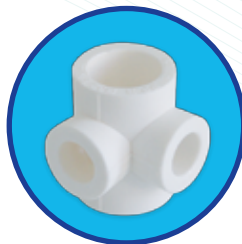




# berkeplastik



**Product Catalogue**







berkeplastik

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berkepla



## 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 odor neutral
- Excellent weld ability
- Good chemical resistance
- Bacteriologic ally neutral
- Physiologically harmless

## Physical, Thermal and Mechanical Properties

Properties	Testing methods	Unit	Values
Physical properties			
Density at 23 °C	ISO 1183	g /cm <sup>3</sup>	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 <sup>-1</sup>	1.5 x 10 <sup>-4</sup>
Heat conductivity	DIN 8078	WK-1m-1	0,23
Surface resistance	DIN 8078	Ω	>10 <sup>12</sup>
Elasticity module	DIN 8078	N/mm <sup>2</sup>	800
Thermal properties			
Melting point	DSC	C°	146–150
Subjective heat	Calorimeter	Kj/kgK	1.73
Coefficient 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
Mechanical properties			
Tensile stress at yield at 50 mm/min	ISO 527–1,-2	Mpa	25
Elongation at yield at 50 mm/min		%	%
Elongation at break at 50 mm/min		13	>500
Charpy impact strength (0 °C)	ISO 179	15J	<i>Fara rupere</i>

### Long Service Life

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

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 color 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 fittings conform to DIN 8077/78, EN ISO 15874 -1,2,3 and DIN 16962 standards.

### 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 weld ability also makes them faster and simpler to install.

## Measuring Hydrostatic Pressure Performance

Hydrostatic pressure is calculated according to the below formula:

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

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

### Service life DIN 8077 (SF=1.S 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	



## Standards And Guidelines

<b>DIN 8077</b>	Polypropylene (PP) pipes. PP-H. PP-B. PP-R. PP-RCT dimensions.
<b>DIN 8078</b>	Polypropylene (PP) pipes. PP-H. PP-B. PP-R. PP-RCT general quality requirements and testing
<b>DIN 16962</b>	Pipe fittings and joint assemblies for polypropylene (PP) pressure pipes. Part 5- General Quality Requirements and Testing. Part 6- Injection Molded Elbows for socket-welding Dimension. Part 9 Injection Molded reducers and nipples for socket welding Dimension.
<b>DIN 1988</b>	Drinking water supply systems- Part 1 General, Part 2 Materials, components, appliances, design and installation.
<b>ISO 3213</b>	Polypropylene (PP) pipes effect of time and temperature on the expected strength.
<b>ISO 10508</b>	Plastics piping systems for hot and cold water installations -- Guidance dor classification and design.
<b>EN ISO 15874</b>	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
<b>DVGW544</b>	Plastic pipes in the drinking water installation; Requirements and testing
<b>DVS 2207</b>	Welding of thermoplastics materials heated tool welding of piping system and sheet 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 chromiumplated 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	-	-
Acephenone	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 metaphosphate	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
Benzoic acid	Sat.sol	S	S	-
Benzyl alcohol	100%	S	L	-
Boron trifluoride	Sat.sol	S	-	-
Bromine, gas		NS	NS	NS
Bromine, 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 monoxide, 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

Chemical or Product	Concentration	Temperature °C		
		20	60	100
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	-
Diocyl phthalate	100%	L	L	-
Distilled water	100%	S	S	S
Ethanolamine	100%	S	S	S
Ethyl acetate	100%	L	NS	NS
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	From 35 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



Chemical or Product	Concentration	Temperature °C		
		20	60	100
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) nitrate	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 chloride	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	-	-
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 metaphosphate	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	-

Chemical or Product	Concentration	Temperature °C		
		20	60	100
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
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.

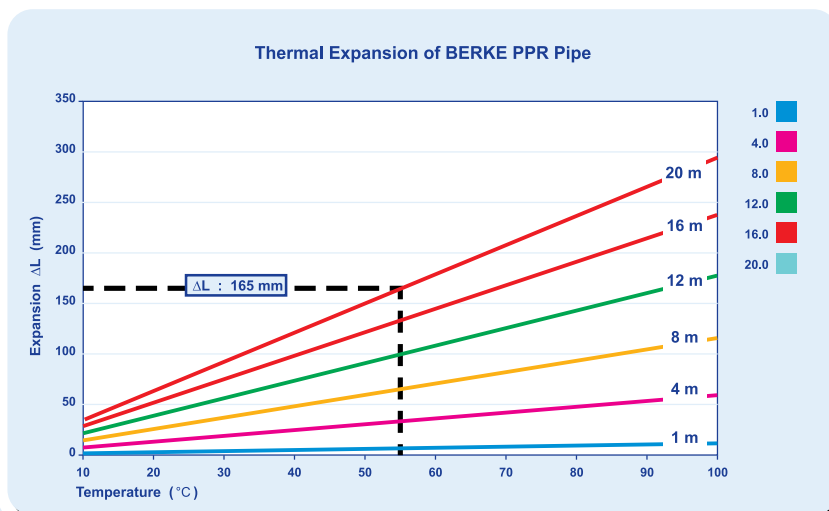
## Thermal Expansion Of Berke PP-R Pipe

Calculation of thermal expansion is as follows:

where

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

- $\Delta T$  = variation of working temperature in Kelvin degrees (K) or Celsius (C°)
- $\Delta L$  = variation of length in mm
- $L$  = initial length of the pipe in m
- $\lambda$  = coefficient of linear thermal expansion. The value of  $\lambda$  is  $1.5 * 10^{-4}$  (K<sup>-1</sup>) for pp-r pipe.





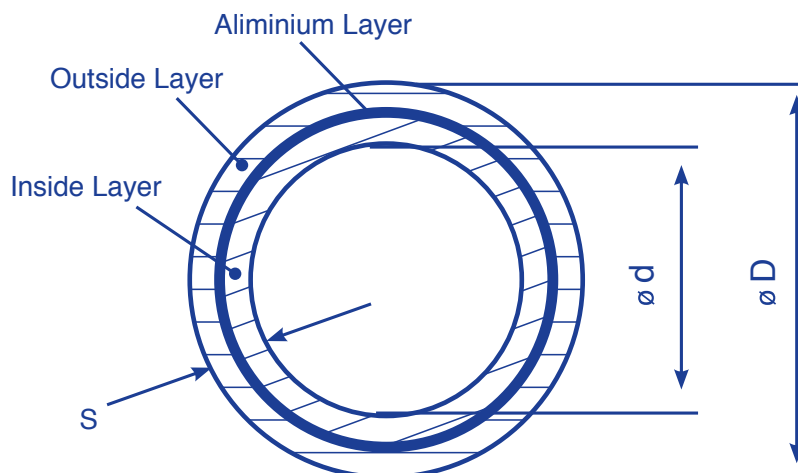
Pipe length (m)	Temperature variation $\Delta T$ in K									
	10	20	30	40	50	60	70	80	90	100
Linear Expansion $\Delta L$ (mm)										
1.0	1.50	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
4.0	6.0	12.0	18.0	24.0	30.0	36.0	42.0	48.0	54.5	60.0
8.0	12.0	24.0	36.0	48.0	60.0	72.0	84.0	96.0	108.0	120.0
12.0	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

### Polypropylene Tubes with Middle Layer Aluminium Foil

This pipe consists of three layers: the pipe inside and outside layer are made of PPR-Type 3 with an aluminum foil inbetween. The foil is attached with wrapping welding and by using a special PP film to establish the mechanical connection between the aluminum foil and the PP-layer.

#### Advantages

- No need to shave the pipe for welding
- Easy welding
- Easy installation in a short time
- Dimensions are same normal ppr tube.



Pipe Dimensions according to 8077 (S=2 SDR=5) (PN 25)

**Pipe Dimensions according to 8077 (S=2 SDR=5) (PN 25)**

Outer Diameter and Tolerance ØD, mm		Wall Thickness and Tolerance		Aluminium Thickness (micron)	Approximaty Weight kg/m
		S, mm			
20	+0,3	3,4	+0,5	150	0,192
25	+0,3	4,2	+0,6	150	0,291
32	+0,3	5,4	+0,7	150	0,459
40	+0,4	6,7	+0,8	150	0,694
50	+0,5	8,3	+1,0	150	1,087
63	+0,6	10,5	+1,2	150	1,734

**Operating Conditions DIN 8078 (S=2, SDR=5) (PN 25)**

Temperature (°C)	Life (years)	Pressure (bar)
20	50	32,4
40	50	23,1
60	50	16,2
70	50	10,7
80	25	8,1
95	5	6,5

**Oxygen Impermeability**

Oxygen penetration reduces the system life by corroding the radiator and the heater device. Oxygen diffusion from the air is one of the most common ways of oxygen penetrating into the system. Plastic pipes do not prevent this diffusion. The aluminum foil increases the life of the radiator and the heater by acting as a barrier.

**Thermal Expansion in PP-R Tubes with Middle Layer Aluminium Foil**

Polypropylene pipes with an aluminum folio have lower expansion coefficients.

The expansion is calculated as follows:  $\Delta L=L*\Delta T*\lambda$

The approximate value for  $\lambda$  in PP-R tubes with alu folio is  $0,3*10^{-4}$  (K-1).

Pipe length (m)	Temperature variation $\Delta T$ in K									
	10	20	30	40	50	60	70	80	90	100
	Linear expansion $\Delta L$ (mm)									
1	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3
2	0.6	1.2	1.8	2.4	3	3.6	4.2	4.8	5.4	6
3	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9
4	1.2	2.4	3.6	4.8	6	7.2	8.4	9.6	10.8	12
5	1.5	3	4.5	6	7.5	9	10.5	12	13.5	15
6	1.8	3.6	5.4	7.2	9	10.8	12.8	14.4	16.2	18
7	2.1	4.2	6.43	8.4	10.5	12.6	14.7	16.8	18.9	21
8	2.4	4.8	7.2	9.6	12	14.4	16.8	19.2	21.6	24
9	2.7	5.4	8.1	10.8	13.5	16.2	18.9	21.6	24.3	27
10	3	6	9	12	15	18	21	24	27	30

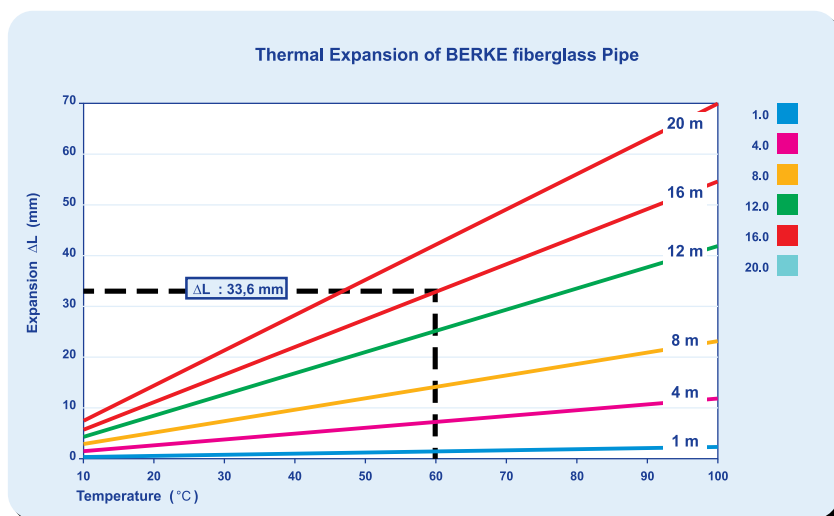
## Thermal Expansion of Berke PP-R Fiberglass Pipe

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<sup>-4</sup> (K<sup>-1</sup>) 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	0,35	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



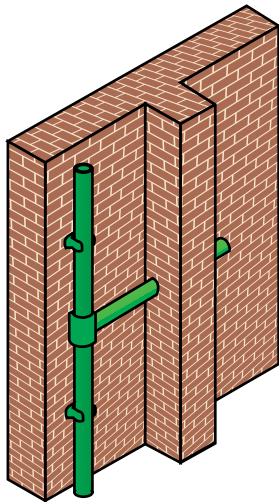
## Support Intervals

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

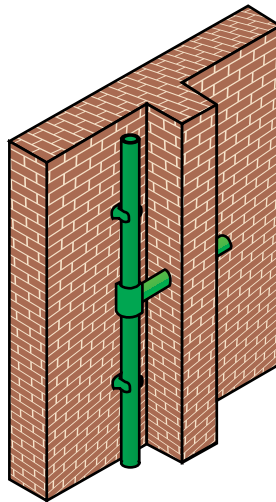
Temperature $\Delta T$ (K)	Pipe diameter d (mm)								
	20	25	32	40	50	63	75	90	110
	Support intervals in cm								
20	60	70	90	100	120	140	150	160	180
30	60	70	90	100	120	140	150	160	180
40	60	70	80	90	110	130	140	150	170
50	60	70	80	90	110	130	140	150	170
60	50	60	70	80	100	110	120	140	160
70	50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

## Type Of Assembly For Installation Of The Flat

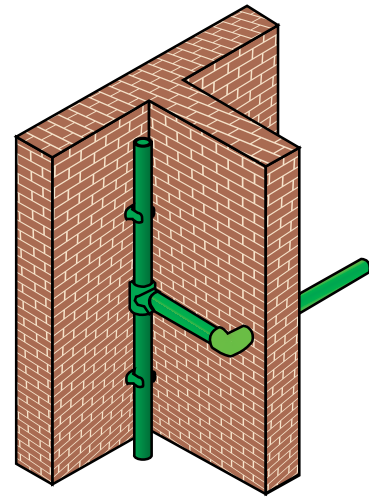
To allow for the subsequent linear expansion of the pipes regarding the connections at the entrances of flats, one of the techniques below should be used for making the connections.



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



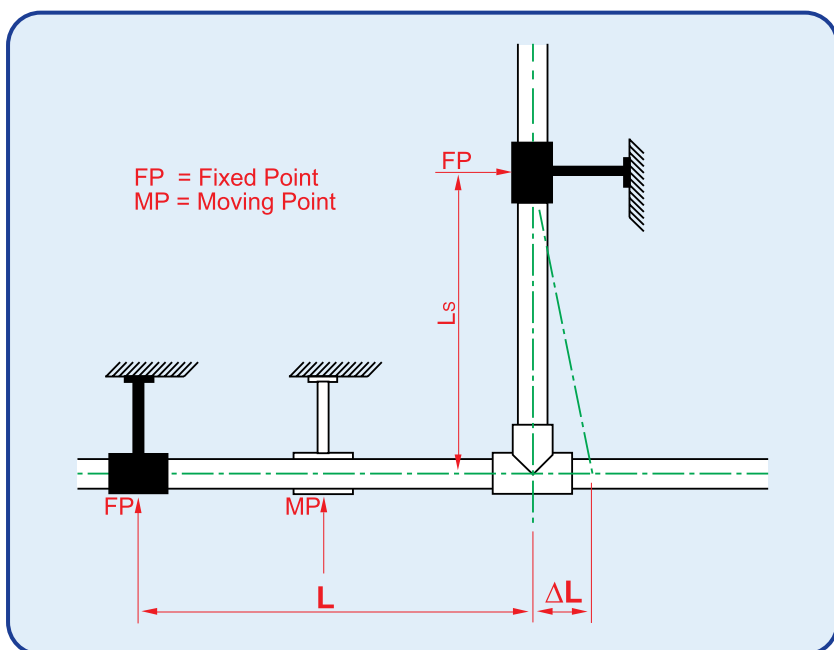
B: The connection can be made via allowing a wide hole at the point where the pipe enters the flat.



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** = 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)



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

**Example :**

L = 5m	$\Delta L = L \cdot \Delta T \cdot \lambda$	$Ls = K \sqrt{d \times \Delta L}$
$\Delta T = 50$	$\Delta L = 5 \cdot 50 \cdot 0,15$	$Ls = 15 \sqrt{40 \cdot 37,5}$
$\varnothing d = 40\text{mm}$	$\Delta L = 37,5 \text{ mm}$	$Ls = 580 \text{ mm}$
$Ls = ?$		

## Calculation Of Thermal Expansion

Thermal expansion  $\Delta L$  is calculated with the below stated formula:

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

- $\Delta T$**  = Variation of working temperature in Kelvin (K) or Celcius (C°)
- $\Delta L$**  = Variation of length in mm
- $L_s$**  = Initial length of the pipe in m
- $\lambda$**  = Coefficient of linear thermal expansion. The value of  $\lambda$  is  $1,5 \times 10^{-4}$  (K<sup>-1</sup>) for pp-r pipe.

## Length Of The Flexible Pipe Side Is Calculated With The Following Formula:

- $L_s$**  = Length of the flexible pipe side, mm
- $d$**  = Outer diameter of the Berke pipe, mm
- $\lambda L$**  = Variation of length, mm
- $K$**  = 15 (material based constant of Berke pipe)

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

### Example:

1- Calculation of thermal expansion  
Temperature difference between cold water and enviroment

#### Input

$\lambda = 0.15$  mm/m-K  
 $L = 2.0$  m

#### Required

$\Delta L = \lambda * \Delta T * L$   
 $\Delta L = 0.15 * 40 * 2.0 = 12$  mm

2- Calculation of the shortest flexible length

$d = 40$  mm  
 $\Delta L = 12$  mm  
 $K = 15$

$L_s = \lambda * \Delta T * L$   
 $L_s = 0.15 * \sqrt{40} * 2.0 = 328$  mm

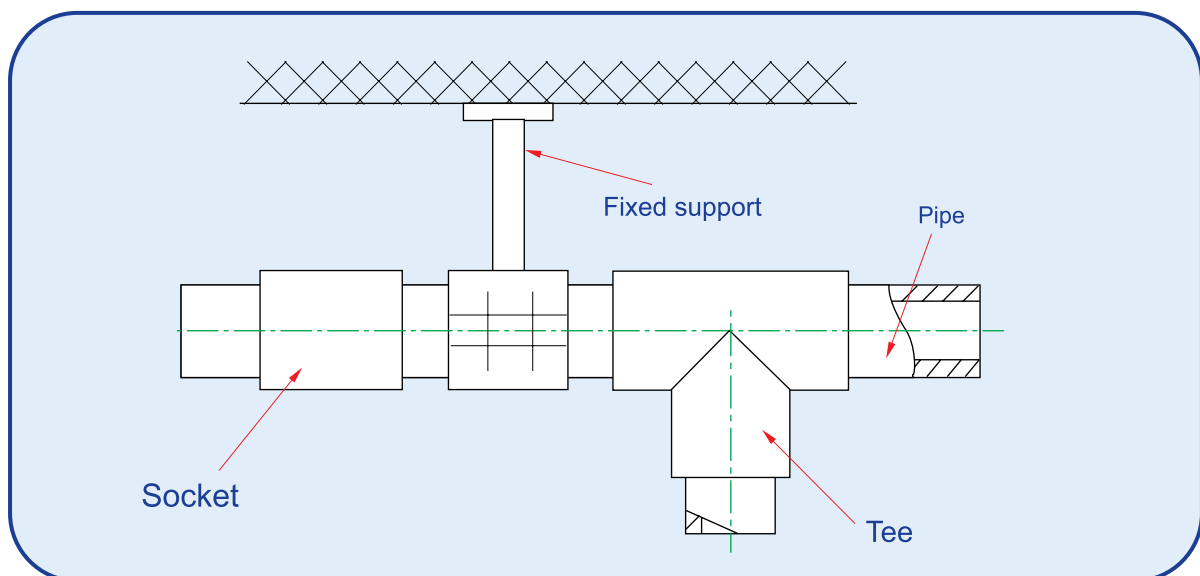


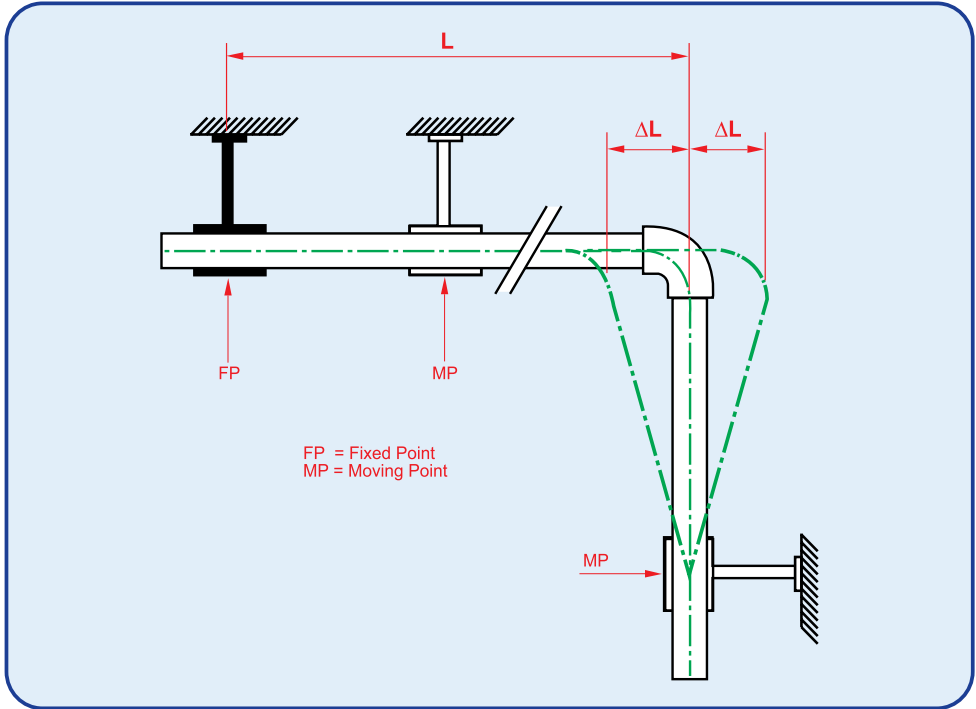
## Assembly Principles

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.

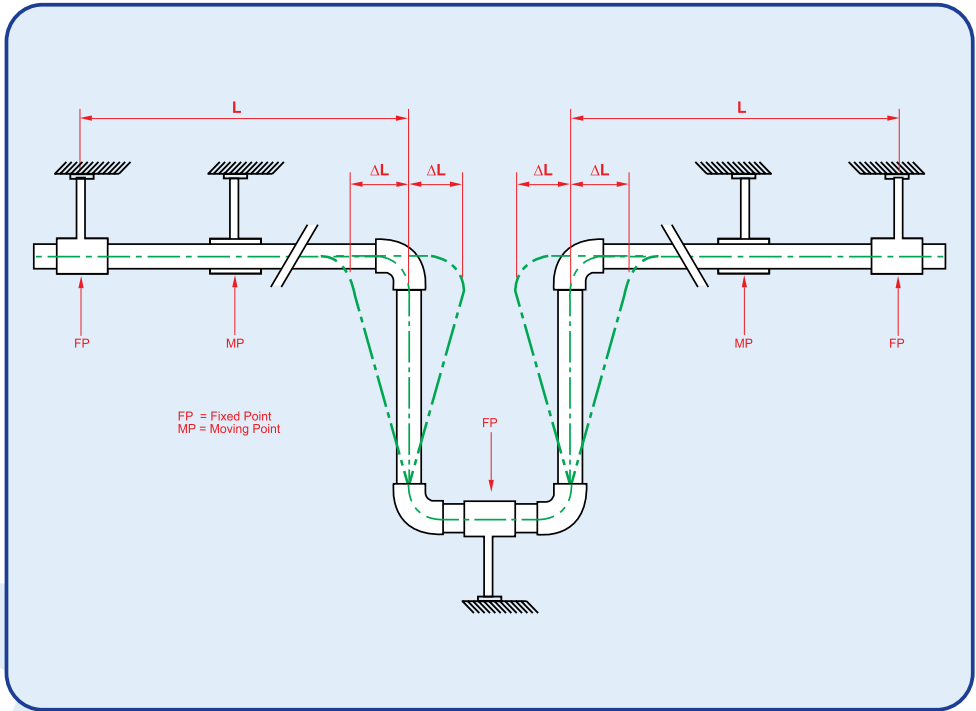
### Fixed Support

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 plan period.



## Insulation

Pipe Outer Diameter	Insulation Thickness in BERKE Pipes	
	$\lambda = 0,035 \text{ W/mK}$	$\lambda = 0,04 \text{ W/mK}$
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 necessary 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
2.4010.10.020	ø20 x 1,9	100
2.4010.10.025	ø25 x 2,3	80
2.4010.10.032	ø32 x 2,9	40
2.4010.10.040	ø40 x 3,7	32
2.4010.10.050	ø50 x 4,6	20
2.4010.10.063	ø63 x 5,8	16
2.4010.10.075	ø75 x 6,8	12
2.4010.10.090	ø90 x 8,2	8
2.4010.10.110	ø110 x 10,0	4

**PP-R PIPE PN 16**

Code	d(mm)	Package Standart
2.4010.16.020	ø20 x 2,8	100
2.4010.16.025	ø25 x 3,5	80
2.4010.16.032	ø32 x 4,4	40
2.4010.16.040	ø40 x 5,5	32
2.4010.16.050	ø50 x 6,9	20
2.4010.16.063	ø63 x 8,6	16
2.4010.16.075	ø75 x 10,3	12
2.4010.16.090	ø90 x 12,3	8
2.4010.16.110	ø110 x 15,1	4

**PP-R PIPE PN 20**

Code	d(mm)	Package Standart
2.4010.20.020	ø20 x 3,4	100
2.4010.20.025	ø25 x 4,2	80
2.4010.20.032	ø32 x 5,4	40
2.4010.20.040	ø40 x 6,7	32
2.4010.20.050	ø50 x 8,3	20
2.4010.20.063	ø63 x 10,5	16
2.4010.20.075	ø75 x 12,5	12
2.4010.20.090	ø90 x 15,0	8
2.4010.20.110	ø110 x 18,3	4

**PP-R UV RESIST PIPE PN 25**

Code	d(mm)	Package Standart
2.4022.25.020	ø20	100
2.4022.25.025	ø25	80
2.4022.25.032	ø32	40
2.4022.25.040	ø40	32
2.4022.25.050	ø50	20
2.4022.25.063	ø63	16
2.4022.25.075	ø75	12
2.4022.25.090	ø90	8
2.4022.25.110	ø110	4





### PP-R GLASS FIBER PIPE PN 20

Code	d(mm)	Package Standart
2.4030.20.020	ø20 x 2,8	100
2.4030.20.025	ø25 x 3,5	80
2.4030.20.032	ø32 x 4,4	40
2.4030.20.040	ø40 x 5,5	32
2.4030.20.050	ø50 x 6,9	20
2.4030.20.063	ø63 x 8,6	16
2.4030.20.075	ø75 x 10,3	12
2.4030.20.090	ø90 x 12,3	8
2.4030.20.110	ø110 x 15,1	4



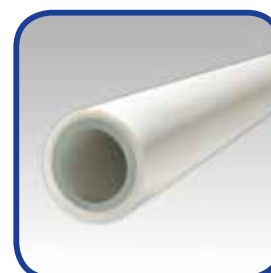
### PP-R GLASS FIBER PIPE PN 25

Code	d(mm)	Package Standart
2.4030.25.020	ø20 x 3,4	100
2.4030.25.025	ø25 x 4,2	80
2.4030.25.032	ø32 x 5,4	40
2.4030.25.040	ø40 x 6,7	32
2.4030.25.050	ø50 x 8,3	20
2.4030.25.063	ø63 x 10,5	16
2.4030.25.075	ø75 x 12,5	12
2.4030.25.090	ø90 x 15,0	8
2.4030.25.110	ø110 x 18,3	4



### PP-R FOILED SUPER PIPE PN 25

Code	d(mm)	Package Standart
2.4024.25.020	ø20	100
2.4024.25.025	ø25	80
2.4024.25.032	ø32	40
2.4024.25.040	ø40	32
2.4024.25.050	ø50	20
2.4024.25.063	ø60	16
2.4024.25.075	ø75	12
2.4024.25.090	ø90	8
2.4024.25.110	ø100	4



### PP-R C BRIDGE

Code	d(mm)	Package Standart
2.4040.27.020	20	200
2.4040.27.025	25	100
2.4040.27.032	32	60



### PP-R BRIDGE WITH CONNECTIONS

Code	d(mm)	Package Standart
2.4040.25.020	20	120
2.4040.25.025	25	60
2.4040.25.032	32	20



### PP-R BRIDGE

Code	d(mm)	Package Standart
2.4040.26.020	20	90
2.4040.26.025	25	60
2.4040.26.032	32	40
2.4040.26.040	40	18



### PP-R STRAIGHT CONNECTOR

Code	d(mm)	Package Standart
2.4040.12.020	20	600
2.4040.12.025	25	350
2.4040.12.032	32	180
2.4040.12.040	40	100
2.4040.12.050	50	60
2.4040.12.063	63	36
2.4040.12.075	75	24
2.4040.12.090	90	16
2.4040.12.110	110	4



### PP-R ELBOW 90°

Code	d(mm)	Package Standart
2.4040.13.020	20	400
2.4040.13.025	25	250
2.4040.13.032	32	120
2.4040.13.040	40	60
2.4040.13.050	50	35
2.4040.13.063	63	16
2.4040.13.075	75	12
2.4040.13.090	90	4
2.4040.13.110	110	2



### PP-R ELBOW 45°

Code	d(mm)	Package Standart
2.4040.14.020	20	500
2.4040.14.025	25	300
2.4040.14.032	32	125
2.4040.14.040	40	70
2.4040.14.050	50	40
2.4040.14.063	63	20
2.4040.14.075	75	12



### PP-R TE

Code	d(mm)	Package Standart
2.4040.18.020	20	240
2.4040.18.025	25	150
2.4040.18.032	32	80
2.4040.18.040	40	40
2.4040.18.050	50	25
2.4040.18.063	63	14
2.4040.18.075	75	10
2.4040.18.090	90	4
2.4040.18.110	110	2



### PP-R UNEQUAL TE

Code	d(mm)	Package Standart
2.4040.19.012	20/25/20	150
2.4040.19.014	25/20/20	150
2.4040.19.016	25/20/25	150
2.4040.19.018	25/25/20	150
2.4040.19.020	32/20/20	100
2.4040.19.022	32/20/25	100
2.4040.19.024	32/20/32	80
2.4040.19.026	35/25/20	100
2.4040.19.028	35/25/25	100
2.4040.19.030	32/25/32	80
2.4040.19.042	40/20/40	50
2.4040.19.050	40/25/40	50
2.4040.19.058	40/32/40	50
2.4040.19.074	50/20/50	35
2.4040.19.084	50/25/50	35
2.4040.19.094	50/32/50	30
2.4040.19.104	50/40/50	30
2.4040.19.116	63/20/63	20
2.4040.19.128	63/25/63	20
2.4040.19.140	63/32/63	20
2.4040.19.152	63/40/60	16
2.4040.19.154	63/50/63	16
2.4040.19.168	75/20/75	10
2.4040.19.182	75/25/75	10
2.4040.19.196	75/32/75	10
2.4040.19.210	75/40/75	10
2.4040.19.212	75/50/75	10
2.4040.19.214	75/63/75	10
2.4040.19.218	90/50/90	4
2.4040.19.220	90/63/90	4
2.4040.19.226	110/63/110	2



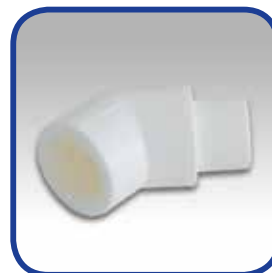
### PP-R TAIL ELBOW 90°

Code	d(mm)	Package Standart
2.4040.15.020	20	300
2.4040.15.025	25	200



### PP-R TAIL ELBOW 45°

Code	d(mm)	Package Standart
2.4040.16.020	20	300
2.4040.16.025	25	200



### PP-R REDUCER

Code	d(mm)	Package Standart
2.4040.23.010	25/20	600
2.4040.23.012	32/20	300
2.4040.23.014	32/25	300
2.4040.23.016	40/20	250
2.4040.23.018	40/25	250
2.4040.23.020	40/32	150
2.4040.23.022	50/20	100
2.4040.23.024	50/25	120
2.4040.23.026	50/32	120
2.4040.23.028	50/40	100
2.4040.23.030	63/20	80
2.4040.23.032	63/25	80
2.4040.23.034	63/32	60
2.4040.23.036	63/40	60
2.4040.23.038	63/50	50
2.4040.23.040	75/20	60
2.4040.23.042	75/25	50
2.4040.23.044	75/32	50
2.4040.23.046	75/40	50
2.4040.23.048	75/50	40
2.4040.23.050	75/63	40
2.4040.23.060	90/50	20
2.4040.23.062	90/63	20
2.4040.23.064	90/75	16
2.4040.23.066	110/63	16
2.4040.23.068	110/75	16
2.4040.23.070	110/90	12



### PPR REDUCER COUPLING FEMALE

Code	d(mm)	Package Standart
2.4040.24.010	25/20	300
2.4040.24.012	32/20	200
2.4040.24.014	32/25	200
2.4040.24.016	40/20	150
2.4040.24.018	40/25	150



### PP-R REDUCER ELBOW 90°

Code	d(mm)	Package Standart
2.4040.17.012	25/20	200





### PP-R CROSS TE

Code	d(mm)	Package Standart
2.4040.21.020	20	200
2.4040.21.025	25	100
2.4040.21.032	32	60



### PP-R CORNER CROSS TEE

Code	d(mm)	Package Standart
2.4040.22.020	32 x 20	80
2.4040.22.025	32 x 25	80
2.4040.22.032	40 x 20	60
2.4040.22.040	40 x 25	60



### PP-R TE BRANCH

Code	d(mm)	Package Standart
2.4040.20.012	20/20	100
2.4040.20.014	25/20	60
2.4040.20.016	25/25	60



### PP-R END PLUG

Code	d(mm)	Package Standart
2.4040.31.020	20 x 1/2"	600
2.4040.31.025	25 x 3/4"	600
2.4040.31.032	32 x 1"	300
2.4040.31.U20	20 x 1/2" (Long)	200



### PP-R BLANKING CAP

Code	d(mm)	Package Standart
2.4040.28.020	20	900
2.4040.28.025	25	500
2.4040.28.032	32	300
2.4040.28.040	40	150
2.4040.28.050	50	80
2.4040.28.063	63	50
2.4040.28.075	75	32
2.4040.28.090	90	18
2.4040.28.110	110	9





### PP-R PIPE CLIPS

Code	d(mm)	Package Standart
2.4040.29.020	20	750
2.4040.29.025	25	600
2.4040.29.032	32	500
2.4040.29.040	40	300
2.4040.29.050	50	250



### PP-R DOUBLE PIPE CLIPS

Code	d(mm)	Package Standart
2.4040.30.020	20	400
2.4040.30.025	25	300
2.4040.30.032	32	150



### PP-R FILTER FEMALE / FEMALE

Code	d(mm)	Package Standart
2.4050.58.010	20	60
2.4050.58.012	25	30
2.4050.58.014	32	25



### PP-R FILTER MALE / FEMALE

Code	d(mm)	Package Standart
2.4050.59.010	20	60
2.4050.59.012	25	30
2.4050.58.016	32	25



### PP-R DOUBLE WALLPLATE ELBOW FEMALE - NEW MODEL

Code	d(mm)	Package Standart
2.4050.22.C20	20 x 1/2"	40
2.4050.22.C25	25 x 1/2"	40



### PP-R DOUBLE WALLPLATE ELBOW FEMALE

Code	d(mm)	Package Standart
2.4050.21.C20	20 x 1/2"	30
2.4050.21.C25	25 x 1/2"	20



### PP-R DOUBLE FEMALE WALLPLATE FOR WC

Code	d(mm)	Package Standart
2.4050.19.020	20 x 1/2"	20
2.4050.19.025	25 x 1/2"	20



### PP-R WALLPLATE ELBOW FEMALE

Code	d(mm)	Package Standart
2.4050.20.010	20 x 1/2"	75
2.4050.20.012	25 x 1/2"	40



### PP-R ELBOW FEMALE

Code	d(mm)	Package Standart
2.4050.16.010	20 x 1/2"	120
2.4050.16.012	20 x 3/4"	75
2.4050.16.014	25 x 1/2"	80
2.4050.16.016	25 x 3/4"	75
2.4050.16.018	32 x 1/2"	40
2.4050.16.020	32 x 3/4"	40
2.4050.16.022	32 x 1"	40



### PP-R ELBOW MALE

Code	d(mm)	Package Standart
2.4050.18.010	20 x 1/2"	100
2.4050.18.012	20 x 3/4"	60
2.4050.18.014	25 x 1/2"	60
2.4050.18.016	25 x 3/4"	60
2.4050.18.018	32 x 1/2"	30
2.4050.18.020	32 x 3/4"	40
2.4050.18.022	32 x 1"	30



### PP-R TE FEMALE

Code	d(mm)	Package Standart
2.4050.30.010	20 x 1/2"	75
2.4050.30.012	20 x 3/4"	60
2.4050.30.014	25 x 1/2"	60
2.4050.30.016	25 x 3/4"	45
2.4050.30.018	32x1/2"	30
2.4050.30.020	32 x 3/4"	30
2.4050.30.022	32 x 1"	30



### PP-R TE MALE

Code	d(mm)	Package Standart
2.4050.32.010	20 x 1/2"	75
2.4050.32.012	20 x 3/4"	45
2.4050.32.014	25 x 1/2"	60
2.4050.32.016	25 x 3/4"	45
2.4050.32.018	32 x 1/2"	30
2.4050.32.020	32 x 3/4"	30
2.4050.32.022	32 x 1"	30





### PP-R ROUND NIPPLE FEMALE

Code	d(mm)	Package Standart
2.4050.40.010	20 x 1/2"	150
2.4050.40.012	20 x 3/4"	120
2.4050.40.014	25 x 1/2"	120
2.4050.40.016	25 x 3/4"	120
2.4050.40.018	32 x 1/2"	75
2.4050.40.020	32 x 3/4"	75
2.4050.40.022	32 x 1"	60



### PP-R ROUND NIPPLE MALE

Code	d(mm)	Package Standart
2.4050.41.010	20 x 1/2"	120
2.4050.41.012	20 x 3/4"	100
2.4050.41.014	25 x 1/2"	100
2.4050.41.016	25 x 3/4"	80
2.4050.41.018	32 x 1/2"	75
2.4050.41.020	32 x 3/4"	75
2.4050.41.022	32 x 1"	60



### PP-R HEXAGONAL NIPPLE FEMALE

Code	d(mm)	Package Standart
2.4050.42.032	32 x 1"	45
2.4050.42.040	40 x 1 1/4"	30
2.4050.42.050	50 x 1 1/2"	15
2.4050.42.063	63 x 2"	12
2.4050.42.075	75 x 2 1/2"	8
2.4050.42.090	90 x 3"	4
2.4050.42.110	110 x 4"	2



### PP-R HEXAGONAL NIPPLE MALE

Code	d(mm)	Package Standart
2.4050.43.032	32 x 1"	45
2.4050.43.040	40 x 1 1/4"	24
2.4050.43.050	50 x 1 1/2"	15
2.4050.43.063	63 x 2"	8
2.4050.43.075	75 x 2 1/2"	6
2.4050.43.090	90 x 3"	8
2.4050.43.110	110 x 4"	3



### PP-R TEE WITH LOOSE NUT

Code	d(mm)	Package Standart
2.4050.33.010	20 x 1/2"	100
2.4050.33.012	20 x 3/4"	50
2.4050.33.014	25 x 3/4"	50
2.4050.33.016	25 x 1"	40
2.4050.33.018	32 x 1 1/4"	20



### PP-R ELBOW WITH LOOSE NUT

Code	d(mm)	Package Standart
2.4050.17.010	20 x 1/2"	120
2.4050.17.012	20 x 3/4"	70
2.4050.17.014	25 x 3/4"	70
2.4050.17.016	25 x 1"	50
2.4050.17.018	32 x 1 1/4"	30
2.4050.17.020	32 x 1"	30



### PP-R NIPPLE WITH LOOSE NUT

Code	d(mm)	Package Standart
2.4050.39.010	20 x 1/2"	150
2.4050.39.012	20 x 3/4"	150
2.4050.39.014	25 x 3/4"	100
2.4050.39.016	25 x 1"	60
2.4050.39.018	32 x 1"	60
2.4050.39.020	32 x 1 1/4"	40



### PP-R TRANSITION UNION FEMALE

Code	d(mm)	Package Standart
2.4060.13.010	20 x 1/2" (ECO)	200
2.4060.13.014	25 x 3/4" (ECO)	100
2.4060.13.020	32 x 1" (ECO)	75
2.4060.13.024	40 x 1 1/4" (ECO)	45
2.4060.11.026	50 x 1 1/2"	25
2.4060.11.028	63 x 2"	12
2.4060.11.030	75 x 2 1/2"	6
2.4060.11.032	90 x 3"	3
2.4060.11.034	110 x 4"	2



### PP-R TRANSITION UNION MALE

Code	d(mm)	Package Standart
2.4060.14.010	20 x 1/2" (ECO)	150
2.4060.14.014	25 x 3/4" (ECO)	100
2.4060.14.020	32 x 1" (ECO)	60
2.4060.14.024	40 x 1 1/4" (ECO)	40
2.4060.12.026	50 x 1 1/2"	20
2.4060.12.028	63 x 2"	12
2.4060.12.030	75 x 2 1/2"	6
2.4060.12.032	90 x 3"	3
2.4060.12.034	110 x 4"	2



### PP-R TRANSITION UNION PLASTIC TO PLASTIC

Code	d(mm)	Package Standart
2.4060.10.020	20	200
2.4060.10.025	25	125
2.4060.10.032	32	75
2.4060.10.040	40	50
2.4060.10.050	50	30
2.4060.10.063	63	15
2.4060.10.075	75	10
2.4060.10.090	90	3
2.4060.10.110	110	2



### PP-R BALL VALVE FOR RADIATOR - ELBOW

Code	d(mm)	Package Standart
2.4070.18.020	20 x 1/2"	50
2.4070.18.025	25 x 3/4"	30



### PP-R BALL VALVE FOR RADIATOR

Code	d(mm)	Package Standart
2.4070.19.020	20 x 1/2"	50
2.4070.19.025	25 x 3/4"	40



### PP-R VALVE FOR RADIATOR WITH CORE - ELBOW

Code	d(mm)	Package Standart
2.4070.26.020	20 x 1/2"	50



### PP-R VALVE FOR RADIATOR WITH CORE

Code	d(mm)	Package Standart
2.4070.27.020	20 x 1/2"	50



### PP-R BALL VALVE WITH DOUBLE TRANSITION UNION

Code	d(mm)	Package Standart
2.4070.10.020	20	30
2.4070.10.025	25	25
2.4070.10.032	32	15



### PP-R BALL VALVE WITH TRANSITION UNION

Code	d(mm)	Package Standart
2.4070.11.020	20	35
2.4070.11.025	25	30
2.4070.11.032	32	15



### PP-R BALL VALVE

Code	d(mm)	Package Standart
2.4070.15.020	20	40
2.4070.15.025	25	35
2.4070.15.032	32	20
2.4070.15.040	40	15
2.4070.15.050	50	8
2.4070.15.063	63	5
2.4070.15.075	75	5



### PP-R BALL VALVE (LONG)

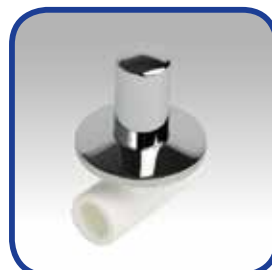
Code	d(mm)	Package Standart
2.4070.24.020	20	35
2.4070.24.025	25	25





### PP-R CHROME VALVE HIDDEN

Code	d(mm)	Package Standart
2.4070.14.020	20	30
2.4070.14.025	25	25
2.4070.14.032	32	20



### PP-R CHROME BALL VALVE

Code	d(mm)	Package Standart
2.4070.28.020	20	20
2.4070.28.025	25	20



### Standart PP-R CHROME VALVE LUXURY

Code	d(mm)	Package Standart
2.4070.13.020	20	20
2.4070.13.025	25	16
2.4070.13.032	32	15



### PP-R SHUT OFF VALVE

Code	d(mm)	Package Standart
2.4070.20.020	20	30
2.4070.20.025	25	24
2.4070.20.032	32	15
2.4070.20.040	40	10



### PP-R MINI BALL VALVE

Code	d(mm)	Package Standart
2.4070.29.020	20	80
2.4070.29.025	25	60
2.4070.30.020	20	80
2.4070.30.025	25	60



### PP-R MANIFOLD

Code	d(mm)	Package Standart
2.4080.10.2MK	2	25
2.4080.10.2MM	2	25
2.4080.10.3MK	3	20
2.4080.10.3MM	3	20
2.4080.10.4MK	4	15
2.4080.10.4MM	4	15
2.4080.10.5MK	5	10
2.4080.10.5MM	5	10
2.4080.10.6MK	6	10
2.4080.10.6MM	6	10



### PP-R CHECK VALVE

Code	d(mm)	Package Standart
2.4040.32.020	20	150
2.4040.32.025	25	100



### PP-R COUPLING WITH LOOSE NUT

Code	d(mm)	Package Standart
2.4060.16.020	20	100
2.4060.16.025	25	70
2.4060.16.032	32	45



### PP-R TRANSITION NIPPLE FEMALE

Code	d(mm)	Package Standart
2.4090.10.010	20 x 3/4"	150
2.4090.10.012	25 x 1"	100
2.4090.10.014	32 x 1 1/4"	100



### PP-R TRANSITION NIPPLE MALE

Code	d(mm)	Package Standart
2.4090.11.010	20 x 3/4"	150
2.4090.11.012	25 x 1"	150
2.4090.11.014	32 x 1 1/4"	100



### 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 when installing PPR pipes and fittings



1. Due to their brittle characteristic and behavior below 0 ° C, pipes should not be used where water can freeze in pipes, or they should be prevented from freezing.



2. PPR pipes and fittings should not be exposed to sunlight (UV).



3. During the installation, products should be kept away from sharp objects.



4. Before welding, pipes and fittings should be cleaned.



5. Damaged pipes and pipes with cut/cracked ends should not be used.



6. Products should be protected against hits and shocks.



7. Use only sharp tools for cutting pipes.



8. Welding length should be marked on pipe before welding.



9. Open fire should not be used to heat the pipes.



10. Welding waiting time should be followed.



11. During melting and after welding, pipe and fittings definitely should not be turned.



12. Welding die should be cleaned before use, and dies with damaged coating should not be used.



13. Excessive tightening should be avoided for metal fittings.



14. To prevent leakage, teflon tape should be used.



15. Plastic end-plugs should be used instead of metal end-plugs.

16. After finishing pipe installation, leakage test must be done according to water test instructions.

Please look at the leakage test procedure below.

17. After the leakage test, the water in the installation should be completely emptied against the freezing danger.



18. Pipe and fittings installed outside buildings should be protected from sunlight (UV) and freezing.

### Leakage test procedure

Installation that is finished must be completely filtered and vacuumed and then must be completely filled with water.

### Pressure testing shall be carried out in two stages:

a) 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. Then it shall be checked whether, over a further period of 30 minutes, the pressure has dropped by more than 0,6 bar (with a rate of 0,1 bar per minute) and leakage has occurred or not.

b) The second stage shall follow the first stage without interval and shall last two 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 or not.

**Please note that test must be done according to DIN 1988-2, tests out of standards should be avoided.**





PVC-U  
-U PVC-U  
-U PVC-U  
PVC-U  
-U PVC-U  
-U PVC-U  
PVC-U  
-U PVC-U  
-U PVC-U  
PVC-U  
-U PVC-U  
PVC-U



berkepla

## Berke Plastik PVC-U Waste Water Systems

### Raw Material and General Properties

Berke Waste Water Systems are formed of pipes and jointing parts which are produced from the raw material of PVC-U and they are manufactured according to the B and BD application areas of EN 1329 -1,2 standart and submitted to the usage of the plumbers together its seal.

PVC-U pipe and jointing parts (B and BD marked) are used for the below mentioned purposes.

- Warm and cold domestic waste water,
- Air conditioning systems for domestic waste water lines,
- Building rain water installation,

From the pipes and jointing parts: the ones which are marked with “B” can be used only inside the building and the “BD” marked ones can be used as embedded under the ground in the building and within the building.

### Application Area Code :

The application area code is the code showing the application areas of the pipes and fittings according to the below mentioned applications.

B: The application area code for the pipes and fittings which are mounted on the wall outside the building or for the pipes and fittings which will be used on the ground inside the building.

D: The application area code used for the pipes and fittings used embedded under the ground which are 1 meter away from the building and under the building in order to make connections for the underground drainage and sewerage systems.

BD: The application area code for the pipes and fittings used in both application areas specified in B and D codes.

Note : The nominal diameter of the elements which are used as embedded under the ground inside the building (BD marked) should be at least 75mm. Additional properties for the ground surface applications outside the building according to the weather conditions are determined by the user and the manufacturer.

The elements which are produced according to the other plastic pipe system standarts can be used together if they conform the PVC-U pipes and fittings, fitting dimensions and functional properties according to the EN 1329-1,2 standart.

Berke PVC-U pipes and fittings are produced with DN 50, DN 75, DN 110, DN 125, DN 160, DN 200 and DN 250 dimensions. It is long-term and reliable system with its problem-free assembly technique. It provides long-term and easy usage with its interrelated easy fitting system.

Because the seals used in the Berke PVC-U pipes and fittings are covered with a special silicone layer, the seal is prevented from deformation and degradation in case of being exposed to sun rays.

The smooth and bright internal and external layers of Berke PVC-U pipes and fittings prevents the blockage of installation by keeping the residue and lime accumulation at the lowest level and provides fast and uniform flow.

## PVC-U Physical and Mechanical Properties

**Vinyl Chloride formula :**  $\text{CH}_2=\text{CH}-\text{Cl}$

**Polymer formula :**  $(\text{CH}_2-\text{CHCl}-\text{CH}_2-\text{CHCl}-\text{CH}_2-\text{CHCl})_n$

**Crystal Structure :** Amorphous, having approximately 5% crystal

**Glass Transition Temperature :**  $80^\circ\text{C}$

**Process Temperature :**  $140-200^\circ\text{C}$

Polyvinyl chloride comes under the amorphous plastics and it is a granulated polymer with white or light yellow color. It is possible to process polyvinyl chloride up to  $60^\circ\text{C}$ . When is heated, it is solved by chlorinated hydrocarbons. It is resistant against the effect of acids and bases. Water, alcohol and benzene do not show any reaction to PVC. PVC has high electrolysis feature and it is fireproofing polymer. PVC decomposes slowly at  $140^\circ\text{C}$  and easily at  $170^\circ\text{C}$  by HCL decomposition and double bond formed at the polymer.

PVC has two usage areas as rough and flexible. Rough PVC is mainly used in the areas such as pipes, window profiles, wall coverings etc. These are weather-resistant, have high durability, are rough and self fireproofing material properties.

Properties	Value	Standarts
Density ( $\text{g}/\text{cm}^3$ )	1,41	ISO 1183
Water Absorption, 24hr(%)	0,05	ASTM D570
Tensile Strength, $\text{N}/\text{mm}^2$	52	ASTM D638
Flexural Strength, ( $\text{N}/\text{mm}^2$ )	88	ASTM D790
Flexural Modulus, ( $\text{N}/\text{mm}^2$ )	3316	ASTM D790
Hardness, (Rockwell R)	115	ASTM D785
IZOD Impact resistance (Joule)	5,40	ASTM D256
Coefficient of Linear Thermal Expansion, $\text{K}(\text{C})$	$0,6 \times 10^{-4}$	ASTM D696
VICAT softening temperature, ( $^\circ\text{C}$ )	93	ASTM D1525
Surface resistivity ( $\text{ohm-cm}$ ) at 50% RH	$5,4 \times 10^{15}$	ASTM D 257

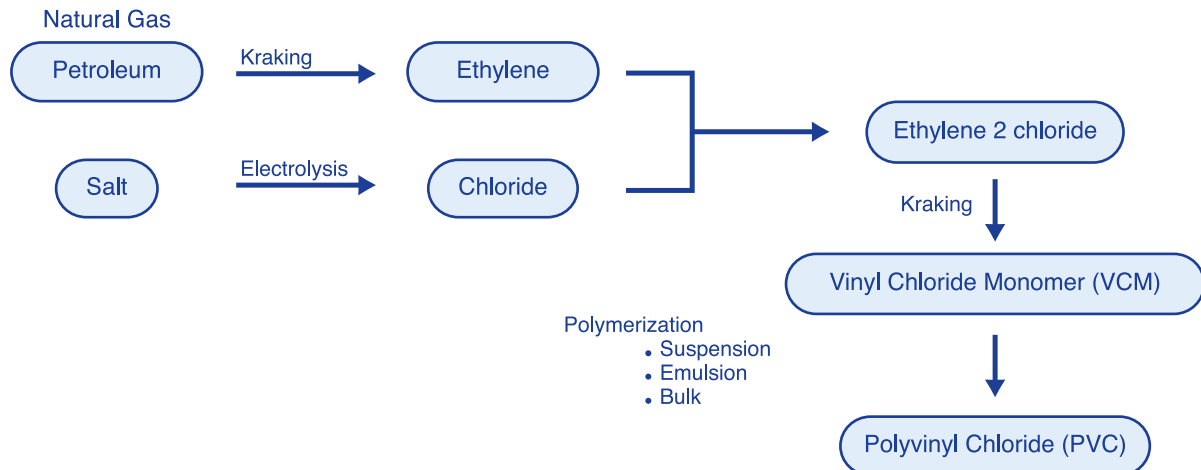
**Resistant:** Berke PVC-U Waste Water Pipes and Fittings keep its physical properties up to  $60^\circ\text{C}$ . In case no internal pressure is applied and no external mechanical impact is applied, it is resistant against pH 2-7 acids at  $20^\circ\text{C}$  and pH 7-12 alkaline. Berke PVC-U Waste Water Pipes and Fittings are resistant against various mechanical effects. The impact durability is controlled with the falling ball test.

**Abrasion-proofing:** Because Berke PVC-U Waste Water Pipes and Fittings is rough PVC, it is more resistant against the external factors.

**Smooth Internal Surface:** The smooth and internal surface of Berke PVC-U Waste Water Pipes and Fittings provide ideal viscosity property. It is out of question to develop pollution which will cause choking.

**Explosion-proof:** The Berke PVC-U Waste Water Pipes and Fittings do not have spontaneous combustion property because of the structure of PVC-U and fittings. They can only burn under open flame.

## Formation of PVC



## Deformation of PVC

PVC degradates by two ways.

1. by Heat
2. by Light

1- Its degradation by heat formed by HCl (Hydrogen Chloride) liberation. Together with this gas liberation, yellowing occurs on the PVC color.

When PVC is directly exposed to heat, hydrogen chloride (HCl) liberates and yellowing occurs on the PVC color. Related to the degradation level; yellowing, reddening, brown and black colors are seen on the PVC color. Together with this, changes in the physical and chemical properties of the product are seen. The waste gases and humidity which are formed during the process are removed from the environment and then eliminated.

2- When PVC does not include ant stabilizer material, it degradates either it is heated at a temperature over 100°C or it is exposed to UV rays or gamma rays.

## PVC-U Formulation

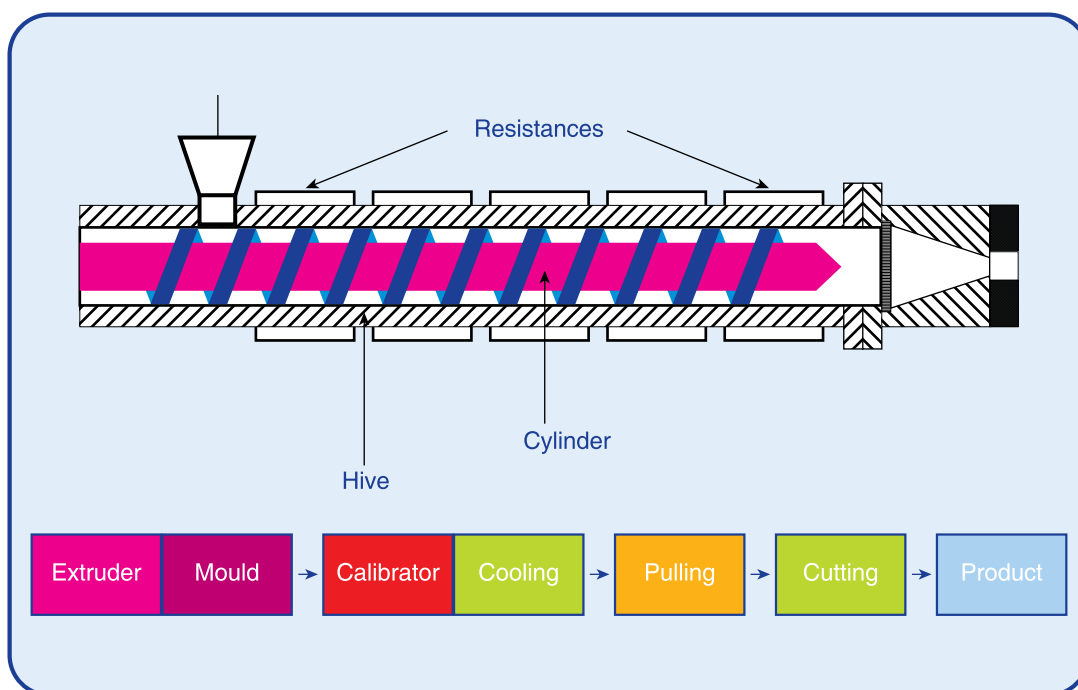
PVC-U is the material which some additives are added in the raw material. The PVC content of the material is at least 80% by mass for the pipes suitable to EN 1905 and at least 85% by mass for the fittings which are produced by injection molding. In PVC-U processes, according to the product type, it is compulsory to add some adjuvant additives. This means to prepare a formulation for PVC. Correspondingly, the formulation is generally as follows:

1. PVC resin,
2. Stabilizers,
3. Lubricants,
4. Durability improvers,
5. Process adjuvant,
6. Pigments

Together with the above mentioned items, some other additives such as fire protectors, optic bleaches are used in the formulation.



## PVC Process



## Chemical Resistance table of PVC-U according to ISO/TR 10358, TS 11448

Chemical Material	Concentration (%)	Temperature °C	
		20	60
Adipic Acid	Saturated solution % 1,4	D	YD
Aluminium hydroxide	Suspension	D	D
Ammonia, aqueous	Saturated solution	D	D
Ammonium chloride	Saturated solution	D	D
Ammonium sulphate	Saturated solution	D	D
Acetic Acid	50	D	YD
Acetone	ts-s	ZD	ZD
Copper 2 sulphate	Saturated solution	D	D
Benzene	ts-s	ZD	ZD
Gasoline	Working solution	D	D
Beer	Working solution	D	D
Mercury	ts-s	D	D
Iron 2 chloride	Saturated solution	D	D
Iron 3 chloride	Saturated solution	D	D
Ethanol	95	D	YD
Phenol	90	ZD	ZD
Formaldehyde	30-40	D	D
Phosphoric acid	25-85	D	-
Glycerine	Adipic Acid	D	D
Hydrogene peroxide	30	D	D

Chemical Material	Concentration (%)	Temperature °C	
		20	60
Hydrofluoric acid gas	ts-g	YD	ZD
Hydrofluoric acid	Up to 10	D	D
Hydrofluoric acid	40	YD	ZD
Urine		D	YD
Calcium carbonate	Suspensio	D	D
Calcium chloride	Saturated solution	D	D
Carbon dioxide, gas	ts-g	D	D
Carbon monoxide, gas	ts-g	D	D
Carbon tetrachloride	ts-s	ZD	ZD
Chlorine, dry gas	ts-g	YD	ZD
Chloroform	ts-s	ZD	ZD
Sulphur dioxide, dry gas	Suspension	D	D
Methyl alcohol	ts-s	D	YD
Nitric acid	25	D	-
Nitric acid	>50	ZD	ZD
Oxygen, gas	ts-g	D	D
Aliphatic hydrocarbons		ZD	ZD
Potassium hydroxide	Solution	D	D
Potassium hydroxide	Up to 50	D	D
Soap	Solution	D	YD
Vinegar	Working solution	D	D
Sodium bicarbonate	Saturated solution	D	D
Sodium hydroxide	Saturated solution	D	D
Sodium carbonate	Saturated solution	D	D
Sodium chloride	Saturated solution	D	D
Sodium sulfate	Saturated solution	D	D
Water distilled		D	D
Water, use, mineral	Working solution	D	D
Sulfuric acid	50	D	D
Sulfuric acid	98	ZD	ZD
Sulfuric acid	Smoky	ZD	ZD
Milk	Working solution	D	D
Wine	Working solution	D	D
Toulene	ts-s	ZD	ZD
Trichlorethylene	ts-s	D	ZD
Oils plant and animal	ts-s	D	D

#### Abbreviations :

D : Resistant

YD : Resistant adequately

ZD : Poor Resistance

Solution : More than 10% concentrated but unsaturated aqueous solution

Saturated aqueous solution, at 20 °C

Ts : At technical purity, at least

Ts-k : At technical purity, solid

Ts-s : At technical purity, liquid

Ts-g : At technical purity, gas

Working Solution : At the concentration which is commonly used in the industry

Suspension : Prepared at 20 °C saturated solution.



## Thermal Expansion in PVC-U Pipes

Calculation of thermal expansion is as follows:

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

where

$\Delta T$  = variation of working temperature in Kelvin degrees (K) or Celsius (C°)

$\Delta L$  = variation of length in mm

L = initial length of the pipe in m

$\lambda$  = coefficient of linear thermal expansion. The value of  $\lambda$  is  $0,6 * 10^{-4}$  (K<sup>-1</sup>) for PVC-U tubes.

Pipe length (m)	Temperature variation $\Delta T$ in K									
	10	20	30	40	50	60	70	80	90	100
	Linear Expansion $\Delta L$ (mm)									
1.0	0,60	1,20	1,80	2,40	3,00	3,60	4,20	4,80	5,40	6,00
4.0	2,40	4,80	3,60	9,60	12,00	14,40	16,80	19,20	21,60	24,00
5.0	3,00	6,00	9,00	12,00	15,00	18,00	21,00	24,00	27,00	30,00
6.0	3,60	7,20	10,80	14,40	18,00	21,60	25,60	28,80	32,40	36,00
7.0	4,20	8,40	12,60	16,80	21,00	25,20	29,40	33,60	37,80	42,00
8.0	4,80	9,60	14,40	19,20	24,00	28,80	33,60	38,40	43,20	48,00
9.0	5,40	10,80	16,20	21,60	27,00	32,40	37,80	43,20	48,60	54,00
10.0	6,00	12,00	18,00	24,00	30,00	36,00	42,00	48,00	54,00	60,00

## Assembly and Storage

### Points to take into consideration in the assembly of Berke PVC-U Pipes

1. Berke PVC-U pipes should be avoided from impacts, hits etc effects. Because the friableness of the pipe increases in case of the temperature is approximately 0 °C, this matter gains importance.
2. It should be avoided from the processes which can cause any notches, cuts or races on the Berke PVC-U Pipes. The clamps to be used should have rounding corners, smooth and flat internal surface and should wrap the pipe completely.
3. For the vertically assembled Berke PVC-U pipes, the pipes should be fixed together by the clamps right after they are interlaced together and thus their shifting should be prevented.
4. 10 mm space should be left between the fitting and the pipe muff base at the joints because of thermal expansion.
5. During the assembly, Berke PVC-U pipes and fittings should be easily interlaced together by greasing with liquid soap or grease oil.
6. Berke PVC-U Pipes and fittings should not be coupled without gaskets.
7. The Berke PVC-U pipes which will stay under the alum should be tested with the below mentioned methods before pouring the alum. AS 2032



PERFORMED TEST TO PVC-U PIPE AND FITTINGS:				
Name of the test	Test Standard	Test Condition	Duration	Result
Leakage	TS EN 1277	P= 0,5 bar T= 23 °C	15 min.	No leakage
Falling ball test	TS EN 744	T= 0 °C	-	< %10 damage
Resistance to Dichloromethane	TS EN 580	T= 15 °C	30 min.	No deterioration on the surface
Vicat Softening Temperature (VST)	TS EN 727	T= ≥ 79 °C	-	No visual distortion
Longitudinal change in dimension	TS EN 743 Method B Air	T= 150 °C	30 min.	≥ %5 No cracking or swelling in pipe.
Effect of temperature test <sup>1</sup>	TS EN 763 Method B Air	T= 150 °C	30 min.	No cracking or swelling in fittings.

### Transporting, Unloading And Storage For Product

1. Transporting for product : Products must not be dropped during transport .Products should be transported in bonds.
2. Unloading the product from the vehicle : Products should not be thrown from the vehicle. Also, products should not be felled from the vehicle.
3. Storage of Product :  
 Products should be stacked properly.  
 If necessary, pallets should be placed under the product.  
 While pipes stacked, pipe butt connectors must not touch each other and products should be stacked maximum 2 meters.

### The Application-Related Information

#### Preparing The Pipe

It is possible to get any length of pipe from Berke, although you must need to cut pipe in the field. Pipe can be easily cut with a hacksaw or power driven abrasive disc, be sure you make a square cut. Bevel the end of pipe with a beveling tool, wood rasp or power sander to the same angle as provided on the factory finished pipe (150). If you don't do the beveling correctly, insertion of pipe can be very difficult and dislocation of gasket in its place is inevitable.

#### Above Ground Installations

Use appropriate amount of clamps when installing inside or outside the buildings. Using enough amounts of clamps, help your lines alignments and keep the weight of pipes. If you want to use less amount of clamps other than required, it will cost you more in technical and financial sides. If you use clamps 1-1,5 m. apart, it will eliminate many potential problems.



- Use experienced and skilled personnel for transportation and installing of pipes.
- Transport and store PVC pipes as described in article 5.
- Take care caused by temperature different for elongation/shrinkage of PVC line. (10 mm space should be left between the fitting and the pipe muff base at the joints).
- Use appropriate clamps and clamps distances.
- Don't use pressurized air and gas in testing.
- Protect the line from outside damages. Example, after the leakage test, places that possible should be covered with plaster.
- Clamps must be used in every branch points and elbows on the installing line.
- Use appropriate clamp with pipe dimensions.
- When you want to use metal clamps take excessive care not to damage to pipe. For this reason, gasket clamp should be used.
- It is recommended for very high buildings to use metal clamps with rubber in it.
- Bottom of vertical lines (like rain water) must be fixed and supported to carry the pipeline and its content.

#### **Preparing Underground Installaion:**

- All safety precautions should be taken during lying or before laying.
- The excavated soil from the channel should be placed away (0,5 meter) which should not be hinder during lying.
- The channel inside must be kept dry as possible. If the underground is wet, line pipes moves and leaks occur from the pipes.
- Precautions should be taken to prevent ingress of water into the channel. Otherwise, the pipe moves and it may lead to leak.
- Height of loose backfill material required to prevent floatation of empty pipe is conservatively equal to 1,5 times the pipe diameter.

## Pipe Assembly

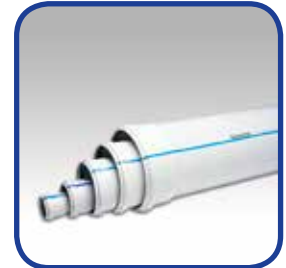
- Berke PVC-U pipes should be avoided from impacts, hits etc. effects. Because the friableness of the pipe increases in case of the temperature is drop below 10 °C, this matter gains importance.
- It should be avoided from the processes, which can cause any notches, cuts or races on the Berke PVC-U Pipes. The clamps to be used should have rounding corners, smooth and flat internal surface and should wrap the pipe completely.
- For the vertically assembled Berke PVC-U pipes, the pipes should be fixed together by the clamps right after they are interlaced together and thus their shifting should be prevented.
- 10 mm space should be left between the fitting and the pipe muff base at the joints because of thermal expansion. (Due to the increase and decrease of the temperature, of the pipes elongation or shortening.)
- Remove any mud, sand or other foreign material from the bell interior and spigot exterior that could prevent an effective seal between the bell and spigot.
- Carefully clean gasket area with your hand and make sure the gasket is seated uniformly in the groove by running your finger around the edge of the gasket.
- To make easy assembly and avoiding dislocation of gasket, fully apply liquid soap on gasket and on spigot area. After applying liquid soap, immediately perform the assembly.
- Pipe should be inserted sweet tight to each other. If you have trouble assembling the joint, disassemble and examine the gasket.
- Gasket should be replaced if damaged. Repeat assembly steps. If difficulties continue pipeline may be not aligned. Check and align the line to resolve the itching and repeat the process of assembly.

The Berke PVC-U pipes which will stay under the alum should be tested with the below mentioned methods before pouring the alum AS 2032

- **Water Test:** The pipe to be tested should be filled with water at a level of not less than minimum 1 mm from the surface. The mechanism should be tested from the upper point but this upper point should not exceed 5 meters from the minimum level. The test should keep the water level for at least 15 minutes without any leakage. Each joints should be controlled visually whether there is any leakage or not and if there is any defect, it should be repaired and the test should be repeated.

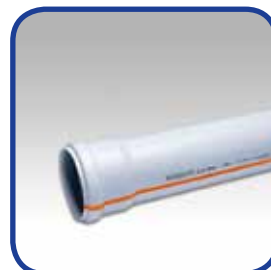
**PIPE 2.2**

Code	d(mm)	Package Standart
1010.A.015	50x150	100
1010.A.025	50x250	80
1010.A.050	50x500	50
1010.A.100	50x1000	10
1010.A.200	50x2000	10
1010.A.300	50x3000	10
1010.A.600	50x6000	1
1010.B.015	75x150	40
1010.B.025	75x250	35
1010.B.050	75x500	30
1010.B.100	75x1000	5
1010.B.200	75x2000	5
1010.B.300	75x3000	5
1010.B.600	75x6000	1
1010.C.015	110x150	25
1010.C.025	110x250	15
1010.C.050	110x500	14
1010.C.100	110x1000	5
1010.C.200	110x2000	5
1010.C.300	110x3000	5
1010.C.600	110x6000	1
1010.D.015	125x150	15
1010.D.025	125x250	12
1010.D.050	125x500	10
1010.D.100	125x1000	5
1010.D.200	125x2000	5
1010.D.300	125x3000	5
1010.D.600	125x6000	1



**PIPE 3.2**

Code	d(mm)	Package Standart
1110.A.015	B 50x150	100
1110.A.025	B 50x250	80
1110.A.050	B 50x500	50
1110.A.100	B 50x1000	10
1110.A.200	B 50x2000	10
1110.A.300	B 50x3000	10
1110.A.600	B 50x6000	1
1110.B.015	BD 75x150	40
1110.B.025	BD 75x250	35
1110.B.050	BD 75x500	30
1110.B.100	BD 75x1000	5
1110.B.200	BD 75x2000	5
1110.B.300	BD 75x3000	5
1110.B.600	BD 75x6000	1
1110.C.015	BD 110x150	25
1110.C.025	BD 110x250	15
1110.C.050	BD 110x500	14
1110.C.100	BD 110x1000	5
1110.C.200	BD 110x2000	5
1110.C.300	BD 110x3000	2
1110.C.600	BD 110x6000	1
1110.D.015	BD 125x150	15
1110.D.025	BD 125x250	12
1110.D.050	BD 125x500	10
1110.D.100	BD 125x1000	2
1110.D.200	BD 125x2000	2
1110.D.300	BD 125x3000	2
1110.D.600	BD 125x6000	1
1110.E.015	B 160x150	10
1110.E.025	B 160x250	8
1110.E.050	B 160x500	6
1110.E.100	B 160x1000	2
1110.E.200	B 160x2000	2
1110.E.300	B 160x3000	2
1110.E.600	B 160x6000	1
1110.F.015	B 200x150	6
1110.F.025	B 200x250	4
1110.F.050	B 200x500	4
1110.F.100	B 200x1000	2
1110.F.200	B 200x2000	2
1110.F.300	B 200x3000	2
1110.F.600	B 200x6000	1
1110.G.015	B 250x150	4
1110.G.025	B 250x250	3
1110.G.050	B 250x500	3
1110.G.100	B 250x1000	1
1110.G.200	B 250x2000	1
1110.G.300	B 250x3000	1
1110.G.600	B 250x6000	1





**ELBOW 45°**

Code	d(mm)	Package Standart
1112.45.A	50	200
1112.45.B	75	75
1112.45.C	110	30
1112.45.D	125	20
1112.45.E	160	10
1112.45.F	200	5
1112.45.G	250	3


**ELBOW 87°**

Code	d(mm)	Package Standart
1112.87.A	50	150
1112.87.B	75	75
1112.87.C	110	25
1112.87.D	125	15
1112.87.E	160	10
1112.87.F	200	4
1112.87.G	250	2


**SINGLE BRANCH 45°**

Code	d(mm)	Package Standart
1113.45.AA	50/50	80
1113.45.BA	75/50	50
1113.45.BB	75/75	20
1113.45.CA	110/50	15
1113.45.CB	110/75	15
1113.45.CC	110/110	10
1113.45.DA	125/50	15
1113.45.DB	125/75	10
1113.45.DC	125/110	10
1113.45.DD	125/125	8
1113.45.EA	160/50	8
1113.45.EB	160/75	8
1113.45.EC	160/110	6
1113.45.ED	160/125	5
1113.45.EE	160/160	4
1113.45.FA	200/50	5
1113.45.FB	200/75	5
1113.45.FC	200/110	4
1113.45.FD	200/125	4
1113.45.FE	200/160	4
1113.45.FF	200/200	23
1113.45.GA	250/50	3
1113.45.GB	250/75	3
1113.45.GC	250/110	3
1113.45.GD	250/125	3
1113.45.GE	250/160	3
1113.45.GF	250/200	3
1113.45.GG	250/250	



**SINGLE BRANCH 87°**

Code	d(mm)	Package Standart
1113.87.AA	50/50	100
1113.87.BA	75/50	30
1113.87.BB	75/75	20
1113.87.CA	110/50	15
1113.87.CB	110/75	20
1113.87.CC	110/110	15
1113.87.DA	125/50	10
1113.87.DB	125/75	15
1113.87.DC	125/110	10
1113.87.DD	125/125	10
1113.87.EA	160/50	10
1113.87.EB	160/75	10
1113.87.EC	160/110	6
1113.87.ED	160/125	6
1113.87.EE	160/160	5
1113.87.FA	200/50	5
1113.87.FB	200/75	10
1113.87.FC	200/110	6
1113.87.FD	200/125	4
1113.87.FE	200/160	4
1113.87.FF	200/200	4
1113.87.GA	250/50	3
1113.87.GB	250/75	3
1113.87.GC	250/110	3
1113.87.GD	250/125	3
1113.87.GE	250/160	3
1113.87.GF	250/200	3
1113.87.GG	250/250	3

**DOUBLE BRANCH 45°**

Code	d(mm)	Package Standart
1114.45.AA	50/50	60
1114.45.BA	75/50	20
1114.45.BB	75/75	20
1114.45.CA	110/50	20
1114.45.CB	110/75	10
1114.45.CC	110/110	8
1114.45.DA	125/50	15
1114.45.DB	125/75	10
1114.45.DC	125/110	6
1114.45.DD	125/125	10
1114.45.EA	160/50	10
1114.45.EB	160/75	5
1114.45.EC	160/110	4
1114.45.ED	160/125	4
1114.45.EE	160/160	4
1114.45.FA	200/50	5
1114.45.FB	200/75	5
1114.45.FC	200/110	3
1114.45.FD	200/125	3
1114.45.FE	200/160	3
1114.45.FF	200/200	3
1114.45.GA	250/50	3
1114.45.GB	250/75	3
1114.45.GC	250/110	3
1114.45.GD	250/125	3
1114.45.GE	250/160	3
1114.45.GF	250/200	2
1114.45.GG	250/250	2



**DOUBLE BRANCH 87°**

Code	d(mm)	Package Standart
1114.87.AA	50/50	75
1114.87.BA	75/50	10
1114.87.BB	75/75	10
1114.87.CA	110/50	20
1114.87.CB	110/75	10
1114.87.CC	110/110	8
1114.87.DA	125/50	15
1114.87.DB	125/75	10
1114.87.DC	125/110	10
1114.87.DD	125/125	10
1114.87.EA	160/50	10
1114.87.EB	160/75	10
1114.87.EC	160/110	5
1114.87.ED	160/125	5
1114.87.EE	160/160	5
1114.87.FA	200/50	5
1114.87.FB	200/75	5
1114.87.FC	200/110	5
1114.87.FD	200/125	3
1114.87.FE	200/160	3
1114.87.FF	200/200	3
1114.87.GA	250/50	3
1114.87.GB	250/75	3
1114.87.GC	250/110	4
1114.87.GD	250/125	3
1114.87.GE	250/160	3
1114.87.GF	250/200	3
1114.87.GG	250/250	3


**REDUCER**

Code	d(mm)	Package Standart
1115.BA	75/50	100
1115.CA	110/50	60
1115.CB	110/75	60
1115.DA	125/50	40
1115.DB	125/75	40
1115.DC	125/110	30
1115.EA	160/50	25
1115.EB	160/75	25
1115.EC	160/110	25
1115.ED	160/125	25
1115.FA	200/50	10
1115.FB	200/75	10
1115.FC	200/110	15
1115.FD	200/125	15
1115.FE	200/160	15
1115.GA	250/50	10
1115.GB	250/75	10
1115.GC	250/110	10
1115.GD	250/125	10
1115.GE	250/160	10
1115.GF	250/200	10



**S COMPLETE**

Code	d(mm)	Package Standart
1120.45.B	75/45	25
1120.45.C	110/45	10
1120.87.C	110/87	10

**SOCKET**

Code	d(mm)	Package Standart
1121.A	50	200
1121.B	75	100
1121.C	110	30
1121.D	125	25
1121.E	160	10
1121.F	200	8

**CLEANING PIECE**

Code	d(mm)	Package Standart
1116.A	50	100
1116.B	75	25
1116.C	110	15
1116.D	125	10
1116.E	160	5
1116.F	200	4
1116.G	250	3

**CLEANING ELBOW 87°**

Code	d(mm)	Package Standart
1116.87.C	110	15

**NEW!**

### PIPE PLUG

Code	d(mm)	Package Standart
1400.14.010	50	500
1400.15.010	75	400
1400.16.010	110	150
1400.17.010	125	100
1400.18.010	160	80
1400.19.010	200	35



### AIR HOLE

Code	d(mm)	Package Standart
1117.B	75	30
1117.C	110	18



### CHECK VALVE

Code	d(mm)	Package Standart
1118.C	110	8
1118.D	125	8
1118.E	160	8
1118.F	200	1
1118.G	250	1



### PIPE CLIPS

Code	d(mm)	Package Standart
1400.21.010	50	250
1400.22.010	75	100
1400.23.010	110	150
1400.24.010	125	120
1400.25.010	160	80
1400.26.010	200	35
1400.27.010	250	20



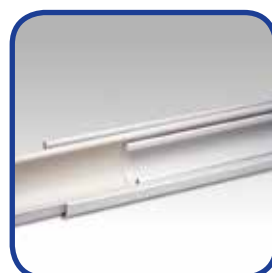
### CENTERING ADAPTOR

Code	d(mm)	Package Standart
1400.29.010	110	36



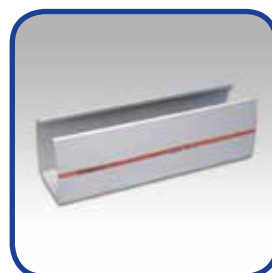
### ROUND RAIN GUTTER PROFILE AND FITTINGS

Code	d(mm)	Package Standart
121.010.110	110 Round Rain Gutter Profile	5
121.012.110	110 Rain Gutter Out Corner	30
121.014.110	110 Rain Gutter In Corner	30
121.016.110	110/75 Rain Gutter Down Piece	30
121.018.110	110 Rain Gutter Connection Piece	200
121.020.110	110 Rain Gutter Plug	400



### RECTANGULAR RAIN GUTTER PROFILE AND FITTINGS

Code	d(mm)	Package Standart
131.010.150	150 Rectangular Rain Gutter Profile	5
131.014.150	150 Rain Gutter Corner	30
131.016.150	150 Rain Gutter Connection Piece	60
131.018.150	150 Rain Gutter Plug	120
131.020.150	150/110 Rain Gutter Down Piece	20





FITTIGNS  
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VALVE **AND FITTIGNS**

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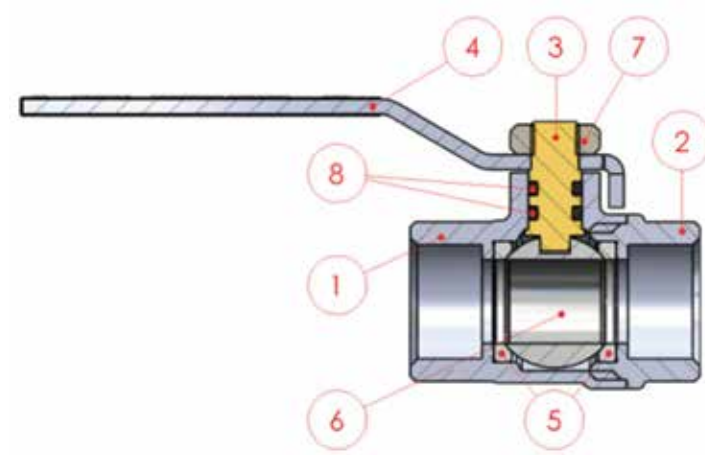
VALVE **AND**



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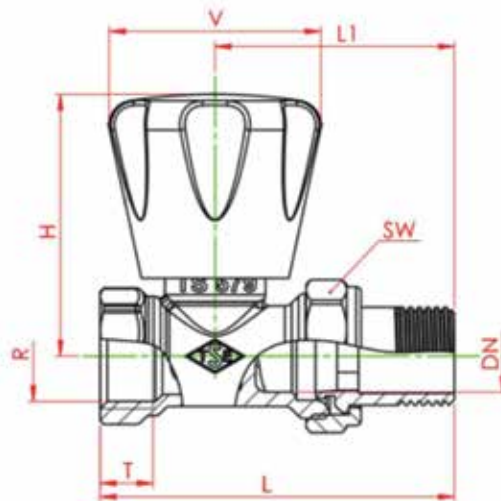
## WATER BALL VALVE



PART NO	PART NAME	MATERIAL
1	Body	CuZn40Pb2 / HOT PRESSED
2	Bonnet	CuZn40Pb2 / HOT PRESSED
3	Stem	CuZn39Pb3 OTOMAT
4	Lever	St37
5	Seals	PTFE / TEFLON
6	Ball	CuZn39Pb3 COATED
7	Loaf	St37
8	O-ring	EPDM

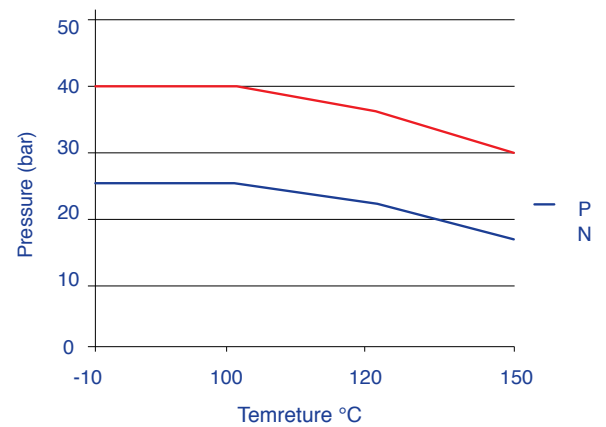
Ball valves, widely used in water distribution systems as industrial and domestic heating systems, hydraulic, pneumatic and agricultural plants. Temperature range : -10° +100° C and working pressure 600WOG WSP150

## RADIATOR VALVES



Kalde radiator valves are manufactured in straight and corner type, heating systems (hot water, steam), heaters (radiators, air heaters, etc.). suitable for use. Produced in accordance with TS 579 standard. The max. working pressure is 10 bar, max. working temperature is 120 °C.

Flat Radiator Valve			
Nominal Diameter	DN	15	20
Nominal Pressure	PN	10	10
Valve Dimensions	L	74,5	79,5
	L1	50,5	53,3
	H	58	63,7
	V	40	44
	T	10	12
	SW	30	37
	R	1/2"	3/4"



## BALL VALVE ASSEMBLY AND OPERATING INSTRUCTIONS

1. Prior to assembly, remove all foreign material (sand, gravel, dirt, etc.) from the installation.
2. First connect one side of the valve to the installation. Then, without allowing the other side to cause tensile stress connect the other side as well.
3. The thread length at the end of the metal pipe or -fittings where the valve is to be connected should be shorter than the thread length at the exit and entrance of the valve. To connect pipe and valve do the following: Close the valve and tighten it at the mouth using a wrench. When sealing, do not use teflon and linen excessively because this can cause cracks in the body. Conical screw-threaded pipe cannot be connected to the valve.
4. Unpack the valve only when you are going to connect it to the installation.
5. Apply force to the valve levers only in the directions indicated by the arrow for opening and closing. When the lever is stopped by the restraint pin, stop applying force to the lever.
6. Drinking water, potable water, and air installations, distribution and service valves are used.
7. Use the valve in fully open or in fully closed positions.
8. When assembling or removing the valve, use wrench openings in both sides. Do not assemble by applying force to the body of the valve.
9. All valve parts have a 2-year warranty. In case of malfunction, valve will be replaced free of charge during its warranty period. Do not lose your warranty documents.
10. Malfunctions caused by not following operating instructions in the User's Guide are not covered by the warranty.
11. The maximum working pressure of kalde ball water valves is for PN25 25 bars, PN40 40 bars. The minimum operating temperature is -10 °C, maximum operating temperature is 100 ° C. Do not use the valves at higher pressures and outside of this temperature range.
12. In installation applications: existing local installation regulations and codes of practice should be observed and be taken into consideration.

PS: After the installation process is completed, check the connections for leaks with water. Do not use the valve if it is leaking.

Use Filter fittings the installation for valve security.



## BERKE BRASS FITTINGS

### Raw Material, Technical Specifications And Standards

- Material: CuZn39Pb3, CuZn40Pb2 (EN 12164-12165)
- 1/2" – 2" inch (EN 10226-1-2, ISO 228-1)
- Dezincification resistance: CR/DRA (the largest Dezincification depth <200 µm, EN ISO 6509)
- Used in heating and cooling systems, potable water, radiator systems, under-floor heating, chiller water, fan-coil systems
- Maximum temperature and pressure comply with the pipe material performance specified in the applicable pipe and valves standards relating to temperature and pressure for coupling after mounting
- Kalde press fitting material's hardness is 100–112 HB. Also, all materials are tempered for eliminating tension (EN ISO 196).
- Kalde brass fittings' chemical composition is seen in Table – 1.

Table -1 CHEMICAL COMPOSITION % (Min) (EN 12164-12165)													
Symbol	Number	Element	Cu	Al	As	Fe	Mn	Ni	Pb	Sn	Zn	Others total	Density g/cm <sup>3</sup>
CuZn39Pb3	CW614N	Min	57,0	-	-	-	-	-	2,5	-	Kalan	-	8,4
		Max	59,0	0,05	-	0,3	-	0,2	3,5	0,3	-	0,2	
CuZn40Pb2	CW617N	Min	57,0	-	-	-	-	-	1,5	-	Kalan	-	8,4
		Max	59,0	0,05	-	0,3	-	0,2	2,2	0,3	-	0,2	

**MUFF**

Code	d(mm)	Package Standart
0BF3500	1/2"	250
0BF3501	3/4"	150
0BF3502	1"	80

**REDUCING COUPLING**

Code	d(mm)	Package Standart
0BF3601	3/4" - 1/2"	175
0BF3602	1" - 1/2"	100
0BF3603	1" - 3/4"	100

**FEMALE ELBOW**

Code	d(mm)	Package Standart
0BF3200	1/2"	125
0BF3201	3/4"	65
0BF3202	1"	35





### MALE ELBOW

Code	d(mm)	Package Standart
0BF3300	1/2"	120
0BF3301	3/4"	80
0BF3302	1"	40



### FEMALE TEE

Code	d(mm)	Package Standart
0BF4200	1/2"	100
0BF4201	3/4"	50
0BF4202	1"	25



### TRANSITION FEMALE ELBOW

Code	d(mm)	Package Standart
0BF4300	1/2"	80
0BF4301	3/4"	50



### TRANSITION FEMALE NIPPLE

Code	d(mm)	Package Standart
0BF4400	1/2"	150
0BF4401	3/4"	80
0BF4402	1"	40
0BF4403	1 1/4"	25



### PROPORTIONAL NIPPLE

Code	d(mm)	Package Standart
0BF3902	1/2"x3/8"	300
0BF3903	3/4"x1/2"	200
0BF3904	1"x1/2"	120
0BF3905	1"x3/4"	100
0BF3908	1 1/4"x1"	60



### REDUCTION

Code	d(mm)	Package Standart
0BF3801	1/4"x1/2"	400
0BF3802	3/8"x1/2"	400
0BF3803	1/2"x3/4"	300
0BF3804	1/2"x1"	150
0BF3805	3/4"x1"	150
0BF3808	1 1/4"x1"	100



### COUPLING

Code	d(mm)	Package Standart
0BF3700	1/2"	300
0BF3701	3/4"	200
0BF3702	3/8"	500
0BF3703	1"	100
0BF3704	1 1/4"	60



### MALE STOPEND

Code	d(mm)	Package Standart
0BF4100	1/2"	400
0BF4101	3/4"	250
0BF4102	1"	200



### FILTER

Code	d(mm)	Package Standart
0BF4700	1/2"	70
0BF4701	3/4"	40
0BF4702	1"	25
0BF4703	1 1/4"	15
0BF4704	1 1/2"	10
0BF4705	2"	6



### STRAIGHT CHECK VALVE

Code	d(mm)	Package Standart
0BF4800	1/2"	50
0BF4801	3/4"	40
0BF4802	1"	30
0BF4803	1 1/4"	15
0BF4804	1 1/2"	10
0BF4805	2"	5



**BALL VALVE FEMALE**

Code	d(mm)	Package Standart
0BV1900	1/2"	25
0BV1901	3/4"	20
0BV1902	1"	20
0BV1903	1 1/4"	15

**BALL VALVE MALE**

Code	d(mm)	Package Standart
0BV2000	1/2"	25
0BV2001	3/4"	20
0BV2002	1"	20
0BV2003	1 1/4"	15

**TRANSITION BALL VALVE**

Code	d(mm)	Package Standart
0BV2100	1/2"	144
0BV2101	3/4"	120
0BV2102	1"	72
0BV2103	1 1/4"	32



### BALL VALVE FEMALE BUTTERFLY HANDLE

Code	d(mm)	Package Standart
0BV1300	1/2"	80
0BV1301	3/4"	50
0BV1302	1"	30
0BV1303	1 1/4"	30



### BALL VALVE MALE BUTTERFLY HANDLE

Code	d(mm)	Package Standart
0BV1200	1/2"	80
0BV1201	3/4"	50
0BV1202	1"	30
0BV1203	1 1/4"	30



### TRANSITION BALL VALVE BUTTERFLY HANDLE

Code	d(mm)	Package Standart
0BV1400	1/2"	60
0BV1401	3/4"	40
0BV1402	1"	20
0BV1403	1 1/4"	20



### TRANSITION BALL VALVE ELBOW

Code	d(mm)	Package Standart
0BV1500	1/2"	50
0BV1501	3/4"	50



### BALL VALVE WITH NIPPLE

Code	d(mm)	Package Standart
0BV2300	1/2"	40
0BV2301	3/4"	40



### BALL VALVE WITH FILTER

Code	d(mm)	Package Standart
0B3200	1/2"	70
0B3201	3/4"	45





### STOP VALVE

Code	d(mm)	Package Standart
0BV2700	1/2"	40
0BV2701	3/4"	30
0BV2702	1"	20



### RADIATOR VALF RETURN ELBOW

Code	d(mm)	Package Standart
0BV3500	1/2"	80



### RADIATOR VALF RETURN STRAIGHT

Code	d(mm)	Package Standart
0BV3600	1/2"	80





### RADIATOR VALF GO STRAIGHT HEXAGONAL

Code	d(mm)	Package Standart
0BV3000	1/2"	50



### RADIATOR VALF GO PE-X ATTACHED HEXAGONAL

Code	d(mm)	Package Standart
0BV3100	1/2"	50



### RADIATOR VALF GO PE-X ATTACHED HEXAGONAL

Code	d(mm)	Package Standart
0BV2900	1/2"	50



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RADIATOR

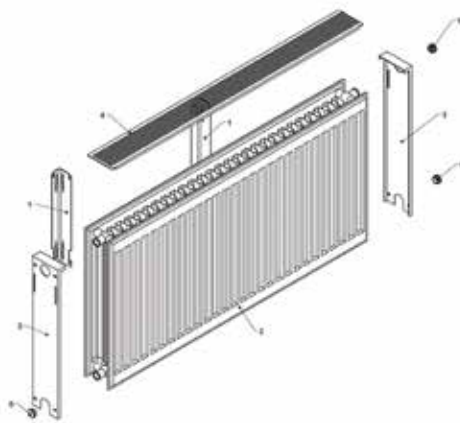


berkepla



## TECHNICAL SPECIFICATIONS

KALDE steel panel radiators are produced with fully integrated and fully automated lines under PLC supervision which use latest technologies in compliance with BS, DIN EN 442 norms. The radiators come in two different heights (500 mm, 600 mm) and 27 different lengths (from 400 mm to 3,000 mm increasing by 100 mm). They are produced with German made presses and moulding equipment specially designed for panel radiator. To provide maximum heat output capacity, we use high quality steel sheets produced specifically for panel radiator and wide surface convectors, and raw materials that comply with EN norms.



Both the radiator's inner and outer surfaces are fully cleaned and purified by dipping, spray oil taking, phosphatizing and passivation conforming to DIN 55900. As a result, the whole surface of the radiator is totally purified from any chemical substances that might effect the quality of the paint. A premier coating is applied by dipping. The radiators then pass through a furnace, and are painted in climatized cabinets by robotic pistols with electrostatic powder paint and are furnace again.

Thickness of the panel steel sheet	: 1,11 ± 0,09 mm
Thickness of the convector steel sheet	: 0,30 ± 0,09 mm
Thickness of the grill and side cover steel sheet	: 0,50 ± 0,09 mm
Maximum working temperature	: 120 °C
Maximum working pressure	: 10 Bars
Test pressure	: 13 Bars

## DIMENSIONS

Standart heights are: (H) 500 mm and 600 m

Standart lengths are: (L) From 400 to 3,000 mm in 100 mm increments

Produced with fully automated Italian robot welding machinery, each radiator is tested fully under 13 bars.

Height	Axis Distance	Width	Weight	Water Content
(H) mm	(A) mm	(a) mm	Kg/m	Mt/Lt
500	450	104	24,53	4,82
600	550	104	29,26	5,66

## TYPE

Type 22 is connected from the holes to the installation system using T type welded connection parts. T parts enable the radiator to be connected to different shapes. This provides the flexibility to connect the radiator to different installation systems under different positions.

## PACKING AND ASSEMBLY

The radiators have side covers and top grills which can be easily mounted to the body. They are protected from outer impacts by cardboard carton and plastic cover for hangers, and are also wrapped in nylon against dust and humidity. Inside the radiator, you will find a full assembly set including purjor plug, blind plug, screws, dubels, suspension brace clamp for easy installation. Our packaging system with added protection also enables the radiators to be assembled to the wall while the packaging is still on the radiator giving protection against dust, external effects and other impacts during the construction phase of the house.

Radiator Length	Type 11-21-22-33	Radiator Length	Type 11-21-22-33	
mm	L3 (mm)	mm	L1 (mm)	L2 (mm)
400	200	1700	766,5	733,5
500	300	1800	800	800
600	400	1900	866,5	833,5
700	500	2000	900	900
800	600	2100	966,5	933,5
900	700	2200	1000	1000
1000	800	2300	1066,5	1033,5
1100	900	2400	1100	1100
1200	1000	2500	1166,5	1133,5
1300	1100	2600	1200	1200
1400	1200	2700	1266,5	1233,5
1500	1300	2800	1300	1300
1600	1400	2900	1366,5	1333,5
		3000	1400	1400

Radiator Height	B	C
Mm	mm	Mm
500	285	107,5
600	385	107,5
Type 11-21-22-33	A (mm)	
	100	

## ASSEMBLY

### STEP 1

Carefully take out the set inside the pe bag in order not to scratch the radiator. Check contents of the bag. If there is any missing item, please obtain it before starting the installation.

### STEP 2

Place the inner and outer surfaces of the radiator according to the installation connections. Mark the location of the radiator on the wall leaving spaces on the bottom, top, left and right sides of the radiator. You will also need some space to install the valves both on the right and left sides of the radiator.

### STEP 3

Mark the wall 107.5 mm below the bottom edge of the radiator on suspension brace clamp axis.



#### **STEP 4**

The suspension brace clamp can be mounted on the wall so that either the wide or the narrow part can be on the wall.

#### **STEP 5**

You can use the suspension brace clamp as a guide. Place lower edge to match point A showing upwards and the clamp holes to center the axis line to make it vertical to the floor. Use a water gauge during this process.

#### **STEP 6**

Mark the wall where the suspension brace clamps will be screwed to the wall.

#### **STEP 7**

Use the values on page 5 (L1, L2, or L3) to mark the location where the suspension brace clamp axis should be. Again use the suspension brace clamps as a template to mark the locations to be drilled in.

#### **STEP 8**

Using a suitable drill make the holes in the wall and place the dubels inside the holes.

#### **STEP 9**

Place the suspension brace clamps on the wall taking care of the position of the narrow/wide sides. Use the screws to firmly mount the first clamp to the wall. Use a water gauge to make sure that the clamps are located parallel to each other and then mount the other clamp to the wall.

#### **STEP 10**

Hang the radiator on the suspension brace clamps

#### **STEP 11**

Unplug the plastic on the side (right or left) where the water is flowing. Fasten the valve to the top hole and the blind plug to the bottom hole.

#### **STEP 12**

Then unplug the other plastic on the top and replace it with the purjor plug, and fasten the valve to the bottom hole. Now, the radiator is ready to be connected to the system. You can make the connections.

#### **STEP 13**

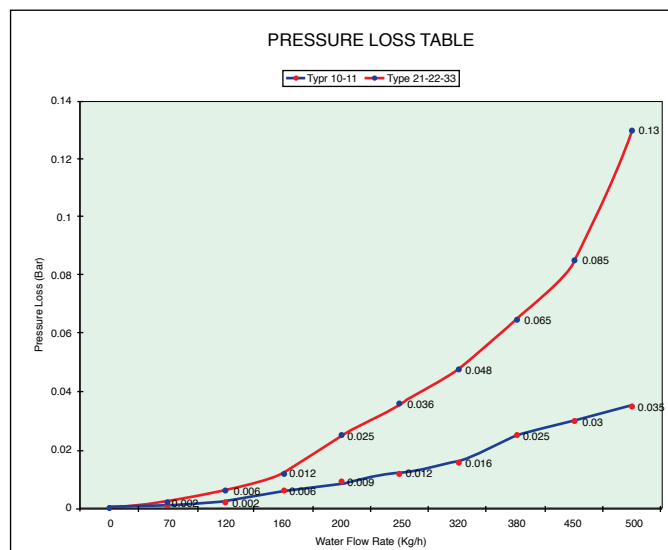
Do not use the radiator before filling water into the system and controlling if there is any leakage.

## RADIATOR CHOICE CALCULATIONS

In order to get the biggest efficiency from the radiator, you should choose the appropriate one for your needs. While making your choice, you need to calculate the capacity changes according to the pressure losses, different water in and out conditions, and the room temperatures. Below you can find some samples for these choices.

## PRESSURE LOSS

Due to the friction inside the system, a pressure loss will occur. This is important for the choice of the pump. Most of the pressure loss happens inside the radiator. You can calculate the pressure loss in the radiators using the below chart.



**Example:** What is the pressure loss on a 600/22DPDC/1000 radiator?

$Q_n = 1808$  watt = for one radiator of size 600/22DPDC/1000; it is 1554 kcal/h (1 watt = 0,86 kcal/h)

Water flow percentage =  $Q_{rv} / (\text{water temperature in} - \text{water temperature out})$

Water flow percentage =  $1554 / (75 - 65)$  Water flow percentage = 155,4 kg/h

You can use the chart to calculate the pressure loss as below.

-On type 22 line; draw a vertical line from x-axis to meet water flow

-Then draw a horizontal line from y-axis;

-Where the lines meet is the value of the pressure loss for type 22 x 600 x 1000. For this example, the value of the pressure loss is 0,002 bars.

Generally speaking, pressure loss depends on the water flow and the radiator's type and dimensions. It is more critical for longer radiators.

### EXAMPLE 1

If heat output value for (75/65) 20 °C room temperature is 1808 watts, what will be the heat output for a room of 18 °C and 70/55°C In Table 3 (showing F Factor), in the first vertical column you can see the water temperature and in the second vertical column you can see the room temperature. In the horizontal column you can see the temperature of the water out from the radiator. Where these columns meet, you can find the F value. F value is 1,17 for the values of 70/55 °C and 18 °C.

**New heat output value is calculated with the below formula:**  $Q=Q_n/F$

$$Q = 1808/1.17 = 1,545 \text{ watts}$$

Q = Needed heat output

Q<sub>n</sub> = Standard heat output

F = Capacity factor in the Table 3

### EXAMPLE 2

This calculation is used to choose a radiator for a room or a space.

Let's assume that heat needed for a room is Q=1,700 watts. How can we calculate the heat output of a radiator on 18°C and 70/55°C And how can we choose a radiator?

From Table 2, F value is 1.17

$$Q_n=Q \times F \quad Q_n=1,700 \times 1.17 \quad Q_n=1,989 \text{ watts}$$

So, we choose a radiator of Q<sub>n</sub>=1,989 watts (according to 75/65 °C and room temperature 20 °C) we can choose these radiators: DPDC 500x1400mm or 600x1200mm.

If we do not apply this condition and choose a radiator of 1,700 watts instead of 1,989 watts, then the room temperature will never come to requested levels.

HEAT OUTPUT TABLE (90 "C / 70 "C) WATER TEMPERATURE									
Height		500				600			
Room Temp. °C		PC	DPSC	DPDC	TPTC	PC	DPSC	DPDC	TPTC
12 °C	Watt/mt	598	868	1211	1585	717	1036	1414	1895
	Kcal/mt	514	747	1042	1363	616	891	1216	1630
15 °C	Watt/mt	642	933	1302	1704	770	1114	1519	2037
	Kcal/mt	552	802	1120	1465	663	958	1307	1752
18 °C	Watt/mt	678	985	1374	1798	813	1176	1604	2150
	Kcal/mt	583	847	1182	1546	699	1011	1379	1849
20 °C	Watt/mt	892	1296	1808	2366	1070	1547	2110	2829
	Kcal/mt	767	1114	1555	2035	920	1330	1815	2433
22 °C	Watt/mt	740	1076	1501	1964	888	1284	1751	2348
	Kcal/mt	637	925	1291	1689	764	1104	1506	2019
24 °C	Watt/mt	767	1115	1555	2035	920	1330	1815	2433
	Kcal/mt	660	959	1337	1750	791	1144	1561	2092

**HEAT INPUT / OUTPUT (Watt)**

20°C		TYPE 11		TYPE 21		TYPE22		TYPE 33	
L (mm)	t1/ t2 (°C)	H (mm)		H (mm)		H (mm)		H (mm)	
		500	600	500	500	500	600	500	600
400	90 / 70	357	428	518	619	723	844	946	1132
	75 / 65	281	336	408	487	578	675	743	885
	70 / 55	244	293	356	424	463	540	646	768
	55 / 45	143	171	209	249	291	339	377	445
500	90 / 70	446	535	648	773	904	1055	1183	1415
	75 / 65	351	421	510	608	723	844	928	1107
	70 / 55	305	366	445	530	578	675	807	961
	55 / 45	179	214	261	311	363	424	471	557
600	90 / 70	535	642	778	928	1085	1266	1419	1697
	75 / 65	421	505	612	730	868	1013	1114	1328
	70 / 55	366	439	533	636	694	810	968	1153
	55 / 45	215	257	314	373	436	509	565	668
700	90 / 70	624	749	907	1083	1265	1477	1656	1980
	75 / 65	491	589	714	852	1012	1182	1300	1550
	70 / 55	428	512	622	742	810	945	1130	1345
	55 / 45	251	300	366	435	509	594	659	779
800	90 / 70	713	856	1037	1237	1446	1688	1893	2263
	75 / 65	561	673	817	973	1157	1350	1485	1771
	70 / 55	489	565	711	847	925	1080	1291	1537
	55 / 45	287	342	418	497	581	679	753	891
900	90 / 70	803	963	1166	1392	1627	1899	2129	2546
	75 / 65	631	757	919	1095	1301	1519	1671	1992
	70 / 55	550	659	800	953	1041	1215	1453	1729
	55 / 45	322	385	471	559	654	763	847	1002
1000	90 / 70	892	1070	1296	1547	1808	2110	2366	2829
	75 / 65	701	841	1021	1217	1446	1688	1856	2214
	70 / 55	611	732	889	1059	1157	1350	1614	1921
	55 / 45	358	428	523	621	727	848	942	1113
1100	90 / 70	981	1177	1426	1701	1988	2321	2602	3112
	75 / 65	772	925	1123	1338	1591	1857	2042	2435
	70 / 55	672	805	978	1165	1272	1485	1775	2113
	55 / 45	394	471	575	684	799	933	1036	1225
1200	90 / 70	1070	1284	1555	1856	2169	2532	2839	3395
	75 / 65	842	1009	1225	1460	1735	2026	2228	2656
	70 / 55	733	878	1067	1271	1388	1620	1937	2305
	55 / 45	430	514	627	746	872	1018	1130	1336

HEAT INPUT / OUTPUT (Watt)									
20°C		TYPE 11		TYPE 21		TYPE22		TYPE 33	
L (mm)	t1/t2 (°C)	H (mm)		H (mm)		H (mm)		H (mm)	
		500	600	500	500	500	600	500	600
1400	90 / 70	1248	1499	1814	2165	2531	2954	3312	3961
	75 / 65	982	1177	1429	1704	2024	2363	2599	3099
	70 / 55	855	1024	1245	1483	1620	1891	2260	2690
	55 / 45	502	599	732	870	1017	1188	1318	1559
1600	90 / 70	1427	1713	2074	2475	2892	3376	3785	4527
	75 / 65	1122	1346	1633	1947	2314	2701	2970	3542
	70 / 55	977	1171	1423	1695	1851	2161	2582	3074
	55 / 45	573	685	836	994	1163	1357	1507	1781
1800	90 / 70	1605	1927	2333	2784	3254	3798	4258	5092
	75 / 65	1263	1514	1837	2190	2603	3038	3342	3984
	70 / 55	1099	1317	1600	1907	2082	2431	2905	3458
	55 / 45	645	770	941	1119	1308	1527	1695	2004
2000	90 / 70	1783	2141	2592	3093	3615	4220	4731	5658
	75 / 65	1403	1682	2041	2434	2892	3376	3713	4427
	70 / 55	1221	1463	1778	2119	2314	2701	3228	3842
	55 / 45	717	856	1046	1243	1453	1696	1883	2226
2200	90 / 70	1962	2355	2851	3403	3977	4642	5204	6224
	75 / 65	1543	1850	2245	2677	3181	3714	4084	4870
	70 / 55	1344	1610	1956	2331	2545	2971	3551	4226
	55 / 45	788	941	1150	1367	1599	1866	2071	2449
2400	90 / 70	2140	2569	3110	3712	4338	5064	5678	6790
	75 / 65	1852	2220	2695	3212	3817	4052	4901	5844
	70 / 55	1612	1932	2347	2797	3054	3565	4261	5072
	55 / 45	946	1130	1380	1640	1918	2239	2486	2939
2600	90 / 70	2318	2783	3369	4021	4700	5486	6151	7356
	75 / 65	1824	2187	2654	3164	3760	4389	4827	5755
	70 / 55	1588	1902	2312	2754	3008	3511	4196	4995
	55 / 45	931	1113	1359	1616	1889	2205	2448	2894
2800	90 / 70	2497	2997	3629	4331	5061	5908	6624	7921
	75 / 65	1964	2355	2858	3407	4049	4726	5198	6198
	70 / 55	1710	2049	2490	2966	3239	3781	4519	5379
	55 / 45	1003	1198	1464	1740	2035	2375	2636	3117
3000	90 / 70	2675	3211	3888	4640	5423	6330	7097	8487
	75 / 65	2104	2523	3062	3.650	4338	5064	5569	6641
	70 / 55	1832	2195	2667	3178	3470	4051	4842	5763
	55 / 45	1075	1284	1568	1864	2180	2545	2825	3340

ENTRANCE WATER TEMPERATURE t1 (°C)	EXIT WATER TEMPERATURE t2 (°C)	F FACTOR VALUES						
		10 °C	12 °C	15 °C	18 °C	20 °C	22 °C	24 °C
95	80	0.57	0.59	0.62	0.65	0.68	0.70	0.73
	70	0.62	0.65	0.68	0.73	0.76	0.79	0.83
	60	0.69	0.72	0.77	0.83	0.87	0.91	0.96
	50	0.79	0.83	0.89	0.96	1.02	1.08	1.15
90	80	0.59	0.61	0.64	0.68	0.71	0.74	0.77
	75	0.62	0.64	0.68	0.72	0.75	0.78	0.82
	70	0.65	0.67	0.72	0.76	0.80	0.83	0.87
	65	0.68	0.71	0.76	0.81	0.85	0.89	0.93
	60	0.72	0.76	0.81	0.87	0.91	0.96	1.01
	55	0.77	0.81	0.87	0.93	0.98	1.04	1.10
	50	0.83	0.87	0.93	1.01	1.07	1.14	1.21
85	75	0.64	0.67	0.71	0.75	0.79	0.82	0.86
	70	0.68	0.70	0.75	0.80	0.84	0.88	0.92
	65	0.72	0.75	0.80	0.85	0.89	0.94	0.99
	60	0.76	0.79	0.85	0.91	0.96	1.01	1.07
	55	0.81	0.85	0.91	0.98	1.04	1.10	1.16
80	70	0.71	0.74	0.79	0.84	0.88	0.93	0.97
	65	0.75	0.78	0.84	0.90	0.94	0.99	1.05
	60	0.80	0.83	0.89	0.96	1.01	1.07	1.13
	55	0.85	0.89	0.96	1.04	1.10	1.16	1.24
	50	0.91	0.96	1.04	1.13	1.20	1.28	1.37
75	65	0.79	0.82	0.88	0.95	1.00	1.05	1.12
	60	0.84	0.88	0.94	1.02	1.08	1.14	1.21
	55	0.89	0.94	1.01	1.10	1.17	1.24	1.32
	50	0.96	1.01	1.10	1.20	1.28	1.37	1.47
70	60	0.88	0.93	1.00	1.08	1.15	1.22	1.30
	55	0.94	0.99	1.08	1.17	1.25	1.33	1.42
	50	1.01	1.07	1.17	1.28	1.37	1.47	1.58
	45	1.10	1.16	1.28	1.42	1.52	1.64	1.79
65	55	1.00	1.05	1.15	1.26	1.34	1.43	1.54
	50	1.08	1.14	1.25	1.37	1.47	1.59	1.71
	45	1.17	1.24	1.37	1.52	1.64	1.78	1.94
	40	1.28	1.37	0.52	1.71	1.87	2.05	2.27
55	50	1.23	1.31	1.45	1.62	1.75	1.90	2.07
	45	1.34	1.43	1.60	1.80	1.96	2.15	2.37
	40	1.47	1.59	1.78	2.03	2.24	2.48	2.78
	35	1.64	1.78	2.03	2.36	2.64	2.99	3.43



ENTRANCE WATER TEMPERATURE t1 (°C)	EXIT WATER TEMPERATURE t2 (°C)	F FACTOR VALUES						
		10 °C	12 °C	15 °C	18 °C	20 °C	22 °C	24 °C
50	45	1.45	1.56	1.75	1.98	2.17	2.40	2.67
	40	1.6	1.73	1.96	2.25	2.50	2.79	3.15
	35	1.78	1.94	2.24	2.63	2.96	3.38	3.92
	30	2.03	2.24	2.64	3.20	3.70	4.39	5.39
45	40	1.75	1.90	2.17	2.53	2.83	3.19	3.66
	35	1.96	2.15	2.50	2.96	3.37	3.89	4.58
	30	2.24	2.48	2.96	3.63	4.25	5.11	6.38
40	35	2.17	2.40	2.83	3.41	3.93	4.62	5.54
	30	2.50	2.79	3.37	4.21	5.01	6.14	7.87



**STEEL PANEL RADIATOR TYP 22/DPDC**

Code	d(mm)	Package Standart
4075.22.300400	22x300x400	1
4075.22.300500	22x300x500	1
4075.22.300600	22x300x600	1
4075.22.300700	22x300x700	1
4075.22.300800	22x300x800	1
4075.22.300900	22x300x900	1
4075.22.301000	22x300x1000	1
4075.22.301100	22x300x1100	1
4075.22.301200	22x300x1200	1
4075.22.301300	22x300x1300	1
4075.22.301400	22x300x1400	1
4075.22.301500	22x300x1500	1
4075.22.301600	22x300x1600	1
4075.22.301700	22x300x1700	1
4075.22.301800	22x300x1800	1
4075.22.301900	22x300x1900	1
4075.22.302000	22x300x2000	1
4075.22.302100	22x300x2100	1
4075.22.302200	22x300x2200	1
4075.22.302300	22x300x2300	1
4075.22.302400	22x300x2400	1
4075.22.302500	22x300x2500	1
4075.22.302600	22x300x2600	1
4075.22.302700	22x300x2700	1
4075.22.302800	22x300x2800	1
4075.22.302900	22x300x2900	1
4075.22.303000	22x300x3000	1



**STEEL PANEL RADIATOR TYP 22/DPDC**

Code	d(mm)	Package Standart
4075.22.400400	22x400x400	1
4075.22.400500	22x400x500	1
4075.22.400600	22x400x600	1
4075.22.400700	22x400x700	1
4075.22.400800	22x400x800	1
4075.22.400900	22x400x900	1
4075.22.401000	22x400x1000	1
4075.22.401100	22x400x1100	1
4075.22.401200	22x400x1200	1
4075.22.401300	22x400x1300	1
4075.22.401400	22x400x1400	1
4075.22.401500	22x400x1500	1
4075.22.401600	22x400x1600	1
4075.22.401700	22x400x1700	1
4075.22.401800	22x400x1800	1
4075.22.401900	22x400x1900	1
4075.22.402000	22x400x2000	1
4075.22.402100	22x400x2100	1
4075.22.402200	22x400x2200	1
4075.22.402300	22x400x2300	1
4075.22.402400	22x400x2400	1
4075.22.402500	22x400x2500	1
4075.22.402600	22x400x2600	1
4075.22.402700	22x400x2700	1
4075.22.402800	22x400x2800	1
4075.22.402900	22x400x2900	1
4075.22.403000	22x400x3000	1



**STEEL PANEL RADIATOR TYP 22/DPDC**

Code	d(mm)	Package Standart
4075.22.500400	22x500x400	1
4075.22.500500	22x500x500	1
4075.22.500600	22x500x600	1
4075.22.500700	22x500x700	1
4075.22.500800	22x500x800	1
4075.22.500900	22x500x900	1
4075.22.501000	22x500x1000	1
4075.22.501100	22x500x1100	1
4075.22.501200	22x500x1200	1
4075.22.501300	22x500x1300	1
4075.22.501400	22x500x1400	1
4075.22.501500	22x500x1500	1
4075.22.501600	22x500x1600	1
4075.22.501700	22x500x1700	1
4075.22.501800	22x500x1800	1
4075.22.501900	22x500x1900	1
4075.22.502000	22x500x2000	1
4075.22.502100	22x500x2100	1
4075.22.502200	22x500x2200	1
4075.22.502300	22x500x2300	1
4075.22.502400	22x500x2400	1
4075.22.502500	22x500x2500	1
4075.22.502600	22x500x2600	1
4075.22.502700	22x500x2700	1
4075.22.502800	22x500x2800	1
4075.22.502900	22x500x2900	1
4075.22.503000	22x500x3000	1


**STEEL PANEL RADIATOR TYP 22/DPDC**

Code	d(mm)	Package Standart
4075.22.600400	22x600x400	1
4075.22.600500	22x600x500	1
4075.22.600600	22x600x600	1
4075.22.600700	22x600x700	1
4075.22.600800	22x600x800	1
4075.22.600900	22x600x900	1
4075.22.601000	22x600x1000	1
4075.22.601100	22x600x1100	1
4075.22.601200	22x600x1200	1
4075.22.601300	22x600x1300	1
4075.22.601400	22x600x1400	1
4075.22.601500	22x600x1500	1
4075.22.601600	22x600x1600	1
4075.22.601700	22x600x1700	1
4075.22.601800	22x600x1800	1
4075.22.601900	22x600x1900	1
4075.22.602000	22x600x2000	1
4075.22.602100	22x600x2100	1
4075.22.602200	22x600x2200	1
4075.22.602300	22x600x2300	1
4075.22.602400	22x600x2400	1
4075.22.602500	22x600x2500	1
4075.22.602600	22x600x2600	1
4075.22.602700	22x600x2700	1
4075.22.602800	22x600x2800	1
4075.22.602900	22x600x2900	1
4075.22.603000	22x600x3000	1





**STEEL PANEL RADIATOR TYP 22/DPDC**

Code	d(mm)	Package Standart
4075.22.700400	22x700x400	1
4075.22.700500	22x700x500	1
4075.22.700600	22x700x600	1
4075.22.700700	22x700x700	1
4075.22.700800	22x700x800	1
4075.22.700900	22x700x900	1
4075.22.701000	22x700x1000	1
4075.22.701100	22x700x1100	1
4075.22.701200	22x700x1200	1
4075.22.701300	22x700x1300	1
4075.22.701400	22x700x1400	1
4075.22.701500	22x700x1500	1
4075.22.701600	22x700x1600	1
4075.22.701700	22x700x1700	1
4075.22.701800	22x700x1800	1
4075.22.701900	22x700x1900	1
4075.22.702000	22x700x2000	1
4075.22.702100	22x700x2100	1
4075.22.702200	22x700x2200	1
4075.22.702300	22x700x2300	1
4075.22.702400	22x700x2400	1
4075.22.702500	22x700x2500	1
4075.22.702600	22x700x2600	1
4075.22.702700	22x700x2700	1
4075.22.702800	22x700x2800	1
4075.22.702900	22x700x2900	1
4075.22.703000	22x700x3000	1



**STEEL PANEL RADIATOR TYP 22/DPDC**

Code	d(mm)	Package Standart
4075.22.900400	22x900x400	1
4075.22.900500	22x900x500	1
4075.22.900600	22x900x600	1
4075.22.900700	22x900x700	1
4075.22.900800	22x900x800	1
4075.22.900900	22x900x900	1
4075.22.901000	22x900x1000	1
4075.22.901100	22x900x1100	1
4075.22.901200	22x900x1200	1
4075.22.901300	22x900x1300	1
4075.22.901400	22x900x1400	1
4075.22.901500	22x900x1500	1
4075.22.901600	22x900x1600	1
4075.22.901700	22x900x1700	1
4075.22.901800	22x900x1800	1
4075.22.901900	22x900x1900	1
4075.22.902000	22x900x2000	1
4075.22.902100	22x900x2100	1
4075.22.902200	22x900x2200	1
4075.22.902300	22x900x2300	1
4075.22.902400	22x900x2400	1
4075.22.902500	22x900x2500	1
4075.22.902600	22x900x2600	1
4075.22.902700	22x900x2700	1
4075.22.902800	22x900x2800	1
4075.22.902900	22x900x2900	1
4075.22.903000	22x900x3000	1







