as represented in the following picture.



These fittings are available only in the version with the same diameter at all the ends in the following measures:

- DN 40 (50x4,6)
- DN 50 (63x5,8)
- DN 65 (75x6,8)
- DN 80 (90x8,2)
- DN 100 (110x10,0)
- DN 125 (125x11,4)

WARNING TAPE AND END CAPS

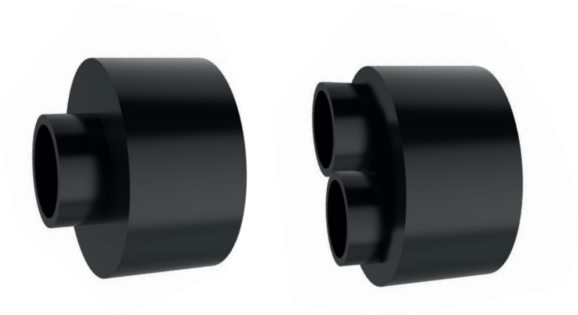
WARNING TAPE

When the pipe is being buried with approximately 50cm of ground cover or in accordance with specific design requirements, it is appropriate to install district heating pipeline warning tape.

On ECOLINE plastic tape is written "WARNING DISTRICT HEATING PIPELINE", it is red/purple and it is delivered in rolls of 200m length and 100m width.

END CAP

At the end of the **ECOPEX®** flexible pre-insulated pipeline inside the boiler room end caps can be installed for the protection of the polyurethane insulation of the pipe end, as shown in the following picture.



The following table lists the available dimensions of those elements:

Heat shrinkable end cap for **ECOPEX®** UNO	
Service pipe [mm]	Outer casing pipe [DE]
25	75 (90 plus)
32	75 (90 plus)
40	90 (110 plus)
50	110 (125 plus)
63	125 (140 plus)
75	140 (160 plus)
90	160 (180 plus)
110	160 (180 plus)

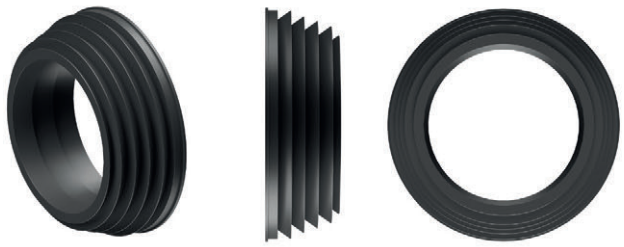
Heat shrinkable end cap for WATER-STOP for **ECOPEX®** DUO	
Service pipe [mm]	Outer casing pipe [DE]
25+25	90 (110 plus)
32+32	110 (125 plus)
40+40	125 (140 plus)
50+50	160 (180 plus)
63+63	180 (200 plus)
75+75	200

*for sanitary use ask information to the Sale Department

WALL ENTRY SEALS

WALL ENTRY SLEEVES

At building entries rubber wall entry seals are installed. Dimensions are approximately 50mm wide and 18,5mm thick.



Dimensions are shown in the following table:

DE - HDPE	DE - WALL ENTRY SLEEVE [mm]
75	118
90	127
110	147
125	162
140	177
160	197
180	217

PRESSURE TIGHT WALL ENTRY SEALS

For more secure sealing at building entries, pressure tight single or double wall entry seals can be adopted.

Dimensions are shown in the following table:

DE - HDPE	DE - WALL ENTRY SLEEVE [mm]
75	150
90	150
110	200
125	200
140	200
160	250
180	250

ECOPEX® SYSTEM

Designing

DESIGNING

DESIGNING OF FLEXIBLE PRE-INSULATED PIPELINE SYSTEMS WITH PE-Xa SERVICE PIPE

In the following pages will provide instructions on how to design district heating systems when flexible pipelines with PE-Xa service pipe are to be used.

MECHANICAL DESIGNING

As already written above, one of the main advantages in the use of **ECOPEX®** pipelines is that of the low value of the result between the modulus of elasticity 'E' and the coefficient of linear expansion; the obtained limited values of service pipe stress and deformation, therefore do not need to be compensated.

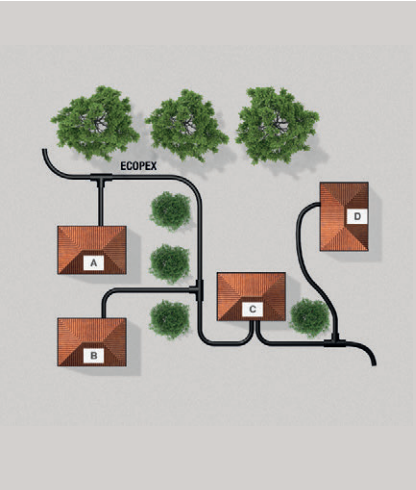
The following pictures represent three different laying methods for the flexible pre-insulated pipelines used for:

a) the complete building of district heating networks

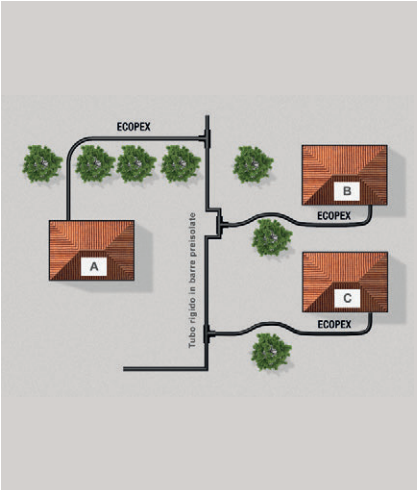
b) for the installation of users' connections

c) limited branches:

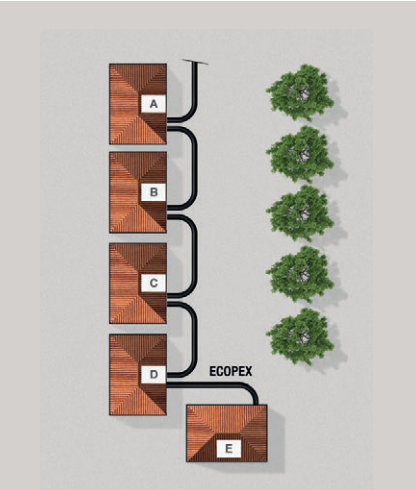
PRE-INSULATED DISTRICT HEATING NETWORK WITH PE-XA SERVICE PIPE



BRANCH FROM RIGID PRE-INSULATED NETWORK BUILDING TO BUILDING CONNECTION



BUILDING TO BUILDING CONNECTION (DAISY CHAIN)



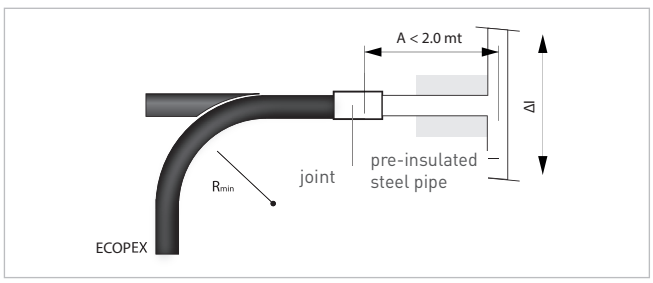
Schemes of flexible pre-insulated pipelines laying

MECHANICAL DESIGNING

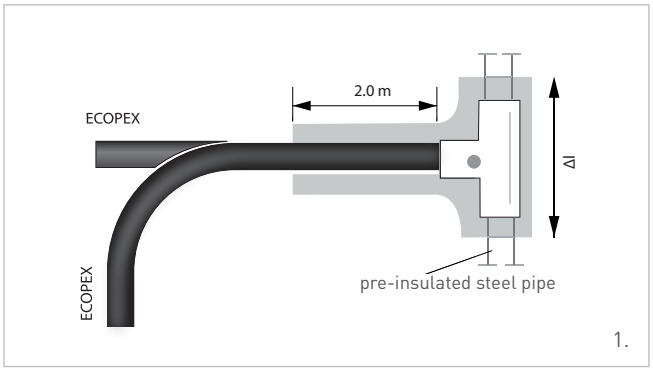
From a design point of view, it is necessary to take some precautionary measures at the connections to the rigid pre-insulated pipelines or to other types of pipelines, as flexible pre-insulated pipelines with PE-Xa service pipe are not able to compensate expansion and stresses transmitted by other pipelines. There are different types of possible connections according to the geometric characteristics of the rigid pre-insulated network.

CONNECTION AFTER A TEE

When the connection occurs after a pre-insulated rigid TEE, laying can be performed without any special precautionary measures. Expansion of the main pipeline must be absorbed by the connected pipeline, or through the compensation branch of the rigid pipeline, (the steel section with expansion absorbed by foam pads), or directly by the **ECOPEX®** flexible pipeline. The expansion length of the rigid pipeline will be calculated with respect to the expansions coming from the main pipeline (for further details, refer to the designing sections of **ECOLINE** catalogue), but taking into consideration that the length must not exceed 2m, as the flexible pipeline cannot bear the stresses transmitted by the rigid pipeline.



1.

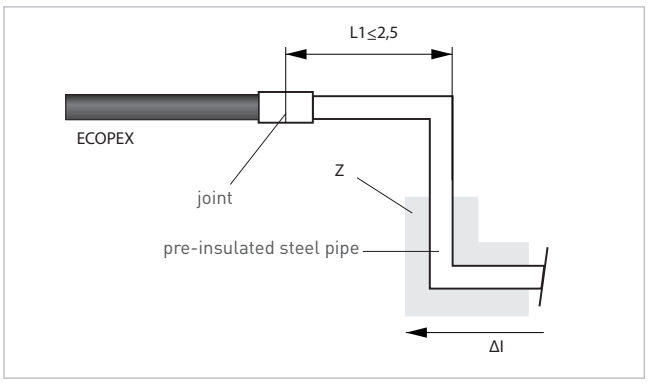


1.

CONNECTION AFTER A "Z" OR AN "LOOP" COMPENSATION

When the connection occurs after a "Z" or "Loop" compensation element, laying can be performed without any special precautionary measures, but ensuring an equal to or slightly longer distance than the compensation length of the expansion is installed (the steel section with expansion absorbed by foam pads).

The length of the "Z" compensation branch or the "Loop" compensation is calculated according to the pre-insulated rigid pipeline elongations; for further details, refer to the designing sections of **ECOLINE** catalogue.



2.

[1] Connection scheme between the flexible pipeline and the rigid pipeline at a TEE

[2] Connection scheme between the flexible pipeline and the rigid pipeline at a Z or Loop compensation

DESIGNIN

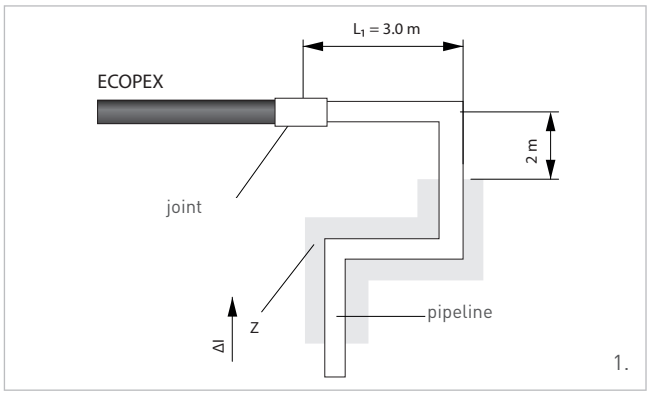
CONNECTION AFTER A COMPENSATION BEND

When the connection occurs after a compensation bend, laying can be performed without any special precautionary measures as long as the connection after a straight section of rigid pipeline of the same length or slightly longer than the compensation length of the expansion is installed (the steel section with expansion absorbed by foam pads).
The arrangement of the foam pads on the pre-insulated rigid compensation bend is performed according to the expansions of the pre-insulated rigid pipeline; for further details, refer to the designing sections of the **ECOLINE.**

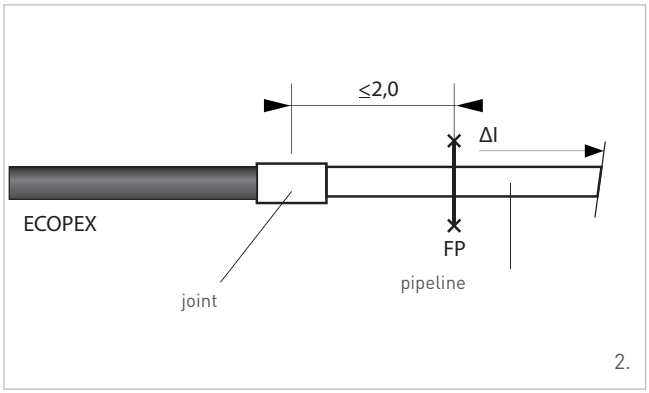
PIPELINE

When the connection occurs at the end of a straight section of pre-insulated rigid pipeline, it is necessary to check that the expansion at the connection point due to the rigid pipeline does not exceed the value of 10mm. If that value is higher than the above-mentioned limit, as already mentioned above the flexible pipelines cannot absorb the expansion and the stresses coming from the rigid pipelines, and therefore necessary to install an anchor. In such a configuration it is very important to evaluate the effects of the anchor's insertion on the pre-insulated rigid pipeline.

CONNECTION AFTER A STRAIGHT SECTION OF



1.



2.

[1] Connection scheme between a flexible pipeline and a rigid pipeline at a bend

[2] Connection scheme between a flexible pipeline and a rigid pipeline at a straight end

HYDRAULIC DESIGNING

HYDRAULIC DESIGNING

Fluid dynamic dimensioning of a network involves two important aspects:

- Hydraulic dimensioning of the district heating system sections;
- Calculation of the heat losses in the different sections of the district heating system and calculation of the total heat losses.

Hydraulic dimensioning

Hydraulic dimensioning of a district heating/ cooling network consists in defining, for each section of the designed system, the section diameter and as a consequence of the main hydraulic parameters, such as velocity, head losses, pressure in the nodes. Each network can be divided into single elements (pipeline sections), bound at the ends by two nodes; the system hydraulic dimensioning involves the necessity to determine the diameter and the velocity of each network section and to calculate at each node the total load and pressure.

In order to do that, first of all it is necessary to determine the thermal power which should pass in each pipeline section, defining the users to serve and the respective thermal powers to provide. In the initial phase of studying and developing a district heating system it is very important to determine the potential service connections, which determine the size of the heat generation system and the diameter of the first pipelines which will be laid near the power plant. Under-dimensioning of those parameters will indeed involve a limit in the future developing and as a consequence of the power plant profitability; on the contrary over dimensioning of those parameters will involve very high investments in the power plant building and in the network, which will not be compensated by the revenues by heat selling. Once stated the thermal power of a single pipeline section it will be possible to calculate the circulating flow through the formula:

$$Q = \frac{P}{c_s \Delta T} V_s \quad \left[\frac{l}{s}\right] \qquad [1]$$

where

P: thermal power [kW];

c_s: water specific heat [kJ/kg*K];

ΔT: temperature difference between supply and return pipelines [K];

V_s: water specific volume [dm^3/kg].

Once the flow and stated velocity of the circulating fluid in the pipeline is known, it is possible to calculate the theoretical diameter of the pipeline segment which has been dimensioned through the formula.

$$D = \sqrt{\frac{4}{\pi v} * \frac{Q}{1.000}} \qquad [2]$$

where:

Q: water flow calculated through the formula [1] [l/s]; v: fluid velocity [m/s].

The real pipeline diameter is identified choosing the first higher commercial diameter than the one identified through the formula [2].

The water velocity necessary to calculate the

HYDRAULIC DESIGNING

diameter of first calculation is stated in the range between 0,5-2m/s according to the type of pipeline service (transport network or distribution network). The choice of the fluid velocity in a pipeline segment indeed determines the head losses present in that specific network section. The head losses per length unit can be calculated through the Darcy-Weisbach equation according to which:

$$J = \frac{\lambda v^2}{2gD} \left[\frac{m}{m}\right] \quad [3]$$

where:
λ: dimensionless friction coefficient;
The coefficient λ depends on the so-called Reynolds number, defined by the formula:

$$Re = \frac{vD}{\eta} \quad [4]$$

where
η: fluid kinematic viscosity [m^2/s].

For turbulent regimes of flow, typical of the water and district heating networks (Re > 3500) the coefficient λ can be calculated through the Colebrook-White formula:

$$\frac{1}{\sqrt{\lambda}} = -2\log\left(\frac{2,51}{Re\sqrt{\lambda}} + \frac{\varepsilon}{3,71D}\right) \quad [5]$$

Ɛ: The formula [5] is generally represented also in the so-called Moody chart, a logarithmic diagram where is traced a curve beam characterized by constant relative roughness Ɛ/D.

For the so-called smooth pipes (such as PE-Xa pipes), the formula [5] can be reduced to the following:

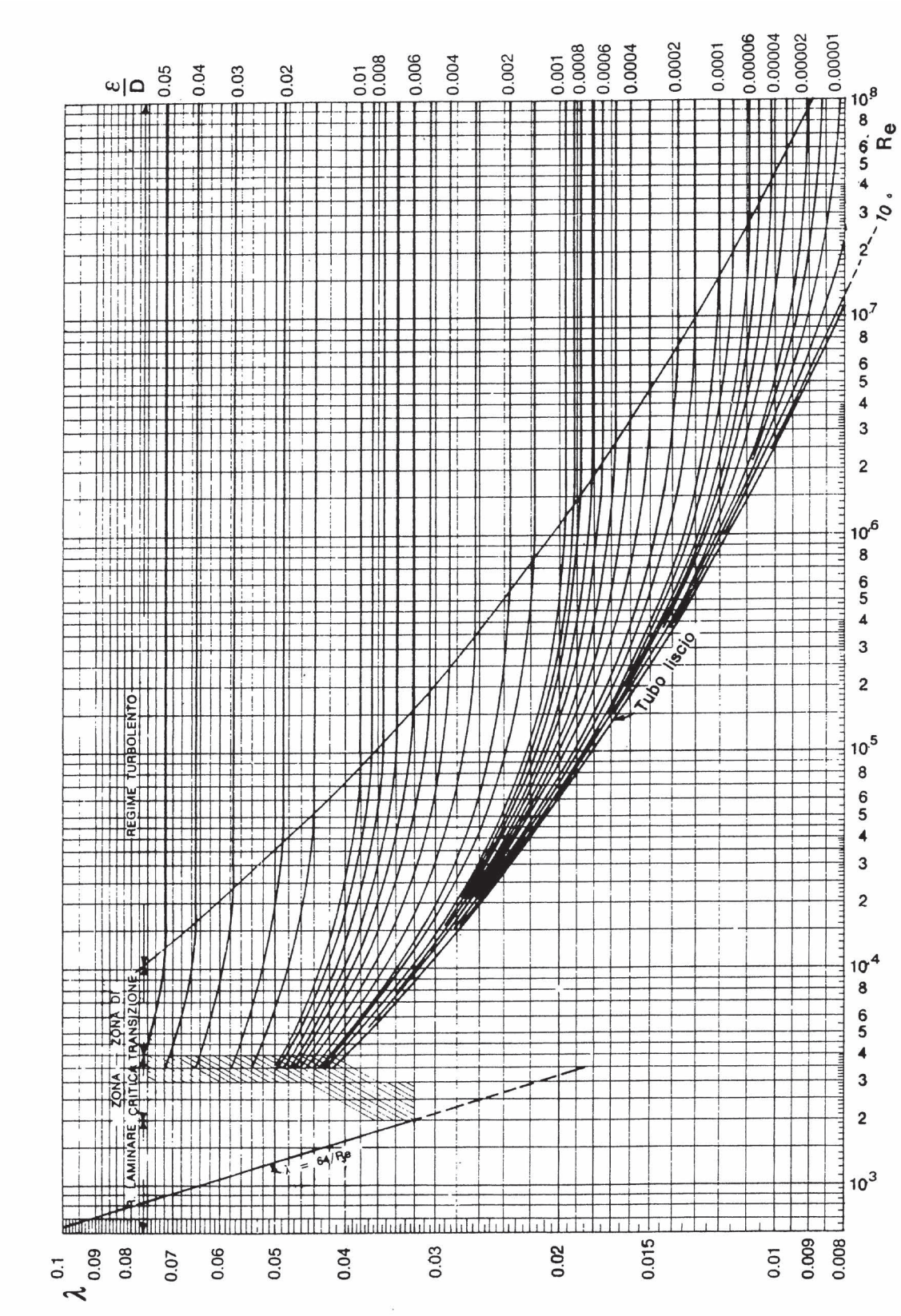
$$\frac{1}{\sqrt{\lambda}} = -2\log\left(\frac{2,51}{Re\sqrt{\lambda}}\right) \quad [5a]$$

Different practical formulas have been studied in order to determine the friction pressure loss, once know the flow and the velocity.
One of these, valid for hydraulically smooth pipes, is the Datei-Veronese equation, according to which:

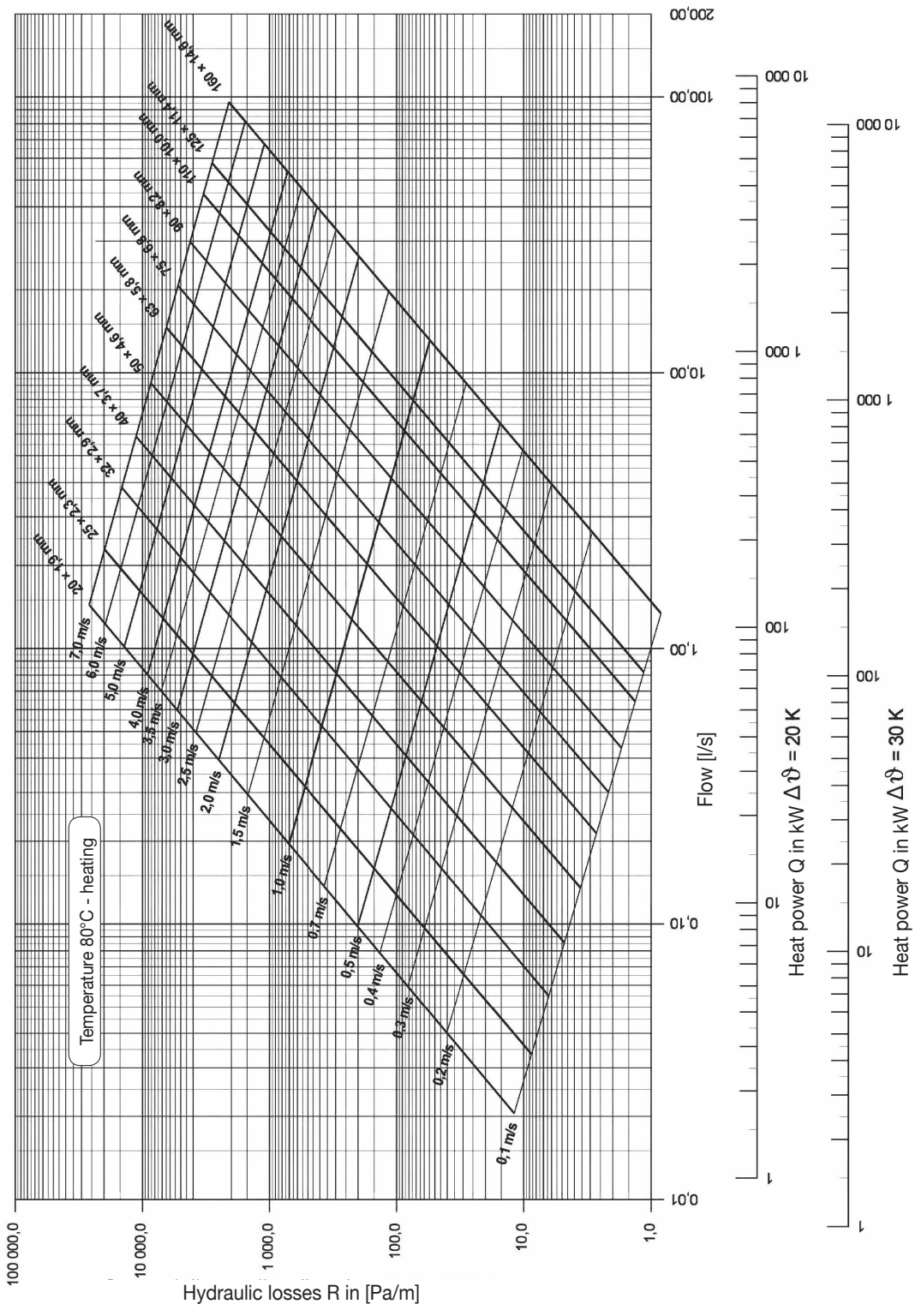
$$J=0,00092Q^{1,80}\ D^{(-4,80)}$$

In the following tables are listed the linear head losses in the flexible pipelines with PE-Xa service pipe according to the different available commercial diameters, known the current flow in the pipeline.

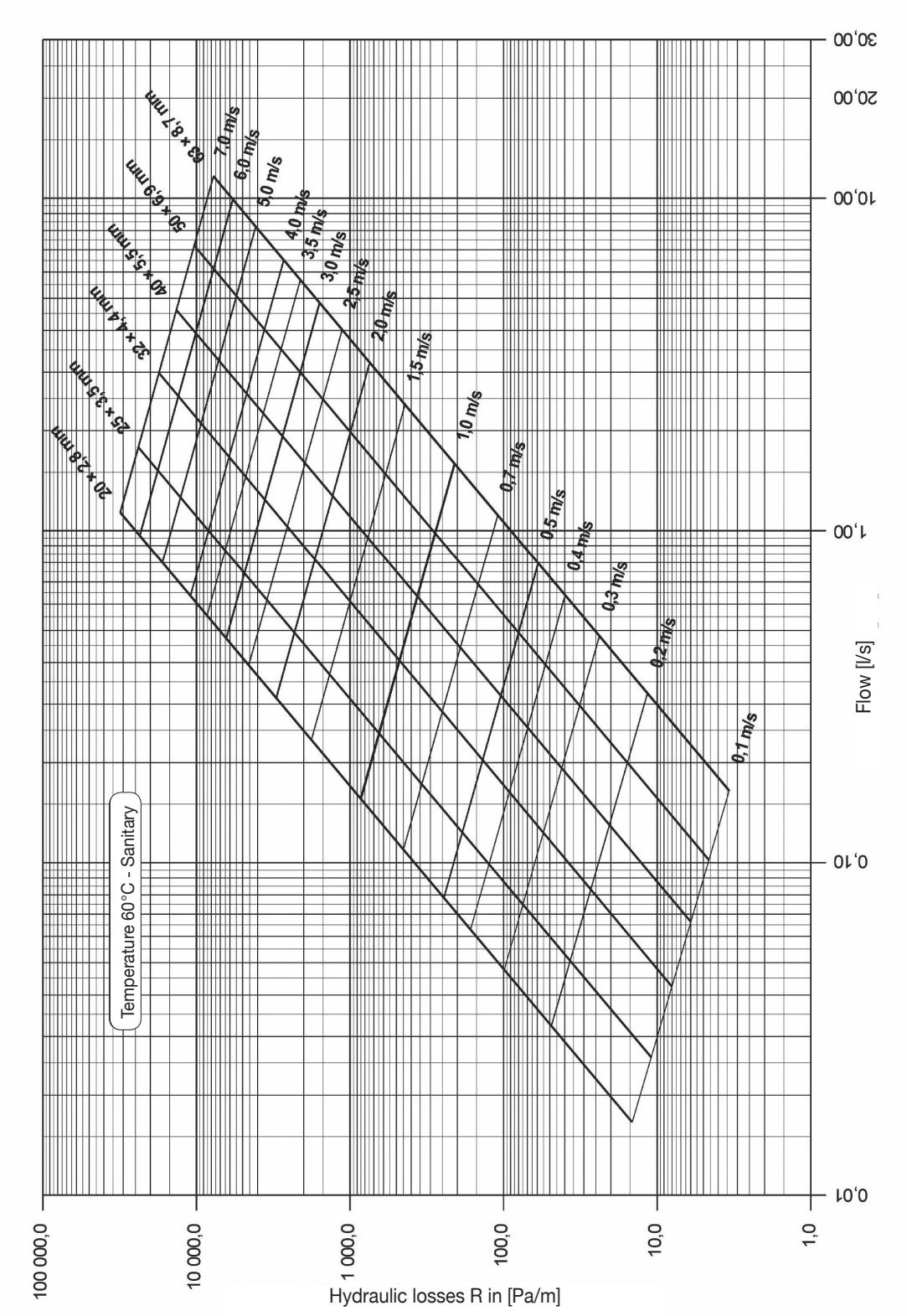
HYDRAULIC DESIGNING



HYDRAULIC DESIGNING



HYDRAULIC DESIGNING



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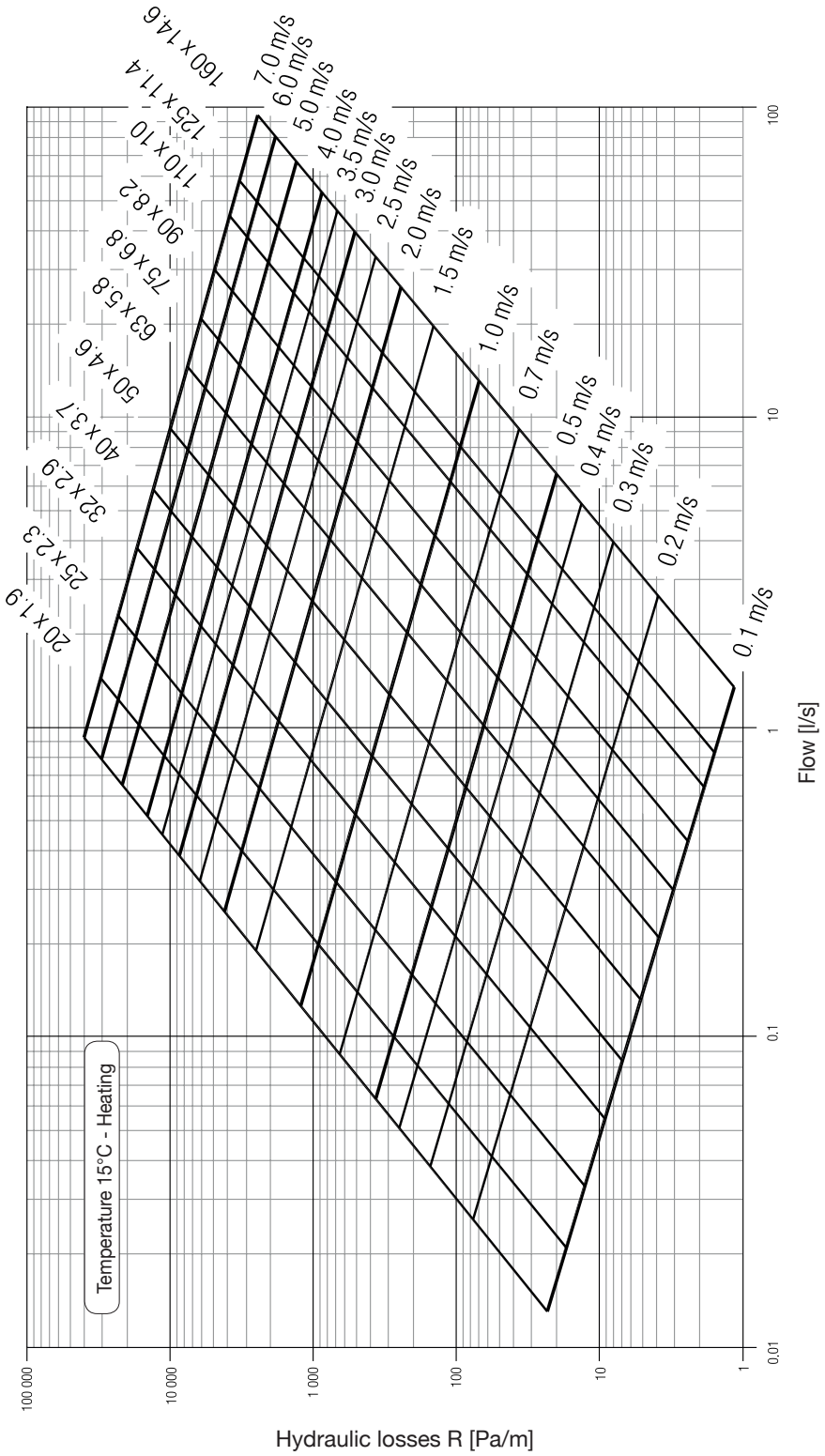
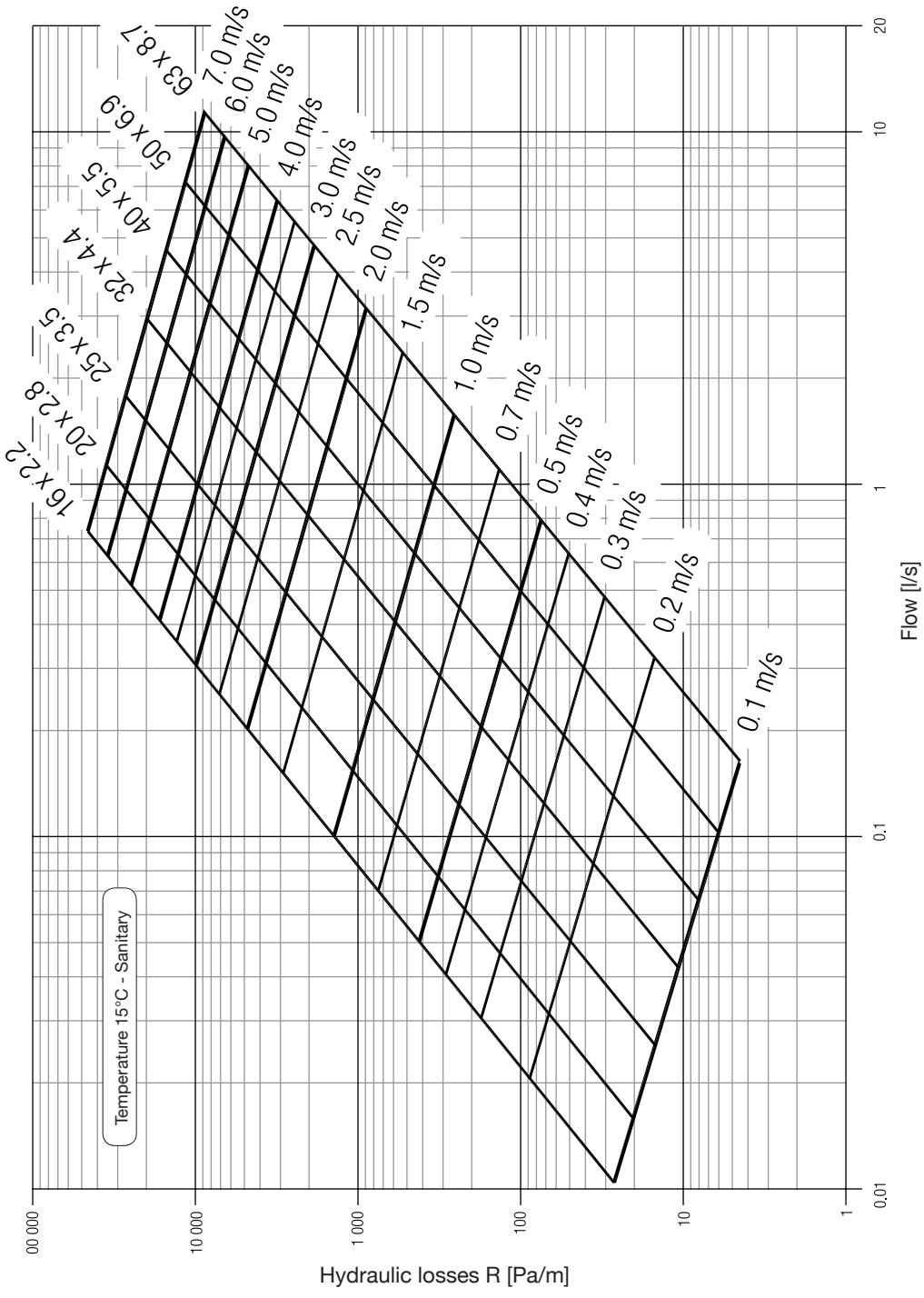


HYDRAULIC DESIGNING



HEAT LOSS

THERMAL LOSSES IN THE PIPES

Heat loss calculations in the pre-insulated pipelines have been performed, for every type of pipeline available, referring to the methodology proposed by the standard UNI EN 13941. In detail the proposed methodology allows you to determine, once the coefficients of thermal conductivity are known, the different materials used, the heat loss value in the pipeline per length unit and per temperature unit. Heat loss calculation in the buried pipeline can be calculated through the following expression:

$Q = U (T_m - T_t)$ [W/mK]

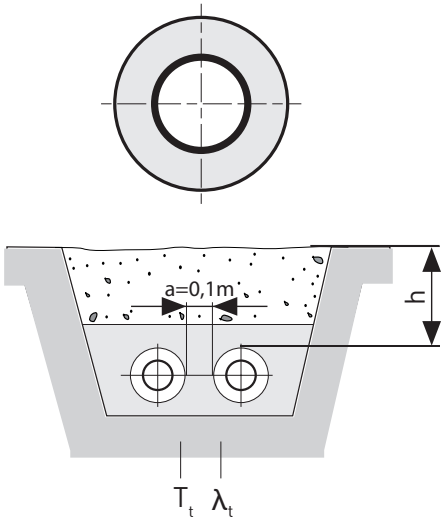
where
U = thermal heat transfer coefficient [W/mK]
T_m = average operating temperature [°C]
T_t = soil temperature [°C]

In particular, calculations have been performed using the following basic assumptions:

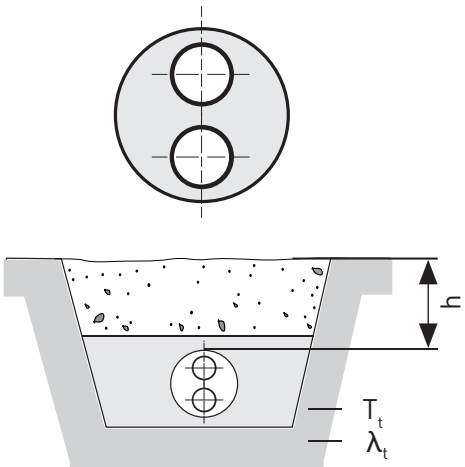
pipe PN6 - SDR11
Distance among pipes: a = 0,1m
Depth of cover: h = 0,6m
Soil temperature: T_t = 10°C
Soil conductivity:: λ_t = 1,0 W/mK
PUR foam conductivity: λ_{PUR} = 0,023 W/mK
PE-Xa pipe conductivity: PE-Xa: $\lambda_{PE\text{-}Xa}$ = 0,38 W/mK
Outer casing pipe conductivity: λ_{PE}= 0,33 W/mK

pipe PN10 - SDR7.4
Distance among pipes: a = 0,1m
Depth of cover: h = 1,0m
temperature: T_t = 10°C
Soil conductivity: λ_t = 1,0 W/mK
PUR foam conductivity: λ_{PUR} = 0,032 W/mK
PE-Xa pipe conductivity: $\lambda_{PE\text{-}Xa}$ = 0,38 W/mK
Outer casing pipe conductivity: λ_{PE}= 0,33 W/mK

1.



2.



[1] **ECOPEX®** UNO
[2] **ECOPEX®** DUO

HEAT LOSS

HEAT LOSSES IN THE ECOPEX UNO PIPELINES – HEATING USE PN6 - STANDARD INSULATION						
DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20	0,122	3,66	4,88	6,09	7,31	8,53
25	0,154	4,62	6,16	7,70	9,24	10,78
32	0,160	4,79	6,38	7,98	9,58	11,17
40	0,163	4,88	6,51	8,13	9,76	11,39
50	0,184	5,51	7,34	9,18	11,01	12,85
65	0,199	5,96	7,95	9,93	11,92	13,91
80	0,213	6,38	8,51	10,63	12,76	14,89
100	0,302	9,06	12,07	15,09	18,11	21,13
125	0,308	9,24	12,32	15,40	18,48	21,56
140	0,315	9,45	12,60	15,75	18,90	22,05
150	0,266	7,98	10,64	13,30	15,96	18,62

HEAT LOSSES IN THE ECOPEX UNO PIPELINES – HEATING USE PN 6 - PLUS INSULATION						
DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20	0,105	3,15	4,20	5,25	6,30	7,35
25	0,128	3,84	5,12	6,40	7,68	8,96
32	0,130	3,90	5,20	6,50	7,80	9,10
40	0,142	4,26	5,68	7,10	8,52	9,94
50	0,160	4,80	6,40	8,00	9,60	11,20
65	0,168	5,04	6,72	8,40	10,08	11,76
80	0,181	5,43	7,24	9,05	10,86	12,67
100	0,242	7,26	9,68	12,10	14,52	16,94

HEAT LOSS

HEAT LOSSES IN THE ECOPEX UNO PIPELINES – SANITARY USE PN 10 - STANDARD INSULATION						
DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
15	0,138	4,14	5,52	6,90	8,28	9,66
20	0,163	4,89	6,52	8,15	9,77	11,40
25	0,204	6,11	8,15	10,19	12,23	14,26
32	0,211	6,34	8,46	10,57	12,68	14,80
40	0,216	6,47	8,63	10,79	12,95	15,11
50	0,243	7,28	9,70	12,13	14,55	16,98

HEAT LOSSES IN THE ECOPEX UNO PIPELINES – HEATING USE PN 10 - PLUS INSULATION						
DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
15	0,122	3,67	4,89	6,11	7,33	8,56
20	0,141	4,24	5,66	7,07	8,49	9,90
25	0,171	5,14	6,85	8,56	10,27	11,99
32	0,174	5,22	6,96	8,71	10,45	12,19
40	0,190	5,69	7,59	9,48	11,38	13,28
50	0,213	6,40	8,53	10,67	12,80	14,94

HEAT LOSS

HEAT LOSSES IN THE ECOPEX UNO PIPELINES – HEATING USE PN 6 - STANDARD INSULATION						
DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20	0,191	5,74	7,66	9,57	11,49	13,40
25	0,197	5,92	7,89	9,86	11,83	13,80
32	0,224	6,72	8,95	11,19	13,43	15,67
40	0,209	6,28	8,37	10,46	12,56	14,65
50	0,251	7,54	10,06	12,57	15,09	17,60
65	0,290	8,69	11,59	14,49	17,39	20,28

HEAT LOSSES IN THE ECOPEX UNO PIPELINES – HEATING USE PN 6 - PLUS INSULATION						
DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20	0,148	4,44	5,92	7,39	8,87	10,35
25	0,165	4,96	6,61	8,26	9,91	11,57
32	0,187	5,60	7,47	9,33	11,20	13,07
40	0,176	5,29	7,05	8,81	10,57	12,34
50	0,220	6,60	8,80	11,00	13,20	15,40

HEAT LOSS

HEAT LOSSES IN THE ECOPEX UNO PIPELINES – HEATING USE PN 10 - STANDARD INSULATION						
DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20+15	0,229	6,86	9,15	11,43	13,72	16,00
25+15	0,210	6,30	8,40	10,50	12,60	14,70
32+20	0,229	6,88	9,17	11,47	13,76	16,06
40+25	0,316	9,47	12,63	15,79	18,95	22,11

HEAT LOSSES IN THE ECOPEX UNO PIPELINES – SANITARY USE PN 10 - PLUS INSULATION						
DN	U [W/(mK)]	AVERAGE OPERATING TEMPERATURE [°C]				
		40	50	60	70	80
20+15	0,184	5,51	7,34	9,18	11,01	12,85
25+15	0,184	5,52	7,36	9,20	11,04	12,88
32+20	0,202	6,05	8,07	10,08	12,10	14,11
40+25	0,221	6,63	8,85	11,06	13,27	15,48

ECOPEX® SYSTEM

Laying and installation

INSTALLATION

The following pages include some instructions for laying **ECOPEX®** flexible pre-insulated pipelines, with PE-Xa service pipe.

TRANSPORT AND STORAGE

If transport or storage is not performed in the right way, **ECOPEX®** pipes, accessories and fittings could be damaged so that the pipeline and especially its features of thermal insulation do not work properly.
Before laying, carefully check the pipelines and accessories of the pre-insulated pipeline, ensuring to lay only the integral elements with no damages caused by transport and/or storage.

STORAGE TIMES

In order to avoid, for example, possible damages to the inner pipe, caused by exposure to UV radiation, the ends of the **ECOPEX®** pipeline must be closed and protected. Avoid contact with harsh and damaging environments.
Because of the possible effects of the exposure to UV radiation, **ECOPEX®** pipes with LD-PE casing can be stored for a limited period of time:

- Max. 2 years if stored outdoor in central Europe area (not intense sunlight)
- Max. 6 months in areas with a more intense sunlight, for example sea areas, countries in southern Europe or areas beyond 1500m altitude.

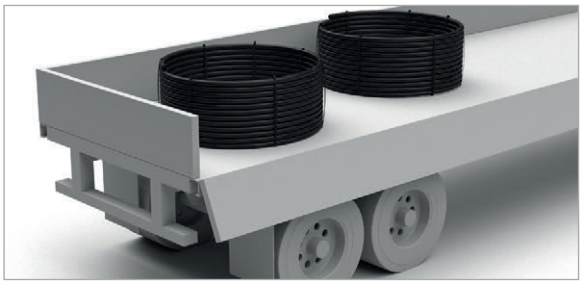
It is necessary to store the pipes sheltered from the sun. If tarpaulins are used to cover them, this must ensure resistance to UV radiation and good ventilation to the pipes. If the pipes are stored away from uv-rays, there are no time limits.

WARNING: operations and equipment described in this manual, anyway, must meet the regulations of every single country about the safety and health of workers.

INSTALLATION

TRANSPORT

Rolls must be transported on site on a load platform, in the horizontal position or tied in the vertical position and they must be blocked so that they cannot accidentally slip or slide. It is recommended to clean the load platform before the transport.



HANDLING WITH DIGGER OR TELESCOPIC HANDLER

When handling the roll, it is important to not drag it along the ground. It is recommended not to use ropes, but a belt or sling with a minimum width of approximately 100mm.

HANDLING WITH FORKLIFT

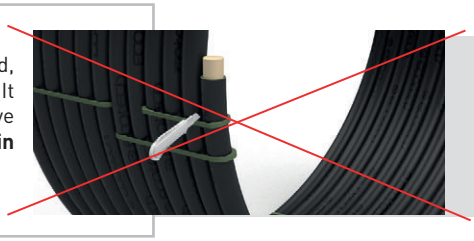
It is vitally important that when using a forklift to manoeuvre the coils that the forks do not dig into the outer-casing and damage the pipe.

STORAGE

It is suggested to place the rolls in either the vertical or horizontal position. Coils should not be leant on materials with sharp edges.

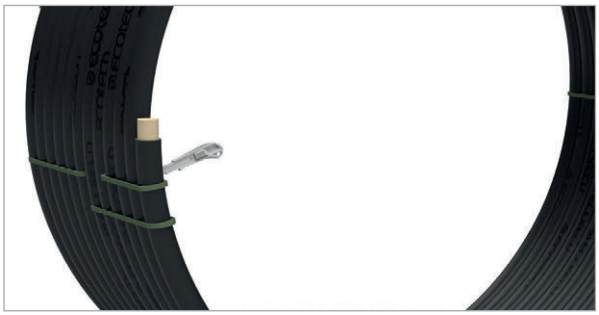
LAYING

WARNING! As soon as the packaging straps are untied, the pipe ends could get out of control and open quickly. It is suggested to perform the operations in a progressive sequence. **Avoid to perform the cutting operation in dangerous areas!**



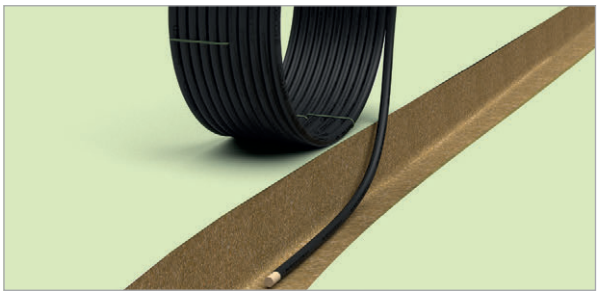
UNPACKING ROLLS

ECOPEX® pipes with an outer diameter up to 200mm are supplied in rolls. Pay attention to the fact that once the packaging straps are untied the pipe ends can get out control and open quickly.



COIL OPENING

Avoid twisting the pipes as they are uncoiled as they could squeeze and cause damage. For that reason, the pipe should be unrolled layer by layer.

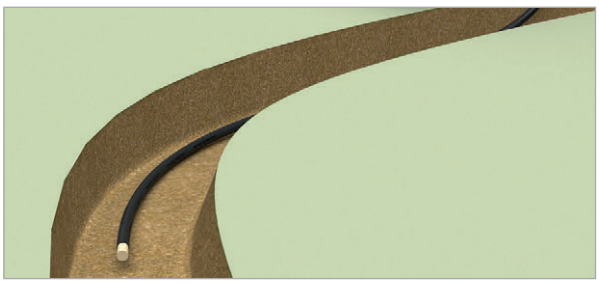


COIL UNROLLING

With regards to pipes with outer diameter up to 160mm, the pipe is generally unrolled with the roll settled in the vertical position. For bigger diameters it is suggested to use appropriate unrolling devices. In this case, rolls can be settled the horizontal position on rolling/de-coiling devices.

FIXING IN BENDING SECTIONS

The maximum flexibility of the **ECOPEX®** pipes facilitates much of the laying operations. For example, any obstacles can be easily overcome without the necessity of installing fittings. With this in mind the minimum bending radii must be considered.



WARNING: operations and equipment described in this manual anyway must meet the regulations of every single country about safety and health of workers.

BENDING RADII

BENDING RADII

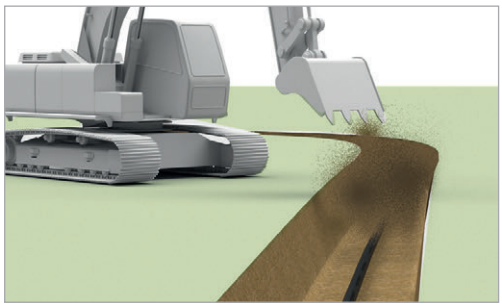
If the listed bending radii needs to be reached at lower temperatures, the section to be bent has to be pre-heated (using hot air at a temperature not exceeding 95°C)

Outer diameter ECOPEX® D	Minimum bending radius at a temperature of the outer casing of 10°C
75mm	0,7m
90mm	0,8m
110mm	0,9m
125mm	1,0m
140mm	1,1m
160mm	1,2m
180mm	1,4m

At temperatures near to the freezing point the pipe is harder to unroll because of the unavoidable reduced flexibility due to the cold temperature. In order to facilitate the unrolling operations, it could be useful to pre-heat the roll keeping it for some hours inside a room or a heated tent.

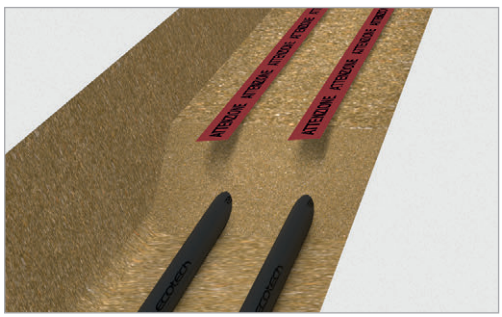
BACKFILLING OF PIPES WITHIN THE TRENCH WITH SAND

Filling the trench with sand of a grade 0-4mm for at least 100mm above and below pipes and manually compact layer by layer.



WARNING TAPE

To facilitate the identification of the pipeline's route, when necessary to perform further works in the ground, it is recommended to place warning tape at a distance of 350mm over the pipes. Warning tapes are marked with "Warning: district heating pipeline".



TYPES OF LAYING

OPEN-CUT TECHNIQUE

The most common laying method is the one performed inside a trench. For **ECOPEX®** pipes the trench can be very narrow. Only at the fitting points it is appropriate to prepare a space to work more easily. Features:

- maximum flexible laying without special tools
- narrow trench
- simple and cheap
- additional connection can be made at any time

PULL-THROUGH TECHNIQUE

This technique allows laying of the ECOPEX pipes in disused channels; already laid empty pipes or plastic outer casings requiring renovation.

Features:

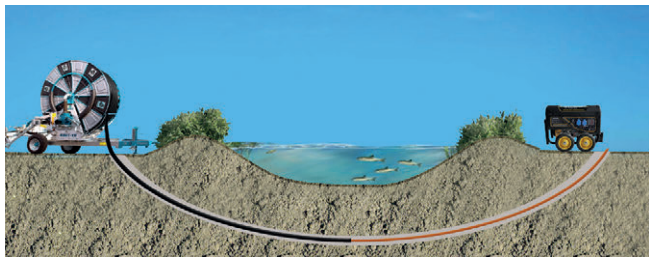
- damaged pipelines can be renovated easily
- cost-effective laying through empty pipes that already exist or have been installed using horizontal directional drilling
- the fully bonded construction allows high pull forces to be used. This, in turn, allows large distances to be covered

HORIZONTAL DIRECTIONAL DRILLING TECHNIQUE

The horizontal directional drilling technique **ECOPEX®**.

Features:

- possibility to avoid open trenches in areas where this is difficult (eg. protected or conservation areas) allowing cost effectiveness
- it is also possible to cross under water. In this case the pipes should be installed in a protective sleeve



PLOUGHING-IN TECHNIQUE

In the ploughing-in technique, the pipes are laid quickly and without any great effort. The ploughing in method can be used for soils that are free of stones or when the ploughing-in method can guarantee that the pipe will be laid in a bed of sand.

Features:

- no need for pipe trenches
- fast laying of the pipelines

TRENCH FOR LAYING PIPES

TRENCH FOR LAYING PIPES

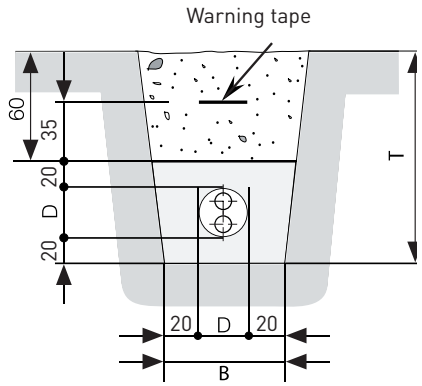
Trench dimensions depend on different factors, first of all possible interferences with other underground utilities.
Apart from local problems, trenches have to consider minimum dimensions required to provide enough space between the pipelines and the trench wall in order to:

- perform network installation, especially welding and joints;
- compact backfilling materials, especially sand around the pipelines;
- perform safe laying.

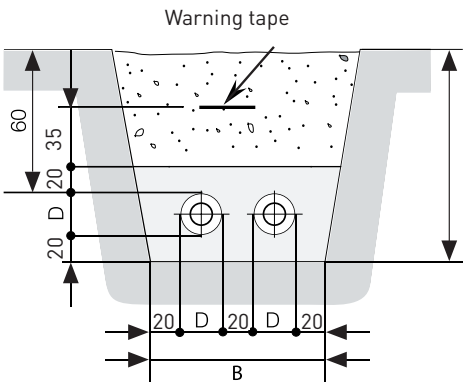
The minimum backfilling depth depends on the superstructure and on the risks connected to it, such as heavy road loads or risks of damages caused by working vehicles during the laying in agricultural zones.
In the table a value of 60cm has been stated; also, smaller backfilling values are permitted provided that pipelines are protected, for example installing a reinforced concrete slab to cover them or installing steel plates of a proper thickness on the backfilling sand.
In order to forewarn the operators of any other works in the district heating network zone, it is important to ensure laying warning tape above the pipes.
Top width of the trench depends on the slope of the trench which will be defined considering the friction angle of the soil on the base of the geological report, attached to the designing documents.
In case of deep trenches or if it is not possible to widen the top width of the trench, it will be necessary (also in order to ensure security to the workers in the trench) to implement wall reinforcement systems (for example modular metal shoring).

TYPES OF LAYING

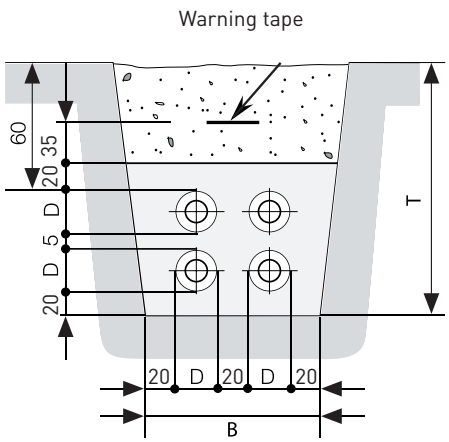
The following pictures show the sections of excavations (all the dimensions are expressed in cm). In the area where the pipelines pass must be used only sand of granulation 0-4mm and must be installed in layer by layer manual backfilling.



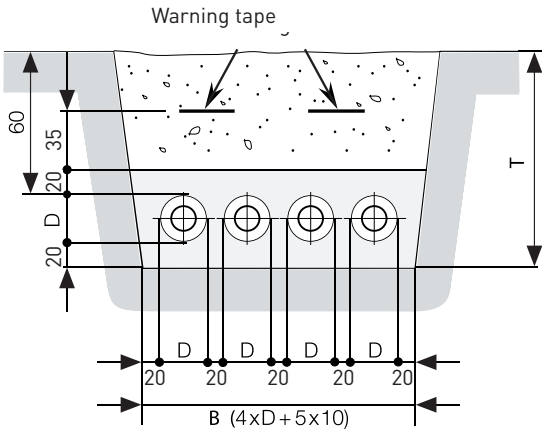
1.



2.



3.



4.

Dimensions are expressed in cm

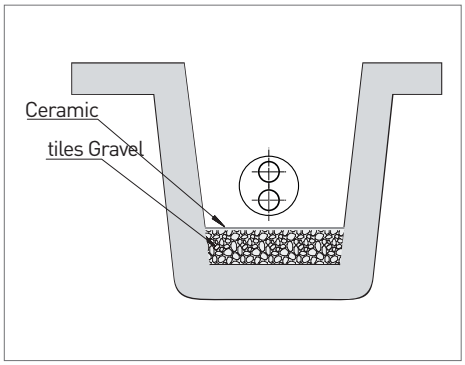
[1] DUO pipes
[2] UNO pipes
[3] UNO pipes laid in a row
[4] UNO pipes laid in two rows

TYPES OF LAYING

LAYING OF PIPELINES IN SPECIAL SITUATIONS

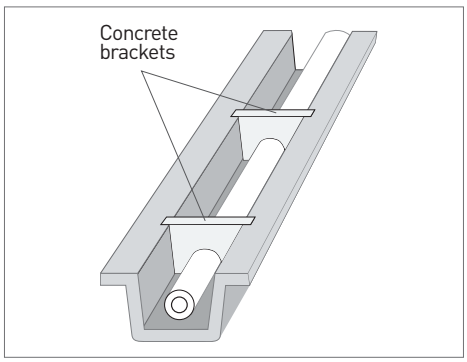
Marshy-meadow and alluvial soils

In the event of laying pipelines in coastal marshy meadow and alluvial soils, close to underwater or below high-traffic areas, it is necessary to remove any obstacles, which can influence the sand bed of the pipelines, till a sufficient depth under the pipes. If the bottom of the trench is unstable and/or it contains too much water or if there are different type of layers of soils with varying levels of stability, the pipeline has to be secured using appropriate construction measures, for example by applying a layer of precast elements.



SLOPED TRENCHES

On slopes, cross brackets are required to prevent the bedding from being washed away and, in some cases, drainage may be needed.



TYPES OF LAYING

JOINT AMONG PIPELINES

When laying **ECOPEX®** flexible pre-insulated pipelines it can be necessary to install joints between two rolls of flexible pipeline or between a roll and a pipe/special piece in a different material. Those joints are mainly of two parts:

- Joint **ECOPEX®** - other pipe (end joint)
- Joint **ECOPEX®-ECOPEX®** (intermediate joint)

As already described above, there are different types of joints, according to the different features of the pipelines to be connected and the connecting ways, especially:

FITTING	TYPE OF JOINT
End	Screw
	Press
Intermediate	Screw
	Press
	Electrofusion weld – heating use

The following pages of the catalogue show the installation phases of the press, screw and electrofusion weld fittings. The installation instructions for the tee fittings will be also described using the **ECOTECH** supplied kit.

EQUIPMENT FOR INSTALLATION

EQUIPMENT FOR FITTING INSTALLATION

Cut to length and outer casing abrasion

Cutting saw for cutting the outer casing and the insulation

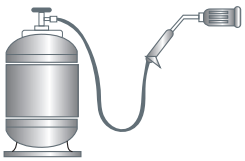
Pipe cutter for PEX pipe

Knife for removing the insulation

Hammer to facilitate the abrasion

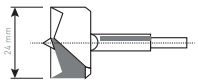
Cleaning agent and rags for cleaning

Heat shrinking



Heating sleeves or heat shrinking with soft flame

It is recommended to wear protective gloves

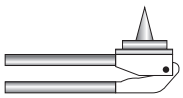


Hole saw Ø 24mm

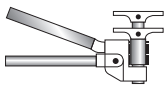
Screw fitting installation

Tightening wrench

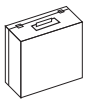
Manual equipment PEX Ø - 40mm



Hole gripper up to Ø 32mm

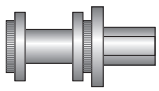


Manual gripper for pressing up to Ø 40mm

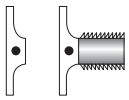


Tool case

Expansion cone up to Ø 32mm

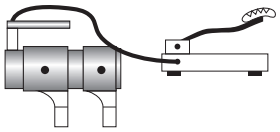


Expansion cone from Ø 40mm

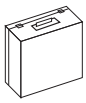


Press jaws Ø 22 - 40mm

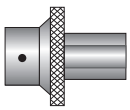
Hydraulic press tool for PEX Ø 50 - 110mm



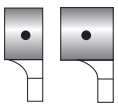
Hydraulic shop press with manual pneumatic control with expansion and compression function



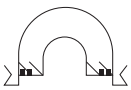
Tool case



Expansion cone Ø 50 - 110mm

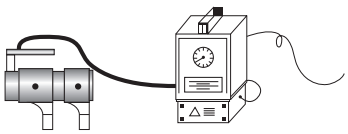


Jaws Ø 50 - 110mm

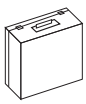


Reductions

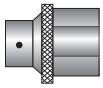
Electric hydraulic press tool for PEX Ø 125 - 160mm



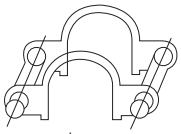
Hydraulic press with electric pump



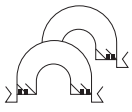
Tool case



Expansion cone Ø 125 - 160mm



Jaws Ø 140mm, 160mm



Reductions Ø 125 for jaws Ø 160

INSTALLING

PRESS JOINT

Phase 1: Pipe cutting
Cut the roll, if necessary, according to the length of the section to be installed.

1

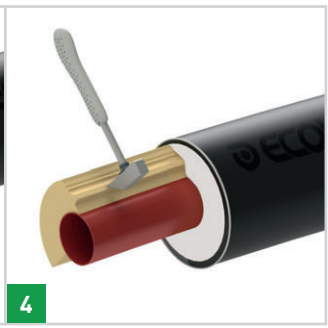
Phase 2: Outer casing and insulation removal
The pipe section to be removed is measured. If the end of the pipe is not squared, an extra approx. 2-4cm should also be stripped so that the pipe can be trimmed. The measure of the section to be removed is listed in the following table.

DE PE - Xa	l [mm]
20 - 40	100
50 - 110	125

2

Remove the outer casing of the pipe using a cutting saw or a pipe cutter, paying attention not to cut the inner pipe (picture 3).
Remove the foamed polyurethane layer, paying attention not to damage the oxygen diffusion barrier (picture 4).

3

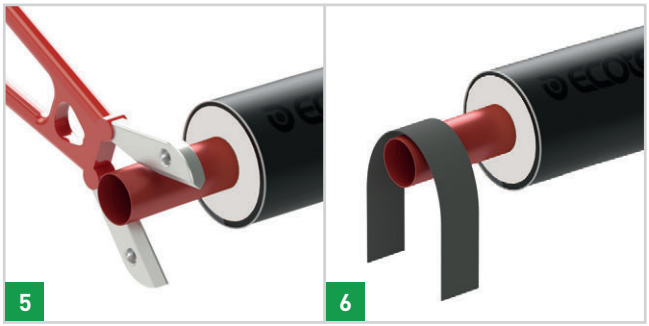


4

[1] Pipeline cutting
[2] Measure insulation length to be removed
[3] Removing PE outer casing
[4] Insulation removing

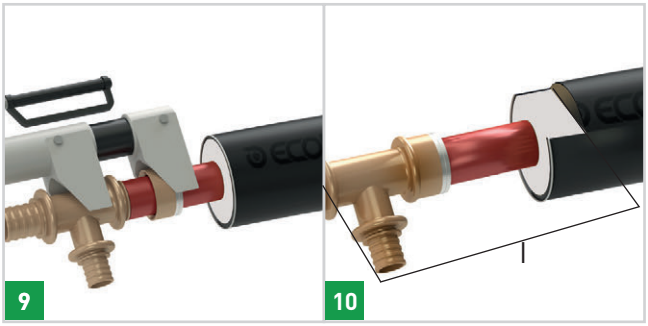
INSTALLING FITTINGS

Phase 3: Ends preparation
Refine the end of the pipe cutting straight (picture 5) and then removing the remaining foamed polyurethane from the pipe using the sand paper (picture 6).



Phase 4: Joint performing
Slide a compression sleeve on to the pipe, taking care that the chamfered end faces towards the joint. (picture 7). Expand the pipe twice, offset by approx. 30° taking care the sleeve is not in the expansion area (picture 8).

Then insert the fitting, positioning the clamping jaws over the tool and clamp on to the joint.
For diameters above 63mm use a proper lubricant on the pipes in the area of the compression sleeve (picture 9). Before starting the installation read the operation instructions supplied with the tool very carefully.
ECOTECH provides its Clients with all the necessary equipment for the installation of the joint. If required, cut out a recess to make room for the clamping tool (picture 10).



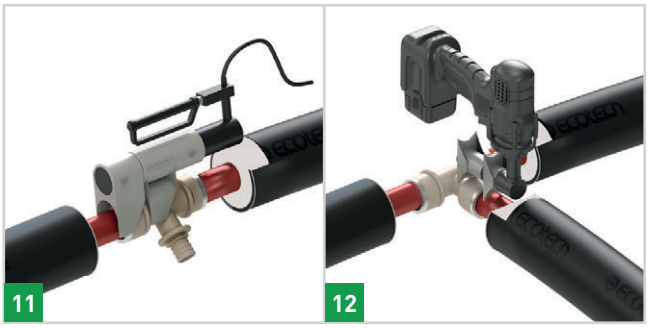
The insulation is removed as specified in the table.

DE PE - Xa	l [mm] Tool A2 o M1	l [mm] Tool G1
20 - 40	170	------
40 - 110	------	270

[5] PE-Xa pipe end cutting
[6] Foam remaining removal
[7] Sleeve insert
[8] PE-Xa pipe expansion
[9] Fitting insert
[10] Cutting out a recess to make room for the clamping tool

INSTALLING FITTINGS

Clamp also the second pipe. If you are performing an intermediate joint, the pipe connection is done (picture 11); when creating a T branch, clamp also the third pipe.
Clamp a recess to make room for the clamping tool (picture 12).
Once these steps have been carried out, the pipe connection is done.


11

12

Once completed the connection among the pipes, joint and insulation installation are performed in the area of the joint, as described in the related paragraph.

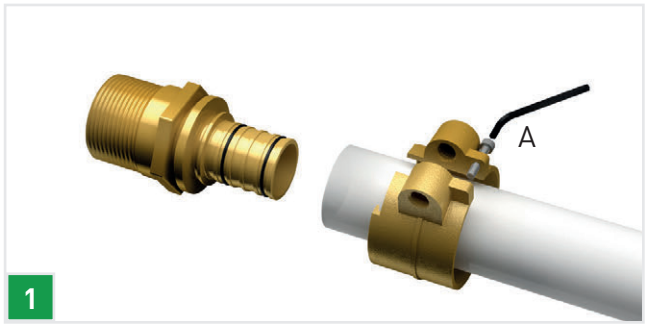
[12] Finishing TEE joint

INSTALLING FITTINGS

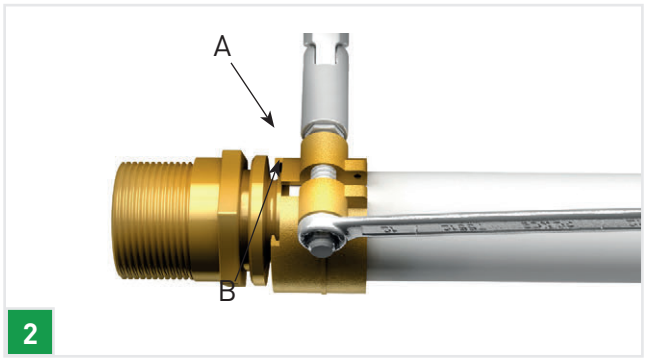
SCREW JOINT

Before performing the joint between two pipelines using the screw joints a part of the insulation must be removed from each pipeline, according to the instructions described for the press joints (Phase 1, Phase 2 and Phase 3).

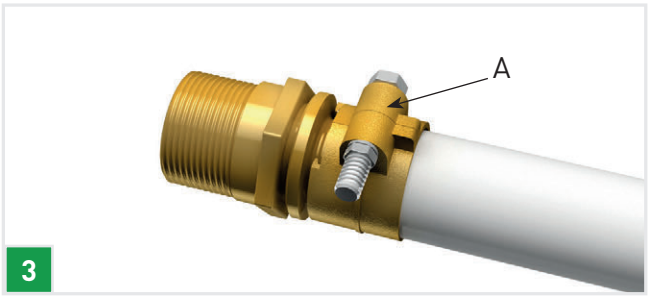
Phase A: Cut the pipe straight and chamfer the inner edge. Then remove the clamp bolt, loosen the sleeve using the Allen wrench (A) and insert it in the pipe as shown then lubricate the insertion.



Phase B: Then insert the pipe, pressing until the end of the fitting, placing the sleeve so that the tabs (A) are in line with the body groove. Screw and clamp repeatedly in order to allow the pipe to adapt. At the end of the operation, ensure the pipe can never move, staying on the bottom (B) of the fitting.



Phase C: Tighten then the bolt until the two halves of the blocking sleeve (A) are flush with one another. For tightening fittings with diameter above 63mm make some pauses in order to allow the pipe to adapt. Depending on the circumstances, big fittings can require pauses of 30 minutes or more. The screw bolt is lubricated in the factory, but especially for bigger fittings (above 63mm), it can be necessary to apply further lubrication. Do not use mineral-base lubricants.
The joint system has to be always rinsed and tested in pressure according to the test method described in the designing.



[1] Sleeve expansion
[2] Sleeve screw
[3] Completed screw

INSTALLING FITTINGS

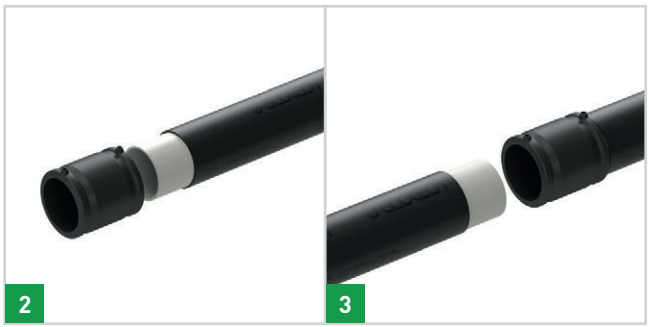
ELECTROFUSION WELD JOINTS

Before joining two pipelines using the weld joints a part of the insulation has to be removed from each pipeline, according to the instructions for the press joints (Phase 1, Phase 2 e Phase 3). Then remove the outer casing of the PE-Xa pipe (oxygen barrier) using the proper tool for a thickness of about 0,2mm, cleaning also that pipeline section with the proper cleansing.
The section length of insulation and oxygen barrier to be removed is listed in the following table.

Place the sleeve on the clean end and then prepare the end of the second pipeline to be jointed, placing it in the sleeve.

DE Pe - Xa	l [mm]
20	30
25	30
32	35
40	39
50	44
63	53
75	56
90	66
110	67

Place the sleeve on the clean end and then prepare the end of the second pipeline to be jointed, placing it in the sleeve.



Connect then the welding machine to the sleeve using the supplied suitable cables; the welding parameters for the specific joint are automatically detected.
Pressing the button "Start" on the machine the welding parameters appear: check they correspond to the ones on the sleeve.
Pressing again the button "Start" the welding starts.
An alarm alerts when the process is finished and on the machine monitor appears the message "OK".

[1] PE-Xa pipe outer casing removal
[2] Joint insertion on the pipeline
[3] Finished joint insertion
[4] Electro welding process starting

INSTALLING INSULATION KIT

MAIN EQUIPMENT

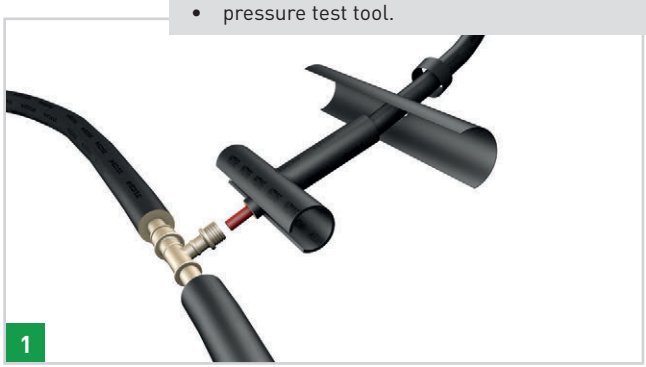
- Polyfusion tool for welding plugs;
- gas tank;
- soft flame burner Ø 30-50mm;
- gas pressure regolator;
- electric drill;
- hole saw Ø 24mm;
- 60-80 grid glazed canvas in 50mm wide rolls;
- various tools (hammer, screwdriver, chisel, etc.);
- alcohol and tatters;
- pressure test tool.

TEE KIT JOINT

The following picture represents the kit content for performing a press Tee joint.

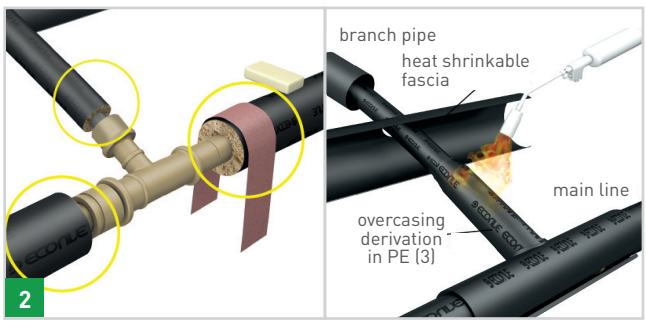
Phase 1

On the ends of the three pipes to be connected, remove the insulation for the length shown in the picture. Before the connection of the branch pipe, insert on it in sequence, the heat shrinkable ring (4), the heat shrinkable holed sheet (2) and the PE overcasing branch cut on the long side (3) or to be cut on site so that to offset the overlaps respect to the holed sheet.



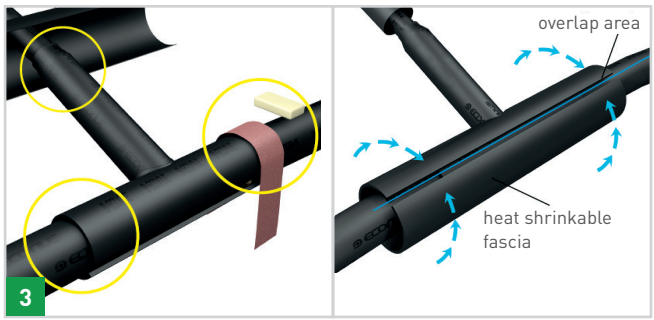
Phase 2

After having connected the pipelines using the tee fitting, check the PE overcasing branch (3) is CLEAN and DRY, both inside and outside. Place the PE overcasing branch (3), around the pipe of the main line; using the grid glazed canvas, clean and roughen the overlapping surface of the heat shrinkable branch (use rag and specific solvent for polyolefins to remove any dirt or polyethylene and sand remaining), then heat and heat shrink the overcasing on the branch pipe. (Take care not to weld the empty area where the insulation has to be restored).



INSTALLING INSULATION KIT

Phase 3
Clean and roughen with the sand paper the working surfaces of the ring and of the heat shrinkable holed sheet (use rag and the specific solvent for polyolefins in order to remove any traces or remaining of polyethylene and sand), then thread with the heat shrinkable holed sheet, placing the overlapping area in the opposite area compared to the closing area of the overcasing and remove the protection film.



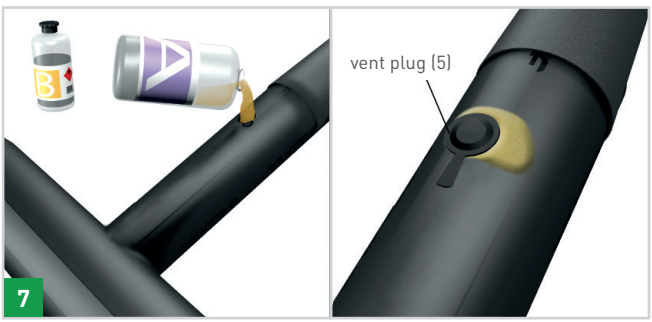
Phase 4
Check the protective film is completely removed. Centre the ring on the branch sealing area and check the temperature of the application area is about of 40-50°C, then heat shrink, starting from the centre towards the ends going around the pipe, till the complete heat shrinking (release of a slight layer of mastic from the edges).

Phase 5
Then apply the closing patch (1) on the previously threaded sheet and start the heating phase till the heat shrink is completed and the section on the line pipeline is sealed.

INSTALLING INSULATION KIT

Phase 6
After the natural cooling (<30°C), make the injection hole for the polyurethane foam using the proper hole cutter Ø24mm, on the higher area of the one to be filled in; then the joint can be pressure tested at 0,2 bar for at least two minutes.

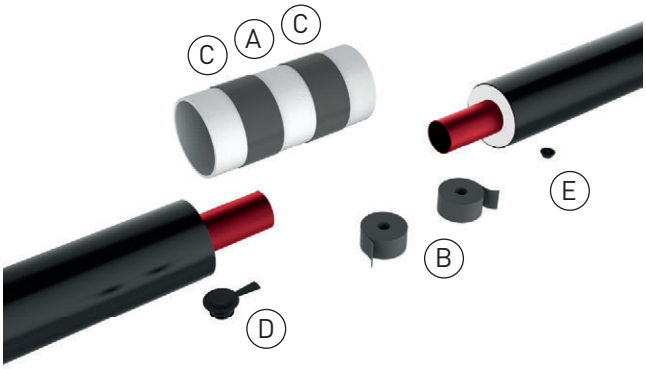
Phase 7
Foaming: before handling the polyurethane components, read carefully the security instructions on the labels. After shaking vigorously, the mixed components, pour the mixture in the hole (a consistent colour with no veins indicates the components have been mixed well); then close the injection hole using the proper venting plug, taking care to leave space for the air to go out.



Phase 8
Once the polyurethane foam has expanded and the reaction is finished, clean carefully the area around the plug and seal the injection hole according to the formalities requested (sealing the venting plug, replacing it with the PE plug to be welded using the proper welder, or a proper closing patch.

Phase 9
Now the joint is ready.

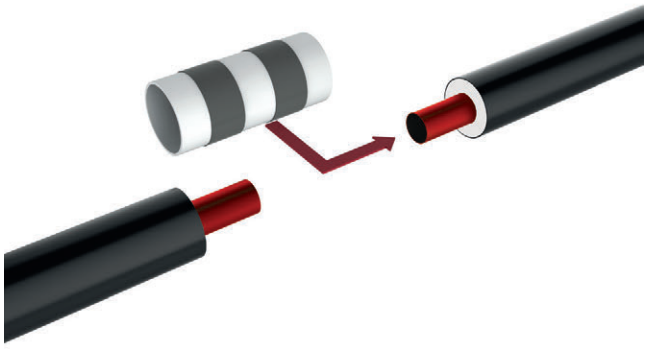
DOUBLE SEAL JOINT



Kit components:

- A) n. 1 heat-shrinkable mechanically expanded polyethylene overcasing;
- B) sealing mastic (it can be supplied already applied inside the overcasing);
- C) n. 2 heat-shrinkable rings;
- D) n. 2 venting plugs;
- E) n. 2 welding plugs*;
- • polyurethane pre-dosed components for "in place" insulation;

* Alternatively, it is possible to supply n. 2 heat bonding patches [FOPS]

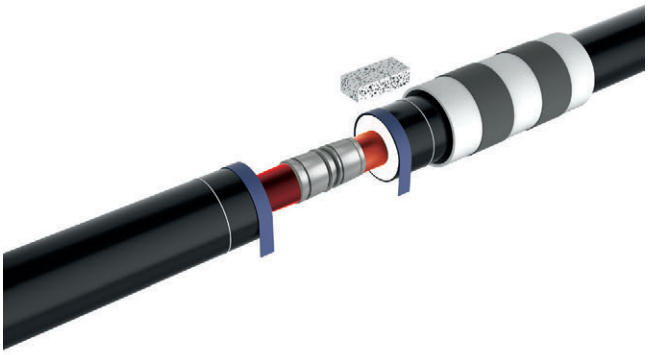


1.

Before joining the pipelines, thread the overcasing and the heat-shrinkable sleeves on one of their ends.

2.

Join the pipelines.



3.

Remove about 1-2cm of insulation from the pipe ends. Clean the HDPE outer casing for at least 150mm on both the ends using sand paper. Surfaces must be CLEAN AND DRY.

DOUBLE SEAL JOINT

MAIN EQUIPMENT

- Polyfusion tool for welding plugs;
- gas tank;
- soft flame burner Ø 30-50mm;
- gas pressure regolator;
- electric drill;
- hole saw Ø 24mm;
- 60-80 grid glazed canvas in 50mm wide rolls;
- various tools (hammer, screwdriver, chisel, etc.);
- alcohol and tatters;
- pressure test tool.

4.

Heat gently the outer casing for at least 150mm on both the pipe ends until a temperature of about 40°C is reached.

5.

Place the mastic (if it has not already applied inside the overcasing) around the outer casing of both the ends of the pipes at about 20mm from the edge. Press both the mastic ends against each other.

6.

Remove the protective film from the overcasing. Check that it is CLEAN AND DRY, inside and outside. Centre overcasing in the casing joint area. After having checked the overcasing is in the right position, remove the mastic protective film. Check again the overcasing is properly centred and heat shrink both its ends for about 100mm.

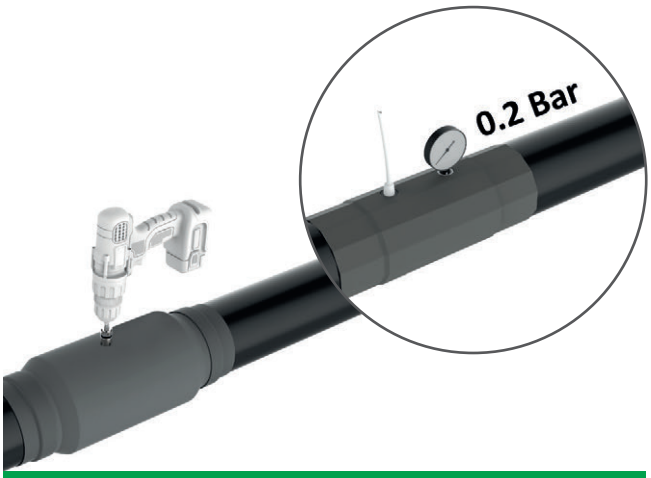
7.

Use the sand paper to clean and roughen the surface where the heat shrinkable sleeves has been applied and use a rag and alcohol to remove any polyethylene or sand traces or waste.

DOUBLE SEAL JOINT

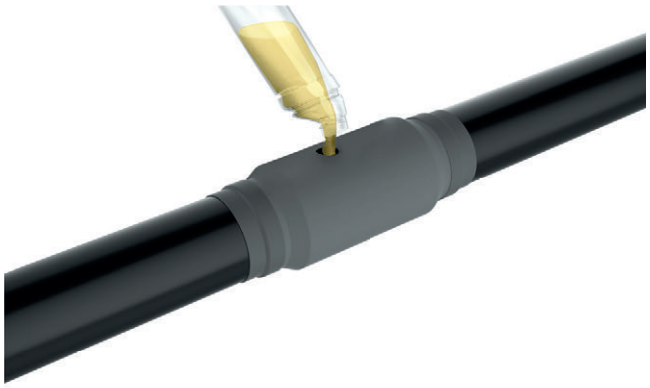
8.

Remove the packaging material and the protective film from the heat shrinkable sleeve. Check the protective film is completely removed. Centre the sleeve on the overcasing end and heat shrink starting from the centre towards the ends with a rotating movement around the pipe. Repeat the same operations with the other heat shrinkable sleeve on the other overcasing end.



9.

Drill hole on the overcasing for the following foaming.
After cooling, the pressure test must be performed, applying 0,2 bar



10.

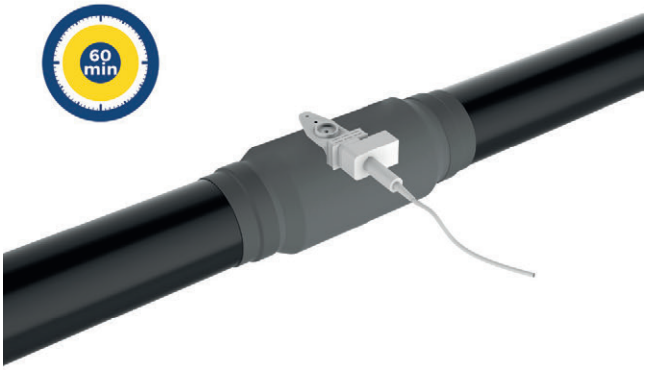
After properly mixing the two polyurethane components, pour the compound in the open hole.

11.

Close the injection hole using its venting plug and carefully clean the area around the plug.

DOUBLE SEAL JOINT

NOTE
Once completed the shrinking, sleeve must be left to stand as much as possible before the burying (from minimum one hour).
This ensures that the adhesive cools completely, guaranteeing the sealing.
In order to prevent damages at the overcasing, use proper feeding material (free from cutting and big stones).



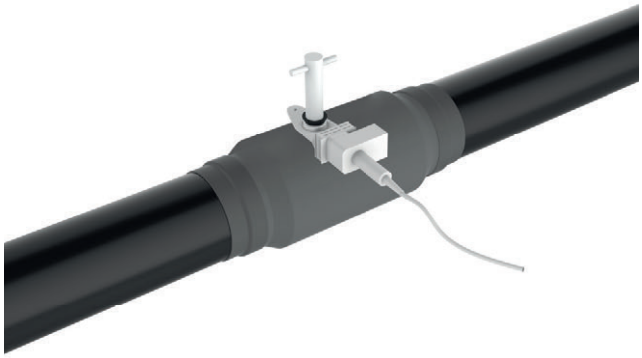
12.

At the end of the polyurethane foam expansion and once the reaction is finished, (after about one hour) remove the venting plug/s. Adjust the temperature of the plug heating equipment at about 260°C [± 10°C]. Heat shrink the hole, pushing down the appropriate crucible.

HDPE Outer casing dimensions and heating time

075÷125 - 140÷200

↓ 10 sec. ↓ 20 sec.



13.

Place the welding plug inside the heating crucible, with the aid of the temporary handle. Pressing and holding the welding plug on the crucible and, as a consequence, the crucible on the hole which must be closed, heat contemporary the edges which will then be in contact in order to be welded.

14.

Once the two parts will be properly heated, remove the heating equipment and insert immediately the plug into the hole. Pull until the top surface of the plug and the hole one are aligned. Do not overcome this limit. Then press and hold properly so that the welding surfaces keep in touch for at least one minute. N. 1 or 2 weld seams should appear around the plug edge. Until the welded plug temperature is high, do not remove the temporary handle. If the holes are two, repeat the same for the other plug.

15.

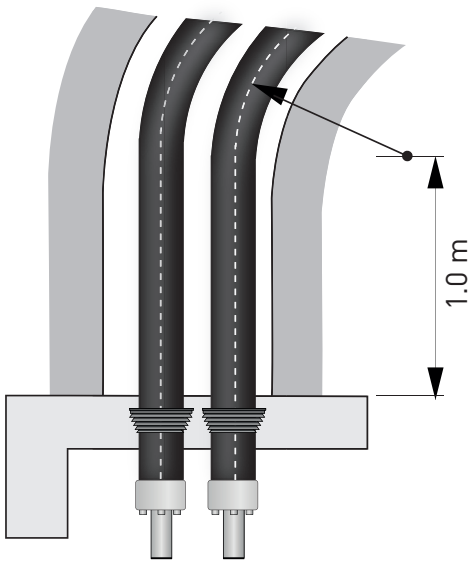
The joint is ready.

BUILDING ENTRIES

ENTRY MODE IN BUILDINGS

The pipelines entering in the building must always be preceded by a straight at least 1m long section, in order to avoid crushing to the insulation during the transition through the wall.

Laying for the entrance in the buildings



As **ECOPEX®** pipeline end fitting cannot stand the stresses transmitted by any other pipelines to which the flexible pipeline is connected, inside the building it will be necessary to place an anchor which functions as a fixed point.

According to the local conditions (e.g. level of the aquifer) it will be necessary to install a wall entry sleeve or a sealing ring (single or double joint) on the flexible pipeline (ref. section about the products in this catalogue)

[1] Laying scheme for pipelines entering in the buildings.

BUILDING ENTRIES

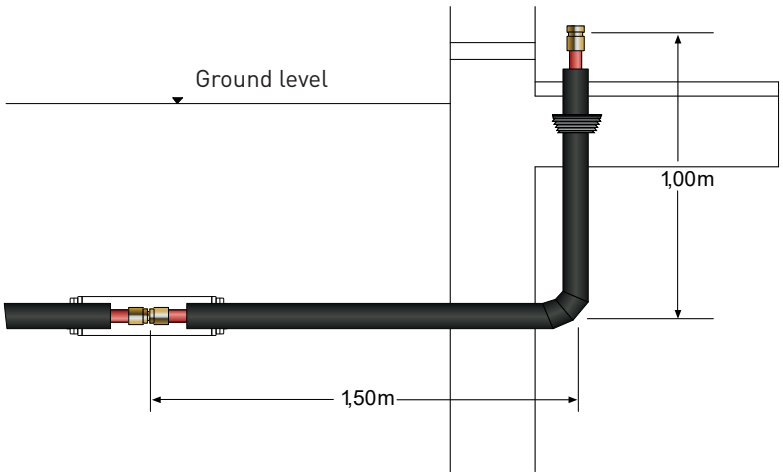
PREFORMED BEND FOR ENTERING BUILDINGS ECOPEX® pre-insulated bends for entering the buildings have to be used when the required bend radius is lower than allowed by the pipelines

INSTALLING

- Install the wall entry sleeve and place the pre-insulated bend in the foundations.
- Fix the vertical shoulder, before installing the foundations.

1

2



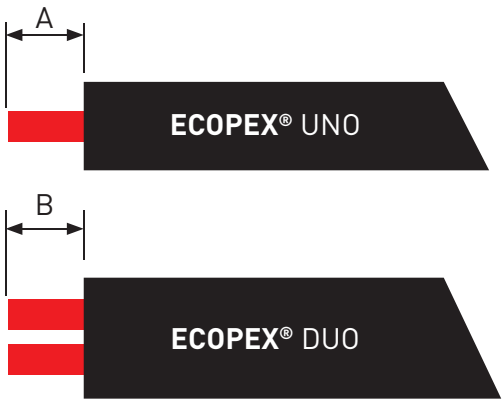
WARNING: The protection plugs at the end of the pipe must stay in the pipes until installed.
If, in case of free laying of the pipes, there is a risk of pollution or damage due to the action of the UV rays, it is necessary to protect the pipes themselves using a UV resistant plastic film.

[1] Reformed bend for entering buildings for UNO and DUO pipes
[2] Installing preformed bend for entering buildings

BUILDING ENTRIES

LENGTH OF THE INSULATION TO BE REMOVED WHEN CLOSING THE ENDS

The lengths of the ends free from insulation must be at least those shown in the table below. Also heat-shrinkable end-caps must be installed before placing the pipelines.
Alternatively, it is possible to remove the plugs after placing them into the pipes.



INSTALLATION OF HEAT-SHRINKABLE END CAPS

- Remove insulation of **ECOPEX®** pipe as described in the table
- Pass the sand paper on the area to be heat-shrunk and pre-heat at a temperature of 60°C using the open flame of a blowtorch, checking the temperature with the appropriate measuring strips
- Apply the heat-shrinkable end-cap and heat-shrink
- Perform the connection of the self-locking fitting

End cap	Measures
ECOPEX® UNO outer diameter	**A**
from 20 to 40mm from 50 to 110mm from 125 to 160mm	150mm 175mm 200mm
ECOPEX® DUO Diametro esterno	**B**
from 20 to 40mm 50 and 63mm	150mm 175mm

BUILDING ENTRIES

INSTALLING POLYETHYLENE CAPS

- Remove the insulation of the **ECOPEX®** pipe as described in the table
- Insert the cap to close the ends

Caps for closing ends	Measures
ECOPEX® UNO outer diameter	A
from 20 to 40mm from 50 to 110mm from 125 to 160mm	100mm 125mm 150mm
ECOPEX® DUO outer diameter	B
from 20 to 40mm 50 e 63mm	100mm 125mm

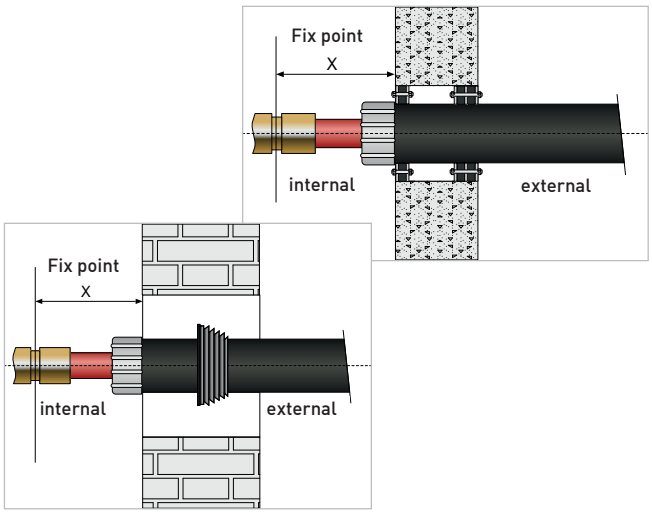
BUILDING ENTRIES

EXPANSION DURING LAYING IN THE TRENCH

For laying **ECOPEX®** pipelines in the trench it is not necessary to use fixed-point elements or compensator elements as the pipe friction with the soil is higher than the expansion forces of the plastic material.

EXPANSION DURING UNBURRIED LAYING

ECOPEX® pipes must be installed in the inner wall of the building as per the measurements show in the table (on the page at the side), thus limiting the expansion because of the different temperatures. If the end-caps and/or the polyethylene plugs are included in the building or in the coring hole, "X" measurements could be reduced by 60mm. In order to install fixed points, clamps must be applied, which must be designed to withstand the forces listed in the table. The fixed points must be fixed on the fitting grooves, but not on the self-locking sleeves.



EXPANSION DURING NOT DIG LAYING (PIPE CASING PROTECTION)

ECOPEX® pipes under the buildings or alternatively in harder accessible areas it can be laid inside protective pipes. Their inner diameter must be bigger than at least 2cm that of the outer diameter of the **ECOPEX®** outer casing. The latter can be insert using a tow rope and a tubular wire mesh, taking into account the permitted friction forces. To reduce the pipe friction, it is recommended to lubricate the inner side of the protective pipe. Any route deviations must be performed only in accessible areas.

LATER CONNECTION

The excellent flexibility of the **ECOPEX®** pipes allows for T branches to be applied later. In this event, it is necessary to put out of operation the interested pipeline section. The heating water must be cooled at a temperature of 30°C. As with **ECOPEX®** pipes shrinkage, (typical for plastic pipes) does not occur. It is necessary to fix the inner pipes before cutting the pipeline.

[1] Laying scheme for pipelines entering the buildings

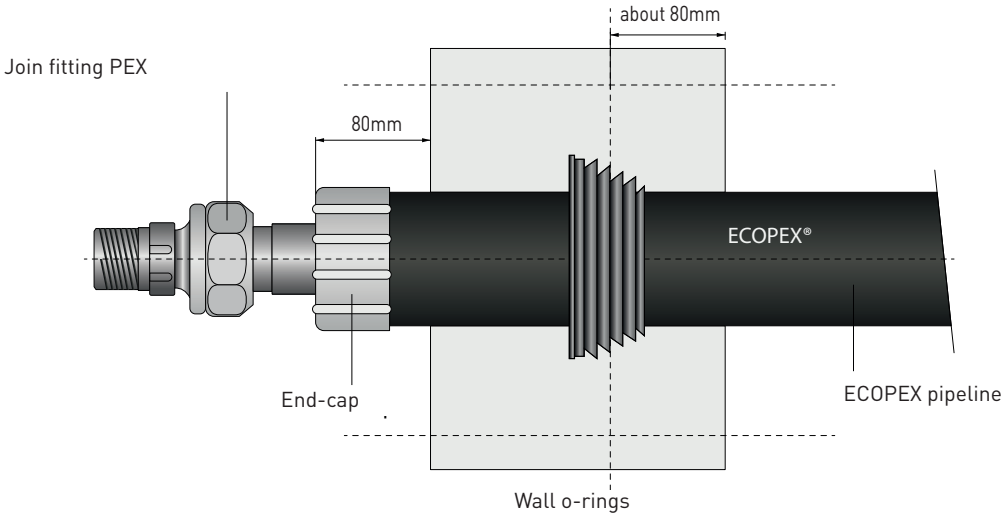
BUILDING ENTRIES

Outer diameter of the pipe x t [mm]	Projection within the building min/max [mm]*	Maximun force on the fixing point for each pipe [kN]
25 x 2,3	220 - 270	0,93
32 x 2,9	220 - 270	1,50
40 x 3,7	220 - 270	2,40
50 x 4,6	220 - 270	3,70
63 x 5,7	260 - 300	5,80
75 x 6,8	260 - 300	8,20
90 x 8,2	260 - 300	11,90
110 x 10	260 - 300	17,70
20 x 2,8	220 - 270	1,00
25 x 3,5	220 - 270	1,70
32 x 4,4	220 - 270	2,10
40 x 5,5	220 - 270	3,30
50 x 6,9	220 - 270	5,20
63 x 8,7	260 - 300	8,20

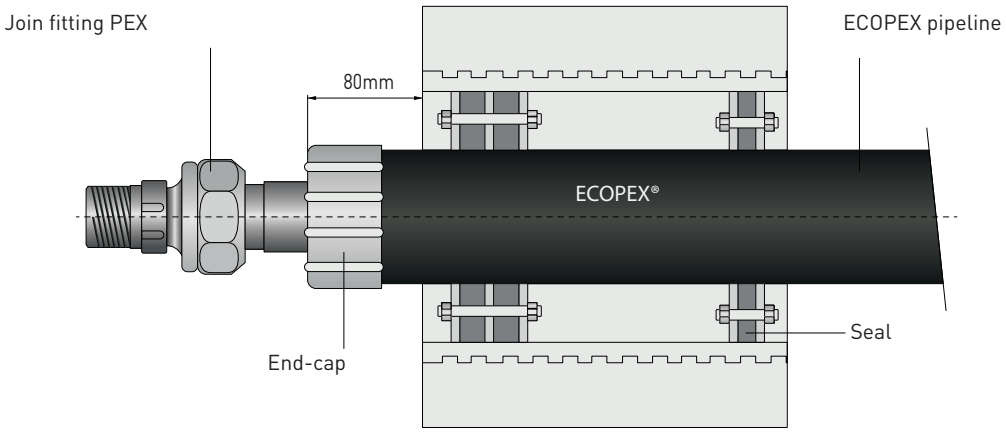
*to make possible the installation of the joint

BUILDING ENTRIES

WALL ENTRY SEAL



SEALING SEAL (PRESSURE TIGHT)



[1] Laying scheme for the wall entry seal

[2] Laying scheme for the sealing seal (Pressure)

BUILDING ENTRIES

CONNECTION PIPE TO THE BUILDING

ECOPEX® pipes must be inserted perpendicular to the outer wall of the building. In the event the **ECOPEX®** pipeline should pass next to the building (parallel), the necessary bend radius for the entering inside the building must be at least 2,5 times the one shown in the table on page 83, in order to avoid any stresses on the pipes at the crossing point of the wall. In the event of spatial problems, it is possible to use a prefabricated bend to enter the building (page 22). For the installation of the connections in the buildings, the pipes must have a projection inside the building according to the values listed in the table on page 107.

WALL ENTRY SEALS

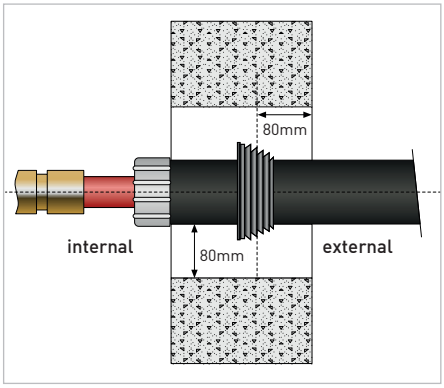
Wall entry sleeves can be installed in the coring holes or in the walls, as per the diameters listed on the page 108, grouting them using cement mortar. With reference to the holes installed in the walls, a distance of 8cm between the pipe outer casing and the building structure must be maintained. By doing this the holes for two pipes, provide the minimum dimensions listed in the table on page 110. The pressure of the o-ring seal on the pipe outer casing can be made lighter using a lubricant. The flat side of the o-ring seal must face inside the building, while the oblique one must face the outside.
Then, insert the pipeline with the wall entry sleeve in the coring hole or in the hole installed on the wall. The distance between the wall entry seals and the outer side of the wall must be of at least 80mm. The water tightness can be ensured applying some commercially available expansive cement mortar.

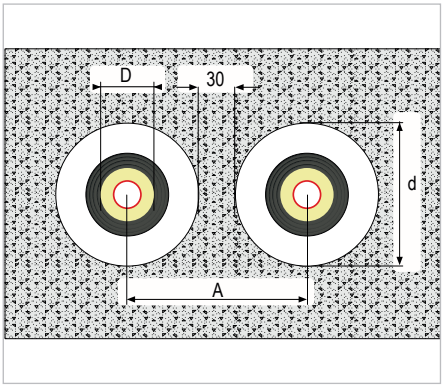
1.

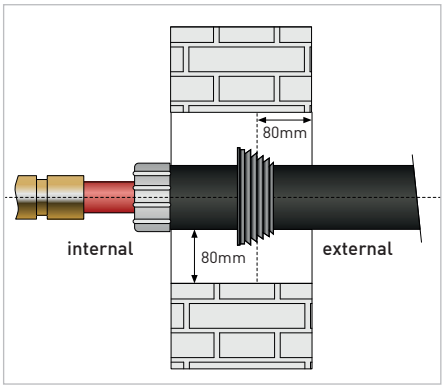
[1] Wall o-rings

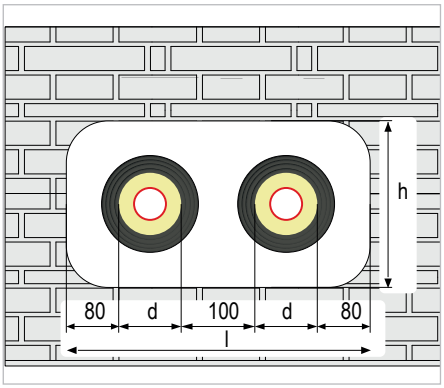
BUILDING ENTRIES

Outer diameter of the outer casing D [mm]	Concrete Coring holes d [mm]	Hole realized in the wall for 1 pipe h x l [mm]	Hole realized in the wall for 2 pipes h x l [mm]
75	180	250x250	250x450
90	200	250x250	250x500
110	220	300x300	300x500
125	240	330x330	330x550
140	260	350x350	350x600
160	280	350x350	350x650
180	300	370x370	370x700
200	350	400x400	400x720





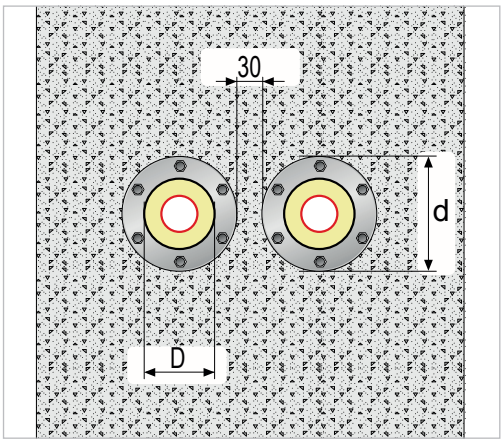


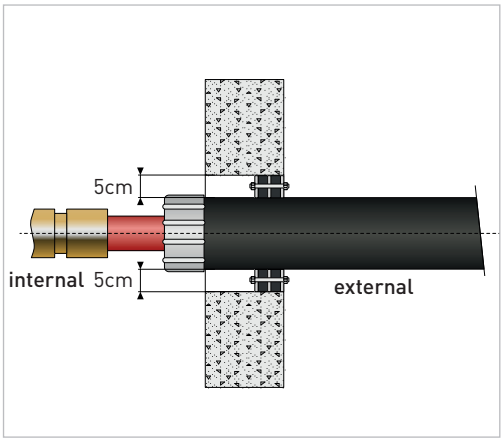


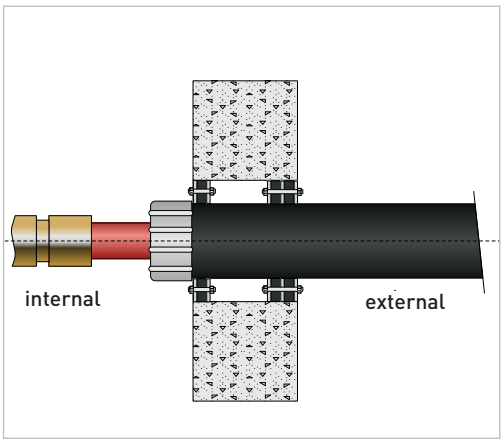
BUILDING ENTRIES

PRESSURE-TIGHT WALL ENTRY SEALS

Waterproof pressure-tight wall seals are used for the water tightness of **ECOPEX®** pipelines, used as connections to the building through foundations, ceilings, etc. The pressure tight seal is installed inside coring holes, protective pipes / plastic wall sleeves. In the event of side-by-side pipes, the distance between coring holes or protective pipes must be at least of 30mm. **ECOPEX®** pipes installed through the hole must have a maximum inclination of 7°. The pipe in the coring hole or protective pipe must be placed tightly.
If plastic protective pipes are used it is recommended to fix them and to steady them using a proper support. With coring holes, it should be recommended to seal the complete wall of the hole in order to close any cracks formed during drilling and/or the building work.







PRESSURE-TIGHT WALL ENTRY SEALS FOR WATER PRESSURE RESISTANCE TILL 1,5 BAR

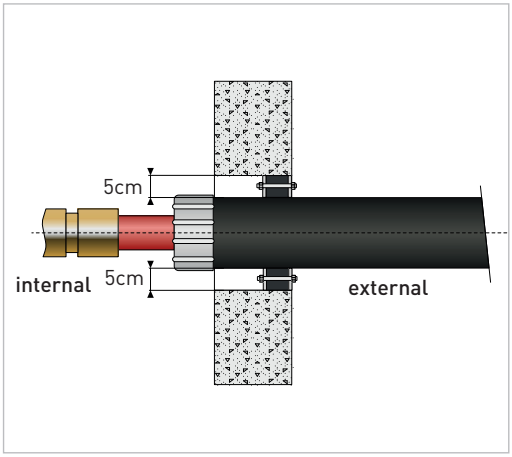
1. For waterproof requirements use a pressure-tight wall entry seal.

2. In order to steady the pipe inside the hole it is possible to use, in addition, a pressure-tight wall entry sleeve.

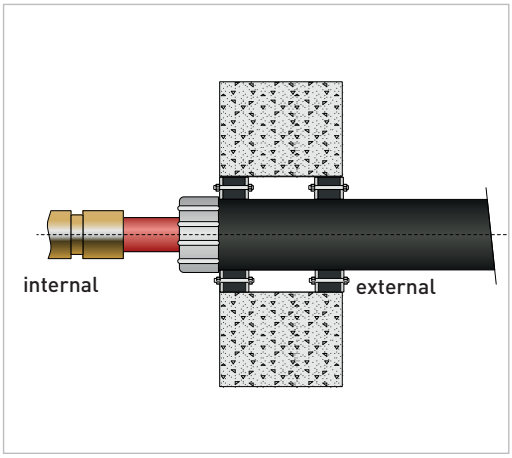
BUILDING ENTRIES

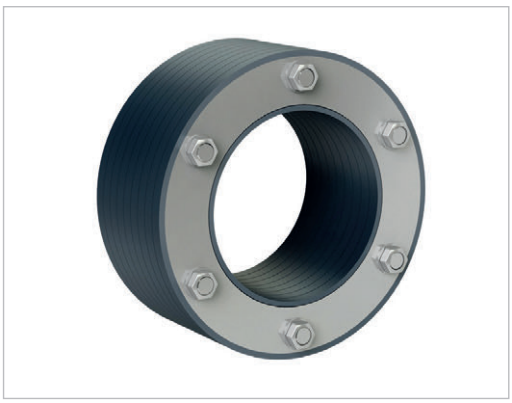
PRESSURE-TIGHT WALL ENTRY SEALS FOR NOT PRESSURED WATER

1. With non-pressured water it is possible to use a wall o-ring seal.



2. In order to steady the pipe inside the coring hole it is possible to use, in addition, a second flange.





BUILDING ENTRIES

INSTALLATION

Unroll the **ECOPEX®** pipelines. Push the pipe in the hole and fix it inside the laying trench.
Apply the waterproof seals, install and tighten them, then apply the nuts with a properly regulated torque wrench (see the table below).

The waterproof seal is tightened inside the building because of the maintenance of the system. In the event of the presence of a second seal in order to steady the pipe, prepare equipment (for ex. ratchet torque wrench with proper extension) for correctly tightening the rear seal.

Outer diameter ECOPEX® D [mm]	Coring hole for protective pipe / inner diameter d [mm]	Screws	Wrench size [mm]	Tightening torque [Nm]
75	125 ± 2mm	M 61	05	
90	150 ± 2mm	M 61	05	
110	200 ± 2mm	M 81	31	0
125	200 ± 2mm	M 81	31	0
140	200 ± 2mm	M 81	31	0
160	250 ± 2mm	M 81	31	0
180	250 ± 2mm	M 81	31	0
250	350 ± 2mm	M 81	31	0

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