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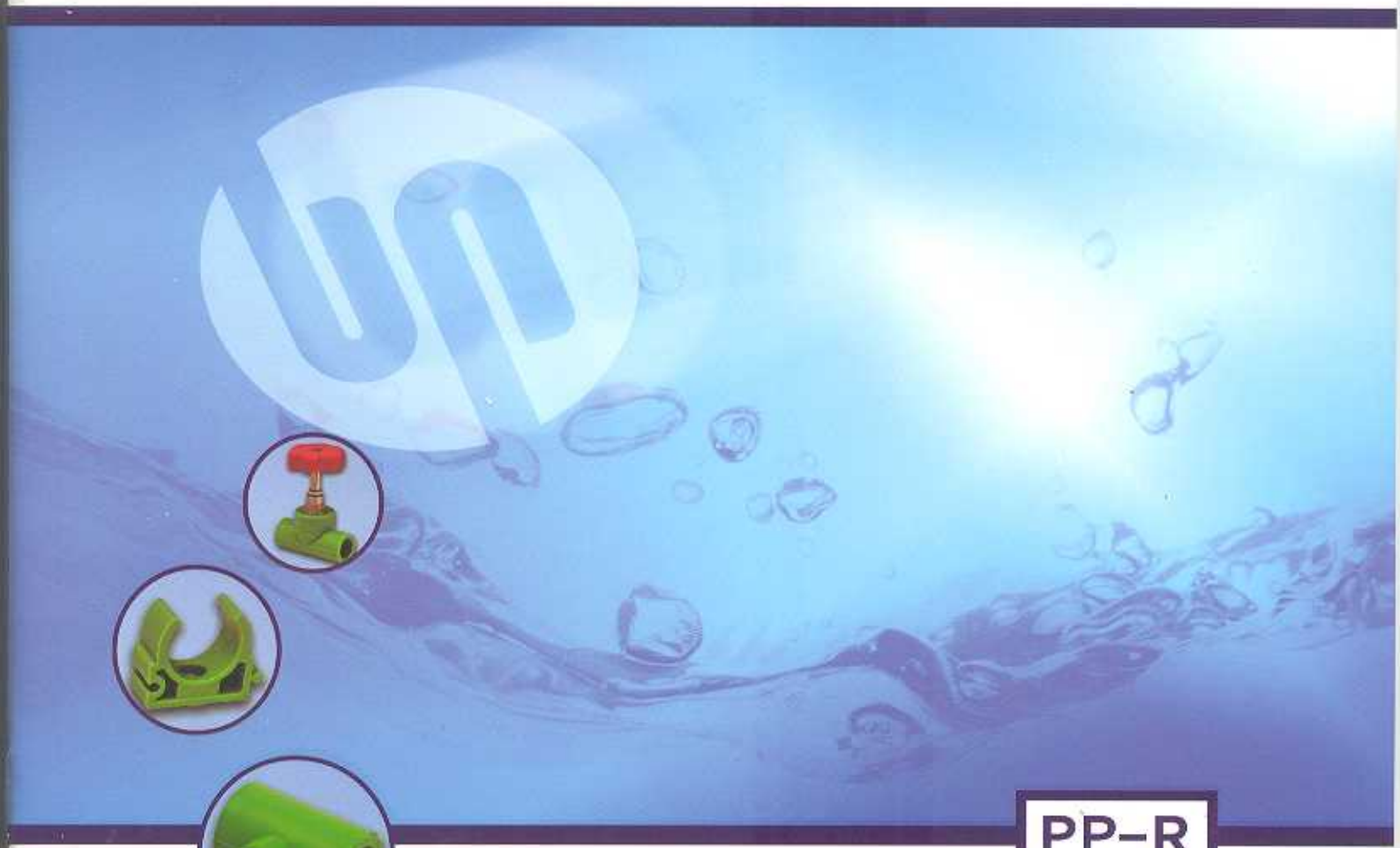

PP-R

DVGW PC SKZ TSE K-Q TSE-ISO-EN 9001 TZW


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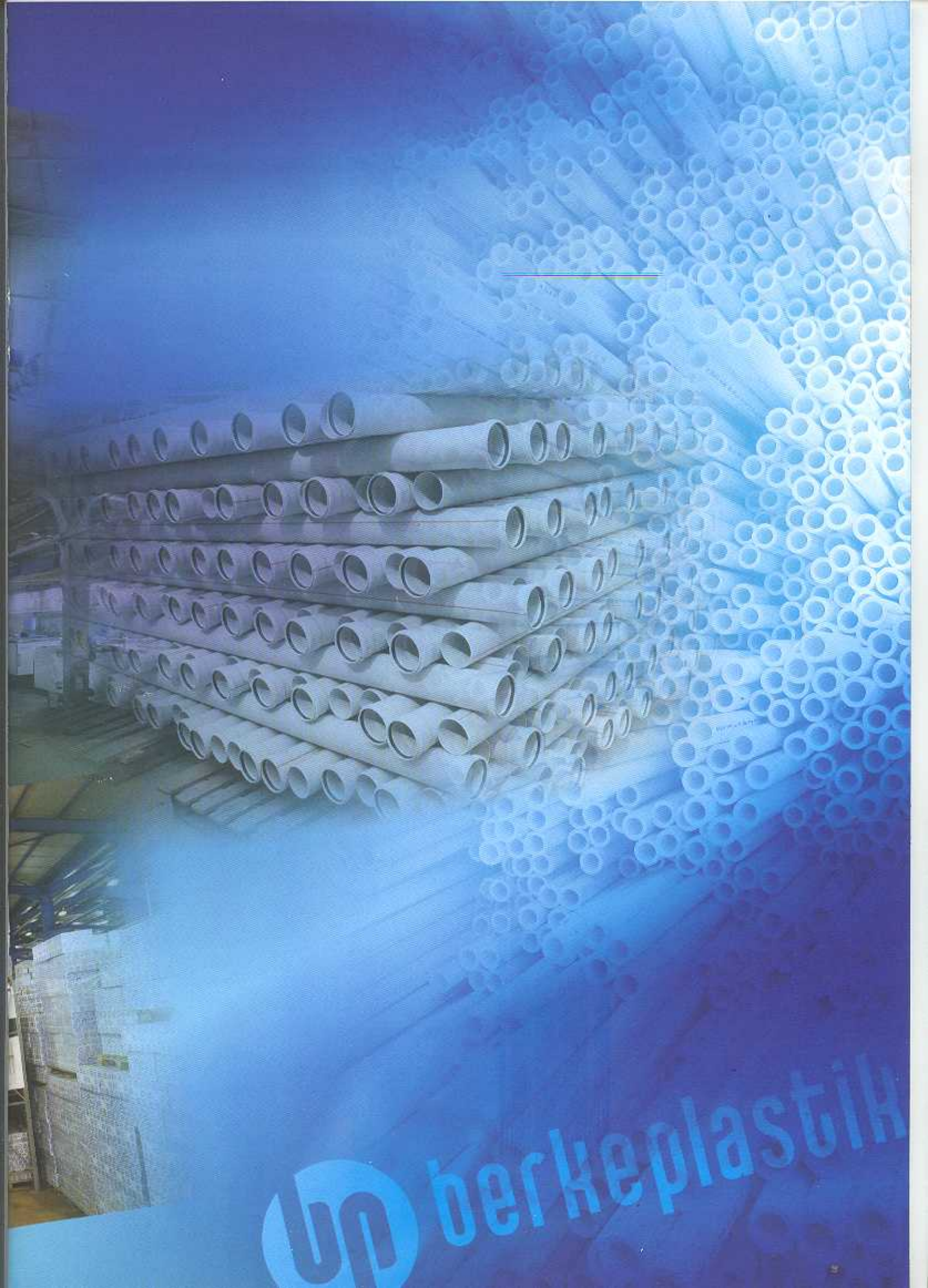
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СИСТЕМА СЕРТИФИКАЦИИ ГОСТ Р
ГОССТАНДАРТ РОССИИ

СЕРТИФИКАТ СООТВЕТСТВИЯ

0798503

ZERTIFIKAT — SKZ

Certificate

A 410

for the following plastic products

Heating pipes made of polypropylene PP-R 80

DVGW-Baumusterprüfzertifikat
DVGW type examination certificate

ФЕДЕРАЛЬНАЯ СЛУЖБА ПО НАДЗОРУ
В СФЕРЕ ЗАЩИТЫ ПРАВ ПОТРЕБИТЕЛЕЙ И БЛАГОПОЛУЧИЯ ЧЕЛОВЕКА
Управление Федеральной службы по надзору в сфере защиты прав потребителей и благополучия человека по городу Москве

САНИТАРНО-ЭПИДЕМИОЛОГИЧЕСКОЕ ЗАКЛЮЧЕНИЕ

СЕРТИФИКАТ ВІДПОВІДНОСТІ

ROMÂNIA
MINISTERUL DEZVOLTĂRII REGIONALE SI TURISMULUI
CONSILIUL TEHNIC PERMANENT PENTRU CONSTRUCȚII

AVIZ TEHNIC

ТЕХНИЧЕСКОЕ СВИДЕТЕЛЬСТВО

ТС 01.0050.10

KALİTE YÖNETİM SİSTEMİ BELGESİ
QUALITY MANAGEMENT SYSTEM CERTIFICATE
TSE

K - Q
TSE-ISO-EN
9000

TÜRK STANDARDLARI ENSTİTÜSÜ
TURKISH STANDARDS INSTITUTION

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PP-R

INDEX

PP-R; Polypropylene Random Copolymer Type - 3

This material is a proven, high performance random copolymer that enables the production of top quality solutions for hot & cold water piping applications.

Thanks to its high exceptional heat stability, extraction resistance, stable processing characteristics, and ease of welding and installation, random copolymer enables pipes with reliable performance to be manufactured

- Extremely long life at least 50 years
- Taste and odour neutral
- Excellent weldability
- Good chemical resistance
- Bacteriologically neutral
- Physiologically harmless

Physical, Thermal and Mechanical Properties

Properties	*Testing methods*	*Unit*	*Values*
	Physical properties		
Density at 23 °C	ISO 1183	g /cm^3	0.9
Melt flow index (MFI) 190 C°/ 5 kg	ISO 1133	g/10 min	<0.8
Melt flow index (MFI) 230 C°/ 2.16 kg	ISO 1133	g/10 min	<0.5
Linear expansion coefficient	DIN 8078	K^{-1}	1.5×10^{-4}
Heat conductivity	DIN 8078	WK-1m-1	0.23
Surface resistance	DIN 8078	Ω	$>10^{12}$
Elasticity module	DIN 8078	N/mm^2	800
	Thermal properties		
Melting point	DSC	C°	146–150
Subjective heat	Calorimeter	Kj/kgK	1.73
Coeficient of linear expansion	ASTM D 696	mm / m(C°)	0.15
Deflection temperature under load – 1.8Mpa	ISO 75A–1, -2	°C	46
VICAT softening point	ISO 306	°C	132
	Mechanial properties		
Tensile stress at yield ,at 50mm/min	ISO 527–1,-2	Mpa	25
Elongation at yield ,at 50mm/min		%	%
Elongation at break ,at 50mm/min		13	>500
Charpy impact strength (0 °C)	ISO 179	15J	*Fara rupere*

Long service life

With all water carrying pipes, resistance to internal pressure is an important factor affecting long life characteristics.

To assure optimal life performance, straight and curved pipes have been subjected to extensive hydrostatic pressure testing, in the laboratory, at a variety of temperatures.

Long-lasting performance

Random copolymer that is used for production of Berke pipes and fittings can withstand temperatures up to 70° C without losing shape, and handle short duration temperatures of up to 100° C.

Combined with good chemical resistance and impact strength, Berke pipes can simply be installed and forgotten about for at least 50 years!

Particularly important for domestic water installations, is the fact that random copolymer type 3 is physiologically harmless, and taste and colour neutral.

Excellent stability

In use, the formulation of Berke pipes is such that it offers a high molecular weight, plus excellent mechanical properties. Additional benefits include high heat stability as well as excellent resistance to extraction.

Berke pipes and fittigs conform to DIN 8077/78, EN ISO 15874 -1,2,3 and DIN 16962 standarts.

Easy installation, cost-effective in use

Whatever the complexity of a domestic water installation, Berke pipes have the ability to be shaped to conform to even most complex layouts.

Berke pipes easy weldability also makes them faster and simpler to install.

Measuring hydrostatic pressure performance

Hydrostatic pressure is calculated according to the below formula :

$$P = \frac{\sigma \times 2 e_{min}}{(d_{em} - e_{min})}$$

P = internal pressure ,MPa
d_{em} = outside diameter of the pipe, mm
e_{min} = minimum wall thickness of the pipe, mm
σ = hydrostatic stress, MPa
1 Mpa = 10 bar

Service life DIN 8077 (SF=1.5 PP-R)

Temperature °C	Services Life	Pipe Series (S) - Standart Dimension Rate (SDR)							
		5	11	3.2	7.4	2.5	6	2	5
		PN 10		PN 16		PN 20		PN 25	
		Pressure (bar)							
20	1	15.0		23.7		29.9		37.7	
	5	14.1		22.3		28.1		35.4	
	10	13.7		21.7		27.4		34.5	
	25	13.2		21.0		26.4		33.3	
	50	12.9		20.4		25.7		32.4	
40	1	10.8		17.1		21.6		27.2	
	5	10.1		16.0		20.2		25.4	
	10	9.8		15.5		19.6		24.7	
	25	9.4		15.0		18.8		23.7	
	50	9.2		14.5		18.3		23.1	
60	1	7.7		12.2		15.4		19.4	
	5	7.1		11.3		14.3		18.0	
	10	6.9		11.0		13.9		17.5	
	25	6.6		10.5		13.3		16.7	
	50	6.4		10.2		12.9		16.2	
70	1	6.5		10.3		12.9		16.3	
	5	6.0		9.5		12.0		15.1	
	10	5.8		9.2		11.6		14.6	
	25	5.0		8.0		10.0		12.7	
	50	4.2		6.7		8.5		10.7	
80	1	5.4		8.6		10.8		13.7	
	5	4.8		7.6		9.6		12.1	
	10	4.0		6.4		8.1		10.2	
	25	3.2		5.1		6.5		8.1	
95	1	3.8		6.1		7.6		9.6	
	5	2.6		4.1		5.2		6.5	

Standarts and guidelines

DIN 8077 Polypropylene (PP) pipes. PP-H. PP-B. PP-R. PP-RCT dimensions.

DIN 8078 Polypropylene (PP) pipes. PP-H. PP-B. PP-R. PP-RCT general quality requirements and testing

DIN 16962 Pipe fittings and joint assemblies for polypropylene (PP) pressure pipes. Part 5- General Quality Requirements and Testing. Part 6- Injection Moulded Elbows for socket-welding Dimension. Part 9 Injection Moulded reducers and nippels for socket welding Dimension.

DIN 1988 Drinking water supply systems- Part 1 General, Part 2 Materials, components, appliances, design and installation.

ISO 3213 Polypropylene (PP) pipes effect of time and temperature on the expected strength.

ISO 10508 Plastics piping systems for hot and cold water installations -- Guidance dor classification and design

EN ISO 15874 Plastic piping systems for hot and cold water installations polypropylene (PP) - Part 1 - general, Part 2 -pipe, Part 3 - fittings, Part 5 - fitness for purpose of the system, Part 7 -guidance for the assessment of conformity

DVGW 544 Plastic pipes in the drinking water installation; Requirements and testing

DVS 2207 Welding of thermoplastics materials heated tool welding of piping system and sheets of PP.

Metal Component Compatibility

As with all polypropylenes prolonged exposure to copper can cause damage to the properties of random copolymer Type-3.

Where metal inserts are to be used in an installation the recommended choice is nickel or chromium-plated brass components in order not to harm raw material properties. All the metal inserts that are used in production of Berke metal fittings are nickel or chromium-plated brass components that does not harm the raw material

Chemical Resistance

As with all PP pipes it is advisable that substances such as oils, waxes and bitumen should be kept away from the pipes.

Chemical or Product	*Concentration*	*Temperature* °C		
		20	60	100
Acetic acid	Up to 40%	S	S	-
Acetic acid	50%	S	-	-
Acetic acid, glacial	>96%	S		NS
Acetic anhydride	100%	S	L	-
Acetone	100%	S	-	-
Aceptophenone	100%	S	S	-
Acrylonitrile	100%	S	L	-
Air		S	-	S
Allyl alcohol	100%	S	S	-
Almond oil		S	S	-
Alum	Sol	S	-	-
Ammonium acetate	Sat.sol	S	S	-
Ammonium fluoride	Up to 20%	S	S	-
Ammonium hydrogen carbonate	Sat. sol	S	S	-
Ammonium metaphospheate	Sat.sol	S	S	S
Ammonium nitrate	Sat.sol	S	S	S
Ammonium persulphate	Sat.sol	S	S	-
Ammonium sulphide	Sat.sol	S	S	-
Amly acetate	100%	L	-	-
Amly alcohol	100%	S	S	S
Aniline	100%	S	S	-
Apple juice		S	-	-
Barium bromide	Sat.sol	S	S	S
Barium carbonate	Sat.sol	S	S	S
Barium hydroxide	Sat.sol	S	S	S
Barium sulphide	Sat.sol	S	S	S

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Benzoic acid	Sat.sol	S	S	-
Benzyl alcohol	100%	S	L	-
Boron trifluoride	Sat.sol	S	-	-
Boromine. gas		NS	NS	NS
Boromine. liquid	100%	NS	NS	NS
Butanol	100%	S	L	L
Butyl acetate	100%	L	NS	NS
Butyl glycol	100%	S	-	-
Butyl phenols	Sat.sol	S	-	-
Butyl phthalate	100%	S	L	L
Calcium carbonate	Sat.sol	S	S	S
Calcium chlorate	Sat.Sol	S	S	-
Calcium chloride	Sat.sol	S	S	S
Calcium hydroxide	Sat.sol	S	S	S
Calcium hypochlorite	Sol	S	-	-
Calcium nitrate	Sat.sol	S	S	-
Carbon dioxide. dry gas		S	S	-
Carbon dioxide. wet gas		S	S	-
Carbon disulphide	100%	S	NS	NS
Carbon monoxside. gas		S	S	-
Carbon tetrachloride	100%	NS	NS	NS
Castor oil	100%	S	S	-
Caustic soda	Up to 50%	S	L	L
Chlorine. dry gas	100%	NS	NS	NS
Chlorine. liquid	100%	NS	NS	NS
Chloroacetic acid	Sol	S	-	-
Chloroethanol	100%	S	-	-
Chloroform	100%	L	NS	NS
Chlorosulphonic acid	100%	NS	NS	NS
Chrom alum	Sol	S	S	-
Chromic acid	Up to 40%	S	L	NS
Citric acid	Sat.sol	S	S	S
Coconut oil		S	-	-
Copper (II) chloride	Sat.sol	S	S	-
Copper (II) nitrate	Sat.sol	S	S	S
Copper (II)	Sat.sol	S	S	-
Corn oil		S	L	-
Cottonseed oil		S	S	-
Cyclohexane	100%	S	-	-
Cyclohexanol	100%	S	L	-
Cyclohexaone	100%	L	NS	NS
Dextrin	Sol	S	S	-
Dextrose	Sol	S	S	S
Dibutyl phtalate	100%	S	L	NS
Dichloroacetic acid	100%	L	-	-
Dichloroethylene (A and B)	100%	L	-	-
Diethanolamine	100%	S	-	-
Diethyl ether	100%	S	L	-
Diethylene glycol	100%	S	S	-
Diglycolic acid	Sat.sol	S	-	-
Diisooctyl	100%	S	L	-
Dimethyl amine. gas		S	S	-
Dimethyl formamide	100%	S	S	-
Dioctyl phthalate	100%	L	L	-
Distilled water	100%	S	S	S
Ethanolamine	100%	S	S	S
Ethyl acetate	100%	L	NS	NS

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Ferric chloride	Sat.sol	S	S	S
Formic acid	10%	S	S	L
Formic acid	85%	S	NS	NS
Fructose	Sol	NS	NS	NS
Fruit juice		S	S	S
Gasoline, petrol (aliphatic hydrocarbons)		NS	NS	NS
Gelatine		S	S	-
Glucose	20%	S	S	S
Glycerine	100%	S	S	S
Glycolic acid	30%	S	-	-
Hexane	100%	S	L	-
Hydrochloric acid	Up to 20%	S	S	S
Hydrochloric acid	30%	S	L	L
Hydrochloric acid	From35 to 36%	S	-	-
Hydrofluoric acid	Dil.sol	S	-	-
Hydrofluoric acid	40%	S	-	-
Hydrogen	100%	S	-	-
Hydrogen chloride, dry gas	100%	S	S	-
Hydrogen peroxide	Up to 30%	S	L	-
Hydrogen sulphide, dry gas	100%	S	S	-
Iodine in alcohol		S	-	-
Isopropyl alcohol	100%	S	S	S
Isopropyl ether	100%	L	-	-
Lactic acid	Up to 90%	S	-	
Lanoline		S	L	-
Linseed oil		S	S	S
Magnesium carbonate	Sat.sol	S	S	S
Magnesium chloride	Sat.sol	S	S	S
Magnesium hydroxide	Sat.sol	S	S	-
Magnesium sulphate	Sat.sol	S	S	-
Maleic acid	Sat.sol	S	S	-
Mercury (II) chloride	Sat.sol	S	S	-
Mercury (II) cyanide	Sat.sol	S	S	-
Mercury (I) nitrade	Sol	S	S	-
Mercury	100%	S	S	-
Methyl acetate	100%	S	S	-
Methyl amine	Up tp 32%	S	-	-
Methyl bromide	100%	NS	NS	NS
Methyl ethyl ketone	100%	S	-	-
Methylene cloride	100%	L	NS	NS
Milk		S	S	S
Monochloroacetic acid	>85%	S	S	-
Nickel chloride	Sat.sol	S	S	- -
Nickel nitrate	Sat.sol	S	S	-
Nickel sulphate	Sat.sol	S	S	-
Nitric acid	From 40 to 50%	L	NS	NS
Nitric acid, fujming (with nitrogen dioxide)		NS	NS	NS
Oleic acid	100%	S	L	-
Oleum (sulphuric acid with 60% of SO3)		S	L	-
Olive oil		S	S	L
Oxalic acid	Sat.sol	S	L	NS
Oxygen,gas		S	-	-

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Paraffin oil (FL65)		S	L	NS
Peanut oil		S	S	-
Peppermint oil		S	-	-
Perchloric acid	(2N) 20%	S	-	-
Petroleum ether		L	L	-
Phenol	5%	S	S	-
Phenol	90%	S	-	-
Phosphine, gas		S	S	-
Phosphorus oxychloride	100%	L	-	-
Picric acid	Sat.sol	S	-	-
Potassium bicarbonate	Sat.sol	S	S	S
Potassium borate	Sat.Sol	S	S	-
Potassium bromated	Up to 10%	S	S	-
Potassium bromide	Sat.sol	S	S	
Potassium carbonate	Sat.sol	S	S	
Potassium chlarate	Sat.sol	S	S	
Potassium chloerite	Sat.sol	S	S	
Potassium chromate	Sat.sol	S	S	
Potassium cyanide	Sol	S	-	
Potassium chloerite	Sat.sol	S	S	
Potassium dichromate	Sat.sol	S	S	S
Potassium ferricyanide	Sat.sol	S	S	-
Potassium fluride	Sat.sol	S	S	-
Potassium iodide	Sat.sol	S	-	-
Potassium nitrate	Sat.sol	S	S	-
Potassium pechlorite	10%	S	S	-
Potassium permanganate	(2N) 39%	S	-	-
Potassium persulphate	Sat.sol	S	S	-
Propionic acid	>50%	S	-	-
Pyridine	100%	L	-	-
Sea water		S	S	S
Silver nitrate	Sat.sol	S	S	L
Sodium acetate	Sat.sol	S	S	S
Sodium benzoate	35%	S	L	-
Sodium bicarbonate	Sat.sol	S	S	S
Sodium carbonate	Up to 50%	S	S	L
Sodium chlorite	20%	S	L	NS
Sodium dichromate	Sat.sol	S	S	S
Sodium hydrogen carbonate	Sat.sol	S	S	S
Sodium hydrogen sulphate	Sat.sol	S	S	-
Sodium hydrogen sulphite	Sat.sol	S	-	-
Sodium hypochlorite	5%	S	S	-
Sodium hypochlorite	10%-15%	S	-	-
Sodium hypochlorite	20%	S	L	-
Sodium metaphospate	Sol	S	-	-
Sodium nitrate	Sat.sol	S	S	-
Sodium perorate	Sat.sol	S	S	-
Sodium phisohate (neutral)		S	S	S
Sodium silicate	Sol	S	S	-
Sodium sulphate	Sat.sol	S	S	-
Sodium sulphide	Sat.sol	S	-	-
Sodium sulphite	40%	S	S	S
Sodium thiosulphate (hypo)	Sat.sol	S	-	-
Say-bean oil		S	L	-
Succinic acid	Sat.sol	S	S	-
Sulphur acid	From 10 to 30%	S	S	-
Sulphuric acid	50%	S	L	L
Sulphuric acid	96%	S	L	NS

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Sulphurous acid	Up to 30%	S	-	-
Tartaric acid	Sat.sol	S	S	-
Tetralin	100%	NS	NS	NS
Thiophene	100%	S	L	-
Tin (IV) chloride	Sol	S	S	-
Tin (II) chloride	Sat.sol	S	S	-
Toulene	100%	L	NS	NS
Trichloroacetic acid	Up to 50 %	S	S	-
Trichloroethylene	100%	NS	NS	NS
Triethanolamine	Sol	S	-	-
Turpentine		NS	NS	NS
Urea	Sat.sol	S	S	-
Vinegar		S	S	S
Water brackish. mineral. portable		S	S	S
Wines		S	S	-
Xylene	100%	NS	NS	NS
Yeast	Sol	S	S	S
Zinc sulphate	Sat.sol	S	S	-

S = Satisfactory
L = Limited
NS = Not Satisfactory
Sat. sol = Saturated aqueous solution prepared at 20°C
Sol = Aqueous solution at a concentration higher than 10% but not saturated
Dil. sol = Dilute aqueous solution at a concentration equal to or lower than %10
Work. sol = Aqueous solution having the usual concentration for industrial use

Thermal expansion and support intervals of Berke pipes

Pipes elongate when heated. These changes in longitude should especially be regarded during installation of hot water installations.

To prevent the unwanted bendings the pipes should be supported at designated intervals. Freely selected fixed support should be arranged so as to balance the length changes via changing the direction of the flow in the installation.

If it is possible to balance such an expansion as in the case of straight pipe lines in between the two fixed supports resilience balancers are applied. During the assembly of the resilience balancers longitudinal changes caused by the functioning of the installation and by the changes in the environmental temperatures should be taken into account.

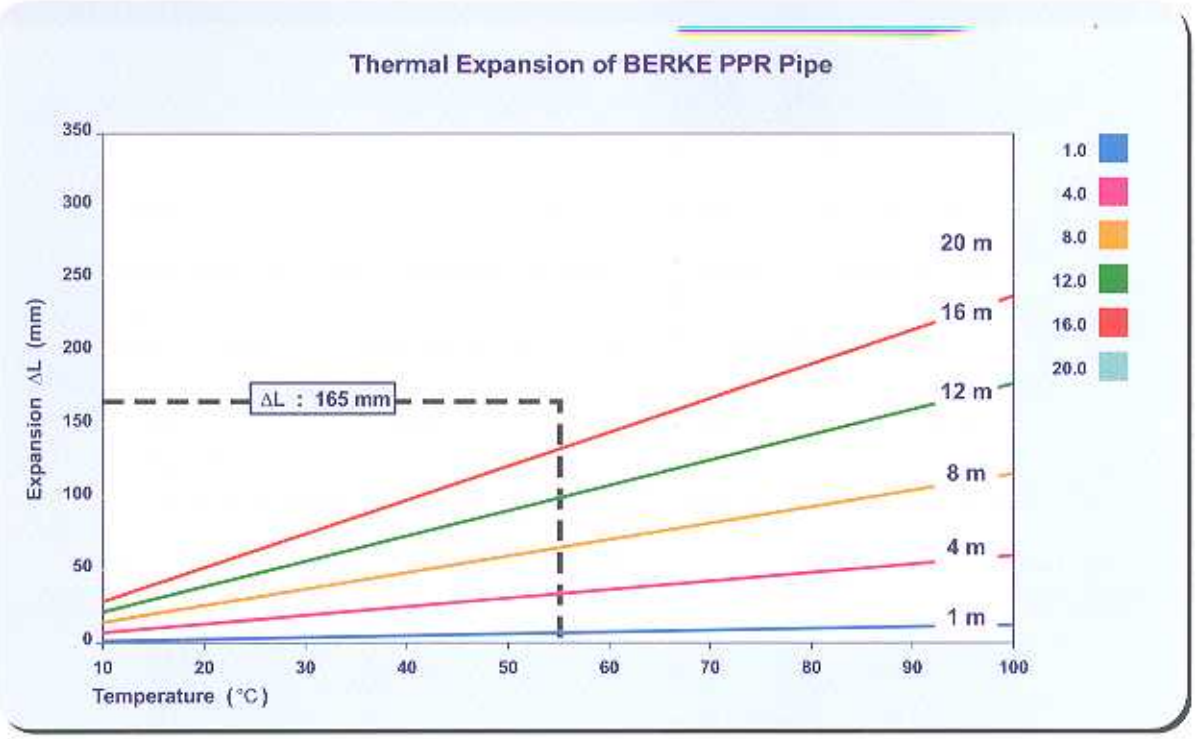
Thermal expansion of Berke PP-R pipe

Calculation of thermal expansion is as follows:

$$\Delta L = L * \Delta T * \lambda$$

where

ΔT = variation of working temperature in Kelvin degrees (K) or Celsius (C°)
ΔL = variation of length in mm
L = initial length of the pipe in m
λ = coefficient of linear thermal expansion. The value of λ is $1.5 * 10^{-4}$ (K^{-1}) for pp-r pipe.



Pipe length (m)	Temperature variation ΔT in K									
	10	20	30	40	50	60	70	80	90	100
	Linear Expansion ΔL (mm)									
1.0	1.50	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
4.0	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	54.5	60.0
8.0	12.0	24.0	36.0	48.0	60.0	72.0	84.0	96.0	108.0	120.0
12.0	18.0	36.0	54.0	72.0	90.0	108.0	126.0	144.0	162.0	180.0
16.0	24.0	48.0	72.0	96.0	120.0	144.0	168.0	192.0	216.0	240.0
20.0	30.0	60.0	90.0	120.0	150.0	180.0	210.0	240.0	270.0	300

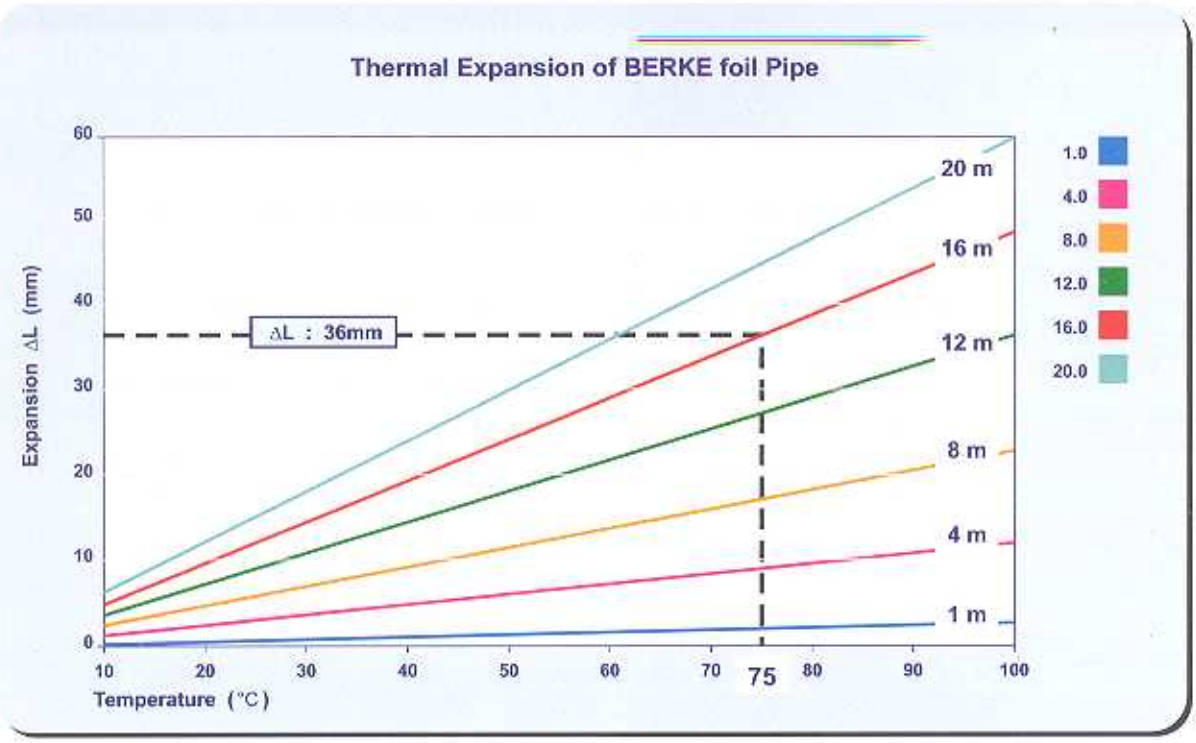
Thermal expansion of Berke PP-R foil pipe

Calculation of thermal expansion is as follows:

$$\Delta L = L * \Delta T * \lambda$$

where

ΔT = variation of working temperature in Kelvin degrees (K) or Celsius (C°)
ΔL = variation of length in mm
L = initial length of the pipe in m
λ = coefficient of linear thermal expansion. The value of λ is $0,3 * 10^{-4}$ (K^{-1}) for pp-r foil tubes.



Pipe length (m)	Temperature variation ΔT in K									
	10	20	30	40	50	60	70	80	90	100
	Linear Expansion ΔL (mm)									
1.0	0,30	0,60	0,90	1,20	1,50	1,80	2,10	2,40	2,70	3,00
4.0	1,20	2,40	3,60	4,80	6,00	7,20	8,40	9,60	10,80	12,00
8.0	2,40	4,80	7,20	9,60	12,00	14,40	16,80	19,20	21,60	24,00
12.0	3,60	7,20	10,80	14,40	18,00	21,60	25,20	28,80	32,40	36,00
16.0	4,80	9,60	14,40	19,20	24,00	28,80	33,60	38,40	43,20	48,00
20.0	6,00	12,00	18,00	24,00	30,00	36,00	42,00	48,00	54,00	60,00

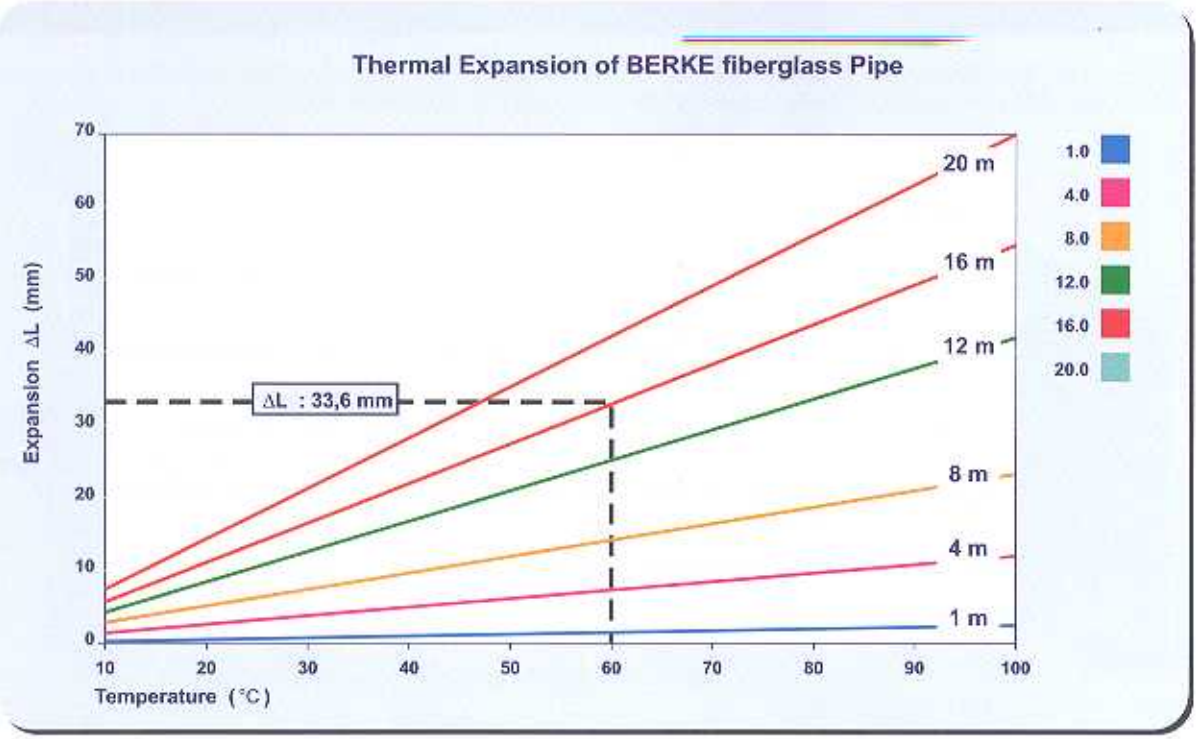
Thermal expansion of Berke PP-R fiberglass pipe

Calculation of thermal expansion is as follows:

$$\Delta L = L * \Delta T * \lambda$$

where

ΔT = variation of working temperature in Kelvin degrees (K) or Celsius (C°)
ΔL = variation of length in mm
L = initial length of the pipe in m
λ = coefficient of linear thermal expansion. The value of λ is $0{,}35 * 10^{-4}$ (K^{-1}) for pp-r fiberglass pipe.



Pipe length (m)	Temperature variation ΔT in K									
	10	20	30	40	50	60	70	80	90	100
	Linear Expansion ΔL (mm)									
1.0	0,35	0,70	1,05	1,40	1,75	2,10	2,45	2,80	3,15	3,50
4.0	1,40	2,80	4,20	5,60	7,00	8,40	9,80	11,20	12,60	14,00
8.0	2,80	5,60	8,40	11,20	14,00	16,80	19,60	22,40	25,20	28,00
12.0	4,20	8,40	12,60	16,80	21,00	25,20	29,40	33,60	37,80	42,00
16.0	5,60	11,20	16,80	22,40	28,00	33,60	39,20	44,80	50,40	56,00
20.0	7,00	14,00	21,00	28,00	35,00	42,00	49,00	56,00	63,00	70,00

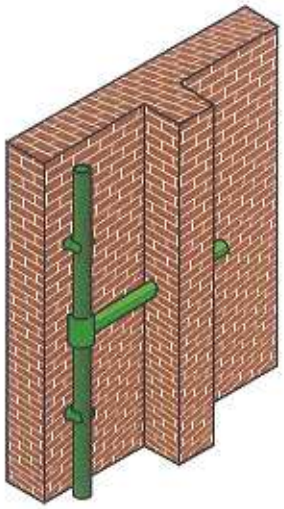
Support intervals

Berke PP-R pipe SDR:6 – SDR:7.4 (PN20 – PN16)

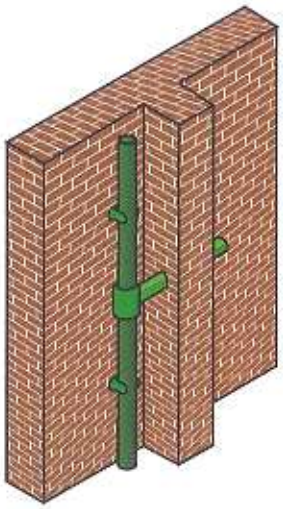
Temperature ΔT (K)	Pipe diameter d (mm)								
	20	25	32	40	50	63	75	90	110
	Support intervals in cm								
20	60	70	90	100	120	140	150	160	180
30	60	70	90	100	120	140	150	160	180
40	60	70	80	90	110	130	140	150	170
50	60	70	80	90	110	130	140	150	170
60	50	60	70	80	100	110	120	140	160
70	50	60	70	80	90	100	110	120	140

Type of Assembly for Installation of the flat

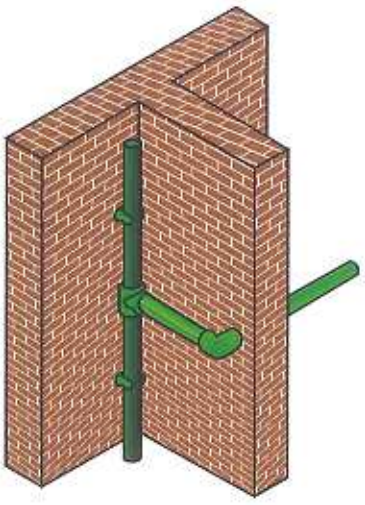
To allow for the subsequent linear expansion of the pipes regarding the connections at the entrances of flats, one of the techniques below should be used for making the connections.



A: This connection can be made at particular a distance from the wall.

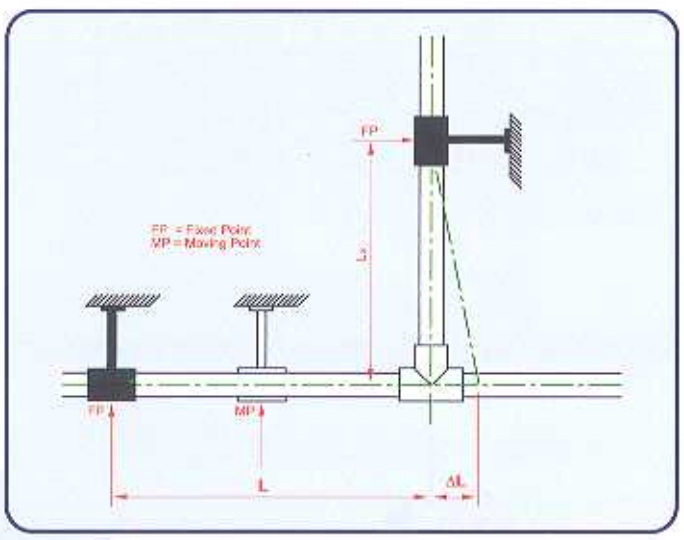


B: The connection can be made via allowing awide hole at the point where the pipe enters the flat.



C: The pipe can be inserted into the entrance point of the flat, via an "L" formed arm.

Minimum distance for connection allowing for the expansion during joint connection



$$Ls = K\sqrt{d \times \Delta L}$$

Example :

L = 5m	ΔL = L*ΔT*λ	Ls = K √d x ΔL
ΔT = 50	ΔL = 5*50*0,15	Ls = 15√40*37,5
Ød = 40mm	ΔL = 37,5 mm	Ls = 580 mm
Ls = ?		

Ls = length of the flexible pipe side, mm
d = outer diameter of the Berke pipe, mm
ΔL = variation of length, mm
K = 15 (material based constant of Berke pipe)

Calculation of thermal expansion

Thermal expansion ΔL is calculated with the below stated Formula:

$$\Delta L = \lambda \times \Delta T \times L$$

ΔT = variation of working temperature in Kelvin (K) or Celcius (°C)
ΔL = variation of length in mm
Ls = initial length of the pipe in m
λ = coefficient of linear thermal expansion. The value of λ is $1,5 * 10^{-4} (K^{-1})$ for pp-r pipe.

Length of the flexible pipe side is calculated with the following Formula:

$$Ls = K\sqrt{d \times \Delta L}$$

Ls = length of the flexible pipe side, mm
d = outer diameter of the Berke pipe, mm
ΔL = variation of length, mm
K = 15 (material based constant of Berke pipe)

Example :

1- Calculation of thermal expansion

Temperature difference between cold water and enviroment

Input

λ = 0.15 mm/m-K
L = 2.0 m
ΔT = 40K(°C)

Required

ΔL= λ x ΔT x L
ΔL= 0.15 x 40 x 2.0 = 12 mm

2- Calculation of the shortest flexible length

d = 40 mm
ΔL = 12 mm
K = 15

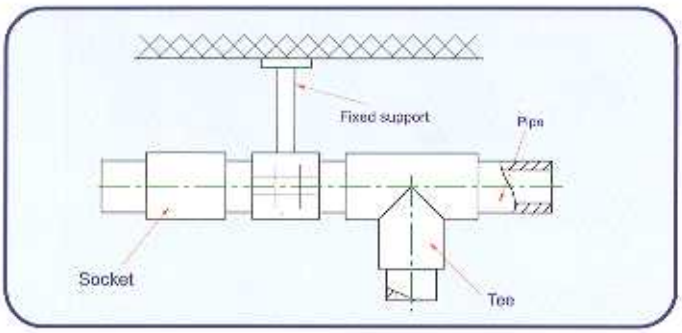
Ls = K * √d * ΔL
Ls = 15 * √40 * 12 = 328 mm

Assembly Principles

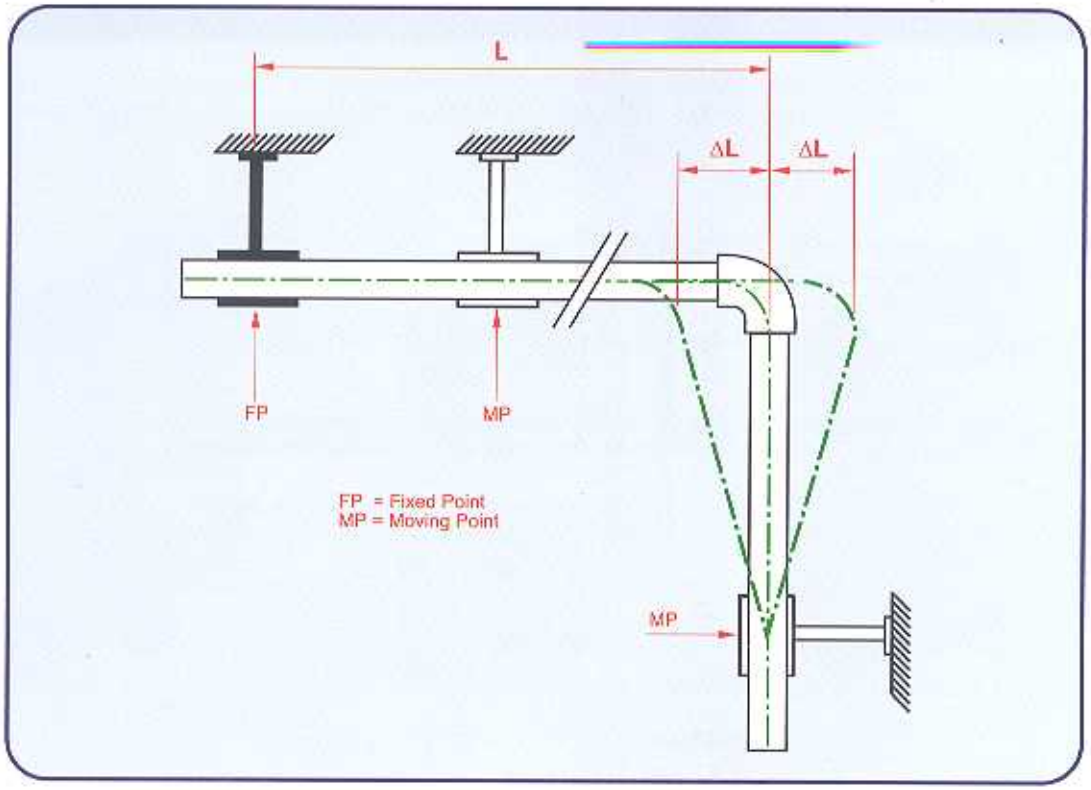
Radial and axial expansion of the pipe assembled outdoors should not be prevented. To obtain good results fixed supports should be chosen in such way that they do not damage the outer surface of the pipe.

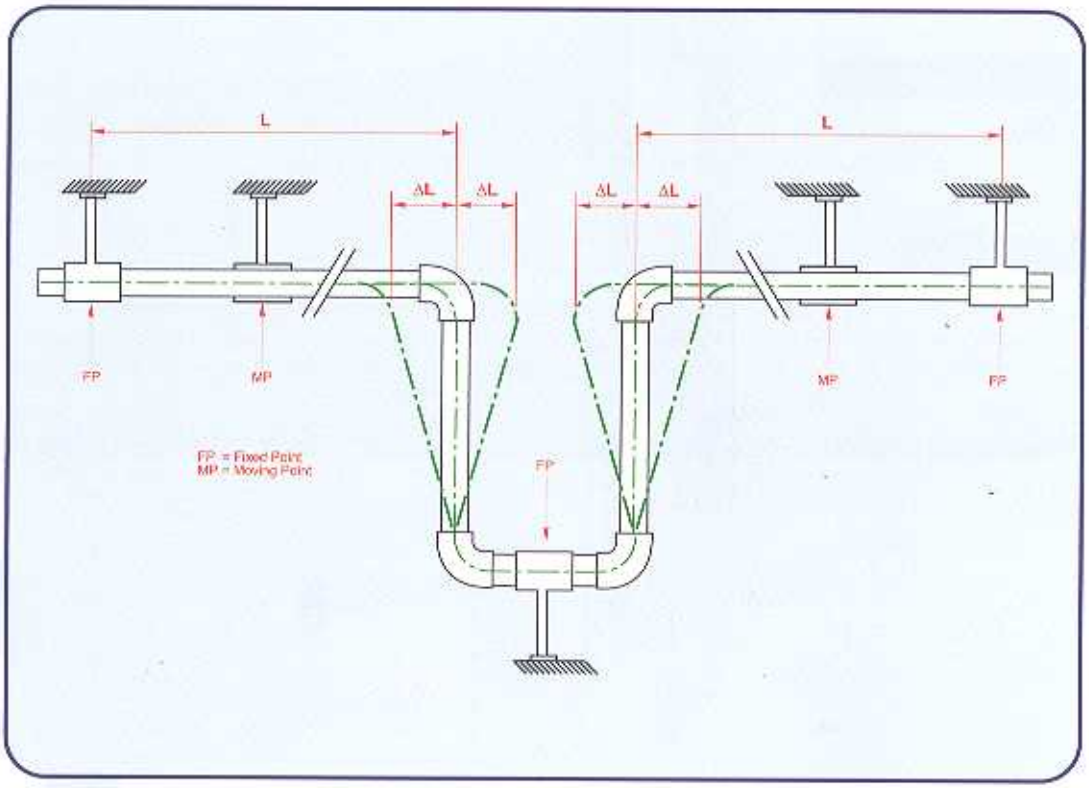
Fixed Support

Fixed supports are used to fix the pipe at a certain points against undesired pipe movements. Fixed supports should be stronger compared to the sliding supports. Fittings are used to construct fixed supports. At the points where direction changes fixed supports should not be used. The distance between the fixed supports should be chosen in such a way that pipe thermal expansion is not affected.



For insulated BERKE pp-r pipes installed outdoor, thermal expansion should be calculated within the planperiod.


L
ΔL
ΔL
FP
MP
FP = Fixed Point
MP = Moving Point
MP


L
ΔL
ΔL
L
ΔL
ΔL
FP
MP
MP
FP
FP = Fixed Point
MP = Moving Point
FP

Insulation

Pipe Outer Diameter	Insulation Thickness in BERKE Pipes	
	λ = 0,035 W/mK	λ = 0,04 W/mK
20 x 3.4 mm	16.5 mm	21.0 mm
25 x 4.2 mm	16.8 mm	20.2 mm
32 x 5.4 mm	16.9 mm	32.2 mm
40 x 6.7 mm	24.5 mm	31.0 mm
50 x 8.3 mm	25.0 mm	30.2 mm
63 x 10.5 mm	35.0 mm	42.0 mm
75 x 12.5 mm	41.0 mm	51.0 mm
90 x 15.0 mm	48.5 mm	60.5 mm
110 x 18.3 mm	60.0 mm	74.2 mm

Welding principles of Berke pipes and fittings

Preparation of the welding machine

1- Welding machine is heated up to 260°C. When the control light goes off at 260°C welding process can be started. Pipe should be cut to the appropriated length perpendicular to the pipe axis. Welding distance should be marked from the pipe.

If its is an al-foiled pipe

2- A special peeler is used to take off the co-extruded PP layer and Al-foil

3- Welding surfaces of pipes and fittings should be clean. If neccessary welding surfaces should be cleaned with alcohol and dried with a dry cloth. During welding neither the pipe nor the fittings should be moved.

Welding

4- Pipes and fittings should be heated. When the heating process ends they should be taken out quickly and joined by pressing one to another axially without twisting. Welding machine should be cleaned after every operation for the next use.

PP-R PIPE PN 10

Code	d(mm)	Package Standart
1.4010.10.020	20 x 1,9	100
1.4010.10.025	25 x 2,3	80
1.4010.10.032	32 x 2,9	40
1.4010.10.040	40 x 3,7	32
1.4010.10.050	50 x 4,6	20
1.4010.10.063	63 x 5,8	16
1.4010.10.075	75 x 6,8	12
1.4010.10.090	90 x 8,2	8
1.4010.10.110	110 x 10,0	4

PP-R PIPE PN 16

Code	d(mm)	Package Standart
1.4010.16.020	20 x 2,8	100
1.4010.16.025	25 x 3,5	80
1.4010.16.032	32 x 4,4	40
1.4010.16.040	40 x 5,5	32
1.4010.16.050	50 x 6,9	20
1.4010.16.063	63 x 8,6	16
1.4010.16.075	75 x 10,3	12
1.4010.16.090	90 x 12,3	8
1.4010.16.110	110 x 15,1	4

PP-R PIPE PN 20

Code	d(mm)	Package Standart
1.4010.20.020	20 x 3,4	100
1.4010.20.025	25 x 4,2	80
1.4010.20.032	32 x 5,4	40
1.4010.20.040	40 x 6,7	32
1.4010.20.050	50 x 8,3	20
1.4010.20.063	63 x 10,5	16
1.4010.20.075	75 x 12,5	12
1.4010.20.090	90 x 15,0	8
1.4010.20.110	110 x 18,3	4

Code	d(mm)	Package Standart
1.4020.20.020	Ø 20	100
1.4020.20.025	Ø 25	80
1.4020.20.032	Ø 32	40
1.4020.20.040	Ø 40	32
1.4020.20.050	Ø 50	20
1.4020.20.063	Ø 63	16
1.4020.20.075	Ø 75	12
1.4020.20.090	Ø 90	8
1.4020.20.110	Ø 110	4

PP-R AL FOILED PIPE PN 20

Code	d(mm)	Package Standart
1.4020.25.020	Ø 20	100
1.4020.25.025	Ø 25	80
1.4020.25.032	Ø 32	40
1.4020.25.040	Ø 40	32
1.4020.25.050	Ø 50	20
1.4020.25.063	Ø 60	16
1.4020.25.075	Ø 75	12
1.4020.25.090	Ø 90	8
1.4020.25.110	Ø 100	4

PP-R AL FOILED PIPE PN 25

Code	d(mm)	Package Standart
1.4022.25.020	Ø 20	100
1.4022.25.025	Ø 25	80
1.4022.25.032	Ø 32	40
1.4022.25.040	Ø 40	32
1.4022.25.050	Ø 50	20
1.4022.25.063	Ø 63	16
1.4022.25.075	Ø 75	12
1.4022.25.090	Ø 90	8
1.4022.25.110	Ø 110	4

PP-R UV RESIST PIPE PN 25

PP-R GF PIPE PN 20

Code	d(mm)	Package Standart
1.4030.20.020	20 x 2,8	100
1.4030.20.025	25 x 3,5	80
1.4030.20.032	32 x 4,4	40
1.4030.20.040	40 x 5,5	32
1.4030.20.050	50 x 6,9	20
1.4030.20.063	63 x 8,6	16
1.4030.20.075	75 x 10,3	12
1.4030.20.090	90 x 12,3	8
1.4030.20.110	110 x 15,1	4

PP-R GF PIPE PN 25

Code	d(mm)	Package Standart
1.4030.25.020	20 x 3,4	100
1.4030.25.025	25 x 4,2	80
1.4030.25.032	32 x 5,4	40
1.4030.25.040	40 x 6,7	32
1.4030.25.050	50 x 8,3	20
1.4030.25.063	63 x 10,5	16
1.4030.25.075	75 x 12,5	12
1.4030.25.090	90 x 15,0	8
1.4030.25.110	110 x 18,3	4

PP-R STRAIGHT CONNECTOR

Code	d(mm)	Package Standart
1.4040.12.020	20	600
1.4040.12.025	25	350
1.4040.12.032	32	180
1.4040.12.040	40	100
1.4040.12.050	50	60
1.4040.12.063	63	36
1.4040.12.075	75	24
1.4040.12.090	90	16
1.4040.12.110	110	4

PP-R ELBOW 90°

Code	d(mm)	Package Standart
1.4040.13.020	20	400
1.4040.13.025	25	250
1.4040.13.032	32	120
1.4040.13.040	40	60
1.4040.13.050	50	35
1.4040.13.063	63	16
1.4040.13.075	75	12
1.4040.13.090	90	4
1.4040.13.110	110	2

PP-R ELBOW 45°

Code	d(mm)	Package Standart
1.4040.14.020	20	500
1.4040.14.025	25	300
1.4040.14.032	32	125
1.4040.14.040	40	70
1.4040.14.050	50	40
1.4040.14.063	63	20
1.4040.14.075	75	12

PP-R TE

Code	d(mm)	Package Standart
1.4040.18.020	20	240
1.4040.18.025	25	150
1.4040.18.032	32	80
1.4040.18.040	40	40
1.4040.18.050	50	25
1.4040.18.063	63	14
1.4040.18.075	75	10
1.4040.18.090	90	4
1.4040.18.110	110	2

PP-R UNEQUAL TE

Code	d(mm)	Package Standart
1.4040.19.012	20/25/20	150
1.4040.19.014	25/20/20	150
1.4040.19.016	25/20/25	150
1.4040.19.018	25/25/20	150
1.4040.19.020	32/20/20	100
1.4040.19.022	32/20/25	100
1.4040.19.024	32/20/32	80
1.4040.19.026	35/25/20	100
1.4040.19.028	35/25/25	100
1.4040.19.030	32/25/32	80
1.4040.19.042	40/20/40	50
1.4040.19.050	40/25/40	50
1.4040.19.058	40/32/40	50
1.4040.19.074	50/20/20	40
1.4040.19.084	50/25/50	40
1.4040.19.094	50/32/50	30
1.4040.19.104	50/40/50	30
1.4040.19.116	63/20/63	20
1.4040.19.128	63/25/63	20
1.4040.19.140	63/32/63	20
1.4040.19.152	63/40/60	16
1.4040.19.154	63/50/63	16
1.4040.19.168	75/20/75	10
1.4040.19.182	75/25/75	10
1.4040.19.196	75/32/75	10
1.4040.19.210	75/40/75	10
1.4040.19.212	75/50/75	10
1.4040.19.214	75/63/75	10
1.4040.19.218	90/50/90	4
1.4040.19.224	110/50/110	3
1.4040.19.226	110/63/110	2

PP-R CROSS TE

Code	d(mm)	Package Standart
1.4040.21.020	20	200
1.4040.21.025	25	100
1.4040.21.032	32	60

PP-R REDUCER

Code	d(mm)	Package Standart
1.4040.23.010	25/20	600
1.4040.23.012	32/20	400
1.4040.23.014	32/25	300
1.4040.23.016	40/20	250
1.4040.23.018	40/25	250
1.4040.23.020	40/32	150
1.4040.23.022	50/20	100
1.4040.23.024	50/25	120
1.4040.23.026	50/32	120
1.4040.23.028	50/40	100
1.4040.23.030	63/20	80
1.4040.23.032	63/25	80
1.4040.23.034	63/32	60
1.4040.23.036	63/40	60
1.4040.23.038	63/50	50
1.4040.23.040	75/20	60
1.4040.23.044	75/25	50
1.4040.23.044	75/32	50
1.4040.23.048	75/50	40
1.4040.23.050	75/63	40
1.4040.23.062	90/63	20
1.4040.23.064	90/75	16
1.4040.23.066	110/63	16
1.4040.23.068	110/75	16
1.4040.23.070	110/90	12

PP-R BRIDGE WITH CONNECTIONS

Code	d(mm)	Package Standart
1.4040.25.020	20	120
1.4040.25.025	25	60
1.4040.25.032	32	20

PP-R BRIDGE

Code	d(mm)	Package Standart
1.4040.26.020	20	90
1.4040.26.025	25	60
1.4040.26.032	32	40
1.4040.26.040	40	18

PP-R BLANKING CAP

Code	d(mm)	Package Standart
1.4040.28.020	20	900
1.4040.28.025	25	500
1.4040.28.032	32	300
1.4040.28.040	40	200
1.4040.28.050	50	80
1.4040.28.063	63	50
1.4040.28.075	75	32
1.4040.28.090	90	18
1.4040.28.110	110	9

PP-R PIPE CLIPS

Code	d(mm)	Package Standart
1.4040.29.020	20	800
1.4040.29.025	25	700
1.4040.29.032	32	500
1.4040.29.040	40	300
1.4040.29.050	50	250

PP-R DOUBLE PIPE CLIPS

Code	d(mm)	Package Standart
1.4040.30.020	20	400
1.4040.30.025	25	300
1.4040.30.032	32	150

PP-R END PLUG

Code	d(mm)	Package Standart
1.4040.31.020	20x½ "	700
1.4040.31.025	25x3/4 "	600
1.4040.31.032	32x1 "	300
1.4040.31.U20	20x½ " (Long)	200

PP-R ELBOW FEMALE

Code	d(mm)	Package Standart
1.4050.16.010	20x1/2 "	120
1.4050.16.012	20x3/4 "	75
1.4050.16.014	25x1/2 "	80
1.4050.16.016	25x3/4 "	75
1.4050.16.018	32x1/2 "	40
1.4050.16.020	32x3/4 "	40
1.4050.16.022	32x1 "	40

PP-R ELBOW MALE

Code	d(mm)	Package Standart
1.4050.18.010	20x1/2 "	100
1.4050.18.012	20x3/4 "	60
1.4050.18.014	25x1/2 "	60
1.4050.18.016	25x3/4 "	60
1.4050.18.018	32x1/2 "	30
1.4050.18.020	32x3/4 "	40
1.4050.18.022	32x1 "	30

PP-R WALLPLATE ELBOW FEMALE

Code	d(mm)	Package Standart
1.4050.20.010	20x1/2 "	75
1.4050.20.012	25x1/2 "	40

PP-R DOUBLE WALLPLATE ELBOW FEMALE

Code	d(mm)	Package Standart
1.4050.21.Ç20	20x1/2 "	30
1.4050.21.Ç25	25x1/2 "	20

PP-R TE FEMALE

Code	d(mm)	Package Standart
1.4050.30.010	20 x 1/2 "	75
1.4050.30.012	20 x 3/4 "	60
1.4050.30.014	25 x 1/2 "	60
1.4050.30.016	25 x 3/4 "	45
1.4050.30.018	32 x 1/2 "	30
1.4050.30.020	32 x 3/4 "	30
1.4050.30.022	32 x 1 "	30

PP-R TE MALE

Code	d(mm)	Package Standart
1.4050.32.010	20 x 1/2 "	75
1.4050.32.012	20 x 3/4 "	45
1.4050.32.014	25 x 1/2 "	60
1.4050.32.016	25 x 3/4 "	45
1.4050.32.018	32 x 1/2 "	30
1.4050.32.020	32 x 3/4 "	30
1.4050.32.022	32 x 1 "	30

PP-R ROUND ADAPTOR FEMALE

Code	d(mm)	Package Standart
1.4050.40.010	20 x 1/2 "	150
1.4050.40.012	20 x 3/4 "	120
1.4050.40.014	25 x 1/2 "	120
1.4050.40.016	25 x 3/4 "	120
1.4050.40.018	32 x 1/2 "	75
1.4050.40.020	32 x 3/4 "	75
1.4050.40.022	32 x 1 "	60

PP-R ROUND ADAPTOR MALE

Code	d(mm)	Package Standart
1.4050.41.010	20x1/2 "	150
1.4050.41.012	20x3/4 "	100
1.4050.41.014	25x1/2 "	100
1.4050.41.016	25x3/4 "	80
1.4050.41.018	32x1/2 "	75
1.4050.41.020	32x3/4 "	75
1.4050.41.022	32x1 "	60

PP-R HEXAGONAL NIPPLE FEMALE

Code	d(mm)	Package Standart
1.4050.42.032	32 x 1"	45
1.4050.42.040	40 x 1¼ "	30
1.4050.42.050	50 x 1½ "	15
1.4050.42.063	63 x 2 "	12
1.4050.42.075	75 x 2½ "	8

PP-R HEXAGONAL NIPPLE MALE

Code	d(mm)	Package Standart
1.4050.43.032	32 x 1"	45
1.4050.43.040	40 x 1¼ "	24
1.4050.43.050	50 x 1½ "	15
1.4050.43.063	63 x 2 "	8
1.4050.43.075	75 x 2½ "	6

PP-R FILTER FEMALE / FEMALE

Code	d(mm)	Package Standart
1.4050.58.010	20	60
1.4050.58.012	25	30
1.4050.58.014	32	25

PP-R FILTER MALE / FEMALE

Code	d(mm)	Package Standart
1.4050.59.010	20	60
1.4050.59.012	25	30
1.4050.58.016	32	25

PP-R UNION PLASTIC TO PLASTIC

Code	d(mm)	Package Standart
1.4060.10.020	20	200
1.4060.10.025	25	125
1.4060.10.032	32	75
1.4060.10.040	40	50
1.4060.10.050	50	30
1.4060.10.063	63	15
1.4060.10.075	75	10
1.4060.10.090	90	3
1.4060.10.110	110	2

PP-R TRANSITION UNION FEMALE

Code	d(mm)	Package Standart
1.4060.13.010	20 x 1/2 "	200
1.4060.13.014	25 x 3/4 "	100
1.4060.13.020	32 x 1 "	75
1.4060.13.024	40 x 1¼ "	45
1.4060.11.026	50 x 1½ "	25
1.4060.11.028	63 x 2 "	12
1.4060.11.030	75 x 2½ "	6

PP-R TRANSITION UNION MALE

Code	d(mm)	Package Standart
1.4060.14.010	20 x 1/2 "	150
1.4060.14.014	25 x 3/4 "	100
1.4060.14.020	32 x 1 "	60
1.4060.14.024	40 x 1¼ "	40
1.4060.12.026	50 x 1½ "	20
1.4060.12.028	63 x 2 "	12
1.4060.12.030	75 x 2 1/2 "	6

PP-R BALL VALVE WITH DOUBLE TRANSITION UNION

Code	d(mm)	Package Standart
1.4070.10.020	20	30
1.4070.10.025	25	25
1.4070.10.032	32	15

PP-R BALL VALVE WITH TRANSITION UNION

Code	d(mm)	Package Standart
1.4070.11.020	20	35
1.4070.11.025	25	30
1.4070.11.032	32	15

PP-R CHROME VALVE - SS

Code	d(mm)	Package Standart
1.4070.12.020	20	20
1.4070.12.025	25	16
1.4070.12.032	32	15

PP-R CHROME VALVE LUXURY

Code	d(mm)	Package Standart
1.4070.13.020	20	20
1.4070.13.025	25	16
1.4070.13.032	32	15

PP-R CHROME VALVE HIDDEN

Code	d(mm)	Package Standart
1.4070.14.020	20	30
1.4070.14.025	25	25
1.4070.14.032	32	20

PP-R BALL VALVE

Code	d(mm)	Package Standart
1.4070.15.020	20	40
1.4070.15.025	25	35
1.4070.15.032	32	20
1.4070.15.040	40	15
1.4070.15.050	50	6
1.4070.15.063	63	5
1.4070.15.075	75	5

PP-R BALL VALVE FOR RADIATOR - ELBOW

Code	d(mm)	Package Standart
1.4070.18.020	20x½	50
1.4070.18.025	25x¾	30

PP-R BALL VALVE FOR RADIATOR

Code	d(mm)	Package Standart
1.4070.19.020	20x½	50
1.4070.19.025	25x¾	40

PP-R SHUT OFF VALVE

Code	d(mm)	Package Standart
1.4070.20.020	20	30
1.4070.20.025	25	24
1.4070.20.032	32	15
1.4070.20.040	40	10

PP-R BALL VALVE (LONG)

Code	d(mm)	Package Standart
1.4070.24.020	20	35
1.4070.24.025	25	25

PP-R BALL VALVE FOR RADIATOR WITH CORE - ELBOW

Code	d(mm)	Package Standart
1.4070.26.020	20 x ½	50

PP-R BALL VALVE FOR RADIATOR WITH CORE

Code	d(mm)	Package Standart
1.4070.27.020	20	50

WELDING SET

Code	d(mm)	Package Standart
4400.10.010	20-40	5

WELDING MACHINE

Code	d(mm)	Package Standart
4400.10.022	90-110	1

WELDING TOOLS

Code	d(mm)	Package Standart
4400.11.010	20	100
4400.11.012	25	100
4400.11.014	32	50
4400.11.016	40	40
4400.11.018	50	30
4400.11.020	63	20
4400.11.022	75	12
4400.11.024	90	5
4400.11.026	110	5

FOIL PEELER

Code	d(mm)	Package Standart
4400.15.010	20-25	35
4400.15.012	32-40	20
4400.15.014	50-63	10
4400.15.016	75	10
4400.15.020	90	4
4400.15.022	110	4

PIPE SCISSORS

Code	d(mm)	Package Standart
4400.14.010	20-40	20
4400.14.012	32-63	5

Points to pay attention to when installing polypropylene pipes and fittings

*Do not expose the pipes and fittings to the sun. Protect the pipes against hard and sharp objects. Do not use accidentally damaged pipes.

*Never use fire when heating the pipes. Bend the pipes with hot air.

*The pipes and the fittings to be installed should be clean.

*Cut the pipes perpandicularly with a proper scissor, do not use other sharp objects that can cause impurity in the pipes.

*Mark the welding length on the pipe before welding.

*When welding follow the instructions (temperature, heating time, etc) in the manufacturer' catalogue.

*Do not turn neither the pipes nor the fittings during the welding.

*Do not use polypropylene pipes and fittings where water may freeze. The expansion can break the pipe.

*Cold weather weakens the resistance of polypropylene against hit and it becomes fragile. Protect the pipes against hit when there is a risk of freezing.

*The maximum angle you can turn the pipe and the fitting after welding is 5°

*With pipes with folio, clean the rests generated when the folio was sharpened.

*After shaving the aluminum layer make sure that there is no aluminum rests on the welding surface, otherwise it will cause leakage.

*To prevent leaks in your installation use teflon tapes with the threaded fittings.

*Before burying/covering the installation completely test the system using water in room temperature and observe wheather there are any air bubbles. Continue the control process for 24 hours using water under 20-bar pressure, this under surveillence. At the end of the 24 hours inspect the system again for leaks.