1. Crosslinked Polyethylene. Composition and Characterization

FILPEX are composed of crosslinked polyethylene (PE-X).

The crosslinked polyethylene represents the final state of a raw material that suffers a transformation from its source, in this case petroleum, until its final state, as already mentioned.

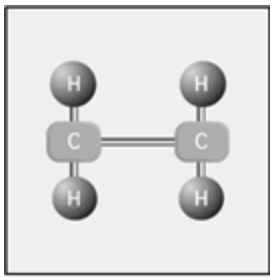
Therefore, the starting point for the production of a FILPEX pipe have as a basis an high-density polyethylene (PEAD). This is a product from the polymerisation of the Ethylene, linked in chains of Ethylene monomers which come from petroleum in a gaseous state. During polymerisation, large chains of simple ramifications are formed, as exemplified in drawing 2.

The raw material presents the following properties:

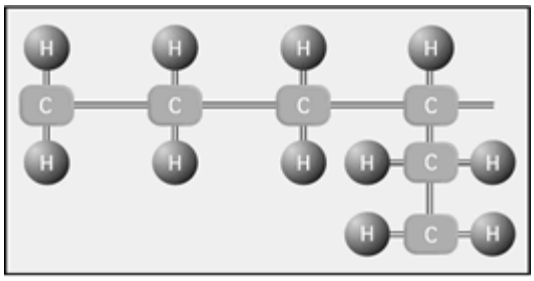
Property	Essay	Unit	Value
Density	ASTM D792	g/cm3	0.952
Enlargement at rupture	ASTM	%	200
Resistance to impact (20º C)	BS 2782	J/m	140
Elasticity modulus			
a 0º C	ASTM D638	N/mm2	1200
a 40º C			1000
Fluidity index (190º C / 5kg)	ASTM D1238	g/10 min.	3.0

Chart 1 - Raw material medium properties

As it can be observed in drawing 1, the Ethylene is a pure hydro-carbonate. Not being an easily flammable material (high auto-ignition point) and, therefore, a combustible material. Its combustion products are not toxic, being therefore a material indicated by the environmental organisms as having excellent characteristics for its use in pipe systems for the transport of fluids in places where there is a possible fire risk, such as domestic housing.



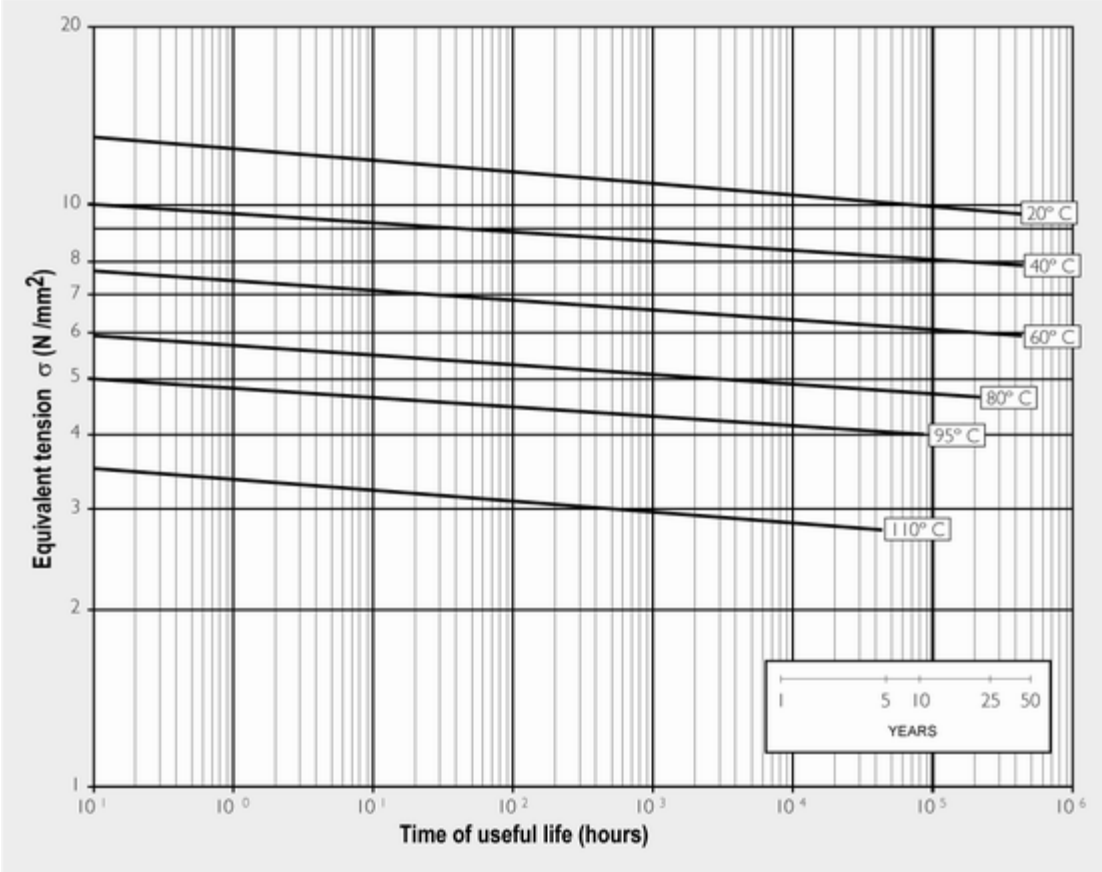
Draw. 1 - Ethylene Monomer



Draw. 2 - PEAD molecule scheme

Polyethylene is a partially crystalline material. This classification comes from the fact of existing in its structure long and perfectly alienated chains whose density is higher (crystalline areas) and chains highly disordered with lower partial densities (amorphous areas). These two areas have different fusion points, about 130ºC for the crystalline area and near 200ºC for amorphous areas, for it will be necessary to carry out an extrusion at temperatures close to the last one so that the raw material becomes fluid. However, it must be kept in mind that too high temperatures during extrusion cause an acceleration of the material's degradation.

This statement is more perceptible when we analyse the behaviour of the Polyethylene at high temperatures, throughout the years. The following graph presents the behaviour of the crosslinked polyethylene along the years.



Graph 1-Behavior of the tubes in PEX throughout the years (standard DIN 16892)

The pipes in crosslinked polyethylene are obtained by extrusion, with a raw material in high-density polyethylene (PEAD) with additives that allow reticulation. The High Density Polyethylene pipes (PEAD) do not allow operational temperatures higher than 40ºC, having as reference a 50 year old duration. So that the increase of the operational temperature was possible, the raw material would have to have a much higher molecular weight and it would be needed a production process for this type of material. The

reticulation increases the resistance higher temperatures for the same operational pressure. On the other hand, the pipe's flexibility increases as much high is his degree of reticulation.

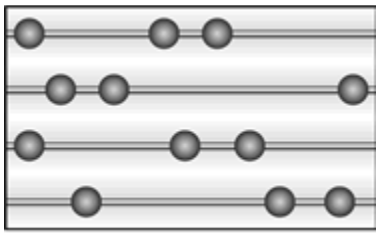


Fig. 3.1

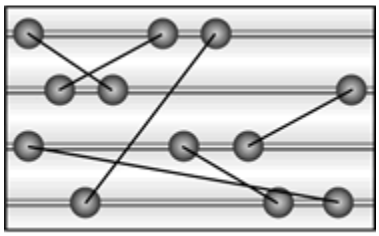


Fig. 3.2

Fig. 3-schematic comparison of molecular dispositions between PEAD

The reticulation process can be made during the production process, adding to the raw material elements which provide the reticulation taking advantage of the high working temperature (peroxide method), or after the extrusion process by immersion in hot water (liquid state), action of low temperature water steam or hot water circulation inside the tube.

It is important to point out that, after reticulation, it won't be possible to consider that the pipe is made composed of thermoplastic material. This material is no longer meltable. It can be considered that it was proceeded to the union of good characteristics of the thermoplastic material with the elastomers, for it is considered that the tubes in crosslinked polyethylene are composed by a "thermoelastic" material.

2. Production range

Crosslinked polyethylene pipes are according to standard DIN 16893.

It is considered a limit tangential tension. For this value, exists an associated security coefficient.

The calculation formula is based on the following:

$$S = \frac{\sigma}{PN} = \frac{1}{2} \cdot \left(\frac{DN}{s} - 1 \right) = \frac{SDR - 1}{2}$$

Where,

PN - Nominal pressure

DN - Nominal diameter

s - Thickness

S - Class or series

SDR - Reason between DN and s

It is established that the minimum thickness dimension for PEX pipes is of 1.8 mm.

2.1 -FILPEX-a

FILPEX-a pipe is produced through the peroxide method, for example, using ENGEL method.

Classification	Code	Nominal diameter (mm)	Thickness (mm)	Weight (g/m)	Quantity per Packing (m/box)
S5 SDR 11 PN 12.5	PA 001 0160000 1800	16	1.8	73	100
	PA 001 0200000 1900	20	1.9	103	100 or 240
	PA 001 0250000 2300	25	2.3	156	100
	PA 001 0320000 2900	32	2.9	252	100
	PA 001 0400000 3700	40	3.7	402	100
S3.15 SDR 7.3 PN 20	PA 001 0120000 1800	12	1.8	55	100
	PA 001 0160000 2200	16	2.2	91	100
	PA 001 0200000 2800	20	2.8	144	100 or 240
	PA 001 0250000 3500	25	3.5	225	100
	PA 001 0320000 4400	32	4.4	363	100
Milimetric Series	PA 001 0120000 2000	12	2.0	60	100
	PA 001 0160000 2000	16	2.0	84	100
	PA 001 0200000 2000	20	2.0	108	100 or 240

Chart 2 - FILPEX - a production range

FILPEX-a pipes are packed in cardboard boxes:

The existent marking in the external surface of FILPEX-a respects the standard, indicating:

• Manufacturer •Maximum operation temperature and corresponding Pressure

• Commercial designation • operator

• material •date

• dimensions • order of Production

• Nominal pressure and corresponding temperature •Metric marking

As an example, the configuration of FILPEX-a pipe may be verified:

DUOFIL • FILPEX • PER-P • 12 x1.8 • 95° C/0.6MPa • 20° C/2.0MPa • OP121 • 00/06/28 • PEX-00011/00 • 014 mt

FILPEX-a pipe is manufactured according to the German standards DIN 16892 AND DIN 16893.

2.2 - FILPEX-b

FILPEX-b pipe is produced by extrusion by the silanium method in the following dimensions:

Classification	Code	Nominal diameter (mm)	Thickness (mm)	Weight (g/m)	Quantity per Packing (m/box)
S5 SDR 11 PN 12.5	PB 001 0160000 1800	16	1.8	73	100
	PB 001 0200000 1900	20	1.9	103	100 or 240
	PB 001 0250000 2300	25	2.3	156	100
	PB 001 0320000 2900	32	2.9	252	100
	PB 001 0400000 3700	40	3.7	402	100
S3. 15 SDR 7.3 PN 20	PB 001 0120000 1800	12	1.8	55	100
	PB 001 0160000 2200	16	2.2	91	100
	PB 001 0200000 2800	20	2.8	144	100 or 240
	PB 001 0250000 3500	25	3.5	225	100
	PB 001 0320000 4400	32	4.4	363	100
Milimetric Series	PB 001 0120000 2000	12	2.0	60	100
	PB 001 0160000 2000	16	2.0	84	100
	PB 001 0200000 2000	20	2.0	108	100 or 240

Chart 3 - FILPEX - b production range

FILPEX-b pipes are packed in cardboard boxes:

The existent branding in the external surface of FILPEX-b pipe respects the standards, indicating:

• Manufacturer •Maximum operation temperature and corresponding Pressure

• Commercial designation • operator

• material •date

• dimensions • order of Production

• Nominal pressure and corresponding temperature •Metric marking

As an example, the configuration of FILPEX-b pipe may be verified:

DUOFIL • FILPEX • PER-S • 16 x2.2 • Homologation LNEC 507 • 95º C/0.6MPa • 20º C/2.0MPa • 0P.68 • 00/05/24 • PEX-00025/00 • 089 mt

FILPEX-b pipe is manufactured according to the German standards DIN 16892 and DIN 16893 being homologated by LNEC (DH507) and certified by AENOR (no. 001/1335).

2.3 FILFLEX

FILFLEX pipes are produced by extrusion, in Polypropylene, having as a purpose to allow the protection and later removal of the installed crosslinked Polyethylene pipes. The dimensions must be respected, so that the replacement of the pipe is possible.

Code	External diameter (mm)	DInternal diameter (mm)	Dimensional relationship [1] (mm)
PB.001.0250000.2500	25	20	12
PB.001.0300000.2500	30	25	16
PB.001.0370000.2500	37	32	20

Chart 5 - production range of FILFLEX pipe

FILFLEX pipe is available in blue, red and black colour in coils of 50 or 100 m.

1) The dimensional relationship indicates the Nominal Diameter in crosslinked polyethylene.

3. Durability

The crosslinked polyethylene pipes are produced according to the standard DIN 16893 which establishes a relation between the value of nominal pressure, with the working temperature of 20ºC for an estimated lifetime of 50 years.

This situation is not very frequent. In fact, it is usually intended to use higher temperatures. Therefore, it is necessary to value the relationship among these three variables, verifying if the values of the working pressures allow the use of the tube during the required life time.

The chart 6 shows the relationship between the maximum working pressures and the respective working temperatures, estimating a durability of the system.

Working Temperature	DURABILITY									
	1 Year		5 Years		10 Years		25 Years		50 Years	
	PN 12.5	PN 20.0	PN 12.5	PN 20.0	PN 12.5	PN 20.0	PN 12.5	PN 20.0	PN 12.5	PN 20.0
20° C	13.7	21.7	13.3	21.2	13.2	21.0	13.1	20.7	12.5	20.0
30° C	12.3	19.6	12.0	19.0	11.9	18.8	11.7	18.6	11.6	18.4
40° C	11.0	17.5	10.8	17.1	10.7	16.9	10.5	16.7	10.4	16.5
50° C	9.7	15.4	9.5	15.0	9.3	14.8	9.2	14.6	9.1	14.4
60° C	8.7	13.8	8.4	13.3	8.3	13.1	8.1	12.9	8.1	12.8
70° C	7.7	12.2	7.5	11.9	7.3	11.6	7.2	11.4	7.1	11.2
80° C	6.5	10.4	6.4	10.2	6.3	10.1	6.3	9.9	–	–
90° C	5.9	9.4	5.8	9.2	5.7	9.1	–	–	–	–
95° C	5.7	9.0	5.5	8.8	5.4	8.6	–	–	–	–

Chart 6-Maximum service pressure (bar) regarding the desired duration and of the working temperature (extract from standard DIN 16893)

For a working temperature of 20ºC and considering a period of useful life of 50 years, chart 6 indicates the value of nominal pressure as limit value for the working pressure.

Please note that the millimetre series of FILPEX is not represented in Chart 6. Therefore, you can consider useful life the values presented by the column concerning FILPEX -PN 12.5. Such conclusion comes from the fact that the thickness of the wall for the series in reference is always superior to the thickness of the class represented by S5, for the same values of the Nominal Diameter.

The values indicated in the Chart 6 do not consider eventual UV influences, that is, the natural degradation caused by the quick aging when in direct contact with the UV rays may compromise the truthfulness of the values presented in Chart 6.

4. Properties

High range of working temperatures.

It can be affirmed that the reticulation of a pipe in PEAD increases the capacity of operating with higher temperatures. Therefore the crosslinked polyethylene pipes will be able to work with temperatures between -50ºC and 95ºC. The crosslinked polyethylene pipes can work until temperatures of 110ºC, for brief periods of production.

Low thermal conductivity coefficient.

Being a plastic material, this characteristic allows to increase the efficiency of fluid transport systems at non-environmental temperatures. In the systems of hot water transport, the availability of water at a certain temperature, with higher pressure of the system, happens with a decrease of the heating power and in a quicker way, when compared with metallic pipe systems.

Low Thermal Conductivity coefficient

This characteristic does not allow the transmission of wandering currents which cause perforations in the metallic tubes.

Low rugosity coefficient in the interior wall.

The low rugosity of the inner wall (almost flat wall) allows to reduce the necessities of the height barometrical pumping systems that are translated in a energy saving. This characteristic also allows the availability of superior working pressures with more pressure of the system, when there are hydrostatic pressures (sanitary systems), when compared with similar metallic materials. The probability of accumulation of residuals, commonly designated by inlays which cause significant reductions of the sections of the pipes, is also reduced.

Possibility of later replacement and floor assembly.

According to the existent regulation, it is not possible to install systems of pipes in floors if the system does not use flexible pipes and with possibility of later removal. The installation of the pipe in crosslinked polyethylene inside the Polypropylene sleeve (FILFLEX) and its flexibility allows the satisfaction of such a condition, allowing a reduction of the effective quantities to install.

Resistance to Corrosion

Being a plastic material, the high resistance to corrosion allows a higher duration of the systems.

Physiologic behaviour.

The pipes in crosslinked polyethylene maintain the characteristics of drinkable water when locked within, not existing any migrations to the fluid being transported. (See verification of the National Institute of Health Dr. Ricardo Jorge).

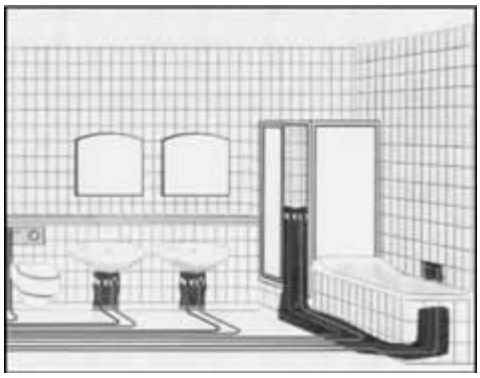
Anti-oxygen barrier

esistance to UV rays

The composition of the pipes in crosslinked polyethylene does not allow a long exhibition to the UV without the existence of a degradation and consequent decrease of the duration of the pipe.

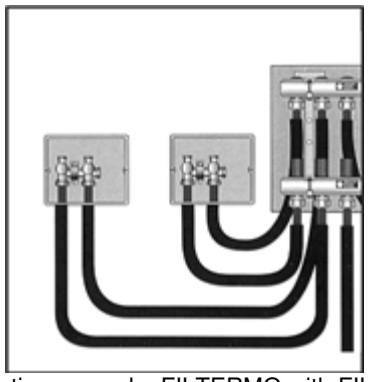
5. Application fields

5.1-Sanitary systems



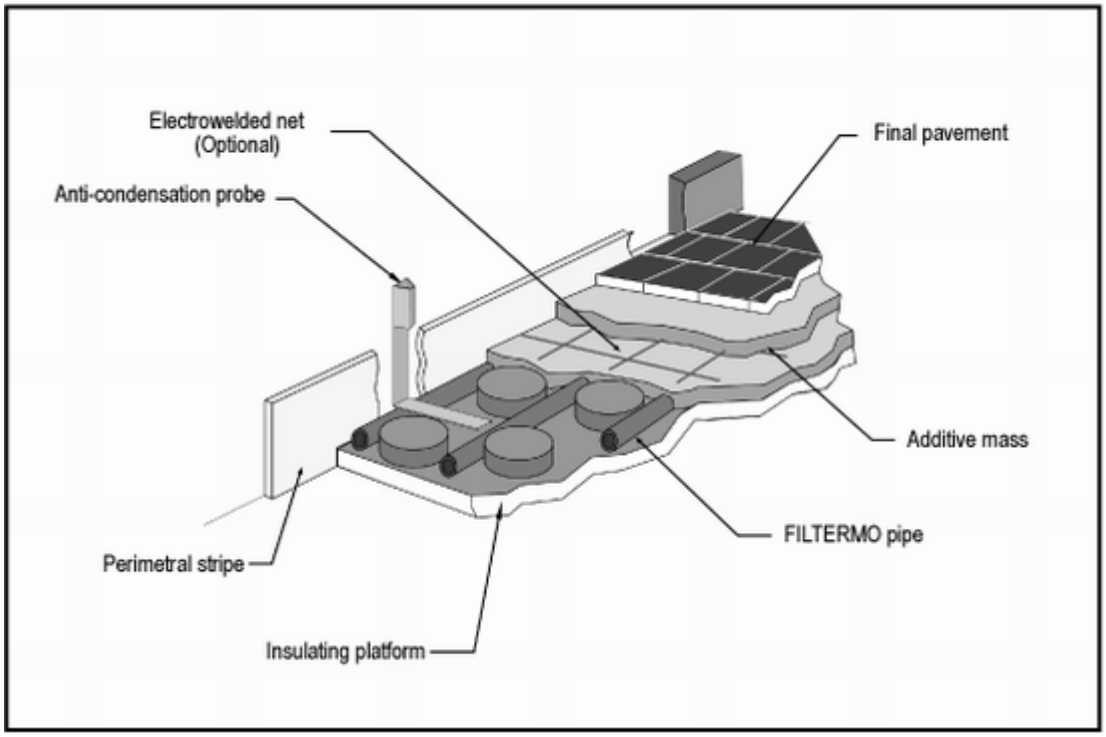
Installation example: FILPEX-a or FILPEX-b with FILFLEX

5.2-Central Heating Systems



Installation example: FILTERMO with FILFLEX

5.3-Radiant Floor Heating Systems



Installation example: FILTERMO

7. Thermal expansions

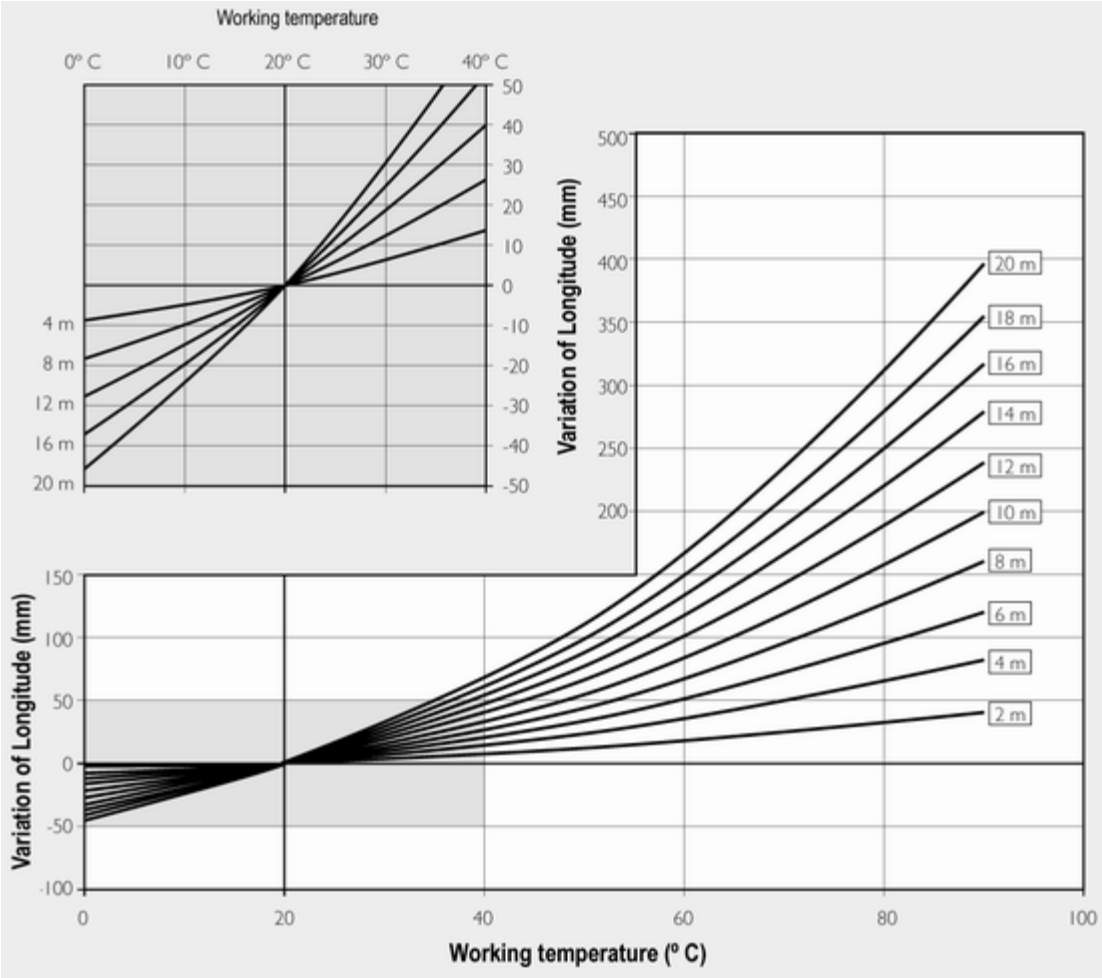
The crosslinked polyethylene pipes present values of thermal expansion that must calculated keeping in mind the possible rupture of the system.

In order to simplify, it is considered that the thermal expansion happens only in the longitudinal sense of the pipe. Although this does not totally correspond to the truth as there are three-dimensional expansions due to the temperature variations, it is the longitudinal thermal expansion the most visible and important concerning the crosslinked polyethylene pipes.

It is easily understood that the thermal expansions or contractions in a milimetric dimension when the respective coefficient of thermal dilation is about tenth millesimal meters, present values that can be considered worthless (sometimes values around µm). On the other hand, being the longitude of the pipe around of dozens of meters, the thermal dilation will present important millimetrical which must be «absorbed» by system so that the rupture doesn't happen. These concepts can easily be understood through the analysis of the linear dilations of the crosslinked polyethylene pipes.

The pipes present linear thermal expansions coefficients of around 0.2 mm/mºC. This coefficient represents a medium value as it varies according to the basis temperature.

As it is observed, there will be a dilation of 1 mm for each meter of pipe and for each unitary increase of temperature. The same verification can and should be done in case there is any temperature decrease, being necessary to absorb the contractions of the system.



Graph 2-Linear thermal expansions of the Crosslinked Polyethylene pipes, considering Ambient Temp=20ºC

9. FILPEX Systems

FILPEX pipes have a group of fittings associated which allows the realization of the necessary systems, being usually used mechanical opening fittings.

Adaptor R 179 for FILPEX and FILTERMO pipes

CODE	DIMENSIONS	CODE	DIMENSIONS	CODE	DIMENSIONS
'9 012012 0018	12.0 x (12.0 x 1.8)	GR 179 016017 0020	16.0 x (17.0 x 2.0)	GR 179 018020 0019	18.0 x (20.0 x 1.9)
'9 012012 0020	12.0 x (12.0 x 2.0)	GR 179 016018 0020	16.0 x (18.0 x 2.0)	GR 179 018020 0020	18.0 x (20.0 x 2.0)
'9 012016 0018	12.0 x (16.0 x 1.8)	GR 179 016020 0019	16.0 x (20.0 x 1.9)	GR 179 018020 0028	18.0 x (20.0 x 2.8)
'9 012016 0020	12.0 x (16.0 x 2.0)	GR 179 016020 0020	16.0 x (20.0 x 2.0)	GR 179 022020 0019	22.0 x (20.0 x 1.9)
'9 012016 0022	12.0 x (16.0 x 2.2)	GR 179 018012 0020	18.0 x (12.0 x 2.0)	GR 179 022020 0020	22.0 x (20.0 x 2.0)
'9 016012 0018	16.0 x (12.0 x 1.8)	GR 179 018014 0020	18.0 x (14.0 x 2.0)	GR 179 022025 0023	22.0 x (25.0 x 2.3)
'9 016012 0020	16.0 x (12.0 x 2.0)	GR 179 018016 0018	18.0 x (16.0 x 1.8)	GR 179 022025 0035	22.0 x (25.0 x 3.5)
'9 016014 0020	16.0 x (14.0 x 2.0)	GR 179 018016 0020	18.0 x (16.0 x 2.0)	GR 179 028032 0029	28.0 x (32.0 x 2.9)
'9 016016 0018	16.0 x (16.0 x 1.8)	GR 179 018016 0022	18.0 x (16.0 x 2.2)	GR 179 028032 0044	28.0 x (32.0 x 4.4)
'9 016016 0020	16.0 x (16.0 x 2.0)	GR 179 018017 0020	18.0 x (17.0 x 2.0)		
'9 016016 0022	16.0 x (16.0 x 2.2)	GR 179 018018 0020	18.0 x (18.0 x 2.0)		

Union male R556 for FILPEX and FILTERMO pipes

CODE	DIMENSIONS	CODE	DIMENSIONS	CODE	DIMENSIONS
'6 038012 P020	3/8" x (12.0 x 2.0)	GR 556 012016 P020	1/2" x (16.0 x 2.0)	GR 556 034018 P020	3/4" x (18.0 x 2.0)
'6 038016 P022	3/8" x (16.0 x 2.2)	GR 556 012017 P020	1/2" x (17.0 x 2.0)	GR 556 034020 P023	3/4" x (20.0 x 2.3)
'6 038016 P020	3/8" x (16.0 x 2.0)	GR 556 012018 P020	1/2" x (18.0 x 2.0)	GR 556 034020 P020	3/4" x (20.0 x 2.0)
'6 012012 P020	1/2" x (12.0 x 2.0)	GR 556 012020 P020	1/2" x (20.0 x 2.0)	GR 556 034020 P019	3/4" x (20.0 x 1.9)
'6 012014 P020	1/2" x (14.0 x 2.0)	GR 556 012020 P019	1/2" x (20.0 x 1.9)	GR 556 034025 P035	3/4" x (25.0 x 3.5)
'6 012016 P022	1/2" x (16.0 x 2.2)	GR 556 034016 P022	3/4" x (16.0 x 2.2)	GR 556 034025 P023	3/4" x (25.0 x 2.3)

Pre-set manifold R553D for heating floor installations with FILTERMO pipe

CODE	DIMENSIONS	CODE	DIMENSIONS	CODE	DIMENSIONS
53 100018 PD02	1" x 18 (2 exits)	GR 553 100018 PD10	1" x 18 (10 exits)	GR 553 114018 PD07	1 1/4" x 18 (7 exits)
53 100018 PD03	1" x 18 (3 exits)	GR 553 100018 PD11	1" x 18 (11 exits)	GR 553 114018 PD08	1 1/4" x 18 (8 exits)
53 100018 PD04	1" x 18 (4 exits)	GR 553 100018 PD12	1" x 18 (12 exits)	GR 553 114018 PD09	1 1/4" x 18 (9 exits)
53 100018 PD05	1" x 18 (5 exits)	GR 553 114018 PD02	1 1/4" x 18 (2 exits)	GR 553 114018 PD10	1 1/4" x 18 (10 exits)
53 100018 PD06	1" x 18 (6 exits)	GR 553 114018 PD03	1 1/4" x 18 (3 exits)	GR 553 114018 PD11	1 1/4" x 18 (11 exits)
53 100018 PD07	1" x 18 (7 exits)	GR 553 114018 PD04	1 1/4" x 18 (4 exits)	GR 553 114018 PD12	1 1/4" x 18 (12 exits)
53 100018 PD08	1" x 18 (8 exits)	GR 553 114018 PD05	1 1/4" x 18 (5 exits)		
53 100018 PD09	1" x 18 (9 exits)	GR 553 114018 PD06	1 1/4" x 18 (6 exits)		

Manifold R585 with retainers for central heating and/or sanitary systems with FILPEX or FILTERMO					
CODE	DIMENSIONS	CODE	DIMENSIONS	CODE	DIMENSIONS
85 034012 P002	3/4" x 12 (2 exits)	GR 585 034012 P012	3/4" x 12 (12 exits)	GR 585 100016 P002	1" x 16 (2 exits)
85 034012 P003	3/4" x 12 (3 exits)	GR 585 034016 P002	3/4" x 16 (2 exits)	GR 585 100016 P003	1" x 16 (3 exits)
85 034012 P004	3/4" x 12 (4 exits)	GR 585 034016 P003	3/4" x 16 (3 exits)	GR 585 100016 P004	1" x 16 (4 exits)
85 034012 P005	3/4" x 12 (5 exits)	GR 585 034016 P004	3/4" x 16 (4 exits)	GR 585 100016 P005	1" x 16 (5 exits)
85 034012 P006	3/4" x 12 (6 exits)	GR 585 034016 P005	3/4" x 16 (5 exits)	GR 585 100016 P006	1" x 16 (6 exits)
85 034012 P007	3/4" x 12 (7 exits)	GR 585 034016 P006	3/4" x 16 (6 exits)	GR 585 100016 P007	1" x 16 (7 exits)
85 034012 P008	3/4" x 12 (8 exits)	GR 585 034016 P007	3/4" x 16 (7 exits)	GR 585 100016 P008	1" x 16 (8 exits)
85 034012 P009	3/4" x 12 (9 exits)	GR 585 034016 P008	3/4" x 16 (8 exits)	GR 585 100016 P009	1" x 16 (9 exits)
85 034012 P010	3/4" x 12 (10 exits)	GR 585 034016 P009	3/4" x 16 (9 exits)	GR 585 100016 P010	1" x 16 (10 exits)
85 034012 P011	3/4" x 12 (11 exits)	GR 585 034016 P010	3/4" x 16 (10 exits)		

Manifold R 580 for sanitary systems with FILPEX pipe					
CODE	DIMENSIONS	CODE	DIMENSIONS	CODE	DIMENSIONS
80 034012 P002	3/4" x 12 (2 exits)	GR 580 100012 P005	1" x 12 (5 exits)	GR 580 034016 P009	3/4" x 16 (9 exits)
80 034012 P003	3/4" x 12 (3 exits)	GR 580 100012 P006	1" x 12 (6 exits)	GR 580 034016 P010	3/4" x 16 (10 exits)
80 034012 P004	3/4" x 12 (4 exits)	GR 580 100012 P007	1" x 12 (7 exits)	GR 580 100016 P002	1" x 16 (2 exits)
80 034012 P005	3/4" x 12 (5 exits)	GR 580 100012 P008	1" x 12 (8 exits)	GR 580 100016 P003	1" x 16 (3 exits)
80 034012 P006	3/4" x 12 (6 exits)	GR 580 100012 P009	1" x 12 (9 exits)	GR 580 100016 P004	1" x 16 (4 exits)
80 034012 P007	3/4" x 12 (7 exits)	GR 580 100012 P010	1" x 12 (10 exits)	GR 580 100016 P005	1" x 16 (5 exits)
80 034012 P008	3/4" x 12 (8 exits)	GR 580 100012 P011	1" x 12 (11 exits)	GR 580 100016 P006	1" x 16 (6 exits)
80 034012 P009	3/4" x 12 (9 exits)	GR 580 034016 P002	3/4" x 16 (2 exits)	GR 580 100016 P007	1" x 16 (7 exits)
80 034012 P010	3/4" x 12 (10 exits)	GR 580 034016 P003	3/4" x 16 (3 exits)	GR 580 100016 P008	1" x 16 (8 exits)
80 034012 P011	3/4" x 12 (11 exits)	GR 580 034016 P004	3/4" x 16 (4 exits)	GR 580 100016 P009	1" x 16 (9 exits)
80 034012 P012	3/4" x 12 (12 exits)	GR 580 034016 P005	3/4" x 16 (5 exits)	GR 580 100016 P010	1" x 16 (10 exits)
80 100012 P002	1" x 12 (2 exits)	GR 580 034016 P006	3/4" x 16 (6 exits)	GR 580 100016 P011	1" x 16 (11 exits)
80 100012 P003	1" x 12 (3 exits)	GR 580 034016 P007	3/4" x 16 (7 exits)		
80 100012 P004	1" x 12 (4 exits)	GR 580 034016 P008	3/4" x 16 (8 exits)		

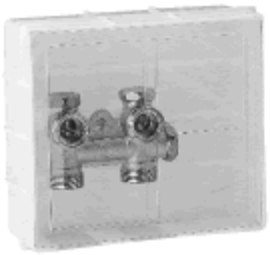
Pre-set terminal R554B for manifolds with automatic air purge	
Reference	Dimensions
GR 554 034000 PB00	3/4"
GR 554 100000 PB00	1"
GR 554 114000 PB00	1 1/4"

Pre-set terminal R554C for manifolds with manual air purge	
Reference	Dimensions
GR 554 034000 PC00	3/4"
GR 554 100000 PC00	1"
GR 554 114000 PC00	1 1/4"

R500 box for manifolds R553D	
Reference	Dimensions
GR 500 000000 0A00	400 x 450 x 110
GR 500 000000 0B00	600 x 450 x 110
GR 500 000000 0C00	800 x 450 x 110
GR 500 000000 0D00	1000 x 450 x 110

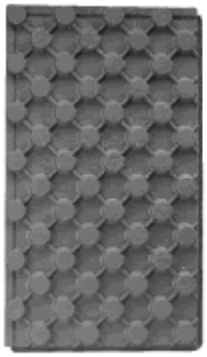
Terminal box R573D for sanitary systems	
Reference	Dimensions
GR 573 012012 PD00	1/2" x 12
GR 573 012016 PD00	1/2" x 16
GR 573 012018 PD00	1/2" x 18

Double terminal box R544 for sanitary systems	
Reference	Dimensions
GR 544 012016 P000	1/2" x 16
GR 544 012018 P000	1/2" x 18



R 317M in wall hydraulic saddle for central heating systems	
Reference	Dimensions
GR 317 016016 0M00	*16 x 16*
GR 317 018016 0M00	*18 x 16*
GR 317 034016 PM00	*3/4" x 16*

R317C cover for in wall hydraulic saddle	
Reference	Dimensions
GR 317 000000 0C00	–



R982 Pre-set plaque for the installation of the FILTERMO pipe in heating systems	
Reference	Dimensions
GR 982 075060 0000	*h = 60 p = 75*
GR 982 075060 0000	*h = 45 p = 75*
GR 982 075060 0000	*h = 60 p = 50*
GR 982 075060 0000	*h = 45 p = 50*

h = height ; p = step