Onur® Plastik O.F.S.

Raw Material

Technical data

Polypropylene Random Copolimer (PP-R)

Pipe and fittings are produced using PP Random Copolimer (PP-R). PP Random Copolimer is commonly used in drinking water installations, hot water, floor and radiator heating systems and every kind of industrial liquid distribution systems.

PP-R has a lot of advantages over other plastics such as; long life duration, high resistance to pressure and heat, better flexibility, high acoustic and thermal insulaton, high molecular weight, low MFI.

PP-R confirms the requirements of ASTM F 2389, DIN 8077, DIN 8078 ,EN ISO 15874 standards.

Technical Specifications

Characteristics		Unit	Test Method	Values
Density	+23°C	g/cm3	ISO 1183	0,909
Melt Flow Index (MFI)	190 °C /5 kg	g/10 min	ISO 1133	0,4-0,6
	230°C /2,16 kg	g/10 min	ISO 1133	0,2-0,5
	230°C /5 kg	g/10 min	ISO 1133	0,8-1,3
Tensile Stress at yield (23°C)	(50 mm/min)	MPa	ISO 527	25
Tensile Strain at Yield	(50 mm/min)	%	ISO 527	10
Flexural Modules	+23°C	N/mm²	ISO 527	800
Charpy Impact Strength (notched)	+23°C	kJ/m²	ISO 179	>15
	0°C	kJ/m²	ISO 179	>5
Charpy Impact Strength (unnotched)	0°C	kJ/m²	ISO 179	No break
Vicat Softening Point	(1 kg)	°C	ASTM D 1525 ISO 306 DIN 53460	130
	(5 kg)	°C		60
Melting Range		°C	Polarizing Microscope	140-150
Linear Thermal Expansion Co-efficient		1/K	DIN 53752	1,5x10-4
Thermal Conductivity		W/mK	DIN 52612	0,24
Hardness (Shore D)	(3 sec value)		ISO 868	65
Pipe Friction Factor				0,007

Mechanical characteristics of tubular test pieces made of PPR by injection moulding (TS EN ISO 15874-3)

Characteristic	Requirement	Test parameters for the individual tests PPR					Test method
		Hydrostatic Stress (Mpa)	Test Temp. (C°)	Test Period (h)	Number of test pieces	Test Pressure (Bar)	
Resistance to İnternal pressure	No failure during the test period	16,0	20	1	3	53,1	ISO 1167-1 ISO 1167-3
		3,5	95	1000	3	11,6	

Mechanical characteristics of pipes (TS EN ISO 15874-2)

Characteristic	Requirement	Test parameters for the individual tests PPR					Test method
		Hydrostatic Stress (Mpa)	Test Temp. (C°)	Test Period (h)	Number of test pieces	Test Pressure (Bar)	
Resistance to İnternal pressure	No failure during the test period	16,0	20	1	3	64	ISO 1167-1 ISO 1167-2
		4,3	95	22	3	17,2	
		3.8	95	165	3	15,2	
		3,5	95	1000	3	14	

Physical and chemical characteristics of pipes (TS EN ISO 15874-2)

Characteristic	Requirement	Test parameters		Test method
		Parameter	Value	
Longitudinal reversion	≤ %2	Test temperature PPR Duration of exprosure for: en ≤ 8 mm 8mm ≤ en≤ 16mm en > 16mm Number of test pieces	135 °C 1 h 2 h 4 h 3	Method B of ISO 2505 (oven test)
Thermal stability by hydrostatic pressure testing	No bursting during the test period	Test temperature Hydrostatic stress Test period Number of test pieces	110 °C 1,9 MPa 8760 h 1	ISO 1167-1 ISO 1167-2
Impact resistance	≤ %10	Test temperature Number of test pieces	0 °C 10	ISO 9854-1 ISO 9854-2
MFI (Raw material)	≤ 0,5g /10 min	Test temperature Mass Number of test pieces	230 °C 2,16 kg 3	ISO 1133-1
MFI (Pipe)	%30 maximum difference compared with compound from the same batch	Test temperature Mass Number of test pieces	230 °C 2,16 kg 3	

Pipe Dimension and Tolerances According to DIN 8077

SDR 11 (PN10)

Outside Ø mm.	Tolerance mm.	Thickness mm.	Tolerance mm.	Inside Ø mm.	In" inches
20	+0.3/-0	1.9	+0.3/-0	16.20	1/2"
25	+0.3/-0	2.3	+0.4/-0	20.40	3/4"
32	+0.3/-0	2.9	+0.4/-0	26.20	1"
40	+0.4/-0	3.7	+0.5/-0	32.60	1 1/4"
50	+0.5/-0	4.6	+0.6/-0	40.80	1 1/2"
63	+0.6/-0	5.8	+0.7/-0	51.40	2"
75	+0.7/-0	6.8	+0.8/-0	61.40	2 1/2"
90	+0.9/-0	8.2	+1.0/-0	73.60	3"
110	+1.0/-0	10.0	+1.1/-0	90.00	4"
125	+1.2/-0	11.4	+1.3/-0	102.20	5"

SDR 7,4 (PN16)

Outside Ø mm.	Tolerance mm.	Thickness mm.	Tolerance mm.	Inside Ø mm.	In" inches
20	+0.3/-0	2.8	+0.4/-0	14.00	1/2"
25	+0.3/-0	3.5	+0.5/-0	18.00	3/4"
32	+0.3/-0	4.4	+0.6/-0	23.20	1"
40	+0.4/-0	5.5	+0.7/-0	29.00	1 1/4"
50	+0.5/-0	6.9	+0.8/-0	36.20	1 1/2"
63	+0.6/-0	8.6	+1.0/-0	45.80	2"
75	+0.7/-0	10.3	+1.2/-0	54.40	2 1/2"
90	+0.9/-0	12.3	+1.4/-0	65.40	3"
110	+1.0/-0	15.1	+1.7/-0	79.80	4"
125	+1.2/-0	17.1	+1.9/-0	90.80	5"

SDR 6 (PN20)

Outside Ø mm.	Tolerance mm.	Thickness mm.	Tolerance mm.	Inside Ø mm.	In" inches
20	+0.3/-0	3.4	+0.5/-0	13.20	1/2"
25	+0.3/-0	4.2	+0.6/-0	16.60	3/4"
32	+0.3/-0	5.4	+0.7/-0	21.20	1"
40	+0.4/-0	6.7	+0.8/-0	26.60	1 1/4"
50	+0.5/-0	8.3	+1.0/-0	33.40	1 1/2"
63	+0.6/-0	10.5	+1.2/-0	42.00	2"
75	+0.7/-0	12.5	+1.4/-0	50.00	2 1/2"
90	+0.9/-0	15.0	+1.7/-0	60.00	3"
110	+1.0/-0	18.3	+2.0/-0	73.40	4"
125	+1.2/-0	20.8	+2.2/-0	83.40	5"

Operating life According to DIN 8077 (SF=1,5)

Temperature (C°)	Years of Service	PN10	PN16	PN20
		Pipe Series (S)		
		5	3,2	2,5
		Standart Dimension Ratio (SDR)		
		11	7,4	6
		Allowable Operating Pressure (Bar)		
10	1	17,5	27,8	35,1
	5	16,5	26,2	33,0
	10	16,1	25,6	32,2
	25	15,6	24,7	31,1
	50	15,2	24,1	30,3
20	1	15,0	23,7	29,9
	5	14,1	22,3	28,1
	10	13,7	21,7	27,4
	25	13,2	21,0	26,4
	50	12,9	20,4	25,7
30	1	12,7	20,2	25,4
	5	11,9	18,9	23,8
	10	11,6	18,4	23,2
	25	11,2	17,7	22,3
	50	10,9	17,2	21,7
40	1	10,8	17,1	21,6
	5	10,1	16,0	20,2
	10	9,8	15,5	19,6
	25	9,4	15,0	18,8
	50	9,2	14,5	18,3
50	1	9,1	14,5	18,2
	5	8,5	13,5	17,0
	10	8,2	13,1	16,5
	25	7,9	12,6	15,9
	50	7,7	12,2	15,4
60	1	7,7	12,2	15,4
	5	7,1	11,3	14,3
	10	6,9	11,0	13,9
	25	6,6	10,5	13,3
	50	6,4	10,2	12,9
70	1	6,5	10,3	12,9
	5	6,0	9,5	12,0
	10	5,8	9,2	11,6
	25	5,0	8,0	10,0
	50	4,2	6,7	8,5
80	1	5,4	8,6	10,8
	5	4,8	7,6	9,6
	10	4,0	6,4	8,1
	25	3,2	5,1	6,5
95	1	3,8	6,1	7,6
	5	2,6	4,1	5,2

Thermal Expansion in PPR Pipes

PPR pipes have an expansion coefficient that is much higher than the metal pipes. So, this characteristic should be taken into consideration during installations.

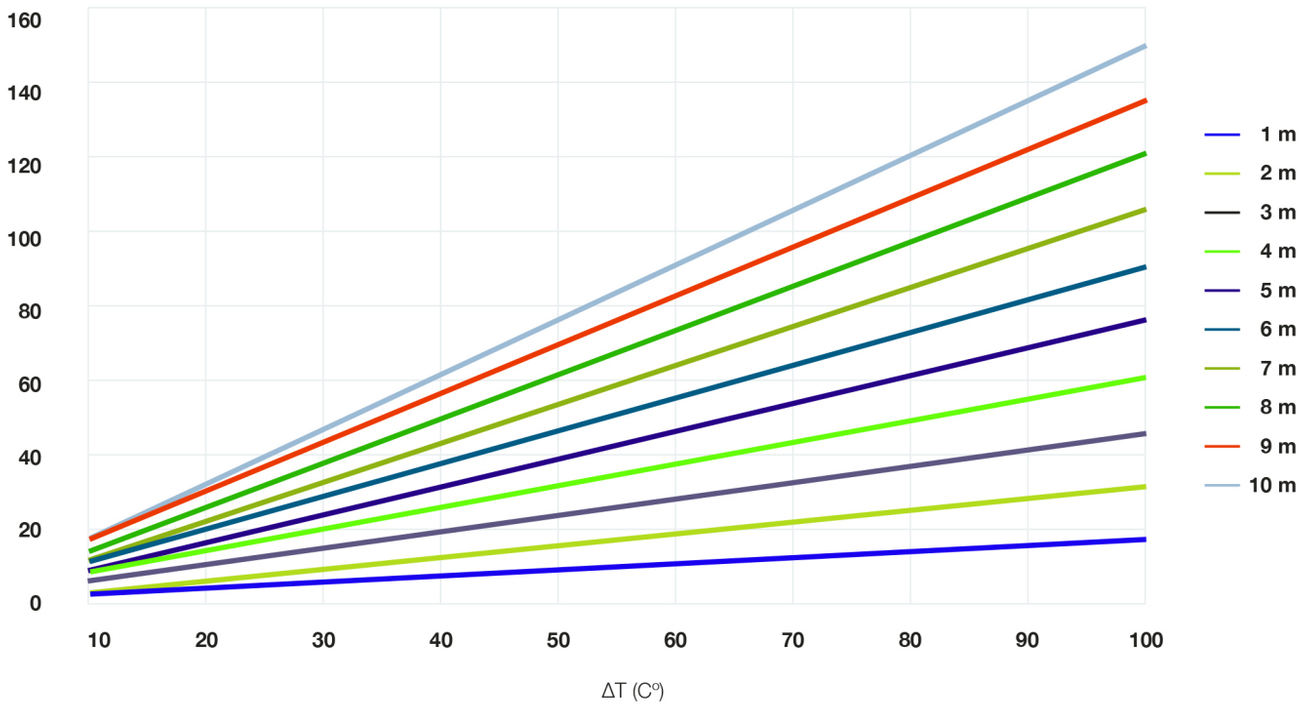
Calculation of thermal expansion is as follows:

$\Delta L = L * \Delta T * \alpha$

where
ΔT = The difference between environmental temperature and water temperature in Kelvin degrees (K) or Celsius (°C).
ΔL = Variation of length in mm.
L = Initial length of the pipe in m.
α = Coefficient of linear thermal expansion. The value of α is 1,5 * 10-4 (K-1) for PPR pipes.

Pipe Length L (m.)	Linear Expansion ΔL (mm.)									
	Temperature Difference ΔL (°C)									
	10	20	30	40	50	60	70	80	90	100
1	1.5	3	4.5	6	7.5	8	10.5	12	13.5	15
2	3	6	9	12	15	18	21	24	27	30
3	4.5	9	13.5	18	22.5	27	21..5	36	40.5	45
4	6	12	18	24	30	36	42	48	54	60
5	7	15	22.5	30	37.5	45	52.5	60	67.5	75
6	9	18	27	36	45	54	63	72	81	90
7	10.5	21	31.5	42	52.5	63	73.5	84	94.5	105
8	12.5	24	36	48	60	72	84	96	108	120
9	13.5	27	40	54	67.5	81	94.5	108	121.5	135
10	15	30	45	60	75	90	105	120	135	150

Thermal Expansion of the Standart PP-R Pipe



Example; at 70 °C for 8m PPR pipe, ΔL=?
ΔL = L * ΔT * α
ΔL=8000 mm*70*0,00015
ΔL=84 mm

PPR Glassfiber Reinforced Pipe

PP-R Glassfiber Reinforced Pipe (PP-R/GF/PP-R) consist of three layers where the inner and outer layers are produced of PP-R and the middle layer is produced of the special mixture of PP-R and Glassfiber raw material.

Main Advantages of the PP-R Glassfiber Reinforced Pipe

1) Easier and faster installation since it does not require peeling before the welding operation.
2) It has 75 % less linear expansion than the standart PP-R pipe.
3) Higher stiffness than standart PP-R pipe.
4) Glassfiber PP-R pipes have thermal expansion co-efficient close to foil pipes, they can conveniently be used in the areas where foil pipes are used. Expansion co-efficient:
   For Glassfiber Reinforced PP-R pipe: 0,035 mm/mK
   For Aluminium Foil Reinforced PP-R Pipe: 0,030 mm/mK
   For Standart PP-R Pipe: 0,15 mm/mK
5) Lighter than standart PP-R pipes.

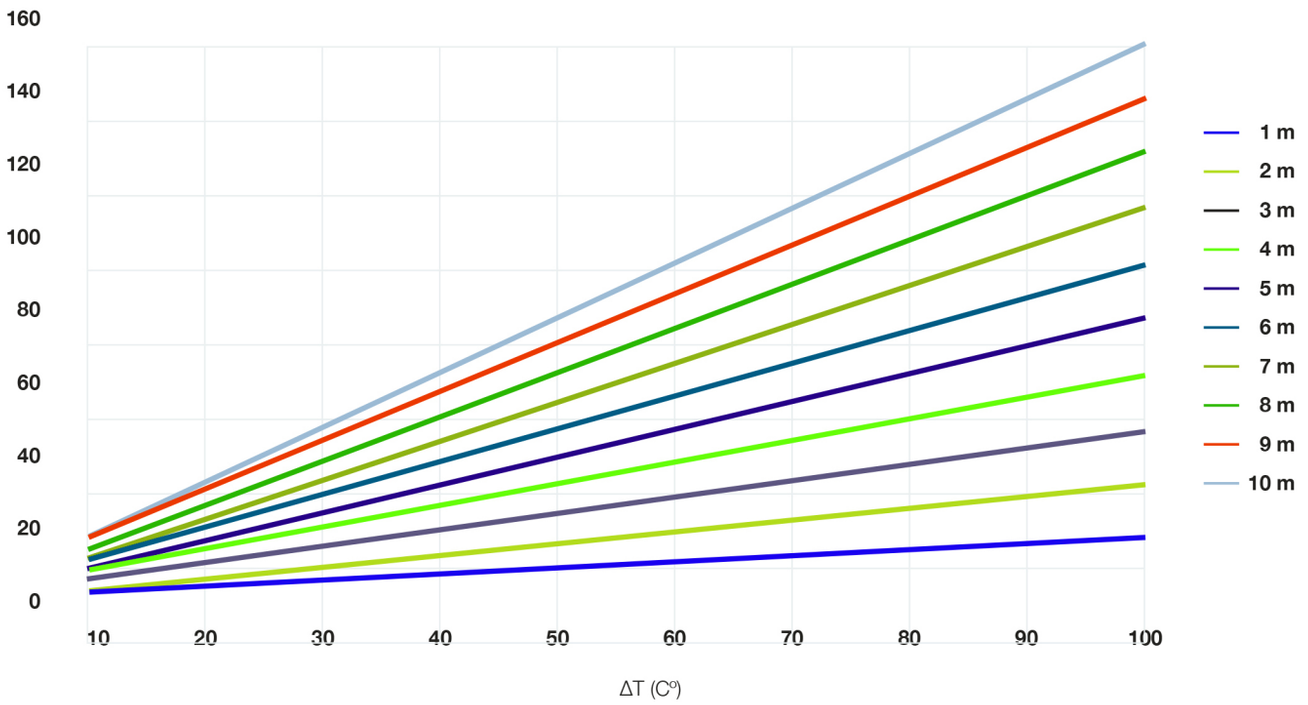
Application Areas:

1) All kinds of hot and cold water installations.
2) Air pressure installations.
3) Heating installations and radiator connections.
4) Industry.

Thermal Expansion in Glassfiber Reinforced PP-R pipe

Calculation of Glassfiber Reinfprced PP-R pipe thermal expansion is as follows:
ΔL = L * ΔT * β
where
ΔT = The difference between environmental temperature and water temperature in Kelvin degrees (K) or Celsius (°C).
ΔL = Variation of length in mm.
L = Initial length of the pipe in m.
ΔT = The difference between environmental temperature and water temperature in Kelvin degrees (K) or Celsius (°C).
β = Coefficient of linear thermal expansion. The value of β is 0,35 * 10-4 (K-1) for Glassfiber Reinforced PPR pipes.

Thermal Expansion of the Glassfiber Reinforced PP-R Pipe



Example; at 70 °C for 8m Glassfiber Reinforced PP-R pipe, ΔL=?
ΔL = L * ΔT * β
ΔL=8000 mm*70*0,000035
ΔL=19,6 mm

PPR Aluminium Foil Reinforced Pipe

This pipe consists of three layers: the pipe and the coat are made of PP-R with aluminium foil inbetween. The Aluminium foil is attached with wrapping welding and by using a special PP coating film to establish the mechanical connection between the aluminium foil and the PP-R layer.

Characteristics

- Low thermal expansion
- Oxygen impermeability
- Low heat loss
- High resistance to pressure and heat
- Easy forming, installation and application
- Hygenic
- Resistance to chemicals
- Low pressure loss due to the smoothness

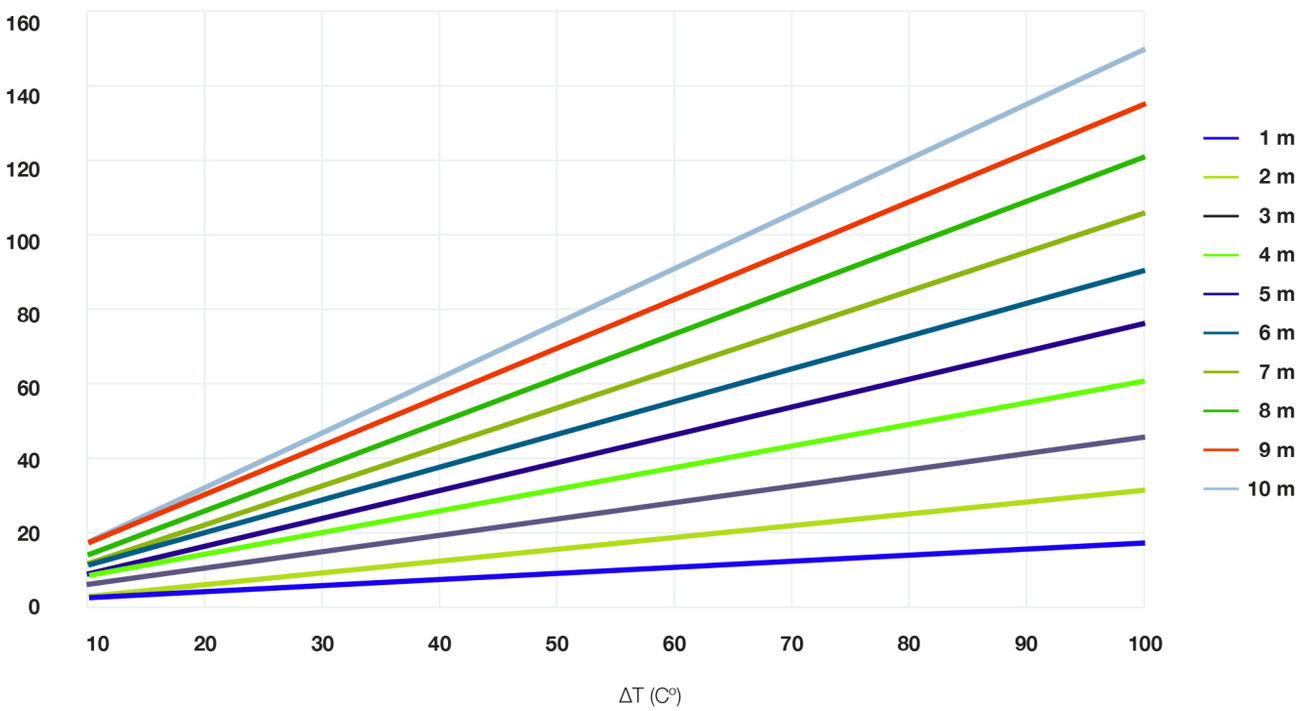
Oxygen Impermeability

Oxygen penetration reduces the operating life by corroding the radiator and heater device. Oxygen diffusion from the atmospheric air is one of the most common ways of oxygen penetration into the system. Plastic pipes do not prevent this penetration. The aluminium layer increases the life of the radiator and the heater device by preventing.

Thermal Expansion in Aluminium Foil Reinforced PP-R Pipe

Calculation of Aluminium Foil Reinforced PP-R pipe thermal expansion is as follows:
ΔL = L * ΔT * Φ
where
ΔT = The difference between environmental temperature and water temperature in Kelvin degrees (K) or Celsius (°C).
ΔL = Variation of length in mm.
L = Initial length of the pipe in m.
ΔT = The difference between environmental temperature and water temperature in Kelvin degrees (K) or Celsius (°C).
Φ = Coefficient of linear thermal expansion. The value of Φ is 0,30 * 10-4 (K-1) for Aluminium Foil Reinforced PPR pipes.

Thermal Expansion of the Aluminium Foil Reinforced PP-R Pipe



Example; at 70 °C for 8m Aluminium Foil Reinforced PP-R pipe, ΔL=?
ΔL = L * ΔT * Φ
ΔL=8000 mm*70*0,000030
ΔL=16,8 mm

Expansion Comparison Among Standard Pipe,Glassfiber Pipe and Aluminium Foil Reinforced PPR Pipe

As for seen from the examples above , at 70 °C for 8m of pipe expansion is;

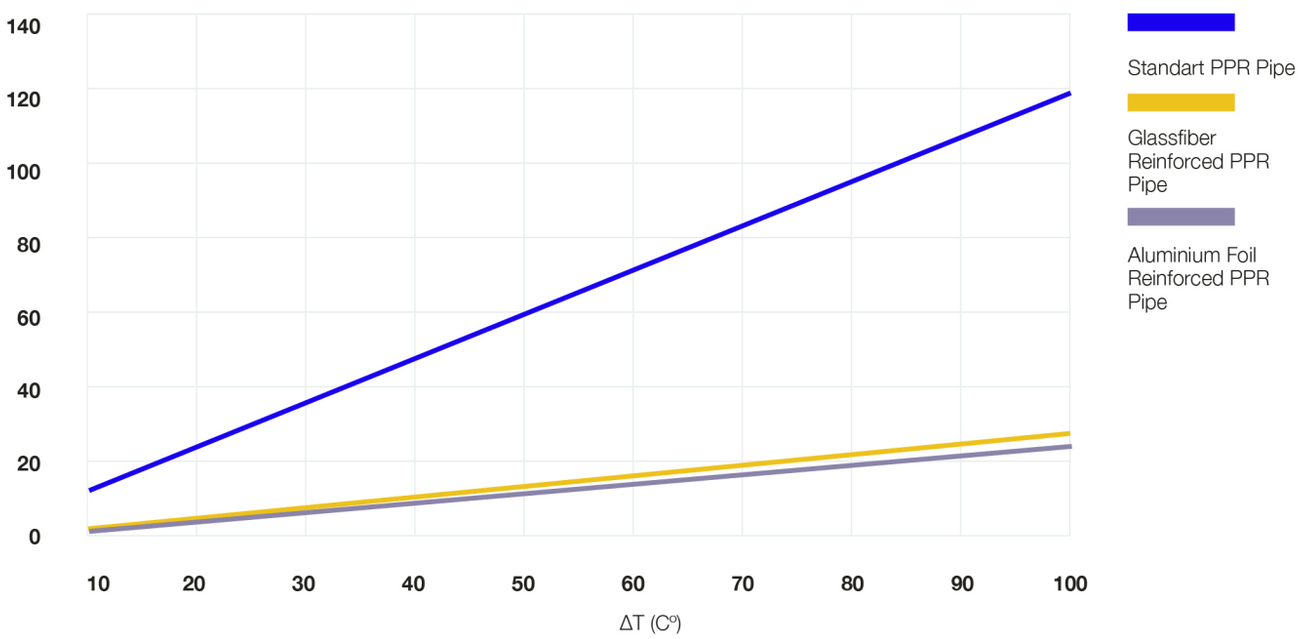
ΔL (Standart PPR Pipe) = 84 mm

ΔL (Glassfiber Reinforced PPR Pipe) = 19,6 mm

ΔL (Aluminium Foil Reinforced PPR Pipe) = 16,8 mm

In conclusion we can say Glassfiber and Aluminium Foil Reinforced PPR pipes have very closer expansion values. Therefore Glassfiber Reinforced PPR Pipe might be used easily instead of Aluminium Foil Reinforced PPR pipe.

Expansion Comparison Among Standard Pipe,Glassfiber Pipe and Aluminium Foil Reinforced PPR Pipe



Welding Technique

The quality of an installation depends on the tightness, stability and lifetime of its connections. Fusion welding technique is safe because parts made of polypropylene create a homogenous connection within the process. When the welded joint cools down, it can be fully loaded. The resulting joints are very reliable, and they are as strong as the pipe itself. The pipe may even break before the socket welded joint under tension.



Welding takes only a few seconds. After cutting the pipe perpendicularly to its axis, both the pipes and the fittings (these must be clean if not please clean it with a cloth or alcohol-water solution) are heated with the welding machine (generally up to 260 °C +/- 10 °C) and they are joined wtihout twisting. For proper connections please follow the table given below.

Outer Diameter (mm)	Heating Time (Secs)	Joining Time (Secs)	Cooling Time (Minutes)	Welding Depth (mm)
20	5	4	2	14,5
25	7	4	3	16
32	8	6	4	18
40	12	6	4	20,5
50	18	6	5	23,5
63	24	8	6	27,5
75	30	8	8	31
90	40	8	8	35,5
110	50	10	8	41,5
125	60	10	8	46,5

After Assembling Test Procedure

After assembling to start the test procedure system should be checked please see the steps below.

- Whole valves in the system must be turned off.
- While filling the system, first main valve is opened slightly.
- In order to avoid strong pressure impacts, pipe lines must be reduced air pressure from the utilization points at the highest and farthest sections.
- Separate tests are made by opening the valves of every zone.

When finishing the assembly of the installation, quality control of the system must be made by following below test procedure. Pressure testing shall be carried out in two stages.

1) For the first stage, a test pressure equal to the permissible working pressure plus 5 bar shall be produced twice within 30 minutes at 10 minute intervals. Than it shall be checked whether, over a further period of 30 minutes, the pressure has dropped by more than 0,6 bar and leakage has occurred.
2) The second stage shall follow the first stage without interval and shall last 2 hours. Then, it shall be checked whether the pressure has dropped by more than 0.2 bar and the pipework shows any signs of leakage.

Finally, If pressure drops more than the values given above in the manometer where test is observed, then leakage occurs. Leaking pipe line must be controlled and replaced or re-tightened.

Installation and Expansion Compensation

Pipes can be installed under or above the floor. The installation is very easy and quick. However, one has to pay attention to the following simple points when installing polypropylene pipes.
Pipes have to discharge the radial and axial extensions; compensation may be done by using Omega and U parts. As an alternative, metal compansation also can used instead
of the omega and U parts.

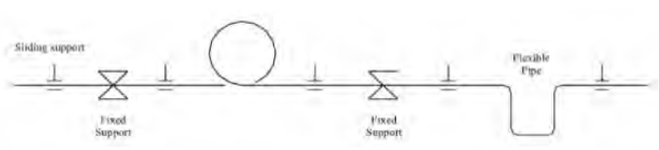


Figure 1- Omega and U part

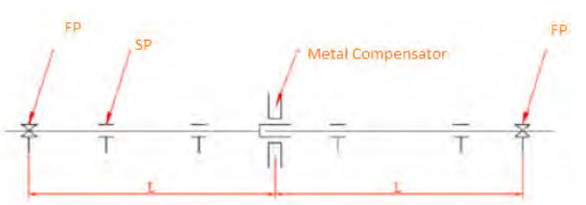


Figure 2- Metal Compensator

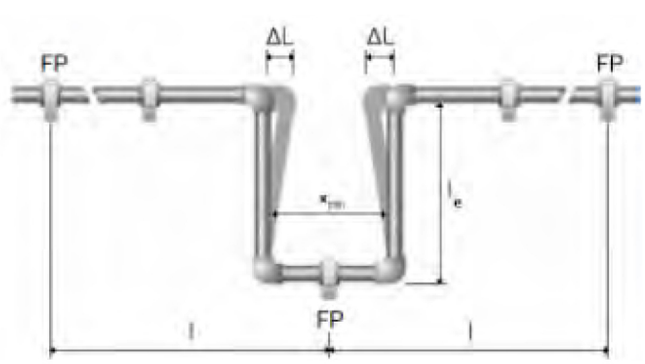


Figure 3-Distance of bending part

Length of the bending part is calculated by following equation.
Le=k * d * ΔL

Le = Lenght of the bending part (U part, mm)
d = Outside diameter of the pipe (mm)
ΔL = Variation of length (mm)
k = Material dependent constant (15 for PP)
FP: Fixing point, support point, SP: Sliding point, support point.

Clamps Interfaces
Clamps interface of standart PPR pipes (mm)

Temperature Difference ΔT (ºC)	Standart PPR Pipe Diameter (mm)									
	20	25	32	40	50	63	75	90	110	125
0	85	105	125	140	165	190	205	220	250	270
20	60	75	90	100	120	140	150	160	180	195
30	60	75	90	100	120	140	150	160	180	195
40	60	70	80	90	110	130	140	150	170	185
50	60	70	80	90	110	130	140	150	170	185
60	55	65	75	85	100	115	125	140	160	175
70	50	60	75	80	95	105	115	125	140	150

Clamps interface of Glassfiber Reinforced PPR pipes (mm)

Temperature Difference ΔT (°C)	Glassfiber Reinforced PPR Pipe Diameter (mm)									
	20	25	32	40	50	63	75	90	110	125
0	115	130	150	165	185	215	240	260	280	295
20	90	100	115	130	145	165	185	200	215	225
30	90	100	115	130	145	165	185	200	210	220
40	80	90	105	120	135	155	175	190	200	210
50	80	90	105	120	135	155	175	190	180	190
60	70	80	100	115	130	145	165	180	175	180
70	65	75	90	105	120	135	155	175	175	180

Clamps interface of Aluminium Foil Reinforced PPR pipes (mm)

Temperature Difference ΔT (°C)	Aluminium Foil Reinforced PPR Pipe Diameter (mm)									
	20	25	32	40	50	63	75	90	110	125
0	155	170	195	220	245	270	285	300	325	345
20	120	130	150	170	190	210	220	230	250	265
30	120	130	150	170	190	210	220	230	240	250
40	110	120	140	160	180	200	210	220	210	220
50	110	120	140	160	180	200	210	220	210	220
60	100	110	130	150	170	190	200	210	200	210
70	90	100	120	140	160	180	190	200	200	200

CHEMICAL RESISTANCE

Polypropylene is a polymer with very high chemical resistance. Chemical resistance varies on factors such as composition, quality condition, time of affection, concentration and temperature. The tables shown below give chemical resistance in different temperature and concentrations.

The Symbols used in the table are:
S : Saturated solution
f : Resistant
p : Partially resistant
n : Nonresistant

Products	Concentration	Temperature		
	%	20 C°	60 C°	100 C°
Accumulator acid		f	f	
Acetic glacial acid	100	f	p	n
Acetic acid	50	f	f	
Acetic acid	10	f	f	
Acetic anhydride	100	f		
Acetone	100	f	p	n
Acrylonitrile	100	p		
Alum	All	f	f	
Ammonia	High	f	f	

Products	Concentra-tion	Temperature		
	%	20 C°	60 C°	100 C°
Ammonia	10	f	f	
Ammonia	100	f	f	
Ammonium acetate	All	f	f	f
Ammonium carbonate	All	f	f	
Ammonium chloride	All	f	f	f
Ammonium nitrate	All	f	f	f
Ammonium metaphosphate	S	p	p	p
Ammonium phosphate	All	f	f	f
Ammonium sulphate	S	p	p	p
Ammonium bicarbonate	S	p	p	
Animal cooking oil		f	p	
Anti-frreze car		f	f	
Aqua regia		f	n	
Barrium chloride	All	f	f	f
Beer		f		
Benzaldhehyde		f	f	
Benzaldhehyde	S	f	f	f
Benzene		p	n	
Benzoic acid	S	f	f	p
Benzoyl chloride	100	n		
Bitter almonds fragrance		f		
Bleach	12.50%	p	p	
Borax				
Boric acid	100	f	f	
Boric acid	S	f	f	
Brandy		f		
Bromine	100	n		
Bromine	High	n	n	
Bromine	Low	n	n	
Butane	100	f		
Butane (P)	100	f	f	
Butter		f	f	
Butyol alcohol	100	f	f	
Calcium nitrate	S	f	f	
Camphor		f		
Carvon tetracloride	100	p	n	
Chlorine	100	n		
Chlorine (dry)	100	n	n	n
Chlorine (wet)	10	p	n	n
Chlorosulphonic	100	n	n	

Products	Concentra-tion	Temperature		
	%	20 C°	60 C°	100 C°
Chromic acid	S	f	n	
Chroomium (3) salts				
Chroomium (6) salts				
Citric acid	S	f	f	f
Cocoa		f	f	p
Cod liver oil		f		
Cresol	100	f	p	
Cresol	S	f	p	
Cresol oil		f		
Cyclohexane	100	f		
Cycloexanol	100	f	p	
Cycloexanon	100	f	n	
Decahydronaphtlene	100	p	n	n
Dioxan	100	f	p	n
Distilled water	100	f	f	n
Engine oil		f	p	
Ethyl alcohol	100	f		
Ethyl alcohol	96	f	f	
Ethyl alcohol	50	f	f	
Ethers	100	f	p	
Ethyl alcohol (denatured)	10	f	f	
Ethyl clorides	100	n		
Ethylene chlorides	100	p	p	
Ethylene tetracloride	100	p	n	
Formaldehyde	40	f	f	
Formaldehyde	30	f	f	
Formaldehyde	10	f	f	
Formic acid	98	f	p	
Formic acid	90	f		
Formic acid	50	f	f	
Formic acid	10	f	f	f
Fruit-juice		f	f	
Fumic sulfurric acid		n	n	n
Galvanic solutions		f	f	
Glycerol	100	f	f	
Glycerol	High	f	f	
Glycerol	Low	f	f	f
Glycol	100	f	f	
Glycol	High	f	f	
Glycol	Low	f	f	f

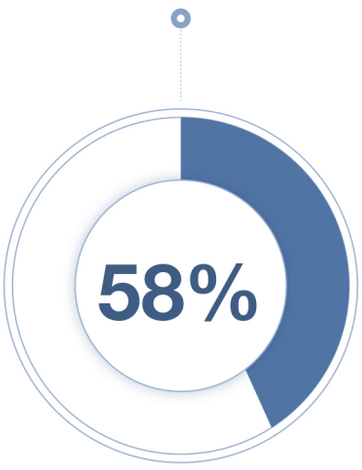
Products	Concentra-tion	Temperature		
	%	20 C°	60 C°	100 C°
Heptan	100	f	p	
Hexan	100	f	p	
Honey		f	f	
Hydrobromic acid	10	f	f	
Hydrofluoric acid	40	f	f	
Hydrogen peroxide water	30	f	p	
Hydrobromic acid	High	f	f	
Hydrogen peroxide water	10	f	f	
Hydrogen peroxide water	3	f	f	f
Ink		f	f	
Isooctane	100	f	p	
Lactic acid	90	f	f	
Lactic acid	50	f	f	
Lactic acid	10	f	f	f
Lacual water	100	f	f	f
Limestone		f	f	f
Linseed oil		f	f	
Mercury		f	f	
Mercury salts	100			
Methyl alcohol	50	f	f	
Methyl alcohol	100	f	f	
Methyl chloride	100	p		
Methym ethyl ketone	100	f	p	
Methylene diformammyde		f		
Milk		f	f	p
Mineral water		f	f	f
Naphtha		f	p	
Naphthalene	100	f		
Nitro benzene	100	p	p	
Normal gasoline		p	n	
Oil		n	n	
Oleic acid	100	f		
Olive oil		f	f	
Nitric acid	50	p	n	
Nitric acid	25	f	f	
Nitric acid	10	f	f	
Oxalic acid	S	f	f	f
Ozone	<0.5 ppm	p	p	
Paraffine	100	f	f	n
Petroleum	100	f	p	

Products	Concentra-tion	Temperature		
	%	20 C°	60 C°	100 C°
Phenylamine		f	p	
Phenylmethylketone	100	p	p	
Phosphoric acid	S	f	p	
Phosphoric acid	50	f	f	
Phosphoric acid	10	f	f	f
Potassium carbonate	S	f	f	
Potassium chlorate	S	f	f	
Potassium chloride X	S	f	f	f
Potassium dichromate	S	f	f	f
Potassium hydroxide	50	f	f	
Potassium hydroxide	25	f	f	
Potassium hydroxide	10	f	f	
Potassium hypochlorite	5	f		
Potassium iodide	S	f	f	
Potassium nitrate	S	f	f	
Sea water		f	f	f
Shampoo		f	f	
Silicone oil		f	p	
Soap solution	S	f	f	
Soap solution	10	f	f	f
Sodium bicarbonate	S	f	f	f
Potassium sluphate	S	f	f	f
Propane ®	100	f	f	f
Propane	100	f	f	f
Pyridine	100	f	p	
Sodium carbonate	S	f	f	
Sodium carbonate	10	f	f	f
Sodium chlorate	5	f		
Sodium chlorite	25	f	f	
Sodium chloride	S	f	f	f
Sodium disulphite	S	f	f	f
Sodium hidroxide	100	f	f	
Sodium hydroxide	50	f	f	
Sodium hydroxide	25	f	f	
Sodium hidroxide	10	f	f	
Sodium nitrate	S	f	f	
Sodium nitrite (P)	S	f		
Sodium perborate	S	f	f	f
Sodium phosphate	S	f	f	f

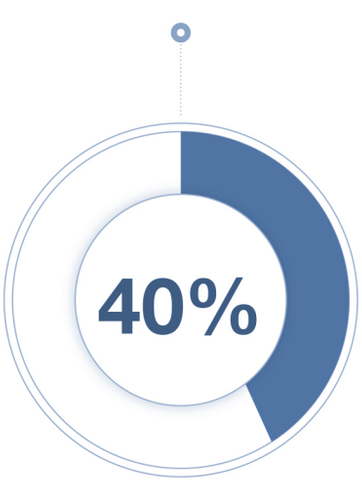
Products	Concentration	Temperature		
	%	20 C°	60 C°	100 C°
Sodium sulphate	S	f	f	f
Sodium sulphite	S	f	f	
Soluble coffee		f	f	f
Say-bean oil		f	p	
Sulphocromic acid		n	n	
Sulphur	100	f	f	f
Sulphuric acid	96	f	p	
Sulphuric acid	50	f	f	
Sulphuric acid	25	f	f	
Sulphuric acid	10	f	f	f
Sulphurous anhydride	Low	f	f	
Spirits		f		
Stannus chloride	S	f	f	
Starch	All	f	f	
Stearic acid	100	f		
Succinic acid	100	f	f	
Super gasoline		p	n	
Syntetic detersive		f	f	f
Tar		f	p	
Tartaric acid	S	f	f	
Tartaric acid	10	p	p	
Tetrahydrofurane	100	p	n	
Tetrahydronaphtalene	100	p	n	
Thea		f	f	p
Thiophene	100	p	n	
Tlouen	100	p	n	
Tomatoes-juice		f	f	
Tooth paste		f	f	
Trichlorcethylene	100	p	p	
Turpentine		n	n	n
Turpentine oil		p	n	
Two stroke engine oil		p	p	
Typewriter oil		f	p	
Urea	S	f	f	
Vaselina		f	p	
Vegetable cooking oil		f	p	
Water	100	f	f	f
Whipped cream		f		
Whisky	40	f		
Xylene or xylol	100	p	n	

Metal Insert Used For The Fittings Are BRASS MS 58 Which Means

Copper



Zinc



Others

Pb, Sn, P, Mn, Fe, Ni, Si, Mg, Cr, Al, etc.

