MULTILAYER PIPES

Technical data sheet of PE-Xc/Al/PE-Xc pipes for sanitary,heating, cooling and compressed air systems

GENERAL FITTINGS
YOUNIQUE · ITALIAN

Contents

PE-Xc/Al/PE-Xc multi-layer pipes for WATER

Multilayer pipes for sanitary, heating, cooling and compressed air systems

DESCRIPTION

The Pe-Xc/Al/Pe-Xc pipe is characterized by a 5-layer structure in which a butt-welded aluminum layer is enclosed between two layers of cross-linked polyethylene (PEX) and fixed to the latter by two layers of adhesive.
Thanks to this feature, TB00.20 Pe-Xc/Al/Pe-Xc pipe represents a perfect combination of the properties of plastic (cross-linked polyethylene with high mechanical resistance) and ductile metal (highly flexible aluminum), in which the qualities of PEX are added to those of aluminum, giving life to a product with extraordinary and multiple qualities
Pe-Xc confers chemical resistance, corrosion resistance, lightness, hygiene and guarantees a very smooth and polished surface in contact with the transported fluid such as to reduce pressure drops and avoid encrustations
The presence of aluminum allows the pipe to be modeled very easily in order to significantly speed up installation and prevent the passage of oxygen inside the pipeline. The pipe is suitable for sanitary, heating, cooling and compressed air systems.

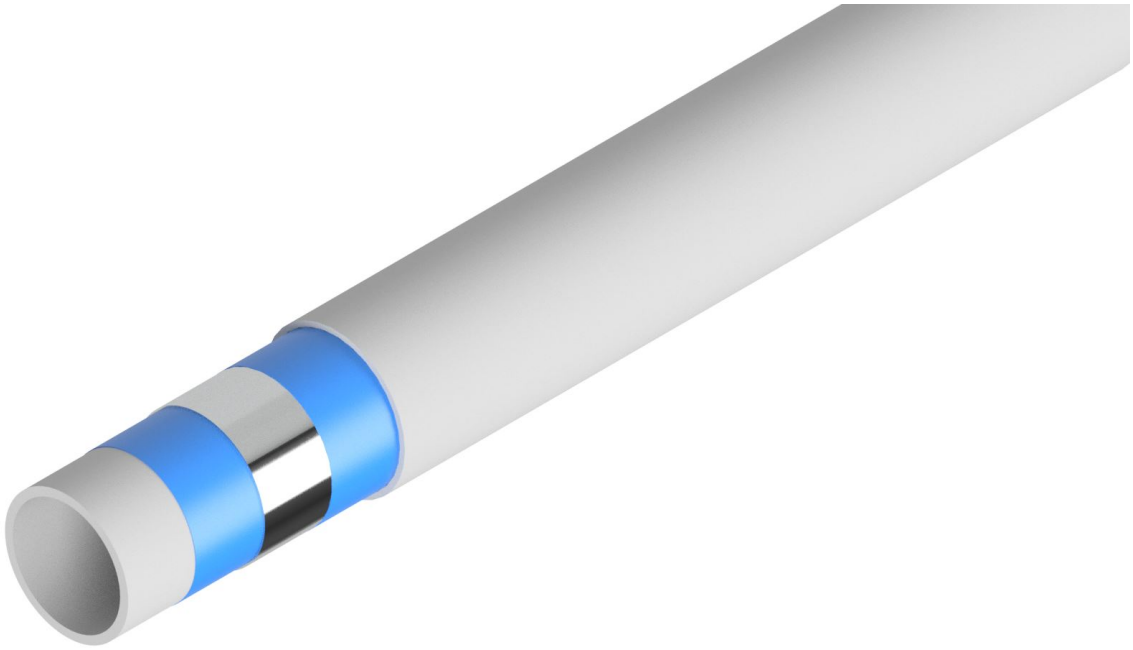
ADVANTAGES

- Excellent sound insulation: the elasticity of the cross-linked polyethylene allows for excellent absorption of vibrations
- Corrosion resistance
- Lightness: pipes are much lighter than metal pipes
- Hygiene: the materials used are non-toxic and certified for the transport of drinking water
- Hygiene, absence of encrustations and fungi (the extreme smoothness of the internal surface reduces the possibility of obstructions caused by the growth of encrustations and fungi)
- Reduced pressure drops: the smooth and polished internal surface reduces pressure drops and avoids the formation of encrustations
- Flexibility: the presence of aluminum with a high degree of yield allows the tube to be modeled very easily
- Reduced thermal expansion: thermal expansion is limited to 0.025mm / m °C
- Chemical and electrochemical resistance (PEX being a bad electrical conductor it is not subject to destructive phenomena of stray currents)
- Barrier to light and oxygen: the butt-welded aluminum layer forms an oxygen barrier that promotes the formation of algae, fungi and corrosion
- Ideal for seismic areas thanks to its flexibility and ability to attenuate vibrations

FIELDS OF APPLICATION

APPLICATIONS		T. of the system
	drinking water	-20°C/+95°C
	hot sanitary water	-20°C/+95°C
	cooling	-20°C/+95°C
	conditioning	-20°C/+95°C
	radiators	-20°C/+95°C
	floor heating	-20°C/+95°C
	irrigation	-20°C/+95°C

COMPOSTION OF BARE PIPE



LAYER COMPOSITION
An outer pipe in catalyst cross-linked polyethylene (Pe-Xc), extruded with cross-linkable high-densitypolyethylene
A layer of high quality glue to ensure a homogeneous connection between the aluminum pipe and the internal PE-Xc pipe
An aluminum tube, longitudinally welded and electronically controlled
A layer of high quality glue to ensure a homogeneous connection between the aluminum pipe and the internal PE-Xc pipe
An outer pipe in catalyst cross-linked polyethylene (Pe-Xc), extruded with cross-linkable high-densitypolyethylene
The inner and outer pipe are made from polyethylene (HDPE) granulates which have been cross-linked using electron beams. Cross-linking multiplies the natural qualities of the polyethylene many times over. This improves the pressure and temperature resistance of the pipe. The pipe meets themost stringent requirements for drinking water installations, and is even resistant to aggressive substances.
The aluminium pipe guarantees that the pipe stays oxygentight and retains its shape. The butt welds along the length of the aluminium pipe ensure that the aluminium retainsa consistent thickness. Consequently, the cross-linked outer layer that is applied with the connecting layer to the aluminium pipe by means of the bond layer will also have the same thickness. This also offers advantages when pressing, as it means that the press loads are perfectly distributed.
Depending on the diameter of the pipe, the thickness of the aluminium layer is calculated in such a way that the pipe always retains the greatest flexibility and resistance to pressure.

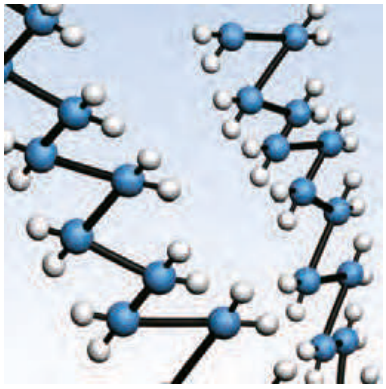
CERTIFICATIONS

COUNTRY	CERTIFICATION	COUNTRY	CERTIFICATION	COUNTRY	CERTIFICATION
					
					
					
					

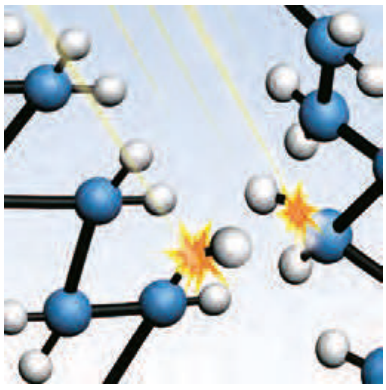
INNER AND OUTER PIPES MADE FROM PE-XC WITH GUARANTEED QUALITY

General Fittings Pe-Xc/Al/Pe-Xc multilayer pipes have both an inner and outer pipe consisting of PE-Xc, electron-beam cross-linked polyethylene.
1)PE = stands for polyethylene
2)X = stands for cross-linking
3) c = stands for cross-linking by means of electron beams,n other words the process in which the polyethylene is cross-linked

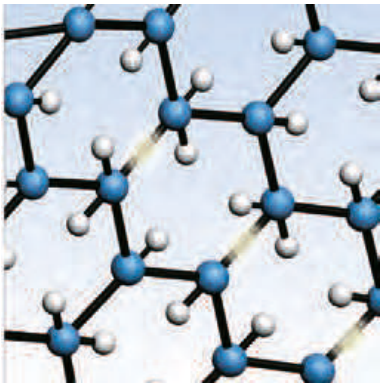
Polyethylene is a plastic that consists of various chains of molecules. These chains are not directly connected to each other. The basic structure is kept together by weak mutual forces between the molecules. When heated, the chains move further away from each other. This makes the material become softer, more elastic and less pressure-resistant. In other words, polyethylene is less suited to sanitary applications or heating.



Exposing the multilayer pipe to intense electron beams creates cross connections between the different molecular chains in the plastic. The electrons cause the hydrogen atomsto split from the various polyethylene chains. This enables carbon atoms to bond to each other and form a strong cross-linked structure.



The cross connections mean the movement of the chains with respect to each other is kept to a minimum. Applying heat or another form of energy will not distort, the strongstructure of the pipe. Cross-linked polyethylene displays optimal behaviour under continuous loads due to pressure or temperature loads. Cross-linking gives enormous durability.



The best and most accurate way of cross-linking polyethylene is through the use of electron beams. Polyethylene can be cross-linked in the following ways:

a. PE-Xa: the so-called Engel process, where the polyethylene is mixed with highly concentrated organic peroxide. The peroxide enables bonding to occurto take place between the polyethylene chains. This is a chemical method.

b. PE-Xb: cross-linking is achieved by adding silane to the polyethylene, followed by a water treatment. This is a chemical method.

c. PE-Xc: in contrast to the two previous methods, cross-linking takes place during a second process when the pipe is exposed to intense electron beams.The beams excite the polyethylene molecules so much that they cross-link. This is a physical method.

ADHESIVE PRIMER

The aluminum tape is attached to the inner and outer PEX layers by two layers of glue.
The latter was specifically developed to maximize the adhesion between PEX and aluminum and to ensure that the bond strength does not decline with time and with high temperatures.
Thanks to the adhesive, the two layers of PEX and the aluminum layer form a whole with superior properties compared to the single component.

PERMEABILITY TO OXYGEN

General Fittings Pe-Xc/Al/Pe-Xc pipe is impermeable to any diffusion phenomenon, as the intermediate aluminum structure guarantees a zero passage of gases inside the tube itself.
This feature makes it the perfect solution in any heating system that includes aluminum exchangers or metal tube bundles sensitive to oxygen diffusion.
General Fittings multilayer pipes can also be used in underfloor heating systems in compliance with the provisions of the UNI EN1264 standard which prescribes an oxygen diffusion barrier on the pipes for radiant floor heat systems, limiting it to 0.32 mg / m2 per day in order to avoid the reduction of the useful life of the pipe itself.

APPLICATION CLASS TABLE (EN ISO 21003-1)

Class	°C	Time years	°C	Time years	°C	Time h	Typical applicatio n
1a	60	49	80	1	95	100	Hot water supply (60°C)
2a	70	49	80	1	95	100	Hot water supply (70°C)
4b	20 plus cumulative	2.5	70	2.5	100		Underfloor heating and low temperatures radiators
4b	40 plus cumulative	20	70	2.5	100		Underfloor heating and low temperatures radiators
4b	60	25	70	2.5	100		Underfloor heating and low temperatures radiators
5b	20 plus cumulative	14	90	1	100		High-temperature radiators
5b	60 plus cumulative	25	90	1	100		High-temperature radiators
5b	80	10	90	1	100		High-temperature radiators

a Countries can choose either class 1 or class 2 according to with their national legislation.
b Where there is more than 1 design temperature for a class, the times should be added together. “Plus cumulative” in the table implies a temperature profile for the aforementioned temperature over a certain period. (e.g. for class 5, the design temperature profile over 50 years is 20°C over 14 years. This becomes 60 °C over 25 years, 80 °C over 10 years, 90 °C over 1 year and 100 °C over 100 hours respectively

TECHNICAL DATA

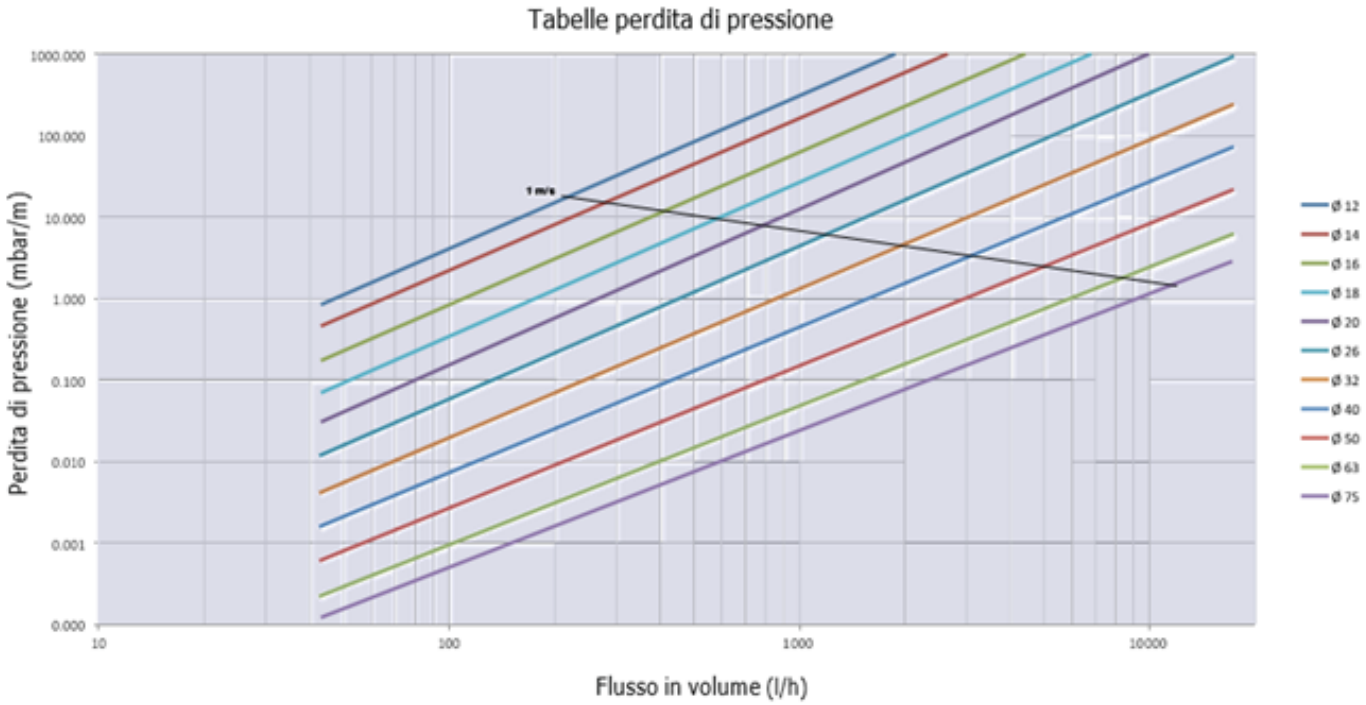
Outside diameter (mm)	16	20	26	32	40	50	63
INTERNAL DIAMETER mm	12	16	20	26	33	42	54
Wall thickness (mm)	2		3		3.5	4	4.5
Aluminum thickness mm	0.2	0.28		0.35	0.5		0.7
Operating temperature (°C)	95						
Working pressure (bar)	10						
Application class (EN ISO 21003-1)	2-4-5						
Coefficient Of Thermal Conduction W / Mk	0.43						
Coefficiente di dilatazione lineare (mm/mK)	0.025						
Trazione minima strato di colla (N/10mm)	30						
INNER PIPE SURFACE ROUGHNESS (μ)	7						
Oxygen diffusion mg / l	0						

Outside diameter (mm)	16	20	26	32	40	50	63
Raggio di curvatura min. manuale /molla piegatubi esterna (mm)	5XDe			*			
Raggio di curvatura min. manuale /molla piegatubi interna (mm)	3XDe			*			
Degree of crosslinking %	60						
WEIGHT (Kg/m)	0.101	0.129	0.261	0.39	0.528	0.766	1.155
Flow rate (l/m)	0.113	0.201	0.314	0.531	0.855	1.385	2.29
*è necessario usare raccordi a gomito + 2xDe in caso di uso di piega-tubi manuale							

TEMPERATURE AND PRESSURE

NOMINAL DIAMETER OF THE PIPE	16x2.0	20x2.0	26x3.0	32x3.0	40x3.5	50x4.0	63x4.5
maximum working pressure bar °C	90						
MINIMUM OPERATING TEMPERATURE °C	-20						
PEAK TEMPERATURE (malfunction) °C	95						
MAXIMUM OPERATING PRESSURE (bar) AT 20 °C (in combination with 5S00 series fittings)	10						

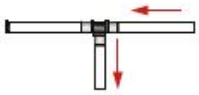
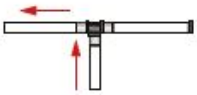
PRESSURE DROPS



Liquids lose energy when they flow through a pipe as a result of friction between the liquid and the walls of the pipe.
The diagram and tables below show the pressure loss for a given volumetric flow rate in relation to the pipe diameter and the flow speed.

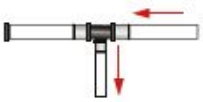
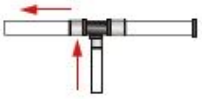
FITTINGS

Both radial press fittings and compression fittings are available to be used with Pe-Xc/Al/Pe-Xc multilayer pipes.
Given the wide range of fittings offered by General Fittings, we recommend that you refer to the commercial catalogue or the website www.generalfittings.it.
Overview of flow loss coefficients (Zeta values)
Liquids do not only lose energy when they flow through a pipe. They also lose energy when they change direction. This is because liquids have to overcome extra resistance.The table below provides an overview of the flow loss coefficients for the various fittings and the corresponding number of meters of piping

Valori zeta (Fluido: acqua a 15°C Velocità di flusso 2m/s)										
Snnb		Ø14	Ø16	Ø18	Ø20	Ø26	Ø32	Ø40	Ø50	Ø63
Gomito curvato 	zeta	1,500	1,250	1,100	1,850	0,700	-	-	-	-
	m	0,74	0,65	0,61	0,50	0,49	-	-	-	-
Gomito 90° 	zeta	3,071	2,021	2,839	1,870	1,974	1,981	1,865	1,753	1,666
	m	1,16	0,96	1,63	1,27	1,76	2,44	3,08	3,88	5,01
Gomito 45° 	zeta	-	-	-	-	-	-	0,761	0,690	0,614
	m	-	-	-	-	-	-	1,26	1,53	1,84
Elemento di collegamento dritto 	zeta	0,918	0,689	0,610	0,559	0,504	0,472	0,388	0,342	0,327
	m	0,35	0,33	0,35	0,38	0,45	0,58	0,64	0,76	0,98
Elemento a T 	zeta	1,026	0,829	0,739	0,639	0,629	0,562	0,472	0,407	0,347
	m	0,39	0,39	0,42	0,43	0,56	0,69	0,78	0,90	1,04
	zeta	2,772	2,329	2,126	1,890	1,974	1,844	1,716	2,001	1,884
	m	1,05	1,10	1,22	1,28	1,76	2,27	2,83	4,43	5,66
	zeta	2,851	2,372	2,268	2,010	2,104	1,898	1,716	1,902	1,785
	m	1,08	1,12	1,30	1,36	1,88	2,34	2,83	4,21	5,36

Valori zeta (Fluido: acqua a 15°C Velocità di flusso 2m/s)

Snnb			Ø16-Ø14-Ø16	Ø18-Ø14-Ø18	Ø18-Ø16-Ø18	Ø20-Ø14-Ø20	Ø20-Ø16-Ø20	Ø20-Ø18-Ø20	Ø26-Ø16-Ø26	Ø26-Ø18-Ø26	Ø26-Ø20-Ø26	Ø32-Ø16-Ø32	Ø32-Ø18-Ø32	Ø32-Ø20-Ø32	Ø32-Ø26-Ø32
Elemento a T riduttore		zeta	0,790	0,702	0,734	0,606	0,588	0,648	0,578	0,563	0,592	0,544	0,539	0,544	0,549
		m	0,37	0,40	0,42	0,41	0,40	0,44	0,52	0,50	0,53	0,67	0,66	0,67	0,68
		zeta	1,864	1,726	1,711	1,486	1,516	1,575	1,256	1,359	1,358	1,32	1,289	1,257	1,296
		m	0,88	0,99	0,98	1,01	1,03	1,07	1,12	1,21	1,21	1,63	1,59	1,55	1,60
		zeta	1,697	1,578	1,654	1,408	1,408	1,497	1,181	1,033	1,119	1,464	1,245	1,074	1,129
		m	0,80	0,91	0,95	0,95	0,95	1,01	1,05	0,92	1,00	1,80	1,53	1,32	1,39

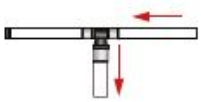
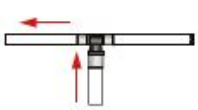
			Ø40-Ø16-Ø40	Ø40-Ø20-Ø40	Ø40-Ø26-Ø40	Ø40-Ø32-Ø40	Ø50-Ø20-Ø50	Ø50-Ø26-Ø50	Ø50-Ø32-Ø50	Ø50-Ø40-Ø50	Ø63-Ø26-Ø63	Ø63-Ø32-Ø63	Ø63-Ø40-Ø63	Ø63-Ø50-Ø63
		zeta	0,427	0,378	0,477	0,447	0,362	0,357	0,377	0,397	0,312	0,317	0,327	0,337
		m	0,70	0,62	0,74	0,74	0,80	0,79	0,83	0,88	0,94	0,95	0,98	1,01
		zeta	1,315	1,155	1,123	1,599	1,056	1,022	1,183	1,243	1,014	1,262	1,119	1,326
		m	2,17	1,91	1,85	2,64	2,34	2,26	2,62	2,75	3,05	3,79	3,36	3,98
		zeta	1,412	1,101	0,999	1,49	1,101	1,027	0,861	0,855	0,92	1,04	0,696	0,988
		m	2,33	1,82	1,65	2,46	2,44	2,27	1,91	1,89	5,77	3,12	2,09	2,97

Valori zeta (Fluido: acqua a 15°C Velocità di flusso 2m/s)

Snnb			Ø16-Ø14-Ø14	Ø18-Ø16-Ø16	Ø20-Ø16-Ø16	Ø20-Ø18-Ø18	Ø20-Ø20-Ø16	Ø26-Ø20-Ø20	Ø26-Ø26-Ø16	Ø26-Ø26-Ø20	Ø32-Ø26-Ø26	Ø40-Ø32-Ø32	Ø40-Ø40-Ø26
Elemento a T Doppio riduttore		zeta	0,907	0,732	0,699	0,759	0,800	0,694	0,859	0,674	0,671	0,673	0,704
		m	0,43	0,42	0,47	0,51	0,54	0,62	0,77	0,60	0,83	1,11	1,16
		zeta	1,902	1,667	1,759	1,657	1,900	1,413	1,983	2,441	1,254	1,441	1,721
		m	0,90	0,96	1,19	1,12	1,29	1,26	1,77	2,18	1,54	2,38	2,84
		zeta	1,879	1,885	1,340	1,924	1,110	1731	0,978	1,104	1,398	1,609	0,748
		m	0,89	1,08	0,91	1,30	0,75	1,54	0,87	0,98	1,72	2,65	1,23

			Ø40-Ø40-Ø32	Ø50-Ø40-Ø40	Ø26-Ø16-Ø20	Ø26-Ø20-Ø16	Ø32-Ø20-Ø26	Ø40-Ø20-Ø32	Ø40-Ø26-Ø32	Ø50-Ø20-Ø40	Ø50-Ø26-Ø40	Ø50-Ø32-Ø40
		zeta	0,633	0,597	0,694	0,832	0,619	0,633	0,673	0,616	0,587	0,621
		m	1,04	1,32	0,62	0,74	0,76	1,04	1,11	1,36	1,30	1,37
		zeta	1,701	1,308	1,445	2,526	1,236	1,142	1,123	1,061	1,088	1,307
		m	2,81	2,89	1,29	2,25	1,52	1,88	1,85	2,35	2,41	2,89
		zeta	1,02	1,328	1,393	1,337	1,231	1,102	1,143	1,056	1,054	1,223
		m	1,68	2,94	1,24	1,19	1,52	1,82	1,89	2,34	2,33	2,71

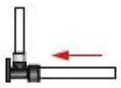
Valori zeta (Fluido: acqua a 15°C Velocità di flusso 2m/s)

Snnb			Ø16-Ø18-Ø16	Ø16-Ø20-Ø16	Ø20-Ø26-Ø20	Ø26-Ø32-Ø26	Ø32-Ø40-Ø32	Ø40-Ø50-Ø40
Elemento a T Maggioratore		zeta	0,841	0,896	0,671	0,629	0,678	0,452
		m	0,48	0,61	0,60	0,77	1,12	1,00
		zeta	1,483	1,255	1,140	1,029	1,233	2,209
		m	0,85	0,85	1,02	1,27	2,03	4,80
		zeta	1,749	1,598	1,507	1,395	1,629	2,298
		m	1,00	1,08	1,34	1,72	2,69	5,08

Valori zeta (Fluido: acqua a 15°C Velocità di flusso 2m/s)

Snnb		Ø16-Ø18-Ø16	Ø16-Ø20-Ø16	Ø20-Ø26-Ø20	Ø26-Ø32-Ø26	Ø32-Ø40-Ø32	Ø40-Ø50-Ø40
Elemento a T Maggioratore 	zeta	0,841	0,896	0,671	0,629	0,678	0,452
	m	0,48	0,61	0,60	0,77	1,12	1,00
	zeta	1,483	1,255	1,140	1,029	1,233	2,209
	m	0,85	0,85	1,02	1,27	2,03	4,80
	zeta	1,749	1,598	1,507	1,395	1,629	2,298
	m	1,00	1,08	1,34	1,72	2,69	5,08

Valori zeta (Fluido: acqua a 15°C Velocità di flusso 2m/s)

Snnb		Ø14-1/2"	Ø16-3/8SDSq	Ø16-1/2SDSq	Ø18-1/2SDSq	Ø20-1/2SDSq	Ø20-3/4SDSq	Ø26-3/4SDSq
Supporto a parete 	zeta	1,697	1,417	1,441	1,513	1,587	1,264	1,385
	m	0,64	0,67	0,68	0,87	1,07	0,86	1,24

	Ø16-1/2"-Ø16	Ø20-1/2"-Ø20
Doppio supporto a parete  zeta	4,157	4,315
m	1,97	2,92

	Ø16-Ø14	Ø18-Ø14	Ø18-Ø16	Ø20-Ø14	Ø20-Ø16	Ø20-Ø18	Ø26-Ø16	Ø26-Ø18	Ø26-Ø20
Riduttore  zeta	0,953	0,913	0,722	0,838	0,765	0,669	0,746	0,813	0,684
m	0,45	0,52	0,41	0,57	0,52	0,45	0,67	0,73	0,61

zeta	Ø32-Ø16	Ø32-Ø20	Ø32-Ø26	Ø40-Ø26	Ø40-Ø32	Ø50-Ø32	Ø50-Ø40	Ø63-Ø40	Ø63-Ø50
m	0,807	0,689	0,598	0,622	0,599	0,671	0,592	0,661	0,531
	0,99	0,85	0,74	1,03	0,99	1,46	1,31	1,99	1,60

THERMAL EXPANSION

During the design and installation phases of Pe-Xc/Al/Pe-Xc multilayer pipes, the phenomenon of thermal expansion must not be neglected.
Through the table below it is possible to make the appropriate assessments. Thermal expansion can be evaluated using the formula: ΔL = αa x L x Δt where
ΔL = expansion expressed in mm
αa = coefficient of linear thermal expansion, which corresponds to 0.025 mm / m K
L = length of the pipe expressed in m
Δt = temperature variation expressed in degrees Kelvin [K] or Celsius [°C]
All materials used in manufacturing the pipe expand when they are warmed and shrink when they cool down. That is why you always have to take length differencesinto account as a result of variations in temperature
The temperature difference and the length of the pipe are the two parameters that will determine the change in length.
You can use the expansion table below to see the change in length that can be expected with a certain pipe length and a certain temperature difference. The coefficient of expansion is the same for all diameters.

LINEAR EXPANSION (mm)	TEMPERATURE DIFFERENCE (AT)							
PIPE LENGTH (m)	10	20	30	40	50	60	70	80
1	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
2	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00
3	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00
4	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
5	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00
6	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00
7	1.75	3.50	5.25	7.00	8.75	10.50	12.25	14.00
8	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
9	2.25	4.50	6.75	9.00	11.25	13.50	15.75	18.00
10	2.50	5.00	7.50	10.00	12.50	15.00	17.50	20.00

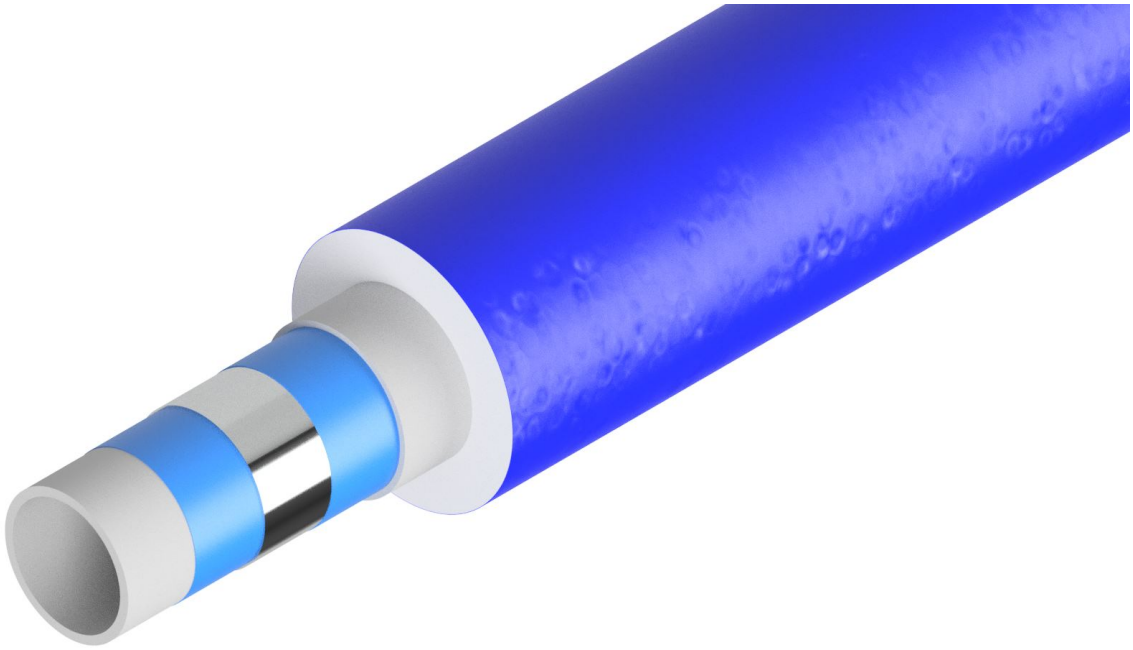
MARKINGS

Pex/Sheath	MARKING
Pipe	>I< M 001 A03 General Fittings Dn. PIPE SIZE PE-Xc Al PE-Xc ISO 21003 Class 2-5/10 bar - Max 90°C KIWA CODE KIWA DVGW CODE DVGW Sanitary and Heating - Made in Italy - DATE HOUR - BATCH
Codes: TB0020G202000H, TB0020G263000H, TB0020R202000H, TB0020R263000H, TB0020B202000H, TB0020B263000H	>I< M 001 A03 General Fittings COLORETherm Dn. PIPE SIZE + SHEATH THICKNESS mm - Made in Italy - DATE HOUR - BATCH

REGULATIONS

• ISO 21003-2
It is the European standard for multilayer pipes for hot and cold water in installations inside homes. This legislation specifies the general characteristics of pipes and multilayer systems for conveying hot and cold water inside homes in heating and drinking water systems

COATED PIPE COMPOSITION



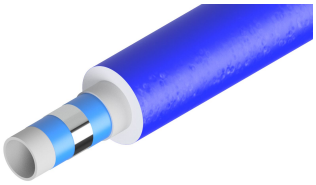
LAYER COMPOSITION

Coating: layer of insulating material, made of closed cell expanded polyethylene, which increases the energy efficiency of the installation, and further improves the already reduced noise level. The coating structure consists of two layers. The coating has 0.040 at 40°Cinsulating properties and the outer film is in self-extinguishingPVC.

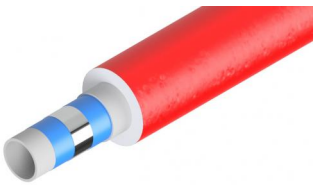
Extra protection: The protective sleeves are made from Polyethylene. This offers extra protection to pipes carrying water and gas during building works

Insulating capacity: This prevents laid pipes from transmitting too much heat to the floor above when the pipes are used with central heating systems. The layer of air in the protective sleeve provides an insulating effect.

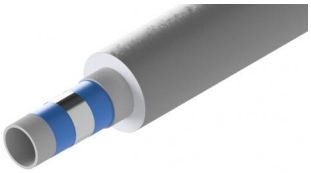
BLUE COATED PIPE



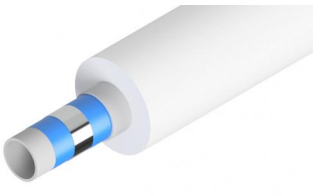
RED COATED PIPE



GREY COATED PIPE



WHITE COATED PIPE - WHITE FRIO



COVERING

The layer of insulating material, made of closed cell polyethylene foam, in addition to increasing the energy efficiency of the installation, further improves the already reduced noise level of systems made of synthetic materials.
PE-Xc/Al/PE-Xc pipes come with a round or eccentric thermal insulating material made from extruded PR foam with a closed cell structure.
Covering: red, blue and grey (for heating systems) and white (for air conditioning / chilled water systems).

THERMAL AND ACOUSTIC INSULATION

The multilayer pipes for hot and cold water (or other heat transfer fluid) must be adequately insulated to comply with specific regulations in terms of thermal and acoustic insulation as well as to absorb in cases where any expansion of the pipeline is possible. Since the thickness and sizing varies according to the concerned environments, the minimum thickness for the insulation materials is shown in the table.
Once the diameter of the pipe and the value of the useful thermal conductivity of the insulation (expressed in W / m ° C at a temperature of 40 ° C) are known, the minimum thicknesses to be applied in the most common cases can be obtained.
All ducts must be acoustically insulated to avoid the transmission of noise; it is always suggested to detach the risers from the building, where possible use specific support collars and bandage them with materials suitable for reducing acoustic bridges.

Thermal conductivity of the insulation (W / m °C)	Outside diameter of the pipe (mm)					
Thermal conductivity of the insulation (W / m °C)	< 20	From 20 to 39	From 40 to 59	From 60 to 79	From 80 to 99	> 100
0.030	13	19	26	33	37	40
0.032	14	21	29	36	40	44
0.034	15	23	31	39	44	48
0.036	17	25	34	43	47	52
0.038	18	28	37	46	51	56
0.040	20	30	40	50	55	60
0.042	22	32	43	54	59	64
0.044	24	35	46	58	63	69
0.046	26	38	50	62	68	74
0.048	28	41	54	66	72	79
0.050	30	42	56	71	77	84

SHEATH TECHNICAL CHARACTERISTICS

NOMINAL DIAMETER OF THE PIPE	16x2.0	20x2.0	26x3.0	32x3.0
OPERATING TEMPERATURE	-30 °C ; + 95°C			
DENSITY	33 Kg/m3			
COEFFICIENT OF THERMAL CONDUCTIVITY (at 40 °C)	0.0397 W/(m*K)			
RESISTANCE TO THE DIFFUSION OF WATER VAPOR	> 6000			
FIRE RESISTANCE CLASSIFICATION	class 1			

FLUIDS AND REAGENTS

Fluid	%	20°C	60°C	80°C
Acetic acid	60	C		
Glacial acetic acid	>96	C	L	
Vinager	-	C		-
Acetone	liquid	S	-	L
Adipic acid	Sol. Sat.	C		-
Air	-	C		
Acetate silver	Sol. Sat.	C		-
Nitrate silver	Sol. Sat.	C		-
Allyl Alcohol	liquid	-	NC	-
Methyl alcohol	5	C		-
Methyl alcohol	liquid	C		-
Alum	Sol. Sat.	C		-
Aluminium (chlorate)	Sol. Sat.	C		-
Aluminum (fluorinated)	Sol. Sat.	C		-
Aluminum (nitrate)	Sol. Sat.	C		-
Aluminum (potassium sulf.)	Sol. Sat.	C		
Ammonia	Sol. Sat.	C		-
Ammonia	gas	C		-
Ammonium Carbonate	Sol. Sat.	C		-
Ammonium (chloride)	Sol. Sat.	C		-
Ammonium (carbonate)	Sol. Sat.	C		-
Ammonium (nitrate)	Sol. Sat.	C		
Ammonium (sulfate)	Sol. Sat.	C		
Amyl Acetate	liquid	L		
Amile alcohol	liquid	C		-
aqua regia	HCl/HNO33/1	NC		
Barium (bromate)	Sol. Sat.	C		
Barium (carbonate)	Sosp.	C		
Barium (chloride)	Sol. Sat.	C		
Barium (hydroxide)	Sol. Sat.	C		

Fluid	%	20°C	60°C	80°C
Barium (sulfate)	Sosp.	C		
Barium (sulphite)	Sol. Sat.	C		
Benzaldehyde	liquid	L	NC	
Benzene	liquid	C	-	
Benzoic (acid)	Sol. Sat.	C		-

Fluid	%	20°C	60°C	80°C
Beer	-	C		
Bismuth carbonate	Sol. Sat.	C		
Borax	Sol.	C		
Borax	Sol. Sat.	C		
Boric (acid)	Sol. Sat.	C		
Bromine	gas	NC		
Bromine	liquid	NC		
Butane	gas	C		-
n-Butane	liquid	C	L	-
Butyl (acetate)	Liquid	L		-
Butyl (glycol)	liquid	C		-
Butyric (acid)	liquid	L		-
Calcium (carbonate)	Sosp.	C		
Calcium (chlorate)	Sol. Sat.	C		
Calcium (hydroxide)	Sol. Sat.	C		-
Calcium (hypochlorite)	Solution	C		-
Calcio (nitrato)	Sol. Sat.	C		
Calcium (sulfate)	Sosp.	C		
Camphor (oil)	Liquid	NC		
Carbon (dioxide)	Sol. Sat.	C		-
Carbon (dioxide)	gas	C		-
Carbon (monoxide)	gas	C		-
Carbon (tetrachloride)	Liquid	L	NC	
Chlorine	gas	NC		-
Chlorine	Sol. Sat.	NC		-
Chloroform	liquid	NS		-
Hydrochloric acid	<25	C		
Hydrochloric acid	<36	C		-
Acid chromium	Sol. Sat.	C		-
Acid chromium	50	C	L	-
Citric acid	Sol. Sat.	C		

Fluid	%	20°C	60°C	80°C
Ferric chloride	Sol. Sat.	C		
Ferric nitrate	Sol. Sat.	C		-
Ferric sulfate	Sol. Sat.	C		-
Ferrous chloride	Sol. Sat.	C		-
Ferrous sulfate	Sol. Sat.	C		-
Fluorine gas	Sol. Sat.	NC		
Formic (acid)	10-100	C		-
Phosphoric (acid)	Up to 50	C		-
Freon	Sol.	C	-	
Diesel fuel	liquid	C	L	-
Glucose	Sol.	C		
Glycerine	liquid	C		-
Hydrogen	gas	C		-
Hydrogen peroxide	10	C		-
Hydrogen peroxide	30	C	L	-
Hydrogen peroxide	90	C	NC	-
Hydrogen sulphide	gas	C		-
Iodine	Sol. Sat.	NC		-
Milk	Sol.	C		
Lactic (acid)	liquid	C		-
Magnesium carbonate	Sosp.	C		-
Magnesium chlorate	Sol. Sat.	C		-
Magnesium hydroxide	Sol. Sat.	C		-
Magnesium nitrate	Sol. Sat.	C		-
Magnesium sulfate	Sol. Sat.	C		-
Naphtha	Sol.	C		L
Nitric acid	0-35	C	L	-
Nitric acid	>40	NC		-
Mineral oils	Sol.	C		L
Vegetable oils	liquid	C	L	-
Oxygen	gas	C	L	-
Ozone	Sol. Sat.	L	NS	-

Fluid	%	20°C	60°C	80°C
Picric (acid)	Sol. Sat.	C	L	-
Potassium dichromate	Sol. Sat.	C		-

Fluid	%	20°C	60°C	80°C
Potassium bicarbonate	Sol. Sat.	C		-
Potassium dichromate	Sol. Sat.	C		-
Potassium bisulfate	Sol. Sat	C		-
Potassium bromide	Sol, Sat.	C		-
Potassium carbonate	Sol. Sat.	C		-
Potassium chlorate	Sol. Sat.	C		-
Potassium chloride	Sol. Sat.	C		-
Potassium hydroxide	Up to 50	C		
Potassium hypochlorite	Sol.	C	L	-
Potassium nitrate	Sat. Sol.	C		-
Potassium orthophosphate	Sat. Sol.	C		-
Potassium permanganate	Sat. Sol.	C		-
Potassium sulfate	Sat. Sol.	C		-
Propionic (acid)	Up to 50	C		-
Copper chloride	Sol. Sat.	C		
Cyanate copper	Sol. Sat.	C		-
Copper nitrate	Sol. Sat.	C		-
Copper sulfate	Sol. Sat.	C		-
Salicylic (acid)	Sol. Sat.	C		-
Sodium acetate	Sol. Sat.	C		-
Sodium benzoate	Sol. Sat.	C		-
Sodium bicarbonate	Sol. Sat.	C		-
Sodium bicarbonate	Sol. Sat.	C		-
Sodium bisulfate	Sol. Sat.	C		-
Sodium bromide	Sol. Sat.	C		-
Sodium carbonate	Up to 50	C		-

Fluid	%	20°C	60°C	80°C
Sodium chloride	Sol. Sat.	C		-
Sodium chromate	Sol. Sat.	C		-
Sodium hydroxide	From 1 to 60	C		-
Sodium hypochlorite	From 10 to 15	C		-

Fluid	%	20°C	60°C	80°C
Sodium nitrate	Sat. Sol.	C		-
Sodium nitrite	Sat. Sol.	C		-
Sodium phosphate	Sol. Sat.	C		-
Sodium silicate	Sol. Sat.	C		-
Sodium sulfate	Sol. Sat.	C		-
Sodium sulfate	Sol. Sat.	C		-
Sulfuric acid	Up to 50	C		-
Sulfuric acid	From 50 to 98	C	L	NC
Fruit juice	Sol.	C		-
Photographic development	Sol.	C		-
Acid tannic	Sol.	C		-
Toluene	liquid	C	L	-
Trichlorethylene	Liquid	L	NC	
Urea	Sol. Sat.	C		-
Urine	Sol.	C		-
Wine	Sol.	C		-
Zinc carbonate	Sosp.	C		-
Chlorinated zinc	Sol. Sat.	C		-
Zinc nitrate	Sol. Sat.	C		-
Zinc oxide	Sosp.	C		-
Zinc sulfate	Sol. Sat.	C		-

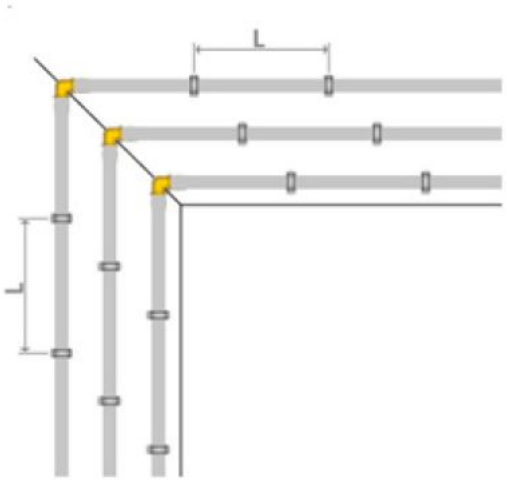
LEGEND	
C	compatible
L	limitedly compatible
NC	Incompatible

PIPES INSTALLATION

To facilitate quick sizing of the sanitary water network, an hypothesis is reported below (load units serving the various users).
In the case of above-average adduction for connection to individual users, check with the pressure drop diagrams that the minimum requirements for flow rate, pressure drop and water speed are met.

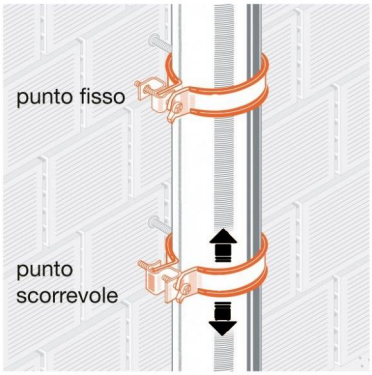
CONSUMPTION	CONNECTOR	Ø EXTERNAL PIPE	Ø INTERNAL PIPE
Kitchen sink	1/2"	16x2.0 mm	Ø 12mm
Service sink	1/2"	16x2.0 mm	Ø 12mm
Bathroom sink	1/2"	16x2.0 mm	Ø 12mm
Bidet	1/2"	16x2.0 mm	Ø 12mm
Shower	3/4"	20x2.0 mm	Ø 16mm
Cabinet	3/4"	20x2.0 mm	Ø 16mm
Distribution rising columns	3/4"	20x2.0 mm	Ø 16mm
Distribution rising columns	3/4"	26x3.0 mm	Ø 16mm
Distribution rising columns	1"	32x3.0 mm	Ø 20mm
Distribution rising columns	1" 1/4	40x3.50 mm	Ø 33mm
Distribution rising columns	1" 1/2	50x4.00 mm	Ø 42mm
Distribution rising columns	2"	63x4.50 mm	Ø 54mm

To lay the pipes, it is necessary to follow some simple precautions concerning the connection of the pipe using the appropriate fittings and adapters, the bends of the pipes, the protection from sunlight and possible damage:
- the connection of the pipes to the distribution manifolds or to the elbows for the connection of taps must be made by means of fittings and adapters of suitable size for the pipe used
- the connection of the pipes to the manifold must be carried out in such a way as to avoid that the components are subjected to permanent mechanical stress
- all the materials used to manufacture the pipes expand when heated and shrink when cooled: for this reason, the length variation (ΔL) generated by temperature variations must always be taken into account during installation (see paragraph " Thermal expansion ")
- When installing exposed pipes, the length of the pipes must be calculated based on the system requirements, and the distances between the pipe supports must be carefully evaluated. The maximum distance between each support (L) depends on the diameter of the pipe used and is summarized in the following table.



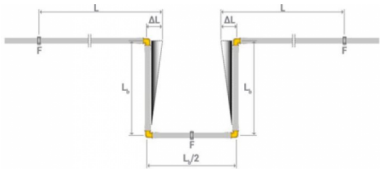
Ø EXTERNAL OF THE PIPE mm	MAX DISTANCE BETWEEN EACH SUPPORT (L) mm
16	1000
18	1100
20	1250
26	1500
32	2000
40	2250
50	2500
63	2760
75	2750
90	2750

The supports made in visible installations have two functions: they support the piping and allow its thermal expansion.
The supports can be fixed, when they block the pipe, or sliding, when they allow the pipe to slide caused by thermal expansions.



In long sections of straight piping, to absorb any variations in length, it is advisable to insert at least one expansion elbow every 10m of pipe, as shown in the following diagram. For pipes with a diameter equal to or greater than 32mm, the expansion curves are mandatory.

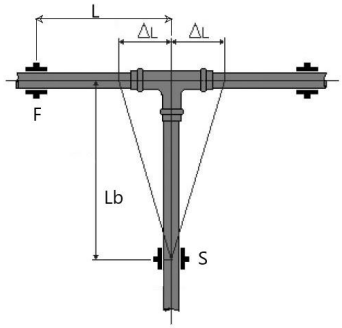
L = Distance between fixed support and expansion curve
ΔL = Change in pipe length
F = Fixed support
Lb = Length of the expansion arm



The minimum length of the expansion arm (Lb) can be calculated using the following formula Lb = C x √ ØxΔL
Lb = minimum length of the expansion arm in mm
C = material constant (for multilayer pipe the value is 33)
Ø = external diameter of the pipe in mm
ΔL = Change in pipe length in mm

When making the expansion bends, it is essential to use fittings and correctly position the fixed supports and sliding supports as shown in the following diagram.
It is advisable to use expansion elbows every time the pipeline undergoes a change of direction

L = Distance between fixed support and expansion curve
ΔL = Change in pipe length
F = Fixed support
S = Sliding support
Lb = Length of the expansion arm



CAUTIONS

The multilayer pipes in Pe-Xc/Al/Pe-Xc require some necessary precautions to guarantee their duration and functionality:
• keep the pipe in the appropriate packaging and store in covered, dry places to prevent moisture from damaging it;
• do not expose directly to sunrays; General Fittings multilayer pipe can be freely laid on sight inside the buildings. However, direct exposure to UV rays must be avoided as they deteriorate the polyethylene by oxidizing the surface;
• always cut the pipe to be installed with the appropriate tools capable of making a clean cut, perpendicular to the axis of the pipe and without burrs;
• after each cutting operation, and before putting on the fitting, calibrate with the appropriate tool and lubricate the sealing elements on the hose holder;
• avoid the formation of ice inside the pipe, because the expansion due to the change of state could damage it irreparably;
• avoid storage at temperatures below -30 °C;
• the pipe must never come into contact with open flames;
• once installation is complete, carry out an acceptance test at a pressure equal to 1.5 times the operating pressure;
• the bending radius when laying the pipes must be greater than 5 times the external diameter of the pipe; this value can drop to 3 times the external diameter of the pipe with pipe bending bender;
• two consecutive fittings must be installed at a sufficient distance not to generate mutual stresses on all components, both during installation and during the operation of the system;
• in visible installations the piping must always be protected from ultraviolet rays, which can alter the chemical-physical characteristics;
• prevent the piping from being exposed for long periods to solar radiation or fluorescent lamps;
• if the pipe is chased without a protective sheath, it must be covered with a screed with a thickness of at least 15 mm to avoid cracks in the plaster due to thermal expansion;
• avoid as much as possible to install concealed fittings. If this is not possible, make the fitting inspectable or protect it from contact with building material and keep track of its position in the project documentation;
• after laying the pipes and before any coverage, a pressure test of the system should be performed in order to immediately highlight any leaks;
• the pressure test must be followed by the protection of the sheaths by covering with cement in order to avoid crushing of the piping or alteration of the laying;

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