

Giacomini Polybutylene for heating, cooling and sanitary distribution systems

Synthetic material pipes are becoming more important in heating, cooling and sanitary distribution systems.

In order to complete its range, Giacomini introduces Polybutylene pipe, the last innovation in this specific sector.

The excellent features of the main polymer, allows Giacomini Polybutylene pipe to be used in hot and cold water distribution for sanitary systems, for traditional heating systems, for installations with radiant panels, heating and cooling at low temperatures.

Moreover this material can also be used in the chemical industry and in naval installations.

Polybutylene polymer is obtained from the monomer 1-buten making a specific stereo polymerization with Ziegler Natta catalysts; the stereo - specificity of the reaction allows to obtain crystal and regular molecular structures whose mechanical features produce very high results.

Giacomini
**Polybutylene
properties**

Physical properties	ASTM Method	Unit of measure	Value
Melt flow rate	D1238	g/10 min.	0,4
Colour	-	-	grey
Density	D1505	g/cm ³	0,937
Dielectric constant	D150-65T	-	2,50

Physical properties	ASTM Method	Unit of measure	Value
Yield point	D638	MPa	17.6
Tensile strength	D638	MPa	33.4
Breaking elongation	D638	%	280%
Elastic module	D638	MPa	265
Shore hardness	D2240	D scale	D60
Embrittlement temperature	D746	°C	-21

Physical properties	ASTM Method	Unit of measure	Value
Fusion point	DTA	°C	124 -126
Vicat Softening point	D1525	°C	113
Thermal expansion coefficient	D696	mm/(m°C)	0.13
Thermal conductivity	C177	W(m°C)	0.22
Latent melting heat	DSC	kJ/kg	100

Features

- Silence of operation with Giacomini polybutylene pipes.
- The high polybutylene elasticity allows resistance to low temperatures and frost; however it is suggested to drain the system when it is not used for long periods during the winter.
- 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 as certified by DVGW.
- Corrosionless; polybutylene is a bad conductor of electric energy.
- Scaleless, total scale absence and to chemical inertia material.
- Resistance to high abrasion; polybutylene feature allows the flow to increase quickly 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).
For this reason the DM 236/88 fixes the admissible maximum limit of free chlorine to 0,2 ppm in drinking water.
Therefore it is suggested to use this product in swimming pool installations.
- High flexibility especially at low temperatures.

- Recycleable material.
- Very good resistance to prolonged stresses combined with pressure and temperature. This feature remains unchanged also with high water temperature.
This can be underlined analysing the stress applied to the pipes, if pressure resistance tests are done in accordance with DIN specifications.

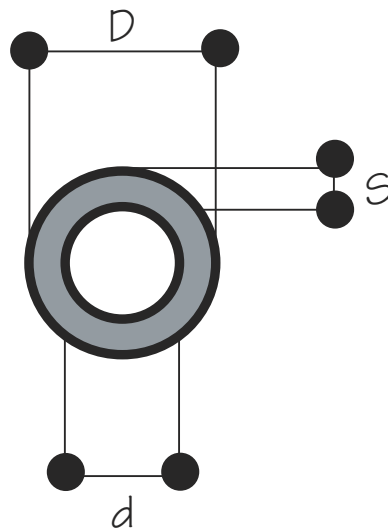
Material	Specification	Test Temperature(°C)	Tangential force (N/mm ²)	Test duration (hours)
PB Polybutylene	DIN 16968	20	15	1
		95	6.0	1000
PE-X Cross Link Polyethylene	DIN 16892	20	12	1
		95	4.4	1000
PP Polypropylene	DIN 8078	20	21	1
		95	3.5	1000
PP-Co Copolymer Polypropylene	DIN 8078	20	16	1
		95	2.5	1000

Polybutylene offers the following benefits:

- High flexibility especially at low temperatures.
- High abrasion resistance
- High resistance to cracking
- High resistance to stresses combined with temperature and pressure, particularly at high temperatures.
- Resistance to chemical agents

	D (mm)	d (mm)	S (mm)	Weight (g/m)	Water contents (l/m)	Length (m)
14x1	14	12	1	43	0,113	240
14x1,5	14	11	1,5	62	0,095	100
15x2	15	11	2	89	0,095	50-100
16x2	16	12	2			
16x2,2	16	11,6	2,2	104	0,106	50-100
18x2	18	2	110	0,154	0,154	50-100-240
20x2	20	16	2	123	0,201	100
22x2	22	18	2	137	0,254	50

Dimensional features pipes of available



- The ability to recycle, a factor that must not be disregarded.

Giacomini polybutylene pipes are compatible with all Giacomini manifolds, fittings, valves and lockshield valves .

Connections are made using Giacomini adapters for polybutylene pipes (R179).

Working pressure

The examples referring to sanitary, heating and cooling installations are shown in the following pages.

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.

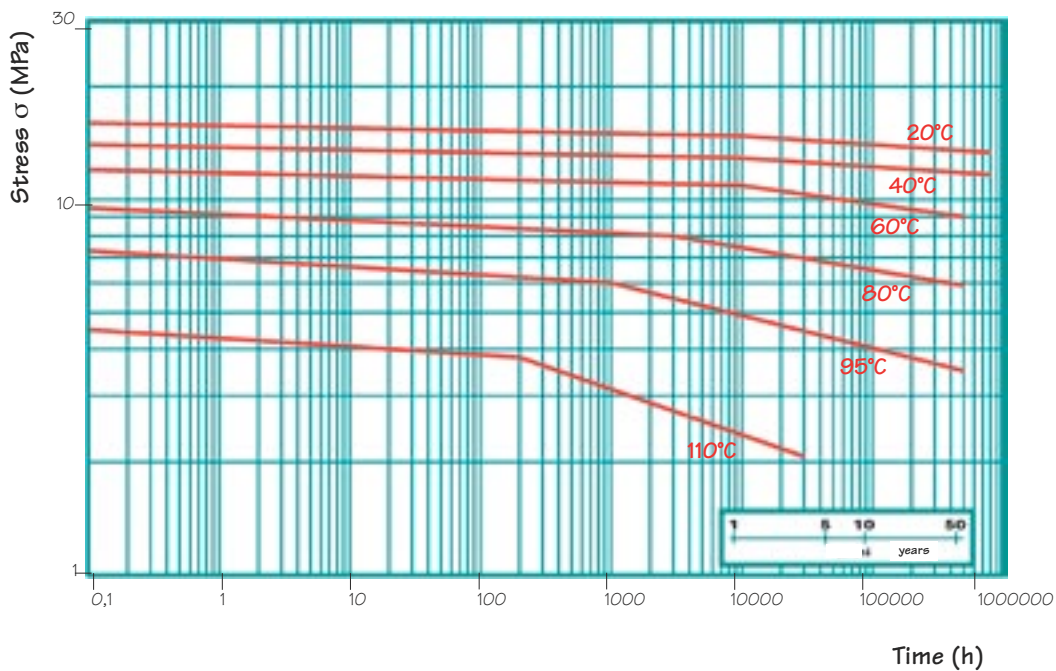
Evaluation of admitted working pressures can be done by the formula and by the diagram as follows:

$$P_{calc} = \frac{20 \cdot sp \cdot \sigma}{DN - sp}$$

$$P_{max} = \frac{P}{sf}$$

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



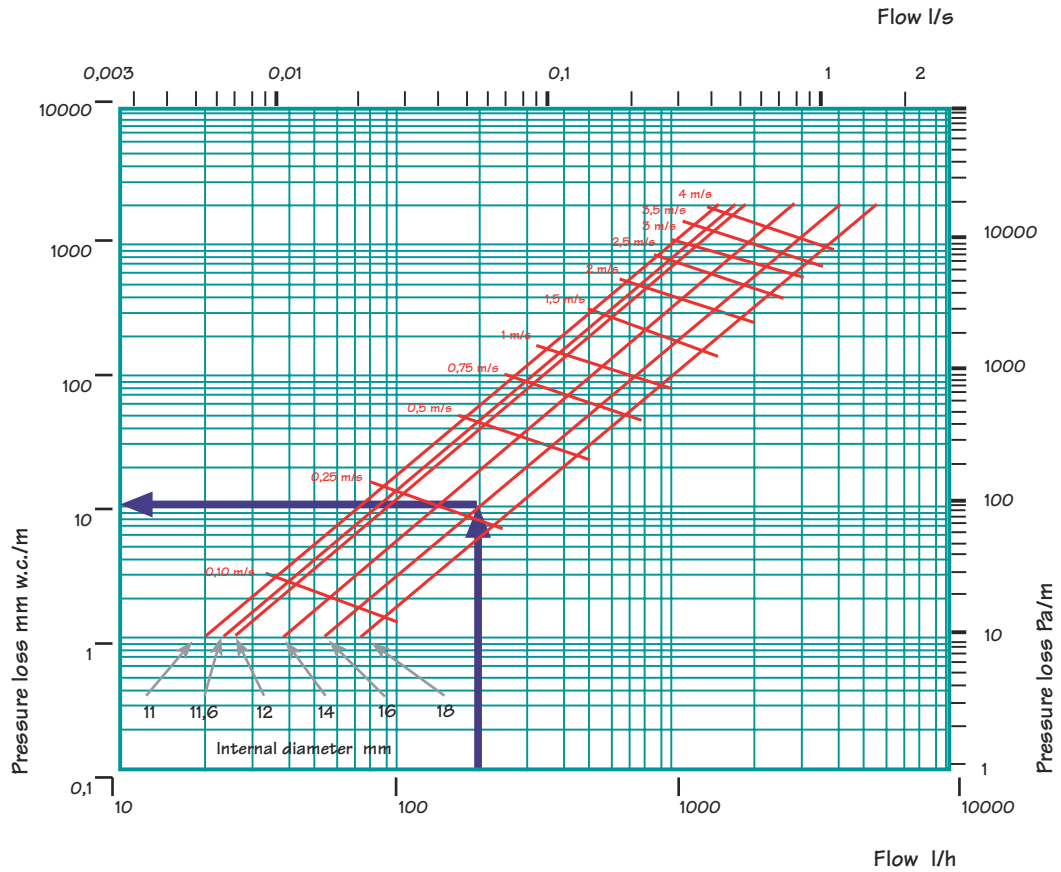
Hydrostatic strength curves Polybutylene

diameter	Sp	50 years 95° σ = 3,5 MPa			50 years 80° σ = 6 MPa			50 years 60° σ = 9 MPa			50 years 40° σ = 12 MPa			50 years 20° σ = 14 MPa		
		P _{calc}	sf	P _{max}	P _{calc}	sf	P _{max}	P _{calc}	sf	P _{max}	P _{calc}	sf	P _{max}	P _{calc}	sf	P _{max}
14	1	5,4	1,5	3,6	9,2	1,5	6,2	13,8	1,5	9,2	17,7	1,5	11,8	20,9	1,5	13,9
14	1,5	8,4	1,5	5,6	14,4	1,5	9,6	21,6	1,5	14,4	27,6	1,5	18,4	32,6	1,5	21,8
15	2	10,8	1,5	7,2	18,5	1,5	12,3	27,7	1,5	18,5	35,4	1,5	23,6	41,8	1,5	27,9
16	2															
16	2,2	11,2	1,5	7,4	19,1	1,5	12,8	28,7	1,5	19,1	36,7	1,5	24,4	43,4	1,5	28,9
18	2	8,8	1,5	5,8	15,0	1,5	10,0	22,5	1,5	15,0	28,8	1,5	19,2	34,0	1,5	22,7
20	2	7,8	1,5	5,2	13,3	1,5	8,9	20,0	1,5	13,3	25,6	1,5	17,0	30,2	1,5	20,1
22	2	7,0	1,5	4,7	12,0	1,5	8,0	18,0	1,5	12,0	23,0	1,5	15,3	27,2	1,5	18,1

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 of hot water recycle), Giacomini polybutylene pipes are able to support pressures of at least 4,7 bar at 95°C (except for 14 x1 pipes which Giacomini produces for ceiling heating and cooling systems with radiant panels only whose max. working temperature is of 40°C corresponding to an admissible pressure of 11,8 bar, after 50 years of continuous working).

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 18 x 2 with a flow of 200 l/h at a temperature of 10°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 expansions

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.

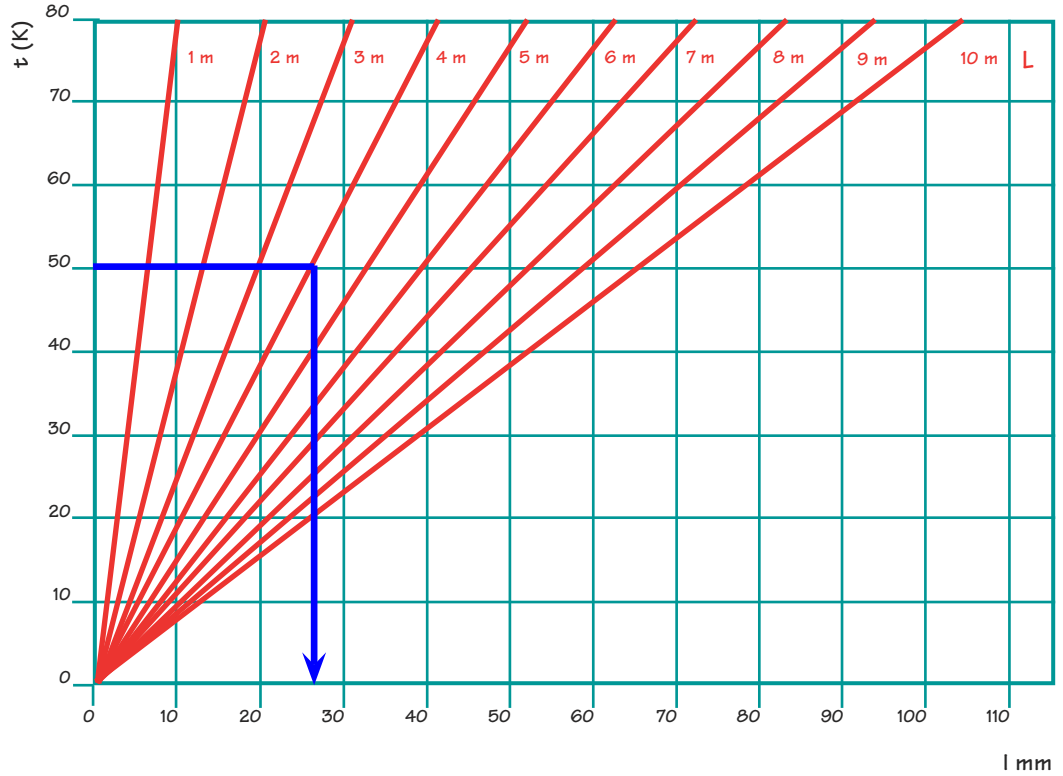
This is possible using the following table and the diagram.

Thermal

**linear
expansion**

Pipe lengtht (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

Thermal expansion



where:

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

Graphic

determination example of linear thermal expansion of Giacomini polybutylene pipes

When a pipe length $L = 4 \text{ m}$ and a probable temperature variation $\Delta t = 50^\circ\text{C}$ 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 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 Kelvin degrees (°K) or Celsius (°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 °C of thermal fall)

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

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

Calculation

**example
of linear thermal
expansion**

N.B.

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.

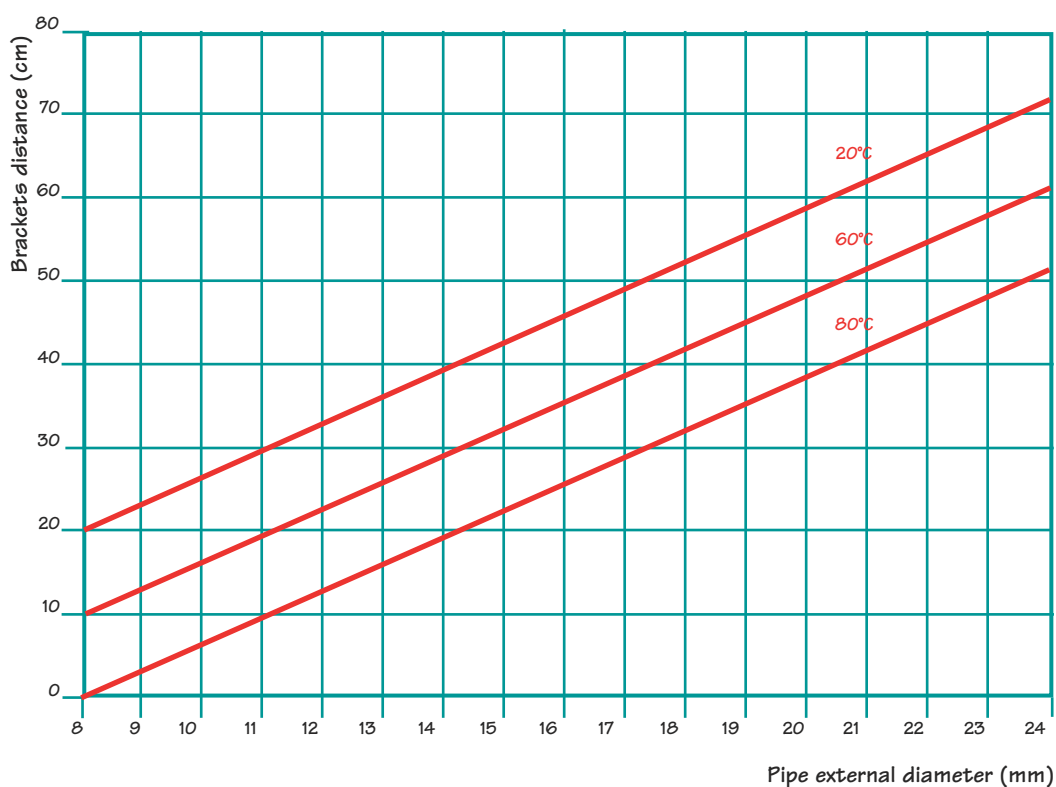
In case of an installation where the outer sleeve is not used, the expansion is absorbed by the pipe due to its high flexibility.

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.

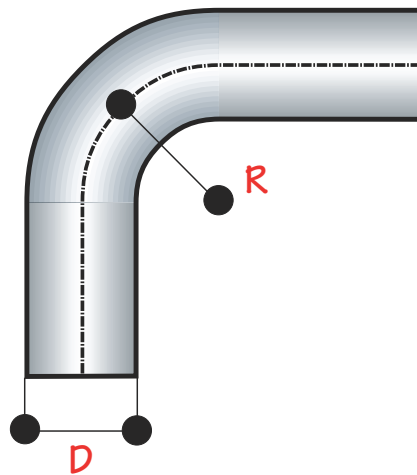
In order to do this valuation, it is necessary to know the working temperature of the pipe.



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 in question (as recommended in the specification DIN 4726), if pipe has been installed without sleeve.



Even though the DIN Standard 4726 allows a minimum curvature radius of $5 \times D$ (5 times the outside diameter), some raw material suppliers precautionary recommend to abide with the curvature value, giving different values from one manufacturer to another, in an interval going from 8 to 15 times the diameter.

In order to demonstrate the versatility of Giacomini polybutylene pipes, some examples of installations are reported in the following pages.

SANITARY DISTRIBUTION SYSTEMS USING GIACOMINI POLYBUTYLENE PIPES

During the last few years sanitary distribution has become an important part of total systems, thanks to a continued research of innovative and comfort conditions to meet the requirements of the customer.

The bathroom is becoming one of the most important rooms in the house, furnished with high cost accessories and ceramics which require functional and lasting distribution systems in order to be exploited to the full.

Giacomini pliable distribution systems, installed with plastic pipe, distribution manifolds and suitable adapters is the right solution to avoid most maintenance problems.

Advantages

- **Lack of scale**

As time passes polybutylene pipes remain clean ensuring a continuous flow and pureness remains when the system is not in use.

- **Flow control**

The water flow supplied to the taps can be controlled as required in order to avoid waste.

A wide range of dimensions is available for any kind of installation.

- **Low noise**

Pliable sanitary systems have a high level of acoustic protection. Polybutylene is particularly silent.

- **Labour saving**

Installing a pliable distribution system using polybutylene pipes reduces the labour time considerably when compared with traditional systems.

Single
connection
systems

Typical lay-outs

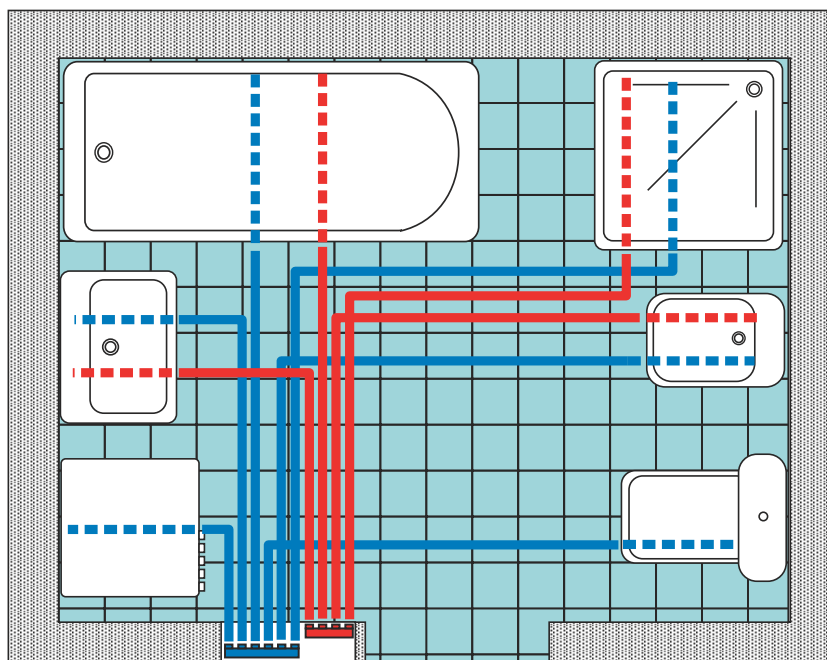
This system is installed using a distribution manifold having a number of outlets equal to the number of connections required for use.

Each tap is connected (via two polybutylene pipes), one for hot and one for cold water, directly to manifolds positioned in the cabinet.

The advantages of this installation are the optimal flow regulation to the device and the possibility to use polybutylene pipes of different diameters according to the tap requirements.

In order to install in a bathroom: a bathtub, a wash-basin, a WC, a shower, a bidet and a washing machine, the following accessories should be used:

- n.1 pre-assembled cabinet R584M/6+4
- n.10 fittings R573D 1/2"x 12 with suitable supports
- R986R Giacomini polybutylene pipe and R986B with the following dimensions: 15 x 2 or 16 x 2,2
- n.20 adapters R179 12 x 15/11 or 12 x 16/11,6



Closed

**circuit
distribution**

In this case not every outlet in the manifold is used, but two pipes only: one for hot and one cold water which passes through every outlet creating a closed circuit.

This distribution system requires minimum use of the pipe, thus it is optimal in case of restructures or when the available space on the floor for laying is limited.

The circuit distribution is done using the R544 double connection fittings.

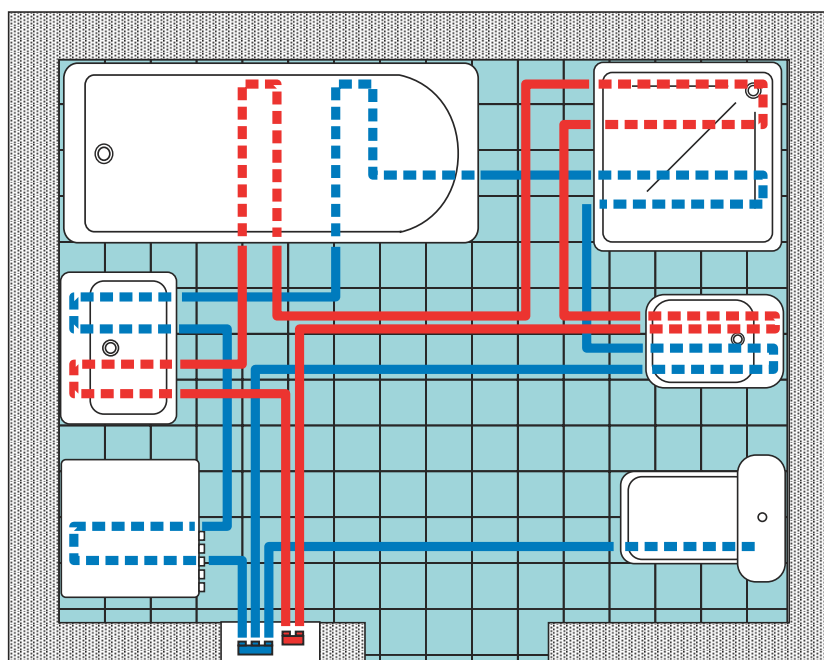
This distribution system gives the possibility to have pressure balancing and allows high water flow to the taps.

In order to do maintenance on this kind of distribution system the circuit must be intercepted using manifold lockshield valves.

This results in a fundamental difference when compared with distribution systems having single connections, where every section is fed.

In order to install in a bathroom a bathtub, a wash-basin, a WC, a shower, a bidet and a washing machine, with the closed distribution, the following components must be used:

- n.1 pre-assembled cabinet R584M/3+2
- n.9 double fittings R544 1/2"x 16 with suitable supports
- n.1 fitting R573D 1/2"x 12 when there is an external WC cabinet
- R986R Giacomini polybutylene pipe and R986B with the following dimension: 15x2 - 16x2,2 - 22x2
- n.18 adapters R179 16x15/11 - 16x16/11,6 - 16x22/18
- n.5 adapters R179 12x15/11 - 12x16/11,6
- n.1 adapter R179 12x16/11,6 in case of external WC cabinet
- n.1 fitting R186F 3/8"x16/11,6 in case of built-in WC cabinet



**High
flow
distribution**

This type of system is often used where taps need high water flows rate such as the hydromassage, bathtub, garden taps, supplies for hotel kitchens or restaurants.

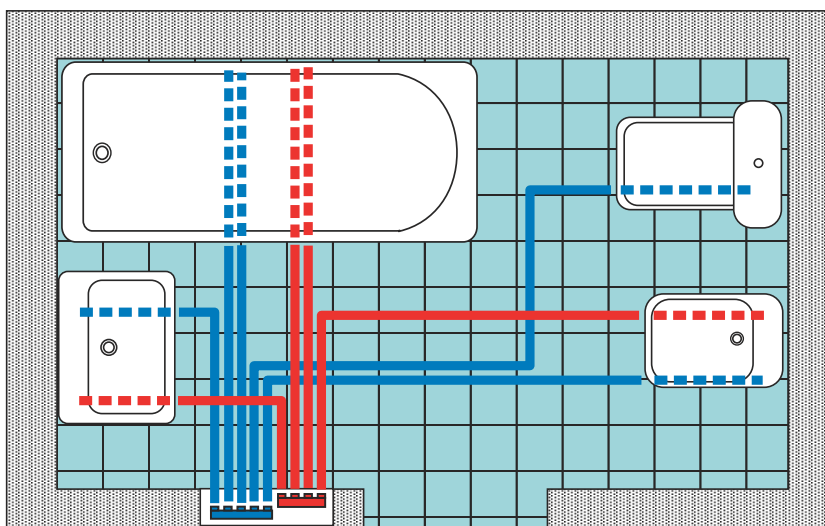
It is installed when a pipe with a small diameter has to be used for usual applications, i.e. a pipe of 16 x 2,2.

This distribution is carried out using R544 double fittings with both supplies connected to the distribution manifold.

In this way the advantage is that the water flows to the manifold from two pipes with a big quantity but with low pressure loss as compared to the case of a supply using one pipe having the same diameter.

With this installation the following components should be used:

- n.1 cabinet R584 3/4"
- n.2 double fittings R544
1/2"x 16 with suitable supports
- n.5 fittings R573D
1/2"x 12 with supports
- n.986R Giacomini polybutylene pipe and R986B with the following dimension:
16x 2,2
- n.14 adapters R179
12x16/11,6
- n.4 adapters R179
16x16/11,6
- n.1 manifold R585/5
3/4"x 12
- n.1 manifold R585/4
3/4"x 12
- n.2 ball valves R604
3/4"



Cooling and heating systems with Giacomini polybutylene pipes

In the case of thermal systems to heat rooms, the advantages include speed and ease of installation for sanitary distribution systems using polybutylene pipes.

In this case the temperatures for thermal vector fluid are the same as used in heating systems.

In effect the water temperatures vary between 40°C and 80°C according to the system i.e. with radiant panels or traditional systems using radiators.

In addition Giacomini polybutylene pipe is used in floor and ceiling cooling systems.

The following installations can be carried out:

- **GIACOSTAR systems with radiators**
(both with 2 or 4 way valves distribution)
- **GIACOKLIMA systems**
(heating and cooling systems with ceiling and floor radiant panels)

GIACOSTAR

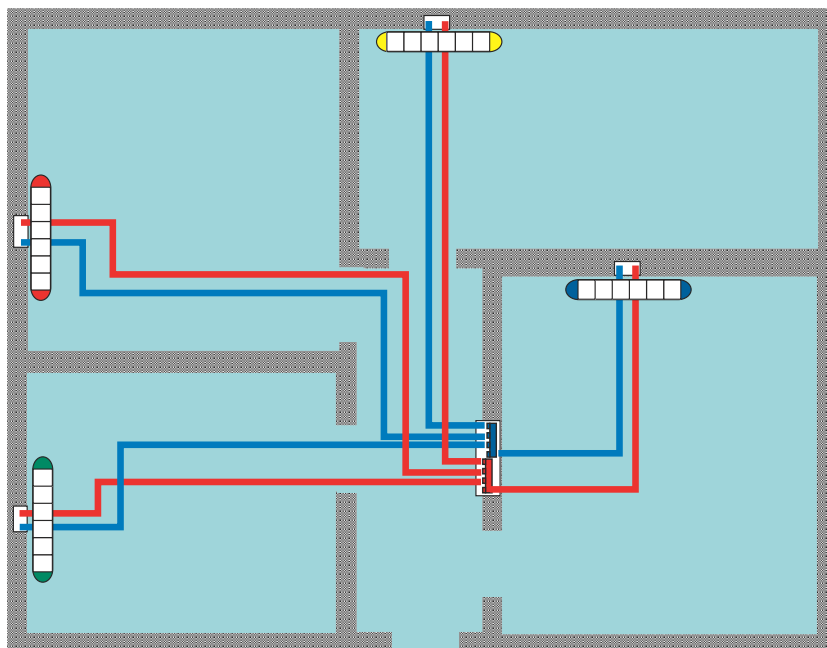
systems with radiators with 2 way valves distribution

Traditional heating systems with manifold 2 way distribution are widespread and have the following important advantages:

- simple and rational distribution
- easy installation of pipes

In order to install a 2 way distribution system with manifolds to feed n.4 radiators of 2000 W (1720 kcal/h) each, the following components should be used:

- R986R Giacomini polybutylene pipe in red guide pipe 18x2
- n.1 pre-assembled manifold R553D/4 1"x18
- n.8 adapters R17918x18/14
- n.4 hydraulic outlet R317M 16x16
- n.8 adapters R179 16x18/14
- n.4 Giacostar radiators R803/12 (complete with thermostatic valve, automatic air vent, draining valve and set for connection to installation)
- R986 Giacomini polybutylene pipe 14x1,5 (necessary for the connection from hydraulic outlet to radiator)



The choice of diameter pipe has to be made according to the thermal power of the radiator.

GIACOSTAR

radiators with 4 way valves distribution

This kind of installation is the most simple, when the installation has to be carried out in a building under reconstruction.

In effect it allows lowest costs for the installation of pipes in the floor because of less meters needed.

Today the only “4 way valve systems” are radiators in series.

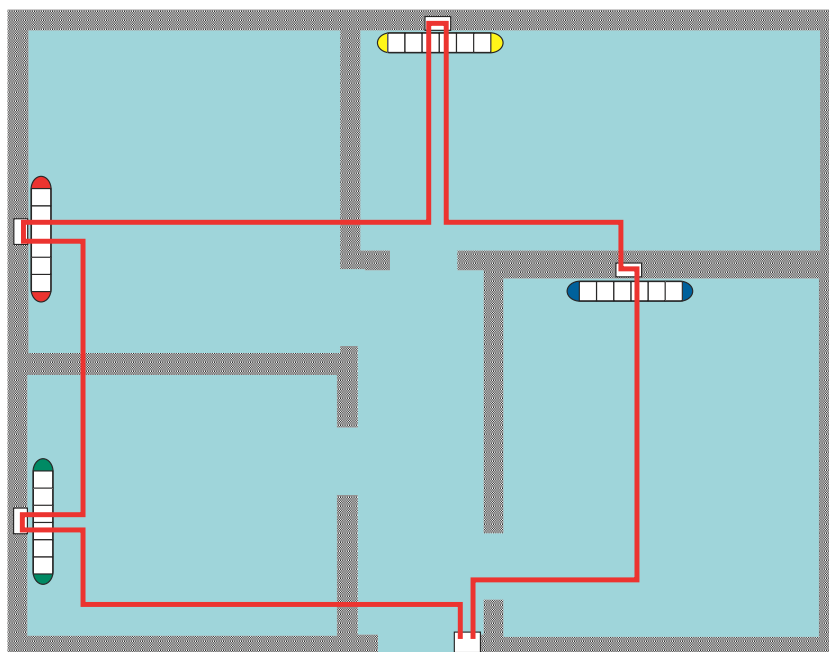
Using GIACOSTAR radiators, distribution is possible thanks to the R317M hydraulic outlet (able to work both with 2 and 4 way valves) which sends all or part of circuit flow in the radiator.

The advantages of this installation are:

- wide flexibility of pipe laying
- minimum use of pipe and a consequent saving of manual work
- rapid installation

In order to install a 4 way valve distribution system to feed n.4 radiators of 1050 W (900 kcal/h) each, for a total of 4200 W (3600 kcal/h), the following components should be used:

- R986R Giacomini polybutylene pipe in red guide pipe 18x2
- n.4 hydraulic outlets R317M 16x16
- n.8 adapters R17 16x18/14
- n.4 Giacostar radiators R803/12 (complete with thermostatic valve, automatic air vent, draining valve and set for connection to installation)
- R986 Giacomini polybutylene pipe 14x1,5 (necessary for the connection from hydraulic outlet to radiator)



Choice of pipe diameter has to be made according to total thermal power dissipated by the circuit and pressure losses.

GIACOKLIMA

systems with floor radiant panels

Giacoklima systems with floor radiant panels constitute one of the most valid solutions for buildings.

Between the years 1960 and 1980 very few radiant panel systems were installed in Italy.

The main reason was that bad planning and installation errors which caused an excellent system to operate in-effectively.

Today new conditions are available in order to treat differently this kind of system.

Following the complete systems in heating, cooling and sanitary distribution presented, Giacomini also proposes a complete system with floor radiant panels.

The big Giacomini innovation is the concept of total climate control, thanks to the possibility of using the same system for both Summer cooling and Winter heating.

The following accessories are available:

- K370A complete Giacoklima set (containing: regulator, outside temperature sensor, flow temperature sensor, dew point sensor, bearing for dew point sensor, flow temperature sensor housing)
- K480 room thermostat
- R982 insulation panels
- K369 wall insulation
- K376 fluid solution for rendering
- R986 Giacomini polybutylene 18x2
- R553D pre-assembled manifold
- R179 adapters 18x18/14
- R500 cabinet
- R475 actuators



The high flexibility and lightness of this pipe guarantees the plumber an easy and rapid installation.

GIACOKLIMA

systems with ceiling cooling and heating distribution

This kind of distribution is particularly recommended for public offices (banks, hospitals, shops, etc.) and solves cooling and heating problems which are common to those installations, using one simple system, placed in the false ceiling, where the vehicle of transmission for cool and heat is water and not air.

This system is very appreciated, thus avoiding air movements, featuring the classic air conditioning systems.

For this specific application Giacomini developed a particular kind of pipe.

Giacomini Polibutylene pipe R986 size 14x1 which combines maximum lightness (very important for hanging on installations) to the best resistant features to temperature and pressure stresses, even if thickness is very small (1mm).

Transmission of thermal power is guaranteed through the pipe by its reduced thickness, installation of such a system requires a specific planning, which is available from Giacomini library.

The following components are needed:

- K370B complete Giacoklima set (containing: regulator, outside temperature sensor, flow temperature sensor, dew point sensor, flow temperature sensor housing)
- K480 room thermostat
- R475 actuators
- R553V - R5536 manifolds 1"x1/8 or 1" 1/4
- R179 adapters 1/8x1/4
- R986 Giacomini polybutylene 14x1



In order to complete the system, Giacomini provide also the false ceiling structure.

Use of R179 adapters

Connection of Giacomini Polybutylene pipes to distribution and regulation systems is carried out with R179 adapters.

To carry out a quick and safe connection, we recommend to following some simple rules:



Cut the pipe perpendicularly to its axis, using the correct cutting tool R990 (slightly rotate the scissors during the operation for an easy cutting).



Place the nut and ring on the pipe.

Lubricate the O'Ring (very important to avoid to damage it and therefore compromise sealing).



Push the plastic tube firmly into the body of R179.



Tighten the connection nut to the distribution or regulation system.



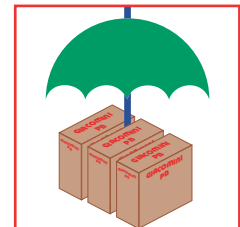
Precautions

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

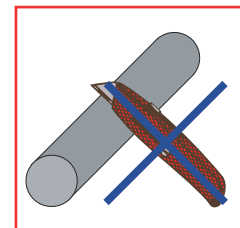
Keep the pipe in suitable packages in order to avoid direct exposure, for long periods, to sun rays.



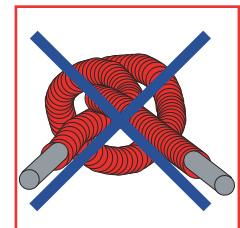
Store the pipe in protected and dry places.



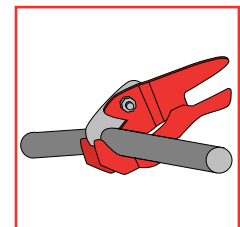
Avoid the pipe coming into contact with sharp objects, and pay particular attention during transportation and installation of the pipe.



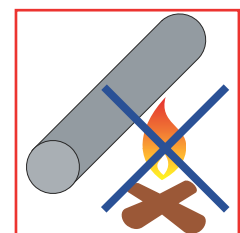
Avoid tight bends during the installation of the sheathed pipe; it is recommended to have curves at least 8 times the external diameter of the pipe used, in order to guarantee pliability.



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.

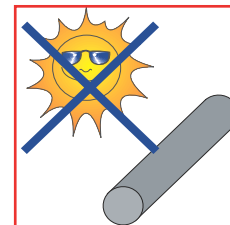


The pipe must not come in contact with free flames.



Protect Giacomini polybutylene pipe from U.V. rays during installation.

Avoid direct exposure to the sun in order to stop “pipe ageing”.



Before covering of the installations, pressure test the system.

Code	Description	Size	Packing
R986Y001	PB - Pipe	14x1	240 m
R986Y004	PB - Pipe	14x1,5	100 m
R986Y011	PB - Pipe	15x2	100 m
R986Y025	PB - Pipe	16x2,2	100 m
R986Y031	PB - Pipe	18x2	100 m
R986Y032	PB - Pipe	18x2	240 m
R986Y042	PB - Pipe	20x2	100 m
R986Y043	PB - Pipe	22x2	50 m
R986RY011	PB - Pipe in red guide pipe	15x2	50 m
R986RY025	PB - Pipe in red guide pipe	16x2,2	50 m
R986RY031	PB - Pipe in red guide pipe	18x2	50 m
R986BY011	PB - Pipe in blue guide pipe	15x2	50 m
R986BY025	PB - Pipe in blue guide pipe	16x2,2	50 m
R986BY031	PB - Pipe in blue guide pipe	18x2	50 m
R985RY001	Red guide pipe	25	100 m
R985RY002	Red guide pipe	30	100 m
R985BY001	Blue guide pipe	25	100 m
R985BY002	Blue guide pipe	30	100 m

Product availability

Warranty

Before supplying into the market, Giacomini polybutylene pipe is submitted to continuous controls in order to guarantee its high quality.

The production cycle provides chemical-physical, plumbing and dimensional controls, in order to discover all probable defects which could damage the system causing a malfunction or fluid loss.

Giacomini polybutylene pipe warranty lasts 25 years from production date.

During this period the Company will indemnify for all the damages caused to persons or articles up to LIT. 2.000.000.000 only if the damage is recognised as component defects.

The warranty is not valid in the following cases:

- 1) if working conditions are different from those prescribed;
- 2) if the components used in order to distribute fluids are incompatible with the material;
- 3) if the installation instructions are not strictly followed;
- 4) if the components show defects at the moment of the installation or of the system pressure test caused by accidental factors visibly perceivable during the installation;
- 5) if the accessories are assembled with other components not produced by Giacomini or different from those allowed, the warranty is limited to GIACOMINI products.