

## **+GF+ AQUASYSTEM**



**The PP-R piping systems  
for hot and cold water and for heating  
The system for the life**

**GEORG FISCHER +GF+**

# Contents

1. Introduction	4
2. PP-R: the characteristics of the material	5
3. Application range	6
4. Main features of the George Fischer PP-R piping system	6
4a. Outstanding features of the +GF+ AQUASYSTEM	6
4b. Outstanding features of the +GF+ PP-R/ALU/PP-R	7
5. General precautions	9
6. Pipe dimension	11
6.1 Pipe selection	11
6.2 Pressure losses	12
6.3 Regression curves (over-time duration)	15
6.4 Thermal expansion	17
6.4.1 Calculation of the thermal expansion	17
6.4.2 Positioning of the flexible arms	19
6.4.3 Installation layout	20
6.4.5 Pipe brackets	20
7. Instruction for the socket fusion	21
7.1 Preparation	21
7.2 Fusion	22
8. Electrofusion	23
9. Hole repairing	24
10. Instruction for the welding saddle	25
11. Product range	27
12. Standards and approvals	46

AQUASYSTEM® trademark Georg Fischer S.p.A.

*The technical data given in this publication are for general information purposes only. They imply no warranty of whatever kind. Please consult our General Conditions of Supply.*

# 1. Introduction

Water services in buildings are complex, requiring both experience and careful material selection.

The goal is to design and produce a piping system for hot and cold water supply that is easy to use and assembly. All components are fully integrated and sturdy, whilst maintaining a low price.

George Fischer is a leader producer of pipe fittings made of various materials since 1858.

In the field of thermoplastic materials, George Fischer is considered to be a pioneer, as well as one of the best known producers, utilising the most advanced technology in the world.

The test laboratory is one of the most famous in the world in the field of plastic materials, and it is completely dedicated to research, development and testing of new products. The equipment and instruments used are the most modern and up-to-date on the market today, this makes it possible to carry out the most sophisticated tests.

This all comes together with the highest standard of technology, production and logistics, which contributes to guaranteeing the best product for the end users:

- **quality**
- **experience**
- **reliability**



1) Research and Development



2) Quality Control



3) Complete system design



4) Raw material testing



5) Endurance testing

## 2. PP-R: the characteristics of the material

Pipes and fittings are made of Polypropylene Random, also known as type 3. The quality of our material can guarantee a long life (50 years), high resistance to pressure and temperature. This material is suitable for hot and cold water and heating systems.

The special properties of the material, compared to the other materials, give the following advantages

- **high dimensional stability (when hot)**
- **maximum resilience**

### Sound reduction index of the most common building materials

Properties	ISO	DIN	Unit	Values
Flow index	ISO 1133	DIN 53735		
MFI 190/5	Procedure 181	Code T	g/10 min	0,4
MFI 230/2,16	Procedure 12	Code M	g/10 min	0,25
MFI 230/5	Procedure 20	Code V	g/10 min	1,25
Density a 23°C	ISO/R 1183	DIN 53479	g/cm <sup>3</sup>	0,90-0,91
Resilience (Charpy)				
23°C	ISO 179/2D	DIN 53479	kJ/ m <sup>2</sup>	n.r.
-30°C	ISO 179/2D	normal scale	kJ/ m <sup>2</sup>	40
Chipping resilience (notch-engraved sample test)				
23°C	ISO 179/2C	DIN 53453	kJ/ m <sup>2</sup>	25
-30°C	ISO 179/2C	normal scale	kJ/ m <sup>2</sup>	2,5
Resilience (Izod)				
23°C	ISO 180/1C	-	kJ/ m <sup>2</sup>	n.r.
-30°C	ISO 180/1C	-	kJ/ m <sup>2</sup>	28
Scratching resilience (engraved sample test) (Izod)				
23°C	ISO 180/1A	-	kJ/ m <sup>2</sup>	23
-30°C	ISO 180/1A	-	kJ/ m <sup>2</sup>	2,5
23°C	ASTMD 256	-	kJ/ m <sup>2</sup>	27
-30°C	ASTMD 256	-	kJ/ m <sup>2</sup>	4
Traction test				
Yield test	ISO 527	DIN 53455	N/mm <sup>2</sup>	27
Yield Elasticity	Forwarding speed	Forwarding speed	%	11
Breakage Elongation	-		%	> 800
Traction Module E	ISO 527	DIN 53457	N/mm <sup>2</sup>	900
Elasticity yield to tangential tension	ISO/R 537Metod A.	DIN 53445	N/mm <sup>2</sup>	450
Bending stress 3.5%	ISO 178 standard test 5.1	DIN 53452	N/mm <sup>2</sup>	24
Brinell hardness test	ISO 2039 (H358/30)	DIN 53456 (H358/30)	N/mm <sup>2</sup>	49
VICAT A/°C Melting point	ISO 306	DIN 53460	°C	135-145
Dimensional heat stability °C	ISO 75/B	DIN 53461	°C	75
Surface Resistance		DIN 53482	Ω	>10 <sup>13</sup>
Mass resistivity		DIN 53482	Ω cm	>10 <sup>16</sup>
Dielectric loss angle (tg),(10 <sup>4</sup> Hz)		DIN 53483	-	2 x 10 <sup>-4</sup>
Relative dielectric constant (10 <sup>4</sup> Hz)		DIN 53483	-	2,3
Dielectric rigidity		ASTMD149	kV/mm	75
Termal conductivity at 20° C	VDE 0304 (1-4)	52612	W/mK	0,22
Termal expansion factor			mm/m°C	0,15
Specific heat 20°C			Kj/KgK	2,0

The above characteristics are the results of the tests on extruded samples after 96 hours storage at normal room conditions 23/50 (2) DIN 5001 4 and represent indicative values.

### 3. Application range

The PP-R AQUASYSTEM is particularly suitable for hot and cold water installation: residential building, office, hotel, new installation and renovation.

The wide range of pipes and fittings, from 20 to 110 mm, is suitable for any kind of installation.

+GF+ AQUASYSTEM is recommended for the following installations:

- **sanitary & plumbing**
- **heating**
- **air conditioning**
- **food industry**
- **compressed air**

### 4a. Outstanding features of the +GF+ AQUASYSTEM

Some of the best advantages offered by the +GF+ AQUASYSTEM®, in comparison with traditional systems, are as illustrated below:

#### **Reduced installation time**

Compared with traditional systems, AQUASYSTEM® can grant a reduction in installation time of at least 30%.

#### **Resistance to electrolysis**

The high resistivity of the piping system (10 Ohm cm.) guarantees a very low electrical conductivity. The risk of PP-R pipe or fittings piercing due to stray currents is practically nothing.

Most chemical substances, which might be present in water or concrete, do not attack PP-R; in cases where special substances are being used, please contact Georg Fischer for advice.

#### **Pipes and fitting pressure losses**

The inner surface of pipes and fittings have a very low frictional resistance, in comparison to traditional systems, thus making it possible to reduce the distribution pressure losses (see diagram on the following page).

#### **No Scaling**

The reduction of the water flow normally occurs as a consequence of scaling (calcium carbonate) especially at high temperatures. PP-R pipes of the Georg Fischer system do not have scaling problems.

#### **Low Thermal Conductivity**

The thermal conductivity of PP-R is very low, thus making it possible to reduce heat losses in the hot water supply and traditional heating systems.

This does not remove the statutory requirements for insulation on pipework, but can improve the effect of insulation.

#### **Long Life**

The Georg Fischer piping system for hot and cold water services under pressure, is designed to guarantee over 50 years operation at pressure and temperature conditions listed in the following tables (regression curves).

#### **Non-toxicity and Safety**

All materials used in the Georg Fischer supply system, which are in contact with water, are certified as non-toxic and suitable for contact with drinking water (L102).

#### **Resistance against abrasion**

Compared with traditional systems, AQUASYSTEM assures a very high resistance against abrasion granting in this way a long life.

#### **Noise Reduction**

The material used has a high sound reduction index for absorbing sound waves and limiting the spread through pipes.

## 4b. Outstanding features of the +GF+ PP-R/ALU/PP-R

The multilayer pipe PP-R/ALU/PP-R is an extension range of +GF+ AQUASYSTEM with better workability and lower thermal expansion.

This system is working with the special PP-R ALU pipe and the traditional PP-R fittings.

The PP-R ALU pipe are extruded on three different layer: the main pipe is made of PP-R, coated with an aluminium foil, then covered with a PP-R film treated to resist long time against UV light.

It's allowed expose the pipe to direct UV light, outside the buildings.

The aluminium foil protect the inside PP-R pipe preserving its features and acting as a barrier to the oxygen.

This pipe can be bent and remain into desired position.

Moreover the aluminium foil strengthen the pipe and permit bigger distance between the brackets.

In addition to the normal features, PP-R ALU pipe has the following characteristic:

- **lower thermal expansion**

$$\alpha = 0,03 \text{ mm/mK}$$

- **better workability**
- **better resistance to knocks**
- **resistance to UV ray**
- **impermeability to oxygen**



## Sound reduction in sanitary installation

For an efficient noise reduction, the recommendations below should be considered.

It is very important to take the necessary preventive measures for noise reduction. Therefore a precise design needs to be done in advance. Careful planning of piping system is necessary to optimise noise reduction.

Pipe sizing and the design of the distribution system is important, as well as the selection of fittings and taps used. The walls, to which the pipes, the taps and other fittings are fixed to, must have a weight coefficient of 220 kg/m<sup>2</sup>.

The most important measure for efficient noise reduction in the water supply system, is the use of taps with a noise level less than 20 db (A) in compliance with DIN 52218.

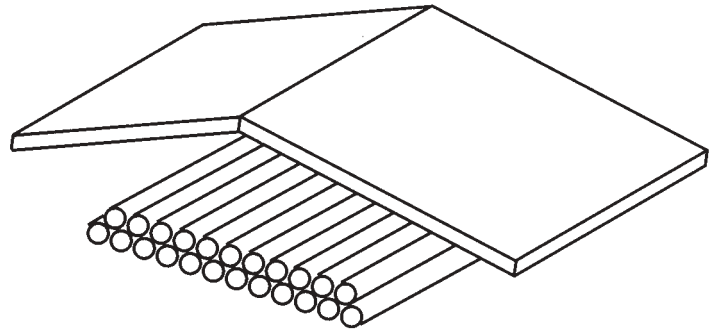
## Sound reduction index of the most common building materials

Type of stone or tile Description	Wall thickness cm	Specific density of stone or tile kg/m <sup>3</sup>	Weight of surface with mortar, without plaster kg/m <sup>2</sup>	Approx sound reduction index in dB <sup>2</sup>	Weight of plastered surface 1x1,5 cm kg/m <sup>2</sup>	Approx sound reduction index in dB <sup>2</sup>	Weight of plastered surface 2x1,5 cm kg/m	Approx sound reduction index in dB <sup>2</sup>
Full bricks made of pumice and inflated clay (Liapor)	9,5	1100	104,5	37	119,5	38	134,5	40
	11,5		126,5	39	141,5	40	156,5	41
	17,5		192,5	44	207,5	44	222,5	45
	24,0		264,0	47	279,0	48	294,0	49
	30,0		330,0	50	345,0	50	360,0	51
Full bricks made of pumice and inflated clay (Liapor)	17,5	1100	192,5	44	207,5	44	222,5	45
	24,0		264,0	47	279,0	48	294,0	49
	30,0		330,0	50	345,0	50	360,0	51
	36,5		401,5	52	416,5	53	431,5	53
Vertical pierced tiles (small size)	11,5	1400	161,0	42	176,0	43	191,0	44
	17,5		245,0	46	260,0	47	275,0	48
	24,0		336,0	50	351,0	51	366,0	51
	30,0		420,0	53	435,0	53	450,0	54
Light tiles (large size)	11,5	1200	138,5	40	153,0	41	168,0	42
	17,5		210,0	45	225,0	45	240,0	46
	24,0		288,0	48	303,0	49	318,0	50
	30,0		360,0	51	375,0	51	390,0	52
Porous tiles, for instance Paraton, Unipor, Pari Klimaton	11,5	1000	115,0	38	130,0	39	145,0	40
	17,5		175,0	43	190,0	44	205,0	44
	24,0		240,0	46	255,0	47	270,0	48
	30,0		300,0	49	315,0	49	330,0	60
Gabeton tiles, for instance Ytong, Hebel	10,0	800	80,0	33	95,0	36	110,0	37
	12,5		100,0	36	115,0	38	130,0	39
	15,0		120,0	38	135,0	40	150,0	41
	20,0		160,0	42	175,0	43	190,0	44
	25,0		200,0	44	215,0	45	230,0	46
	30,0		240,0	46	255,0	47	270,0	48
Gabeton sandstone, gabeton full	11,5	1750	201,0	44	216,0	45	231,0	46
	17,5		306,0	49	321,0	50	336,0	50
	24,0		420,0	53	435,0	53	450,0	54
	30,0		525,0	55	540,0	56	555,0	56
Pierced tiles	11,5	1500	172,5	42	187,5	43	202,5	44
	17,5		262,5	47	277,5	48	292,5	48
	24,0		360,0	51	375,0	51	390,0	52
	30,0		450,0	54	465,0	54	480,0	54
	36,0		547,5	56	562,5	56	577,5	56
Full bricks	11,5	1800	207,0	44	222,0	45	237,0	46
Concrete	10,0	2350	235,0	46				

## 5. General precautions

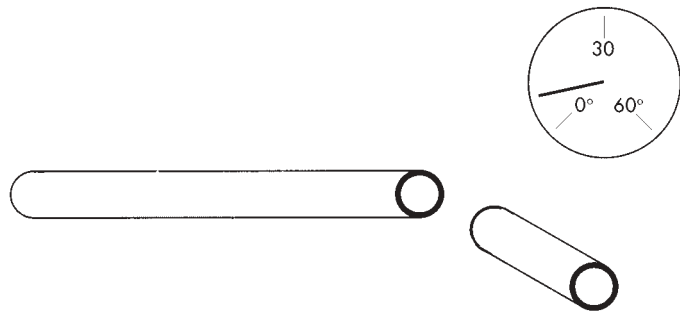
### UV Ray

Like all plastic materials, PP-R even though UV Ray stabilised, must not be exposed to the sun.



### Low Temperatures

With temperatures close to zero, the material becomes brittle, therefore it is recommended to avoid possible knocks to the piping. Should it be possible for the water to freeze whilst in the pipes, it is recommended that the pipes be emptied, since a volume increase could lead to breakages.



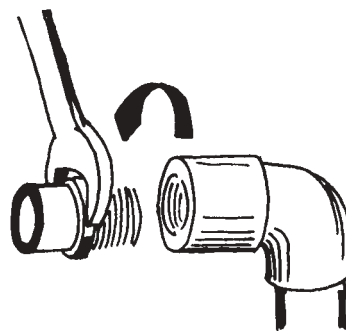
We suggest to cut the pipe end of 5 cm.

### Water Tightness with other Metal Fittings

It is recommended not to join PP-R materials with conical or not suitable fittings. The metal fittings are in special brass type OT58. The thread is made with high precision therefore easy to tighten.

Where it is necessary to join to metal, the use of teflon or PARALIQ PN35 tape is recommended.

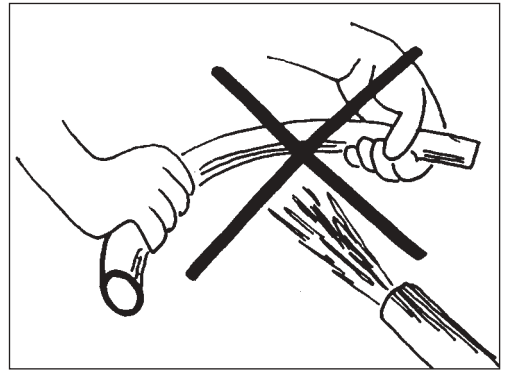
PARALIQ tape is quick and sure and above-all is according to the DVGW/ÖVGW/SSIGA water and gas standards.





### Pipes Bending

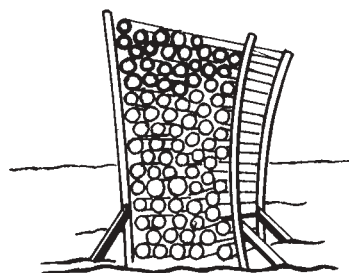
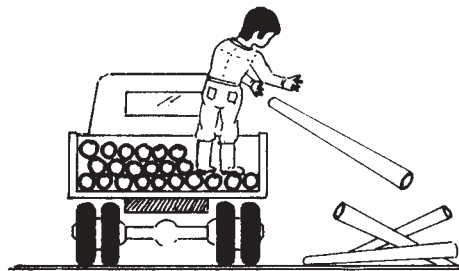
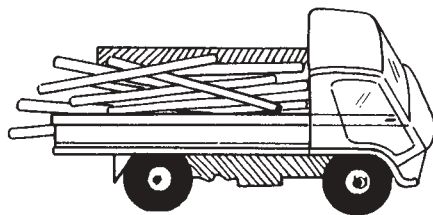
The minimum bending radius must be equal to 8 times the pipe diameter. For this purpose, heat the part which will be bent by using a hair-dryer or suitable equipment. Do not use flame. To bend the PP-R ALU pipe do not warm it.



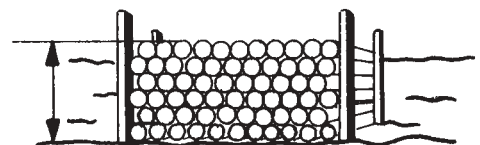
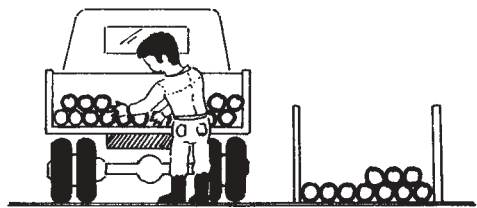
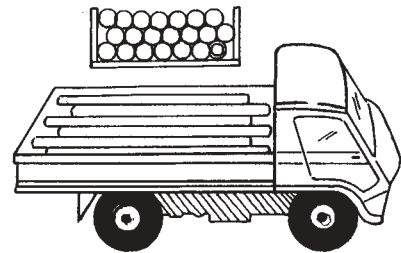
### Transport and Storage

Here below we give a few hints for material transport and storage.

#### Wrong



#### Right



## 6. Pipe dimension

### 6.1 Pipe Selection

In order to select the best water flow depending on the available water pressure and corresponding usage, please refer to the table here below:

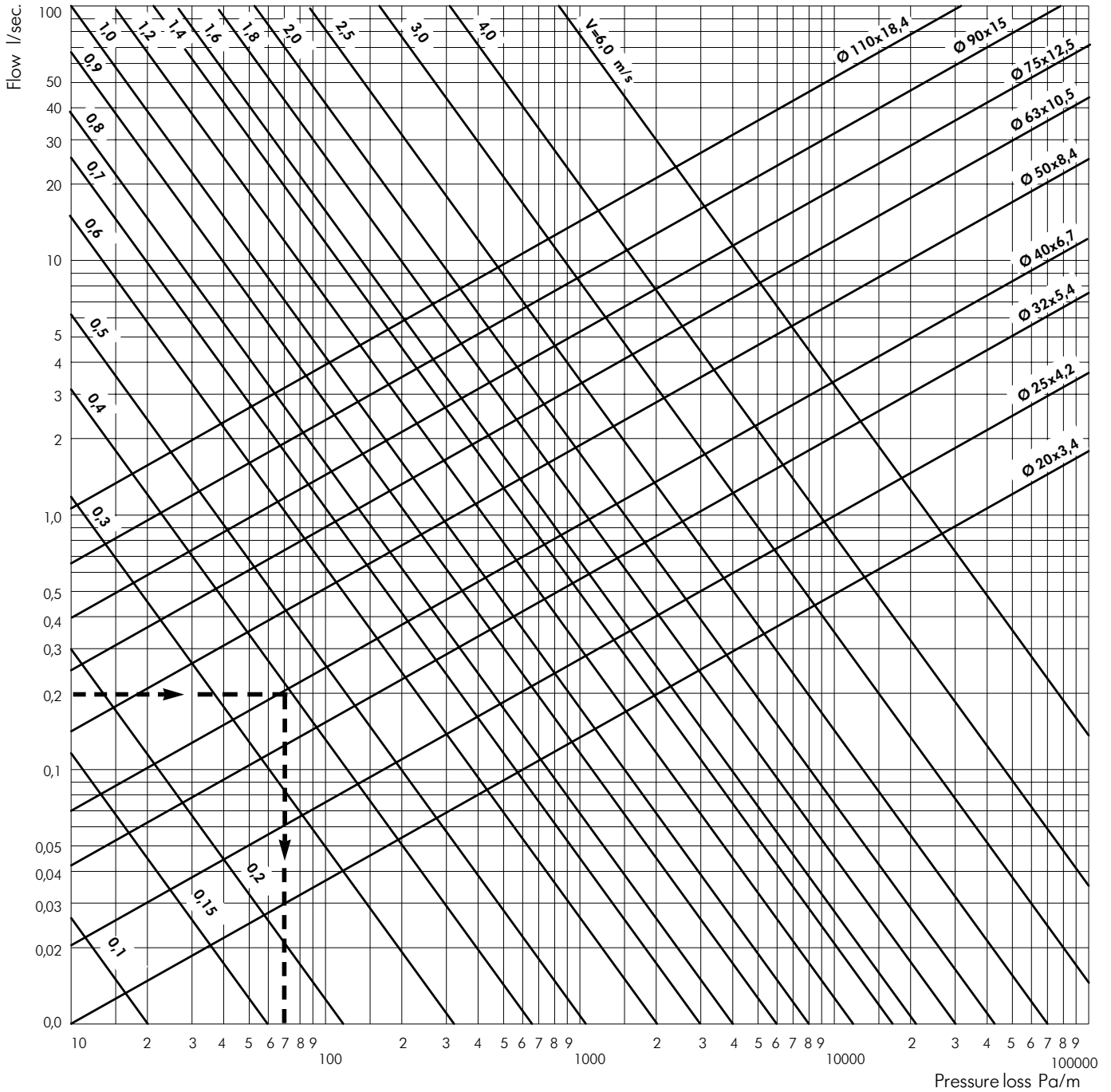
**Table for the selection of pipe diameters and water flow**

<b>Water Connection Point</b>	<b>Flow (l/sec).</b>	<b>Pressure (bar)</b>	<b>Pipe Diameter (mm)</b>
<b>Wash-Basin</b>			
Tap DN 15	0,07	0,50	20
Mixer Tap DN 15	0,07	1,00	20
<b>Bidet</b>			
Tap DN 15	0,07	0,50	20
Mixer Tap DN 15	0,07	1,00	20
<b>Bath tub</b>			
Mixer Tap DN 15	0,15	1,00	20
Mixer Tap DN 20	0,40	1,00	25
Mixer Tap DN 25	1,00	1,00	32
<b>Shower</b>			
Sprinkler DN 15	0,15	1,00	20
Sprinkler DN 15	0,06	1,00	20
Sprinkler DN 20	0,18	1,00	20
Sprinkler DN 25	0,31	1,00	20
<b>Flush and flushing tank</b>			
Flush DN 20	1,00	1,20	32
Flush Tank DN 15	0,13	0,50	20
<b>Electric and gas Boilers</b>			
6 kW	0,07	1,00	20
12 kW	0,10	1,00	20
18 kW	0,15	1,00	20
21 kW	0,17	1,00	20
24 kW	0,20	1,00	20
33 kW	0,30	1,00	20
<b>Sinks</b>			
Mixer DN 15	0,07	1,00	20
Mixer DN 20	0,02	1,00	20
<b>Dishwashers</b>			
	0,15	1,00	20
<b>Washing Machines</b>			
	0,25	1,00	20
<b>Urinals</b>			
Flush DN 15	0,30	1,20	20
Flushing Tank DN 15	0,13	0,50	20

## 6.2 Pressure losses

The pressure losses for distribution in the George Fischer piping system can be assessed by means of the following chart.

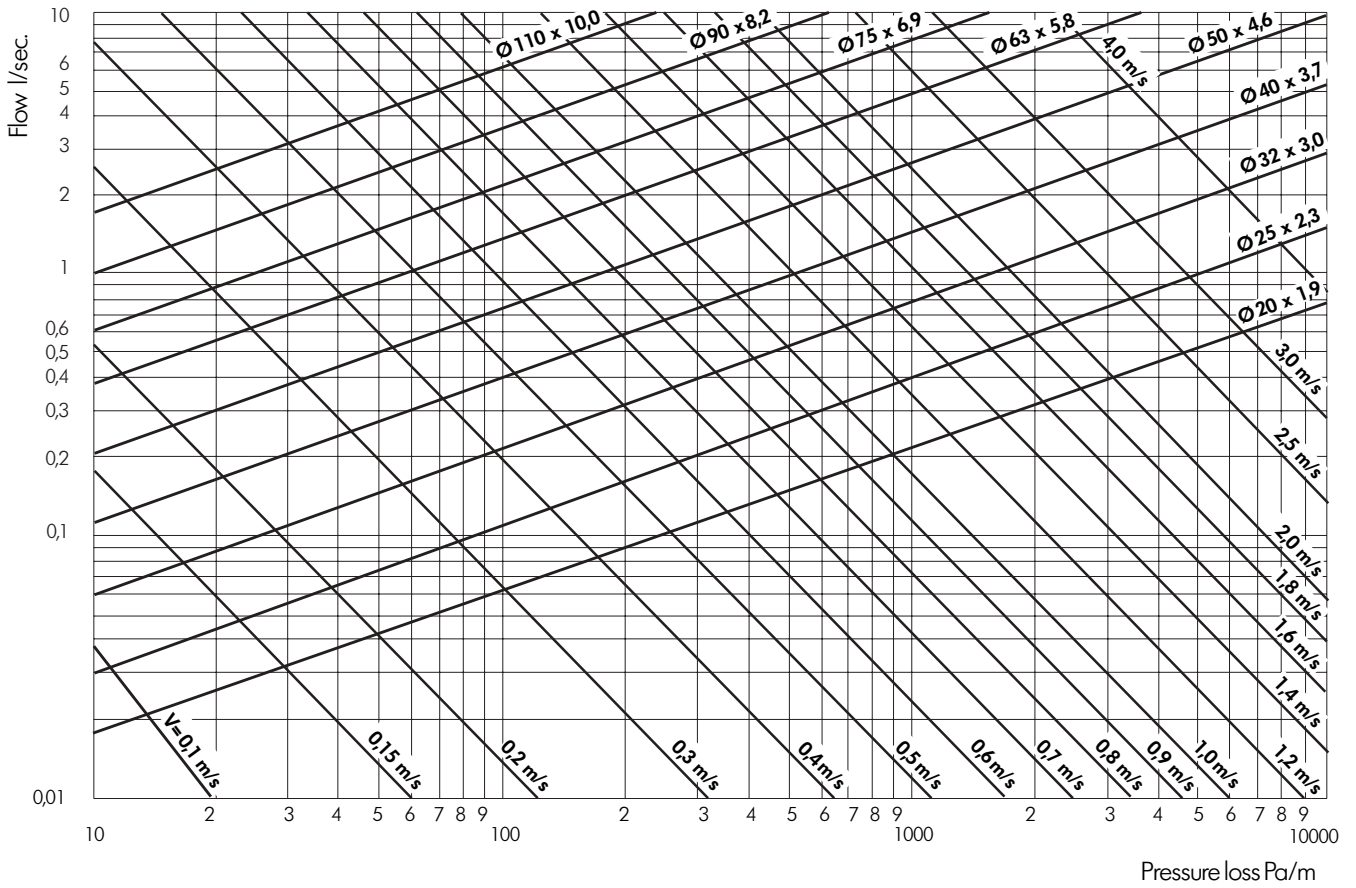
### Loss pressure diagram for PN20 pipe



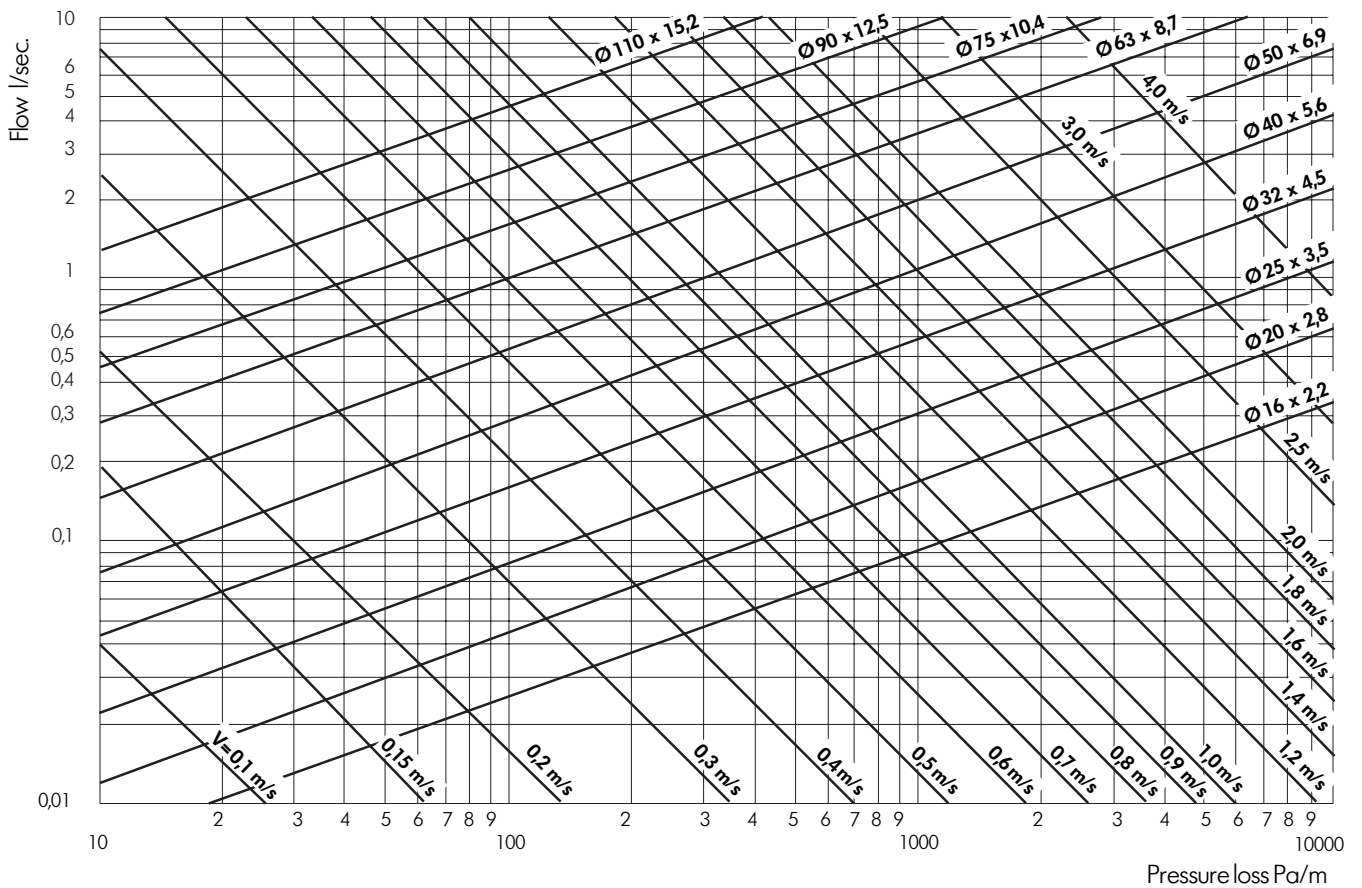
Pressure loss: **Pa/m. (10.000 Pa = 0,1 bar = 1 m. c.a.)**

**Example** pipe: 40 x 6,7 mm  
 flow: 0,2 l/s  
 water velocity: 0,4 m/sec.  
 pressure loss: 70 Pa/m. = 7 mm/m. aprox..

### Loss pressure diagram for PN10 pipe



### Loss pressure diagram for PP-R ALU pipe (PN16)



**Table of fittings pressure loss in Georg Fischer fittings**

Description	Symbol	Coefficient of resistance
Equal coupling		0,25
Elbow 90°		2,00
Elbow 45°		0,60
Equal tee 90°		1,80
Reduced tee 90°		3,60
Equal tee 90°		1,30
Reduced tee 90°		2,60
Equal tee 90°		4,20
Reduced tee 90°		9,00
Equal tee 90°		2,20
Reduced tee 90°		5,00
Threaded tee 90°, male		0,80
Concentric reductions up to 2 size		0,55
Concentric reductions up to 3 size		0,85
Threaded fitting, male		0,40
Threaded fitting, male, reduced		0,85
Threaded elbow, male		2,20
Threaded elbow, male, reduced		3,50

**Calculation Example**

Suppose we have a water services system with the following characteristics:

- diameter 25mm
- total length 10m
- fittings used:
  - 4 sleeves
  - 3 elbows 90°
  - 2 equal tees
  - 1 threaded coupling, male
- velocity 1,5m/sec (constant for a simpler calculation)
- flow rate 0,35 l tr/sec
- T= 20 °C

**from the table:**

- r1 (coupling) = 0,25
- r2 (sleeve 90°) = 2,00
- r3 (equal tees) = 1,80
- r4 (threaded coupling, male) = 0,40

**Total fittings pressure losses:**

**Distributed losses (chart):**

$$H = \frac{11 \times 1,52 \times 1000}{2 \times 9,8} = 1263 \text{ mm ca.}$$

Linear P = 1100 Pa/m  
= 110 mm aprox. /m

Distributed P = 110 x 10  
= 1100 aprox/mm.

**Total charge loss:**

Total P = H + P<sub>dist</sub> = 2363 mm aprox.

The fittings pressure losses are calculated by the following formula:

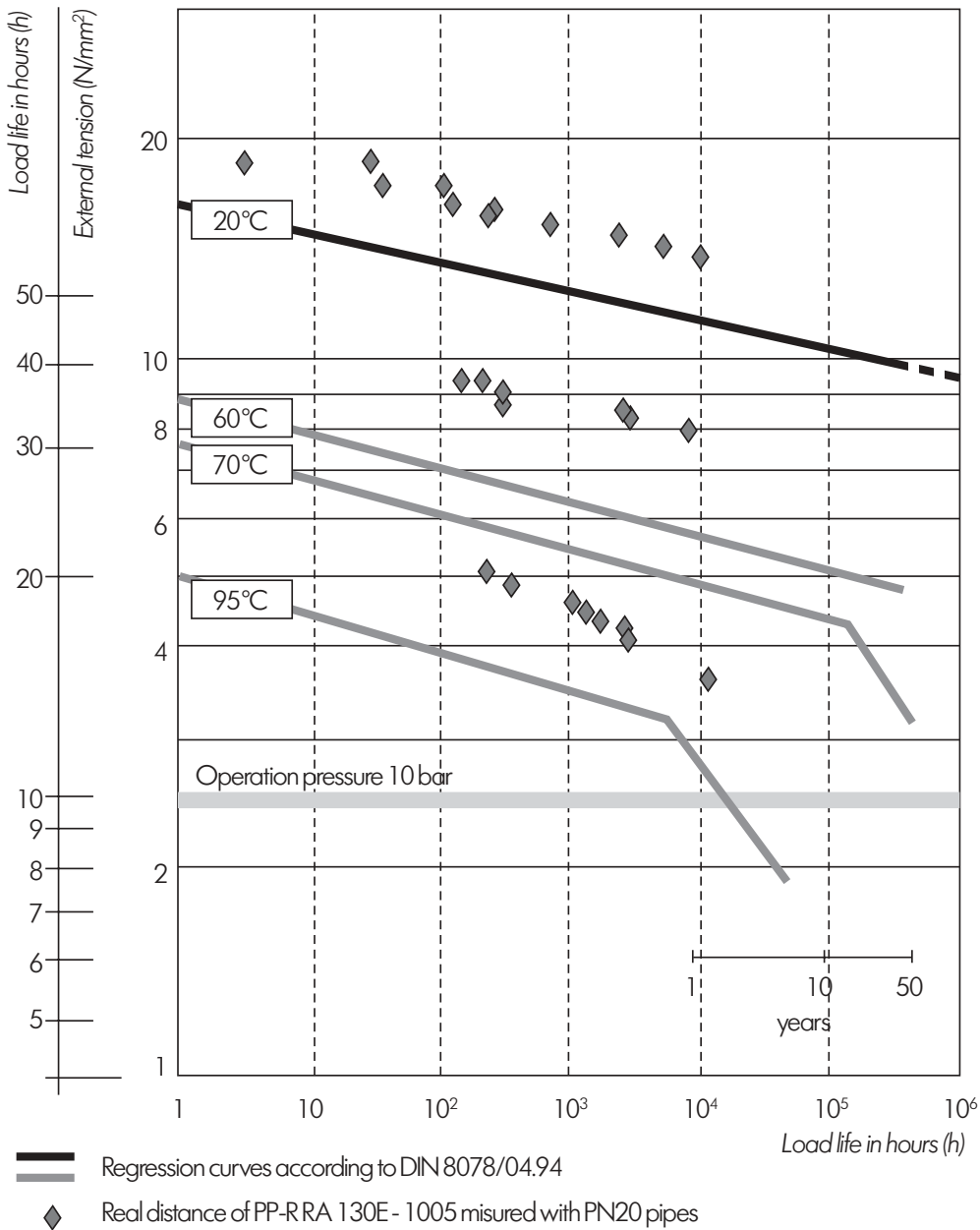
$$H = \Sigma r \cdot v^2 \cdot \gamma / 2g$$

- where: v = water velocity (m/sec)  
g = specific gravating of water (kg/m<sup>3</sup>)  
g = 9,8 m/s<sup>2</sup>

## 6.3. Regression curves (over time duration)

The regression curves affect pipe life depending on the fluid pressure, temperature and outer stress (see chart).

### Regression curves RA 130E - 1005



The formula joining these parameters is:

$$R = P \times \frac{d - s}{2s}$$

$P$  = maximum inner pressure.  
 $d$  = outer diameter  
 $s$  = thickness  
 $R$  = outer stress

**Example**

$T = 60^\circ\text{C}$

Continuous operating life :

50 years

From the regression curve the result is:  $R = 4,9 \text{ Mpa}$

Calculation (from the formula)

$P = 19,7 \text{ bar}$

Or  $P = 13 \text{ bar}$

(using safety coefficient of 1.5)

## Working overpressure admitted

water temperature	working years	Type of pipe		
		PN 10	PN 16	PN 20*
		SDR 11	SDR 7,4	SDR 6
		S 5	S 3,2	S 2,5
		Overpressure bar		
10°C	1	17,6	27,8	35,0
	5	16,6	26,4	33,2
	10	16,1	25,5	32,1
	25	15,6	24,7	31,1
	50	15,2	24,0	30,3
20°C	1	15,0	23,8	30,0
	5	14,1	22,3	28,1
	10	13,7	21,7	27,3
	25	13,3	21,1	26,5
	50	12,9	20,4	25,7
30°C	1	12,8	20,2	25,5
	5	12,0	19,0	23,9
	10	11,6	18,3	23,1
	25	11,2	17,7	22,3
	50	10,9	17,3	21,8
40°C	1	10,8	17,1	21,5
	5	10,1	16,0	20,2
	10	9,8	15,6	19,6
	25	9,4	15,0	18,8
	50	9,2	14,5	18,3
50°C	1	9,2	14,5	18,3
	5	8,5	13,5	17,0
	10	8,2	13,1	16,5
	25	8,0	12,6	15,9
	50	7,7	12,2	15,4
60°C	1	7,7	12,2	15,4
	5	7,2	11,4	14,3
	10	6,9	11,0	13,8
	25	6,7	10,5	13,3
	50	6,4	10,1	12,7
70°C	1	6,5	10,3	13,0
	5	6,0	9,5	11,9
	10	5,9	9,3	11,7
	25	5,1	8,0	10,1
	50	4,3	6,7	8,5
80°C	1	5,5	8,6	10,9
	5	4,8	7,6	9,6
	10	4,0	6,3	8,0
	25	3,2	5,1	6,4
95°C	1	3,9	6,1	7,7
	5	2,5	4,0	5,0

DIN 8077 edition 12/97 - coefficient factor 1,5 - \* valid for PP-R ALU also

## 6.4. Thermal Expansion

### 6.4.1 Thermal expansion calculation

During the design and installation of plastic pipes, it is very important to calculate the duct expansion caused by a possible difference between operating temperature and starting temperature.

#### The medium thermal expansion coefficient

give the elongation of a bar of 1 meter of pipe for the temperature increasing of 1K.

Medium thermal expansion coefficient

#### PP-R pipe

$$\alpha = 0,15 \text{ mm/mK}$$

#### PP-R ALU pipe

$$\alpha = 0,03 \text{ mm/mK}$$

### Example

The length variation is calculated with the following formula

$$\Delta L \text{ (mm)} = L \text{ (m)} \times \Delta T \text{ (}^\circ\text{C)} \times \alpha \text{ (mm/m}^\circ\text{C)}$$

$L$  = Initial pipe length (m)  
 $\Delta L$  = length variation (mm)  
 $\Delta T$  = temperature difference ( $^\circ\text{C}$ )  
 $\alpha$  = expansion coefficient (mm/m $^\circ\text{C}$ )

#### Length variation

##### for PP-R pipe

$$\begin{aligned} L &= 5 \text{ m} \\ \Delta L &= 50^\circ\text{K} \\ \alpha &= 0,15 \text{ mm/mK} \end{aligned}$$

$$\Delta L = 5 \times 50 \times 0,15 \quad \Delta L = 37,5 \text{ mm}$$

#### Length variation

##### for PP-R - ALU pipe

$$\begin{aligned} L &= 5 \text{ m} \\ \Delta L &= 50^\circ\text{K} \\ \alpha &= 0,03 \text{ mm/mK} \end{aligned}$$

$$\Delta L = 5 \times 50 \times 0,03 \quad \Delta L = 7,5 \text{ mm}$$

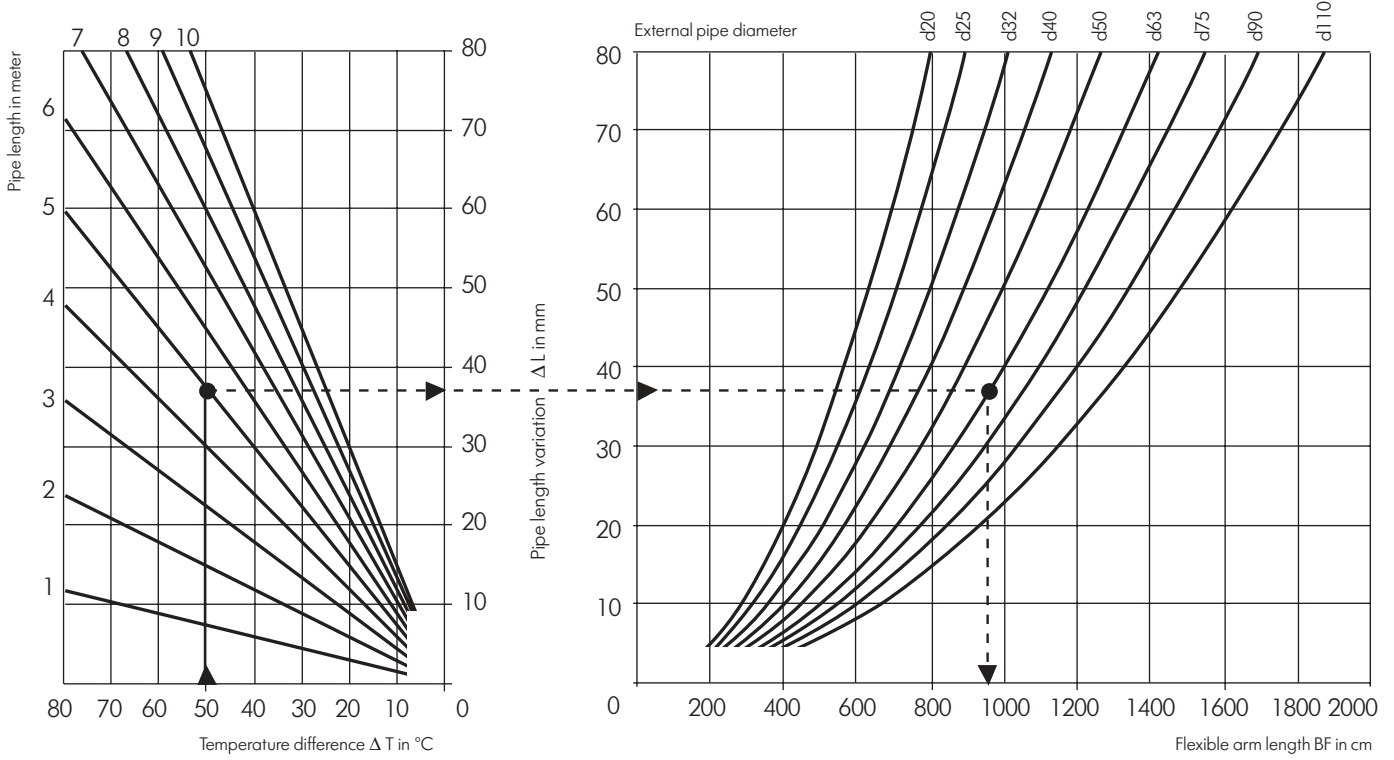
Graphical example at page 18

$$L_{BF} = C \times \sqrt{\Delta L \times d_e}$$

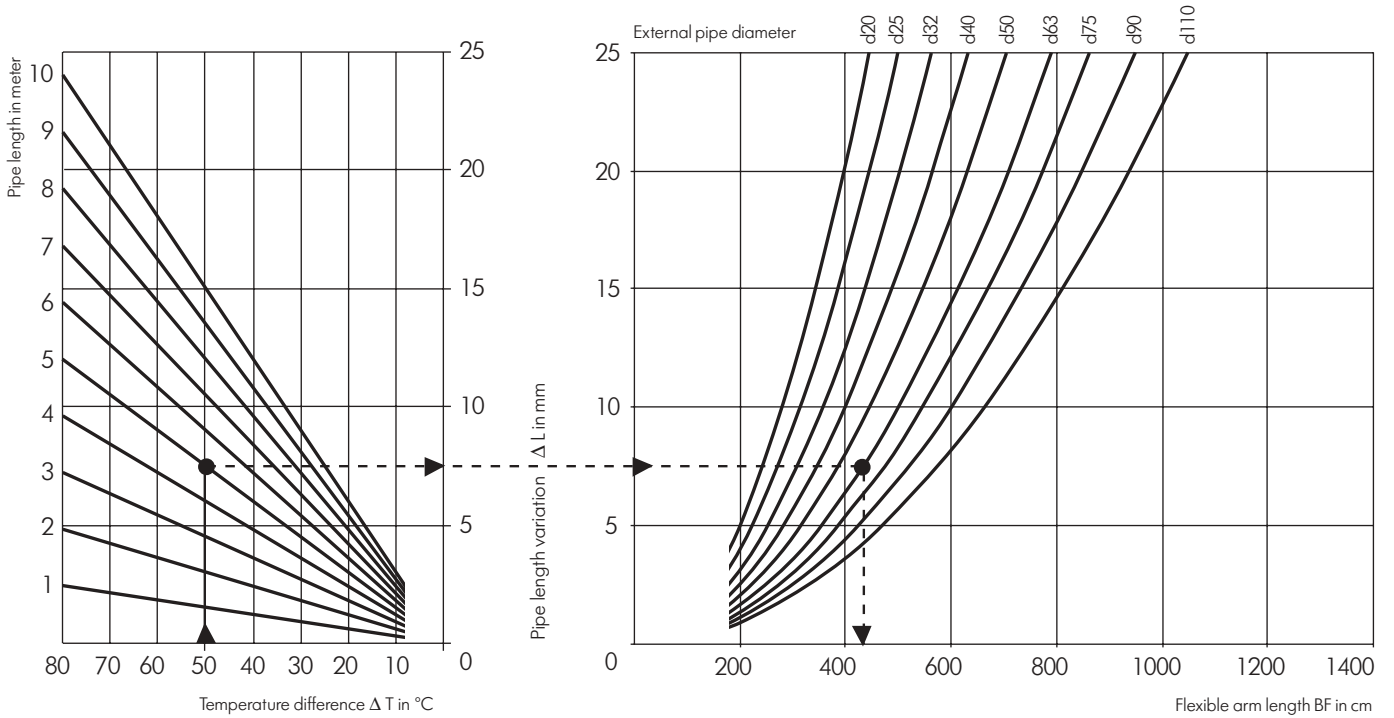
$L_{BF}$  = flexible arms length  
 $C$  = 20 coeff. PP-R +GF+  
 $\Delta L$  = length variation (mm)  
 $d_e$  = external pipe diameter



### Assessment of the flexible arm for PP-R pipe



### Assessment of the flexible arm for PP-R ALU pipe

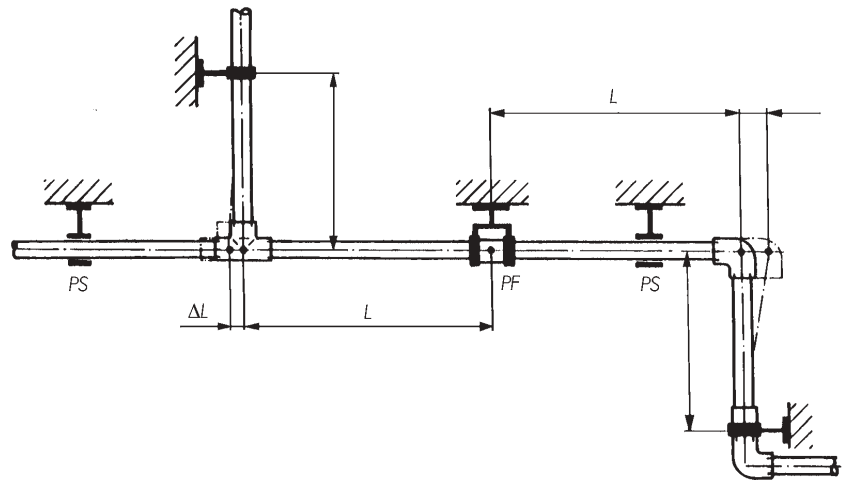


## 6.4.2. Positioning of the flexible arms

**Important:** If the operating temperature is higher than the starting temperature, the pipe is lengthened. In the reverse case, the pipe is shortened.

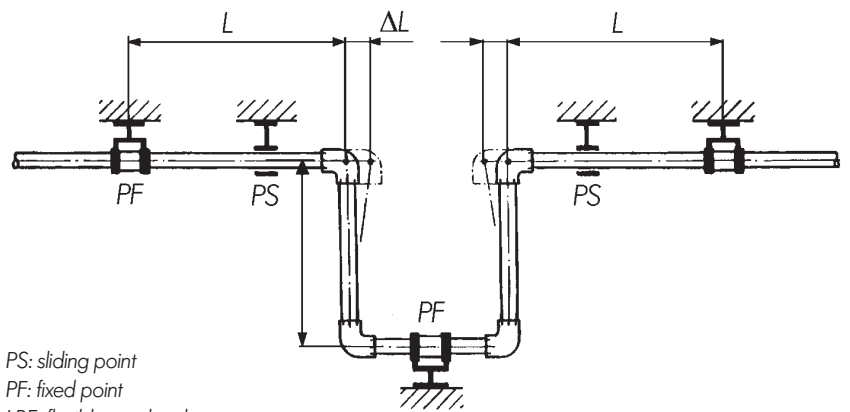
The length difference must also be limited by fixed and movable points suitably placed. The example shown here help to understand how to place fix and movable points.

I° Example



When it is not possible to obtain the length of inflection by changing the direction, use the method illustrated on the right.

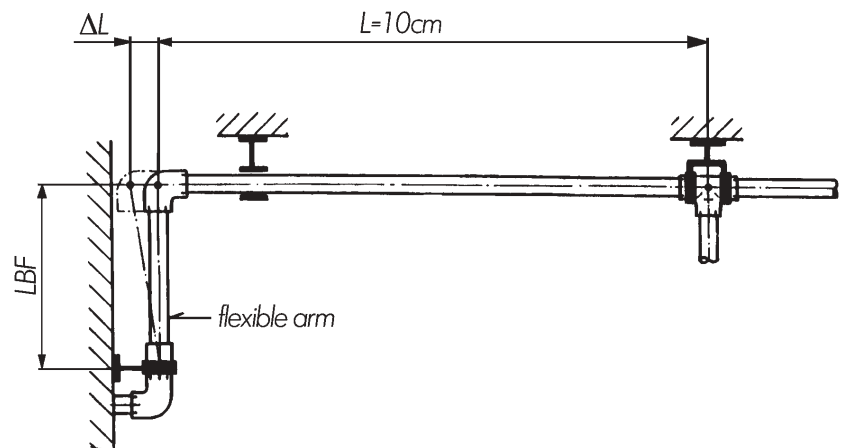
II° Example



PS: sliding point  
PF: fixed point  
LBF: flexible arm length

### Example for the assessment of the flexible arm

Data:  $L = 10 \text{ m}$   
 $d = 50 \text{ mm}$   
 $T_{\text{installation}} = 15 \text{ }^{\circ}\text{C}$   
 $T_{\text{max operation}} = 80 \text{ }^{\circ}\text{C}$   
 $\Delta L = 0,15 \cdot 10 \cdot 65 = 97,5 \text{ mm}$

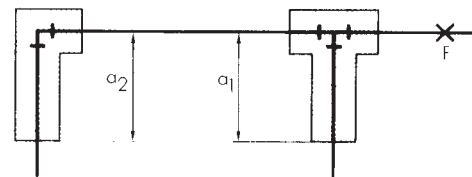


### 6.4.3 Installation layout

**a** It is preferable to use pre-insulated pipes, since they allow stretching due to thermal variation and they comply with the Italian regulations. The Act 373 and relevant additions provides for the insulation of hot water pipes, independently of their coefficient of thermal transmittance. In this case, it is important to keep to the following procedure:

- calculate the exact length of the flexible arm (para. 5.4.2)
- use a compressible material (rock-wool, etc), in association with the flexible arms, in order to permit thermal expansion.

**b** The PP-R pipes can also be embedded directly in concrete, since it can withstand additional axial strains, due to thermal expansion being impeded.



In such cases, the stress present on the pipe and fittings must be calculated so as to prevent too high an internal tension and consequent breakages.

It is important to prevent hollows from forming when the pipe is covered with mortar, such hollows could give rise to weak points in the piping. The same consideration applies to pipes positioned between two fixed points.

### 6.4.5 Pipes brackets

Plastic material pipes need regularly space supports, the bracket distance depends upon many factors such as temperature, pressure, diameter and material.

In every case, the inner diameter of the support must be greater than the external diameter of the pipe, so as to permit pipe movement due to pipe expansion.

For reference, use the table below. Horizontal pipes can be supported by channels or profiles, this can be a more economic solution.



**PP-R Pipe bracket table**

Material and PN	d mm	distance between two brackets in cm					
		20°C	30°C	40°C	50°C	60°C	70°C
PP-R PN20/10	20	75	75	70	65	60	50
	25	85	85	85	80	75	65
	32	100	100	95	90	85	80
	40	110	110	105	100	95	90
	50	130	125	115	110	105	100
	63	150	145	140	125	120	110
	75	170	165	160	150	145	120
	90	180	175	170	165	160	130
110	190	185	175	170	165	140	

**PP-R Pipe bracket table**

Material and PN	d mm	distance between two brackets in cm					
		20°C	30°C	40°C	50°C	60°C	70°C
PP-ALU	20	125	125	115	115	105	95
	25	135	130	120	125	115	105
	32	155	150	145	140	130	120
	40	175	170	165	160	150	140
	50	195	190	185	180	170	160
	63	215	210	205	200	190	180
	75	225	220	215	210	200	190
	90	235	230	225	220	210	200
	110	250	240	230	210	200	200

## 7. Istruzioni per una saldatura di tasca corretta

### 7.1 Preparation

All the following descriptions are valid for both PP-R and PP-R ALU pipe. The only exception at paragraph 7.1.5 where you need two different tools.

#### 7.1.1 Check the temperature

Once the socket fusion machine is on, check the temperature, which must range between 253°C and 274°C.

This operation must be performed by means of tempil sticks.

The yellow one melts at 253°C.

The red one melts at 274°C.

The fusion temperature ranges between 253°C and 273°C, when the yellow pen melts and the red one does not melt, the temperature is perfect for fusion.



N.B. Cut the pipe ends of 5 cm.



#### 7.1.2 Clean the heating tools

After checking the heater bush temperature, wipe the heater bush with a clean cloth. This operation must be repeated after each welding.



#### 7.1.4 Chamfer the PP-R/ALU/PP-R

In case of PP-R ALU pipe to take off the aluminium film use the suitable tools.



#### 7.1.3 Cut the pipe

Cut the pipe at right angle, if necessary remove swarf from inside.

#### 7.1.5 Clean pipe & fitting

Clean the fitting inside and the pipe outside (the presence of dust can cause improper fusion).



## 7.2 Fusion

### 7.2.1 Mark the pipe

Mark the pipe for depth of penetration into the heater bush and fitting (see table).  
The mark must remain visible under heating and joining.



### 7.2.2 Heat pipe & fitting

Push the pipe and the fitting into the heating tools. Once pipe and fitting are hot (after the correct time), pull out pipe and fitting very slowly.



### 7.2.3 Joint pipe & fitting

Joint the pipe & the fitting and push the pipe until it reaches the mark (that has to stay outside).

During the jointing time the welded part of pipe and fitting must remain fix, without any rotation.

During the cooling time, the welded part of pipe and fitting can be adjusted until cold.



### 7.2.4 Fusion inspection

Fusion inspection.

The outer fusion seam must be inspected.  
The seam must be present all around the pipe.



Summary Value table

pipe diameter (mm)	minimum wall thickness (mm)	insert depth (mm)	heating time (sec.)	jointing time (sec.)	cooling time (min.)
20	3,4	14	6	4	2
25	4,2	16	7	4	3
32	5,4	18	8	6	4
40	6,7	20	12	6	4
50	8,4	23	18	6	5
63	10,5	26	25	8	6
75	12,5	28	30	8	8
90	15,0	31	40	10	8
110	18,4	33	50	10	8

## 8. Electrofusion

The welding can also be made by means of the electrofusion machine. This machine is useful in the repair situation, where it is difficult to use the standard machine and where there is a little space.

### Pay attention to the following instructions:

1. Wipe the coupling area of the pipe with a clean cloth. Scrap the same area with a blade all around the pipe. Check the pipe ovalisation ( $\ll 1.5\%$ ).



2. Just before electrofusion, degrease the treated pipe end by means of solvent and lint free cloth.



3. Unpack the fitting and position it on the pipe, so that the sleeve-end matches the pipe-end. Insert the end of the other pipe. Make sure that both ends of the pipe are lined up and secure the fitting and the pipe.



4. Fix the electrofusion machines cables so that the cables do not weigh on the clamps. Connect the clamps to the resistor terminals on the fitting and make sure that the connection is correct. Follow the instructions to program and operate the welding machine.



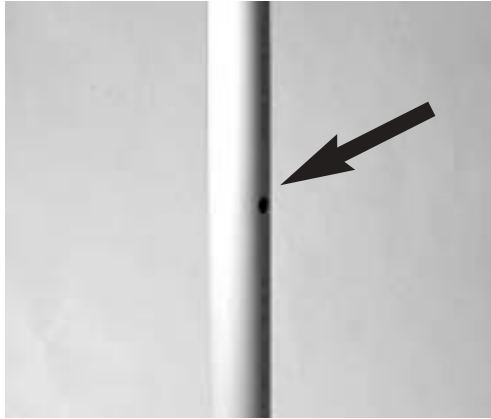
### Minimum cooling time without moving sleeve and pipe

d mm	minutes
20	10
25	10
32	10
40	15
50	15
63	20
75	25
90	30
110	35

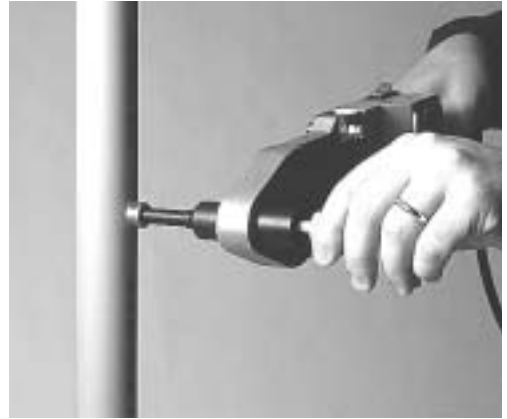
*about 2 hours hardening time must be allowed from when the fitting is cool before any pressure tests can be used.*

## 9. Hole repairing

In case of accidental drilling it is possible to repair the pipe as follows:



**1.** As first, adequate the hole to the hole member dimension. They are available in 7 mm and 11 mm, respectively repairing an hole of 6 mm and 10 mm. Take the hole to this dimensions.



**2.** Proceed to the normal fusion, heating the two part for 5 sec. positioning in relation to the thickness of the pipe, the ogive in brass. This avoid to waste the pipe.



**3.** Joint the two parts and keep the repairing part for a while until cool.



**4.** Wait after the cooling time before cutting the part in excess.



# 10. Instruction for the welding saddle

## Phase of preparation of welding

Mount the saddle welding tool to the manual welding machine. Once the tools are positioned, check the surface temperature, which must be in the range of 253°C and 274 °C.

This operation may be performed with the tempil stick.

Check the surface to be welded, which have to be clean and dry .

Scrap the same area with a blade (picture 1) and just before welding degrease by light solvent and lint free cloth.

In case of PPR-ALU pipe proceed taking away the aluminium film.

### Welding phase

Heat up the pipe with the tools for 30 seconds and then further 20 sec. heat up the saddle, for a total of 50 sec. for the pipe.

Make a light pressure with the saddle on the tools.

Make sure all the surface have to be in contact with the heating tool.

### Joining process

After finishing the heating phase remove the welding unit, place the welding saddle into the pipe. Fix under a light pressure avoiding rotation for an additional 30 sec.

Drill out the pipe at the welding point with a commercial spiral drill bit (picture 4). If necessary clean the hole of chips which may remain.

Caution is to be taken in drilling the correct depth and use the correct diameter see table 1.

The system may be exposed to full load after 30 minutes the last welding.



Please find in page 26 the welding parameters.

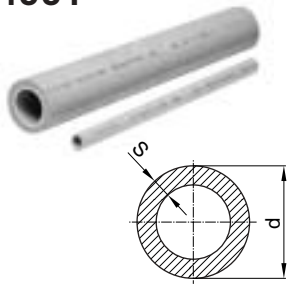


**Table 1. Welding parameter**

<b>Diameter Pipe (mm)</b>	<b>Diameter derivation (mm)</b>	<b>Heating time pipe (sec)</b>	<b>Heating time saddle (sec)</b>	<b>holding time (sec)</b>	<b>Cooling time (min)</b>	<b>Hole Diameter (mm)</b>
40	20	30	20	30	30	15
50	20	30	20	30	30	15
63	20	30	20	30	30	15
63	25	30	20	30	30	20
75	20	30	20	30	30	15
75	25	30	20	30	30	20
90	20	30	20	30	30	15
90	25	30	20	30	30	20
40	1/2"	30	20	30	30	12
40	3/4"	30	20	30	30	12
50	1/2"	30	20	30	30	12
50	3/4"	30	20	30	30	12
63	1/2"	30	20	30	30	12
63	3/4"	30	20	30	30	15
75	1/2"	30	20	30	30	12
75	3/4"	30	20	30	30	15
90	1/2"	30	20	30	30	12
90	3/4"	30	20	30	30	15

# 11. System pipes and fittings

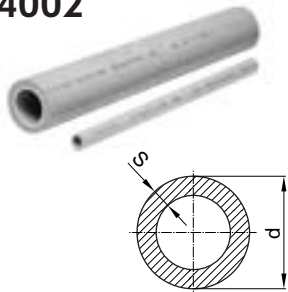
4001



Pipe PN20

d x s	Code	GP	g/m	L
20 x3,4	760 840 002	90 mt	0,176	3000
25 x4,2	760 840 003	60 mt	0,270	3000
32 x5,4	760 840 004	45 mt	0,444	3000
40 x6,7	760 840 005	30 mt	0,686	3000
50 x8,4	760 840 006	15 mt	1,037	3000
63x10,5	760 840 007	9 mt	1,688	3000
75x12,5	760 840 008	9 mt	2,409	3000
90x15,0	760 840 009	9 mt	3,450	3000
110x18,4	760 840 010	6 mt	4,910	3000

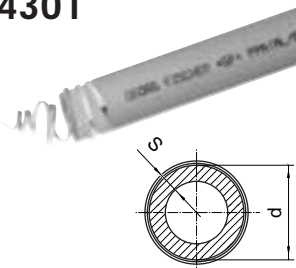
4002



Pipe PN10 for cold water only

d x s	Code	GP	g/m	L
20 x1,9	760 840 012	90 mt	0,107	3000
25 x2,3	760 840 013	60 mt	0,164	3000
32 x3,0	760 840 014	45 mt	0,267	3000
40 x3,7	790 840 015	30 mt	0,412	3000
50 x4,6	760 840 016	15 mt	0,636	3000
63 x5,8	760 840 017	9 mt	1,005	3000
75 x6,9	760 840 018	9 mt	1,418	3000
90 x8,2	760 840 019	6 mt	2,03	3000
110x10,0	760 840 020	6 mt	3,01	3000

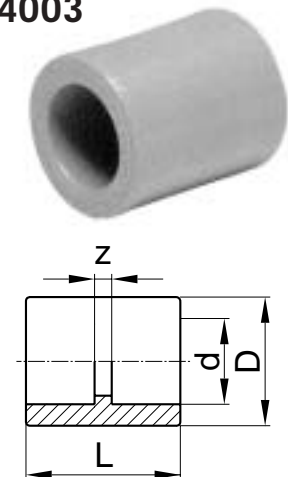
4301



PP-R ALU pipe with aluminium

d x s	Code	GP	g/m	L
20 x2,8	760 840 902	100 mt	0,192	4000
25 x3,5	760 840 903	100 mt	0,298	4000
32 x4,4	760 840 904	40 mt	0,460	4000
40 x5,5	760 840 905	40 mt	0,680	4000
50 x6,9	760 840 906	20 mt	1,055	4000
63 x8,7	760 840 907	12 mt	1,585	4000
75x10,3	760 840 908	12 mt	2,205	4000
90x12,3	760 840 909	4 mt	3,235	4000
110x15,1	760 840 110	8 mt	4,880	4000

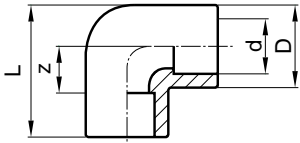
4003



Socket

d	Code	SP	GP	g	D	L	z
20	760 840 022	20	180	13	30	36	4
25	760 840 023	15	135	17	34	40	4
32	760 840 024	10	70	26	42	43	3
40	760 840 025	10	40	52	55	47	3
50	760 840 026	6	24	91	69	53	3
63	760 840 027	2	10	167	86	62	4
75	760 840 028	2	8	168	107	67	5
90	760 840 029	1	6	280	127	74	6
110	760 840 030	2	1	379	135	85	8

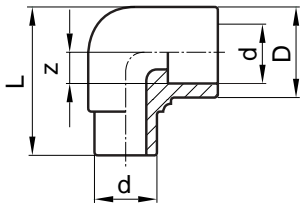
## 4005



## 90° elbow

d	Code	SP	GP	g	D	L	z
20	760 840 032	20	140	18	30	42	11
25	760 840 033	10	80	30	34	48	13
32	760 840 034	10	50	46	42	59	18
40	760 840 035	5	25	90	55	71	21
50	760 840 036	4	12	168	69	87	27
63	760 840 037	2	8	315	86	106	34
75	760 840 038	1	4	535	107	124	39
90	760 840 039	1	2	861	129	145	45
110	760 840 040	1	1	1093	138	163	56

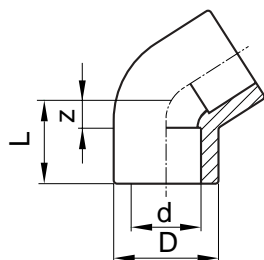
## 4007



## 90° elbow, male-female

d	Code	SP	GP	g	D	L	z
20	760 840 042	20	140	18	29	45	14
25	760 840 047	10	80	29	34	51	16
32	760 840 048	10	50	48	42	60	19

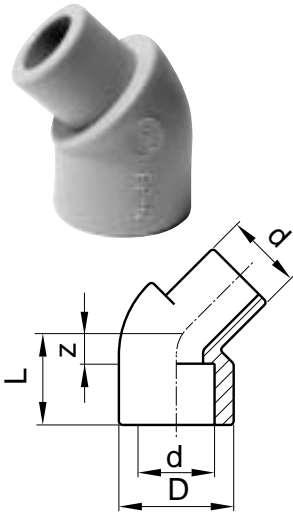
## 4009



## 45° elbow

d	Code	SP	GP	g	D	L	z
20	760 840 052	20	160	15	30	20	5
25	760 840 053	20	100	20	34	22	6
32	760 840 054	10	60	31	42	27	8
40	760 840 055	10	30	69	55	31	10
50	760 840 056	5	15	124	69	36	12
63	760 840 057	2	8	237	86	44	14
75	760 840 058	1	4	396	107	47,5	16
90	760 840 059	1	2	531	122	55	19
110	760 840 060	1	1	650	138	66	23,5

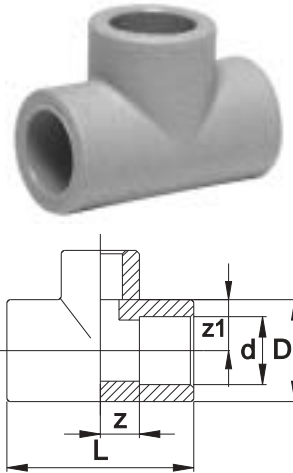
### 4025



### 45° elbow, male-female

d	Code	SP	GP	g	D	L	z
20	760 840 172	20	100	15	30	20	5

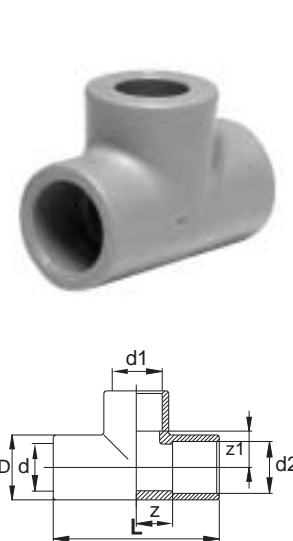
### 4011



### 90° tee

d	Code	SP	GP	g	D	L	z	z1
20	760 840 062	20	100	23	30	55	11,5	11,5
25	760 840 063	10	60	36	34	64	14	14
32	760 840 064	10	30	69	42	77	18,5	18,5
40	760 840 065	5	15	126	55	87	21,5	21,5
50	760 840 066	2	10	239	69	105	27,5	27,5
63	760 840 067	1	4	444	86	126	34	34
75	760 840 068	1	4	704	107	141	39,5	39,5
90	760 840 069	1	2	921	123	162	46	46
110	760 840 070	1	1	1277	138	193	55,5	55,5

### 4013

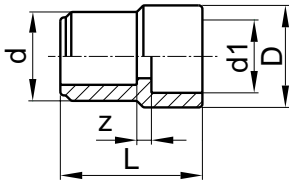


### Reducing tee

d - d1 - d2	Code	SP	GP	g	D	L	z	z1
25- 20- 25	760 840 071	10	60	38	34	64	14	14
25- 20- 20	760 840 072	10	60	41	34	64	15	14
25- 25- 20	760 840 073	10	60	38	34	64	15	14
32- 20- 32	760 840 076	10	30	64	42	77	18,5	18,5
32- 25- 32	760 840 077	10	30	64	42	77	18,5	18,5
32- 32- 25	760 840 078	10	30	64	42	77	19,5	18,5
32- 25- 25	760 840 079	10	30	68	42	77	19,5	18,5
40- 20- 40	760 840 082	5	15	138	55	88	24,7	21
40- 25- 40	760 840 083	5	15	136	55	88	24,7	19
40- 32- 40	760 840 084	5	15	135	55	88	24,7	25,5
50- 20- 50	760 840 087	2	10	268	69	106	27	29
50- 25- 50	760 840 088	2	10	264	69	106	27	28
50- 32- 50	760 840 089	2	10	260	69	106	27	26
50- 40- 50	760 840 090	2	10	254	69	106	27	32
63- 25- 63	760 840 092	1	4	490	86	128	34	33
63- 32- 63	760 840 093	1	4	485	86	128	34	35
63- 40- 63	760 840 094	1	4	480	86	128	34	33
63- 50- 63	760 840 095	1	4	473	86	128	34	34
75- 25- 75	760 840 086	1	4	690	107	141	39,5	43
75- 32- 75	760 840 096	1	4	680	107	141	39,5	41
75- 40- 75	760 840 097	1	4	670	107	141	39,5	38
75- 50- 75	760 840 098	1	4	660	107	141	39,5	38
75- 63- 75	760 840 099	1	4	650	107	141	39,5	35
90- 75- 90	760 840 100	1	2	881	123	162	46	45,5

## 4015

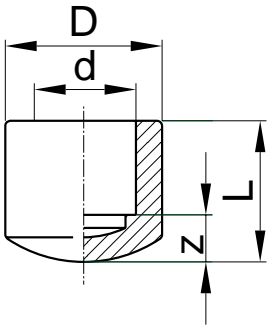
### Reducing bush, male-female



d - d1	Code	SP	GP	g	D	L	z
25 - 20	760 840 102	20	200	10	28	39	5
32 - 20	760 840 105	15	120	16	28	44	8
32 - 25	760 840 106	15	120	18	33	46	8
40 - 20	760 840 107	10	80	27	29	47	10
40 - 25	760 840 109	10	80	29	35	50	11
40 - 32	760 840 110	10	80	34	44	52	11
50 - 20	760 840 111	10	40	47	27	53	12
50 - 25	760 840 112	10	40	52	34	55	12
50 - 32	760 840 114	10	40	52	44	58	13
50 - 40	760 840 115	10	40	61	55	60	13
63 - 20	760 840 117	5	20	87	27	60	15
63 - 25	760 840 118	5	20	86	32	62	15
63 - 32	760 840 119	5	20	86	42	64	15
63 - 40	760 840 120	5	20	97	55	70	19
63 - 50	760 840 121	5	20	111	59	70	17
75 - 25	760 840 129	2	10	127	32	66	12
75 - 32	760 840 130	2	10	129	42	63	12
75 - 40	760 840 122	2	10	135	55	63	14
75 - 50	760 840 123	2	10	150	70	70	14
75 - 63	760 840 124	2	10	183	87	75	15
90 - 50	760 840 125	2	8	192	71	72	17
90 - 63	760 840 126	2	8	205	86	82	19
90 - 75	760 840 127	2	8	245	100	84	19
110 - 75	760 840 116	1	1	360	110	93	29
110 - 90	760 840 128	1	1	344	110	96	31

## 4017

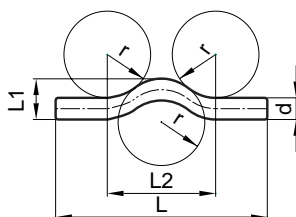
### Cap



d	Code	SP	GP	g	D	L	z
20	760 840 132	20	240	10	30	27	11
25	760 840 133	20	200	13	34	29	11
32	760 840 134	10	100	21	42	33	13
40	760 840 135	10	60	39	55	35	15
50	760 840 136	10	30	73	69	42	20
63	760 840 137	5	20	137	86	50	25
75	760 840 138	2	8	251	107	58	27

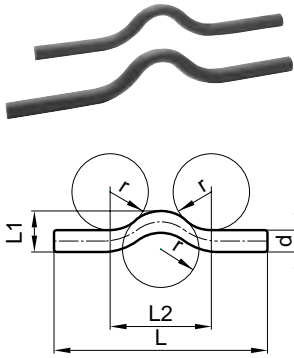
## 4019

### Swan neck



d	Code	SP	GP	g	r	L	L1	L2
20	760 840 142	10	80	64	80	350	45	200
25	760 840 143	10	60	99	80	350	55	200
32	760 840 144	8	32	156	80	350	67	200

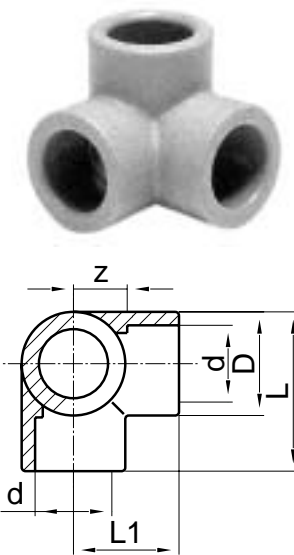
### 4020



### Narrow swan neck

d	Code	SP	GP	g	r	L	L1	L2
20	760 840 146	10	80	64	70	365	55	180

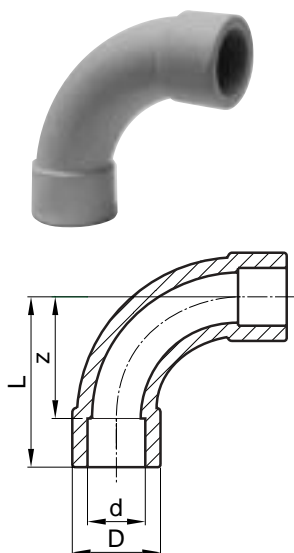
### 4021



### Three-ways welding 90° elbow

d	Code	SP	GP	g	D	L	L1	z
20	760 840 152	20	100	22	30	41,5	27,5	10

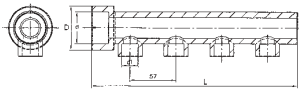
### 4023



### 90° bend

d	Code	SP	GP	g	D	L	z
20	760 840 162	10	100	31	29	70	40
25	760 840 163	10	50	38	34	85	50

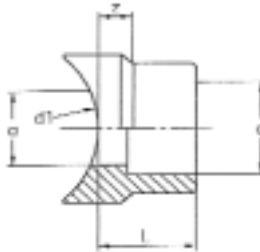
## 4026



## Manifold

d	Code	SP	GP	g	D	L	z
40 x 16	760 840 181	1	10	212	55	255	57
40 x 20	760 840 182	1	10	203	55	255	57
40 x 1/2"	760 840 186	1	10	461	55	255	57

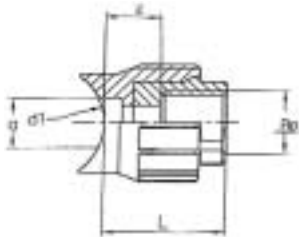
## 4027



## Saddles

d - d1	Code	SP	GP	d1	d	L	α	z
40 - 20	760 840 190	10	100	40	20	23	15	8.5
50 - 20	760 840 192	10	100	50	20	23	15	8.5
63 - 20	760 840 194	10	100	63	20	23	15	8.5
63 - 25	760 840 195	10	100	63	25	25	20	8.5
75 - 20	760 840 197	10	100	75	20	23	15	8.5
75 - 25	760 840 198	10	100	75	25	25	20	9
90 - 20	760 840 220	10	100	90	20	23	15	8.5
90 - 25	760 840 221	10	100	90	25	25	20	9

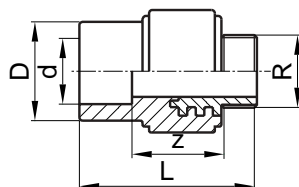
## 4092



## Threaded female saddles

d - Rp	Code	SP	GP	L	α	z
40 - 1/2"	760 840 764	10	100	40	12	22
40 - 3/4"	760 840 765	10	100	40	15	22
50 - 1/2"	760 840 766	10	100	40	12	22
50 - 3/4"	760 840 767	10	100	40	15	22
63 - 1/2"	760 840 768	10	100	40	12	22
63 - 3/4"	760 840 769	10	100	40	15	22
75 - 1/2"	760 840 770	10	100	40	12	22
75 - 3/4"	760 840 771	10	100	40	15	22
90 - 1/2"	760 840 773	10	100	40	12	22
90 - 3/4"	760 840 774	10	100	40	15	22

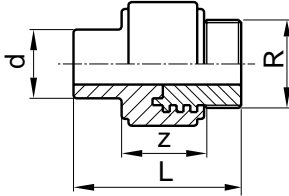
## 4029



## Threaded male coupling

d - R	Code	SP	GP	g	D	L	z
20 - 1/2"	760 840 241	10	90	86	30	54	23
20 - 3/4"	760 840 242	10	60	137	34	56	24
25 - 1/2"	760 840 243	10	60	88	34	56	25
25 - 3/4"	760 840 244	10	60	134	34	56	22
32 - 3/4"	760 840 245	6	30	137	42	67	31
32 - 1"	760 840 246	6	30	328	42	80	43
40 - 1"	760 840 239	6	12	338	54	86	28
40 - 1 1/4"	760 840 247	2	12	463	54	85	43
50 - 1 1/2"	760 840 248	2	12	529	68	89	44
63 - 2"	760 840 249	2	8	776	85	100	46
75 - 2 1/2"	760 840 250	1	5	1170	101	108	50
90 - 3"	760 840 238	1	1	1450	121	113	50

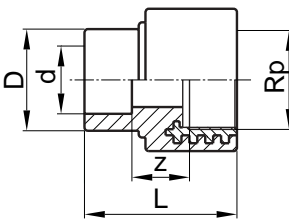
## 4030



### Threaded male coupling for connection

d - R	Code	SP	GP	g	L	z
20 - 1/2"	760 840 251	10	90	83	52	21
25 - 1/2"	760 840 253	10	70	88	52	21
25 - 3/4"	760 840 254	10	70	131	55	21
32 - 3/4"	760 840 255	6	30	168	65	29
32 - 1"	760 840 256	6	30	323	77	40
40 - 1"	760 840 257	6	12	324	78	33

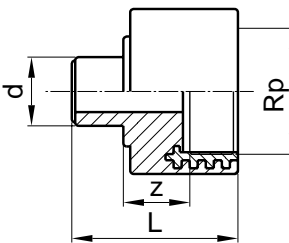
## 4031



### Threaded female coupling

d - Rp	Code	SP	GP	g	D	L	z
20 - 1/2"	760 840 271	10	100	76	30	42	13
20 - 3/4"	760 840 272	10	70	84	34	42	12
25 - 1/2"	760 840 273	10	70	78	34	42	11
25 - 3/4"	760 840 274	10	70	83	34	42	10
32 - 3/4"	760 840 275	6	30	89	42	53	19
32 - 1"	760 840 276	6	30	240	42	62	25
40 - 1"	760 840 269	6	12	249	54	71	28
40 - 1 1/4"	760 840 277	2	12	381	54	68	26
50 - 1 1/2"	760 840 278	2	12	441	68	71	26
63 - 2"	760 840 279	2	8	610	85	80	26
75 - 2 1/2"	760 840 280	1	5	803	101	83	25

## 4032

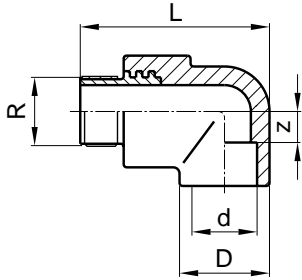


### Threaded female coupling for connection

d - Rp	Code	SP	GP	g	L	z
20 - 1/2"	760 840 281	10	100	66	40	13
25 - 1/2"	760 840 283	10	80	75	40	11
25 - 3/4"	760 840 284	10	80	79	40	10
32 - 3/4"	760 840 285	6	30	117	51	19
32 - 1"	760 840 286	6	30	233	61	26
40 - 1"	760 840 287	6	30	235	62	24



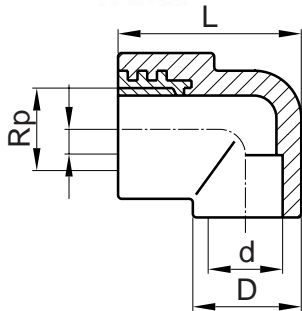
### 4033



### Threaded male 90° elbow

d - R	Code	SP	GP	g	D	L	z
20 - 1/2"	760 840 291	10	70	94	29	61	12
20 - 3/4"	760 840 292	10	50	141	29	65	12
25 - 1/2"	760 840 293	10	40	109	34	69	15
25 - 3/4"	760 840 294	10	40	153	34	71	15
32 - 3/4"	760 840 295	6	30	163	42	83	17
32 - 1"	760 840 296	6	24	345	43	91	19

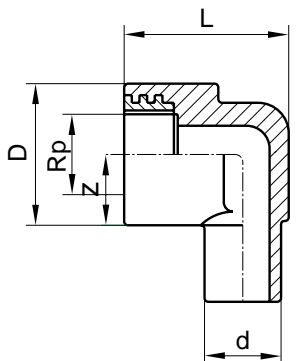
### 4035



### Threaded female 90° elbow

d - Rp	Code	SP	GP	g	D	L	z
20 - 1/2"	760 840 301	10	80	85	29	49	12
20 - 3/4"	760 840 302	10	50	91	29	49	12
25 - 1/2"	760 840 303	10	40	98	34	57	15
25 - 3/4"	760 840 304	10	40	103	34	57	15
32 - 3/4"	760 840 305	5	40	113	43	69	17
32 - 1"	760 840 306	6	24	256	44	75	19

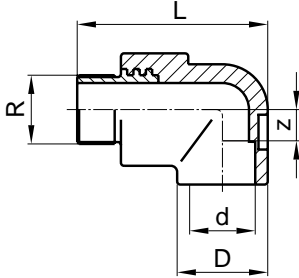
### 4036



### Threaded female 90° elbow with spigot

d - Rp	Code	SP	GP	g	D	L	z
20 - 1/2"	760 840 315	10	80	79	37	43	14

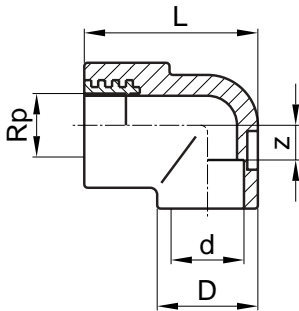
4037



**Threaded male 90° elbow with bracket**

d - R	Code	SP	GP	g	D	L	z
20 - 1/2	760 840 321	10	60	96	29	62	12

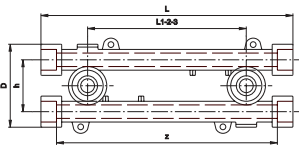
4039



**Threaded female 90° elbow with bracket**

d - Rp	Code	SP	GP	g	D	L	z
20 - 1/2	760 840 331	10	70	88	29	50	12

4040

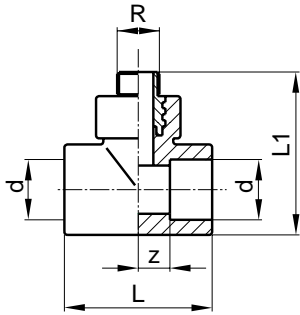


**Modular fastening**

d - Rp	Code	SP	GP	g	L	D	z	L1	L2	L3
20 - 1/2	760 840 335	1	8	129	248	80	220	100	135	153

Variable Wheelbare 130-150-180 mm

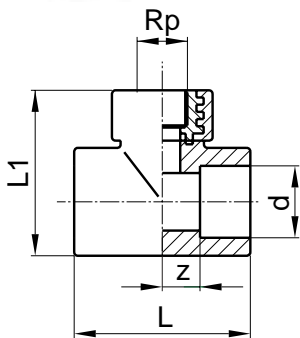
## 4041



## Threaded male tee

d - R	Code	SP	GP	g	L1	L	z
20 - 1/2	760 840 341	10	60	98	64	55	11
20 - 3/4	760 840 342	10	50	144	65	55	11
25 - 1/2	760 840 343	10	40	111	69	64	14
25 - 3/4	760 840 344	10	40	160	72	64	14
32 - 3/4	760 840 345	6	24	184	79	77	18
32 - 1	760 840 346	6	18	357	91	77	18

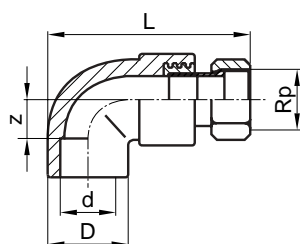
## 4043



## Threaded female tee

d - Rp	Code	SP	GP	g	L1	L	z
20 - 1/2	760 840 351	10	70	87	50	55	11
20 - 3/4	760 840 352	10	50	95	50	55	11
25 - 1/2	760 840 353	10	40	103	57	64	14
25 - 3/4	760 840 354	10	40	108	57	64	14
32 - 1/2	760 840 360	6	24	126	64	77	18
32 - 3/4	760 840 355	6	24	133	64	77	18
32 - 1	760 840 356	6	18	267	75	77	18

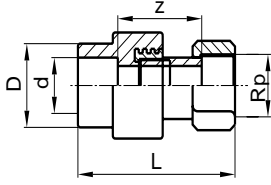
## 4045



## 90° elbow for metal taper threaded

d - Rp	Code	SP	GP	g	D	L	z
20 - 3/4	760 840 362	10	70	145	29	69	12
25 - 1	760 840 365	10	40	209	34	91	15
25 - 1 1/4	760 840 367	6	24	414	43	101	19

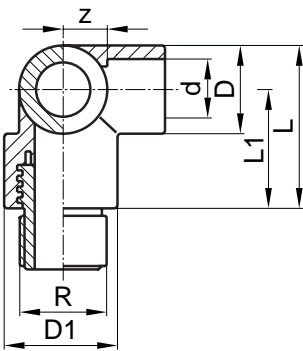
### 4047



### Adaptor union for metal taper threaded

d - Rp	Code	SP	GP	g	D	L	z
20 - 3/4	760 840 372	10	60	130	30	63	23
25 - 1	760 840 375	10	40	189	34	68	27
32 - 1 1/4	760 840 377	6	18	315	43	90	30
40 - 1 1/2	760 840 379	1	10	620	54	102	68
50 - 2	760 840 380	1	10	807	68	110	72

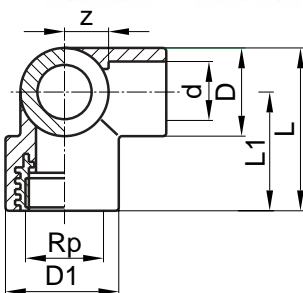
### 4048



### Three-ways wending threaded male 90° elbow

d - R	Code	SP	GP	g	D	L	z	L1	D1
20 - 1/2	760 840 382	10	70	97	29	62,5	12	35	37

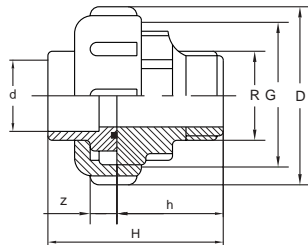
### 4049



### Three-ways wending threaded female 90° elbow

d - Rp	Code	SP	GP	g	D	L	z	L1	D1
20 - 1/2	760 840 392	10	80	87	29	49,5	12	35	37

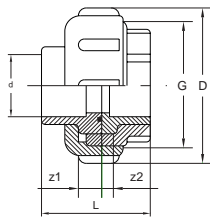
### 4086



### Adaptor union socket threaded male

d - Rp	Code		SP	GP	g	H	h	z	G	D
25 - 3/4	760 840 702		10	20	300	67	41	8	1 1/2	56
32 - 1	760 840 703		5	10	430	73	45	8	2 1/2	69
40 - 1 1/4	760 840 704		5	10	640	80	48	10	2 1/2	83
50 - 1 1/2	760 840 705		2	5	730	83	48	10	2 3/4	90
63 - 2	760 840 706		2	4	1050	92	54	10	3 1/2	104

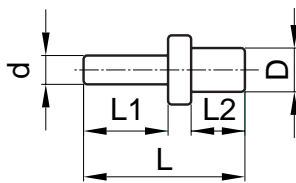
### 4088



### Adaptor union socket-socket

d	Code		SP	GP	g	L	z1	z2	G	D
25	760 840 732		10	20	210	49	8	5	1 1/2	56
32	760 840 733		5	10	290	53	8	5	2 1/2	69
40	760 840 734		5	10	460	59	10	5	2 1/2	83
50	760 840 735		2	5	490	65	10	5	2 3/4	90
63	760 840 736		2	4	710	71	10	5	3 1/2	110

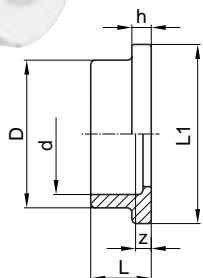
### 4053



### Repairing hole

d	Code		SP	GP	g	D	L		L1	L2
7,5/11,4	760 840 425		20	20	4	11,4	42		22	14

### 4050



### Flange adaptor

d	Code		SP	GP	g	D	L	z	L1
25	760 840 414		10	50	12	33	23	5	41
32	760 840 415		6	30	18	41	25	5	50
40	760 840 416		4	20	24	50	27	5	61
50	760 840 417		2	10	46	61	33	8	74
63	760 840 418		2	10	84	76	37	8	91
75	760 840 419		2	10	140	90	39	8	107
90	760 840 420		2	8	213	106	46	10	126
110	760 840 421		1	1	240	131	49	7	150

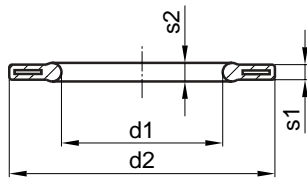
## 5085



## Backing flange

d	Code	SP	GP	g	D	a	k	b	l
25	761 066 983	2		260	105	34	75	12	14
32	761 066 984	2		430	115	42	85	16	14
40	761 066 985	2		650	140	51	100	16	18
50	761 066 986	2		820	150	62	110	18	18
63	761 066 987	2		940	165	78	125	18	18
75	761 066 988	2		1340	185	92	145	20	18
90	761 066 989	2		1400	200	110	160	20	18
110	761 066 990	2		1560	220	133	180	20	18

## 5087



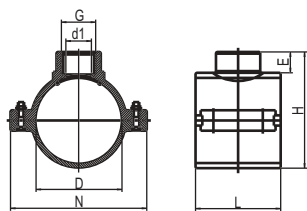
## Flange seals EPDM

d	Code	SP	GP	g	d2	d1	s1	s2
25	761 066 330	5		12	61	25	3	4
32	761 066 331	5		15	71	32	3	4
40	761 066 332	5		19	82	40	3	4
50	761 066 333	5		22	92	50	3	4
63	761 066 334	5		41	107	63	4	5
75	761 066 315	1		54	127	75	4	5
90	761 066 316	1		60	142	90	4	5
110	761 066 317	1		83	162	110	5	6

## Reinforced clamps saddles



from 40 to 110 mm; outlet from 1" to 1".3/4



please contact our office for application range

## 4055



### Stop cock with handle

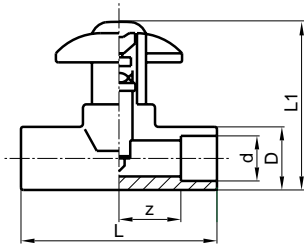
d	Code		SP	GP	g	D	L	z	L1
20	760 840 462		4	16	359	28	77	22	114
25	760 840 463		4	16	384	36	87	25	118
32	760 840 464		4	16	494	43	90	25	119

## 4055



### Stop cock

d	Code		SP	GP	g	D	L	z	L1
20	760 840 432		4	16	309	28	77	22	91
25	760 840 433		4	16	292	36	87	25	91
32	760 840 434		4	16	351	43	90	25	98



#### Handle for cock

20/25/32	760 840 436*		10	100	64	36	87	16/18	121
----------	--------------	--	----	-----	----	----	----	-------	-----



#### Extension for cock

20/25/32	760 840 438		10	100	96	36	87	16/18	130
----------	-------------	--	----	-----	----	----	----	-------	-----

#### Covering tube ①

	760 840 430								
--	-------------	--	--	--	--	--	--	--	--

#### Covering plate ②

	760 840 431								
--	-------------	--	--	--	--	--	--	--	--

#### Stop cock components ③

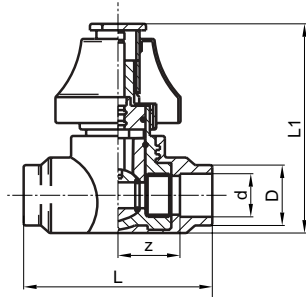
20/25	760 840 437		10	40					
32	760 840 439		10	40					

#### Body stop cock ④

20	760 840 426		10	40					
25	760 840 427		10	40					
32	760 840 428		10	40					

\* ad esaurimento

## 4056



### Ball valve

d	Code	SP	GP	g	D	L	z	L1
20	760 840 444	2	16	393	28	86	27	100
25	760 840 445	2	16	404	33	98	31	100

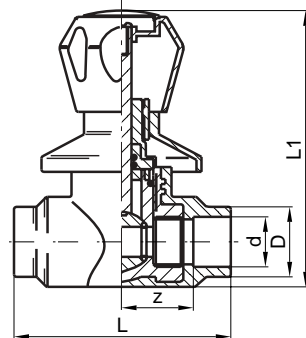
#### Covering tube and plate

	760 840 443			4				
--	-------------	--	--	---	--	--	--	--

#### Extension Kit

20/25	760 840 450			1				
-------	-------------	--	--	---	--	--	--	--

## 4056



### Ball valve with handle

d	Code	SP	GP	g	D	L	z	L1
20	760 840 447	2	16	511	28	86	27	105
25	760 840 448	2	16	522	33	98	31	105

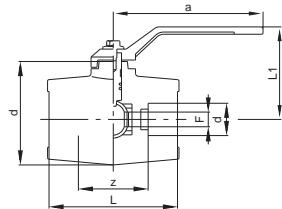
#### Handle and covering tube and plate

	760 840 451			4				
--	-------------	--	--	---	--	--	--	--

#### Extension Kit

20/25	760 840 450			1				
-------	-------------	--	--	---	--	--	--	--

## 4096

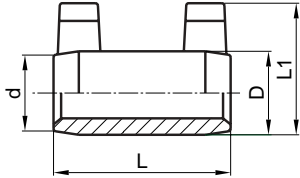


### Ball valve with handle

d	Code	SP	GP	g	L	a	z	L1
32	760 840 794		15	190	79,5	102	43,5	63
40	760 840 795		8	350	94	119,5	54	78
50	760 840 796		6	510	109	119,5	63	83
63	760 840 797		3	935	130	146	78	103



## 4061



### Electric socket

d	Code	SP	GP	g	D	L	L1
20	760 840 452	1	10	40	33	70	50
25	760 840 453	1	10	49	38	70	57
32	760 840 454	1	10	63	46	79	62
40	760 840 455	1	5	92	55	90	71
50	760 840 456	1	2	149	67	100	82
63	760 840 457	1	1	263	86	106	101
75	760 840 458	1	1	320	103	121	115
90	760 840 459	1	1	475	121	131	134
110	760 840 460	1	1	765	142	142	156

## 4083

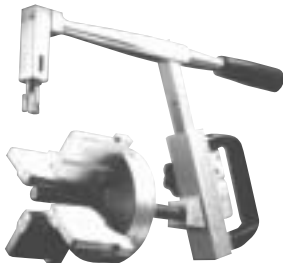


### Electrofusion machine

d	Code
20/110	760 840 689

input voltage 220V – 50Hz  
voltage 24V  
potenza 1200 Watt

## RTC 160



### Pipe scraping tool

d	Code
63 / 110	760 840 508

## 91 98 033



### Pipe scraping tool

d	Code
	799 198 033

4105



**Standard socket welder**

d	Code		SP	GP	mod.
16/63	760 840 518			1	PF63R
16/63	760 840 519			1	PF63E

P Socket welder with electromechanical temperature regulation  
 PE Socket welder with electronic temperature regulation  
 Power 600 Watt

4108

**Standard socket welder**

d	Code		SP	GP	mod.
16/110	760 840 521			1	PF110R

Potenza 1500 Watt - 230 volt

4110



**Bench holder**

d	Code		SP	GP	mod.
	760 840 524			1	PF63R PF63E

4118



**Tool kit for PF63R/PF63E**

d	Code		SP	GP	mod.
	760 840 533			1	PF63R - PF63E

4124



**Complete socket welder**

d	Code		SP	GP	mod.
20/25/32	760 840 540			1	VALPF63

- PF63E manual welding with electromechanical thermostat power 600 Watt
- Heating tools 20 – 25 – 32
- Bench and fork holder
- Empty box

4134



**Electronic socket welding machine**

d	Code		SP	GP	mod.
20/110	760 840 554			1	PW110R

**Set of heating tools**

20/110	760 840 560				complete set
--------	-------------	--	--	--	--------------

box packaging, without heating tools  
 1500 Watt - 230 Volt

## 4145



### Set of heating tools for welder

d	Code		SP	GP	
20	760 840 562		1m+1f		
25	760 840 563		1m+1f		
32	760 840 564		1m+1f		
40	760 840 565		1m+1f		
50	760 840 566		1m+1f		
63	760 840 567		1m+1f		
75	760 840 568		1m+1f		
90	760 840 569		1m+1f		
110	760 840 570		1m+1f		
<b>Hole mender</b>					
7,5	760 840 481		1m+1f		
11,4	760 840 482		1m+1f		

### Set of heating tool for saddles



d	Code		SP	GP	
40	760 840 585		1m-1f		
50	760 840 586		1m-1f		
63	760 840 587		1m-1f		
75	760 840 588		1m-1f		
90	760 840 589		1m-1f		

## 5310



### Thermostatic pencil

	Code		SP	GP	
	799 496 008			1	melting temperature 253°C
	799 496 009			1	melting temperature 274°C

## 5320



### Safety gloves

	Code		SP	GP	
	761 066 799			1	

## 4073



### Cutting nippers

d	Code		SP	GP	
20/32	760 840 484			1	
20/75	760 840 486			1	

Legend:	D : outside diameter of the pipe	Rp : parallel internal thread
	SP : pieces for plastic bag	g : gram
	GP : pieces for box	L : length
	R : taper external thread	z : dimension after welding
	d : inside diameter	

4074



**Pipe cutter**

d	Code	SP	GP
20/75	790 109 505		1
50/110	790 109 506		1

9.300.200  
9.300.300



**Chamfering and peeling tool for PP-R pipes**

d	Code	SP	GP
20	799 300 260		1
25	799 300 270		1
32	799 300 280		1
40	799 300 290		1
50	799 300 300		1
63	799 300 310		1
75	799 300 320		1
90	799 300 330		1
110	799 300 340		1

4185



**Chamfering and peeling tool for PP-R pipes**

d	Code	SP	GP
20	760 840 822		1
25	760 840 823		1
32	760 840 824		1
40	760 840 825		1
50	760 840 826		1
63	760 840 827		1
75	760 840 828		1
90	760 840 829		1
110	760 840 830		1

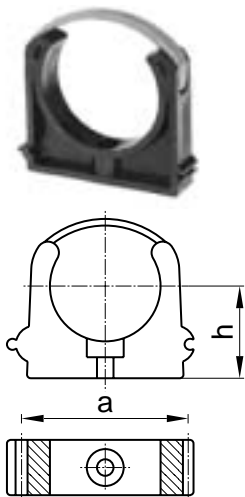
**Handle for chamfering**

d	Code	SP	GP
20/32	760 840 818		1

**Side handle**

d	Code	SP	GP
40/110	760 840 819		1

27.060.000



**Pipe clamp**

d	Code	SP	GP	g	a	h
20	167 061 006	10	200	8	36	25
25	167 061 007	10	200	10	41	27
32	167 061 008	10	200	13	51	31
40	167 061 009	10	150	23	62	35
50	167 061 010	10	140	32	72	40
63	167 061 011	10	80	45	88	52
75	167 061 012	10	60	62	102	58
90	167 061 013	10	-	91	123	70
110	167 061 014	10	-	123	146	80

**Version beige**

d	Code	SP	GP	g	a	h
20	700 244 496	10	200	8	36	25
25	700 244 497	10	200	10	41	27
32	700 244 498	10	200	13	51	31

4058



**Plan test plug**

d	Code	SP	GP	colour
1/2	760 840 512		100	blue
1/2	760 840 513		100	red

Complete of o-ring

## 12. Standards and approvals

<b>DIN 8077</b>	PP pipes - sizes
<b>DIN 8078</b>	PP pipes - quality assurance standards
<b>DIN 16962</b>	PP pipes and fittings for pressure pipings
<b>DIN 2999</b>	Fittings with threaded metal insert
<b>DIN 1988</b>	Standards for drinking water plants
<b>DIN 4109</b>	Standards for piping noise reduction
<b>DIN 8076</b>	Metal insert fittings
<b>DVS 2207</b>	Welding regulations for thermoplastic materials
<b>DVS 2208</b>	Machines and equipment for thermoplastic welding
<b>DIN 16887</b>	Under pressure long time operating
<b>DWGW-GKR</b>	Organolettic qualifications
<b>ÖNORM B 5014</b>	Tests for materials normally in contact with drinking water
<b>L 102</b>	Ministerial paper.

### Product certification +GF+ AQUASYSTEM



**AENOR**

Asociación Española de Normalización y Certificación (Spain).  
Certificado N° 001/1062



**LNEC**

Laboratório Nacional de Engenharia Civil.  
Departamento de Materiais de Construção (Portugal).  
DH 485

**kiwa**

**KIWA**

Certification and Inspection (Holland).  
K 12023/01



**CSTB**

Hydraulique & Équipements Sanitaires (France).  
ATEC 14+15/99 - 545 CSTBat 73/74 - 545



**RINA**

Registro Italiano Navale (Italy).  
N° MAC/71398/1/TO/99



**Lloyd's Register**

LR Type Approval Certificate  
n° 01/00100



**AR**

Comisia de Agrement Tehnic in Constructii (Romania).  
002 - 05/137 - 1998



Ministry of Electricity & Water (Kuwait).  
211-1998



**Agenzia Regionale per la Protezione dell'Ambiente della Lombardia**  
**Laboratorio di Chimica Ambientale**  
v.le di Bergamo  
Via C. Mattei, s.4  
24121 Bergamo  
tel. 035-285815-Fax. 035-285845

**RAPPORTO DI PROVA**  
N° 86/NSA

**CAMPIONE DI** : Racordo del sistema AQUASYSTEM in PPR  
**PRESENTATO DA** : Ditta GEORG FISCHER S.p.A.  
Via Sondrio, 1 Cernusco s/N (MI)  
**IN DATA** : 22/01/2001

**DATI D'ANALISI**

Il campione costituito da provino di Raccordo del sistema AQUASYSTEM in PPR tipo 2 -  
materia prima: POLIPROPILENE RANDOM, è stato sottoposto a contatto per 24 ore a 40°C con  
acqua distillata previo lavaggio con acqua corrente e successivo risciacquo rapido con acqua  
distillata.

Sul liquido sono state eseguite le seguenti determinazioni:

**Migrazione globale** : 0,1 mg/dm<sup>3</sup> pari a 0,8ppm  
**Migrazione dei coloranti** : Trasmissione ottica superiore al 95%  
(determinazione spettrofotometrica tra 400 e 700 nm)

La dichiarazione della composizione del prodotto è stata fornita dalla ditta  
GEORG FISCHER S.p.A. - Cernusco s/N (MI)

**GIUDIZIO**: Per le prove di migrazione globale e migrazione dei coloranti effettuate nelle  
condizioni di sperimentazione sopra descritte, il materiale è idoneo a venire a contatto con acqua  
potabile e/o da potabilizzare secondo i criteri stabiliti dalla Circolare Ministeriale della Sanità n. 102  
del 02.12.78, salvo verifica della formula compositiva.

Bergamo, 02/03/2001

IL RESP. DELLA SEZ. ACQUE POTABILI  
Di *[firma]*

IL RESP. DI CHIMICA AMBIENTALE  
Di *[firma]*

NSA - Registro Generali Analisi  
I risultati delle analisi si riferiscono esclusivamente al campione sottoposto a prova.  
Il presente rapporto di prova non può essere utilizzato a scopo pubblicitario e promozionale  
senza l'autorizzazione del Laboratorio di emissione.

**Agenzia Regionale per la Protezione dell'Ambiente della Lombardia**  
**Laboratorio di Chimica Ambientale**  
v.le di Bergamo  
Via C. Mattei, s.4  
24121 Bergamo  
tel. 035-285815-Fax. 035-285845

**RAPPORTO DI PROVA**  
N° 87/NSA

**CAMPIONE DI** : Tuto del sistema AQUASYSTEM in PPR  
**PRESENTATO DA** : Ditta GEORG FISCHER S.p.A.  
Via Sondrio, 1 Cernusco s/N (MI)  
**IN DATA** : 22/01/2001

**DATI D'ANALISI**

Il campione costituito da provino di Tuto del sistema AQUASYSTEM in PPR tipo 3 -  
materia prima: POLIPROPILENE RANDOM, è stato sottoposto a contatto per 24 ore a 40°C  
con acqua distillata previo lavaggio con acqua corrente e successivo risciacquo rapido con acqua  
distillata.

Sul liquido sono state eseguite le seguenti determinazioni:

**Migrazione globale** : 0,45 mg/dm<sup>3</sup> pari a 2,7 ppm  
**Migrazione dei coloranti** : Trasmissione ottica superiore al 95%  
(determinazione spettrofotometrica tra 400 e 700 nm)

La dichiarazione della composizione del prodotto è stata fornita dalla ditta  
GEORG FISCHER S.p.A. - Cernusco s/N (MI)


**GIUDIZIO**: Per le prove di migrazione globale e migrazione dei coloranti effettuate nelle  
condizioni di sperimentazione sopra descritte, il materiale è idoneo a venire a contatto con acqua  
potabile e/o da potabilizzare secondo i criteri stabiliti dalla Circolare Ministeriale della Sanità n. 102  
del 02.12.78, salvo verifica della formula compositiva.

Bergamo, 02/03/2001

IL RESP. DELLA SEZ. ACQUE POTABILI  
Di *[firma]*

IL RESP. DI CHIMICA AMBIENTALE  
Di *[firma]*

Nota:  
NSA - Registro Generali Analisi  
I risultati delle analisi si riferiscono esclusivamente al campione sottoposto a prova.  
Il presente rapporto di prova non può essere utilizzato a scopo pubblicitario e promozionale  
senza l'autorizzazione del Laboratorio di emissione.

  
**agrement tehnic 002 - 05/137 - 1998**

**Tevi din polipropilena reticulara pentru instalatii de  
alimentare cu apa calda si rece (TIP 3)**  
- **GEORG FISCHER + GF +** -  
Pipes of polypropylene random for water networks - (TIP 3) -  
GEORG FISCHER + GF +  
Tuyaux au polypropilene pour installations de l'eau - (TIP 3) -  
GEORG FISCHER + GF +

**Titular :** CONSOL ROMANIA S.R.L.  
Str. Trestiana nr. 9  
Tel.: 212.27.41  
Fax: 210.14.66  
BUCURESTI, ROMANIA

**GEORG FISCHER + GF +**  
Giorgio Fischer SpA, Via Sondrio no 1  
20063 Cernusco - Sul Naviglio - (MI)  
ITALY  
Tel: 0039 / 02 / 92186.227  
Fax: 0039 / 02 / 92140.785


**Prodicator :** GEORG FISCHER + GF +  
Giorgio Fischer SpA, Via Sondrio no 1  
20063 Cernusco - Sul Naviglio - (MI)  
ITALY  
Tel: 0039 / 02 / 92186.227  
Fax: 0039 / 02 / 92140.785

**COMISIA DE AGREMENT TEHNIC IN CONSTRUCTII**

LABORATORUL CENTRAL s.a. Bucuresti  
ROMANIA ; Bucuresti 2 ; Str. Barbu Vacarescu Nr.162 ; Tel. 230 42 58 ; Telefax 230 54 57 ; Telex 11706

Grupa specializata nr. 5 - produse pentru instalatii aferente constructiilor -

Prezentul Agrement Tehnic este valabil numai inotit de acord  
Comisiei de Agrement Tehnic in Constructii din ROMANIA

  
**MINISTRY OF ELECTRICITY & WATER**  
**WATER RESOURCES DEVELOPMENT CENTER**  
**TOXICITY TEST OF NON-METALLIC MATERIALS**

**Material** : P-P-R POLYPROPYLENE PIPES - GEORG FISCHER.  
**Tested for** : MUSTAFA AL - AYOUB TRADING COMPANY W.L.L.  
**ref.n** : 211 \ 1998  
**Date received** : 16 \ 9 \ 1998. **Date out** : 12 \ 10 \ 1998.

**APPLICATION DETAILS:**  
P-P-R POLYPROPYLENE PIPES - GEORG FISCHER.  
applied by                      on                       
cured for                      to be used in contact with potable water.

**TEST DETAILS:**  
Physical and chemical results of the soaking test carried out on the samples for ten  
days for toxic metals and six days for organics in chlorinated potable water at  
50°C are as follow :

1.Taste,odor or color :                       
2.PH value :                       
3.Release of T.O.C :                       
4.Release of toxic metals :                       
5.Release of T.H.M :                       
6.Release of phenols :                       
7.Release of other organics :                     

Based on the above results the tested material is suitable to be used in contact with  
drinking water under the surveillance condition of Kuwait ( Water Quality &  
Temperature).  
Note :- The results described in this report relate only to the samples  
submitted for evaluation.  
-The Ministry of Electricity & Water is not responsible towards any  
changes in the specifications of the material.

**OPERATOR** : *[firma]*  
**HEAD OF SECTION** : *[firma]*  
**DIRECTOR** : *[firma]*









## DET NORSKE VERITAS QUALITY SYSTEM CERTIFICATE

Certificate No. **CERT-04873-09-Q-MIL-SINCERT**

*Si attesta che / This is to certify that*

**IL SISTEMA QUALITÀ DI / THE QUALITY SYSTEM OF**

**GEORG FISCHER S.p.A.**  
**Via Sondrio, 1 - 20063 Cernusco sul Naviglio (MI) - Italy**

*È CONFORME AI REQUISITI DELLA NORMATIVA  
HAS BEEN FOUND TO CONFORM TO THE QUALITY SYSTEM STANDARD*

**UNI EN ISO 9002:1994 (ISO 9002:1994)**

*Questa certificazione è valida per il seguente campo applicazione:  
This certificate is valid for the following product or service ranges:*

*(The actual compliance requirements in scope + responsibility for aspects of the normative is assessed against contractual formalization conditions  
if further clarifications regarding the scope and/or application of the standard's requirements may be obtained by consulting the certified organization)*

**Commercializzazione di prodotti, sistemi e attrezzature per impianti acqua, aria, gas;  
commercializzazione di accessori per veicoli industriali**

*Trade of products, systems and equipment for water, air and gas works;  
trade of accessories for industrial vehicles*

*L'ufficio e data  
Place and date*  
**Agrate Brianza, (MI) 2002-06-21**

*Data Prima Emisione:  
First Issue Date:*  
**1999-09-01**

*per l'Organismo di Certificazione  
for the Accredited Unit*  
**Det Norske Veritas Italia S.r.l.**

**Lead Auditor: ANDREA MARIA TACCHI**

**Settore EA: 29a**

**SINCERT**  
SINCERT REGISTRAR S.p.A.

**Leonardo Claudio Fortini**  
Management Representative

*An update of this compliance is subjected to periodical audits (every 6, 9 or 12 months) and complete re-assessment of the system every 36 (3) years.  
An update of compliance shall occur in all cases in which the unit concerned is not deemed to be in compliance. Update of Certificate can be verified online on [www.dnv.com](http://www.dnv.com)*

## GEORG FISCHER +GF+

Georg Fischer S.p.A., Via Sondrio, 1-20063 Cernusco s/N (MI)  
Telefono 02 92 186.1 - Fax 02 92 140 785-6  
e-mail: [office@piping.georgfischer.it](mailto:office@piping.georgfischer.it)  
Internet: <http://www.piping.georgfischer.com>

