



R986 - R986S

Description

Giacomini polybutylene pipes with intermediate anti-oxygen barrier can be used for the distribution of water in heating and/or cooling systems. Besides the known advantages of using synthetic material pipes, the PB has a high flexibility that makes the installation quick and easy. These pipes are extruded with an intermediate anti-oxygen barrier made of EVOH, in compliance with DIN 16968, DIN 16837 and DIN 4726 standards. Thanks to the barrier, the modest oxygen quantity that outside permeates towards the inside of the pipe, becomes completely negligible.

Properties

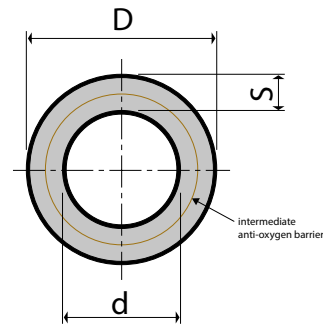
Physical properties	Method	Unit of measure	Value
Melt flow rate	ISO 1133	g/10 min	0,6
Colour	-	-	Grey
Density	ISO 1183	g/cm ³	0,925
Fusion point	DSC	°C	127-129
Flexural modulus	ISO 178	MPa	450
Thermal expansion coefficient	D696	mm/(m °C)	0,13
Thermal conductivity	C177	W/(m °C)	0,22

Features

- Not suitable for domestic water
- Pressure loss reduced
- Lightweight: the specific weight of polybutylene is approximately 9 times lower than the weight of iron and copper
- Reduced thermal expansion
- Non-toxic: Polybutylene is a sure and non-toxic material
- Corrosionless: polybutylene is a bad conductor of electric energy
- Scaleless: linked both to the impossibility of calcareous deposit formation and to the chemical inertia of the material
- Resistance to high abrasion: this specific characteristic of polybutylene allows to increase the flow speed without abrasion problems
- UV ray resistant: when systems are exposed to solar rays, we recommend the piping be protected in order to avoid a premature ageing of the material
- Resistance to shock: the high material flexibility allows the pipe to return again to its original shape after a shock
- Chlorine resistant: as with all the plastic materials, the polybutylene can be damaged by chlorine concentrations higher than 1,5 ppm (mg/l)
- High flexibility especially at low temperatures
- Recycleable material
- Very good resistance to long-term stresses in combination with pressure and temperature. This feature remains unchanged also with high water temperature
- Giacomini polybutylene pipes are compatible with all Giacomini manifolds, fittings, valves and lockshields. Connections are made using Giacomini adapters for plastic pipes (R179, R179AM).

Dimensional features pipes of available

Size	D [mm]	d [mm]	S [mm]	Weight [g/m]	Water contents [l/m]	Length [m]
12 x 1,5	12	9	1,5	47,7	0,064	100, 600
16 x 1,5	16	13	1,5	70,0	0,133	100
16 x 2	16	12	2	85,0	0,113	100, 240, 500
18 x 2	18	14	2	98,4	0,154	100, 240
22 x 2	22	18	2	124,5	0,254	100

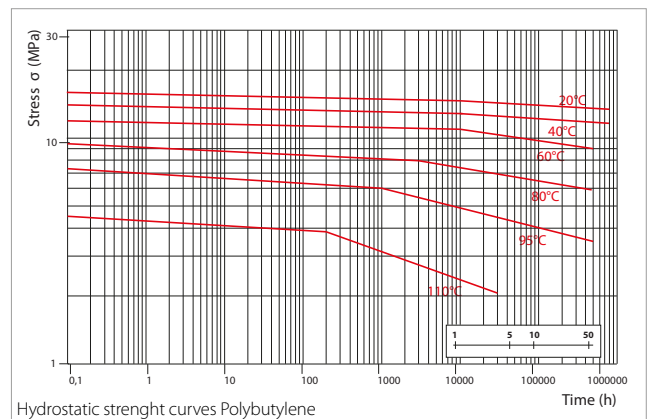


Working pressure

The continuous working duration of Giacomini polybutylene pipe is established according to hydrostatic strength curves connecting the duration (expressed in hours) to pressure and to temperature of the transported fluid. Pipe thickness characterising Giacomini polybutylene pipe is designed according to the required coefficient of security in order to guarantee the necessary reliability in the time. The calculation of admitted working pressure is restrained to a series of parameters such as the temperature and the working period. Evaluation of admitted working pressures can be done by the formula and by the diagram as follows.

$$P_{calc} = \frac{20 \cdot sp \cdot \sigma}{DN \cdot sp} \quad P_{max} = \frac{P}{sf}$$

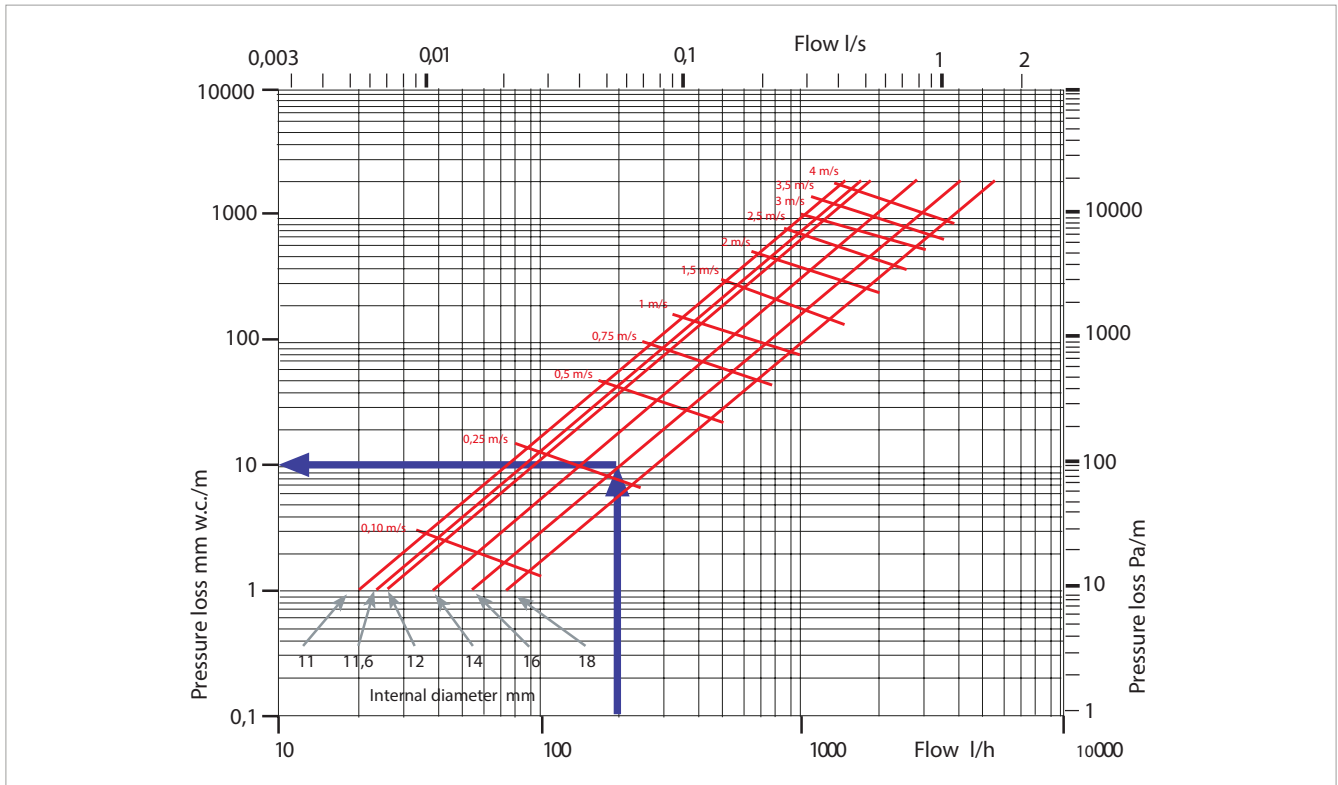
- Where:
- P_{calc} = pressure in bar
 - sp = pipe thickness in mm
 - P_{max} = max. working pressure in bar
 - DN = pipe external diameter in mm
 - σ = extrapolated stress resulting from the diagram in MPa
 - sf = security factor



As shown in the examples of calculation extracted and reported in the table, after a continued working period of the system equal to 50 years with fluids at 95 °C (which will be lesser than the effective life of the system, except for systems with hot water recirculation), Giacomini polybutylene pipes are able to support pressures of at least 4,7 bar at 95 °C.

Pressure losses

The following diagram shows the pressure losses distributed in Giacomini polybutylene pipes.



In order to evaluate a pressure loss at a temperature different from 10 °C (for this temperature is valid the above diagram), it is sufficient to multiply the result obtained by the diagram for the suitable coefficient of correction: $\Delta P_{50^\circ\text{C}} = \Delta P_{10^\circ\text{C}} \cdot 0,89$ $\Delta P_{80^\circ\text{C}} = \Delta P_{10^\circ\text{C}} \cdot 0,78$

Graphic determination example of pressure losses

Examine a Giacomini polybutylene pipe 20 x 2 mm (internal diameter 16 mm) with a flow of 200 l/h at a temperature of 80 °C.

In the diagram it is possible to determine immediately a pressure loss equal to 10 mm w.c./m at a temperature of 10 °C.

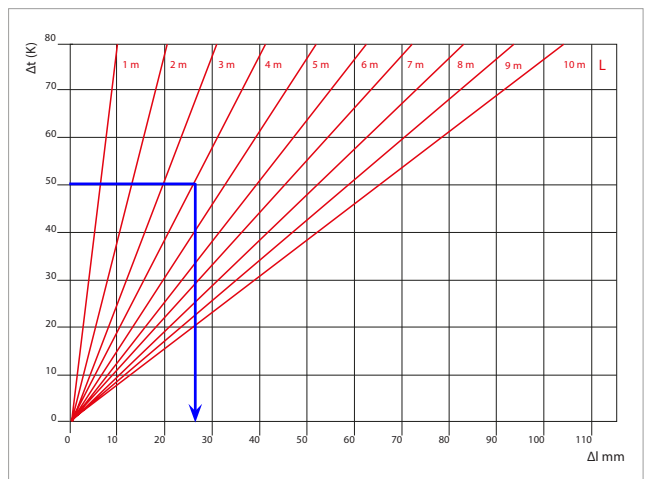
At 80 °C it will result in: $\Delta P_{80^\circ\text{C}} = \Delta P_{10^\circ\text{C}} \cdot 0,78 = 10 \cdot 0,78 = 7,8 \text{ mm w.c./m}$

Thermal linear expansion

Pipe length [m]	Temperature variation [K]								
	5	10	20	30	40	50	60	70	80
0,1	0,07	0,13	0,26	0,39	0,52	0,65	0,78	0,91	1,04
0,2	0,13	0,26	0,52	0,78	1,04	1,30	1,56	1,82	2,08
0,3	0,20	0,39	0,78	1,17	1,56	1,95	2,34	2,73	3,12
0,4	0,26	0,52	1,04	1,56	2,08	2,60	3,12	3,64	4,16
0,5	0,33	0,65	1,30	1,95	2,60	3,25	3,90	4,55	5,20
0,6	0,39	0,78	1,56	2,34	3,12	3,90	4,68	5,46	6,24
0,7	0,46	0,91	1,82	2,73	3,64	4,55	5,46	6,37	7,28
0,8	0,52	1,04	2,08	3,12	4,16	5,20	6,24	7,28	8,32
0,9	0,59	1,17	2,34	3,51	4,68	5,85	7,02	8,19	9,36
1,0	0,65	1,30	2,60	3,90	5,20	6,50	7,80	9,10	10,40
2,0	1,30	2,60	5,20	7,80	10,40	13,00	15,60	18,20	20,80
3,0	1,95	3,90	7,80	11,70	15,60	19,50	23,40	27,30	31,20
4,0	2,60	5,20	10,40	15,60	20,80	26,00	31,20	36,40	41,60
5,0	3,25	6,50	13,00	19,50	26,00	32,50	39,00	45,50	52,00
6,0	3,90	7,80	15,60	23,40	31,20	39,00	46,80	54,60	62,40
7,0	4,55	9,10	18,20	27,30	36,40	45,50	54,60	63,70	72,80
8,0	5,20	10,40	20,80	31,20	41,60	52,00	62,40	72,80	83,20
9,0	5,85	11,70	23,40	35,10	46,80	58,50	70,20	81,90	93,60
10,0	6,50	13,00	26,00	39,00	52,00	65,00	78,00	91,00	104,00

During the planning and outside installation phases of Giacomini polybutylene pipes the thermal expansion must not be overlooked.

If the working pressure of the system can pass through variations up to 10÷15 °C (typical case of systems for the addition of sanitary hot water), the planner will evaluate the piping behaviour. This is possible using the following table and the diagram.



where:
 Δt = working temperature variation in degrees Kelvin (°K) or Celsius (°C)
 Δl = variation of length in mm
 L = initial length of the pipe in mm

Graphic determination example of thermal linear expansion

When a pipe length $L = 4\text{ m}$ and a probable temperature variation $\Delta t = 50\text{ }^\circ\text{C}$ has been fixed, it is possible to go back to a variation of length $\Delta l = 26\text{ mm}$ using the table and the diagram.

Thermal linear expansion calculation

Thermal expansion of Giacomini polybutylene pipes can also be valued with the following formula: $\Delta l = L \cdot \Delta t \cdot \alpha$

where:

- Δt = working temperature variation in degrees Kelvin ($^\circ\text{K}$) or Celsius ($^\circ\text{C}$)
- Δl = variation of length in mm
- L = initial pipe length in mm
- α = linear thermal expansion coefficient of 0,13 mm/mK for Giacomini polybutylene pipes (mm for every $^\circ\text{C}$ of thermal fall)

Example of thermal linear expansion calculation

When a piping length $L = 4\text{ m}$ and a possible variation of temperature $\Delta t = 50\text{ }^\circ\text{C}$, has been fixed the formula used is the following:

$$\Delta l = L \cdot t \cdot \alpha = 4 \cdot 50 \cdot 0,13 = 26\text{ mm}$$



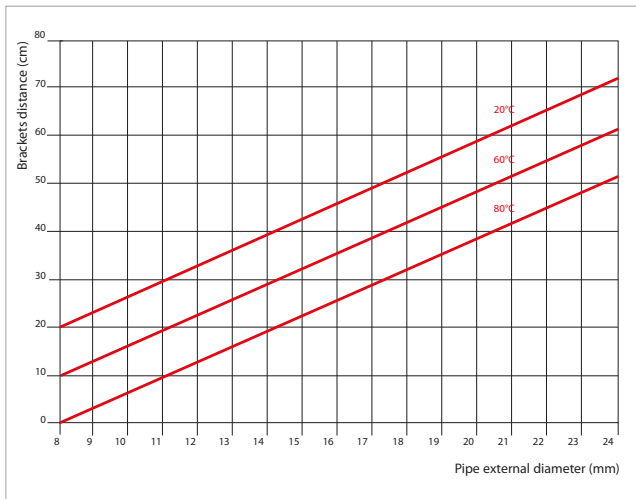
Warning.
The above mentioned thermal expansions refer to the visible pipe installation and it is recommended to cover the pipe to protect it from solar rays.

In case of an installation where the outer sleeve is not used, the expansion is absorbed by the pipe due to its high flexibility.

When using an outer sleeve the expansion will be discharged in the air space between the pipe and the sleeve.

Brackets for external pipe work

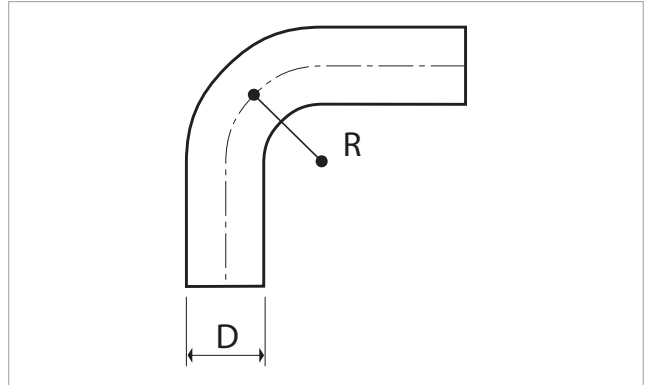
For an outside installation, the designer and the plumber have to carefully value the distances between the pipe brackets. In order to do this valuation, it is necessary to know the working temperature of the pipe.



Warning.
In order to prevent early ageing of the pipe, we recommend to install Giacomini polybutylene pipe away from direct sun light.

Bending

Due to the high flexibility of Giacomini polybutylene pipes simple bending can be carried out manually. The minimum radius of curvature to be realized is equal to 5 times the pipe diameter (as recommended in the specification DIN 4726), if pipe has been installed without sleeve.



Precautions

Giacomini polybutylene pipes, as with all plastic pipes, need some small precautions in order to guarantee duration and operation:

Store the pipe in suitable packaging in order to avoid direct exposure to sun rays.	
Store the pipe packaging in covered and dry places.	
Prevent the pipe from coming into contact with sharp objects, and pay particular attention during transportation and installation of the pipe.	
Avoid tight bends during the installation of the sheathed pipe; it is recommended to have curves at least 8 times the external diameter of the pipe used, in order to guarantee pliability.	
Cut the Giacomini polybutylene pipe using the correct pipe cutters to ensure there are no burrs and that the cut is perpendicular to the pipe axis.	
Prevent the pipe from coming into contact with open flames or other heat sources.	
Protect Giacomini polybutylene pipe from U.V. rays during installation. Avoid direct exposure to the sun in order to stop "pipe ageing".	



Guarantee

All products and components supplied by Giacomini S.p.A. are subjected to the European norms in force as regards to guarantee and responsibility (1994/44/CE Directive, 2001/95/CE Directive and CEE 85/374). The guarantee is not valid in the following cases:

1. If the working conditions are different from the prescribed ones;
2. If the pipes are used to distribute fluids that are not compatible with the material;
3. If the installation instructions are not scrupulously followed;
4. In at the installation time, during the laying phase or at the pressure testing of the system, the pipes shows visually perceivable defects caused by accidental factors.
5. If the pipe is installed using components not produced by Giacomini S.p.A. or anyway different from the allowed ones.

Reference standards

- DIN 16968
- DIN 16837

**ADD ON
EN ISO 15875**

Table 1 - Classification of the working conditions

The performance requirements for pipe systems complying with EN ISO 15875 are specified for a project operation lifetime of 50 years.

Application range	T _{oper.} [°C]	Time at T _{oper.} [years]	T _{max} [°C]	Time at T _{max} [years]	T _{mal} [°C]	Time at T _{mal} [h]
Class 4 Floor heating and low temperature radiators	20 plus 40 plus 60	2,5 plus 20 plus 25	70	2,5	100	100
Class 5 Heating with high temperature radiators	20 plus 60 plus 80	14 plus 25 plus 10	90	1	100	100

- Operating temperature (Toper): operating temperature envisaged for the application field, expressed in °C.
- Max operating temperature (Tmax): highest value of the operating temperature, allowed for a short period of time only.
- Malfunctioning temperature (Tmal): the highest temperature value that can occur when the control systems are not working (the time period and allowed temperature for this value is 100 h in a period of 50 years of continuous operation).

For each application class, maximum usage pressure can be evinced from the table below:

SIZE	CLASS 4	CLASS 5
12 x 1,5	10 bar	8 bar
16 x 1,5	10 bar	8 bar
16 x 2,0	10 bar	10 bar
18 x 2,0	10 bar	10 bar
22 x 2,0	10 bar	8 bar

All pipes are suitable to the transport of water for a period of 50 years at a temperature of 20°C and an operating pressure of 10 bar.
All heating systems shall use as transfer fluid only water or treated water.

Additional information

For additional information please check the website www.giacomini.com or contact the technical service: ☎ +39 0322 923372 📠 +39 0322 923255 ✉ consulenza.prodotti@giacomini.com
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