



Product Catalogue



Factories



Valve and PP-R Systems Production

İstanbul



PVC-U, Corrugated and PP-R Systems Production

Aksaray



PVC-U Systems Production

Sakarya



Metal Production

İstanbul



Radiators and Flexo Production

Denizli

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Why Kalde?

Kalde produces high quality products, designs and develops integrated solutions for customers worldwide.

It is among the leading companies in production of pipes and fittings with its knowledge and expertise of more than 40 years.

The headquarters of the company is located in Istanbul where the continents of Asia and Europe meet.

Our strategical location at the junction of Europe, Asia and Africa together with a reliable supply chain give us unique advantages in providing our business partners and customers with high quality service as well as the competition in the global markets. Currently, our products are exported to more than 40 countries worldwide including Germany, Hungary, Romania, Austria, Greece, Bulgaria, Russia, Ukraine, Egypt, Syria, Lebanon, etc.

Kalde has product design, development and quality control facilities in 300.000 m².

Kalde produces a wide range of products including PP-R pipes, PP-R fittings, PP-R and brass valves, Al-pex & PE-RT pipes, screw fittings, press fittings, PE-X pipes and collectors. Kalde has internationally accredited certificates from respected organisations such as DVGW SKZ (Germany), CSTB (France) and AENOR (Spain). Furthermore, our management system has been certified by ISO. We are proud of our high quality products and experiences...

Our vision is providing our customers with an increasingly wide portfolio of high quality products and solutions with continuous research and development.

Our goal is to develop long term partnerships with our customers and suppliers.

We create integrated solutions by team work as well as collaboration with our customers and partners.

Having market-focused teams of around 1500 professionals supported by a strong management, we offer our business partners and customers worldwide with value-adding solutions.

As result of these reasons, **kalde** Kalde is the "First Choice" of the users worldwide

Kalde Value Commitment.

Kalde was established by four young engineers dedicated to provide customers with the best service in 1977.

This spirit is still alive and is the essence of our mission statement.

The Success of Kalde is the Result of Various Factors.

- **High quality** products.
- Utilization of best **practices**.
- Products meeting your **unique** requirements.
- **Proven** products.
- **Total** customer satisfaction.
- **Long term** relationships with each customer.
- A **dedicated** team of around 1500 professionals.

Why Kalde?

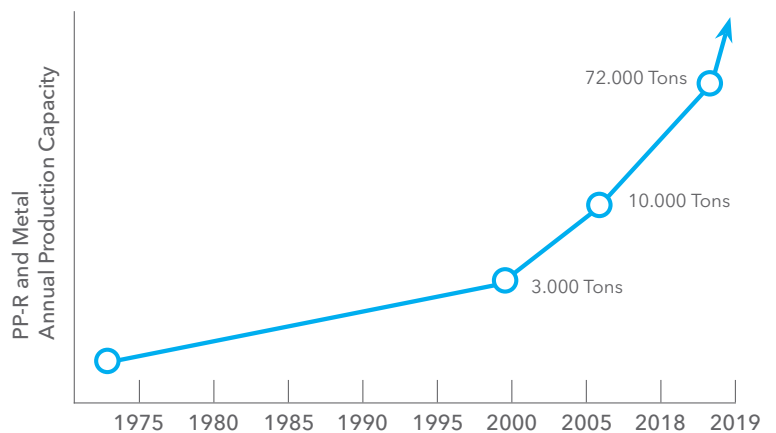
- 1977** Kalde was founded.
- 1977** The production of brass parts for air-conditioners started.
- 2002** Export department was established.
- 2002** Launched the production of PP pipes and fittings.
- 2006** Opened a new factory for the production of pipes.
- 2007** Listed as the Turkey's 199th Largest Exporter.
- 2008** Launched the production of glass fiber reinforced PP products.
- 2008** Listed as Turkey's 164th Largest Exporter.
- 2009** Incorporated a PVC manufacturer, Berke Plastik.
- 2009** Became one of Turkey's Top 500 Industrial Enterprises.
- 2009** Launched the production of corrugated pipes and irrigation systems.
- 2010** Expansion of "Ball Valve" range.
- 2012** Launched the production of silent waste water line.
- 2013** Launched the production of panel radiators.
- 2014** Stainless steel flex hoses
- 2019** Opened a new factory in Aksaray.

The World Leader In the Production of Installation Systems

All Kalde products are made in Turkey. We have different facilities, with a total 300.000 m² area, all administrated from Kalde headquarters in Istanbul. Our production capacity is growing steadily with new investments, allowing us to meet all local and international customer demands. Moreover, with our cutting edge molding machines and equipment bases, we have the flexibility to compensate for any sudden increase in demand.

Today, our annual production capacity is 72.000 tons of PP-R; 24.000 tons of brass; 48.000 tons of PVC and 2.000.000 meter radiator.

In Layman's terms, this means that if we had to attach all the pipes we produce in one year, end to end, they would wrap around the world several times.

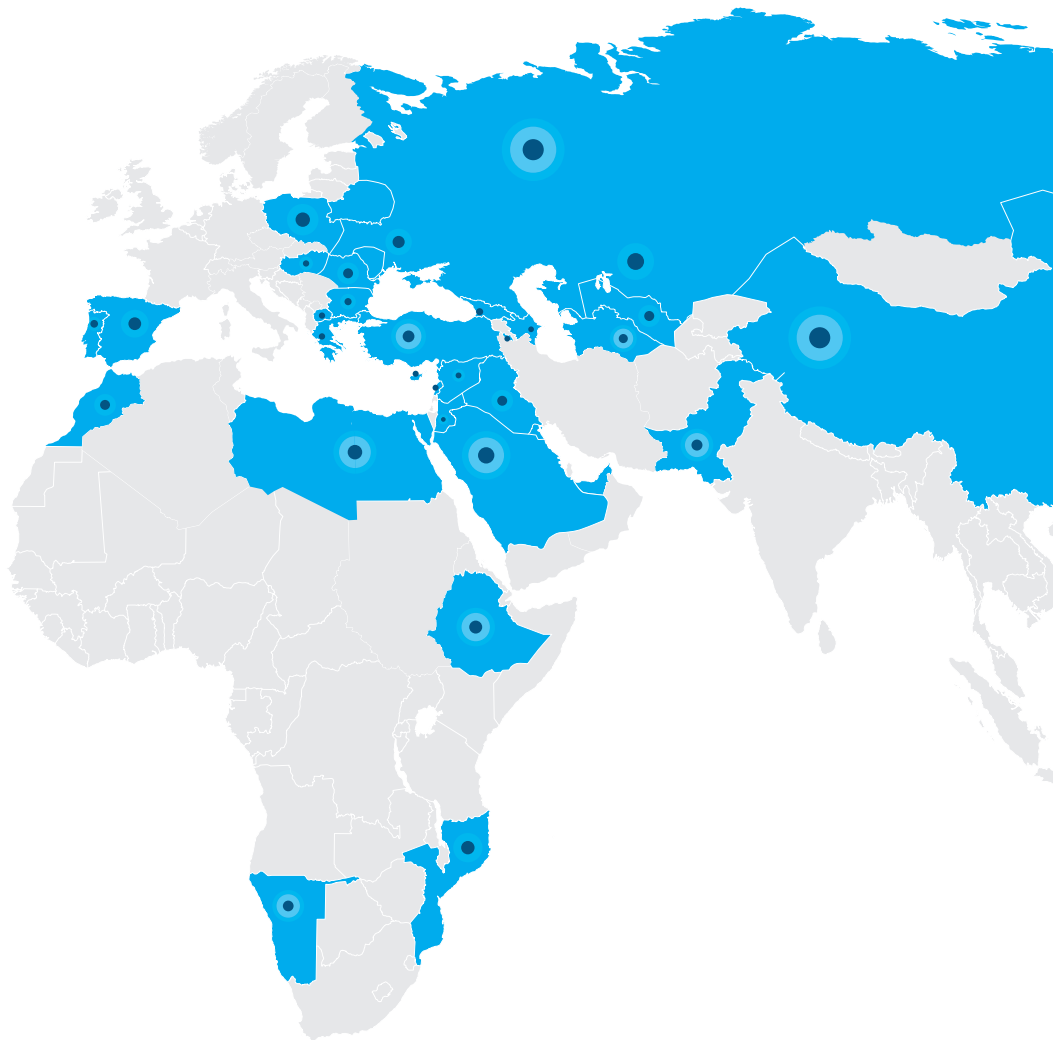


Why Kalde?

Export Markets

The proximity of our Istanbul head office to Europe, Asia and Africa allows us to easily reach our customers in more than 60 countries.

- Algeria
- Angola
- Azerbaijan
- Belarus
- Bulgaria
- Cyprus
- Ethiopia
- Egypt
- Georgia
- Greece
- Hungary
- Iran
- Iraq
- Jordan
- Kazakhstan
- Kuwait
- Lebanon
- Libya
- Macedonia
- Moldova
- Mongolia
- Morocco
- Mozambique
- Pakistan
- People's Republic of China
- Poland
- Portugal
- Romania
- Russia
- Saudi Arabia
- Spain
- Syria
- Turkmenistan
- Ukraine
- United Arab Emirates
- Uzbekistan
- ...



Why Kalde?

Innovation

It's unimaginable for a premier manufacturer to maintain its success without constant innovation and development. Of course, the key to Kalde's success is innovation.

Yes, we are an installation systems manufacturer, but we define ourselves also as a technology provider.

We brainstorm and exchange ideas with our customers on a regular basis; we inform our R&D department and design engineers about the demands of all our partners, plumbers and project offices; and we come up with outstanding solutions that are specifically designed to expedite the application processes and reduce the risks.

As we raise the bar for our sector, naturally we ensure to obtain patents and certificates for all our new products that are invented in-house.

We Offer the Best Quality

Our four-staged Kalde Quality Control Mechanism, besides regular control of production, includes follow-ups on shipments and the application process of the products.

Since all our products are validated by our own control processes, naturally they have also been certified by world's most prestigious institutions of quality control. Some of these quality certifications include: Turkey, Turkish Standards Institute, ISO 9001 Quality Management System; Germany, DVGW and SKZ; Spain, AENOR; Russia, Gost and etc.

The quality of our products are examined periodically by the independent certification institutions, so that at each stage of production the principle of excellency is maintained.

In addition, all products of Kalde are covered by product liability insurance up to 2.000.000 Euro per year.







PP-R Systems

Applied Norms

DIN 8077	Polypropylene (PP) pipes' dimensions
DIN 8078	Polypropylene (PP) pipes' general quality requirements and testing
DIN 16962 (6-9)	Pipe joints and elements for polypropylene (PP) pressure pipelines, types 1 and 2; injection moulded elbows for socket-welding, dimensions
DIN 16962	Pipe joints and components of polypropylene (PP) for pipes under pressure, - Part 5: General quality requirements, testing
DIN 1988	Drinking water line installation
DIN 4109	Sound insulation in building construction
DVS 2207 (11)	Welding regulations for plastic pipes
DVS 2208.1	Machines and devices for welding thermoplastic pipes
DIN 10266-1	Pipe threads where pressure tight joints are made on the threads - Part 1: Taper external threads and parallel internal threads - Dimension, tolerances and designation
DIN 16928	Pipe connections and components - Pipes of thermoplastic materials; pipe joints, elements for pipes, laying; general directions
EN ISO 15874	Plastics piping systems for hot and cold water installations - polypropylene; Part 1: General, Part 2: Pipe, Part 3: Fittings, Part 5: Fitness for purpose of the systems, Part 7: Guidance for the assessment of conformity

Raw Material: Polypropylene Random Copolymer (PP-R)

Polypropylene Random Copolymer (PP-R) is widely used in hot water, floor- and radiator heating systems as well as in industrial liquid distribution systems. Most commonly, this material can be found in drinking water installations.

Kalde pipes are produced using solely PP-R. PP-R has several advantages over other materials: long duration, better flexibility, high resistance to pressure and heat, high molecular weight, low MFR, high acoustic and thermal insulation.

PP-R is suitable for DIN 8078 and EN ISO 15874-1 standards.

The metal inserts used in the polypropylene fittings increase the reliability of the products. Kalde's experience in brass fittings for more than 35 years results in high quality fittings with very reliable metal inserts.

Physical and Thermal Properties

Properties	Testing Methods	Unit	Values
Density, at 23 °C	ISO 1183	g/cm ³	0,9
Melt flow index (MFI) 230 °C/2, 16 kg	ISO 1133	g/10 min	0,3
Thermal conductivity at 23 °C	DIN 52612-1	W/m.K	0,23
Coefficient of linear expansion K ⁻¹ average between 0 °C up to 110 °C	DIN 53712	K ⁻¹	1,5 x10 ⁻⁴
Surface Resistance (ohm)	DIN IEC 60093	Ω	>10 ¹²
Deflection temperature under load			
1,8 N/mm ²	ISO 75A-1, -2	°C	49
0,45 N/mm ²	ISO 75B-1, -2	°C	70
VICAT softening point (1 kg)	ASTM D 1525	°C	130
(5 kg)	ISO 306 DIN 53460	°C	70
Melting point	DSC	°C	146

Mechanical Properties

Properties	Testing Methods	Unit	Values
Tensile stress at yield (23 °C) At 50 mm/min	ISO 527-1,-2	N/mm ²	25
Tensile strain at yield At 50 mm/min		%	10
Flexural modulus at 23 °C	ISO 527	N/mm ²	800
Charpy impact strength (notched) at 23 °C	ISO 179/1eA	kJ/ m ²	22
at 0 °C		kJ/ m ²	4,5
Charpy impact strength (unnotched) (0 °C)	ISO 179	Joule	No break
Hardness (shore D)	ISO 868		60

Pipe Dimension - PN10 According to DIN 8077

Outer Diameter (mm)	Diameter Tolerance (mm)	Wall Thickness, (mm) S:5 SDR:11 (mm)	Thickness Tolerance (mm)	Approx. Weight (kg/m)
20	+0,3	1,9	+0,3	0,107
25	+0,3	2,3	+0,4	0,158
32	+0,3	2,9	+0,4	0,240
40	+0,4	3,7	+0,5	0,401
50	+0,5	4,6	+0,6	0,605
63	+0,6	5,8	+0,7	0,960
75	+0,7	6,8	+0,8	1,360
90	+0,9	8,2	+1,0	1,960
110	+1,1	10,0	+1,2	3,002

Operating Conditions (S:5 SDR:11) (PN 10)

Temperature (C)	Life (years)	Pressure (bar)
20	50	12,9
40	50	9,2
60	50	6,4
70	50	4,2
80	25	3,2
95	5	2,6

Pipe Dimension - PN16 According to DIN 8077

Outer Diameter (mm)	Diameter Tolerance (mm)	Wall Thickness, (mm) S:3,2 SDR:7,4 (mm)	Thickness Tolerance (mm)	Approx. Weight (kg/m)
20	+0,3	2,8	+0,4	0,150
25	+0,3	3,5	+0,5	0,215
32	+0,3	4,4	+0,6	0,343
40	+0,4	5,5	+0,7	0,547
50	+0,5	6,9	+0,8	0,854
63	+0,6	8,6	+1,0	1,347
75	+0,7	10,3	+1,2	1,920
90	+0,9	12,3	+1,4	2,755
110	+1,1	15,1	+1,7	4,116

Operating Conditions (S:3,2 SDR:7,4) (PN 16)

Temperature (C)	Life (years)	Pressure (bar)
20	50	20,4
40	50	14,5
60	50	10,2
70	50	6,7
80	25	5,1
95	5	4,1

Pipe Dimension - PN20 According to DIN 8077

Outer Diameter (mm)	Diameter Tolerance (mm)	Wall Thickness, (mm) S:2,5 SDR:6 (mm)	Thickness Tolerance (mm)	Approx. Weight (kg/m)
20	+0,3	3,4	+0,5	0,170
25	+0,3	4,2	+0,6	0,258
32	+0,3	5,4	+0,7	0,415
40	+0,4	6,7	+0,8	0,642
50	+0,5	8,3	+1,0	0,992
63	+0,6	10,5	+1,2	1,580
75	+0,7	12,5	+1,4	2,245
90	+0,9	15,0	+1,7	3,227
110	+1,1	18,3	+2,0	4,812

Operating Conditions (S:2,5 SDR:6) (PN 20)

Temperature (C)	Life (years)	Pressure (bar)
20	50	25,7
40	50	18,3
60	50	12,9
70	50	8,5
80	25	6,5
95	5	5,2

Fitting Dimension - PN25 According to DIN 8078 (S:2, SDR:5)

Nominal Diameter (Ød) (mm)	Wall Thickness (s) (mm)	Thickness Tolerance (mm)
20	4,1	+0,6
25	5,1	+0,7
32	6,5	+0,8
40	8,1	+1,0
50	10,1	+1,2
63	12,7	+1,4
75	15,1	+1,7
90	18,1	+2,0
110	22,1	+2,3

PP-R Systems

Thermal Expansion in PP-R Tubes

The polypropylene pipes have an expansion coefficient that is much higher than the metal pipes. It is critical to take this characteristic into consideration during installations.

Calculation of thermal expansion is as follows: $\Delta L = L * \Delta T * \alpha$

where

ΔT = The difference between environmental temperature and water temperature in Kelvin degrees (K) or Celsius (°C).

ΔL = Variation of length in mm.

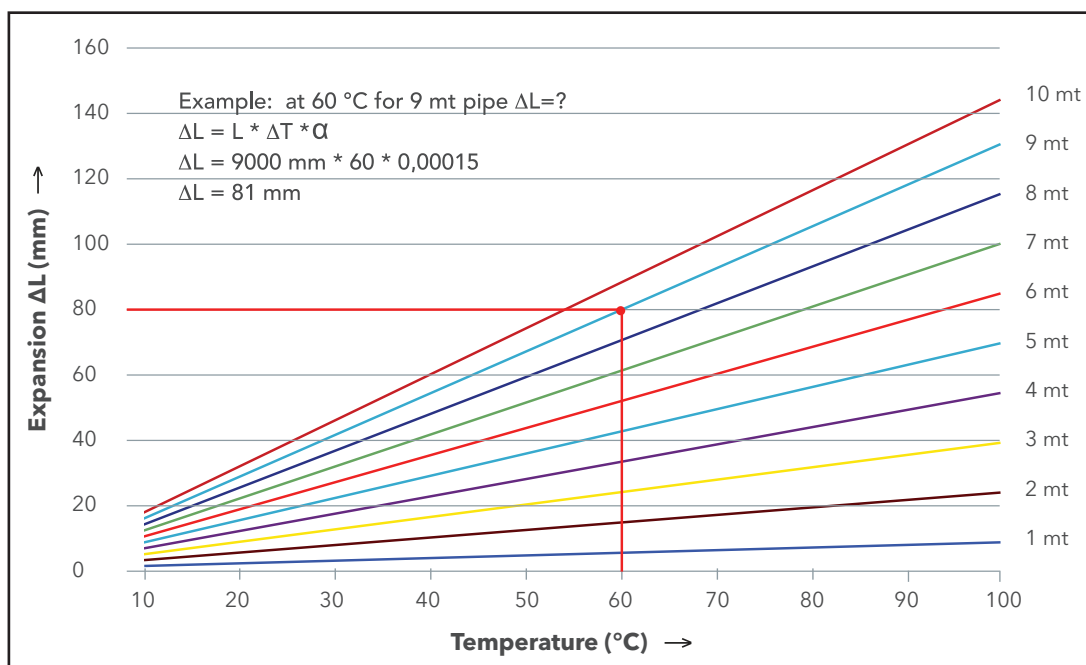
L = Initial length of the pipe in m.

α = Coefficient of linear thermal expansion. The value of α is $1,5 * 10^{-4}$ (K⁻¹) for PP-R tubes.

Pipe Length (m)	Temperature Variation ΔT in K											
	1	5	10	20	30	40	50	60	70	80	90	100
	Linear Expansion ΔL (mm)											
1.0	0.15	0.75	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00	13.50	15.00
2.0	0.30	1.50	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00	30.00
3.0	0.45	2.25	4.50	9.00	13.50	18.00	22.50	27.00	31.50	36.00	40.50	45.00
4.0	0.60	3.00	6.00	12.00	18.00	24.00	30.00	36.00	42.00	48.00	54.00	60.00
5.0	0.75	3.75	7.50	15.00	22.50	30.00	37.50	45.00	52.50	60.00	67.50	75.00
6.0	0.90	4.50	9.00	18.00	27.00	36.00	45.00	54.00	63.00	72.00	81.00	90.00
7.0	1.05	5.25	10.50	21.00	31.50	42.00	52.50	63.00	73.50	84.00	94.50	105.00
8.0	1.20	6.00	12.00	24.00	36.00	48.00	60.00	72.00	84.00	96.00	108.00	120.00
9.0	1.35	6.75	13.50	27.00	40.50	54.00	67.50	81.00	94.50	108.00	121.50	135.00
10.0	1.50	7.50	15.00	30.00	45.00	60.00	75.00	90.00	105.00	120.00	135.00	150.00

Note: When the water temperature circulating in the pipe is higher than the environmental temperature, the result will be an elongation. But if the water temperature circulating in the pipe is lower than the environmental temperature, the result will be a shortage.

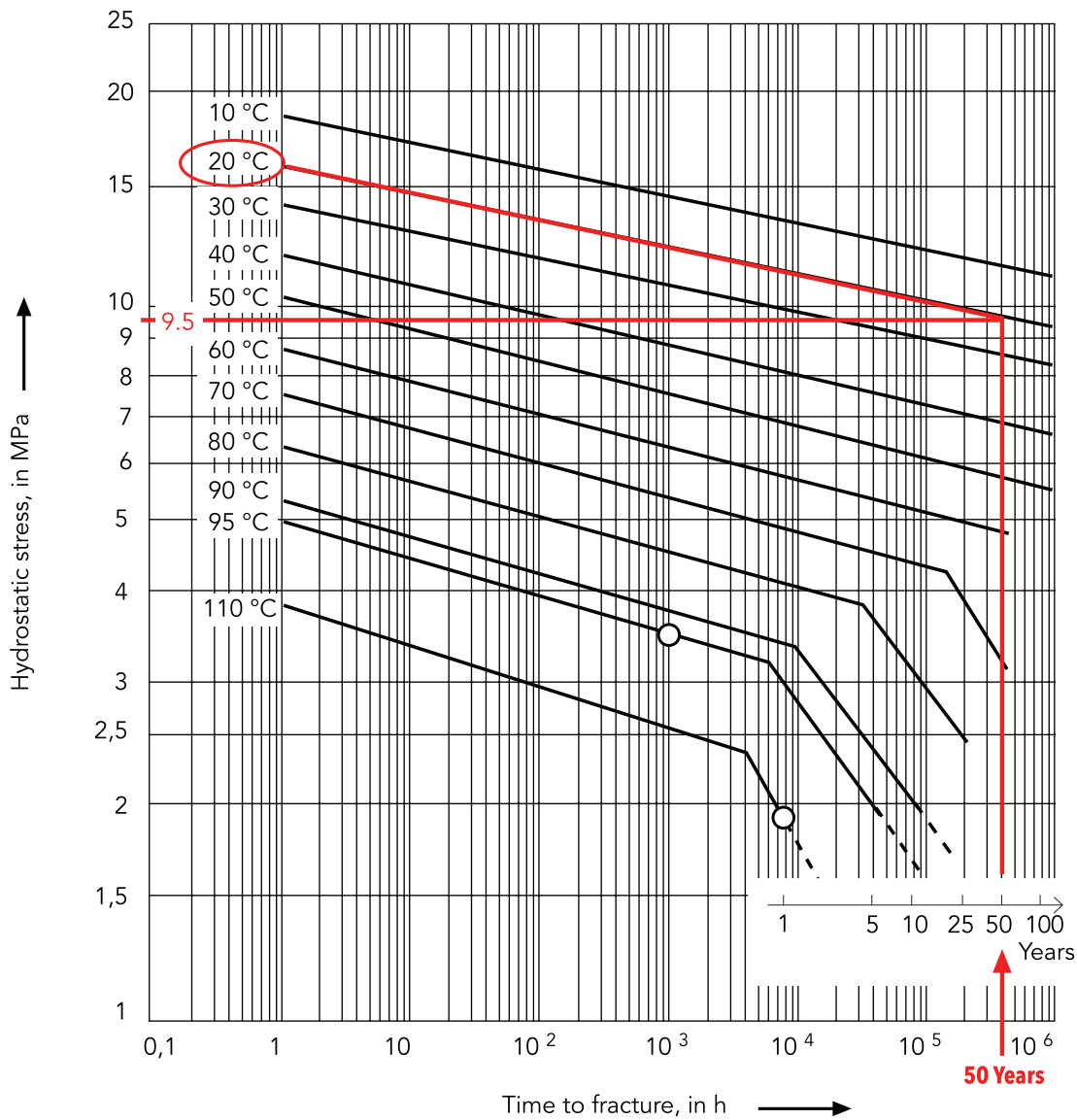
Thermal Expansion of the Kalde PP-R Pipe



Operating Life According to DIN 8077 (SF=1.5 PP-R 80)

Temperature (°C)	Operation Life	Series (S)							
		20	16	12.5	8.3	5	3.2	2.5	2
		Standard Dimension Rate (SDR)							
		41 PN2,5	33 PN3,2	26 PN4	17.6 PN6	11 PN10	7.4 PN16	6 PN20	5 PN25
		Pressure (bar)							
20	1	3.7	4.7	5.9	9	15	23.7	29.9	37.7
	5	3.5	4.4	5.6	8.4	14.1	22.3	28.1	35.4
	10	3.4	4.3	5.4	8.2	13.7	21.7	27.4	34.5
	25	3.3	4.1	5.2	7.9	13.2	21	26.4	33.3
	50	3.2	4	5.1	7.7	12.9	20.4	25.7	32.4
	100	3.1	3.9	5	7.5	12.5	19.9	25	31.5
30	1	3.2	4	5	7.6	12.7	20.2	25.4	32
	5	3	3.7	4.7	7.2	11.9	18.9	23.8	30
	10	2.9	3.6	4.6	7	11.6	18.4	23.2	29.2
	25	2.8	3.5	4.4	6.7	11.2	17.7	22.3	28.1
	50	2.7	3.4	4.3	6.5	10.9	17.2	21.7	27.4
	100	2.6	3.3	4.2	6.3	10.6	16.8	21.1	26.6
40	1	2.7	3.4	4.3	6.5	10.8	17.1	21.6	27.2
	5	2.5	3.2	4	6	10.1	16	20.2	25.4
	10	2.4	3.1	3.9	5.9	9.8	15.5	19.6	24.7
	25	2.3	2.9	3.7	5.6	9.4	15	18.8	23.7
	50	2.3	2.9	3.6	5.5	9.2	14.5	18.3	23.1
	100	2.2	2.8	3.5	5.3	8.9	14.1	17.8	22.4
50	1	2.3	2.8	3.6	5.5	9.1	14.5	18.2	23
	5	2.1	2.7	3.4	5.1	8.5	13.5	17	21.4
	10	2	2.6	3.3	4.9	8.2	13.1	16.5	20.8
	25	2	2.5	3.1	4.7	7.9	12.6	15.9	20
	50	1.9	2.4	3	4.6	7.7	12.2	15.4	19.4
	100	1.8	2.3	2.9	4.5	7.5	11.8	14.9	18.8
60	1	1.9	2.4	3	4.6	7.7	12.2	15.4	19.4
	5	1.8	2.2	2.8	4.3	7.1	11.3	14.3	18
	10	1.7	2.2	2.7	4.1	6.9	11	13.9	17.5
	25	1.6	2.1	2.6	4	6.6	10.5	13.3	16.7
	50	1.6	2	2.5	3.8	6.4	10.2	12.9	16.2
70	1	1.6	2	2.5	3.9	6.5	10.3	12.9	16.3
	5	1.5	1.9	2.4	3.6	6	9.5	12	15.1
	10	1.4	1.8	2.3	3.5	5.8	9.2	11.6	14.6
	25	1.2	1.5	2	3	5	8	10	12.7
	50	1	1.3	1.7	2.5	4.2	6.7	8.5	10.7
80	1	1.3	1.7	2.1	3.2	5.4	8.6	10.8	13.7
	5	1.2	1.5	1.9	2.9	4.8	7.6	9.6	12.1
	10	1	1.2	1.6	2.4	4	6.4	8.1	10.2
	25	0.8	1	1.2	1.9	3.2	5.1	6.5	8.1
95	1	0.9	1.2	1.5	2.3	3.8	6.1	7.6	9.6
	5	0.6	0.8	1	1.5	2.6	4.1	5.2	6.5
	(10)1	-0.5	-0.6	-0.8	-1.3	-2.2	-3.4	-4.3	-5.5

Hydrostatic Pressure Performance



Hydrostatic pressure is calculated according to the below formula:

$$P = \frac{2 \cdot e_{\min} \cdot \sigma}{d_e - e_{\min}}$$

- P** = Internal pressure, MPa.
- d_e** = Outside diameter of the pipe, mm.
- e_{min}** = Minimum wall thickness of the pipe, mm.
- σ** = Hydrostatic stress, MPa.
- 1MPa** = 10 bar = 14.5 Psi.

Sample:

Usage time of the pipe : 50 years
 Operating temperature : 20°C
 Outside diameter of pipe : ø32
 Wall thickness of pipe : 5,4 mm
 Hydrostatic stress : 9.5 MPa

Maksimum operating pressure

$$P = (20 \times 5,4 \times 9,5) / (32 - 5,4)$$

$$P = 1026 / 26,6$$

$$P = 38,57 \text{ bar}$$

This result shows the maximum resistance in a certain time, in order to find the maximum pressure, the value the maximum resistance should be divided by safety factor (for example, Kalde pipe safety factor is SF:1,5)

$$P_{\max} = P_{\max} / SF$$

$$P_{\max} = 38,57 / 1.5$$

$$P_{\max} = 25,7 \text{ bar (see page 15)}$$

Classification of Service Conditions

Application Class	Design Temperature, TD (°C)	Time at TD (years)	Tmax (°C)	Time at max (years)	Tmal (°C)	Time at Tmal (h)	Typical Field of Application
1	60	49	80	1	95	100	Hot water supply (60°C)
2	70	49	80	1	95	100	Hot water supply (70°C)

Chemical Resistance

It's highly resistant as a polypropylene polymer.

The tables annexed show the chemical resistances of Kalde-SuperMUTE PP-R waste water pipes and fittings as per TS 11448.

Since the chemical resistance depends on factors such as chemical composition, concentration and temperature, the tables below provide the chemical resistance for various temperatures and various concentrations.

The Abbreviations Below are Used in the Tables.

W.s. Water solution
S.s Saturated solution
R Resistant
L Limited resistant
NR Not resistant

**Chemical Resistance of Polypropylene,
at 20, 60 and 100°C (ISO 10358)**

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Acetic acid	Up to 40 %	R	R	-
Acetic acid	50 %	R	R	L
Acetic acid, glacial	> 96 %	S	L	NR
Acetic anhydride	100 %	R	-	-
Acetone	100 %	R	R	-
Acetophenone	100 %	R	L	-
Acrylonitrile	100 %	R	-	-
Air		R	R	R
Allyl alcohol	100 %	R	R	-
Almond oil		R	-	-
Alum	W.s	R	R	-
Ammonia, aqueous	S.s	R	R	-
Ammonia, dry gas	100 %	R	-	-
Ammonia, liquid	100 %	R	-	-
Ammonium acetate	S.s	R	R	-
Ammonium chloride	S.s	R	R	-
Ammonium fluoride	Up to 20%	R	R	-
Ammonium hydrogen carbonate	S.s	R	R	-
Ammonium metaphosphate	S.s	R	R	R
Ammonium nitrate	S.s	R	R	R
Ammonium persulphate	S.s	R	R	-
Ammonium phosphate	S.s	R	-	-
Ammonium sulphate	S.s	R	R	R
Ammonium sulphide	S.s	R	R	-
Amyl acetate	100 %	L	-	-
Amyl alcohol	100 %	R	R	R
Aniline	100 %	R	R	-
Apple juice		R	-	-
Aqua regia	HCl/HNO ₃ =3/1	NR	NR	NR
Barium bromide	S.s	R	R	R
Barium carbonate	S.s	R	R	R
Barium chloride	S.s	R	R	R
Barium hydroxide	S.s	R	R	R
Barium sulphide	S.s	R	R	R
Beer		R	R	-
Benzene	100 %	L	NR	NR
Benzoic acid	S.s	R	R	-
Benzyl alcohol	100 %	R	L	-
Borax	W.s	R	R	-
Boric acid	S.s	R	-	-
Boron trifluoride	S.s	R	-	-

**Chemical Resistance of Polypropylene,
at 20, 60 and 100°C (ISO 10358)**

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Bormine, gas	100 %	NR	NR	NR
Bromine, liquid	100 %	NR	NR	NR
Butane, gas	100 %	R	-	-
Butyl acetate	100 %	L	NR	NR
Butyl glycol	100 %	R	-	-
Butyl phenols	S.s	R	-	-
Butyl phthalate	100 %	R	L	L
Calcium carbonate	S.s	R	R	R
Calcium chlorate	S.s	R	R	-
Calcium chloride	S.s	R	R	R
Calcium hydroxide	S.s	R	R	R
Calcium hypochlorite	W.s	R	-	-
Calcium nitrate	S.s	R	R	-
Camphor oil		NR	NR	NR
Carbon dioxide, dry gas		R	R	-
Carbon dioxide, wet gas		R	R	-
Carbon disulphide	100 %	R	NR	NR
Carbon monoxide, gas		R	R	-
Carbon tetrachloride	100 %	NR	NR	NR
Caustic soda	Up to 50%	R	L	L
Chlorine, aqueous	S.s	R	L	-
Chlorine, dry gas	100 %	NR	NR	NR
Chloroacetic acid	W.s	R	-	-
Chloroform	100%	L	NR	NR
Chlorosulphonic acid	100%	NR	NR	NR
Chrome alum	W.s	R	R	-
Chromic acid	Up to 40%	R	L	NS
Citric acid	S.s	R	R	R
Coconut oil		R	-	-
Copper (II) chloride	S.s	R	R	-
Copper (II) nitrate	S.s	R	R	R
Copper (II)	S.s	R	R	-
Corn oil		R	L	-
Cottonseed oil		R	R	-
Decalin (decahydronaphthalene)	100%	NR	NR	NR
Dextrin	W.s	R	R	-
Dextrose	W.s	R	R	R
Dibutyl phthalate	100%	R	L	NR
Dichloroacetic acid	100%	L	-	-
Dichloroethylene (A and B)	100%	L	-	-
Diethanolamine	100%	R	-	-

**Chemical Resistance of Polypropylene,
at 20, 60 and 100°C (ISO 10358)**

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Diethyl ether	100%	R	L	-
Diethylene glycol	100%	R	R	-
Diglycolic acid	S.s	R	-	-
Diisooctyl	100%	R	L	-
Dimethyl amine, gas		R	-	-
Dimethyl formamide	100%	R	R	-
Diocetyl phthalate	100%	L	L	-
Dioxane	100%	L	L	-
Distilled water	100%	R	R	R
Ethanolamine	100%	R	-	-
Ethyl acetate	100%	L	NR	NR
Ferric chloride	S.s	R	R	R
Formaldehyde	40 %	R	-	-
Formic acid	10 %	R	R	L
Formic acid	85 %	R	NR	NR
Formic acid, anhydrous	100 %	R	L	L
Fructose	W.s	R	R	R
Fruit juice		R	R	R
Gasoline, petrol (aliphatic hydrocarbons)		NR	NR	NR
Gelatine		R	R	-
Glucose	20 %	R	R	R
Glycerine	100 %	R	R	R
Glycolic acid	30 %	R	-	-
Heptane	100 %	L	NR	NR
Hexane	100 %	R	L	-
Hydrobromic acid	Up to 48 %	R	L	NR
Hydrochloric acid	Up to 20 %	R	R	R
Hydrochloric acid	30 %	R	L	L
Hydrofluoric acid	w.s	R	-	-
Hydrofluoric acid	40 %	R	-	-
Hydrogen	100 %	R	-	-
Hydrogen chloride, dry gas	100 %	R	R	-
Hydrogen peroxide	Up to 10 %	R	-	-
Hydrogen peroxide	Up to 30 %	R	L	-
Hydrogen sulphide, dry gas	100 %	R	R	-
Iodine, in alcohol		R	-	-
Isopropyl alcohol	100 %	R	R	R
Isopropyl ether	100 %	L	-	-
Lanoline		R	L	-
Linseed oil		R	R	R
Magnesium carbonate	S.s	R	R	R

**Chemical Resistance of Polypropylene,
at 20, 60 and 100°C (ISO 10358)**

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Magnesium chloride	S.s	R	R	-
Magnesium hydroxide	S.s	R	R	-
Magnesium sulphate	S.s	R	R	-
Maleic acid	S.s	R	R	-
Mercury (II) chloride	S.s	R	R	-
Mercury (II) cyanide	S.s	R	R	-
Mercury (I) nitrate	W.s	R	R	-
Mercury	100 %	R	R	-
Methyl acetate	100 %	R	R	-
Methyl alcohol	5 %	R	L	L
Methyl amine	Up to 32 %	R	-	-
Methyl bromide	100 %	NR		NR
Methyl ethyl ketone	100 %	R	-	-
Methylene chloride	100 %	L	NR	NR
Milk		R	R	R
Monochloroacetic acid	>85 %	R	R	-
Naphtha		R	NR	NR
Nickel chloride	S.s	R	R	-
Nickel nitrate	S.s	R	R	-
Nickel sulphate	S.s	R	R	-
Nitric acid	Up to 30 %	R	NR	NR
Nitric acid	From 40 to 50 %	L	NR	NR
Nitric acid, fuming (with nitrogen dioxide)		NR	NR	NR
Nitrobenzene	100%	R	L	-
Oleic acid	100 %	R	L	-
Oleum (sulphuric acid with 60 % of SO ₃)		R	L	-
Olive oil		R	R	L
Oxalic acid	w.s	R	L	NR
Paraffin oil (FL65)		R	L	NR
Peanut oil		R	R	-
Peppermint oil		R	-	-
Perchloric acid	(2N) 20%	R	-	-
Petroleum ether (ligroin)		L	L	-
Phenol	5%	R	R	-
Phenol	90%	R	-	-
Phosphine, gas		R	R	-
Phosphoric acid	Up to 85%	R	R	R
Phosphorus oxychloride	100%	L	-	-
Picric acid	S.s	R	-	-
Potassium borate	S.s	R	R	-
Potassium fluoride	S.s	R	R	-

**Chemical Resistance of Polypropylene,
at 20, 60 and 100°C (ISO 10358)**

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Potassium hydroxide	Up to 50%	R	R	R
Potassium iodide	S.s	R	-	-
Potassium nitrate	S.s	R	R	-
Potassium perchlorate	10%	R	R	-
Potassium permanganate	(2 N) 30%	R	-	-
Potassium persulphate	S.s	R	R	-
Potassium sulphate	S.s	R	R	-
Propane, gas	100%	R	-	-
Propionic acid	>50%	R	-	-
Pyridine	100%	L	-	-
Seawater		R	R	R
Silicon oil		R	R	R
Silver nitrate	S.s	R	R	L
Sodium benzoate	35%	R	L	-
Sodium bicarbonate	S.s	R	R	R
Sodium carbonate	Up to 50%	R	R	L
Sodium chlorate	S.s	R	R	-
Sodium chloride	S.s	R	R	-
Sodium chlorite	2%	R	L	NR
Sodium chlorite	20%	R	L	NR
Sodium dichromate	S.s	R	R	R
Sodium hydrogen carbonate	S.s	R	R	R
Sodium hydrogen sulphate	S.s	R	R	-
Sodium hydrogen sulphite	S.s	R	-	-
Sodium hydroxide	1%	R	R	R
Sodium hydroxide	From 10 to 60 %	R	R	R
Sodium hypochlorite	5%	R	R	-
Sodium hypochlorite	10%-15%	R	-	-
Sodium hypochlorite	20%	R	L	-
Sodium metaphosphate	W.s	R	-	-
Sodium nitrate	S.s	R	R	-
Sodium perorate	S.s	R	R	-
Sodium phisohate (neutral)		R	R	R
Sodium silicate	W.s	R	R	-

**Chemical Resistance of Polypropylene,
at 20, 60 and 100°C (ISO 10358)**

Chemical or Product	Concentration	Temperature °C		
		20	60	100
Sodium sulphate	S.s	R	R	-
Sodium sulphide	S.s	R	-	-
Sodium sulphite	40%	R	R	R
Sodium thiosulphate (hypo)	S.s	R	-	-
Soybean oil		R	L	-
Succinic acid	S.s	R	R	-
Sulphuric acid	Up to 10%	R	R	R
Sulphuric dioxide, dry or wet	10%	R	R	-
Sulphur acid	From 10 to 30 %	R	R	-
Sulphuric acid	50 %	R	L	L
Sulphuric acid	96 %	R	L	NR
Sulphuric acid	98 %	L	NR	NR
Sulphurous acid	Up to 30 %	R	-	-
Tartaric acid	S.s	R	R	-
Tetrahydrofuran	100 %	L	NR	NR
Tetralin	100 %	NR	NR	NR
Thiophene	100 %	R	L	-
Tin(IV) chloride	W.s	R	R	-
Tin (II) chloride	S.s	R	R	-
Toluene	100 %	L	NR	NR
Trichloroacetic acid	Up to 50 %	R	R	-
Trichloroethylene	100 %	NR	NR	NR
Triethanolamine	W.s	R	-	-
Turpentine		NR	NR	NR
Urea	S.s	R	R	-
Vinegar		R	R	-
Water brackish, mineral, potable		R	R	R
Whiskey		R	R	-
Wines		R	R	-
Xylene	100%	NR	NR	NR
Yeast	W.s	R	R	R
Zinc chloride	Sat.w.s	R	R	-
Zinc chloride	S.s	R	R	-

Polypropylene Tubes with Aluminum Foil

This pipe consists of three layers: the pipe and the coat are made of PP-R 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.

Characteristics

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

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

Technical Properties, Pipe Dimensions (PN 20)

Inner Pipe		Aluminum	Outer Pipe	Outside Layer
Outer Diameter, mm	Wall Thickness, mm	Thickness (micron)	Outer Diameter, mm	Thickness, mm
20	2,8	150	21,8	0,5
25	3,5	150	26,8	0,5
32	4,4	150	33,8	0,5
40	5,5	150	41,8	0,5
50	6,9	150	51,8	0,5
63	8,6	150	64,8	0,5
75	10,3	150	76,8	0,5
90	12,3	150	91,8	0,5
110	15,1	150	111,8	0,5

Operating Conditions (PN 20)

Temperature (C)	Life (years)	Pressure (bar)
20	50	25,7
40	50	18,3
60	50	12,9
70	50	8,5
80	25	6,5
95	5	5,2

Technical Properties, Pipe Dimensions (PN 25)

Inner Pipe		Aluminum	Outer Pipe	Outside Layer
Outer Diameter, mm	Wall Thickness, mm	Thickness (micron)	Outer Diameter, mm	Thickness, mm
20	3,4	150	21,8	0,5
25	4,2	150	26,8	0,5
32	5,4	150	33,8	0,5
40	6,7	150	41,8	0,5
50	8,3	150	51,8	0,5
63	10,5	150	64,8	0,5
75	12,5	150	76,8	0,5
90	15,0	150	91,8	0,5
110	18,3	150	111,8	0,5

Operating Conditions (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

Thermal Expansion in PP-R Tubes with Aluminum Foil

Polypropylene pipes with aluminum foil have lower expansion coefficients.

Calculation of thermal expansion is as follows: $\Delta L = L * \Delta T * \alpha$

where

ΔT = The difference between environmental temperature and water temperature in Kelvin degrees (K) or Celsius (°C).

ΔL = Variation of length in mm.

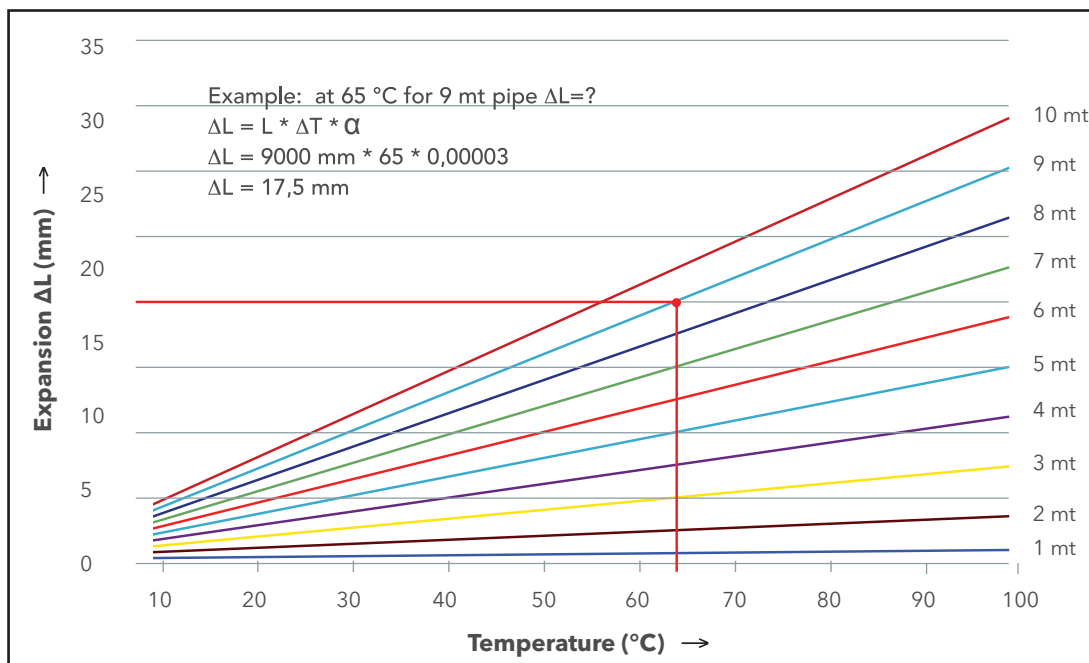
L = Initial length of the pipe in m.

α = Coefficient of linear thermal expansion. The value for α in PP-R tubes with alu foil is $0,3 * 10^{-4} (K^{-1})$.

Pipe Length (m)	Temperature Variation ΔT in K											
	1	5	10	20	30	40	50	60	70	80	90	100
	Linear Expansion ΔL (mm)											
1.0	0,03	0,15	0.30	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00
2.0	0,06	0,30	0.60	1.20	1.80	2.40	3.00	3.60	4.20	4.80	5.40	6.00
3.0	0,09	0,45	0.90	1.80	2.70	3.60	4.50	5.40	6.30	7.20	8.10	9.00
4.0	0,12	0,60	1.20	2.40	3.60	4.80	6.00	7.20	8.40	9.60	10.80	12.00
5.0	0,15	0,75	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00	13.50	15.00
6.0	0,18	0,90	1.80	3.60	5.40	7.20	9.00	10.80	12.80	14.40	16.20	18.00
7.0	0,21	1,05	2.10	4.20	6.43	8.40	10.50	12.60	14.70	16.80	18.90	21.00
8.0	0,24	1,20	2.40	4.80	7.20	9.60	12.00	14.40	16.80	19.20	21.60	24.00
9.0	0,27	1,35	2.70	5.40	8.10	10.80	13.50	16.20	18.90	21.60	24.30	27.00
10.0	0,30	1,50	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00	30.00

Note: When the water temperature circulating in the pipe is higher than the environmental temperature, the pipe will elongate. But if the water temperature circulating in the pipe is lower than the environmental temperature, the result will be a shortage.

Thermal Expansion of the Kalde PP-R Pipe



Polypropylene Pipes with Fiberglass

This pipe consists of three layers: the pipe and the coat are made of PP-R with a fiberglass-mixed PP-R inbetween.

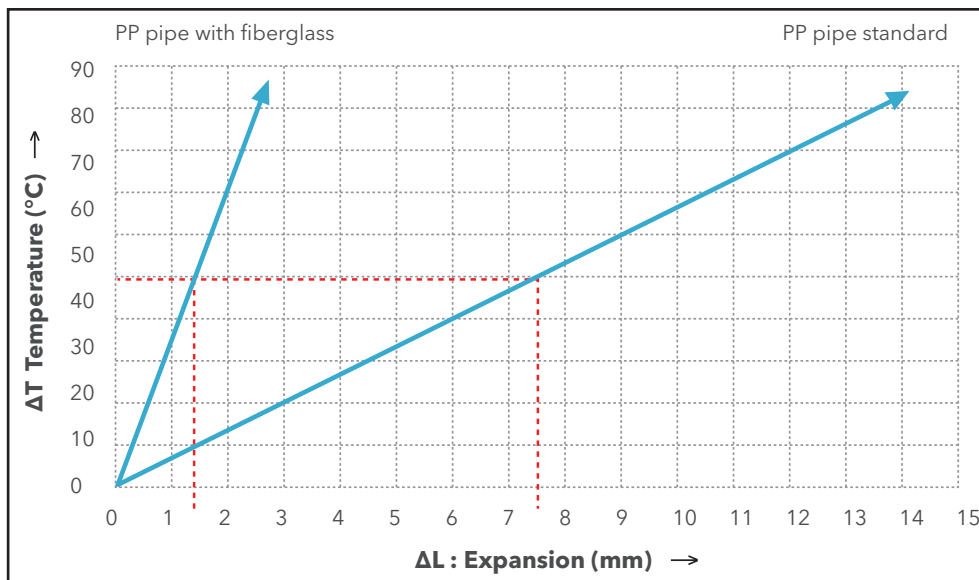
Characteristics

- Hygienic.
- Resistance to chemicals.
- High resistance to pressure and heat.
- Low heat loss.
- Low pressure loss due to the smoothness.
- Low thermal expansion.
- Expansion: 0.035 mm/mK.
- Lighter than standard PP-R pipes.
- The heat conductivity is less than alu-foiled PP-R pipes and same as PP-R standard pipes.
- Higher discharge related to the bigger inner diameter.

Advantages

- %75 less expansion than standard PP-R pipes.
- No need to shave the pipe for welding.
- Lower costs, you use less brackets due to less expansion.
- More resistance despite smaller wall thickness.
- %20 more flow than standard pipes.
- Same or lower heat conductivity in comparison to standard PP-R and aluminum foiled pipes.
- Easy welding and mounting.

Expansion Comparison Between PP Pipes with Fiberglass and Standard Pipe



Pipe Dimension (PN 20)

Outer Diameter (mm)	Diameter Tolerance (mm)	Wall Thickness (mm)	Thickness Tolerance (mm)	Approx. Weight (kg/m)
20	+0,3	2,8	+0,4	0,155
25	+0,3	3,5	+0,5	0,230
32	+0,3	4,4	+0,6	0,380
40	+0,4	5,5	+0,7	0,607
50	+0,5	6,9	+0,8	0,910
63	+0,6	8,6	+1,0	1,440
75	+0,7	10,3	+1,2	2,040
90	+0,9	12,3	+1,4	2,905
110	+1,1	15,1	+1,7	4,380

Operating Life According to DIN 8078 (PN 20)

Temperature (C)	Life (years)	Pressure (bar)
20	50	25,7
40	50	18,3
60	50	12,9
70	50	8,5
80	25	6,5
95	5	5,2

Pipe Dimension (PN 25)

Outer Diameter (mm)	Diameter Tolerance (mm)	Wall Thickness (mm)	Thickness Tolerance (mm)	Approx. Weight (kg/m)
20	+0,3	3,4	+0,5	0,180
25	+0,3	4,2	+0,6	0,270
32	+0,3	5,4	+0,7	0,415
40	+0,4	6,7	+0,8	0,665
50	+0,5	8,3	+1,0	1,030
63	+0,6	10,5	+1,2	1,620
75	+0,7	12,5	+1,4	2,310
90	+0,9	15,0	+1,6	3,326
110	+1,1	18,3	+2,0	4,950

Operating Life According to DIN 8078 (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

Thermal Expansion in Polypropylene Pipes with Fiberglass

Polypropylene pipes with fiberglass have an expansion coefficient that is much higher than metal pipes. It is critical to take this characteristic into consideration during installations.

Calculation of thermal expansion is as follows: $\Delta L = L * \Delta T * \alpha$

where

ΔT = The difference between environmental temperature and water temperature in Kelvin degrees (K) or Celsius (°C).

ΔL = Variation of length in mm.

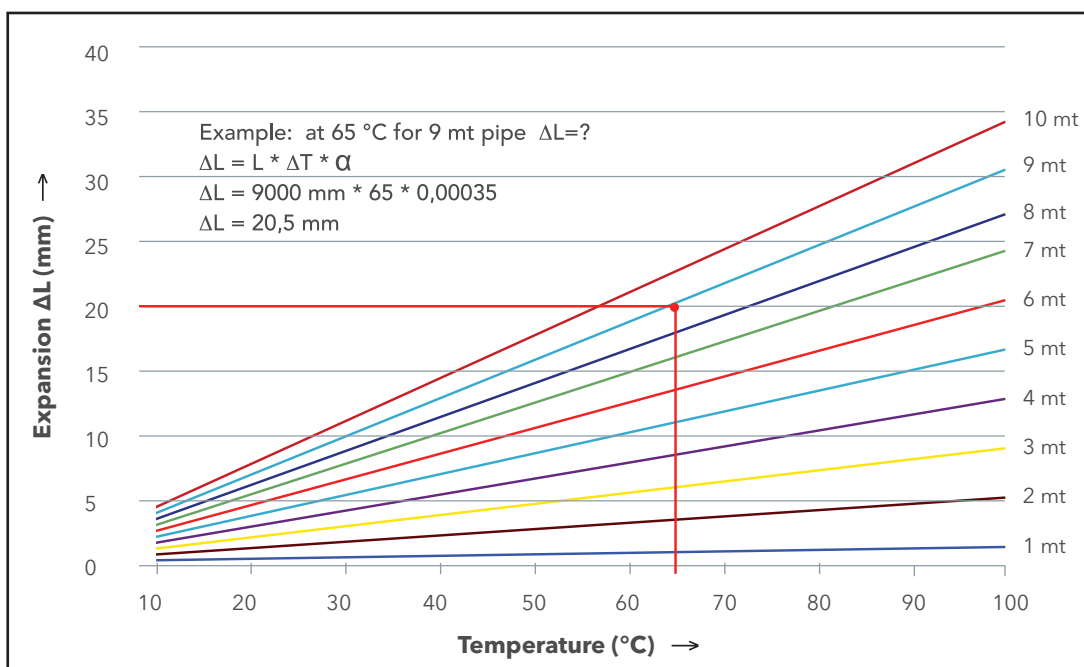
L = Initial length of the pipe in m.

α = Coefficient of linear thermal expansion. The value for α in PP-R tubes with alu foil is $0,35 * 10^{-4} (K^{-1})$.

Pipe Length (m)	Temperature Variation ΔT in K											
	1	5	10	20	30	40	50	60	70	80	90	100
	Linear Expansion ΔL (mm)											
1.0	0,035	0,17	0,35	0,70	1,05	1,40	1,75	2,10	2,45	2,80	3,15	3,50
2.0	0,070	0,35	0,70	1,40	2,10	2,80	3,50	4,20	4,90	5,60	6,30	7,00
3.0	0,105	0,52	1,05	2,10	3,15	4,20	5,25	6,30	7,35	8,40	9,45	10,50
4.0	0,140	0,70	1,40	2,80	4,20	5,60	7,00	8,40	9,80	11,20	12,60	14,00
5.0	0,175	0,87	1,75	3,50	5,25	7,00	8,75	10,50	12,25	14,00	15,75	17,50
6.0	0,210	1,05	2,10	4,20	6,30	8,40	10,50	12,60	14,70	16,80	18,90	21,00
7.0	0,245	1,22	2,45	4,90	7,35	9,80	12,25	14,70	17,15	19,60	22,05	24,50
8.0	0,280	1,40	2,80	5,60	8,40	11,20	14,00	16,80	19,60	22,40	25,20	28,00
9.0	0,315	1,57	3,15	6,30	9,45	12,60	15,75	18,90	22,05	25,20	28,35	31,50
10.0	0,350	1,75	3,50	7,00	10,50	14,00	17,50	21,00	24,50	28,00	31,50	35,00

Note: When the water temperature circulating in the pipe is higher than the environmental temperature, the pipe will elongate. But if the water temperature circulating in the pipe is lower than the environmental temperature, the result will be a shortage.

Thermal Expansion of the Kalde PP-R Fiber-glass Pipe



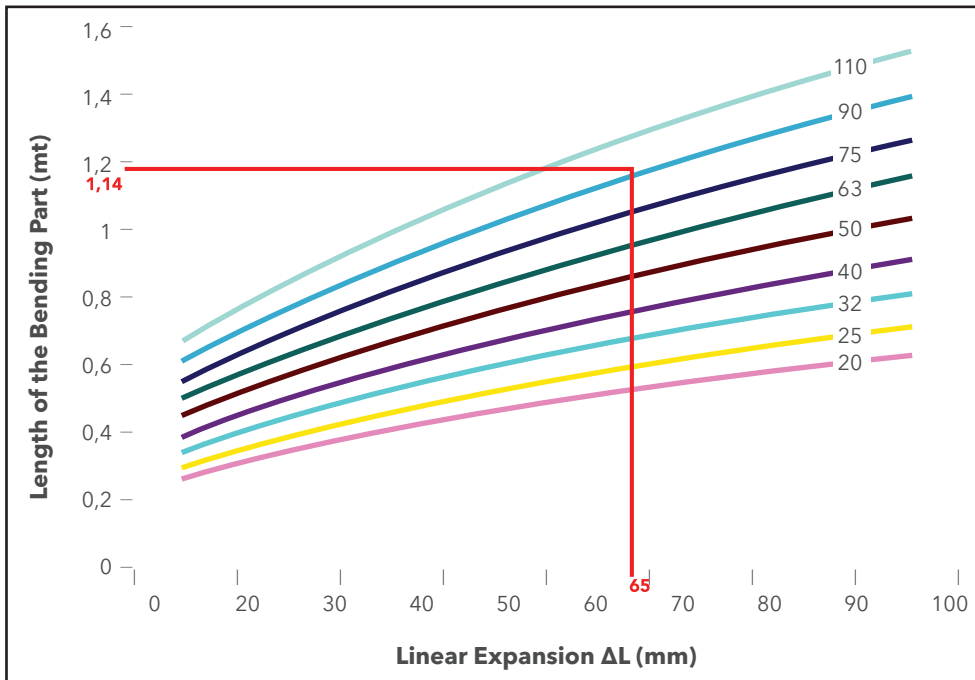
Mounting and Installation

Thermal Tensions

Piping systems are used to convey gas and fluids in a broad area with various pressure and temperatures. Piping materials go through size changes due to changes in temperature, external forces, time-dependent effects (fatigue and relaxation), changes in internal structure, humidity value and some other reasons. When considering pipe systems, the most important elements that require taking measures are temperature and external forces as well as the weight of pipe itself, (other heavy materials used in pipelines; valves, watermeter, filter etc.) weight of fluid being conveyed, operating temperature, and internal and external pressure.

Thermal tensions result from static points blocking the pipe motion in all directions and preventing pipe's angular movement, and the sliding support that hinders the same in two directions.

A piping system should be designed so as to have the longest service life against its intended use, the lowest business and investment cost, and to work in the safest way. This can be ensured by making a thermal tension analysis of the installation. Therefore, thermal tensions must be taken into the same consideration from the basic household installation to those with the highest pressure and temperature values. Amount of thermal tension in piping is determined upon temperature difference in the pipeline, pipe length and material characteristics. Amount of thermal tension of PP-R pipe can be determined using the thermal expansion diagram below.



Removing Expansions from Installation

Omega and (U) Elements

Omega and U parts designed for use in hot pipes. As an alternative, metal (belows) compensator also can be used instead of the omega and U parts. these parts, are used to get extensions in straight pipelines. these components, application forms and calculations of the system are given below.

Use some shape:

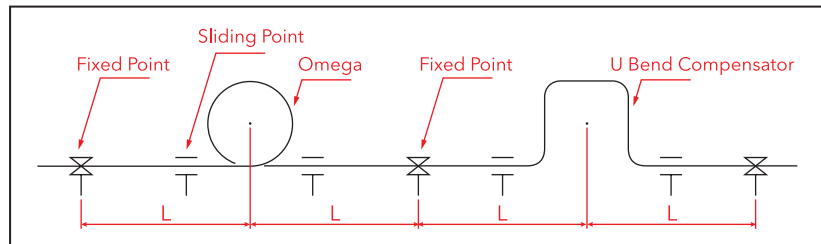


Figure - 1 Omega and U part

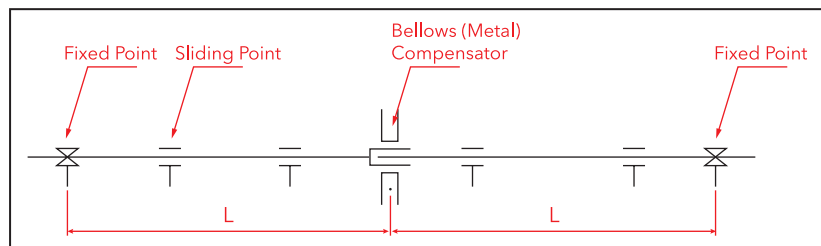


Figure - 2 Metal compensator

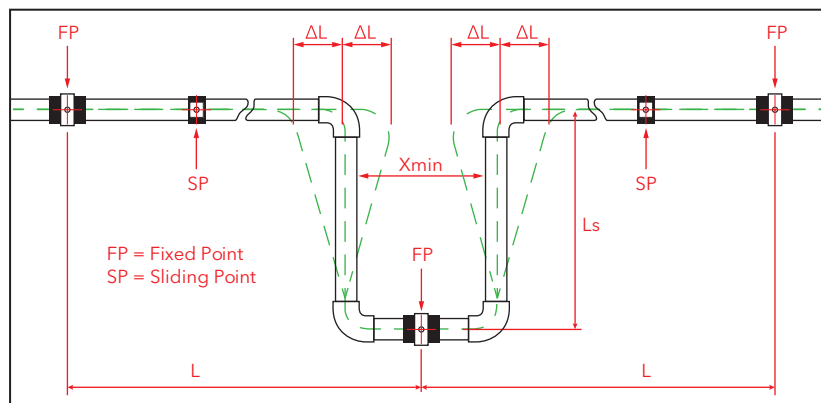


Figure - 3 U part (calculation distance of bending part)

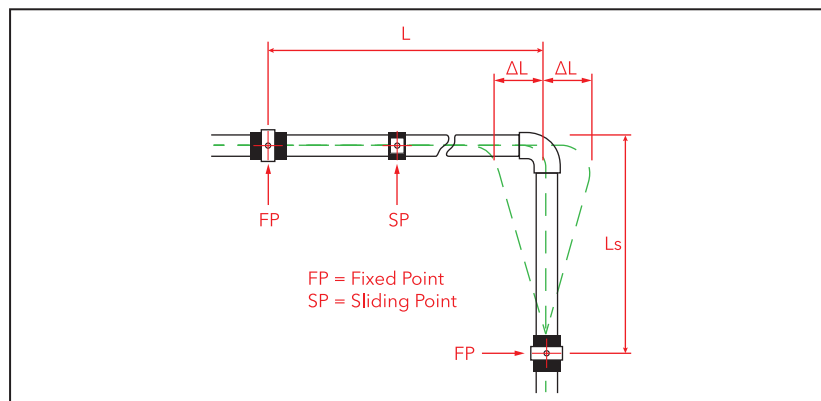


Figure - 4 Calculation distance of bending part

Calculation of Elongation

Length of the bending part is calculated with the following formula.

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

L_s = Length of the bending part mm.

d = Outer diameter of the Kalde pipe mm.

ΔL = Variation of length mm.

C = 15 (material based constant of Kalde pipe).

FP = Fixed Point.

MP = Moving Point.

Kalde Length of the Bending Part

Pipe Out Diameter (mm)	Linear Expansion ΔL (mm)								
	1	5	10	20	30	40	50	60	70
	Length of the Bending Part in (m)								
Ø20	0.30	0.36	0.42	0.47	0.51	0.56	0.60	0.63	0.67
Ø25	0.33	0.41	0.47	0.53	0.58	0.62	0.67	0.71	0.75
Ø32	0.37	0.46	0.53	0.60	0.65	0.70	0.75	0.80	0.84
Ø40	0.42	0.52	0.60	0.67	0.73	0.79	0.84	0.90	0.94
Ø50	0.47	0.58	0.67	0.75	0.82	0.88	0.94	1.00	1.06
Ø63	0.53	0.65	0.75	0.84	0.90	0.99	1.06	1.12	1.19
Ø75	0.58	0.71	0.82	0.91	1.00	1.08	1.16	1.23	1.29
Ø90	0.63	0.78	0.90	1.00	1.10	1.19	1.27	1.35	1.42
Ø110	0.70	0.86	0.99	1.11	1.21	1.31	1.40	1.49	1.57

Example

1. Calculation of elongation

Temperature difference between cold water and environment

Input

$$\alpha = 0.15 \text{ mm/m-K}$$

$$L = 12 \text{ meter}$$

$$\Delta T = 40 \text{ }^{\circ}\text{C}$$

Required

$$\Delta L = \alpha \times \Delta T \times L$$

$$\Delta L = 0.15 \times 40 \times 12 = 72 \text{ mm}$$

2. The calculation of the bending length

$$d = 63 \text{ mm}$$

$$\Delta L = 72 \text{ mm}$$

$$C = 15$$

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

$$L_s = 15 \times \sqrt{63 \times 72} = 1010 \text{ mm}$$

PP-R Systems

Support Intervals

The choice of support points depends on the pipe diameter, the layout of the pipelines, as well as the location of the heavy valves and fittings. There is no rule in this regard. The pipe support intervals are given in the tables below. Heavy valves and device on pipelines should be installed as close to the supports as possible.

Kalde PP-R Pipe SDR:6 - SDR: 7.4 (PN20 - PN16)

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

Kalde Foil Pipe SDR:6 - SDR: 7.4 (PN25 - PN20)

Temperature ΔT (K)	Pipe Diameter d (mm)								
	20	25	32	40	50	63	75	90	110
	Support Intervals in cm								
20	110	120	140	160	180	200	210	220	240
30	110	120	140	160	180	200	210	220	230
40	110	120	130	150	170	190	200	210	220
50	110	120	130	150	170	190	200	210	210
60	100	110	120	140	160	180	190	200	200
70	90	100	110	130	150	170	180	190	200

Kalde PP-R Pipe SDR:11 (PN10) (Temperature of Medium:20°C)

Temperature ΔT (K)	Pipe Diameter d (mm)								
	20	25	32	40	50	63	75	90	110
	Support Intervals in cm								
20	60	70	90	100	120	140	150	160	180

Kalde Fiberglass Pipe SDR:6 - SDR:7.4 (PN25 - PN20)

Temperature ΔT (K)	Pipe Diameter d (mm)								
	20	25	32	40	50	63	75	90	110
	Support Intervals in cm								
20	90	100	110	120	140	160	170	180	200
30	90	100	110	120	140	160	170	180	200
40	80	90	100	110	130	150	160	170	180
50	80	90	100	110	130	150	160	170	180
60	70	80	90	100	120	140	150	160	170
70	70	80	90	100	120	120	140	150	160

Welding Technique

Welding takes only a few seconds. The quality of an installation depends on the tightness, stability and lifetime of its connections. When the welded joint cools down, it can be fully loaded.

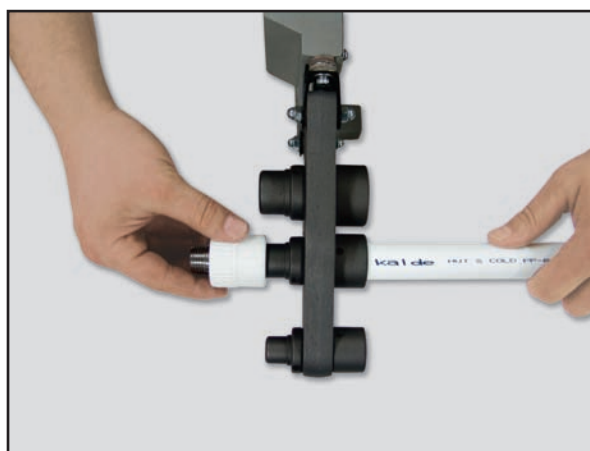
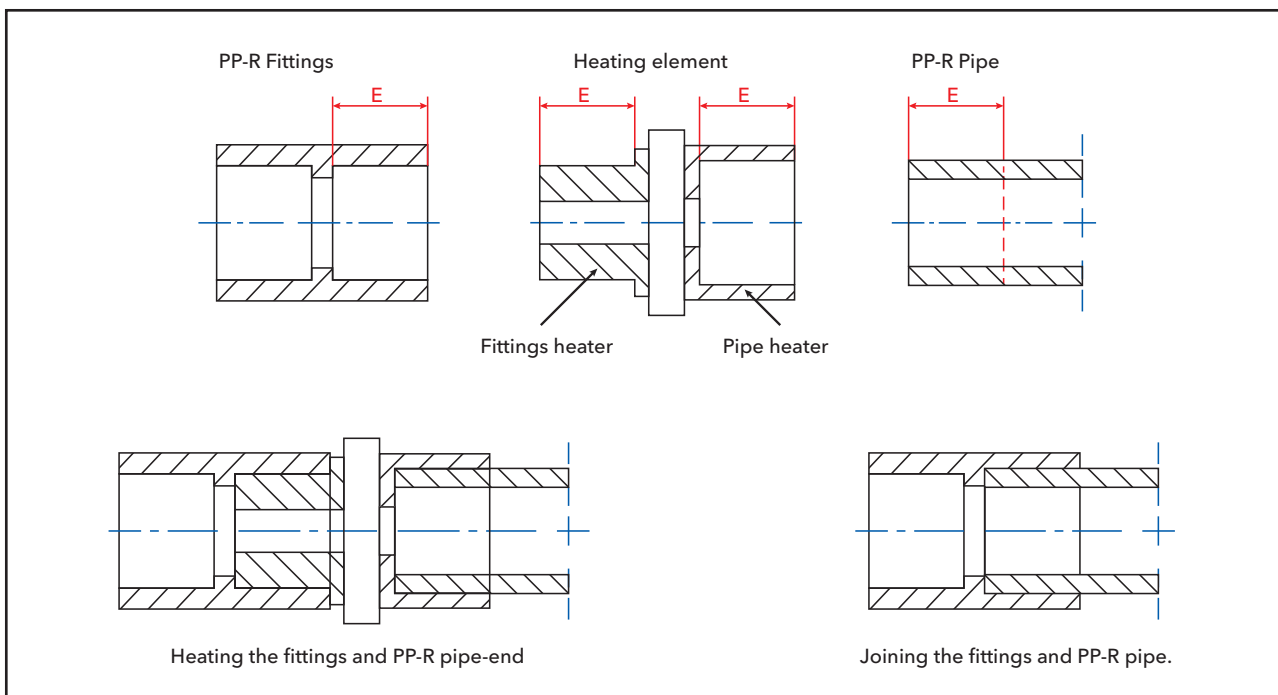
PP-R pipes and fittings, combined with socket welding. This operation is done with welding machines. Surfaces to be welded must be clean.

Welding sequence:

- According to the size of pipes and fittings welding part (Teflon coated) mounted welding machine, welding parts is heated until it ches the temperature ($260^{\circ}\text{C} \pm 10$).
- To be welded pipe, pipe cutting scissors cut perpendicular to the axis of the pipe, (outer foil pipes, after cutting proses the on surface of the pipe aluminum foil must shaved with shave aparatus.)
- Pipe welding distance is marked. (see Chart of welding)
- Pipes and fittings, gently inserted into welding parts.
- A certain period of the welding machine the heated pipe and fitting, getting out from welding parts, and are combined with each other. (see Chart of welding)

Outer Diameter (mm)	Heating (secs)	Joining (secs)	Cooling Time (minutes)	Welding Length (mm)
20	7	4	2	16
25	7	4	3	18
32	8	6	4	20
40	12	6	4	22
50	18	6	5	26
63	24	8	6	29
75	30	10	8	32
90	40	11	8	38
110	50	12	8	42

Diameter (Ø), (mm)	E, (mm)
20	15
25	17
32	19
40	22
50	24
63	28
75	32
90	38
110	42



Insulation of Pipes

PP-R tubes require less insulation compared to other types of pipes under the same conditions. Nevertheless, in cold and hot climates some insulation is required against freezing and heat loss over heating. These are caused by factors such as sun light, rain, snow when the pipes are laid outside. Another advantage of the insulation layer is the protection it provides against impacts.

General

Pipe insulation shall be designed to meet the following requirements.

- a) Legal and other obligations shall be complied with.
- b) Insulation material shall be adequately protected against moisture.
- c) The insulation materials shall ensure that the water is maintained at the designed operating temperature.

The insulating effect is mainly a function of the thickness of the insulation and its thermal conductivity, and increases in direct proportion to the temperature. The performance of insulating materials is impaired if they are moist. Open-cell and fibrous insulating materials shall be provided with a vapour barrier bonded to the outer surface of the insulation. Condensation can form on any insulating material if the cold water pipes are inadequately lagged. If unsuitable materials this may lead to the moisture penetrating to the pipe. Thus, closed-cell materials with a high moisture resistance should be used to insulate cold water pipes. All but joints, cuts, seams and ends shall be sealed. If pipes are located in areas where frost damage is likely, even insulation cannot always prevent freezing if the system is not in service. The pipes should, therefore, be drained or otherwise protected.

Protection of cold water system against warmth and condensation.

Cold water pipework shall be adequately protected against heat sources and condensation, if necessary.

Cold water pipe shall be installed sufficiently clear of heat sources (e.g. hot pipes, chimneys, boilers). Where this is not possible, the pipes shall be insulated so that the water quality is not impaired by warmth.

For residential applications, the insulation thickness specified in the following table shall be used, assuming normal service conditions. Insulation will not provide permanent protection of the water against warmth.

The specifications of the table are also applicable where the protection against condensation on the outer surface of the insulation is concerned, assuming a water temperature of 10°C.

Protection against condensation is not required if the pipe is provided with a suitable sheathing (e.g. ducted pipe).

Recommended Minimum Thickness of Insulation for Cold Water Pipes

Location of Pipe	Insulation Thickness $\lambda=0,040 \text{ W/mK}$ *)
Exposed pipes, in unheated room (e.g. cellar)	4 mm
Exposed pipes, in heated room	9 mm
Ducted pipes, (cold water only)	4 mm
Ducted pipes, (cold and hot water)	13 mm
Chased pipes, risers	4 mm
Pipes in wall recess, next to hot pipes	13 mm
Pipes on concrete floor	4 mm
*) for other values of λ , the thickness is to be obtained by conversion, on the basis of a pipe diameter of 20 mm.	

Protection of Hot Water Pipes Against Heat Loss

The minimum requirements specified in the Heizungsanlagen-Verordnung (heating system regulation) shall be complied with for restricting the heat loss of hot pipes, including circulation pipes.

Thermal Insulation of Warm Water Pipes

The decree for energy saving thermal protection and energy saving technique for buildings shall be considered. Decree for energy saving (EnEV-in Germany) regulates the thermal insulation of pipes and fittings.

Minimum Thickness of Insulation Warm Water Pipes

Line	Type of Pipe / Fitting	Minimum Thickness of Insulation Referred to Thermal Conductivity of $\lambda=0.035 \text{ W/mK}$
1	Inner diameter up to 22 mm	20 mm
2	Inner diameter more than 22 mm up to 35 mm	30 mm
3	Inner diameter more than 35 mm up to 100 mm	Same as inner diameter
4	Inner diameter more than 100 mm	100 mm

Insulation Thickness

Pipe Outer Diameter	Available Thickness Acc.to 2 HAVO $\lambda = 0.035 \text{ W/mK}$	Insulation Thickness in Kalde Pipes $\lambda = 0.035 \text{ W/mK}$
20x3,4 mm	20 mm	20 mm
25x4,2 mm	20 mm	20 mm
32x5,4 mm	20 mm	20 mm
40x6,7 mm	30 mm	30 mm
50x8,3 mm	30 mm	30 mm
63x10,5 mm	42 mm	42 mm
75x12,5 mm	50 mm	50 mm
90x15,0mm	60 mm	60 mm
110x18,3mm	73,4 mm	73,4 mm

Calculation of Economic Pipe Insulation Material Thickness

Optimum values of the thickness of the pipe insulation material is shown in chart of economic insulation thickness.
Such F factor $F = P \cdot (T_i - T_d) \cdot n \cdot \lambda \cdot 10^{-5}$ is calculated by Equation.

where in,

P = Heat energy costs (€ / kWh) in Euro,

n = Annual operating time (hours / year)

λ = Thermal conductivity coefficient of insulation material (W/mk)

T_i = Fluid temperature, °C

T_d = The ambient temperature, °C

Example:

Pipe diameter: 75mm

The temperature of water in the pipe: 80 °C,

Ambient temperature: 20 °C

Heat energy cost: 30 € / kWh,

Line, annual working hours: 8000h

Insulation material, thermal conductivity coefficient: 0.035 W/mk

In this case, what is the economic pipe insulation thickness?

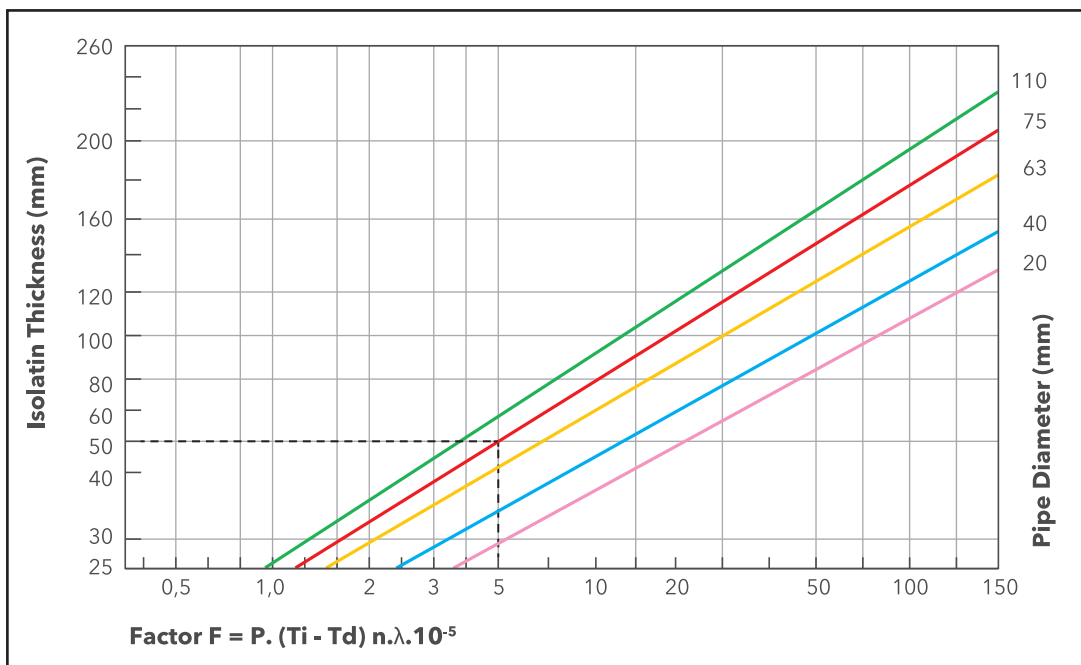
$$F = P \cdot (T_i - T_d) \cdot n \cdot \lambda \cdot 10^{-5}$$

$$F = 30 \times (80 - 20) \times 8000 \times 0.035 \times 10^{-5}$$

$$F = 5.04$$

Looking at the economic insulation thickness chart (below), only the insulation thickness of 50 mm.

Economic Insulation Thickness Chart



Several Thermal Insulation Materials and Their Properties

Materials	User's Location	Temperature Range	Coefficient of Thermal Conductivity
Glass wool	Heating systems, pipes are used to provide heat and sound insulation.	(-20°C) - (+250°C)	20°C de 0,039 W/mk
Polyethylene foam	Central heating, cooling, air-conditioning systems	(-80°C) - (+95°C)	10°C de 0,033 W/mk 40°C de 0,040 W/mk
Elostrometrik polyolefin	Central heating, cooling, ventilation, heat pump systems	(-80°C) - (+95°C)	10°C de 0,033 W/mk 40°C de 0,038 W/mk
Polyurethane foam	Cooling tanks	(-100°C) - (+90°C)	20°C de 0,022 W/mk

Pressure Losses

	Dimension of Pipes (ut diameter x wall thickness) (mm)									
		20x3,4	25x4,2	32x5,4	40x6,7	50x8,3	63x10,5	75x12,5	90x15,0	110x18,3
	d1, mm	13,2	16,6	21,2	26,6	33,4	42	50	60	73,4
q	A, m ²	0,137	0,216	0,353	0,555	0,876	1,385	1,962	2,826	4,229
0,01	ΔPd	0,00055	0,00028	0,00013	0,00007	0,00003	0,00002	0,00001	0,00001	0,00000
	v	0,07299	0,04630	0,02833	0,01802	0,01142	0,00722	0,00510	0,00354	0,00236
0,05	ΔPd	0,00276	0,00139	0,00067	0,00034	0,00017	0,00009	0,00005	0,00003	0,00002
	v	0,36496	0,23148	0,14164	0,09009	0,05708	0,03610	0,02548	0,01769	0,01182
0,1	ΔPd	0,00553	0,00279	0,00134	0,00068	0,00034	0,00017	0,00010	0,00006	0,00003
	v	0,72993	0,46296	0,28329	0,18018	0,11416	0,07220	0,05097	0,03539	0,02365
0,2	ΔPd	0,01106	0,00558	0,00267	0,00135	0,00068	0,00034	0,00020	0,00012	0,00006
	v	1,45985	0,92593	0,56657	0,36036	0,22831	0,14440	0,10194	0,07077	0,04729
0,5	ΔPd	0,02765	0,01394	0,00668	0,00339	0,00171	0,00086	0,00051	0,00029	0,00016
	v	3,64964	2,31481	1,41643	0,90090	0,57078	0,36101	0,25484	0,17693	0,11823
1	ΔPd	0,05530	0,02789	0,01336	0,00677	0,00342	0,00172	0,00102	0,00059	0,00032
	v	7,29927	4,62963	2,83286	1,80180	1,14155	0,72202	0,50968	0,35386	0,23646
1,5	ΔPd	0,08295	0,04183	0,02004	0,01016	0,00513	0,00258	0,00153	0,00088	0,00048
	v	10,94891	6,94444	4,24929	2,70270	1,71233	1,08303	0,76453	0,53079	0,35469
2	ΔPd	0,11060	0,05578	0,02673	0,01355	0,00684	0,00344	0,00204	0,00118	0,00064
	v	14,59854	9,25926	5,66572	3,60360	2,28311	1,44404	1,01937	0,70771	0,47293
2,5	ΔPd	0,13824	0,06972	0,03341	0,01693	0,00854	0,00430	0,00255	0,00147	0,00081
	v	18,24818	11,57407	7,08215	4,50450	2,85388	1,80505	1,27421	0,88464	0,59116
3	ΔPd	0,16589	0,08367	0,04009	0,02032	0,01025	0,00516	0,00306	0,00177	0,00097
	v	21,89781	13,88889	8,49858	5,40541	3,42466	2,16606	1,52905	1,06157	0,70939
3,5	ΔPd	0,19354	0,09761	0,04677	0,02371	0,01196	0,00602	0,00357	0,00206	0,00113
	v	25,54745	16,20370	9,91501	6,30631	3,99543	2,52708	1,78389	1,23850	0,82762
4	ΔPd	0,22119	0,11156	0,00296	0,00150	0,00076	0,00001	0,00000	0,00000	0,00000
	v	29,19708	18,51852	0,62660	0,39854	0,25250	0,00213	0,00039	0,00027	0,00000
4,5	ΔPd	0,24884	0,12550	0,06013	0,03048	0,01538	0,00774	0,00459	0,00265	0,00145
	v	32,84672	20,83333	12,74788	8,10811	5,13699	3,24910	2,29358	1,59236	1,06408
5	ΔPd	0,02595	0,03253	0,04163	0,05216	0,06557	0,08244	0,09810	0,11775	0,14404
	v	3,42500	5,40000	8,82500	13,87500	21,90000	34,62500	49,05000	70,65000	105,72500
5,5	ΔPd	0,01142	0,01431	0,01832	0,02295	0,02885	0,03627	0,04316	0,05181	0,06338
	v	1,50700	2,37600	3,88300	6,10500	9,63600	15,23500	21,58200	31,08600	46,51900
6	ΔPd	0,33179	0,16734	0,08018	0,04064	0,02051	0,01031	0,00612	0,00354	0,00193
	v	43,79562	27,77778	16,99717	10,81081	6,84932	4,33213	3,05810	2,12314	1,41878
6,5	ΔPd	0,35943	0,18128	0,08686	0,04403	0,02222	0,01117	0,00663	0,00383	0,00209
	v	47,44526	30,09259	18,41360	11,71171	7,42009	4,69314	3,31295	2,30007	1,53701
7	ΔPd	0,38708	0,19523	0,09354	0,04742	0,02392	0,01203	0,00714	0,00413	0,00226
	v	51,09489	32,40741	19,83003	12,61261	7,99087	5,05415	3,56779	2,47700	1,65524
7,5	ΔPd	0,41473	0,20917	0,10022	0,05080	0,02563	0,01289	0,00765	0,00442	0,00242
	v	54,74453	34,72222	21,24646	13,51351	8,56164	5,41516	3,82263	2,65393	1,77347
8	ΔPd	0,44238	0,22311	0,10690	0,05419	0,02734	0,01375	0,00815	0,00472	0,00258
	v	58,39416	37,03704	22,66289	14,41441	9,13242	5,77617	4,07747	2,83086	1,89170
9	ΔPd	0,49768	0,25100	0,12026	0,06096	0,03076	0,01547	0,00917	0,00531	0,00290
	v	65,69343	41,66667	25,49575	16,21622	10,27397	6,49819	4,58716	3,18471	2,12816
10	ΔPd	0,55298	0,27889	0,13363	0,06774	0,03418	0,01719	0,01019	0,00590	0,00322
	v	72,99270	46,29630	28,32861	18,01802	11,41553	7,22022	5,09684	3,53857	2,36463

Pressure loss in straight pipes:

The d'arcy formula is used to calculate the pressure loss in the pipes

$$\Delta P_d = (\partial \cdot L/d_1)(\rho \cdot v/2) \cdot 10^{-5} \text{ (bar)}$$

ΔP_d = Pipe pressure loss (bar)

∂ = Pipe friction coefficient (for most cases 0,02)

L = Length of pipe (m)

d_1 = Inside diameter of pipe (m)

ρ = Fluid density (kg/m³)

V = Flow velocity (m/s)

D = Outside diameter of pipe (m)

S = Wall thickness (mm)

q = Flow rate (L/S)

Pipe Laying

Pipes in the ground should be isolated against thermal insulation and corrosion.

Penetration of moisture and water through the pipes underground and insulation material should be avoided.

Water in buried service pipes may be polluted by waste water. Thus, where the distance between drinking and waste water pipes does not exceed 1 m, the former shall not be laid deeper than the latter. The minimum clear distance between drinking water pipes and other pipes shall be 0.2 m. Where this distance cannot be maintained, protective measures (e.g. enclosing pipe in a duct) shall be taken.

Pipes embedded in a building element (e.g. wall or floor) shall be suitably wrapped or coated so as to ensure that the pipe and building element are not in direct contact.

Test Procedure (DIN 1988-2)

The finished installation shall be filtered and vacuumed in order to be filled with water to start testing.

Pressure testing shall be carried out in two stages, the first stage being sufficient for smaller sections of the system (e.g. for testing supply and branch pipes in wet rooms).

- 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.
- 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.

Points to Pay Attention to When Installing Polypropylene Pipes and Fittings

- Do not expose the pipes and fittings to the sun. Protect the pipes against hard and sharp objects.
Do not use accidentally damaged pipes for installation.
- Bend the pipes with hot air. Never use fire when heating the pipes.
- The pipes and the fittings to be installed should be clean.
- Cut the pipes, perpendicular to the axis of pipe with a proper scissor, do not use other sharp objects that can cause impurity in the pipes.
- Mark the welding length on the pipe before welding.
- Information about the welding process (heating time, standby time, cooling time, etc.) In the manufacturer's catalog.
- Protect polypropylene pipe and fittings where water may freeze. Expansion due to freezing water inside the pipe may damage it.
- After shaving the aluminum layer make sure that there is no aluminum parts on the welding surface, otherwise it will cause leakage.
- Cold weather weakens the resistance of polypropylene against hit and it becomes fragile.
- Protect the pipes against hit when there is a risk of freezing.
- To prevent leaks in your installation use teflon tapes with the threaded fittings.
- Use teflon for sealing when assembling threaded parts and do not overload to screw it. If linen is used as sealing material; care should be taken not to over wrap, In case of excessive use, brass inserts or other brass parts may cause fatigue cracking or breakage over time and separation of plastic and metal from each other.
- Before installation, the products to be used must be visually checked, if there are cracks, broken etc. defects should be returned to our company for replacement without using the product.
- After the installation is finished, the products in the system should be tested for leakage. If there are leaking products should be returned to our company to be replaced with a new one.

Note: Products that have not been checked and tested before and after installation are excluded from the warranty. Any damages arising from this reason are the responsibility of the installation company.

Color Codes Definitions

White 	Green 	Grey 	Black 	Brown 
3202-XXX-0X0000	3201-XXX-0X0000	3203-XXX-0X0000	3205-XXX-0X0000	3204-XXX-0X0000

- All PP fittings and pipes are available in white/grey/green.
- Nominal pressure: PN25 for fittings.
- Packaging quantities are subject to change without notice.

PP-R Systems

Polypropylene Tube and Fittings

PN-20 | Polypropylene Tube

Code	Size	Pcs.
3202-tbe-200000	ø20	100
3202-tbe-250000	ø25	80
3202-tbe-320000	ø32	40
3202-tbe-400000	ø40	32
3202-tbe-500000	ø50	20
3202-tbe-630000	ø63	16
3202-tbe-750000	ø75	12
3202-tbe-900000	ø90	8
3202-tbe-110000	ø110	4
3202-tbe-125000	ø125	4



PN-10 | Polypropylene Tube

Code	Size	Pcs.
3202-tbe-200010	ø20	100
3202-tbe-250010	ø25	80
3202-tbe-320010	ø32	40
3202-tbe-400010	ø40	32
3202-tbe-500010	ø50	20
3202-tbe-630010	ø63	16
3202-tbe-750010	ø75	12
3202-tbe-900010	ø90	8
3202-tbe-110010	ø110	4
3202-tbe-125010	ø125	4



PN-25 | Polypropylene Tube with Fiberglass

Code	Size	Pcs.
3202-tfr-200000	ø20	100
3202-tfr-250000	ø25	80
3202-tfr-320000	ø32	40
3202-tfr-400000	ø40	32
3202-tfr-500000	ø50	20
3202-tfr-630000	ø63	16
3202-tfr-750000	ø75	12
3202-tfr-900000	ø90	8
3202-tfr-110000	ø110	4
3202-tfr-125000	ø125	4



PN-20 | Polypropylene Tube with Fiberglass

Code	Size	Pcs.
3202-tfr-200020	ø20	100
3202-tfr-250020	ø25	80
3202-tfr-320020	ø32	40
3202-tfr-400020	ø40	32
3202-tfr-500020	ø50	20
3202-tfr-630020	ø63	16
3202-tfr-750020	ø75	12
3202-tfr-900020	ø90	8
3202-tfr-110020	ø110	4
3202-tfr-125020	ø125	4



PP-R Systems

PN-25 | Polypropylene Tube with Supperoxy

Code	Size	Pcs.
3202-tox-200000	ø20	100
3202-tox-250000	ø25	80
3202-tox-320000	ø32	40
3202-tox-400000	ø40	32
3202-tox-500000	ø50	20
3202-tox-630000	ø63	16
3202-tox-750000	ø75	
3202-tox-900000	ø90	
3202-tox-110000	ø110	



PN-20 | Polypropylene Tube with Supperoxy

Code	Size	Pcs.
3202-tox-200020	ø20	100
3202-tox-250020	ø25	80
3202-tox-320020	ø32	40
3202-tox-400020	ø40	32
3202-tox-500020	ø50	20
3202-tox-630020	ø63	16
3202-tox-750020	ø75	
3202-tox-900020	ø90	
3202-tox-110020	ø110	



PP Bridge

Code	Size	H	Pcs.
3202-twc-200000	ø20	40	140
3202-twc-250000	ø25	50	75
3202-twc-320000	ø32	64	36
3202-twc-400002	ø40	80	25



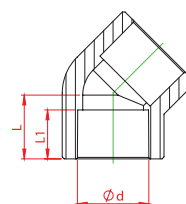
PP C-Bridge

Code	Size	H	Pcs.
3202-twc-200001	ø20	38	275
3202-twc-250001	ø25	51	150
3202-twc-320001	ø32	66	70



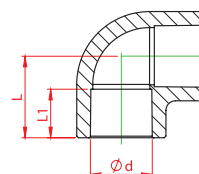
Elbow 45°

Code	Size	d	L1	L	Pcs.
3212-elb-200045	ø20	19	15	20	575
3212-elb-250045	ø25	24	17	23	360
3212-elb-320045	ø32	31	19	27	190
3212-elb-400045	ø40	39	22	31	100
3212-elb-500045	ø50	48,5	24	36	56
3212-elb-630045	ø63	61,5	28	42	25
3212-elb-750045	ø75	73,5	32	50	18
3212-elb-900045	ø90	88,5	38	59	12
3212-elb-110045	ø110	108,5	42	66	6



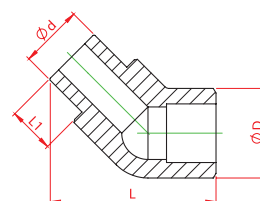
Elbow 90°

Code	Size	d	L1	L	Pcs.
3212-elb-200000	ø20	19	15	26	500
3212-elb-250000	ø25	24	17	30	300
3212-elb-320000	ø32	31	19	36	155
3212-elb-400000	ø40	39	22	43	75
3212-elb-500000	ø50	48,5	24	50,5	40
3212-elb-630000	ø63	61,5	28	62	20
3212-elb-750000	ø75	73,5	32	70	16
3212-elb-900000	ø90	88,5	38	80	6
3212-elb-110000	ø110	108,5	42	94	4



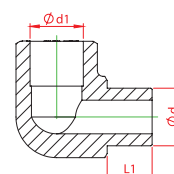
Tail Elbow 45°

Code	Size	d	D	L1	L	Pcs.
3212-elt-200045	ø20	20,5	30	14,5	65	400
3212-elt-250045	ø25	25,5	35	16	73	250



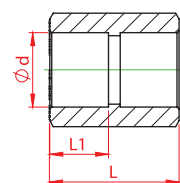
Tail Elbow 90°

Code	Size	d	d1	L1	Pcs.
3212-elt-200000	ø20	20,5	19	14,5	400
3212-elt-250000	ø25	25,5	24	16	250



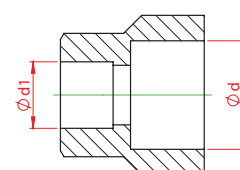
Tail Elbow 90°

Code	Size	d	L1	L	Pcs.
3212-muf-200000	ø20	19	15	33	675
3212-muf-250000	ø25	24	17	37	400
3212-muf-320000	ø32	31	19	42	225
3212-muf-400000	ø40	39	22	46	140
3212-muf-500000	ø50	48,5	24	53	80
3212-muf-630000	ø63	61,5	28	62	48
3212-muf-750000	ø75	73,5	32	69	28
3212-muf-900000	ø90	88,5	38	79	20
3212-muf-110000	ø110	108,5	42	86	10



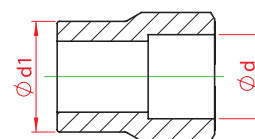
Reducing Female Coupling

Code	Size	d	d1	Pcs.
3212-rdf-252000	ø25 x 20	24	19	400
3212-rdf-322000	ø32 x 20	31	19	250
3212-rdf-322500	ø32 x 25	31	24	250
3212-rdf-402000	ø40 x 20	39	19	175
3212-rdf-402500	ø40 x 25	39	24	175



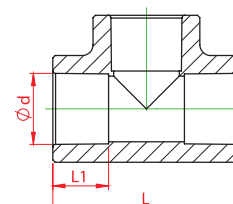
Reducing Coupling

Code	Size	d	d1	Pcs.
3212-rdc-252000	ø25 x 20	19	20	700
3212-rdc-322000	ø32 x 20	19	20	500
3212-rdc-322500	ø32 x 25	24	25	400
3212-rdc-402000	ø40 x 20	19	20	325
3212-rdc-402500	ø40 x 25	24	25	300
3212-rdc-403200	ø40 x 32	31	32	225
3212-rdc-502000	ø50 x 20	19	20	175
3212-rdc-502500	ø50 x 25	24	25	175
3212-rdc-503200	ø50 x 32	31	32	150
3212-rdc-504000	ø50 x 40	39	40	110
3212-rdc-632000	ø63 x 20	19	20	100
3212-rdc-632500	ø63 x 25	24	25	100
3212-rdc-633200	ø63 x 32	31	32	80
3212-rdc-634000	ø63 x 40	39	40	80
3212-rdc-635000	ø63 x 50	48,5	50	56
3212-rdc-752000	ø75 x 20	19	20	70
3212-rdc-752500	ø75 x 25	24	25	70
3212-rdc-753200	ø75 x 32	31	32	55
3212-rdc-754000	ø75 x 40	39	40	55
3212-rdc-755000	ø75 x 50	48,5	50	50
3212-rdc-756300	ø75 x 63	61,5	63	36
3212-rdc-905000	ø90 x 50	48,5	50	36
3212-rdc-906300	ø90 x 63	61,5	63	36
3212-rdc-907500	ø90 x 75	73,5	75	27
3212-rdc-110630	ø110 x 63	61,5	63	16
3212-rdc-110750	ø110 x 75	73,5	75	16
3212-rdc-110900	ø110 x 90	108,5	90	16



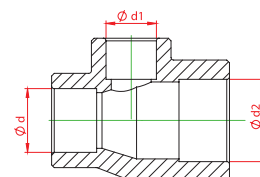
Tee

Code	Size	d	L1	L	Pcs.
3212-teo-200000	ø20	19	14,5	52	350
3212-teo-250000	ø25	24	16	60	200
3212-teo-320000	ø32	31	18	72	100
3212-teo-400000	ø40	39	20,5	86	60
3212-teo-500000	ø50	48,5	23,5	101	30
3212-teo-630000	ø63	61,5	27,5	124	16
3212-teo-750000	ø75	73,5	30	140	12
3212-teo-900000	ø90	88,5	33	160	4
3212-teo-110000	ø110	108,5	37	188	2



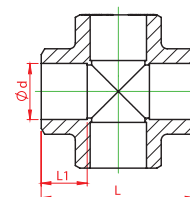
Inegal Tee

Code	Size	d	d2	d1	Pcs.
3212-tio-202520	ø20 x 25 x 20	19	19	24	250
3212-tio-252020	ø25 x 20 x 20	24	19	19	225
3212-tio-252025	ø25 x 20 x 25	24	24	19	240
3212-tio-252520	ø25 x 25 x 20	24	19	24	200
3212-tio-253225	ø25 x 32 x 25	24	24	31	120
3212-tio-322020	ø32 x 20 x 20	31	19	19	130
3212-tio-322025	ø32 x 20 x 25	31	24	19	125
3212-tio-322032	ø32 x 20 x 32	31	31	19	115
3212-tio-322520	ø32 x 25 x 20	31	19	24	125
3212-tio-322525	ø32 x 25 x 25	31	24	24	120
3212-tio-322532	ø32 x 25 x 32	31	31	24	115
3212-tio-323225	ø32 x 32 x 25	31	24	31	120
3212-tio-402040	ø40 x 20 x 40	39	39	19	80
3212-tio-402540	ø40 x 25 x 40	39	39	24	80
3212-tio-403240	ø40 x 32 x 40	39	39	31	65
3212-tio-502050	ø50 x 20 x 50	48,5	48,5	19	40
3212-tio-502550	ø50 x 25 x 50	48,5	48,5	24	40
3212-tio-503250	ø50 x 32 x 50	48,5	48,5	31	36
3212-tio-504050	ø50 x 40 x 50	48,5	48,5	39	36
3212-tio-632063	ø63 x 20 x 63	61,5	61,5	19	24
3212-tio-632563	ø63 x 25 x 63	61,5	61,5	24	24
3212-tio-633263	ø63 x 32 x 63	61,5	61,5	31	24
3212-tio-634063	ø63 x 40 x 63	61,5	61,5	39	20
3212-tio-635063	ø63 x 50 x 63	61,5	61,5	48,5	20
3212-tio-752075	ø75 x 20 x 75	73,5	73,5	19	12
3212-tio-752575	ø75 x 25 x 75	73,5	73,5	24	12
3212-tio-753275	ø75 x 32 x 75	73,5	73,5	31	12
3212-tio-754075	ø75 x 40 x 75	73,5	73,5	39	12
3212-tio-755075	ø75 x 50 x 75	73,5	73,5	48,5	12
3212-tio-756375	ø75 x 63 x 75	73,5	73,5	61,5	12
3212-tio-905090	ø90 x 50 x 90	88,5	88,5	48,5	6
3212-tio-906390	ø90 x 63 x 90	88,5	88,5	61,5	6
3212-tio-115011	ø110 x 50 x 110	108,5	108,5	48,5	3
3212-tio-116311	ø110 x 63 x 110	108,5	108,5	61,5	3



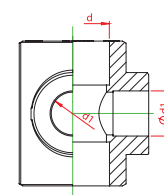
Cross

Code	Size	d	L1	L	Pcs.
3212-crs-200000	ø20	19	15	53	240
3212-crs-250000	ø25	24	17	64	140
3212-crs-320000	ø32	31	19	74	75



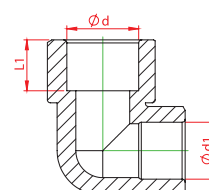
Cross Tee

Code	Size	d	d1	Pcs.
3212-cdl-322000	ø32 x 20	31	19	100
3212-cdl-322500	ø32 x 25	31	24	100
3212-cdl-402000	ø40 x 20	39	19	70
3212-cdl-402500	ø40 x 25	39	24	70



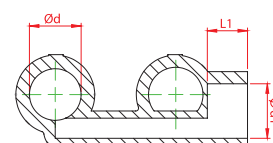
Reduction Elbow

Code	Size	d	d1	L1	Pcs.
3212-elr-252000	ø25 x 20	19	19	16	300
3212-elr-322500	ø32 x 25	24	24	18	200



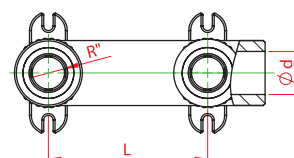
Tee Branch

Code	Size	d	d1	L1	Pcs.
3212-byp-202000	ø20 x 20	19	19	14,5	140
3212-byp-252500	ø25 x 25	24	24	16	80
3212-byp-252000	ø25 x 20	19	24	16	100



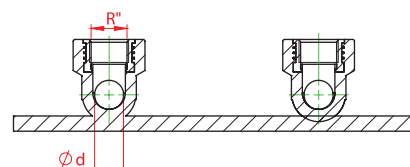
Wallplate Elbow - Double

Code	Size	d	R"	L	Pcs.
3222-btt-200b00	ø20 x 1/2"	19	1/2"	90	60
3222-btt-250b00	ø25 x 1/2"	24	1/2"	90	55



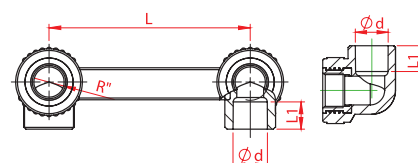
Special Wallplate Elbow - Double

Code	Size	d	R"	Pcs.
3222-bat-200b04	ø20 x 1/2"	19	1/2"	48
3222-bat-250b04	ø25 x 1/2"	24	1/2"	48



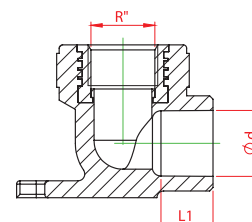
Special Wallplate Elbow - Double Grilled

Code	Size	d	R"	L1	L	Pcs.
3222-bat-200b05	ø20 x 1/2"	19	1/2"	14,5	150	56
3222-bat-250b05	ø25 x 1/2"	24	1/2"	16	150	50



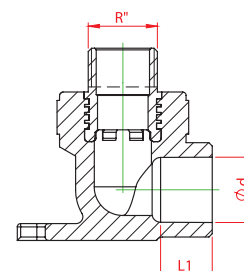
Wallplate Elbow Female

Code	Size	d	R"	L1	Pcs.
3222-bat-200b01	ø20 x 1/2"	19	1/2"	14,5	100
3222-bat-250b01	ø25 x 1/2"	24	1/2"	16	80
3222-bat-250c01	ø25 x 3/4"	24	3/4"	16	80



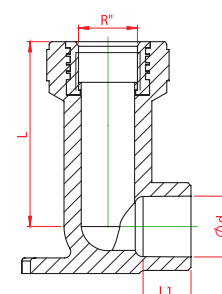
Wallplate Elbow Male

Code	Size	d	R"	L1	Pcs.
3222-btm-200b00	ø20 x 1/2"	19	1/2"	14,5	100



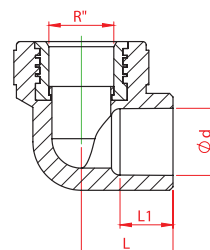
Wallplate Elbow Female - Long

Code	Size	d	R"	L1	L	Pcs.
3222-btl-200b00	ø20 x 1/2"	19	1/2"	14,5	63,5	75



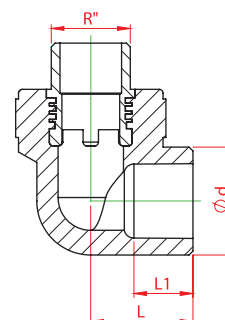
Female Elbow

Code	Size	d	R"	L1	L	Pcs.
3222-efo-200b00	ø20 x 1/2"	19	1/2"	15	30	160
3222-efo-200c00	ø20 x 3/4"	19	3/4"	15	29,5	130
3222-efo-250b00	ø25 x 1/2"	24	1/2"	17	31,5	120
3222-efo-250c00	ø25 x 3/4"	24	3/4"	17	33,5	100
3222-efo-320c00	ø32 x 3/4"	31	3/4"	19	43,5	60
3222-efo-321000	ø32 x 1"	31	1"	19	43,5	56
3222-efo-401a06	ø40 x 1 1/4"	39	1 1/4"	22	55	28



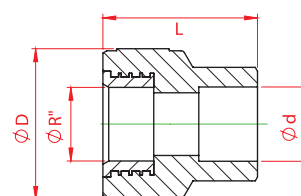
Male Elbow

Code	Size	d	R"	L1	L	Pcs.
3222-emo-200b00	ø20 x 1/2"	19	1/2"	15	50	150
3222-emo-200c00	ø20 x 3/4"	19	3/4"	15	50	110
3222-emo-250b00	ø25 x 1/2"	24	1/2"	17	50	110
3222-emo-250c00	ø25 x 3/4"	24	3/4"	17	53	100
3222-emo-320c00	ø32 x 3/4"	31	3/4"	19	64	60
3222-emo-321000	ø32 x 1"	31	1"	19	64	50
3222-emo-401a06	ø40 x 1 1/4"	39	1 1/4"	22	64	24



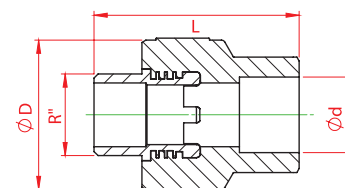
Female Nipple

Code	Size	d	R"	D	L	Pcs.
3222-nfo-200b00	ø20 x 1/2"	19	1/2"	38,5	39,5	200
3222-nfo-200c00	ø20 x 3/4"	19	3/4"	42,5	37	180
3222-nfo-250b00	ø25 x 1/2"	24	1/2"	37,5	36,5	200
3222-nfo-250c00	ø25 x 3/4"	24	3/4"	44	38,5	150
3222-nfo-320b00	ø32 x 1/2"	31	1/2"	47,5	40,5	110
3222-nfo-320c00	ø32 x 3/4"	31	3/4"	47,5	40,5	110
3222-nfo-321000	ø32 x 1"	31	1"	53	44	90



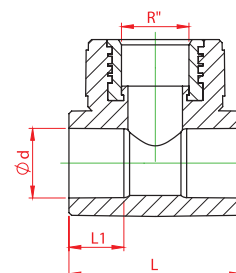
Male Nipple

Code	Size	d	R"	D	L	Pcs.
3222-nmo-200b00	ø20 x 1/2"	19	1/2"	37	46,5	200
3222-nmo-200c00	ø20 x 3/4"	19	3/4"	42,5	49,5	150
3222-nmo-250b00	ø25 x 1/2"	24	1/2"	37,5	49	180
3222-nmo-250c00	ø25 x 3/4"	24	3/4"	42	49,5	140
3222-nmo-320b00	ø32 x 1/2"	31	1/2"	47,5	52	100
3222-nmo-320c00	ø32 x 3/4"	31	3/4"	47,5	52,5	100
3222-nmo-321000	ø32 x 1"	31	1"	48	53,5	90



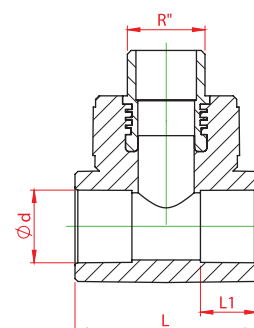
Female Tee

Code	Size	d	R"	L1	L	Pcs.
3222-tfo-200b20	ø20 x 1/2" x 20	19	1/2"	14,5	48	125
3222-tfo-200c20	ø20 x 3/4" x 20	19	3/4"	14,5	60	100
3222-tfo-250b25	ø25 x 1/2" x 25	24	1/2"	16	57	100
3222-tfo-250c25	ø25 x 3/4" x 25	24	3/4"	16	65	80
3222-tfo-320c32	ø32 x 3/4" x 32	31	3/4"	18	72	45
3222-tfo-321032	ø32 x 1" x 32	31	1"	18	76	40
3222-tfo-401a40	ø40 x 1 1/4" x 40	39	1 1/4"	20,5	98	20



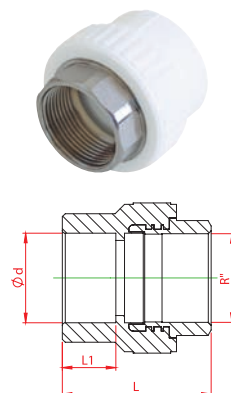
Male Tee

Code	Size	d	R"	L1	L	Pcs.
3222-tmo-200b20	ø20 x 1/2" x 20	19	1/2"	14,5	48	120
3222-tmo-200c20	ø20 x 3/4" x 20	19	3/4"	14,5	60	90
3222-tmo-250b25	ø25 x 1/2" x 25	24	1/2"	16	57	100
3222-tmo-250c25	ø25 x 3/4" x 25	24	3/4"	16	65	80
3222-tmo-320c32	ø32 x 3/4" x 32	31	3/4"	18	72	45
3222-tmo-321032	ø32 x 1" x 32	31	1"	18	76	40
3222-tmo-401a40	ø40 x 1 1/4" x 40	39	1 1/4"	20,5	98	18



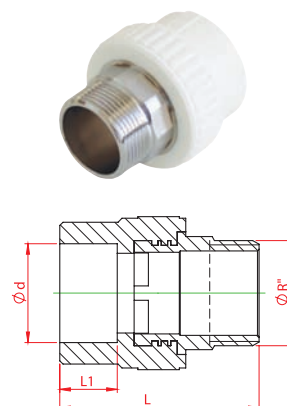
Female Nipple - Octa

Code	Size	d	R"	L1	L	Pcs.
3222-nfo-321006	ø32 x 1"	31	1"	18	56	70
3222-nfo-401a06	ø40 x 1 1/4"	39	1 1/4"	20,5	58,5	40
3222-nfo-501b06	ø50 x 1 1/2"	48,5	1 1/2"	23,5	63	30
3222-nfo-632006	ø63 x 2"	61,5	2"	27,5	73	18
3222-nfo-752b06	ø75 x 2 1/2"	73,5	2 1/2"	30	77,5	12
3222-nfo-903006	ø90 x 3"	88,5	3"	33	93,5	7
3222-nfo-110406	ø110 x 4"	108,5	4"	37	100	3



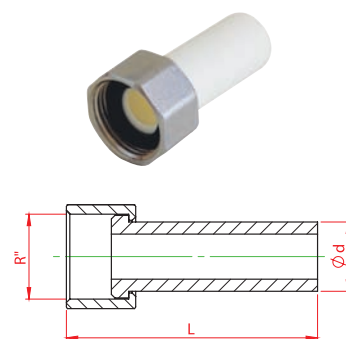
Male Nipple - Octa

Code	Size	d	R"	L1	L	Pcs.
3222-nmo-321006	ø32 x 1"	31	1"	18	62,5	80
3222-nmo-401a06	ø40 x 1 1/4"	39	1 1/4"	20,5	71	36
3222-nmo-501b06	ø50 x 1 1/2"	48,5	1 1/2"	23,5	76	36
3222-nmo-632006	ø63 x 2"	61,5	2"	27,5	88	15
3222-nmo-752b06	ø75 x 2 1/2"	73,5	2 1/2"	30	99	8
3222-nmo-903006	ø90 x 3"	88,5	3"	33	116	6
3222-nmo-110406	ø110 x 4"	108,5	4"	37	128	3



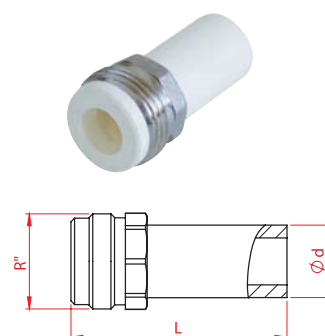
Transition Nipple - Female

Code	Size	d	R"	L	Pcs.
3252-tnf-200c00	ø20 x 3/4"	19	3/4"	60	200
3252-tnf-251000	ø25 x 1"	24	1"	65	200
3252-tnf-321a00	ø32 x 1 1/4"	31	1 1/4"	70	125



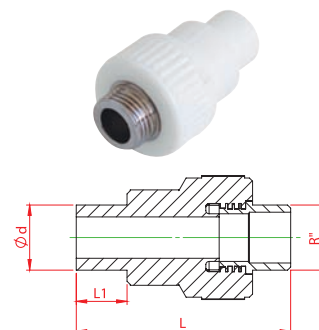
Transition Nipple - Male

Code	Size	d	R"	L	Pcs.
3252-tnm-200c00	ø20 x 3/4"	31	3/4"	60	200
3252-tnm-251000	ø25 x 1"	39	1"	65	200
3252-tnm-321a00	ø32 x 1 1/4"	48,5	1 1/4"	70	150



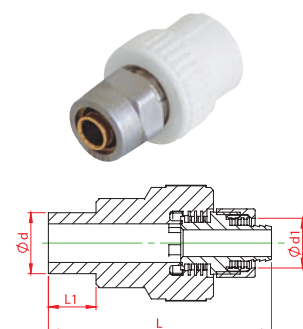
Male Tail Nipple

Code	Size	d	R"	L1	L	Pcs.
3222-nmo-200b01	ø20 x 1/2"	20,5	1/2"	14,5	64,5	100
3222-nmo-250c01	ø25 x 3/4"	25,5	3/4"	16	67,5	80



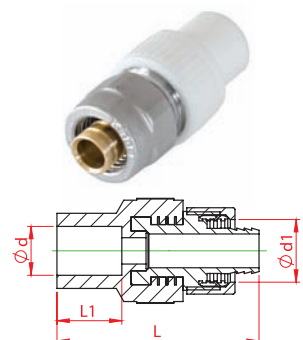
Female Nipple for PE-X Connection

Code	Size	d	d1	L1	L	Pcs.
3222-nfo-200b16	ø20 x 16	19	20,4	14,5	63,5	180



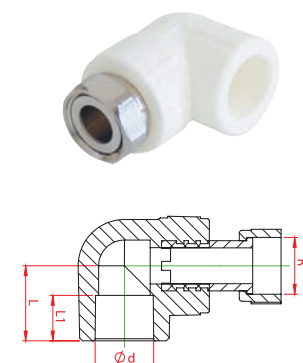
Male Nipple for PE-X Connection

Code	Size	d	d1	L1	L	Pcs.
3222-nmt-200b16	ø20 x 16	20,5	20,9	14,5	52,5	250



Elbow with Loose Nut

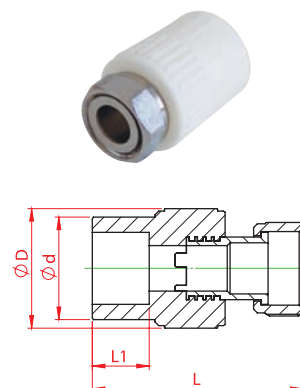
Code	Size	d	R"	L1	L	Pcs.
3222-tue-200b00	ø20 x 1/2"	19	1/2"	14,5	25	180
3222-tue-200c00	ø20 x 3/4"	19	3/4"	14,5	27	150
3222-tue-250c00	ø25 x 3/4"	24	3/4"	16	29	100
3222-tue-251000	ø25 x 1"	24	1"	16	29	80
3222-tue-321000	ø32 x 1"	31	1"	18	36	50
3222-tue-321a00	ø32 x 1 1/4"	31	1 1/4"	18	38	40



PP-R Systems

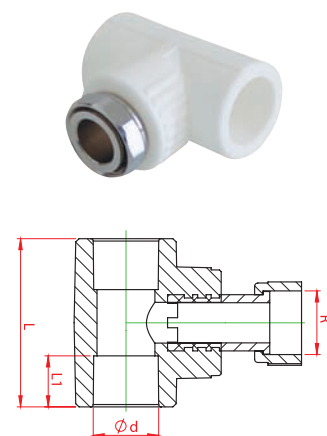
Nipple with Loose Nut

Code	Size	d	D	L1	L	Pcs.
3222-tun-200b00	ø20 x 1/2"	19	30,5	14,5	53	210
3222-tun-200c00	ø20 x 3/4"	19	30,5	14,5	55	210
3222-tun-250c00	ø25 x 3/4"	24	36	16	56	150
3222-tun-251000	ø25 x 1"	24	47,5	16	60	80
3222-tun-321000	ø32 x 1"	31	47,5	18	60,5	80
3222-tun-321a00	ø32 x 1 1/4"	31	47,5	18	61	80



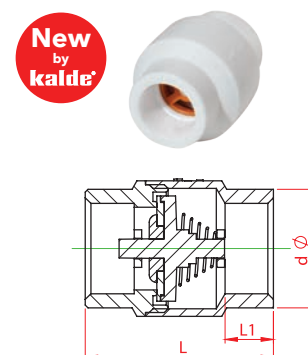
Tee with Loose Nut

Code	Size	d	R"	L1	L	Pcs.
3222-tut-200b00	ø20 x 1/2" x 20	19	1/2"	14,5	43,5	150
3222-tut-200c00	ø20 x 3/4" x 20	19	3/4"	14,5	65	80
3222-tut-250c00	ø25 x 3/4" x 25	24	3/4"	16	65	60
3222-tut-251000	ø25 x 1" x 25	24	1"	16	65	60
3222-tut-321000	ø32 x 1" x 32	31	1"	18	76	40
3222-tut-321a00	ø32 x 1 1/4" x 32	31	1 1/4"	18	76	30



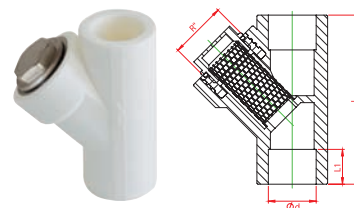
Check Valve

Code	Size	d	L1	L	Pcs.
3222-cvl-0b0000	ø20	19	14,5	58	100
3222-cvl-0c0000	ø25	24	16	61,5	60



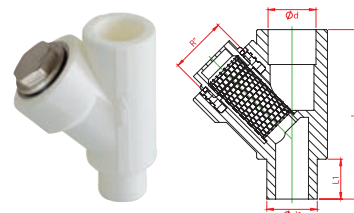
Filter - Female / Female

Code	Size	d	R"	L1	L	Pcs.
3222-flt-200001	ø20	19	1/2"	14,5	66,5	100
3222-flt-250001	ø25	24	3/4"	16	85	60
3222-flt-320001	ø32	31	1"	18	95	30



Filter - Male / Female

Code	Size	d	d1	R"	L1	L	Pcs.
3222-flt-200000	ø20	19	20	1/2"	14,5	65	100
3222-flt-250000	ø25	24	25	3/4"	16	71	60
3222-flt-320000	ø32	31	32	1"	18	98	30



Sealed Filter - Female / Female

Code	Size	d	d1	R"	L1	L	Pcs.
3222-fls-200001	ø20	19	19	1/2"	14,5	66,5	100
3222-fls-250001	ø25	24	24	3/4"	16	85	60
3222-fls-320001	ø32	31	31	1"	18	95	30



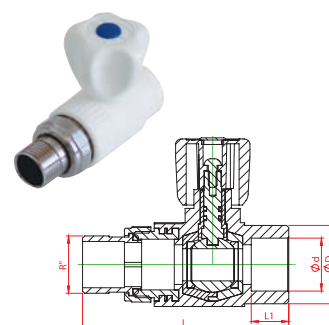
Sealed Filter - Male / Female

Code	Size	d	d1	R"	L1	L	Pcs.
3222-fls-200000	ø20	19	20	1/2"	14,5	65	100
3222-fls-250000	ø25	24	25	3/4"	16	71	50
3222-fls-320000	ø32	31	32	1"	18	98	30



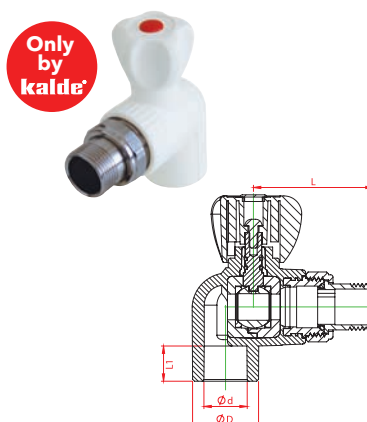
Ball Valve for Radiator - Straight

Code	Size	d	D	R"	L1	L	Pcs.
3242-vlr-200b00	ø20 x 1/2"	19	28	1/2"	14,5	85	60
3242-vlr-200c00	ø20 x 3/4"	19	28	3/4"	14,5	90	60
3242-vlr-250b00	ø25 x 1/2"	24	35	1/2"	16	90	60
3242-vlr-250c00	ø25 x 3/4"	24	35	3/4"	16	90	50



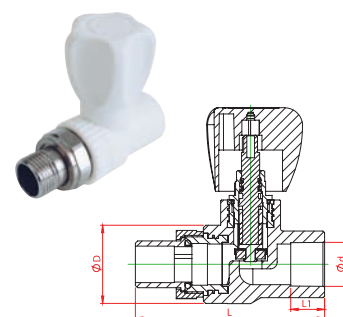
Ball Valve for Radiator - Elbow

Code	Size	d	D	L1	L	Pcs.
3242-vre-200b00	ø20 x 1/2"	19	28	14,5	55	60
3242-vre-200c00	ø20 x 3/4"	19	28	14,5	56,5	50
3242-vre-250b00	ø25 x 1/2"	24	35	16	54	50
3242-vre-250c00	ø25 x 3/4"	24	35	16	57	40



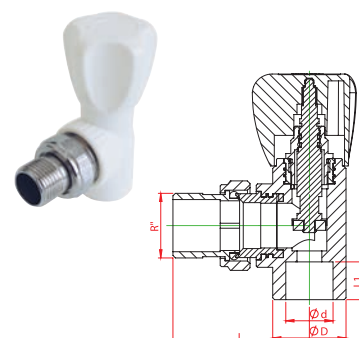
Valve for Radiator - Straight

Code	Size	d	D	L1	L	Pcs.
3242-vsr-200b00	ø20 x 1/2"	19	28	14,5	85	60



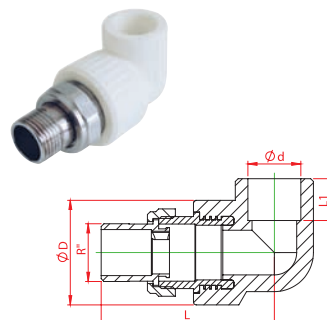
Valve for Radiator - Elbow

Code	Size	d	D	R"	L1	L	Pcs.
3242-vse-200b00	ø20 x 1/2"	19	28	1/2"	14,5	57	60



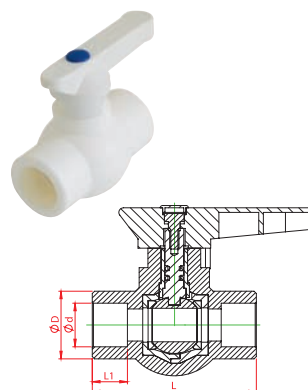
Elbow with Transition Union for Radiator

Code	Size	d	D	R"	L1	L	Pcs.
3222-tre-200b00	ø20 x 1/2"	19	34	1/2"	14,5	68	100



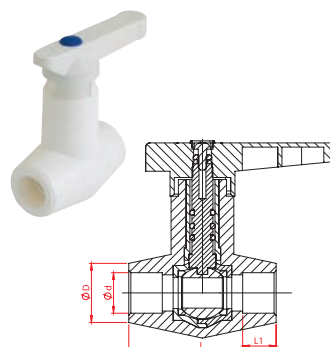
Ball Valve

Code	Size	d	D	L1	L	Pcs.
3242-vlb-200003	ø20	19	29	14,5	63,5	60
3242-vlb-250003	ø25	24	34,5	16	71,8	50
3242-vlb-320003	ø32	31	45,5	18	85	25
3242-vlb-400003	ø40	39	56	20,5	108	15
3242-vlb-500003	ø50	48,5	69	23,5	120	10
3242-vlb-630003	ø63	61,5	87	27,5	143	6
3242-vlb-750003	ø75	73,5	99	30	150,5	5



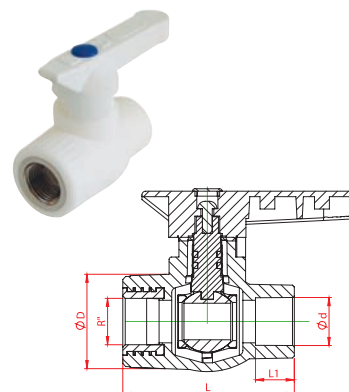
Ball Valve - Long

Code	Size	d	D	L1	L	Pcs.
3242-vlb-200002	ø20	19	33,5	14,5	69,5	40
3242-vlb-250002	ø25	24	38	16	78,5	30



Ball Valve with Female Nipple

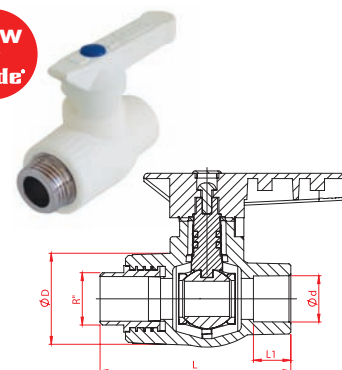
Code	Size	d	D	R"	L1	L	Pcs.
3242-vlb-200b04	ø20 x 1/2"	19	36,5	1/2"	14,5	65	55
3242-vlb-250c04	ø25 x 3/4"	24	42	3/4"	16	76,5	45
3242-vlb-321004	ø32 x 1"	31	48	1"	18	87	20



Ball Valve with Male Nipple

Code	Size	d	D	R"	L1	L	Pcs.
3242-vlb-200b05	ø20 x 1/2"	19	36,5	1/2"	14,5	77,5	50
3242-vlb-250c05	ø25 x 3/4"	24	42	3/4"	16	83	40

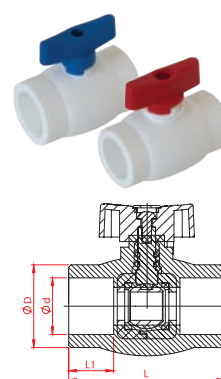
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Mini Ball Valve - Butterfly

Code	Size	d	D	L1	L	Pcs.
3242-vlm-200001	ø20 ●	19	11,5	14,5	60	120
3242-vlm-200002	ø20 ●	19	11,5	14,5	60	120
3242-vlm-250001	ø25 ●	24	14	16	64,5	80
3242-vlm-250002	ø25 ●	24	14	16	64,5	80
3242-vlm-320001	ø32 ●	31	16,5	18	74,5	40
3242-vlm-320002	ø32 ●	31	16,5	18	74,5	40

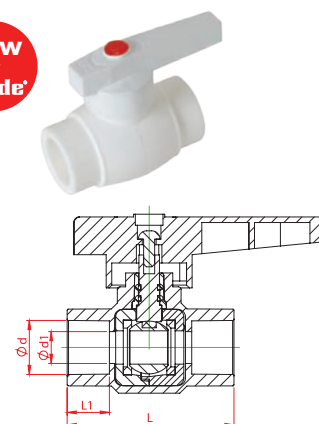
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Mini Ball Valve

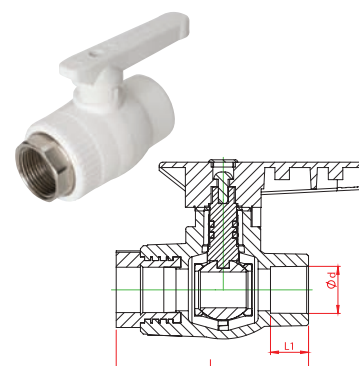
Code	Size	d	d1	L1	L	Pcs.
3242-vlm-200000	ø20	19	11,5	14,5	60	100
3242-vlm-250000	ø25	24	14	16	64,5	75
3242-vlm-320000	ø32	31	16,5	18	74,5	40

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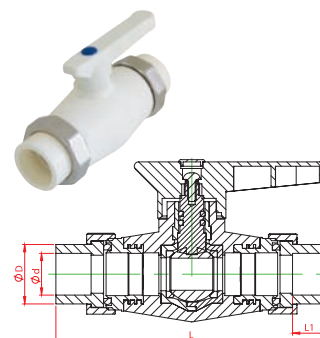
Femal Ball Valve - Hexagonal

Code	Size	d	L1	L	Pcs.
3242-vlb-321104	ø32 x 1"	31	18	86	20



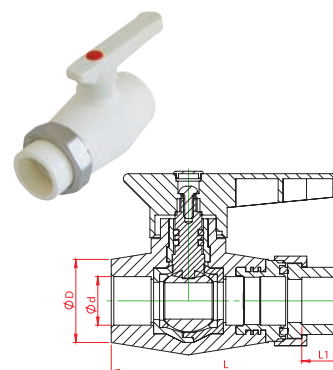
Ball Valve with Double Transtion Union

Code	Size	d	D	L1	L	Pcs.
3242-vlb-200005	ø20	19	27	14,5	120	40
3242-vlb-250005	ø25	24	34	16	129	30
3242-vlb-320005	ø32	31	40	18	150	20
3242-vlb-400005	ø40	39	41	20,5	181	10
3242-vlb-500005	ø50	48,5	64,5	23,5	204	6



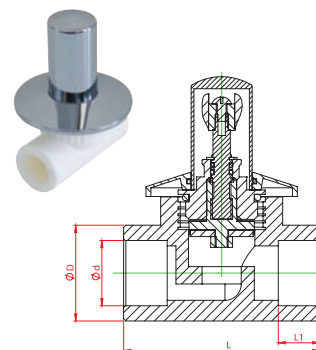
Ball Valve with Single Transition Union

Code	Size	d	D	L1	L	Pcs.
3242-vlb-200006	ø20	19	32	14,5	90	45
3242-vlb-250006	ø25	24	38	16	95	35
3242-vlb-320006	ø32	31	48,5	18	115	25



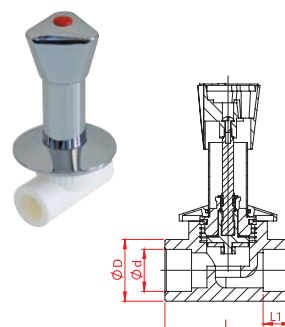
Chrome-Plated Valve - Hidden

Code	Size	d	D	L1	L	Pcs.
3242-vle-200000	ø20 x 1/2"	19	29	14,5	72	45
3242-vle-250000	ø25 x 3/4"	24	35	16	73	35
3242-vle-320000	ø32 x 1"	31	44	18	89	25



Chrome-Plated Valve

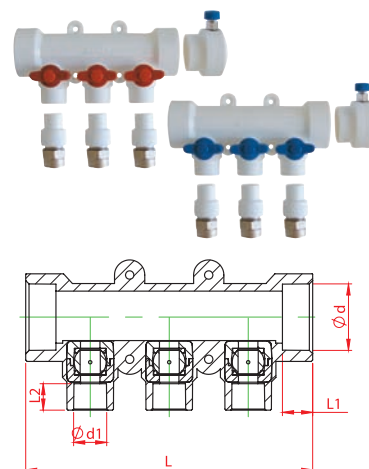
Code	Size	d	D	L1	L	Pcs.
3242-vlk-200000	ø20 x 1/2"	19	29	14,5	72	30
3242-vlk-250000	ø25 x 3/4"	24	35	16	73	25
3242-vlk-320000	ø32 x 1"	31	44	18	89	20



PP-R Systems

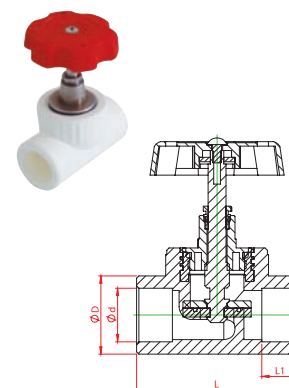
PP Manifold

Code	Size	d1	d	L2	L1	L	Pcs.
932-set-1400220	2 ways  	19	39	14,5	18	122	9
932-set-1400320	3 ways  	19	39	14,5	18	169	6
932-set-1400420	4 ways  	19	39	14,5	18	218	5
932-set-1400520	5 ways  	19	39	14,5	18	261	4
932-set-1400620	6 ways  	19	39	14,5	18	309	3
932-set-1400720	7 ways  	19	39	14,5	18	358	3
932-set-1400820	8 ways  	19	39	14,5	18	398	3



Valve

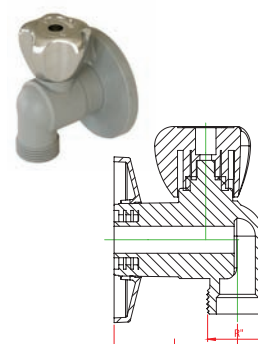
Code	Size	d	D	L1	L	Pcs.
3242-vlf-200000	ø20	19	29	14,5	72	40
3242-vlf-250000	ø25	24	35	16	73	30
3242-vlf-320000	ø32	31	44	18	89	20
3242-vlf-400000	ø40	39	55	20,5	101	15



Valve - Laundry

Code	Size	R"	L	Pcs.
3243-vlc-0b0c00	ø1/2" x 3/4"	1/2"	63	45

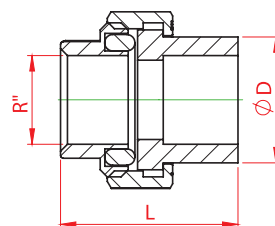
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Transition Union - Female

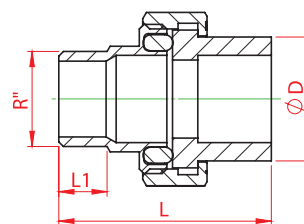
Code	Size	D	R"	L	Pcs.
3272-tuf-200b00	ø20 x 1/2"	27	1/2"	38,5	200
3272-tuf-250c00	ø25 x 3/4"	34	3/4"	43,5	120
3272-tuf-321000	ø32 x 1"	40	1"	46,5	80
3272-tuf-401a00	ø40 x 1 1/4"	51	1 1/4"	50	50
3252-tuf-200b00	ø20 x 1/2"	27	1/2"	36,5	200
3252-tuf-200c00	ø20 x 3/4"	27	3/4"	39	200
3252-tuf-250b00	ø25 x 1/2"	34	1/2"	41	120
3252-tuf-250c00	ø25 x 3/4"	34	3/4"	41	100
3252-tuf-251000	ø25 x 1"	34	1"	44,5	120
3252-tuf-320c00	ø32 x 3/4"	40	3/4"	42,5	100
3252-tuf-321000	ø32 x 1"	40	1"	44	80
3252-tuf-321a00	ø32 x 1 1/4"	40	1 1/4"	48	80
3252-tuf-401a00	ø40 x 1 1/4"	51	1 1/4"	49,5	50
3252-tuf-501b00	ø50 x 1 1/2"	64,5	1 1/2"	53	36
3252-tuf-632000	ø63 x 2"	82	2"	64	14
3252-tuf-752b00	ø75 x 2 1/2"	97,5	2 1/2"	72,5	12
3252-tuf-903000	ø90 x 3"	117	3"	79	6
3252-tuf-110400	ø110 x 4"	145	4"	89	3

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Transition Union - Male

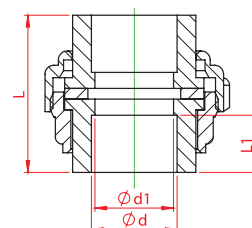
Code	Size	D	R"	L1	L	Pcs.
3272-tum-200b00	ø20 x 1/2"	27	1/2"	14,5	51	200
3272-tum-250c00	ø25 x 3/4"	34	3/4"	16	56	120
3272-tum-321000	ø32 x 1"	40	1"	18	54,6	80
3272-tum-401a00	ø40 x 1 1/4"	51	1 1/4"	20,5	60,5	40
3252-tum-200b00	ø20 x 1/2"	27	1/2"	14,5	45	180
3252-tum-200c00	ø20 x 3/4"	27	3/4"	14,5	45	200
3252-tum-250b00	ø25 x 1/2"	34	1/2"	16	50	120
3252-tum-250c00	ø25 x 3/4"	34	3/4"	16	56,5	100
3252-tum-251000	ø25 x 1"	34	1"	16	50	100
3252-tum-320c00	ø32 x 3/4"	40	3/4"	18	51,5	80
3252-tum-321000	ø32 x 1"	40	1"	18	59,5	70
3252-tum-321a00	ø32 x 1 1/4"	40	1 1/4"	18	59,5	70
3252-tum-401a00	ø40 x 1 1/4"	51	1 1/4"	20,5	60,5	40
3252-tum-501b00	ø50 x 1 1/2"	64,5	1 1/2"	23,5	64	30
3252-tum-632000	ø63 x 2"	82	2"	27,5	76	14
3252-tum-752b00	ø75 x 2 1/2"	97,5	2 1/2"	30	97	8
3252-tum-903000	ø90 x 3"	117	3"	33	105	5
3252-tum-110400	ø110 x 4"	145	4"	37	113	3



PP-R Systems

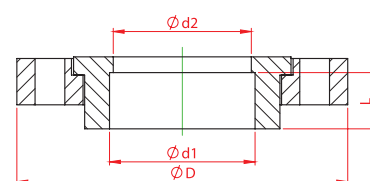
Coupling with Loose Nut

Code	Size	d	d1	L1	L	Pcs.
3252 -mft- 200000	ø20	19	17	14,5	44	150
3252 -mft- 250000	ø25	24	22,5	16	49,5	90
3252 -mft- 320000	ø32	31	29,5	18	53	60



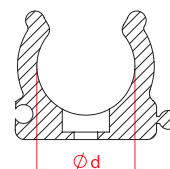
Flange Set

Code	Size	d1	d2	D	L	Pcs.
3222-sls-500000	ø50	48,5	44,5	160	24	25
3222-sls-630000	ø63	61,5	54	160	28	15
3222-sls-750000	ø75	73,5	69	176,5	30,5	10
3222-sls-900000	ø90	88,5	83	197	34	10
3222-sls-110000	ø110	108,5	103	217,5	40	6



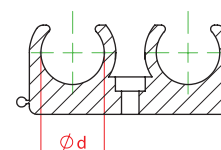
Single Bracket

Code	Size	d	Pcs.
3592-bck-160001	ø16	16	5000
3592-bck-202201	ø20 x 22	20	5000
3592-bck-252701	ø25 x 27	25	5000
3592-bck-323401	ø32 x 34	32	2000
3592-bck-404201	ø40 x 42	40	2000
3592-bck-505201	ø50 x 52	50	1500



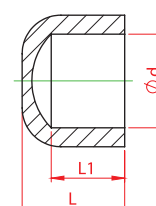
Double Bracket

Code	Size	d	Pcs.
3592-bck-160000	ø16 x 16	16	3000
3592-bck-202200	ø20 x 22	20	2500
3592-bck-252700	ø25 x 27	25	2000
3592-bck-323400	ø32 x 34	32	1000



Stopend

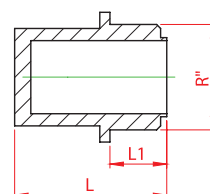
Code	Size	d	L1	L	Pcs.
3292-ste-200000	ø20	19	14,5	24,5	1125
3292-ste-250000	ø25	24	16	26	750
3292-ste-320000	ø32	31	18	31	375
3292-ste-400000	ø40	39	20,5	36	220
3292-ste-500000	ø50	48,5	23,5	43	115
3292-ste-630000	ø63	61,5	27,5	48,5	60
3292-ste-750000	ø75	73,5	30	63	36
3292-ste-900000	ø90	88,5	33	68	24
3292-ste-110000	ø110	108,5	37	76,5	12



PP-R Systems

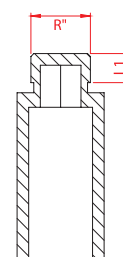
Stopend

Code	Size	R"	L1	L	Pcs.
3292-ste-200b00	ø20 x 1/2"	19	12,5	37,5	800
3292-ste-250c00	ø25 x 3/4"	24	14	35	600
3292-ste-321000	ø32 x 1"	31	16	38	400



Stopend

Code	Size	R"	L1	Pcs.
3292-stu-200000	ø20 x 1/2"	1/2"	10	275



Welding Machine

Code	Size	Pcs.
3292-wmh-000001	Standard	
3292-wmh-000000	Model 2006	5



Welding Apparatus

Code	Size	Pcs.
3292-die-200000	ø20	1
3292-die-250000	ø25	1
3292-die-320000	ø32	1
3292-die-400000	ø40	1
3292-die-500000	ø50	1
3292-die-630000	ø63	1
3292-die-750000	ø75	1
3292-die-900000	ø90	1
3292-die-110000	ø110	1



Tube Sharpener

Code	Size	Pcs.
3292-shv-202500	ø20 x 25	
3292-shv-324000	ø32 x 40	
3292-shv-506300	ø50 x 63	
3292-shv-759000	ø75 x 90	

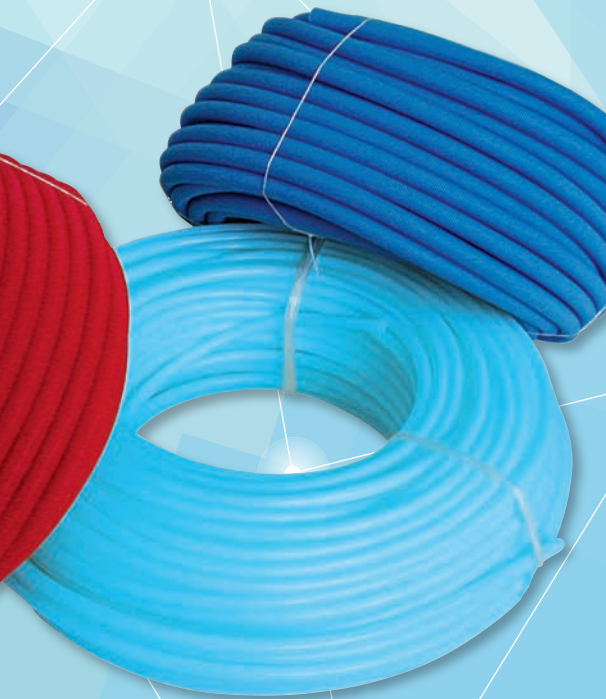
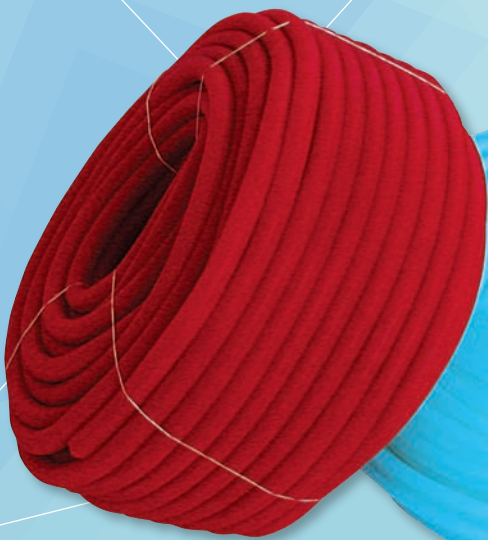


Scissors

Code	Size	Pcs.
3592-sss-000002	16 / 42	100
3592-sss-000003	16 / 42 Automatic	50







Floor Heating Systems

Floor Heating Systems

Multilayer PE-RT Pipes

Pipe design

- Internal pipe PE-RT Type II, DIN 16833
- Adhesive layer
- Butt-welded aluminium layer
- Adhesive layer
- External layer PE-RT Type II or heat-resistant PE

Standards / Approvals

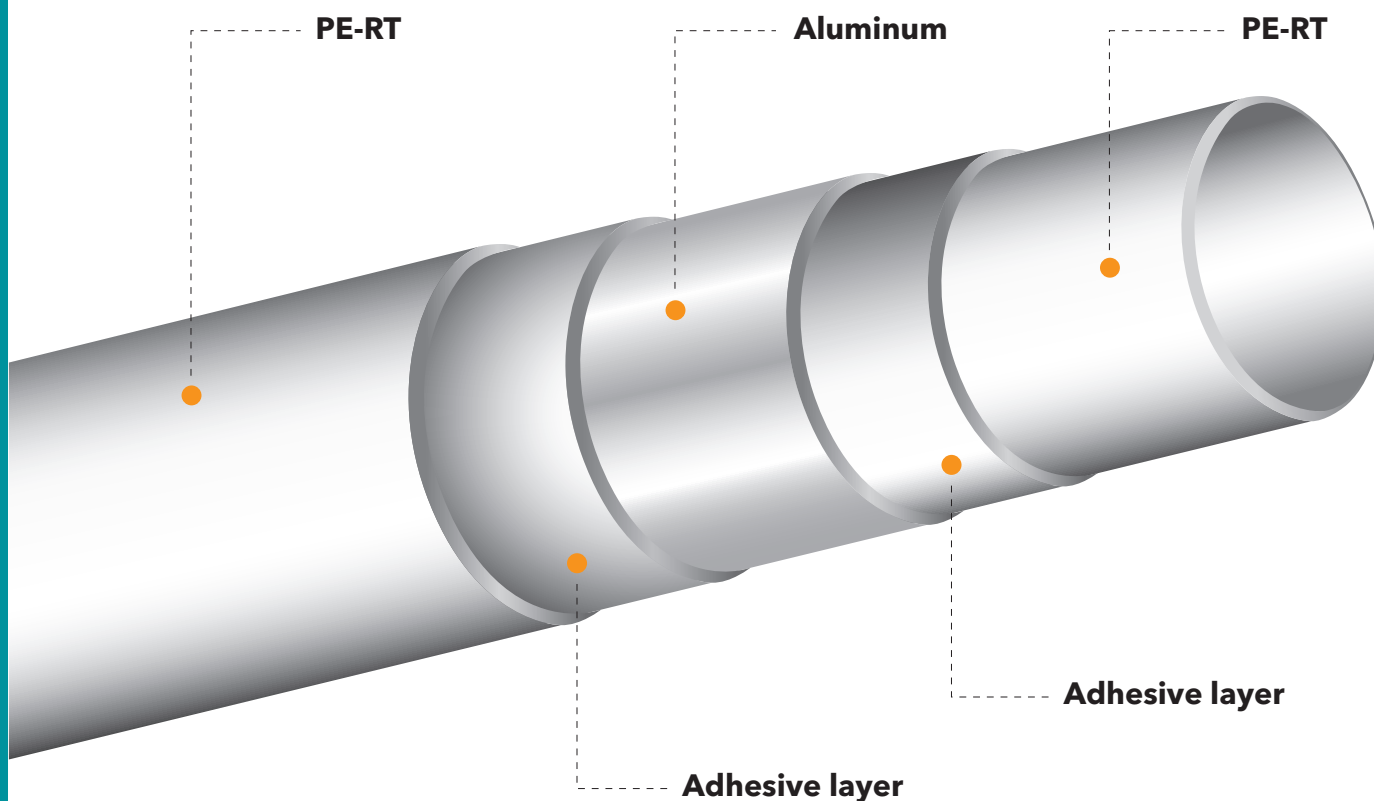
- SKZ Guideline HR 3.12
- DVGW W 542 (certificate no. DW-8236 BN 0125)
- EN ISO 21003 for the pipe (approvals of customised systems when combined with certified connectors)
- EN ISO 22391 series (for the basic pipe)
- DIN 16833/16834 general quality requirements and PE-RT inspections

Range of available products

- Additional specifications on request of the customer
- Dimensions: DN 12 mm to DN 63 mm
- Lengths: rolls a 100 m, 200 m; bars a 5 m
- Pipe color: Standard color white
- Labelling: Standard color black
- Rolls packaged in cardboard boxes; bars in plastic sleeves
- Pipe insulated red/blue
- Insulation thicknesses 6 mm to 20 mm according to size
- Pipe in pipe: Drawn in corrugated protective pipe (red blue, black)

Advantages

- Suitable for drinking water
- Absolute gastight
- Corrosion-free
- Chemical-resistant
- Light weight
- Deposit-free
- Low longitudinal expansion
- Simple laying
- Very flexible
- Dimensionally stable



Kalde Press Fittings

Raw Material, Technical Specifications and Standards

- Material: CuZn36Pb2As (CW602N) (EN 12164)
- Ø20 – 40mm
- EN 1254 - 3: Copper and copper alloy plumbing fittings - part:3: fittings with compression ends for use with plastics pipes
- Dezincification resistance: CR/DRA (the largest Dezincification depth <200 µm, EN ISO 6509)
- Coupling part type: Type A (EN 1254-3, Figure A-5)
- Used in heating and cooling systems, potable water, radiator systems, under-floor heating, chiller water, fan-coil systems
- Type A press-type coupling parts are suitable for use with different type plastic pipes. Type A coupling parts with internal support are recommended for use only in polyethylene pipe materials.
- Maximum temperature and pressure comply with the pipe material performance specified in the applicable pipe standards relating to temperature and pressure for coupling after mounting (Table-5 of DIN 16834 - Polyethylene pipes with enhanced thermal resistance)
- The basic reason for using Kalde press fitting materials with arsenic is its higher corrosion resistance than that of other copper alloy materials.
- Kalde press fitting material's hardness is 100-112 HB. Also, all materials are tempered for eliminating tension (EN ISO 196).
- Kalde press fittings' chemical composition is seen in Table -1.

Table 1

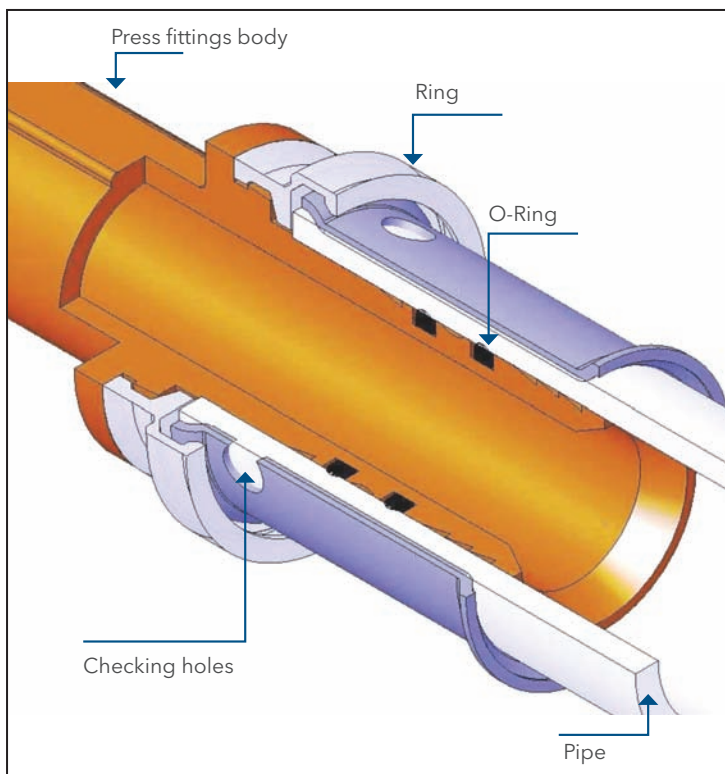
Chemical Composition % (Min) (EN 12164)													
Symbol	Number	Element	Cu	Al	As	Fe	Mn	Ni	Pb	Sn	Zn	Others total	Density g/cm ³
CuZn36Pb2As	CW602N	Min	61	-	0.02	-	-	-	1.7	-	The rest	-	8.4
		max	63	0.05	0.15	0.1	0.1	0.3	2.2	0.1	-	0.2	

Floor Heating Systems

Table-5 of DIN 16834 bearable working pressure for pipes conveying other water, with SF = 1,6

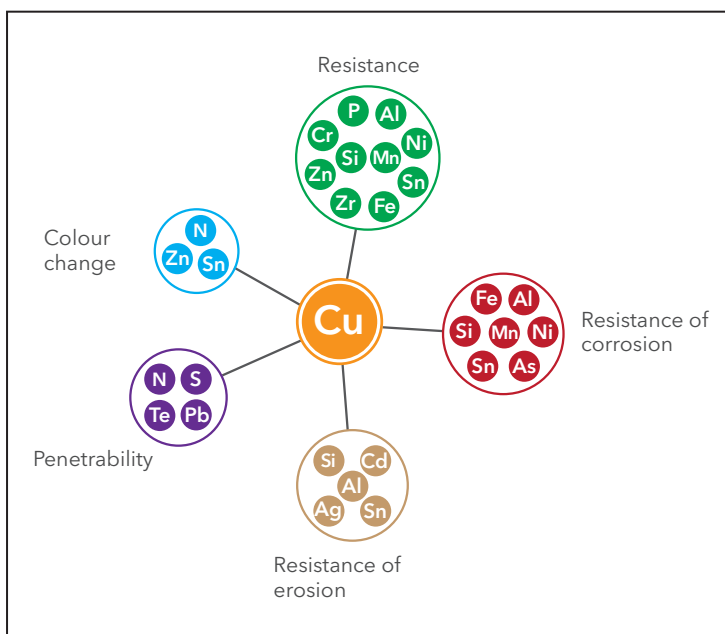
Tempareture °C	Years of Service	Pipe Series (S)					
		6.3	5	4	3.2	2.5	2
		Standard Dimension Rate (SDR)					
		13.6	11	9	7.4	6	5
Allowable Working Pressure, in Bar							
20	1	9.4	11.8	14.7	18.4	23.6	29.5
	5	9.3	11.7	14.6	18.2	23.3	29.2
	10	9.2	11.6	14.5	18.2	23.2	29.1
	25	9.2	11.6	14.4	18.1	23.1	28.9
	50	9.1	11.5	14.4	18	23	28.8
	100	9	11.3	14.1	17.6	22.6	28.2
40	1	7.2	9	11.3	14.1	18	22.5
	5	7.1	8.9	11.1	13.9	17.8	22.3
	10	7	8.9	11.1	13.9	17.7	22.2
	25	7	8.8	11	13.8	17.6	22
	50	7	8.8	11	13.7	17.5	21.9
	100	6.9	8.7	10.9	13.6	17.5	21.8
60	1	5.5	6.9	8.6	10.8	13.8	17.2
	5	5.4	6.8	8.5	10.6	13.6	17
	10	5.4	6.8	8.5	10.6	13.5	16.9
	25	4.9	6.2	7.7	9.6	12.3	15.4
	50	4.3	5.4	6.8	8.5	10.9	13.6
70	1	4.8	6	7.5	9.4	12	15
	5	4.7	5.9	7.4	9.3	11.9	14.9
	10	4.3	5.4	6.7	8.4	10.7	13.4
	25	3.6	4.5	5.7	7.1	9	11.3
	50	3.3	4.1	5.2	6.4	8.3	10.3
80	1	4.2	5.3	6.6	8.2	10.5	13.1
	5	3.6	4.5	5.6	7.1	9	11.3
	10	3.1	4	4.9	6.2	7.9	9.9
	25	2.1	2.7	3.4	4.2	5.4	6.8
95	1	3.1	4	5	6.2	7.9	9.9
	5	2.3	2.9	3.6	4.5	5.8	7.2
	(10)1)	(2,0)1)	(2,5)1)	(3,1)1)	(3,9)1)	(5,0)1)	(6,3)1)

Shema - 1: Section Appearance of Press Fittings



Shema - 2: Effect of Alloy Elements

The effects of the chemical composition of the material used for Kalde press fittings on the material are as follows:



● Floor Heating Systems

Resistance Increasing of Alloy Elements

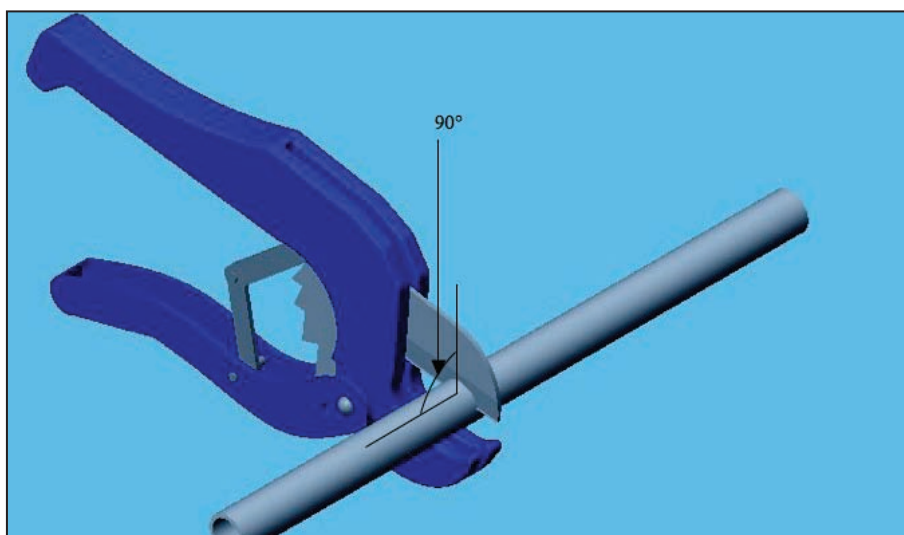
- Chrome (Cr)
- Aluminium (Al)
- Phosphorus (P)
- Iron (Fe)
- Silicon (Si)
- Manganese (Mn)
- Zinc (Zn)
- Zirkonium (Zr)
- Tin (Sn)
- Nickel (Ni)
- Beryllium (Be)
- Cobalt (Co)

Resistance Corrosion Increasing of Alloy Elements

- Nickel (Ni)
- Aluminium (Al)
- Tin (Sn)
- Manganese (Mn)
- Arsenic (As)
- Iron (Fe)
- Silicon (Si)

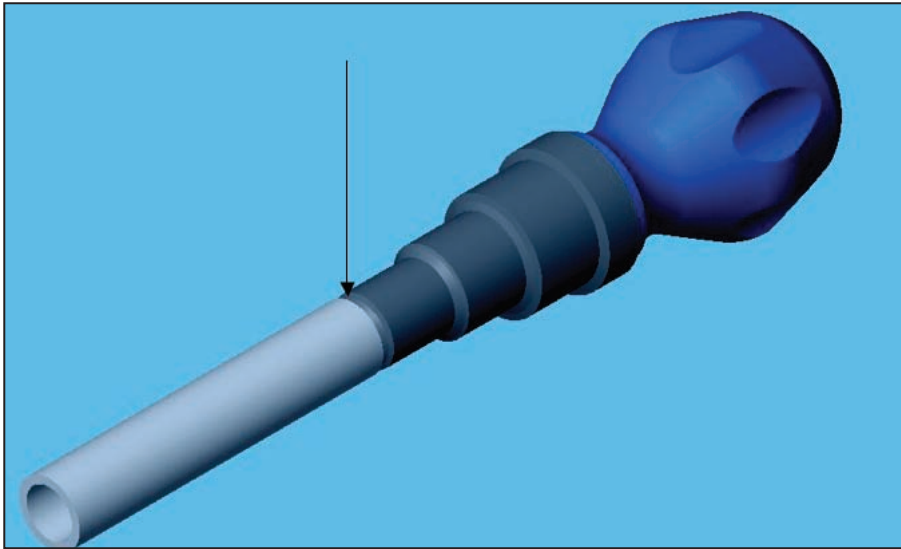
● Kalde Press Fittings Assembling Instructions

1- The pipe must be cut perpendicularly with a 90° angle with appropriate scissors.

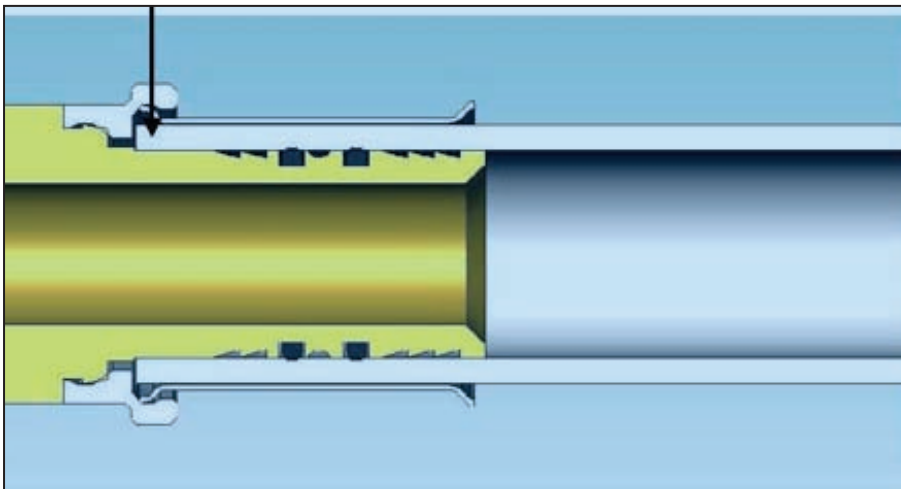


● Floor Heating Systems

2- Before connecting the pipe with the fitting the pipe must be calibrated. It is very important to stepping the pipe. There should be no rest (dirt and waste) at the end of the pipe.

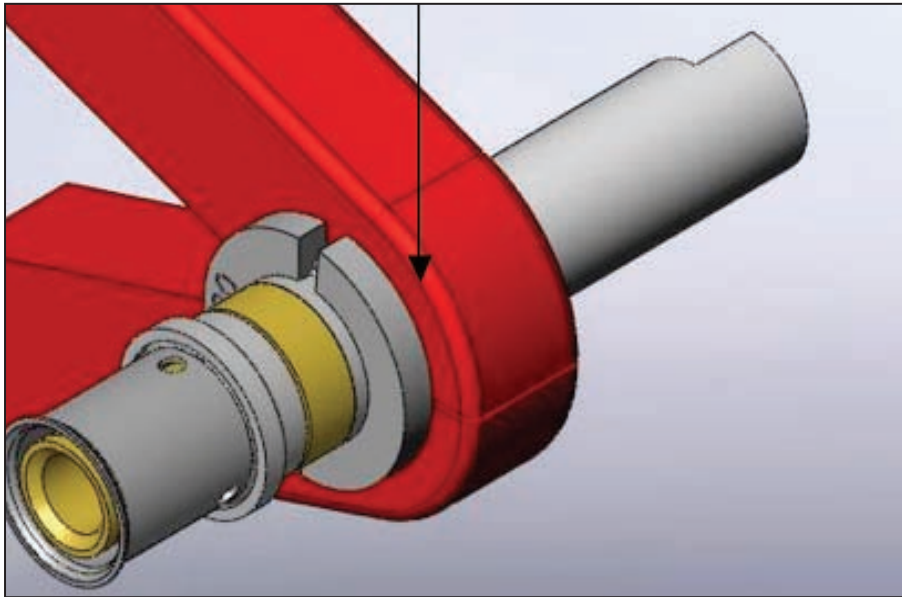


3- After calibrating the pipe, the fitting is placed into the pipe. The pipe is pushed until the transparent plastic edge. It has to be checked wheather the pipe is properly placed or not through the 3 holes in the press sleeve.

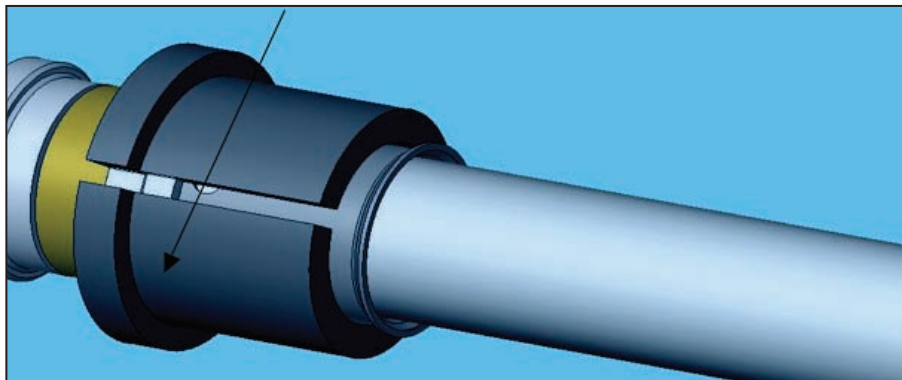


Floor Heating Systems

4- The press sleeve is pushed into the transparent plastic ring. The press tool is placed on the pressing sleeve in order to press it.



Note: In order to do the pressing correctly, it is very important to place the connection into the pressing aparat's jaw.



Checks:

- The circular pressing marks left on the sleeve should be the same.
- The position of the pipe in the fitting should again be checked through the 3 holes on the sleeve. DIN 1988 should be cared for assembling
- After finishing the installation the whole system must be tested during 24 h with air & water pressure.

Pipe Design

Characteristic	Unit	Composite Pipe	
		Pert	Pex
Design	[-]	5-layer	5-layer
Diffusion barrier	[-]	Butt-welded alu	Butt-welded alu
Oxygen diffusion	mg/l d	<0.005	<0.006
Application		Heating/Sanitary	Heating/Sanitary

Mechanical Characteristics

Characteristic	Unit	Composite Pipe	
		Pert	Pex
Surface roughness (Prandtl-Colebrook)	mm	0.007	0.007
Bending radius at 23°C	mm	5 DN	5 DN

Kalde PE-RT Heating Pipe (5 layer)

Dimension mm	Wall thickness mm	Weight kg/m	Water content l / m	Roll length m	Pallet length m
8.0	1.00	0.023	0.028	2000	6000
10.0	1.30	0.039	0.043	200 / 600	3200 / 10800
12.0	1.30	0.045	0.069	200 / 600	3200 / 4800
14.0	2.00	0.080	0.079	200	3600
16.0	2.00	0.090	0.113	200 / 600	3600 / 3600
17.0	2.00	0.100	0.133	200	2400
18.0	2.00	0.104	0.154	200 / 400	2400 / 2000
20.0	2.00	0.120	0.201	200	1600
26.0	3.00	0.220	0.314	100	1100

Floor Heating Systems

Multilayer PE-RT Pipes

PE-RT Pipe

Code	Size	Pcs.
3522-prt-160000	16 x 2	200
3522-prt-200000	20 x 2	100
3522-prt-260000	26 x 3	50
3522-prt-320000	32 x 3	50



PE-RT Pipe

Code	Size	Pcs.
3522-prt-320001	32 x 3	50
3522-prt-400001	40 x 3,5	35



Press Fittings

Elbow 90°

Code	Size	Pcs.
3461-elb-160000	16 x 16 x 2	150
3461-elb-200000	20 x 20 x 2	80
3461-elb-260000	26 x 26 x 3	50
3461-elb-320000	32 x 32 x 3	30
3461-elb-400000	40 x 40 x 3,5	30



Female Elbow

Code	Size	Pcs.
3461-efo-160b00	16 x 1/2" x 2	120
3461-efo-200b00	20 x 1/2" x 2	100
3461-efo-200c00	20 x 3/4" x 2	50
3461-efo-260c00	26 x 3/4" x 3	50
3461-efo-321000	32 x 1" x 3	30
3461-efo-401a00	40 x 1 1/4" x 3,5	30



Floor Heating Systems

Female Elbow

Code	Size	Pcs.
3461-emo-160b00	16 x 1/2" x 2	150
3461-emo-200b00	20 x 1/2" x 2	120
3461-emo-200c00	20 x 3/4" x 2	100
3461-emo-260c00	26 x 3/4" x 3	50
3461-emo-321000	32 x 1" x 3	30
3461-emo-401a00	40 x 1 1/4" x 3,5	30



Wall Plate Elbow

Code	Size	Pcs.
3461-ewo-160b01	16 x 1/2" x 2	50
3461-ewo-200b01	20 x 1/2" x 2	50
3461-ewo-200c01	20 x 3/4" x 2	50
3461-ewo-260c01	26 x 3/4" x 3	50



Double Wall Plate Elbow

Code	Size	Pcs.
3461-ewd-160b01	16 x 1/2" x 2	40
3461-ewd-200b01	20 x 1/2" x 2	40



Nippel

Code	Size	Pcs.
3461-ndb-160000	16 x 16 x 2	200
3461-ndb-200000	20 x 20 x 2	150
3461-ndb-260000	26 x 26 x 3	100
3461-ndb-320000	32 x 32 x 3	50
3461-ndb-400000	40 x 40 x 3,5	50



Floor Heating Systems

Female Nippel

Code	Size	Pcs.
3461-nfo-160b00	16 x 1/2" x 2	150
3461-nfo-200b00	20 x 1/2" x 2	150
3461-nfo-200c00	20 x 3/4" x 2	100
3461-nfo-260c00	26 x 3/4" x 3	100
3461-nfo-261000	26 x 1" x 3	70
3461-nfo-321000	32 x 1" x 3	50
3461-nfo-321a00	32 x 1 1/4" x 3,5	50
3461-nfo-401000	40 x 1" x 3,5	30
3461-nfo-401a00	40 x 1 1/4" x 3,5	30



Male Nippel

Code	Size	Pcs.
3461-nmo-160b00	16 x 1/2" x 2	150
3461-nmo-200b00	20 x 1/2" x 2	150
3461-nmo-200c00	20 x 3/4" x 2	150
3461-nmo-260c00	26 x 3/4" x 3	100
3461-nmo-261000	26 x 1" x 3	80
3461-nmo-321000	32 x 1" x 3	70
3461-nmo-321a00	32 x 1 1/4" x 3,5	50
3461-nmo-401000	40 x 1" x 3,5	30
3461-nmo-401a00	40 x 1 1/4" x 3,5	30



Reduction Nippel

Code	Size	Pcs.
3461-rdn-201600	20 x 2 / 16 x 2	150
3461-rdn-261600	26 x 3 / 16 x 2	100
3461-rdn-262000	26 x 3 / 20 x 2	100
3461-rdn-321600	32 x 3 / 16 x 2	70
3461-rdn-322000	32 x 3 / 20 x 2	70
3461-rdn-322600	32 x 3 / 26 x 3	70
3461-rdn-403200	40 x 3,5 / 32 x 3	50



Floor Heating Systems

Tee

Code	Size	Pcs.
3461-tee-160000	16 x 16 x 16 x 2	60
3461-tee-200000	20 x 20 x 20 x 2	50
3461-tee-260000	26 x 26 x 26 x 3	30
3461-tee-320000	32 x 32 x 32 x 3	25



Reduction Tee

Code	Size	Pcs.
3461-rte-201616	20 x 16 x 16 x 2	50
3461-rte-202016	20 x 20 x 16 x 2	50
3461-rte-261620	26 x 3 / 16 x 2 / 20 x 2	30
3461-rte-261621	26 x 3 / 16 x 2 / 20 x 2,5	30
3461-rte-262016	26 x 3 / 20 x 2 / 16 x 2	30
3461-rte-262020	26 x 3 / 20 x 2 / 20 x 2	30
3461-rte-262616	26 x 3 / 26 x 3 / 16 x 2	30
3461-rte-262620	26 x 3 / 26 x 3 / 20 x 2	30
3461-rte-322026	32 x 3 / 20 x 2 / 26 x 3	30
3461-rte-322626	32 x 3 / 26 x 3 / 26 x 3	30
3461-rte-323220	32 x 3 / 32 x 3 / 20 x 2	30
3461-rte-323226	32 x 3 / 32 x 3 / 26 x 3	30



Inegal Tee

Code	Size	Pcs.
3461-tio-162016	16 x 20 x 16 x 2	50
3461-tio-201620	20 x 16 x 20 x 2	50
3461-tio-202620	20 x 2 / 26 x 3 / 20 x 2	30
3461-tio-261626	26 x 3 / 16 x 2 / 26 x 3	30
3461-tio-262026	26 x 3 / 20 x 2 / 26 x 3	30
3461-tio-263226	26 x 3 / 32 x 3 / 26 x 3	30
3461-tio-321632	32 x 3 / 16 x 2 / 32 x 3	30
3461-tio-322032	32 x 3 / 20 x 2 / 32 x 3	30
3461-tio-322632	32 x 3 / 26 x 3 / 32 x 3	30



Floor Heating Systems

Female Tee

Code	Size	Pcs.
3461-tfo-160b16	16 x 1/2" x 16 x 2	60
3461-tfo-200b20	20 x 1/2" x 20 x 2	50
3461-tfo-200c20	20 x 3/4" x 20 x 2	50
3461-tfo-260b26	26 x 1/2" x 26 x 3	30
3461-tfo-260c26	26 x 3/4" x 26 x 3	30
3461-tfo-320b32	32 x 1/2" x 32 x 3	30
3461-tfo-320c32	32 x 3/4" x 32 x 3	30
3461-tfo-321032	32 x 1" x 32 x 3	30



Male Tee

Code	Size	Pcs.
3461-tmo-160b16	16 x 1/2" x 16 x 2	60
3461-tmo-200b20	20 x 1/2" x 20 x 2	50
3461-tmo-200c20	20 x 3/4" x 20 x 2	50
3461-tmo-260b26	26 x 1/2" x 26 x 3	30
3461-tmo-260c26	26 x 3/4" x 26 x 3	30
3461-tmo-320c32	32 x 3/4" x 32 x 3	30
3461-tmo-321032	32 x 1" x 32 x 3	25



Floor Heating Systems

Nipple with Loose Nut

Code	Size	Pcs.
3461-npt-160c00	16 x 3/4" x 2	150
3461-npt-200c00	20 x 3/4" x 2	150
3461-npt-201000	20 x 1" x 2	100
3461-npt-261000	26 x 1" x 3	80
3461-npt-261a00	26 x 1 1/4" x 3	80
3461-npt-321a00	32 x 1 1/4 x 3	50
3461-npt-321b00	32 x 1 1/2" x 3	40



Stoppend

Code	Size	Pcs.
3461-ste-160000	16 x 2	200
3461-ste-200000	20 x 2	200
3461-ste-260000	26 x 3	100
3461-ste-320000	32 x 3	70



PE-X Pipes

Applied Norms

- EN 578 - Plastics piping systems - plastics pipes and fitting- Determination of the opacity
- EN 579 - Plastics piping systems - cross linked polyethylene (PE-X) pipes - Determination of degree of cross linking by solvent extraction
- EN ISO 2505 - Plastic and duct systems - Thermoplastics pipes - Determination of the longitudinal reversion
- EN ISO 1167- 1 - Plastic piping systems - Thermoplastics pipes, fitting and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - part 1: general method
- EN ISO 1167- 2 - Plastic piping systems - Thermoplastics pipes, fitting and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - part 2: Preparation of pipe test pieces.
- EN ISO 15875 -1 Plastics piping systems for hot and cold water installations - cross linked polyethylene (PE-X); Part 1: General
- EN ISO 15875 -2 Plastics piping systems for hot and cold water installations - cross linked polyethylene (PE-X); Part 2: Pipes
- EN ISO 15875 -3 Plastics piping systems for hot and cold water installations - cross linked polyethylene (PE-X); Part 3: Fittings
- EN ISO 15875-5 Plastics piping systems for hot and cold water installations - cross linked polyethylene (PE-X); Part 5: Fitness for purpose of the system
- DIN 16892 Crosslinked high-density polyethylene (PE-X) pipes - General quality requirements and testing
- DIN 16893 Crosslinked high-density polyethylene (PE-X) pipes - Dimension

Raw Material: Cross Linked Polyethylene (PE-X)

PE-X results from chemically joining individual polyethylene molecules in order to improve the performance of the original base resin in higher temperatures. The primary reason for cross-linking polyethylene (PE) is to raise the thermal stability of the material under load.

For high performance polyethylene applications, requiring higher temperature, creep, abrasion and chemical resistances, cross-linking is a must.

There are three different ways for crosslinking:

- 1- The peroxide method employs a special extruder with a plunger action where peroxide is added to the base resin and through a combination of pressure and high temperature the cross-linking takes place as the tubing is produced.
- 2- The "Silane" method of PE-X production involves grafting a reactive silane molecule to the backbone of the polyethylene. The tubing is produced by blending this grafted compound with a catalyst which can be done using either the Sioplas method or by using a special extruder it can be done using the Monosil method. After extrusion the tubing is exposed to either steam or hot water to induce the final cross-linking reaction in the tubing.
- 3- Electron Beam crosslinking takes place when very high energy radiation is used to initiate molecular cross-linking in high density polyethylene. This product is extruded like normal HDPE then taken to an E-beam facility and routed under a beam or ray in the accelerator where it is dosed with a specific amount of radiation to release the hydrogen atoms and cause polymer chains to bond or link to the open carbon sites.

In European standards these three methods are referred to as PE-X_a, PE-X_b and PE-X_c.

PE-X_a - the Peroxide method

PE-X_b - the Silane

PE-X_c - Electron beam crosslinking

Kalde PE-X pipes are cross-linked using silane.

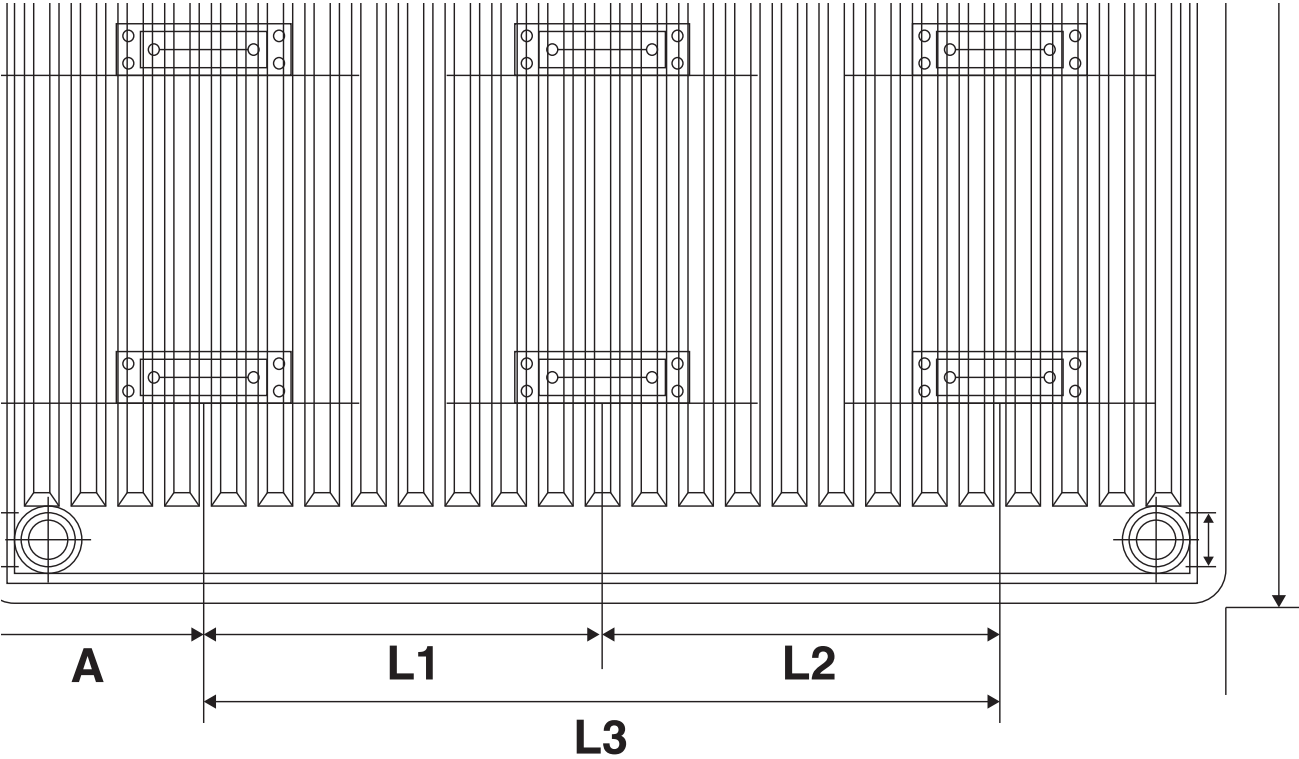
Physical, Thermal and Mechanical Properties

Table 1

Properties	Specification	Value	Unit	Test Method
Density	0,94 - 0,95	0.94	g/cm ³	DIN 53497
Melt Flow Rate	0,7 - 1,9	0.96	(190°C , 5kg)	ISO 1133
Degree of Crosslinking	≥65	68	%	EN 579
Tensile Strength	at 20°C	19-26	N/mm ²	EN ISO 527
	at 100°C	Sep-13		
Elongation at Break	at 20°C	350-500	%	EN ISO 527
	at 100°C	500-700		
Impact Strength	at 20°C	No failure	KJ/m ²	ISO 179
Moisture Absorbtion	at 22°C	0.01	Mg/4d	
Pipe Roughness		5,10 ⁻⁴	mm	
Minimum Bending Radius	at 20°C	5xØd	mm	
Softening Point	>122	130	°C	ASTM D1525
Min. laying Temperature	-	-15	°C	
Max. Operating Temperature	-	95	°C	BS7291-3
Thermal Conductivity at 23C°	≥0,41	0.41	W/mK	DIN 52612
Flexural Modulus at 23C°	>600	600	N/mm ²	DIN EN ISI 178
Coefficient of linear Expansion		2,10 ⁻⁴	K ⁻¹	DIN 53752
Resistance of Faces		10 ¹²	Ω	DIN 53482

Reference Curves for Expected Strength of Cross Linked Polyethylene

Table 2



Pipe Dimension - PN 20 According to EN ISO 15875-2, DIN 16893

Table 3

Outer Diameter (mm)	Diameter Tolerance (mm)	Wall Thickness S:3,2 -SDR:7,4 (mm)	Thickness Tolerance (mm)	Approx. Weight (kg/m)
16	0.3	2.2	0.4	0.94
20	0.3	2.8	0.4	0.148
25	0.3	3.5	0.5	0.23
32	0.3	4.4	0.6	0.368

Operating Conditions (S:3,2 SDR:7,4) (PN 20) DIN16893

Table 4

Temperature (°C)	Life (years)	Pressure (bar)
20	50	20
40	50	15.7
60	50	12.5
70	50	11.2
80	25	10.1
95	5	8.8

Pipe Dimension-PN 12,5 According to EN ISO 15875-2, DIN 16893

Table 5

Outer Diameter (mm)	Diameter Tolerance (mm)	Wall Thickness S:5 - SDR:11 (mm)	Thickness Tolerance (mm)	Approx. Weight (kg/m)
16	0.3	1.8	0.4	0.84
20	0.3	1.9	0.4	0.11
25	0.3	2.3	0.5	0.156
32	0.3	2.9	0.5	0.251

Operating Conditions (S:5 - SDR:11) (PN 12,5) DIN 16893

Table 6

Temperature (°C)	Life (years)	Pressure (bar)
20	50	12.6
40	50	9.9
60	50	7.9
70	50	7.1
80	25	6.4
95	5	5.5

Classification of Service Conditions DIN 16893

Table 7

Application class	Design temperature, TD (°C)	Time at TD (years)	Tmax (°C)	Time at Tmax (years)	Tmal (°C)	Time at Tmal (h)	Typical field of application
1	60	49	80	1	95	100	Hot water supply (60°C)
2	70	49	80	1	95	100	Hot water supply (70°C)

PE-X Pipe Permissible Working Pressure DIN 16893

Table 8

Temperature (°C)	Operating Life (years)	Series (S)			
		6.3	5	4	3.2
		Standart Dimension Ratio (SDR)			
		13.6	11	9	7.4
		Nominal Working Pressure			
		PN 10	PN 12,5	PN 16	PN 20
		Allowable Working Pressure (Bar)			
20	1	10.5	13.2	16.6	20.9
	5	10.3	12.9	16.3	20.5
	10	10.2	12.8	16.2	20.4
	25	10.1	12.7	16	20.1
	50	10	12.6	15.9	20
40	1	8.2	10.4	13.1	16.5
	5	8.1	10.2	12.8	16.2
	10	8	10.1	12.7	16.1
	25	7.9	10	12.6	15.9
	50	7.9	9.9	12.5	15.7
50	1	7.3	9.3	11.7	14.7
	5	7.2	9.1	11.4	14.4
	10	7.1	9	11.3	14.3
	25	7.1	8.9	11.2	14.1
	50	7	8.8	11.1	14
60	1	6.6	8.3	10.4	13.1
	5	6.4	8.1	10.2	12.9
	10	6.4	8	10.1	12.8
	25	6.3	7.9	10	12.6
	50	6.2	7.9	9.9	12.5
70	1	5.9	7.4	9.3	11.8
	5	5.7	7.3	9.1	11.5
	10	5.7	7.2	9.1	11.4
	25	5.6	7.1	9	11.3
	50	5.6	7	8.9	11.2
80	1	5.3	6.6	8.4	10.5
	5	5.2	6.5	8.2	10.3
	10	5.1	6.4	8.1	10.2
	25	5	6.4	8	10.1
90	1	4.7	6	7.5	9.5
	5	4.6	5.8	7.4	9.3
	10	4.6	5.8	7.3	9.2
95	1	4.5	5.7	7.1	9
	5	4.4	5.5	7	8.8
	10	4.3	5.5	6.9	8.7

Thermal Expansion in Polyethylene (PE-X) Pipes

The polyethylene pipes have an expansion coefficient that is much higher than the metal pipes. It is critical to take this characteristic into consideration during installations.

Calculation of thermal expansion is as follows: $\Delta L = L * \Delta T * \alpha$

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

α = coefficient of linear thermal expansion. The value of α is $2 * 10^{-4}$ (K⁻¹) for pex tubes.

Table 9

Pipe length (m)	Temperature variation ΔT in K									
	10	20	30	40	50	60	70	80	90	100
	Linear expansion ΔL (mm)									
1	2	4	6	8	10	12	14	16	18	20
2	4	8	12	16	20	24	28	32	36	40
3	6	12	18	24	30	36	42	48	54	60
4	8	16	24	32	40	48	56	64	72	80
5	10	20	30	40	50	60	70	80	90	100
6	12	24	36	48	60	72	84	96	108	120
7	14	28	42	56	70	84	98	112	126	140
8	16	32	48	64	80	96	112	128	144	160
9	18	36	54	72	90	108	126	144	162	180
10	20	40	60	80	100	120	140	160	180	200

Kalde - PE-X Pipes

Kalde - PE-X is tested in accordance with the most respected standards such as EN ISO15875-2 and DIN 16892/93. All the test and quality controls required by these norms are performed in a modern and well-equipped laboratory. Production range consists of diameters from 16 mm up to 32 mm. The tables 3 and 5 show the details of Kalde - PE-X.

Kalde - PE-X Pipes are

- Flexible for faster and easier installation
- Corrosion free and high resistance to chemicals
- Replaceable pipe-in conduit
- Very good performance at high temperatures and high pressure
- Easy to cut and join
- Pipe laying can be carried out during the construction of building
- No electricity or heat is necessary for installation
- Allows high water speeds,
- Installed with fewer fittings, long runs without joints
- Quiet, does not transmit noise like metal pipes
- Long service life

Kalde - PE-X Pipes have

- excellent resistance to corrosion
- freeze damage resistance
- noise and water hammer resistance
- no odor, impurities or any other harmful chemicals.
- less condensation than the copper and metallic pipes.
- These properties of kalde-pex make it the ideal choice for sanitary piping systems.

Installation

Kalde - PE-X is ideally suited for potable water plumbing applications. The excellent properties of Kalde - PE-X make it perfect for plumbing applications. Kalde is proud of the reliable and proven performance of its pex systems under the harshest conditions.

It is flexible, making it easy to install and service. PE-X is able to withstand the high and low temperatures found in plumbing and heating applications and is highly resistant to chemicals found in the plumbing environment.

Flexible systems are more quiet than rigid piping. The smooth interior will not corrode which can affect other materials long term pipe flow characteristics. PE-X is also very freeze- break resistant. PE-X systems have fewer joints and are easier to install providing a lower cost installation over traditional plumbing materials.

PE-RT Pipes

Applied Norms

- EN 578 - Plastics piping systems - plastics pipes and fitting- Determination of the opacity
- EN 579 - Plastics piping systems - cross linked polyethylene (PE-RT) pipes - Determination of degree of cross linking by solvent extraction
- EN ISO 2505 - Plastic and duct systems - Thermoplastics pipes - Determination of the longitudinal reversion
- EN ISO 1167- 1 - Plastic piping systems - Thermoplastics pipes, fitting and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - part 1: general method
- EN ISO 1167- 2 - Plastic piping systems - Thermoplastics pipes, fitting and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - part 2: Preparation of pipe test pieces.
- EN ISO 15875 -1 Plastics piping systems for hot and cold water installations - cross linked polyethylene (PE-X); Part 1: General
- EN ISO 15875 -2 Plastics piping systems for hot and cold water installations - cross linked polyethylene (PE-X); Part 2: Pipes
- EN ISO 15875 -3 Plastics piping systems for hot and cold water installations - cross linked polyethylene (PE-X); Part 3: Fittings
- EN ISO 15875-5 Plastics piping systems for hot and cold water installations - cross linked polyethylene (PE-X); Part 5: Fitness for purpose of the system
- DIN 16892 Crosslinked high-density polyethylene (PE-X) pipes - General quality requirements and testing
- DIN 16893 Crosslinked high-density polyethylene (PE-X) pipes - Dimension

Raw Material: Temperature Resistance Raised Polyethylene (PE-RT)

PE-RT pipe is made of polyethylene (PE-RT) material, whose mechanical resistance is increased to high temperature.

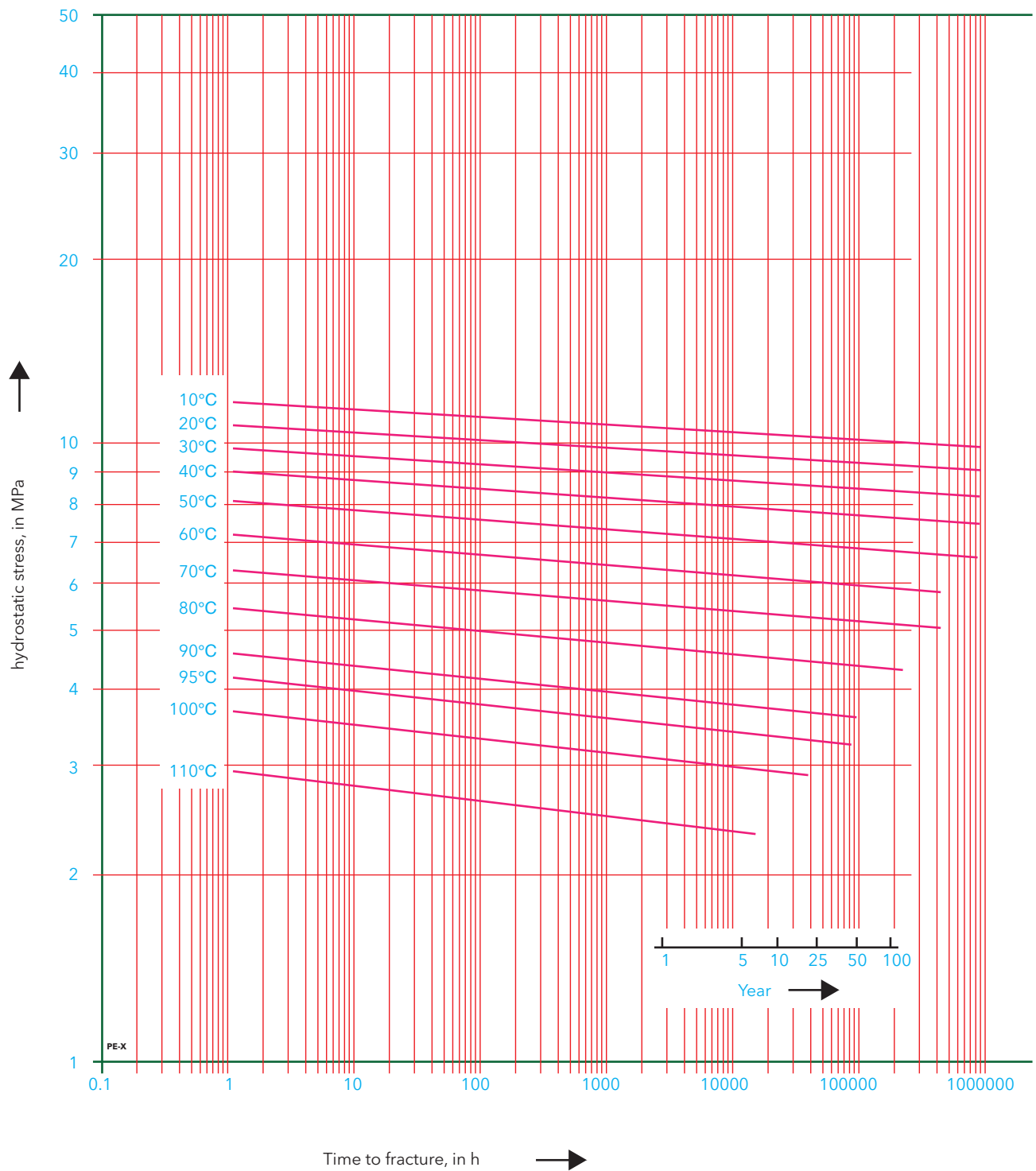
Physical, Thermal and Mechanical Properties

Table 1

Properties	Specification	Value	Unit	Test Method
Density	0,94 - 0,95	0.94	g/cm ³	DIN 53497
Melt Flow Rate	0,7 - 1,9	0.96	(190°C , 5kg)	ISO 1133
Degree of Crosslinking	≥65	68	%	EN 579
Tensile Strength	at 20°C	19-26	N/mm ²	EN ISO 527
	at 100°C	9-13		
Elongation at Break	at 20°C	350-500	%	EN ISO 527
	at 100°C	500-700		
Impact Strength	at 20°C	No failure	KJ/m ²	ISO 179
Moisture Absorption	at 22°C	0.01	Mg/4d	
Pipe Roughness		5,10 ⁻⁴	mm	
Minimum Bending Radius	at 20°C	5xØd	mm	
Softening Point	>122	130	°C	ASTM D1525
Min. laying Temperature	-	-15	°C	
Max. Operating Temperature	-	95	°C	BS7291-3
Thermal Conductivity at 23C°	≥0,41	0.41	W/mK	DIN 52612
Flexural Modulus at 23C°	>600	600	N/mm ²	DIN EN ISI 178
Coefficient of linear Expansion		2,10 ⁻⁴	K ⁻¹	DIN 53752
Resistance of Faces		10 ¹²	Ω	DIN 53482

Reference Curves for Expected Strength of Cross Linked Polyethylene

Table 2



Pipe Dimension - TS EN ISO 22391-2, DIN 16893

Table 3

Outer Diameter (mm)	Diameter Tolerance (mm)	Wall Thickness S:3,2 -SDR:7,4 (mm)	Thickness Tolerance (mm)	Approx. Weight (kg/m)
16	0.3	1.8	0.3	0.82
20	0.3	2.0	0.4	0.110

Operating Conditions (S:3,2 SDR:7,4) (PN 20) DIN16893

Table 4

Temperature (°C)	Life (years)	Pressure (PN12,5) (bar)
20	1	11.8
	5	11.7
	10	11.6
	50	11.5
50	1	7.9
	5	7.8
	10	7.8
	50	7.4
70	1	6.0
	5	5.9
	10	5.4
	50	4.1
95	1	4.0
	5	2.9

Thermal Expansion in Polyethylene (PE-RT) Pipes

The polyethylene pipes have an expansion coefficient that is much higher than the metal pipes. It is critical to take this characteristic into consideration during installations.

Calculation of thermal expansion is as follows: $\Delta L = L * \Delta T * \alpha$

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

α = coefficient of linear thermal expansion. The value of α is $2 * 10^{-4}$ (K⁻¹) for pe-rt tubes.

Table 9

Pipe length (m)	Temperature variation ΔT in K								
	10	20	30	40	50	60	70	80	90
	Linear expansion ΔL (mm)								
1	2	4	6	8	10	12	14	16	18
4	8	16	24	32	40	48	56	64	72
8	16	32	48	64	80	96	112	128	144
10	20	40	60	80	100	120	140	160	180

Floor Heating Systems

Kalde - PE-RT Pipes

Kalde PE-RT pipe is produced in accordance with TS EN ISO 22391-2 and DIN 16833/34 standards and performs its tests and controls in its modern and advanced laboratories according to the quality requirements of all these standards.

Kalde - PE-RT Pipes are

- Flexible for quick and easy installation
- It is stainless and resistant to chemicals.
- It performs very well at high temperatures and high pressures.
- Easy to cut and join.
- No electricity or heater is required for the installation.
- It is silent and does not transmit sound like metal pipes.
- It has a long service life.
- It is odorless and does not contain dirt or other harmful chemicals.
- It makes less concentration than copper and metal pipes.

Kalde - PE-RT Pipes with Oxygen Barrier

Corrosion in metal and metal components in heating systems is caused by the presence of free oxygen in the water. Oxygen can be found in every system, and it can enter into the system from certain points. It is found in any system where it can also enter gas-permeable materials (pipes etc.), such as open-head tanks, valves, threaded connections and pumps connections.

In closed circuit heating systems that are not fed with continuous hot water, minimizing oxygen inflow from the pipe wall will significantly reduce corrosion. For this reason, oxygen barrier pert pipes have been developed. Oxygen barrier pipes consist of 3 basic layers; Kalde oxygen barrier Pert pipes, inner base layer, adhesive (adhesive) and outer layer (ethylene vinyl alcohol copolymer (EVOH)). the middle layer is an adhesive material that is compatible with both inner and outer layer materials to form an integrated structure. EVOH is an oxygen barrier material with very low oxygen permeability properties.

Datasheet Typical Properties of EVAL™ Resin

EVAL™ FP104B

Test Method		Unit	Value
Ethylene Content	Kuraray Method	mol %	32
Oxygen Transmission Rate	ISO 14663-2 annexC 20°C 0%RH	cm ³ .20µm/m ² .day.atm	0.2
	ISO 14663-2 annexC 20°C 35%RH	cm ³ .20µm/m ² .day.atm	0.3
	ISO 14663-2 annexC 20°C 50%RH	cm ³ .20µm/m ² .day.atm	
	ISO 14663-2 annexC 20°C 65%RH	cm ³ .20µm/m ² .day.atm	0.4
	ISO 14663-2 annexC 20°C 85%RH	cm ³ .20µm/m ² .day.atm	1.5
	ISO 14663-2 annexC 20°C 90%RH	cm ³ .20µm/m ² .day.atm	3
	ISO 14663-2 annexC 20°C 100%RH	cm ³ .20µm/m ² .day.atm	19

Installation

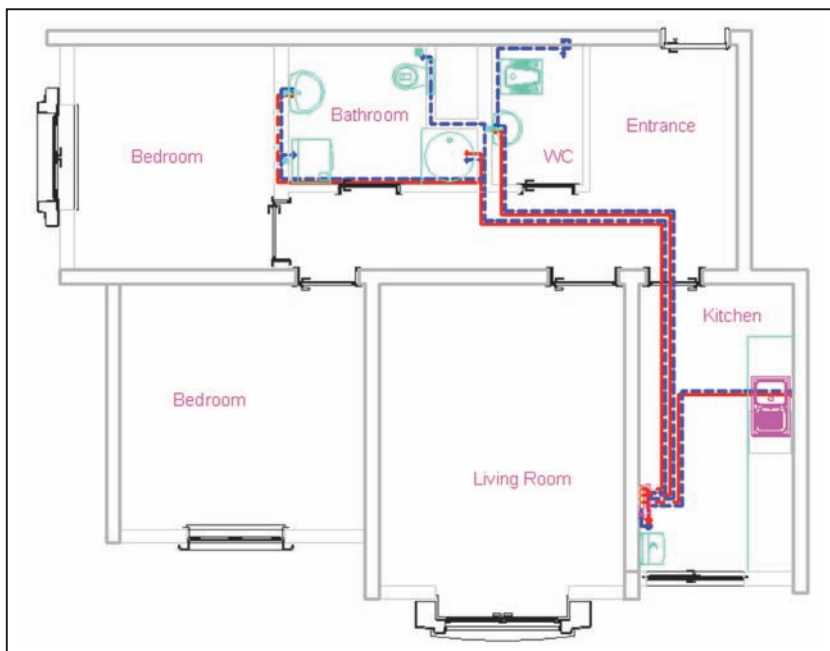
Kalde - PE-RT is ideally suited for potable water plumbing applications. The excellent properties of Kalde - PE-RT make it perfect for plumbing applications. Kalde is proud of the reliable and proven performance of its PE-RT systems under the harshest conditions. It is flexible, making it easy to install and service. PE-RT is able to withstand the high and low temperatures found in plumbing and heating applications, and is highly resistant to chemicals found in the plumbing environment.

Flexible systems are more quiet than rigid piping. The smooth interior will not corrode which can affect other materials long term pipe flow characteristics. PE-RT is also very freeze- break resistant. PE-RT systems have fewer joints and are easier to install providing a lower cost installation over traditional plumbing materials.

Floor Heating Systems

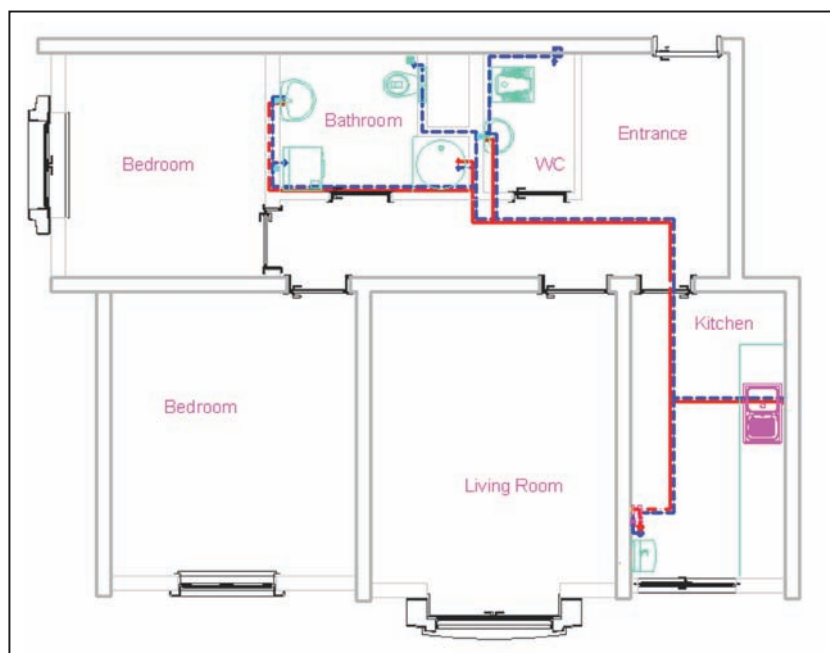
A - Flooring with Manifolds

This installation method allows the pipes to directly reach the consumption points from the manifold. The components needed for installation are minimized also resulting in time and labor savings.



B - Flooring without Manifolds

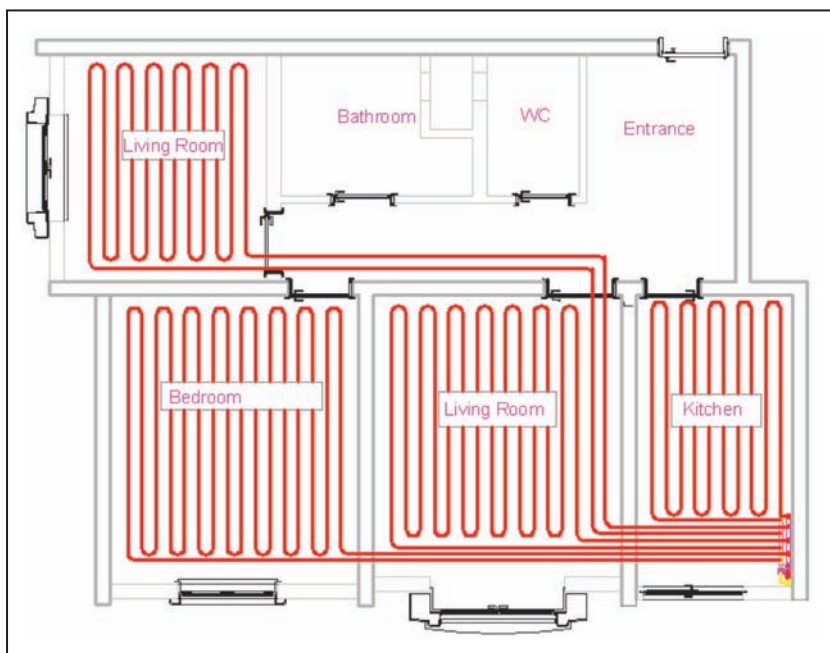
This installation approach is preferred for gaining space by not using a manifold. T-elements are used at junctions, the installed pipe lengths are minimized.



Floor Heating Systems

C- Under-Floor Heating

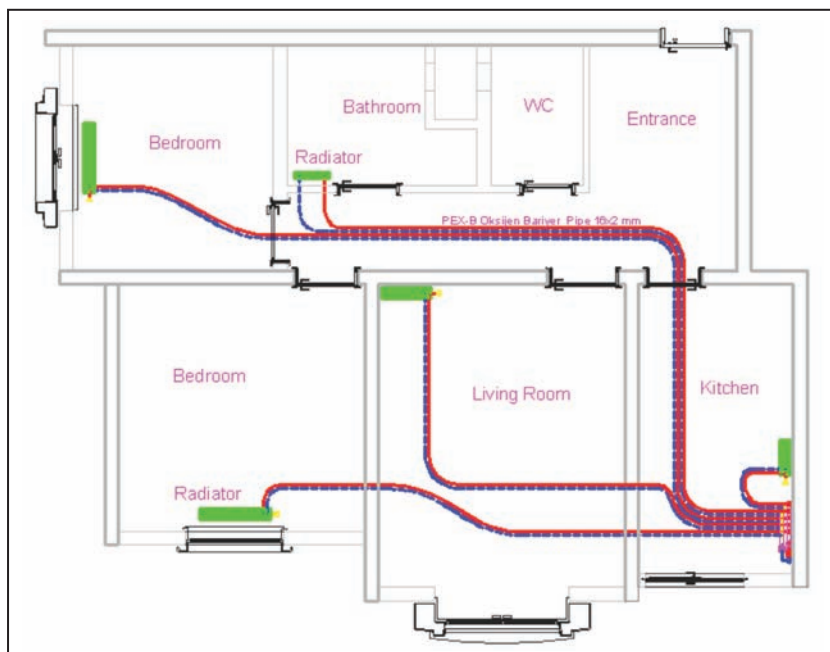
The ideal heat distribution pattern is to have the warmest temperatures at floor level and cooler temperatures at head and ceiling levels. This can be achieved by installing Kalde - PE-X piping system under the floor surface. This is a definite advantage of Kalde - PE-X over some other main heating systems such as radiators where the heat is trapped at the ceiling level.



D- Radiator Connection

The water temperatures in a radiator heating system are around 70 - 90°C. Water at high temperatures is corrosive, especially when it contains added chemicals such as chlorine and acids. The oxygen dissolved in the water reacts with metal components of a heating system causing corrosion, or depositing scale.

Kalde - PE-X pipes overcome these complications with their superior properties at high temperatures. Furthermore, since the pipes are also protected with a corrugated pipe, if the inner pipe gets damaged it can easily be replaced without any damage to the floor or the wall.



General Instructions

- 1- Do not install the pipe if the temperature is below 0°C. If needed, store the pipe and the accessories in a warm room before installation.
- 2- Although the pipe is rather flexible, the minimum bending radius of the pipe is $r_{min}=5 \cdot d_{outer}$. The minimum bending radius at room temperature (20°C) is given in the following table.

Pipe Outer Diameter (mm)	Minimum Pipe Bending radius r (cm)	Bending Diameter R (cm)
16	8.0	16.0
20	10.0	20.0
25	12.5	25.0
32	16.0	32.0

- 3- As the thermal expansion of the pipes is approximately 42 mm per 10°C for every 25 m pipe length, do not pull tubing tight during installation but allow about 10mm longitudinal clearance per meter of run to accommodate thermal expansion.
- 4- Pipe cutting should be done with pipe cutters. The pipe cut should be straight, and perpendicular to the tubing. Cutting the pipe on an angle may result in an improper fitting assembly. Extra care should be taken when cutting the corrugated pipe not to damage the inner pipe.
- 5- Leave some extra pipe at the beginning and end of runs to simplify the connection to manifolds and fittings.
- 6- When entering or exiting the slab, a 90°C angle pipe guide or metal bend supports should be used.
- 7- Installed tubing should be protected from possible damage. Tubing runs should be safeguarded with suitable steel plate protectors during construction since they can be pierced by screws, nails, etc.
- 8- Manifold locations should be chosen so that they are accessible for future use. This provides convenient access to all fixtures, permits easy connections to the supply mains and provides adequate protection from freezing.
- 9- Each exit of the distributing manifolds should have a shut-off valve so that it can be isolated as necessary.
- 10- The system must be tested pressure testing before use and concrete is discarded. During the pressure test, ensure that the pressure is stable and that all joints are leak-free.
- 11- Use teflon for sealing when assembling threaded parts and do not overload to screw it. If linen is used as sealing material; care should be taken not to over wrap, In case of excessive use, brass inserts or other brass parts may cause fatigue cracking or breakage over time and separation of plastic and metal from each other.
- 12- Before installation, the products to be used must be visually checked, if there are cracks, broken etc. defects should be returned to our company for replacement without using the product.
- 13- After the installation is finished, the products in the system should be tested for leakage. If there are leaking products those should be returned to our company to be replaced with a new one.

Note: Products that have not been checked and tested before and after installation are excluded from the warranty. Any damages arising from this reason are the responsibility of the implementing company.

Test Procedures (DIN 1988-2)

finished installation, filtered and vacuum to be filled completely with water.

Pressure testing should be carried out in two stages. The first stage is sufficient for smaller sections of the system, e.g. for testing supply pipes and branch pipes in wet rooms.

- a) For the first stage, a test pressure equal to the permissible working pressure plus 5 bars should 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 (at the rate of 0,1 bar per minute) and leakage has occurred.
- b) The second stage should immediately follow the first stage and should last two hours with no breaks. Then, one checked whether the pressure has dropped by more than 0,2 bar and the pipework shows any signs of leakage.

Floor Heating Systems

PE-X Tube and Fittings

PE-X and Spiral Pipes

Code	Size	Pcs.
3512-pxb-162016	PE-X ø16 x 2	160
3518-pxs-162010	PE-X ø16 x 2 S ●	100
3517-pxs-162010	PE-X ø16 x 2 S ●	100
3512-pxo-162016	PE-X ø16 x 2 O	160
3518-pos-162010	PE-X ø16 x 2 S+O ●	100
3517-pos-162010	PE-X ø16 x 2 S+O ●	100
3512-spb-190010	Spiral ø19 ●	100
3512-spr-190010	Spiral ø19 ●	100

S= Spiral covered O= Oksygen barriered



PE-RT and Spiral Pipes

Code	Size	Pcs.
3858-prs-162010	PE-RT 16 x 2 S ●	100
3857-prs-162010	PE-RT 16 x 2 S ●	100
3852-pro-162016	PE-RT 16 x 2 O	160
3858-pos-162010	PE-RT 16 x 2 S+O ●	100
3857-pos-162010	PE-RT 16 x 2 S+O ●	100

S= Spiral covered O= Oksygen barriered



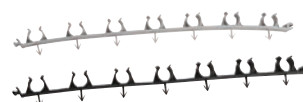
Pipe Fixture for PE-X

Code	Size	Pcs.
3592-pfp-000000	for ø16 PE-X	5000
3595-pfp-250000	for Spiral	5000



Pipe Fixture

Code	Size	Pcs.
3592-pft-350000	ø35	400



Angle Pipe Guide

Code	Size	Pcs.
3595-ccr-000000	ø16	250



Floor Heating Systems

By-Pass

Code	Size	Pcs.
3411-byp-160b00	ø16 x 1/2"	20



Taps Terminal Elbow

Code	Size	Pcs.
3411-elc-0b0100	1/2" x 105° Kısa	75
3411-elc-0b0105	1/2" x 105° Uzun	75



Connection Tube Upper Coupling

Code	Size	Pcs.
3411-cnt-150b00	ø15 x 1/2"	200



Connection Tube Lower Coupling

Code	Size	Pcs.
3411-cnt-151600	ø15 / 16 x 2	125



Connection Tube Upper Elbow

Code	Size	Pcs.
3411-cne-150b00	ø15 x 1/2"	150



Wall Plate Elbow

Code	Size	Pcs.
3411-ewf-160b00	ø16 x 1/2"	75



Floor Heating Systems

Bracket

Code	Size	Pcs.
3391-bck-0c0000	3/4"	75
3391-bck-100000	1"	100
3391-bck-100001	1" Light	100
3391-bck-1a0000	1 1/4"	60



Ball Valve with Thermocouple

Code	Size	Pcs.
3391-bvt-100000	1"	30



Stopend

Code	Size	Pcs.
3391-ste-0c0000	3/4"	300
3391-ste-100000	1"	200
3391-ste-1a0000	1 1/4"	125



PE-X Stopend / AL PE-X Stopend

Code	Size	Pcs.
3391-ste-160000	ø16 x 2 PE-X	400
3391-ste-160001	ø16 x 2 AL PE-X	250



Tee

Code	Size	Pcs.
3391-tep-100000	1"	75
3391-tep-1a0000	1 1/4"	75



Floor Heating Systems

Air Vent

Code	Size	Pcs.
3391-pur-0e0000	1/8"	750
3391-pur-0a0000	1/4"	500
3391-pur-0d0000	3/8"	500
3391-pur-0b0000	1/2"	400



Air Vent Mechanic

Code	Size	Pcs.
3391-pur-0a0001	1/4"	500
3391-pur-0e0002	1/8"	500



Spiral PE-X Stopend

Code	Size	Pcs.
3592-pxs-160000	ø16	1000



Cabinet

Code	Size	L2	L1	L	Pcs.
3392-cab-400000	40 x 70 x 11				1
3392-cab-600000	60 x 70 x 11				1
3392-cab-800000	80 x 70 x 11				1



Floor Heating Systems

Screw Fittings - Attached Type

Elbow

Code	Size	Pcs.
3421-ela-161600	ø16-16	80
3421-ela-181800	ø18-18	75
3421-ela-202000	ø20-20	60
3421-ela-262600	ø26-26	25



Female Elbow

Code	Size	Pcs.
3421-efa-160b00	ø16x1/2"	100
3421-efa-180b00	ø18x1/2"	90
3421-efa-180c00	ø18x3/4"	75
3421-efa-200b00	ø20x1/2"	75
3421-efa-200c00	ø20x3/4"	70
3421-efa-260c00	ø26x3/4"	40
3421-efa-261000	ø26x1"	30



Male Elbow

Code	Size	Pcs.
3421-ema-160b00	ø16x1/2"	125
3421-ema-180b00	ø18x1/2"	100
3421-ema-180c00	ø18x3/4"	100
3421-ema-200b00	ø20x1/2"	85
3421-ema-200c00	ø20x3/4"	75
3421-ema-260c00	ø26x3/4"	45
3421-ema-261000	ø26x1"	30



Wallplate Elbow

Code	Size	Pcs.
3421-ewa-160b00	ø16x1/2"	65
3421-ewa-200b00	ø20x1/2"	50



Floor Heating Systems

Nipple

Code	Size	Pcs.
3421-npa-161600	ø16-16	100
3421-npa-181800	ø18-18	80
3421-npa-202000	ø20-20	75
3421-npa-262600	ø26-26	40



Female Nipple

Code	Size	Pcs.
3421-nfa-160d00	ø16x3/8	150
3421-nfa-160b00	ø16x1/2"	150
3421-nfa-160c00	ø16x3/4"	100
3421-nfa-180b00	ø18x1/2"	125
3421-nfa-180c00	ø18x3/4"	100
3421-nfa-200b00	ø20x1/2"	125
3421-nfa-200c00	ø20x3/4"	100
3421-nfa-260c00	ø26x3/4"	50
3421-nfa-261000	ø26x1"	50



Male Nipple

Code	Size	Pcs.
3421-nma-160d00	ø16x3/8	175
3421-nma-160b00	ø16x1/2"	150
3421-nma-160c00	ø16x3/4"	125
3421-nma-180b00	ø18x1/2"	125
3421-nma-180c00	ø18x3/4"	125
3421-nma-200b00	ø20x1/2"	100
3421-nma-200c00	ø20x3/4"	100
3421-nma-260c00	ø26x3/4"	50
3421-nma-261000	ø26x1"	50



Reducing Nipple

Code	Size	Pcs.
3421-nia-181600	ø18-16	100
3421-nia-201600	ø20-16	75
3421-nia-201800	ø20-18	75



Floor Heating Systems

Tee

Code	Size	Pcs.
3421-toa-161616	ø16x16x16	50
3421-toa-181818	ø18x18x18	40
3421-toa-202020	ø20x20x20	35
3421-toa-262626	ø26x26x26	15



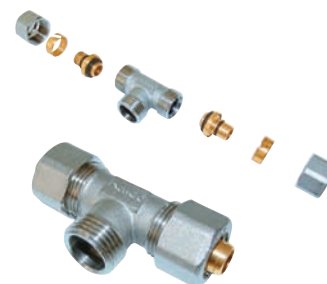
Female Tee

Code	Size	Pcs.
3421-tfa-160b16	ø16x1/2"x16	60
3421-tfa-160c16	ø16x3/4"x16	50
3421-tfa-180b18	ø18x1/2"x18	50
3421-tfa-180c18	ø18x3/4"x18	45
3421-tfa-200b20	ø20x1/2"x20	40
3421-tfa-200c20	ø20x3/4"x20	40
3421-tfa-260c26	ø26x3/4"x26	20
3421-tfa-261026	ø26x1"x26	20



Male Tee

Code	Size	Pcs.
3421-tma-160b16	ø16x1/2"x16	60
3421-tma-160c16	ø16x3/4"x16	50
3421-tma-180b18	ø18x1/2"x18	50
3421-tma-180c18	ø18x3/4"x18	45
3421-tma-200b20	ø20x1/2"x20	40
3421-tma-200c20	ø20x3/4"x20	40
3421-tma-260c26	ø26x3/4"x26	20
3421-tma-261026	ø26x1"x26	20



Inegal Tee

Code	Size	Pcs.
3421-tia-162016	ø16x20x16	45
3421-tia-181618	ø18x16x18	45
3421-tia-201616	ø20x16x16	40
3421-tia-201620	ø20x16x20	40
3421-tia-201820	ø20x18x20	40
3421-tia-202016	ø20x20x16	40



Floor Heating Systems

Screw Fittings - Fixed Type

Elbow

Code	Size	Pcs.
3431-elf-161600	ø16-16	100
3431-elf-181800	ø18-18	80
3431-elf-202000	ø20-20	70
3431-elf-262600	ø26-26	35
3431-elf-323200	ø32-32	20



Female Elbow

Code	Size	Pcs.
3431-eff-160b00	ø16x1/2"	100
3431-eff-160c00	ø16x3/4"	80
3431-eff-180b00	ø18x1/2"	90
3431-eff-180c00	ø18x3/4"	75
3431-eff-200b00	ø20x1/2"	80
3431-eff-200c00	ø20x3/4"	70
3431-eff-260c00	ø26x3/4"	45
3431-eff-261000	ø26x1"	35
3431-eff-321000	ø32x1"	30



Male Elbow

Code	Size	Pcs.
3431-emf-160b00	ø16x1/2"	150
3431-emf-160c00	ø16x3/4"	100
3431-emf-180b00	ø18x1/2"	100
3431-emf-180c00	ø18x3/4"	100
3431-emf-200b00	ø20x1/2"	100
3431-emf-200c00	ø20x3/4"	80
3431-emf-260c00	ø26x3/4"	50
3431-emf-261000	ø26x1"	40
3431-emf-321000	ø32x1"	35



Floor Heating Systems

Wallplate Elbow

Code	Size	Pcs.
3431-ewf-160b00	ø16x1/2"	75
3431-ewf-160c00	ø16x3/4"	60
3431-ewf-180b00	ø18x1/2"	65
3431-ewf-180c00	ø18x3/4"	60
3431-ewf-200b00	ø20x1/2"	60
3431-ewf-200c00	ø20x3/4"	50



Nipple

Code	Size	Pcs.
3431-npf-161600	ø16-16	140
3431-npf-181800	ø18-18	100
3431-npf-202000	ø20-20	80
3431-npf-262600	ø26-26	40
3431-npf-323200	ø32-32	30



Female Nipple

Code	Size	Pcs.
3431-nff-160b00	ø16x1/2"	175
3431-nff-160c00	ø16x3/4"	125
3431-nff-180b00	ø18x1/2"	125
3431-nff-180c00	ø18x3/4"	125
3431-nff-200b00	ø20x1/2"	125
3431-nff-200c00	ø20x3/4"	100
3431-nff-260c00	ø26x3/4"	65
3431-nff-261000	ø26x1"	60
3431-nff-321000	ø32x1"	40



Floor Heating Systems

Male Nipple

Code	Size	Pcs.
3431-nmf-160b00	ø16x1/2"	175
3431-nmf-160c00	ø16x3/4"	125
3431-nmf-180b00	ø18x1/2"	150
3431-nmf-180c00	ø18x3/4"	125
3431-nmf-200b00	ø20x1/2"	125
3431-nmf-200c00	ø20x3/4"	100
3431-nmf-260c00	ø26x3/4"	65
3431-nmf-261000	ø26x1"	60
3431-nmf-321000	ø32x1"	40



Reducing Nipple

Code	Size	Pcs.
3431-nif-181600	ø18-16	100
3431-nif-201600	ø20-16	100
3431-nif-201800	ø20-18	100



Tee

Code	Size	Pcs.
3431-tof-161616	ø16x16x16	60
3431-tof-181818	ø18x18x18	50
3431-tof-202020	ø20x20x20	40
3431-tof-262626	ø26x26x26	20
3431-tof-323232	ø32x32x32	15



Female Tee

Code	Size	Pcs.
3431-tff-160b16	ø16x1/2"x16	65
3431-tff-160c16	ø16x3/4"x16	50
3431-tff-180b18	ø18x1/2"x18	55
3431-tff-180c18	ø18x3/4"x18	50
3431-tff-200b20	ø20x1/2"x20	45
3431-tff-200c20	ø20x3/4"x20	40
3431-tff-260c26	ø26x3/4"x26	25
3431-tff-261026	ø26x1"x26	20
3431-tff-321032	ø32x1x32	15



Male Tee

Code	Size	Pcs.
3431-tmf-160b16	ø16x1/2"x16	75
3431-tmf-160c16	ø16x3/4"x16	60
3431-tmf-180b18	ø18x1/2"x18	60
3431-tmf-180c18	ø18x3/4"x18	55
3431-tmf-200b20	ø20x1/2"x20	50
3431-tmf-200c20	ø20x3/4"x20	50
3431-tmf-260c26	ø26x3/4"x26	25
3431-tmf-261026	ø26x1"x26	20
3431-tmf-321032	ø32x1x32	15



Inegal Tee

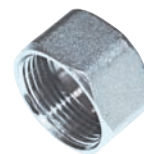
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3431-tif-162016	ø16x20x16	45
3431-tif-181618	ø18x16x18	50
3431-tif-201616	ø20x16x16	45
3431-tif-201620	ø20x16x20	45
3431-tif-201820	ø20x18x20	45
3431-tif-202016	ø20x20x16	45
3431-tif-262026	ø26x20x26	20



Floor Heating Systems

Nut

Code	Size	Pcs.
2421-som-160000	ø16	100
2421-som-180000	ø18	75
2421-som-200000	ø20	75
2421-som-260000	ø26	50
2421-som-320000	ø32	40



Insert

Code	Size	Pcs.
2421-uch-160000	ø16	100
2421-uch-180000	ø18	75
2421-uch-200000	ø20	75
2421-uch-260000	ø26	50
2421-uch-320000	ø32	40

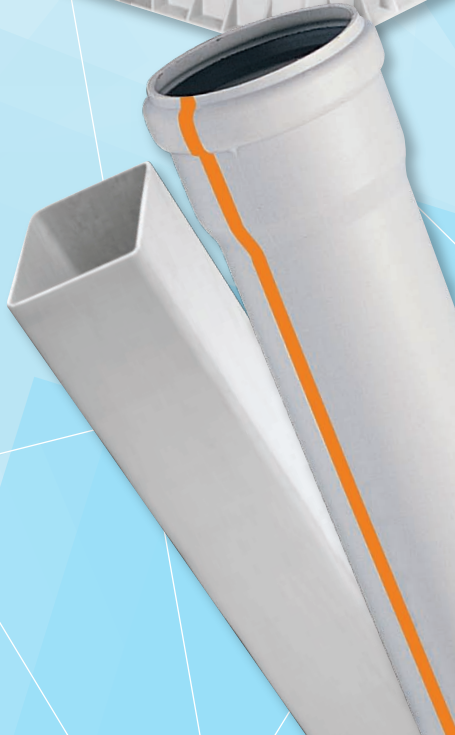
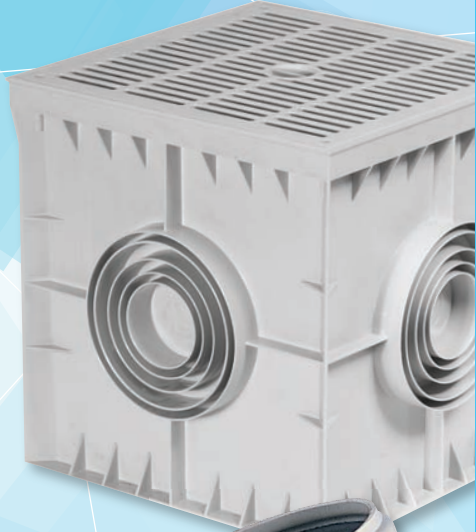
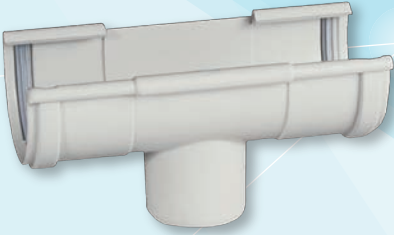


Compression Ring

Code	Size	Pcs.
2421-yks-160000	ø16	100
2421-yks-180000	ø18	75
2421-yks-200000	ø20	75
2421-yks-260000	ø26	50
2421-yks-320000	ø32	40







PVC-U SYSTEMS

Raw Material and General Properties

Kalde Waste Water Systems are formed of pipes and joints which are produced of PVC-U raw material. They are manufactured according to the B and BD application areas of EN 1329 -1,2 standard.

PVC-U pipe and joints (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,

Pipes and Joints:

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 information.

B:

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

D:

The application area code used for pipes and fittings used embedded under the ground which are one (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 75 mm. Additional properties for the ground surface applications outside the building according to the weather conditions are determined by the user and manufacturer.

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

Kalde PVC-U pipes and fittings are produced in 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 kalde PVC-U pipes and fittings are covered by a special silicone layer, the seal is prevented from deformation and degradation in case of being exposed to sunbeam.

The smooth and bright internal and external layers of Kalde PVC-U pipes and fittings prevent 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

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°C. When it 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 a fireproofing polymer. PVC decomposes slowly at 140°C and easily at 170°C by HCL decomposition and double bond is formed at the polymer. Thus stabilizers partake in the polymer.

Properties	Value	Standard
Density (g/cm ³)	1,41	ISO 1183
Water Absorption, 24 hrs. (%)	0,05	ASTM D570
Tensile Strength (N/mm ²)	52	ASTM D638
Flexural Strength, (N/mm ²)	88	ASTM D790
Modulus of Elasticity, (N/mm ²)	3316	ASTM D790
Hardness, (Rockwell R)	115	ASTM D785
IZOD Impact resistance (Joule)	5,40	ASTM D256
Coefficient of Linear Expansion, (mm/mK)	0,06	ASTM D696
Thermal conduction, (W/mK)	0,15	ASTM D696
VICAT softening temperature, (°C)	93	ASTM D1525
Surface Resistance (ohm)	>10 ¹²	ASTM D257

Resistant:

Kalde PVC-U Waste water Pipes and Fittings keep their physical properties up to 60 °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 °C and pH 7-12 alkaline. Kalde 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 Kalde PVC-U Waste Water pipes and fittings are rough PVC, it is more resistant against the external factors.

Smooth Internal Surface:

The smooth and flat internal surface of Kalde 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 Kalde PVC-U Waste Water pipes and fittings do not have spontaneous combustion property due to the structure of PVC-U and additives. They can only burn under open flame.

Deformation of PVC

PVC degrades by two ways.

1. by HEAT

Its degradation by heat is 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. by LIGHT

When PVC does not include any stabilizer material, it degrades over 100 °C temperature or if it is exposed to UV rays or gamma rays.

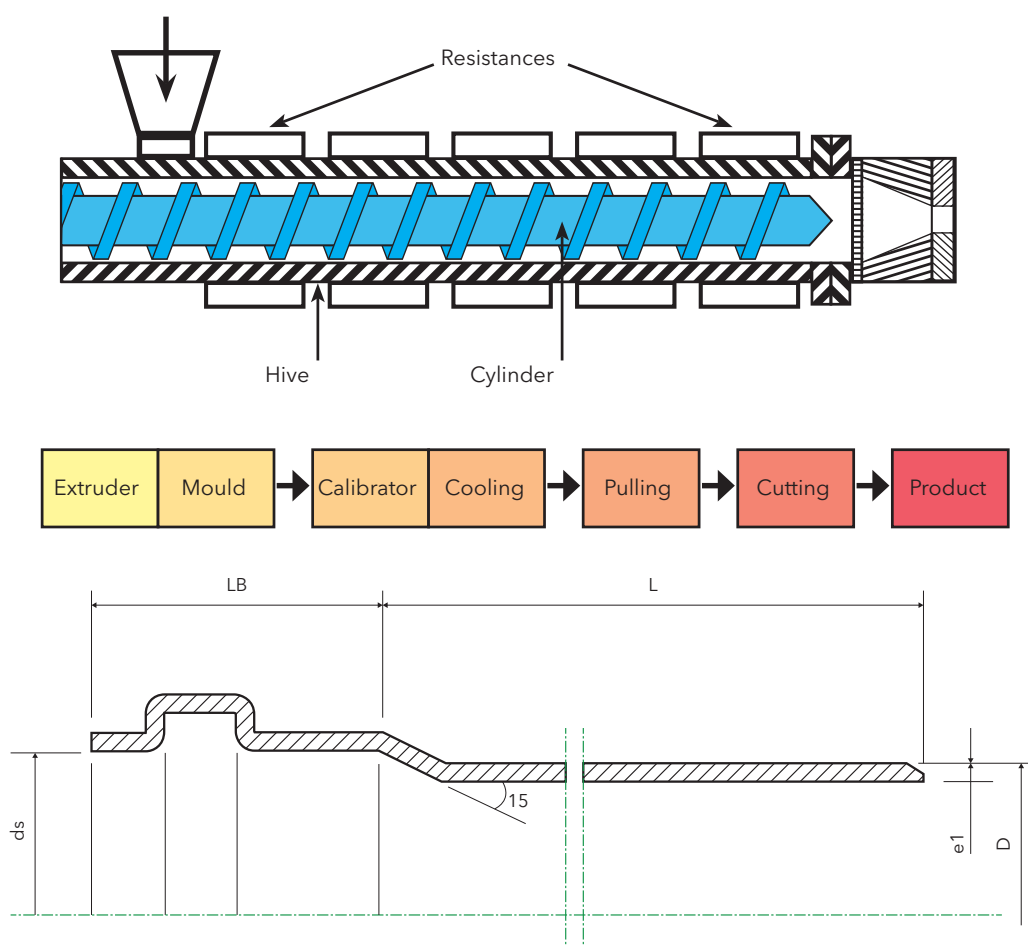
PVC-U SYSTEMS

PVC-U Formulation

PVC-U is the material which some additives are added in the raw material of PVC. 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. Correspondingly, the formulation is generally as follows:

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

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



Dimension (TS EN 1329-1)

Out Diameter D (mm)	ds (mm)	Wall thickness (mm)		LB	Approximately weight (kg/m)
		e1 (min)	e1 (max)		
50	50.2	3	3.5	50	0.725
75	75.3	3	3.5	58	1.15
110	110.3	3.2	3.8	72	1.75
125	125.3	3.2	3.8	72	2.1
160	160.4	3.2	3.8	102	2.614
200	200.5	3.9	4.5	102	4.05
250	250.5	4.9	5.6	125	6.25

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	ts-s	D	D
Hydrogen peroxide	30	D	D
Hydrofluoric acid gas	ts-g	YD	ZD
Hydrofluoric acid	10' a kadar	D	D
Hydrofluoric acid	40	YD	ZD
Urine		D	YD
Calcium carbonate	suspension	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	süsp.	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	50' ye kadar	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
Toluene	ts-s	ZD	ZD
Trichlorethylene	ts-s	ZD	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

PVC-U pipes have low expansion coefficient.

Calculation of thermal expansion is as follows: $\Delta L = L \cdot \Delta T \cdot \lambda$

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 α is $0,6 \cdot 10^{-4} (K^{-1})$ for PVC-U 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	0,60	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

Note: When water temperature circulating in the pipe is higher than environmental temperature, the pipe will elongate. But if water temperature circulating in the pipe is lower than environmental temperature, the result will be a shortage.

Assembly and Storage

Points to consider during transport, discharging and storing the KALDE PVC-U Pipes

1- Moving the product from a place to another place: The products should not be dropped down during transport. The pipes should be transport to the new location in yokes.

2- Discharging the product from the vehicle: The products should not be thrown from the vehicle. They should be placed on a flat surface in yokes. Falling down of the products from the vehicle should be prevented.

3- Storing the products: The products should be suitably stowed and if necessary, a palette should be placed under. When the pipes are being superimposed; it should be considered to leave the hub parts externally without contacting each other. During storage; it should be considered that the height of the pipe yokes should not exceed 1,5 meters.

Information Related to Pipe Laying (Application)

Preparation of the Pipe

Although it is possible to obtain pipes with various sizes; it can be compulsory to cut the pipes on site. In this case, it is very easy to cut the pipe by a hacksaw or a cutting stone. The cutting process should be performed in regular form. In order to chamfer the pipe ends angular as came from the factory; a thick-thread file or abrasive blaster can be used. If the required chamfer angle is not provided (150), pipe assembly can be very hard during pipe laying and it is inevitable that the gasket will slip from its place.



Overground Pipe Laying

In indoor applications; pay attention to use sufficient quantity of clamps. Using clamps both provides to have your line in alignment and supports the pipe weight on the line. In horizontal and vertical lines; attaching a clamp with 1 - 1,5 meters clearance will remove various possible problems.

- Well-informed and qualified personnel should work in transport and combining the PVC products.
- Sufficient quantity of clamps at appropriate clearances (1 - 1,5mt) should be used against possible stress/strain that may occur on the line.
- The line should not be tested with high-pressure air or gas.
- Clamps should be used at every discrimination point on the line and at route changing process of the line.
- The size of the clamp to be used should conform to the pipe diameter.
- The metal clamps to be used should be assembled without developing any pressure and deformation on the pipe.
- If metal clamps are going to be used in high buildings, it will be suitable to use metal clamps consisting of a gasket inside.
- In vertical declines (such as rain falls); a fixed support should be located on the bottom part of the line that will carry the pipe and its contents.

Underground Pipe Laying

- Before starting the pipe laying process and till the pipe laying process is completed; all the required occupational safety precautions should be taken.
- The excavation soil from the canal should be placed to a distance that will not prevent the pipe laying process (0,5 mt).
- Inner section of the canal should be kept as dry as possible. Owing to the water that may occur within the canal; the pipe may move and joint may segregate. In order to prevent this, soil with 1,5 times the nominal diameter of pipe should be placed.
- All precautions shall be taken in order to prevent the water entry inside the canal until the pipe laying process is completed and then covered by the filling material. Otherwise the pipe may move and cause leakages.

Pipe Assembly

- Kalde PVC-U pipes should be protected from impacts, strokes etc. Because the friableness of the pipe increases when the temperature is near to 0°C, this matter becomes more significant.
- On Kalde PVC-U Pipes; avoid applying processes that may cause grooves, cuts or traces. The clamps to be used should wrap the pipe completely, its edges should be rounded and internal surfaces should be flat and smooth.
- Vertically laid Kalde PVC-U pipes should be fastened by a clamp immediately after the pipes are enlaced and thus sliding should be prevented.
- 10 mm clearance should be left between the pipe hub end and the fitting at the joint points because of thermal expansion.
- Before starting the assembly; the hub area and the gasket and the pipe end should be cleaned from slurry, sand or other foreign particles.
- Cleaning of the gasket and the exact assembly of the gasket into the canal are ensured by manually controlling the gasket.
- In order to perform the pipe assembly easily and to prevent the gasket slide from its place during assembly; upper side of the gasket on the hub area and the pipe end should be completely lathered with liquid soap. Immediately after the lathering process; assembly should be performed without delay.
- The pipes should enlace tightly. If you have any difficulty during the assembly, the pipe should be taken out and it should be controlled that whether the gasket slides from its slot or not and the chamfer angle should be controlled.
- If the gasket is damaged, it should be replaced. Re-assembly process should be applied. If difficulty continues; your line may not be in line, it will be required to control and align the line in order to eliminate the shrinkage.
- Kalde PVC-U pipes that will remain under the alum should be tested according to one of the below mentioned methods before the alum is poured. AS 2032



Water Test

The pipe to be tested should be filled with water at a level of not less than minimum 1 meter 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 joint should be controlled visually whether there is any leakage or not and if there is a defect, it should be repaired and the test should be repeated.

Air Test

It is applied to the pipe line slowly till obtaining 0,5 bar pressure by the appropriate method. This pressure should be kept for at least 3 minutes. No visual leakage should be present at the end of the 3rd minute. Then the system providing air should be closed and if the air pressure provided inside the pipe does not go under 0,35 bar within 60 seconds, the pipe line is accepted as sufficient. For any reason, if the pressure cannot be kept between the specified limits, air is again given inside the line and the solution prepared by soapy water should be poured on the joint and it is controlled visually whether there is a leakage or not. If there is a leakage, it should be repaired and the test should be repeated.

3.2 Waste Water Pipe and Fittings

PVC-U Pipe / Type B

Code	Size	e. min.	e. max.	L	Pcs.
5203-tbe-0k0150	ø50	3.0	3.5	150	100
5203-tbe-0k0250	ø50	3.0	3.5	250	80
5203-tbe-0k0500	ø50	3.0	3.5	500	50
5203-tbe-0k1000	ø50	3.0	3.5	1000	10
5203-tbe-0k2000	ø50	3.0	3.5	2000	10
5203-tbe-0k3000	ø50	3.0	3.5	3000	10
5203-tbe-0k6000	ø50	3.0	3.5	6000	1
5203-tbe-0l0150	ø75	3.0	3.5	150	40
5203-tbe-0l0250	ø75	3.0	3.5	250	35
5203-tbe-0l0500	ø75	3.0	3.5	500	30
5203-tbe-0l1000	ø75	3.0	3.5	1000	5
5203-tbe-0l2000	ø75	3.0	3.5	2000	5
5203-tbe-0l3000	ø75	3.0	3.5	3000	5
5203-tbe-0l6000	ø75	3.0	3.5	6000	1
5203-tbe-0m0150	ø110	3.2	3.8	150	25
5203-tbe-0m0250	ø110	3.2	3.8	250	15
5203-tbe-0m0500	ø110	3.2	3.8	500	14
5203-tbe-0m1000	ø110	3.2	3.8	1000	5
5203-tbe-0m2000	ø110	3.2	3.8	2000	5
5203-tbe-0m3000	ø110	3.2	3.8	3000	2
5203-tbe-0m6000	ø110	3.2	3.8	6000	1
5203-tbe-0n0150	ø125	3.2	3.8	150	15
5203-tbe-0n0250	ø125	3.2	3.8	250	12
5203-tbe-0n0500	ø125	3.2	3.8	500	10
5203-tbe-0n1000	ø125	3.2	3.8	1000	2
5203-tbe-0n2000	ø125	3.2	3.8	2000	2
5203-tbe-0n3000	ø125	3.2	3.8	3000	2
5203-tbe-0n6000	ø125	3.2	3.8	6000	1
5203-tbe-0p0150	ø160	3.2	3.8	150	10
5203-tbe-0p0250	ø160	3.2	3.8	250	8
5203-tbe-0p0500	ø160	3.2	3.8	500	6
5203-tbe-0p1000	ø160	3.2	3.8	1000	2
5203-tbe-0p2000	ø160	3.2	3.8	2000	2
5203-tbe-0p3000	ø160	3.2	3.8	3000	2
5203-tbe-0p6000	ø160	3.2	3.8	6000	1



PVC-U Pipe / Type B

Code	Size	e. min.	e. max.	L	Pcs.
5203-tbe-0r0150	ø200	3.9	4.5	150	6
5203-tbe-0r0250	ø200	3.9	4.5	250	4
5203-tbe-0r0500	ø200	3.9	4.5	500	4
5203-tbe-0r1000	ø200	3.9	4.5	1000	2
5203-tbe-0r2000	ø200	3.9	4.5	2000	2
5203-tbe-0r3000	ø200	3.9	4.5	3000	2
5203-tbe-0r6000	ø200	3.9	4.5	6000	1
5203-tbe-0s0150	ø250	4.9	5.6	150	4
5203-tbe-0s0250	ø250	4.9	5.6	250	3
5203-tbe-0s0500	ø250	4.9	5.6	500	3
5203-tbe-0s1000	ø250	4.9	5.6	1000	1
5203-tbe-0s2000	ø250	4.9	5.6	2000	1
5203-tbe-0s3000	ø250	4.9	5.6	3000	1
5203-tbe-0s6000	ø250	4.9	5.6	4000	1



PVC-U Pipe / Type BD

Code	Size	e. min.	e. max.	L	Pcs.
5203-tbd-0p0150	ø160	4.0	4.6	150	10
5203-tbd-0p0250	ø160	4.0	4.6	250	8
5203-tbd-0p0500	ø160	4.0	4.6	500	6
5203-tbd-0p1000	ø160	4.0	4.6	1000	2
5203-tbd-0p2000	ø160	4.0	4.6	2000	2
5203-tbd-0p3000	ø160	4.0	4.6	3000	2
5203-tbd-0p6000	ø160	4.0	4.6	6000	1
5203-tbd-0r0150	ø200	4.9	5.6	150	6
5203-tbd-0r0250	ø200	4.9	5.6	250	4
5203-tbd-0r0500	ø200	4.9	5.6	500	4
5203-tbd-0r1000	ø200	4.9	5.6	1000	2
5203-tbd-0r2000	ø200	4.9	5.6	2000	2
5203-tbd-0r3000	ø200	4.9	5.6	3000	2
5203-tbd-0r6000	ø200	4.9	5.6	6000	1
5203-tbd-0s0150	ø250	6.2	7.1	150	4
5203-tbd-0s0250	ø250	6.2	7.1	250	3
5203-tbd-0s0500	ø250	6.2	7.1	500	3
5203-tbd-0s1000	ø250	6.2	7.1	1000	1
5203-tbd-0s2000	ø250	6.2	7.1	2000	1
5203-tbd-0s3000	ø250	6.2	7.1	3000	1
5203-tbd-0s6000	ø250	6.2	7.1	6000	1



2.2 Waste Water Pipe System



Sedef PVC-U Pipe

Code	Size	e. min.	e. max	L	Pcs.
6203-tbs-0k0150	ø50	2.2		150	100
6203-tbs-0k0250	ø50	2.2		250	80
6203-tbs-0k0500	ø50	2.2		500	50
6203-tbs-0k1000	ø50	2.2		1000	10
6203-tbs-0k2000	ø50	2.2		2000	10
6203-tbs-0k3000	ø50	2.2		3000	10
6203-tbs-0k6000	ø50	2.2		6000	5
6203-tbs-0l0150	ø75	2.2		150	40
6203-tbs-0l0250	ø75	2.2		250	35
6203-tbs-0l0500	ø75	2.2		500	30
6203-tbs-0l1000	ø75	2.2		1000	5
6203-tbs-0l2000	ø75	2.2		2000	5
6203-tbs-0l3000	ø75	2.2		3000	5
6203-tbs-0l6000	ø75	2.2		6000	5
6203-tbs-0m0150	ø110	2.2		150	25
6203-tbs-0m0250	ø110	2.2		250	15
6203-tbs-0m0500	ø110	2.2		500	14
6203-tbs-0m1000	ø110	2.2		1000	5
6203-tbs-0m2000	ø110	2.2		2000	5
6203-tbs-0m3000	ø110	2.2		3000	5
6203-tbs-0m6000	ø110	2.2		6000	5
6203-tbs-0n0150	ø125	2.2		150	15
6203-tbs-0n0250	ø125	2.2		250	12
6203-tbs-0n0500	ø125	2.2		500	10
6203-tbs-0n1000	ø125	2.2		1000	5
6203-tbs-0n2000	ø125	2.2		2000	5
6203-tbs-0n3000	ø125	2.2		3000	5
6203-tbs-0n6000	ø125	2.2		6000	5



PVC-U Elbow 87°

Code	Size	e. min.	Pcs.
5213-elb-0k0087	ø50	3.0	150
5213-elb-0l0087	ø75	3.0	75
5213-elb-0m0087	ø110	3.2	25
5213-elb-0n0087	ø125	3.2	15
5213-elb-0p0087	ø160	4.0	10
5213-elb-0r0087	ø200	3.9	4
5213-elb-0s0087	ø250	4.9	2



PVC-U Elbow 45°

Code	Size	e. min.	Pcs.
5213-elb-0k0045	ø50	3.0	200
5213-elb-0l0045	ø75	3.0	75
5213-elb-0m0045	ø110	3.2	30
5213-elb-0n0045	ø125	3.2	20
5213-elb-0p0045	ø160	4.0	10
5213-elb-0r0045	ø200	3.9	5
5213-elb-0s0045	ø250	4.9	3



PVC-U Double Branch 45°

Code	Size	e. min.	Pcs.
5213-dbr-0k0k45	ø50/50	3.0	60
5213-dbr-0l0k45	ø75/50	3.0	20
5213-dbr-0l0l45	ø75/75	3.0	20
5213-dbr-0m0k45	ø110/50	3.2	20
5213-dbr-0m0l45	ø110/75	3.2	10
5213-dbr-0m0m45	ø110/110	3.2	8
5213-dbr-0n0k45	ø125/50	3.2	15
5213-dbr-0n0l45	ø125/75	3.2	10
5213-dbr-0n0m45	ø125/110	3.2	6
5213-dbr-0n0n45	ø125/125	3.2	5
5213-dbr-0p0k45	ø160/50	4.0	5
5213-dbr-0p0l45	ø160/75	4.0	5
5213-dbr-0p0m45	ø160/110	4.0	4
5213-dbr-0p0n45	ø160/125	4.0	4
5213-dbr-0p0p45	ø160/160	4.0	4
5213-dbr-0r0k45	ø200/50	3.9	3
5213-dbr-0r0l45	ø200/75	3.9	3
5213-dbr-0r0m45	ø200/110	3.9	3
5213-dbr-0r0n45	ø200/125	3.9	3
5213-dbr-0r0p45	ø200/160	3.9	3
5213-dbr-0r0r45	ø200/200	3.9	3
5213-dbr-0s0m45	ø250/110	4.9	3
5213-dbr-0s0n45	ø250/125	4.9	3
5213-dbr-0s0p45	ø250/160	4.9	3
5213-dbr-0s0r45	ø250/200	4.9	3
5213-dbr-0s0s45	ø250/250	4.9	3



PVC-U Double Branch 87°

Code	Size	e. min.	Pcs.
5213-dbr-0m0m87	ø110/110	3.2	8



PVC-U Single Branch 45°

Code	Size	e. min.	Pcs.
5213-sbr-0k0k45	ø50/50	3.0	80
5213-sbr-0l0k45	ø75/50	3.0	50
5213-sbr-0l0l45	ø75/75	3.2	20
5213-sbr-0m0k45	ø110/50	3.2	15
5213-sbr-0m0l45	ø110/75	3.2	15
5213-sbr-0m0m45	ø110/110	3.2	10
5213-sbr-0n0k45	ø125/50	3.2	15
5213-sbr-0n0l45	ø125/75	3.2	10
5213-sbr-0n0m45	ø125/110	3.2	10
5213-sbr-0n0n45	ø125/125	3.2	8
5213-sbr-0p0k45	ø160/50	4.0	8
5213-sbr-0p0l45	ø160/75	4.0	8
5213-sbr-0p0m45	ø160/110	4.0	6
5213-sbr-0p0n45	ø160/125	4.0	5
5213-sbr-0p0p45	ø160/160	4.0	4
5213-sbr-0r0k45	ø200/50	3.9	5
5213-sbr-0r0l45	ø200/75	3.9	5
5213-sbr-0r0m45	ø200/110	3.9	4
5213-sbr-0r0n45	ø200/125	3.9	4
5213-sbr-0r0p45	ø200/160	3.9	4
5213-sbr-0r0r45	ø200/200	3.9	4
5213-sbr-0s0k45	ø250/50	4.9	3
5213-sbr-0s0l45	ø250/75	4.9	3
5213-sbr-0s0m45	ø250/110	4.9	3
5213-sbr-0s0n45	ø250/125	4.9	3
5213-sbr-0s0p45	ø250/160	4.9	3
5213-sbr-0s0r45	ø250/200	4.9	3
5213-sbr-0s0s45	ø250/250	4.9	3



PVC-U Sngle Branch 87°

Code	Size	e. min.	Pcs.
5213-sbr-0k0k87	ø50 x 50	3.0	100
5213-sbr-0l0k87	ø75 x 50	3.0	30
5213-sbr-0l0l87	ø75 x 75	3.0	20
5213-sbr-0m0k87	ø110 x 50	3.2	15
5213-sbr-0m0l87	ø110 x 75	3.2	20
5213-sbr-0m0m87	ø110 x 110	3.2	15
5213-sbr-0n0k87	ø125 x 50	3.2	10
5213-sbr-0n0l87	ø125 x 75	3.2	15
5213-sbr-0n0m87	ø125 x 110	3.2	10
5213-sbr-0n0n87	ø125 x 125	3.2	10
5213-sbr-0p0k87	ø160 x 50	4.0	10
5213-sbr-0p0l87	ø160 x 75	4.0	8
5213-sbr-0p0m87	ø160 x 110	4.0	6
5213-sbr-0p0n87	ø160 x 125	4.0	6
5213-sbr-0p0p87	ø160 x 160	4.0	5
5213-sbr-0r0m87	ø200 x 110	3.9	6
5213-sbr-0r0n87	ø200 x 125	3.9	4
5213-sbr-0r0p87	ø200 x 160	3.9	4
5213-sbr-0r0r87	ø200 x 200	3.9	4
5213-sbr-0s0m87	ø250 x 110	4.9	3
5213-sbr-0s0n87	ø250 x 125	4.9	3
5213-sbr-0s0p87	ø250 x 160	4.9	3
5213-sbr-0s0r87	ø250 x 200	4.9	3
5213-sbr-0s0s87	ø250 x 250	4.9	3



PVC-U Reduction

Code	Size	e. min.	Pcs.
5213-rdc-0l0k00	75/50	3.0	100
5213-rdc-0m0k00	110/50	3.2	60
5213-rdc-0m0l00	110/75	3.2	60
5213-rdc-0n0l00	125/75	3.2	40
5213-rdc-0n0m00	125/110	3.2	30
5213-rdc-0p0l00	160/75	4.0	25
5213-rdc-0p0m00	160/110	4.0	25
5213-rdc-0p0n00	160/125	4.0	25
5213-rdc-0r0m00	200/110	3.9	15
5213-rdc-0r0n00	200/125	3.9	15
5213-rdc-0r0p00	200/160	3.9	15
5213-rdc-0s0m00	250/110	4.9	10
5213-rdc-0s0n00	250/125	4.9	10
5213-rdc-0s0p00	250/160	4.9	10
5213-rdc-0s0r00	250/200	4.9	10



PVC-U Sliding Coupling

Code	Size	e. min.	Pcs.
5213-soc-0k0000	ø50	3.0	200
5213-soc-0l0000	ø75	3.0	100
5213-soc-0m0000	ø110	3.2	30
5213-soc-0n0000	ø125	3.2	25
5213-soc-0p0000	ø160	4.0	10
5213-soc-0r0000	ø200	3.9	8



PVC-U S

Code	Size	e. min.	Pcs.
5213-spi-0l0045	ø75	3.0	25
5213-spi-0m0045	ø110	3.2	10
5213-spi-0l0087	ø75	3.0	25
5213-spi-0m0087	ø110	3.2	10



PVC-U Check Valve

Code	Size	Pcs.
5213-cvl-0m0000	ø110	1
5213-cvl-0n0000	ø125	1
5213-cvl-0p0000	ø160	1
5213-cvl-0r0000	ø200	1



PVC-U Cleaning Part

Code	Size	e. min.	Pcs.
5213-clp-0l0000	ø75	3.0	25
5213-clp-0m0000	ø110	3.2	15
5213-clp-0n0000	ø125	3.2	10
5213-clp-0p0000	ø160	4.0	5
5213-clp-0r0000	ø200	3.9	5
5213-clp-0r0000	ø200		4



PVC-U Cleaning Elbow 87°

Code	Size	e. min.	Pcs.
5213-elp-0m0000	ø110	3.2	15



Kada

Code	Size	e. min.	Pcs.
5213-cad-0m0000	ø110	3.2	100



Stopend

Code	Size	e. min.	Pcs.
5213-ste-0k0000	ø50	3.0	500
5213-ste-0l0000	ø75	3.0	400
5213-ste-0m0000	ø110	3.2	150
5213-ste-0n0000	ø125	3.2	100
5213-ste-0p0000	ø160	3.2	80
5213-ste-0r0000	ø200	3.9	30
5213-ste-0s0000	ø250	4.9	10



PVC-U Air Chimney

Code	Size	e. min.	Pcs.
5213-arh-0l00000	ø75	3.0	30
5213-arh-0m0000	ø110	3.2	18



Clamp

Code	Size	Pcs.
5213-bcc-0k0000	ø50	500
5213-bcc-0l0000	ø75	200
5213-bcc-0m0000	ø110	100
5213-bcc-0n0000	ø125	100
5213-bcc-0p0000	ø160	50
5213-bcc-0r0000	ø200	40



Adapter Joint

Code	Size	Pcs.
5213-arj-0k0000	ø50	200



Joint

Code	Size	e. min.	e. max	Pcs.
5213-rur-0k0000	ø50	6.5	3.5	7000
5213-rur-0l0000	ø75	6.5	4.0	5000
5213-rur-0m0000	ø110	7.9	4.0	2500
5213-rur-0n0000	ø125	8.9	4.5	2000
5213-rur-0p0000	ø160	10.2	4.8	1000
5213-rur-0r0000	ø200	11.2	6.5	700
5213-rur-0s0000	ø250	15.2	10.5	250



PVC-U SYSTEMS

3.2 Waste Water Systems / Roof Gutter and Fittings

Rain Gutter Rectangular

Code	Size	e. min.	L	Pcs.
7203-dre-150000	150	2.2	4000	5



Rain Gutter

Code	Size	e. min.	L	Pcs.
8203-drr-100000	100	2.2	4000	5



Rain Gutter- Corner In

Code	Size	e. min.	Pcs.
8213-der-100001	100	2.2	30



Rain Gutter- Corner Out

Code	Size	e. min.	Pcs.
8213-der-100002	100	2.2	30



Rectangular Rain Gutter

Code	Size	e. min.	Pcs.
7213-ddr-150750	150 x 75	3.2	20
7213-ddr-150110	150 x 110	3.2	20



Rain Gutter Rectangular-Down Piece Rectangular

Code	Size	e. min.	Pcs.
7213-dde-150750	150 x 75	3.2	20



Rain Gutter Rectangular- Corner Piece

Code	Size	e. min.	Pcs.
7213-der-150000	150	3.2	30



Round Rain Gutter

Code	Size	e. min.	Pcs.
8213-ddr-100750	100 x 75	2.2	30



Round Corner Piece (Inside)

Code	Size	e. min.	Pcs.
8213-muf-100000	100	2.2	200



Rectangular Connection Piece

Code	Size	e. min.	Pcs.
7213-muf-150000	150	3.2	60



Rectangular Blanking Cab

Code	Size	e. min.	Pcs.
7213-ste-150000	150	3.2	120



Round Blanking Cab

Code	Size	e. min.	Pcs.
8213-ste-100000	100	2.2	400



Rectangular Bracket

Code	Size	e. min.	Pcs.
7213-bcc-150000	150	3.2	100



Round Bracket

Code	Size	e. min.	Pcs.
8213-bcc-150000	150	2.2	100



PVC-U SYSTEMS

Rectangular Rain Gutter

Code	Size	e. min.	L	Pcs.
7203-tbe-011000	100 x 70	2.2	1000	6
7203-tbe-012000	100 x 70	2.2	2000	6
7203-tbe-013000	100 x 70	2.2	3000	4



Rectangular Down Elbow 45°

Code	Size	e. min.	Pcs.
7213-elb-010000	100 x 70	2.2	50



Rectangular Single Branch

Code	Size	e. min.	L	Pcs.
7213-sbr-010k00	100 x 70	2.2	50	50



Rectangular Double Branch

Code	Size	e. min.	L	Pcs.
7213-dbr-010k00	100 x 70	2.2	50	35



Rectangular Connection Piece

Code	Size	e. min.	L	Pcs.
7213-muf-010000	100 x 70	2.2	50	100



Rectangular Bracelet With Lock

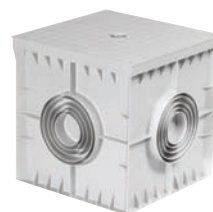
Code	Size	e. min.	Pcs.
7213-bcc-010000	100 x 70	3.2	100



Manhole Boxes And Covers

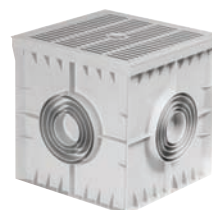
Manhole Box And Cover - Flat

Code	Size	Pcs.
9213-set-202000	20 x 20 x 20	1
9213-set-303000	30 x 30 x 30	1
9213-set-404000	40 x 40 x 40	1
9213-set-555500	55 x 55 x 50	1



Manhole Box And Cover - Grid

Code	Size	Pcs.
9213-set-202001	20 x 20 x 20	1
9213-set-303001	30 x 30 x 30	1
9213-set-404001	40 x 40 x 40	1
9213-set-555501	55 x 55 x 50	1



Manhole Box Cover - Flat

Code	Size	Pcs.
9213-kpk-202000	20 x 20 x 3	1
9213-kpk-303000	30 x 30 x 4	1
9213-kpk-404000	40 x 40 x 4,5	1
9213-kpk-555500	55 x 55 x 6,5	1



Manhole Box Cover - Grid

Code	Size	Pcs.
9213-kpk-202001	20 x 20 x 3	1
9213-kpk-303001	30 x 30 x 4	1
9213-kpk-404001	40 x 40 x 4,5	1
9213-kpk-555501	55 x 55 x 6,5	1







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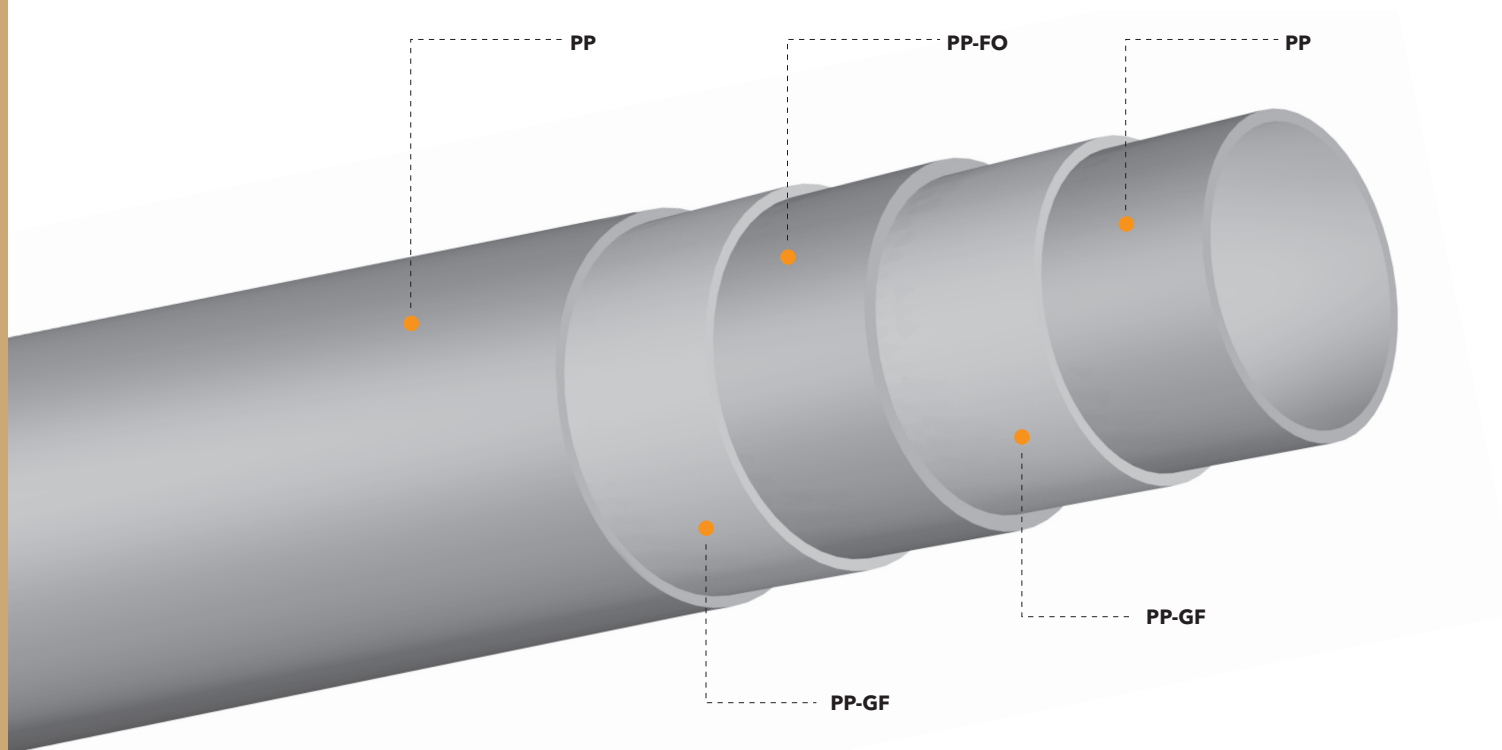
Kalde-SuperMUTE PP/PP-GF/PP-FO/PP-GF/PP 5-Layer Waste Water Pipe

Raw Material and Technical Specifications

- Pipe Type: PP-r foam reinforced.
- Color: Gray (RAL 7040)
- Length: 250 - 500 - 1000 - 2000 - 3000 cm.
- Coefficient of Expansion: 0.062 mm/mK°
- Density: 0.74 gr/cm³

Standards

- 0 58 - 160 mm.
- Fire Class: DIN 4102-B2
- Advantages: Lightweight, flexible, low coefficient of expansion, resistant to chemicals, high temperature resistant.



Pipe Dimensions

Size	Nominal Diameter	Outer Diameter		Pipe Wall Thickness	
DN / OD	dn	Minimum	Maximum	S, min	S, max
58	58	58	58.5	4.0	4.4
78	78	78	78.5	4.5	4.9
110	110	110	110.5	5.3	5.8
125	125	125	125.5	5.3	5.8
160	160	160	160.5	5.3	5.8

Soundproofing values as per DIN 4109

Waste Water System "Kalde-SuperMUTE PP/ PP-FO/PP 110 x 5,3 " Bismat 1000" pipe clamps;					
Water Flow Rate (l/s)		0.5	1.0	2.0	4.0
Application Sound Level L in (db (A)) ground floor test room UG rear 1)		5	5	7	11
Structure-borne characteristic sound level L _{sc,a} (db (A) ₂)		19	18	21	23

1) Assessment as per DIN 4109

2) Assessment as per EN 14366

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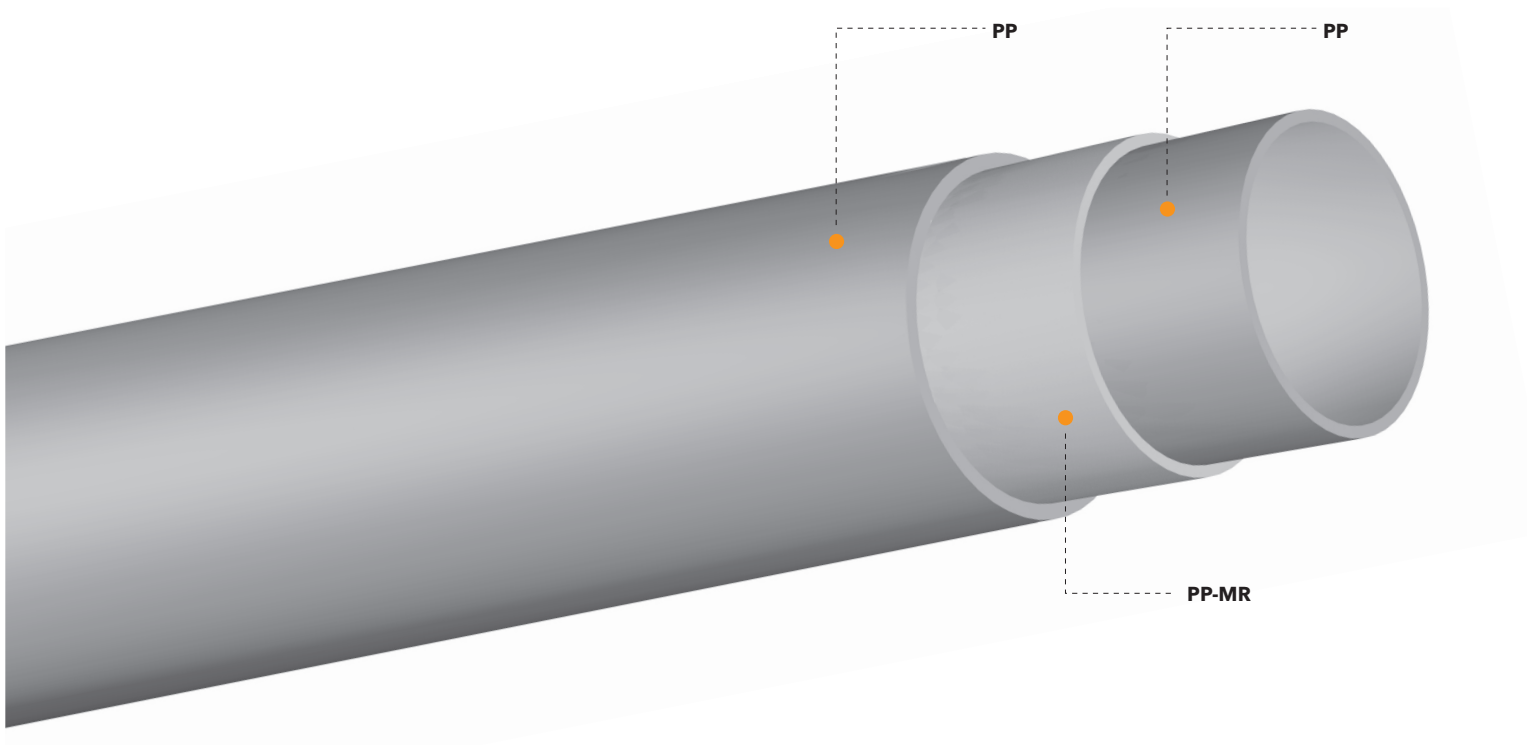
Kalde-SuperMUTE PP/PP-MR/PP 3-Layer Waste Water Pipe

Raw Material and Technical Specifications

- Pipe Type: PP-r mineral reinforced.
- Color: Gray (RAL 7040)
- Length: 250 - 500 - 1000 - 2000 - 3000 cm.
- Coefficient of Expansion: 0.09 mm/mK°
- Density: 1.4-1.5 gr/cm³

Standards

- 0 58 - 160 mm.
- Fire Class: DIN 4102-B2
- Advantages: Flexible, low coefficient of expansion, resistant to chemicals, high temperature resistant.



Pipe Dimensions

Size	Nominal Diameter	Outer Diameter		Pipe Wall Thickness	
DN / OD	dn	Minimum	Maximum	S, min	S, max
58	58	58	58.5	4.0	4.4
78	78	78	78.5	4.5	4.9
110	110	110	110.5	5.3	5.8
125	125	125	125.5	5.3	5.8
160	160	160	160.5	5.3	5.8

Soundproofing values as per DIN 4109

Waste Water System "Kalde-SuperMUTE PP/ PP-MR/PP 110 x 5,3 " Bismat 1000" pipe clamps;					
Water Flow Rate (l/s)	0.5	1.0	2.0	4.0	
Application Sound Level L in (db (A)) ground floor test room UG rear 1)	3	5	7	11	
Structure-borne characteristic sound level L _{sc,a} (db (A) ₂)	12	13	14	16	

1) Assessment as per DIN 4109

2) Assessment as per EN 14366

Acoustics

Sound is defined as the mechanical vibrations in gas (lightning), liquid and solid (bell, pipe wall, glass, wall, ceiling) materials perceived by the eardrum.

The human ear can hear sounds with a frequency between 20 Hz (very low tone) and about 20000 Hz (very high tone).

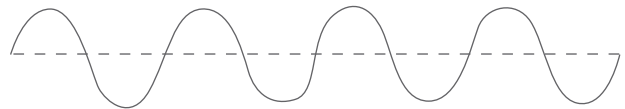
Sounds with a frequency higher than 20000 Hz are defined as ultra sound.

The sound and noise in the environment can have different effects on a person depending on the mood and activities of that person; it can affect work performance and concentration, interrupt rest and sleep and even cause health problems in case of continued exposure.

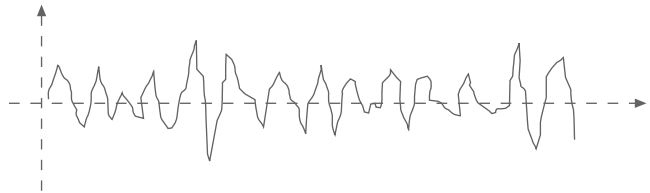
The noise in buildings might be caused by the outer environment, traffic, industry, people, in-house technical installations, elevators, audio systems, kitchen appliances, hot water, clean water and waste water installations.

Various Sounds;

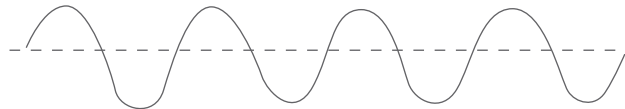
a) Rhythmic Sound



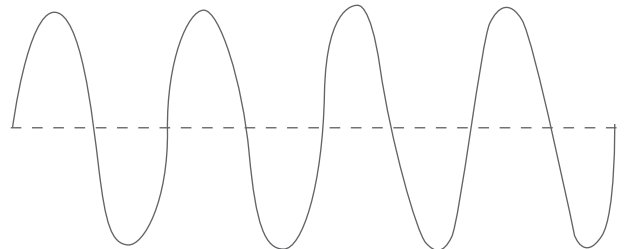
b) Noisy Sound



c) Low Amplitude Sound



d) High Amplitude Sound



a) Howling Sound



b) Water Sound



c) Pounding Sound



d) Walking Sound

a) Howling Sound: Travels through air at a speed of 340 m/s.

b) Water Sound: Occurs in water and similar liquids.

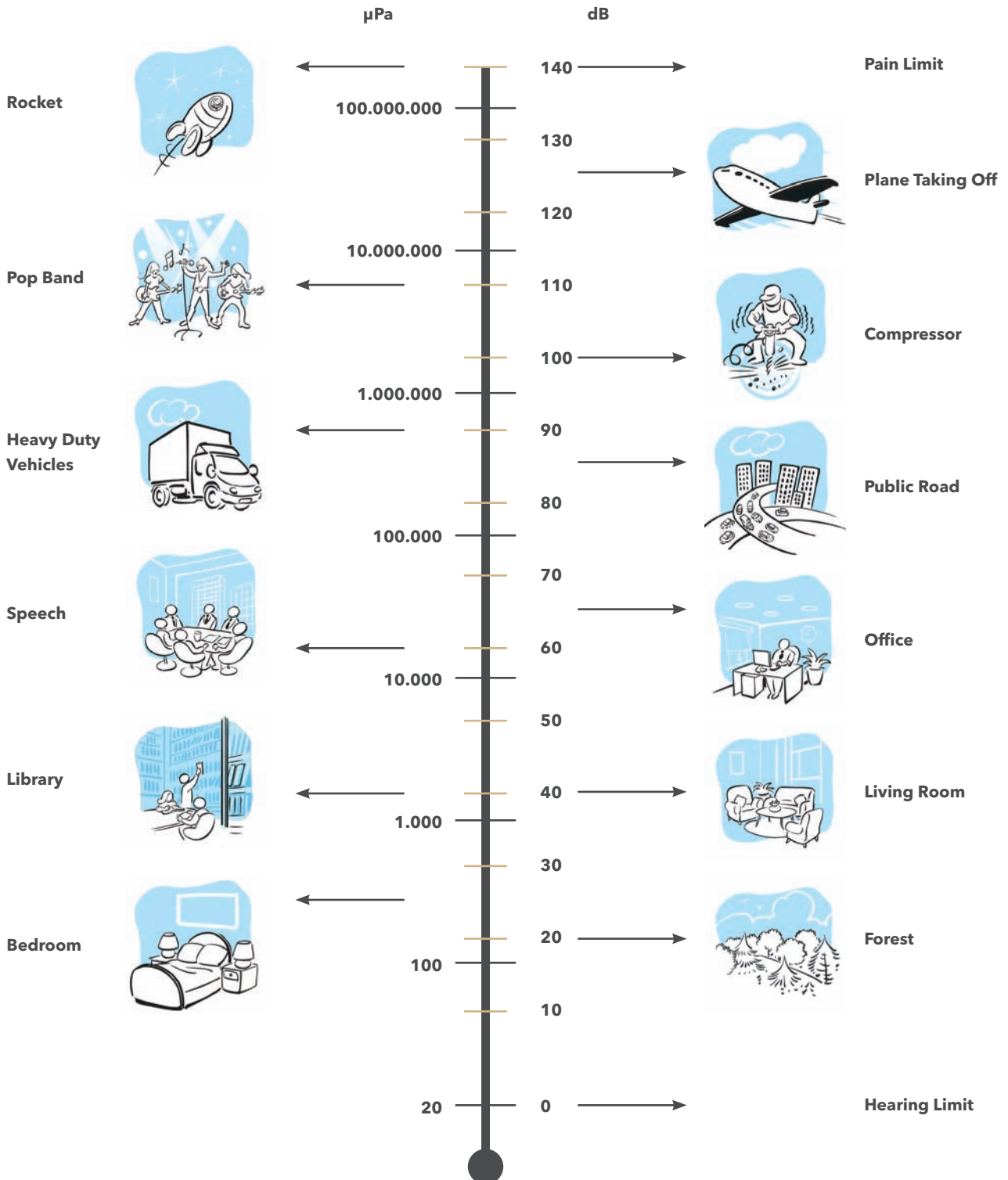
c) Pounding Sound: Travels in solid materials at a speed of 5000 m/s in steel, 4000 m/s in concrete, 500 m/s in foam, etc.

d) Walking sound: It is a special form of contact sound. It occurs when one walks on the floor. It is transmitted partly as contact sound and partly as humming sound.

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- **Tone** is defined as audible humming sounds comprising of continuous vibrations with a single frequency.
- **Harmonic sound** is multiple tones waving together harmonically.
- **Sound** is multiple non harmonic tones.
- **Noise** is a disturbing mixture of tones, harmonic sounds and sound.

Sound Pressure Unit;



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Sound travels as waves and creates a sound pressure.

Sound pressure (p) is transformation into humming of the sound waves created in gases or water as variable pressures.

Sound pressure ($1 \mu\text{bar} = 1/1.000.000 \text{ bar}$). The human ear can hear sounds between $2/10.000 \mu\text{bar} = 2 \cdot 10^{-4} \mu\text{bar}$ (lower hearing limit) and $200 \mu\text{bar} = 2 \cdot 10^2 \mu\text{bar}$

(pain limit). A logarithmic scale is used for measuring the sound pressure and the sound pressure level is expressed in LP decibel (dB).

The reference sound pressure level is 20 micropascals (μbar).

The hearing limit pressure is $0.0002 \mu\text{bar}$ 0 dB while the pain limit pressure is $200 \mu\text{bar}$ 120 dB (at $f = 1000 \text{ Hz}$). (sound pressure unit)

An increase of 10 dB in the sound pressure level means that the sound has doubled.

The addition of another sound source at the same level increases the sound pressure level **3 dB only**.

For instance: two machines producing 50 dB of sound each cause a sound pressure level as follows: **50 dB + 50 dB = 53 dB**.

Sound Pressure Levels of Various Sounds, Sound Pressure Level in L db (A)	Sound
10	Audible sound, ticking of a watch
15 - 20	Considered silence, silence of a forest at night
25 - 30	Whisper (in a reading room)
40	Quiet conversation, quiet chat
50 - 60	Normal chat among people
60 - 65	Vacuum cleaner, shopping center noise, noisy office
70 - 75	Average street noise
80	Loud shouting, scream, sound level in a metro station
80 - 90	Truck passing by at a distance of 1 meter
90 - 100	Chainsaw, train passing by at a short distance
100 - 110	Lightning, motorcycle without muffler
110 - 120	Plane Engine at 3 meters
120 - 130	Jet Engine

Noise Management in Waste Water Installation

Taking measures to prevent outside noise from entering into the buildings where people live is equally important with taking measures against the noises to occur in the building. Due to the importance of this matter, various standards were introduced.

Particularly DIN 4109 (GERMANY) and ÖNORM 8115 (AUSTRIA) standards require that specific measures are taken in various buildings against all sorts of noise to ensure acoustical comfort of people.

The maximum values for the installation noise provided for in DIN 4109 are given in the table below and the noise level for the clean and waste water installations was determined as 35dB max.

Noise Source	The maximum sound pressure levels allowed in the buildings requiring sound insulation as per DIN 4109/VDI 4100 (db)		
	Stages of Noise		
	Stage 1 Standard Buildings	Stage 2 Qualified Buildings	Stage 3 Luxurious Buildings
Water installation			
Clean Water and Waste Water installations together	35 ^{1) 2)}	30 ^{1) 2)}	25 ^{1) 2)}
Other technical installations	30 ^{1) 2)}	30 ^{1) 2)}	25 ^{1) 2)}

1- Individual loud sounds with short duration during opening, closing, adjusting taps and faucets are not taken into account.

2- Unnoticed continuous sounds from ventilation system are allowed up to 5dB of extra.

Waste water installation is an integral part of buildings and the noise from such installations is inevitable.

The noise level can be decreased considerably with various measures to be taken.

Main Factors Causing Noise:

- The type of the building materials used (heavy or light).
- The quality of labor in the building and installation applications.
- The type of materials used in the waste water installation.
- The connections of the waste water installation with the main structure.
- The operating conditions and the manner of use by the user.

The noise sources in the waste water installation are the hardware such as the bathtub, shower, closet, washbasin, etc. and the noise if formed by the water from these sources flowing through the pipes and fittings (elbow, t-piece, etc.).

Furthermore, if the connection of the installation with the main structure was made without sound insulation, these noises are transmitted to the main structure via the fittings.

As it is known, solid materials transmit sound better than air and water.

Sources of Noise in the Waste Water Installation and the Installation Systems Transmitting Noise (Figure 3)

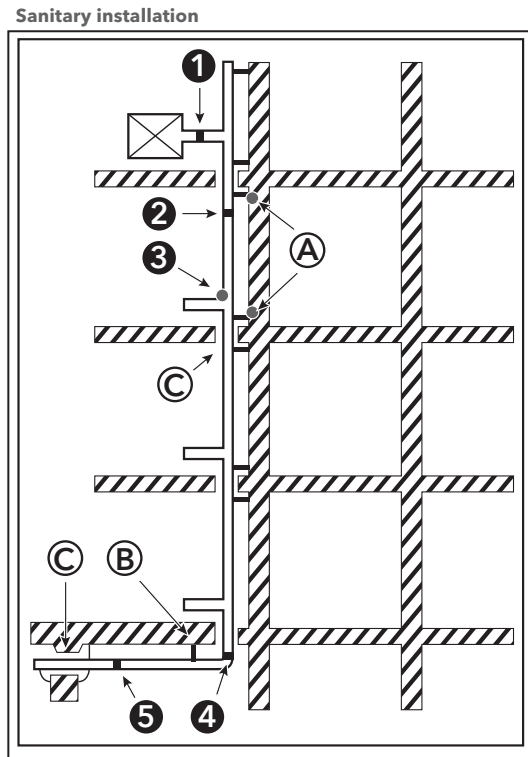


Figure 3

Transmission of noise to the neighboring locations

- A Fixation of the vertical pipes to the walls
- B Fixation of the horizontal pipes to the ceilings
- C Passage of the pipes through flooring and walls

Noise sources

- 1 Sanitary installation (closet, bath, tub...)
- 2 Noises from the flows in the vertical pipes
- 3 Locations such as elbows, corners, etc. where the continuity is spoilt
- 4 Noises caused by change of direction
- 5 Noises from the flows in the horizontal pipes

Locations of Noise in the Waste Water Installations (Figure 4)

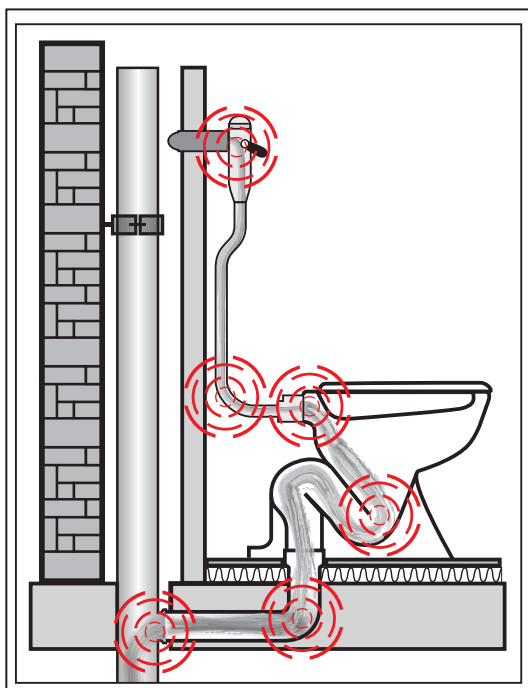


Figure 4

The water from the upper floors cause air sound directly on the walls of the pipes depending on the amount and speed of the water while flowing downwards from the vertical columns. Also, the mass effect sound is transmitted to the neighboring locations via the fittings, walls and flooring. The fittings such as the elbows, t-pieces, etc. which change the direction of flow cause the existing sound to increase. This also applies to horizontal pipe systems and the sound is transmitted to the neighboring locations in the same manner.

In order to prevent the air sound from being dispersed, either high density pipes and fittings should be used or sound insulation materials should be used for the installation.

Since the use of heavy materials lead to detailing and installing challenges, use of lightweight and sound absorbing materials should be preferred.

Kalde-SuperMUTE Pipes and Fittings are the First Choice Thanks to Their Low Weight and Sound Absorbing Features.

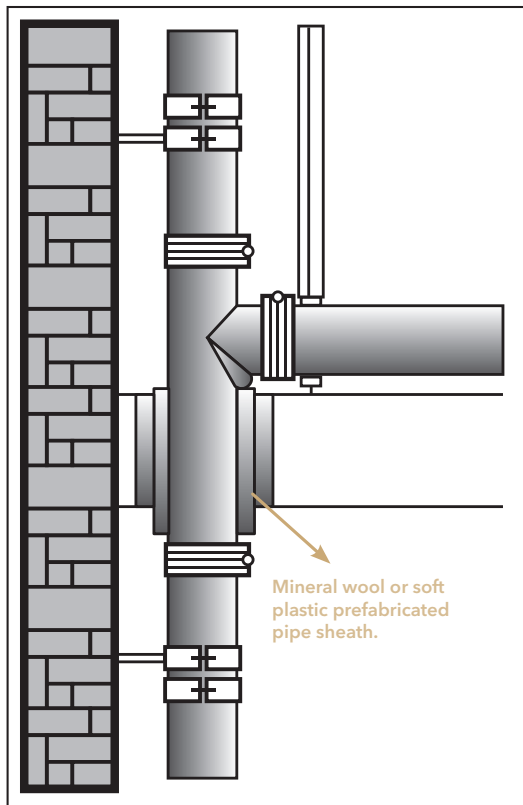


Figure 5

In order to prevent transmission of sound caused by the mass effect, a flexible material which has sound absorbing and pressure resisting features and stops direct contact should be placed between the materials contacting each other.

Sound Absorbing Sheath and Flexible Material Reinforced Clamps Preventing the Mass Sound from Being Transmitted to the Main Structure. (Figure 5)

The flexible material mentioned here is not rubber, it is mineral fibre materials such as glass wool, rock wool, etc. and polyethylene or rubber based foam materials. The materials in this category are usually referred to as flex materials.

The flex materials with low dynamic hardness don't transmit sound but absorb it. On the other hand, rubber has a very high dynamic hardness and it transmits sound.

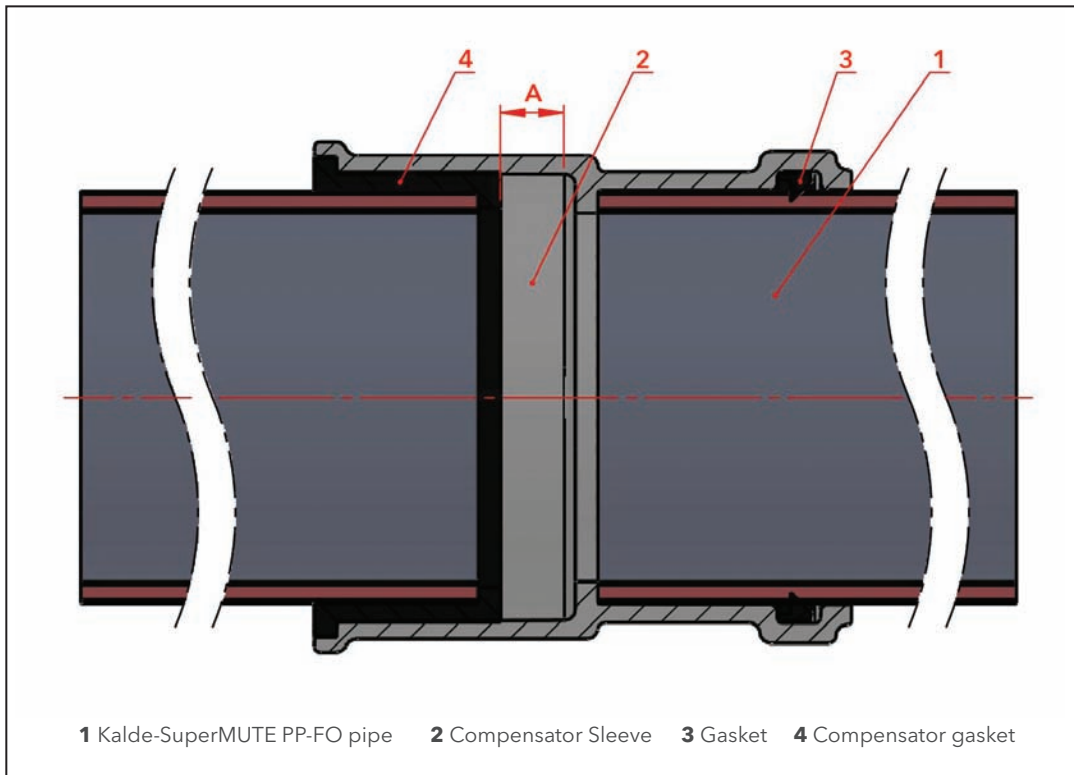
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Compensator Coupling

Compensator sleeve is a type of fitting which connects the pipes without sockets and the fittings (elbow, t-piece, etc.) used in waste water installations. Leaving a gap as much as the distance A ($A > 10$ mm.) between the pipe and the fitting, it absorbs the dimensional changes to occur in the waste water installation due to thermal expansions thanks to a special compensator gasket.

In the traditional installations, this gap was formed by retracting the pipe but this is not a safe method.

Kalde-SuperMUTE compensator sleeve makes this possible and the waste water installation safe thanks to the special compensator gasket.



Installation Instructions for Kalde-SuperMUTE Pipe

The following instructions should be followed during installation with the compensator sleeve.

- Clean the pipe end and the sleeve end.
- Insert the compensator gasket to the end of the cleaned pipe and make sure that the pipe end fits snugly into the bead at the end of the compensator gasket.
- Lubricate or apply liquid soap on the outer surface of the compensator gasket and the slot where the fittings will fit.
- Join the pipe and the compensator sleeve. Make sure that the outer bead of the compensator sleeve fits snugly into the slot in the sleeve.

Connecting the Pipes

Kalde-SuperMUTE pipes should be installed taking into account the expansion of the pipes.

- For the horizontal pipes, the distance between the pipe clamps should be 10 times the average pipe diameter.
- For the vertical pipes, the distance between the pipe clamps should be about 1.5 meters. The maximum distance shouldn't exceed 2 meters. **(Figure 6)**
- The connection of vertical pipe lines for floors higher than 2.5 meters should be made with a wall-mounted clamp and a free clamp. **(Figure 7)**
- The wall-mounted clamps should be placed directly on the fitting at the lower ends of the pipes without sockets. **(Figure 8)**

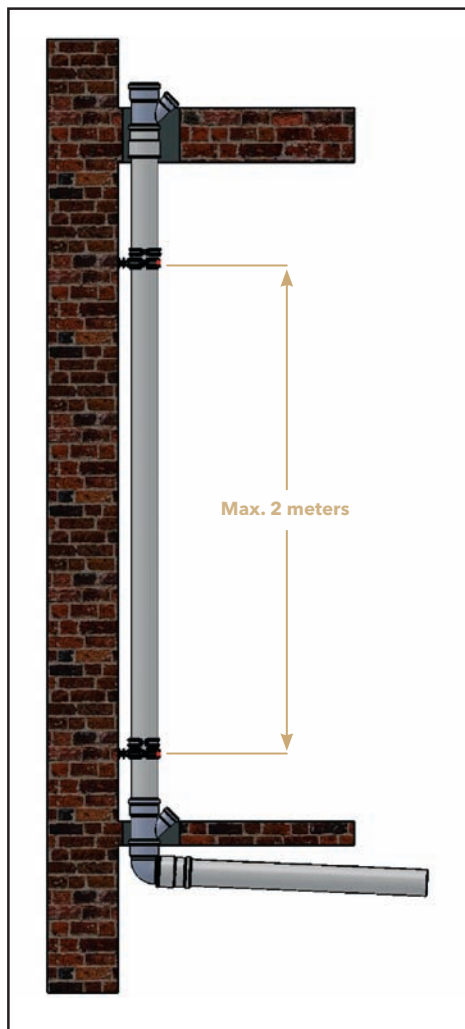


Figure 6

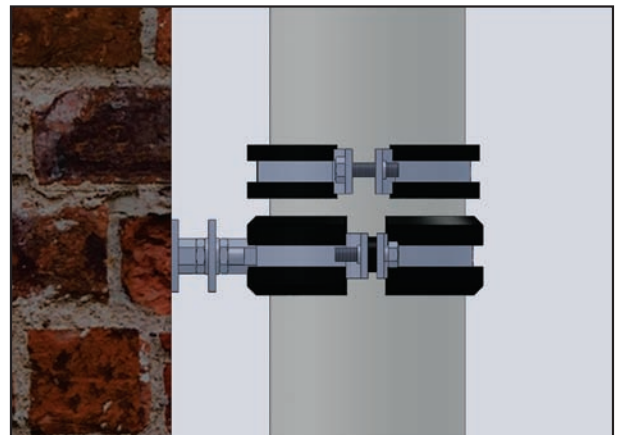


Figure 7

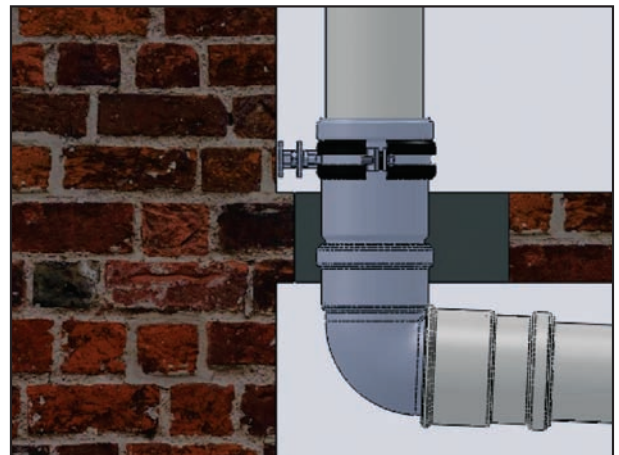


Figure 8

Installing and Storing

Matters to Take into Account While Installing Kalde-SuperMUTE PP Waste Water Pipes

- 1- Kalde-SuperMUTE waste water pipes should be protected against impacts such as striking, hitting, etc. Since the fragility of the pipes increases where the temperature is near 0 °C, this becomes more important.
- 2- Insulation should be made to prevent heat and humidity transmission at the floor and ceiling passages.
- 3- Works causing scratches, cuts or marks on Kalde-SuperMUTE pipes and fittings should be avoided. For the pipes installed vertically, once the pipes are joined with fittings, they should immediately be fixed with clamps.
- 4- During the installation, a small amount of liquid soap or grease should be applied on the gaskets to join Kalde-SuperMUTE pipes and fittings easily.
- 5- Kalde-SuperMUTE pipes and fittings shouldn't be joined without gaskets.
- 6- Kalde-SuperMUTE pipes which will be covered with screed should be tested with one of the methods below before the screed is poured.

AS 2032

Water Test

The pipe line to be tested should be filled with water at a level not less than 1 meter below the ground.

The mechanism should be tested from the top but the height of this top point shouldn't exceed 5 meters from the bottom level.

In order for the test to be completed successfully, the water level should be retained for at least 15 minutes.

All joining points should be checked against leaks and any defects should be repaired and then the test should be repeated.

Air Test

Air is applied to the pipe line slowly until a pressure of 0.5 bars is achieved.

This pressure should be maintained for at least 3 minutes. There should be no visible leaks at the end of 3 minutes.

Then the air supply system should be turned off; if the air pressure in the pipe doesn't fall below 0.35 bars in 60 seconds, the pipe line is considered fit.

If the pressure can't be maintained within the mentioned limits, the pipe line should be filled with air again and any leaks should be checked by pouring the solution of soap and water on the joints. Any leaks should be repaired and the test should be repeated.

Matters to Take into Account While Transporting, Unloading and Storing Kalde-SuperMUTE Pipes

- 1) The products shouldn't be dropped during transportation. The pipes should be transported to the destination in piles.
- 2) The products shouldn't be thrown from the vehicle during the unloading process. They should be placed on a flat surface in piles. Measures should be taken to prevent the products from falling down the vehicle.
- 3) The products should be piled properly and pallets should be placed under the products if required. The pipes should be piled with the sockets facing outwards without contacting each other.

Furthermore, attention should be paid to ensure that the height of the piles of pipes don't exceed 1.5 meters.

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SuperMUTE Waste Water Pipe and Fittings

5 Layered SuperMUTE Tube (PP/GF/FO/GF/PP)

Code	Size	S, min.	L	Pcs.
4503-tbm-0k0250	ø58	4	250	
4503-tbm-0k0500	ø58	4	500	
4503-tbm-0k1000	ø58	4	1000	
4503-tbm-0k2000	ø58	4	2000	
4503-tbm-0k3000	ø58	4	3000	
4503-tbm-0l0250	ø78	4,5	250	
4503-tbm-0l0500	ø78	4,5	500	
4503-tbm-0l1000	ø78	4,5	1000	
4503-tbm-0l2000	ø78	4,5	2000	
4503-tbm-0l3000	ø78	4,5	3000	
4503-tbm-0m0250	ø110	5,3	250	
4503-tbm-0m0500	ø110	5,3	500	
4503-tbm-0m1000	ø110	5,3	1000	
4503-tbm-0m2000	ø110	5,3	2000	
4503-tbm-0m3000	ø110	5,3	3000	
4503-tbm-0n0250	ø125	5,3	250	
4503-tbm-0n0500	ø125	5,3	500	
4503-tbm-0n1000	ø125	5,3	1000	
4503-tbm-0n2000	ø125	5,3	2000	
4503-tbm-0n3000	ø125	5,3	3000	
4503-tbm-0p0250	ø160	5,3	250	
4503-tbm-0p0500	ø160	5,3	500	
4503-tbm-0p1000	ø160	5,3	1000	
4503-tbm-0p2000	ø160	5,3	2000	
4503-tbm-0p3000	ø160	5,3	3000	



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3 Layered SuperMUTE Tube (PP/MR/PP)

Code	Size	S, min.	L	Pcs.
4303-tbm-0k0250	ø58	4	250	
4303-tbm-0k0500	ø58	4	500	
4303-tbm-0k1000	ø58	4	1000	
4303-tbm-0k2000	ø58	4	2000	
4303-tbm-0k3000	ø58	4	3000	
4303-tbm-0l0250	ø78	4,5	250	
4303-tbm-0l0500	ø78	4,5	500	
4303-tbm-0l1000	ø78	4,5	1000	
4303-tbm-0l2000	ø78	4,5	2000	
4303-tbm-0l3000	ø78	4,5	3000	
4303-tbm-0m0250	ø110	5,3	250	
4303-tbm-0m0500	ø110	5,3	500	
4303-tbm-0m1000	ø110	5,3	1000	
4303-tbm-0m2000	ø110	5,3	2000	
4303-tbm-0m3000	ø110	5,3	3000	
4303-tbm-0n0250	ø125	5,3	250	
4303-tbm-0n0500	ø125	5,3	500	
4303-tbm-0n1000	ø125	5,3	1000	
4303-tbm-0n2000	ø125	5,3	2000	
4303-tbm-0n3000	ø125	5,3	3000	
4303-tbm-0p0250	ø160	5,3	250	
4303-tbm-0p0500	ø160	5,3	500	
4303-tbm-0p3000	ø160	5,3	3000	



3 Layered SuperMUTE Tube (PP/MR/PP) Two Side Flat

Code	Size	S, min.	L	Pcs.
4303-tbe-0k3000	ø58	4	3000	
4303-tbe-0l3000	ø78	4,5	3000	
4303-tbe-0m3000	ø110	5,3	3000	
4303-tbe-0n3000	ø125	5,3	3000	
4303-tbe-0p3000	ø160	5,3	3000	



SuperMUTE Elbow 45°

Code	Size	S, min.	d	D	L	Pcs.
4213-elb-0k0045	ø58	4	58	58	52.50	100
4213-elb-0l0045	ø78	4,5	78	78	59.50	50
4213-elb-0m0045	ø110	5,3	110	110	75.50	25
4213-elb-0n0045	ø125	5,3	125	125	83	20
4213-elb-0p0045	ø160	5,3	160	160	77	7
4213-elb-0r0045	ø200	6,2	200	200	97	



SuperMUTE Elbow 87°

Code	Size	S, min.	d	D	L	Pcs.
4213-elb-0k0087	ø58	4	58	58	53.50	100
4213-elb-0l0087	ø78	4,5	78	78	61.50	50
4213-elb-0m0087	ø110	5,3	110	110	75.50	25
4213-elb-0n0087	ø125	5,3	125	125	83	20
4213-elb-0p0087	ø160	5,3	160	160	82.50	7
4213-elb-0r0087	ø200	6,2	200	200	101	



SuperMUTE Single Branch 45°

Code	Size	S, min.	d	D1	D2	L	Pcs.
4213-sbr-0k0k45	ø58/58	4,5	58	58	58	57	50
4213-sbr-0l0k45	ø78/58	4,5	78	78	58		
4213-sbr-0l0l45	ø78/78	5,3	78	78	78	57	50
4213-sbr-0m0k45	ø110/58	5,3	110	110	58		
4213-sbr-0m0l45	ø110/78	5,3	110	110	78	70.50	30
4213-sbr-0m0m45	ø110/110	5,3	110	110	110	72.50	25
4213-sbr-0n0m45	ø125/110	5,3	125	125	110	72	15
4213-sbr-0n0n45	ø125/125	5,3	125	125	125	72	15
4213-sbr-0p0m45	ø160/110	5,3	160	160	110	77	10
4213-sbr-0p0n45	ø160/125	5,3	160	160	125	76	8
4213-sbr-0p0p45	ø160/160	5,3	160	160	160	77	8
4213-sbr-0r0m45	ø200/110	5,3	200	200	110	95	4
4213-sbr-0r0n45	ø200/125	5,3	200	200	125	95	4
4213-sbr-0r0p45	ø200/160	5,3	200	200	160	97	
4213-sbr-0r0r45	ø200/200	6,2	200	200	200	97	



SuperMUTE Single Branch 87°

Code	Size	S, min.	d	D1	D2	L	Pcs.
4213-sbr-0k0k87	ø58/58	4	58	58	58		80
4213-sbr-0l0k87	ø78/58	4,5	78	78	58		25
4213-sbr-0l0l87	ø78/78	5,3	78	78	78		
4213-sbr-0m0k87	ø110/58	5,3	110	110	58		20
4213-sbr-0m0l87	ø110/78	5,3	110	110	78		20
4213-sbr-0m0m87	ø110/110	5,3	110	110	110		15
4213-sbr-0n0k87	ø125/58	5,3	125	125	58		
4213-sbr-0n0l87	ø125/78	5,3	125	125	78		
4213-sbr-0n0n87	ø125/125	5,3	125	125	125		
4213-sbr-0p0k87	ø160/58	5,3	160	160	58		
4213-sbr-0p0m87	ø160/110	5,3	160	160	110		
4213-sbr-0p0n87	ø160/125	5,3	160	160	125		
4213-sbr-0r0n87	ø200/125	5,3	200	200	125		
4213-sbr-0r0p87	ø200/160	5,3	200	200	160		



SuperMUTE Double Branch 45°

Code	Size	S, min.	d	D1	D2	L	Pcs.
4213-dbr-0k0k45	ø58/58	4	58	58	58		
4213-dbr-0l0k45	ø78/58	4,5	78	78	58		
4213-dbr-0l0l45	ø78/78	5,3	78	78	78		
4213-dbr-0m0k45	ø110/58	5,3	110	110	58		
4213-dbr-0m0l45	ø110/78	5,3	110	110	78		
4213-dbr-0m0m45	ø110/110	5,3	110	110	110		
4213-dbr-0n0k45	ø125/58	5,3	125	125	58		
4213-dbr-0n0l45	ø125/78	5,3	125	125	78		
4213-dbr-0n0m45	ø125/110	5,3	125	125	110	71	25
4213-dbr-0n0n45	ø125/125	5,3	125	125	125		
4213-dbr-0p0k45	ø160/58	5,3	160	160	58		
4213-dbr-0p0l45	ø160/78	5,3	160	160	78		
4213-dbr-0p0m45	ø160/110	5,3	160	160	110		
4213-dbr-0p0n45	ø160/125	5,3	160	160	125		
4213-dbr-0p0p45	ø160/160	5,3	160	160	160		



SuperMUTE SYSTEMS

SuperMUTE Double Branch 87°

Code	Size	S, min.	d	D1	D2	L	Pcs.
4213-dbr-0m0m87	ø110/110	5,3	110	110	110		80



SuperMUTE S

Code	Size	S, min.	d	D	I	L	Pcs.
4213-spl-0m0087	ø110/87°	5,3	110	122	107	217	8



SuperMUTE Reduction

Code	Size	S, min.	d	D	L	Pcs.
4213-rdc-0l0k00	ø78/58	4,5	58	78	54.5	100
4213-rdc-0m0k00	ø110/58	4,5	58	110	57.50	40
4213-rdc-0m0l00	ø110/78	5,3	78	110	68	40
4213-rdc-0n0l00	ø125/78	5,3	78	125		
4213-rdc-0n0m00	ø125/110	5,3	110	125	71	20
4213-rdc-0p0m00	ø160/110	5,3	110	160	70	15
4213-rdc-0p0n00	ø160/125	5,3	125	160	82	15
4213-rdc-0r0m00	ø200/110	6,2	110	200		
4213-rdc-0r0p00	ø200/160	6,2	160	200		



SuperMUTE PVC Transition

Code	Size	S, min.	d	D	L	Pcs.
4213-psw-0k0000	ø78/50	5,3	50	78	48.50	50
4213-psw-0l0000	ø78/75	5,3	78	75	47	50



SuperMUTE SYSTEMS

SuperMUTE Sliding Coupling

Code	Size	S, min.	d	L	Pcs.
4213-soc-0k0000	ø58	4	58	92	100
4213-soc-0l0000	ø78	4,5	78		
4213-soc-0m0000	ø110	5,3	110		
4213-soc-0n0000	ø125	5,3	125	136.50	75
4213-soc-0p0000	ø160	5,3	160	175	25
4213-soc-0r00000	ø200	6,2	200	201	20



SuperMUTE Coupling

Code	Size	S, min.	d	l	L	Pcs.
4213-fmf-0k0000	ø58	4	58	44.50	92	100
4213-fmf-0l0000	ø78	4,5	78			
4213-fmf-0m0000	ø110	5,3	110			
4213-fmf-0n0000	ø125	5,3	125	66	136.50	75
4213-fmf-0p0000	ø160	5,3	160	85.5	175	25
4213-fmf-0r00000	ø200	6,2	200	98	201	20



SuperMUTE Expanding Coupling

Code	Size	S, min.	L	Pcs.
4213-emf-0k0000	ø58	4		75
4213-emf-0l0000	ø78	4,5		50
4213-emf-0m0000	ø110	5,3		25
4213-emf-0n00000	ø125	5,3		20
4213-emf-0p00000	ø160	5,3		10



SuperMUTE Coupling-Long

Code	Size	S, min.	d	D	l	L	Pcs.
4213-lmf-0m0000	ø110	5,3	110	110	71	210	15



SuperMUTE Stopend

Code	Size	S, min.	d	D	L	Pcs.
4213-ste-0k0000	ø58	4	58	65	61	100
4213-ste-0l0000	ø78	4,5	78	83	69.50	75
4213-ste-0m0000	ø110	5,3	110	123	75	50
4213-ste-0n0000	ø125	5,3	125	139	84	40
4213-ste-0p0000	ø160	5,3	160	171	89	30
4213-ste-0r0000	ø200	6,2	200			



SuperMUTE Bracket

Code	Size	Pcs.
4213-bcc-0k0000	ø58	100
4213-bcc-0l0000	ø78	100
4213-bcc-0m0000	ø110	100
4213-bcc-0n00000	ø125	100
4213-bcc-0p00000	ø160	100



SuperMUTE Bracket-Acoustic

Code	Size	Pcs.
4213-apc-0l0000	ø58	100
4213-apc-0n0000	ø78	75
4213-apc-0p0000	ø110	25



SuperMUTE Joint

Code	Size	Pcs.
4213-rur-0k0000	ø58	100
4213-rur-0l0000	ø78	100
4213-rur-0m0000	ø110	100
4213-rur-0n00000	ø125	100
4213-rur-0p00000	ø160	100
4213-rur-0r00000	ø200	100

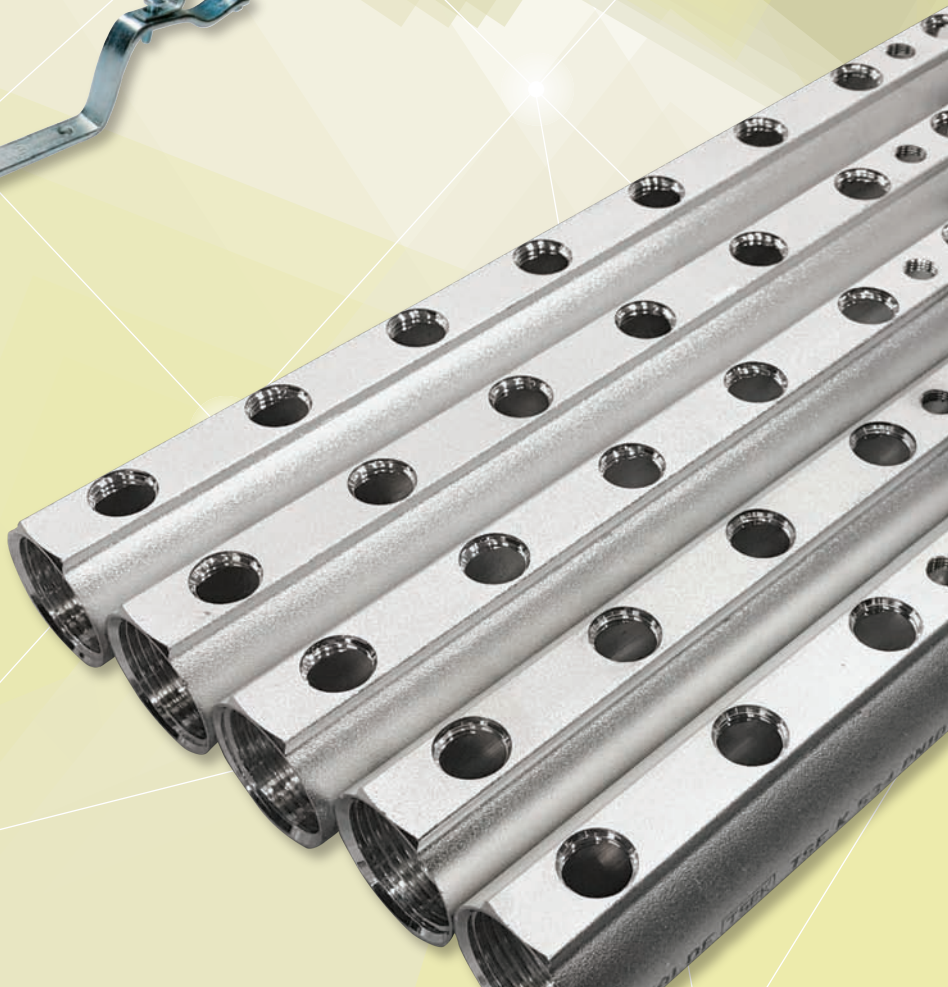
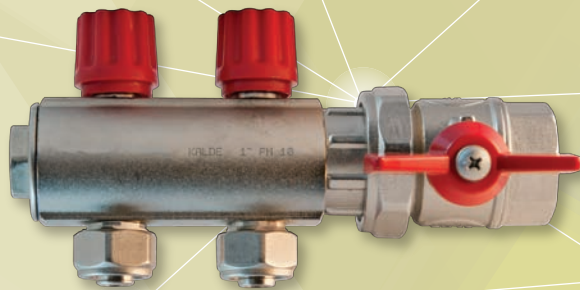


SuperMUTE Adaptor Joint

Code	Size	Pcs.
4213-arj-0k0000	ø58	100
4213-arj-005850	ø58/50	100
4213-arj-007875	ø78/75	100



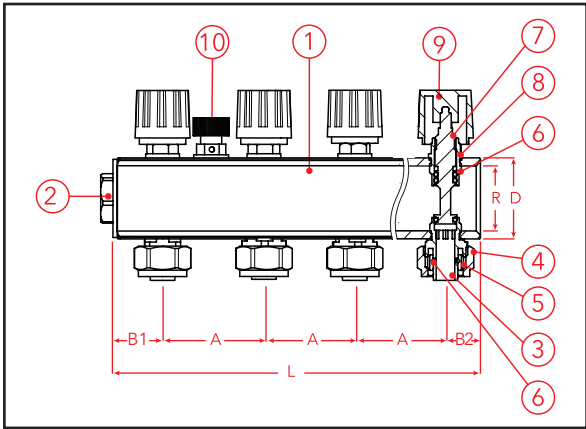




Manifolds

Manifolds

Standard Type Brass Manifolds



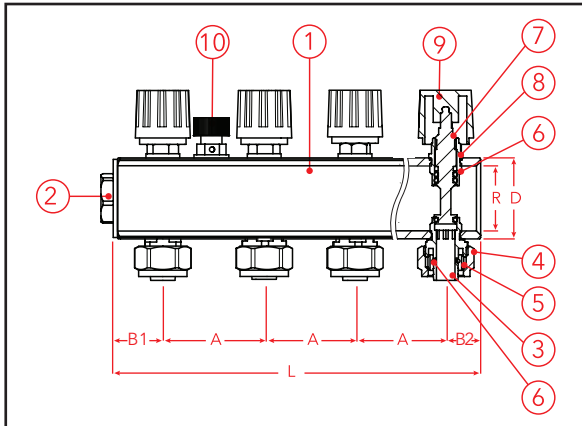
Part No	Name	Material
1	Body	CuZn39Pb3 Otomat
2	Male Plug End	CuZn40Pb2 Hot Pressed
3	Bottom Nipple	CuZn39Pb3 Otomat
4	Nut	CuZn40Pb2 Hot Pressed
5	Brass Ring	CuZn39Pb3 Otomat
6	O-Ring	EPDM
7	Shaft	CuZn39Pb3 Otomat
8	Top Nipple	CuZn39Pb3 Otomat
9	Wheel	Plastic (abs)
10	Airplug	CuZn39Pb3 Otomat

Nominal Pressure	PN 10		
Nominal Diameter	R"	1"	1 1/4"
Manifold Dimensions	A	43	43
	B1 + B2	86	86
	D	37	48
	L	[(Mouth pcs-1) x A] + B1 + B2	[(Mouth pcs-1) x A] + B1 + B2

Temperature	Pressure	Aplications
°C	PN (Bar)	Water systems
0.....+95	10	Pressurized Air Systems

Manifolds

Light Type Brass Manifolds



Part No	Name	Material
1	Body	CuZn39Pb3 Otomat
2	Male Plug End	CuZn40Pb2 Hot Pressed
3	Bottom Nipple	CuZn39Pb3 Otomat
4	Nut	CuZn40Pb2 Hot Pressed
5	Brass Ring	CuZn39Pb3 Otomat
6	O-Ring	EPDM
7	Shaft	CuZn39Pb3 Otomat
8	Top Nipple	CuZn39Pb3 Otomat
9	Wheel	Plastic (abs)
10	Airplug	CuZn39Pb3 Otomat

Nominal Pressure	PN 10		
Nominal Diameter	R"	1"	1 1/4"
Manifold Dimensions	A	43	43
	B1 + B2	86	86
	D	37	48
	L	[(Mouth pcs-1) x A] + B1 + B2	[(Mouth pcs-1) x A] + B1 + B2

Temperature	Pressure	Applications
°C	PN (Bar)	Water systems
0.....+95	10	Pressurized Air Systems

Manifolds

Self Valved Manifolds - Blue - Standard Type

Code	Size	A	L	Pcs.
3312-vpf-100216	1" 2 Ways	43	129	20
3312-vpf-100316	1" 3 Ways	43	172	15
3312-vpf-100416	1" 4 Ways	43	215	10
3312-vpf-100516	1" 5 Ways	43	258	10
3312-vpf-100616	1" 6 Ways	43	301	10
3312-vpf-100716	1" 7 Ways	43	344	5
3312-vpf-100816	1" 8 Ways	43	387	5
3312-vpf-100916	1" 9 Ways	43	430	5
3312-vpf-101016	1" 10 Ways	43	473	5
3312-vpf-101116	1" 11 Ways	43	516	5
3312-vpf-101216	1" 12 Ways	43	559	5
3312-vpf-101316	1" 13 Ways	43	602	5
3312-vpf-1a0216	1 1/4" 2 Ways	43	129	16
3312-vpf-1a0316	1 1/4" 3 Ways	43	172	12
3312-vpf-1a0416	1 1/4" 4 Ways	43	215	8
3312-vpf-1a0516	1 1/4" 5 Ways	43	258	8
3312-vpf-1a0616	1 1/4" 6 Ways	43	301	8
3312-vpf-1a0716	1 1/4" 7 Ways	43	344	4
3312-vpf-1a0816	1 1/4" 8 Ways	43	387	4
3312-vpf-1a0916	1 1/4" 9 Ways	43	430	4
3312-vpf-1a1016	1 1/4" 10 Ways	43	473	4
3312-vpf-1a1116	1 1/4" 11 Ways	43	516	4
3312-vpf-1a1216	1 1/4" 12 Ways	43	559	4
3312-vpf-1a1316	1 1/4" 13 Ways	43	602	4



Manifolds

Self Valved Manifolds - Red - Standard Type

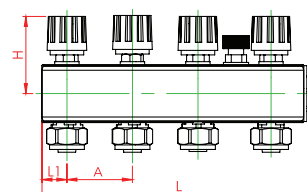
Code	Size	A	L	Pcs.
3313-vpf-100216	1" 2 Ways	43	129	20
3313-vpf-100316	1" 3 Ways	43	172	15
3313-vpf-100416	1" 4 Ways	43	215	10
3313-vpf-100516	1" 5 Ways	43	258	10
3313-vpf-100616	1" 6 Ways	43	301	10
3313-vpf-100716	1" 7 Ways	43	344	5
3313-vpf-100816	1" 8 Ways	43	387	5
3313-vpf-100916	1" 9 Ways	43	430	5
3313-vpf-101016	1" 10 Ways	43	473	5
3313-vpf-101116	1" 11 Ways	43	516	5
3313-vpf-101216	1" 12 Ways	43	559	5
3313-vpf-101316	1" 13 Ways	43	602	5
3313-vpf-1a0216	1 1/4" 2 Ways	43	129	16
3313-vpf-1a0316	1 1/4" 3 Ways	43	172	12
3313-vpf-1a0416	1 1/4" 4 Ways	43	215	8
3313-vpf-1a0516	1 1/4" 5 Ways	43	258	8
3313-vpf-1a0616	1 1/4" 6 Ways	43	301	8
3313-vpf-1a0716	1 1/4" 7 Ways	43	344	4
3313-vpf-1a0816	1 1/4" 8 Ways	43	387	4
3313-vpf-1a0916	1 1/4" 9 Ways	43	430	4
3313-vpf-1a1016	1 1/4" 10 Ways	43	473	4
3313-vpf-1a1116	1 1/4" 11 Ways	43	516	4
3313-vpf-1a1216	1 1/4" 12 Ways	43	559	4
3313-vpf-1a1316	1 1/4" 13 Ways	43	602	4



Manifolds

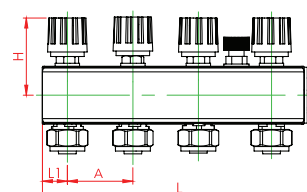
Manifold - Blue - Light Type

Code	Size	A	L1	L	H	Pcs.
3312-vhf-100216	1" - 2 x Ø16	43	22,5	94	50,7	20
3312-vhf-100316	1" - 3 x Ø16	43	22,5	137	50,7	15
3312-vhf-100416	1" - 4 x Ø16	43	22,5	180	50,7	10
3312-vhf-100516	1" - 5 x Ø16	43	22,5	266	50,7	10
3312-vhf-100616	1" - 6 x Ø16	43	22,5	309	50,7	10
3312-vhf-100716	1" - 7 x Ø16	43	22,5	352	50,7	5
3312-vhf-100816	1" - 8 x Ø16	43	22,5	395	50,7	5
3312-vhf-100916	1" - 9 x Ø16	43	22,5	438	50,7	5
3312-vhf-101016	1" - 10 x Ø16	43	22,5	524	50,7	5
3312-vhf-101116	1" - 11 x Ø16	43	22,5	567	50,7	5
3312-vhf-101216	1" - 12 x Ø16	43	22,5	610	50,7	5
3312-vhf-101316	1" - 13 x Ø16	43	22,5	653	50,7	5



Manifold - Red - Light Type

Code	Size	A	L1	L	H	Pcs.
3313-vhf-100216	1" - 2 x Ø16	43	22,5	94	50,7	20
3313-vhf-100316	1" - 3 x Ø16	43	22,5	137	50,7	15
3313-vhf-100416	1" - 4 x Ø16	43	22,5	180	50,7	10
3313-vhf-100516	1" - 5 x Ø16	43	22,5	266	50,7	10
3313-vhf-100616	1" - 6 x Ø16	43	22,5	309	50,7	10
3313-vhf-100716	1" - 7 x Ø16	43	22,5	352	50,7	5
3313-vhf-100816	1" - 8 x Ø16	43	22,5	395	50,7	5
3313-vhf-100916	1" - 9 x Ø16	43	22,5	438	50,7	5
3313-vhf-101016	1" - 10 x Ø16	43	22,5	524	50,7	5
3313-vhf-101116	1" - 11 x Ø16	43	22,5	567	50,7	5
3313-vhf-101216	1" - 12 x Ø16	43	22,5	610	50,7	5
3313-vhf-101316	1" - 13 x Ø16	43	22,5	653	50,7	5



Mounting Ball Valve on the Manifold

- 1- You can change the location of the stop-end, which is on the manifold, in line with the direction of your current installation. Make sure "TSEK" logo and writings on the manifold face frontwards, and therefore, the air-purge valve's bleed port faces frontwards as well.
- 2- Remove ball valve's movable union part (spool and nut) and manually screw it onto the manifold as shown in the figure, using the back side of the wrench shown in the figure through the lugs inside the spool, in such a way that the nut is on top of the spool.
- 3- Fit the screwdriver into the hole on the wrench and tightly screw down the spool into manifold using screwdriver.

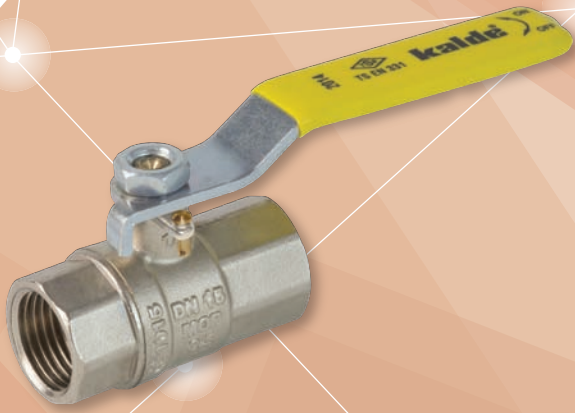
Note: Sealing is ensured by an o-ring when mounting ball valve spool on the manifold. Moreover, there is a special gasket for sealing purposes located between the ball valve body and the union. The operator can, if needed, use liquid gasket on the threads of the joint between the ball valve spool and the manifold body. When Teflon and linen use is a necessity, avoid using them excessively.

Mounting Pipes to the Manifold

- 1- First, cut the pipe perpendicular to its axis. Slip the pipe through movable nut and brass ring located in the manifold's lower nipple, straighten the pipe outlets through the guide shown in the figure to make sure the o-ring does not get out of its current channel when fitting the pipes into the hose nozzles.
- 2- Once the connection pipe is fitted into the hose nozzle, it must be made sure that the o-ring remains safe in its position under the pipe and it must be checked that the pipe has been tightly fitted into the hose nozzle.
- 3- Then, push up the brass ring and the nut which were previously fitted onto the connection pipe and screw it into the manifold lower nipple using the wrench shown in the figure. Once whole manifold set has been assembled, test the system for two minutes under 6 bars pressure pursuant to TS 9809 standard. If no leakage is observed in joints and connections, the manifold set is ready to use.

Note: The wrench used for connecting the manifold spool and the lower pipes is designed to be used in manifold set and will become deformed when forced excessively. Using it for other purposes is not recommended.

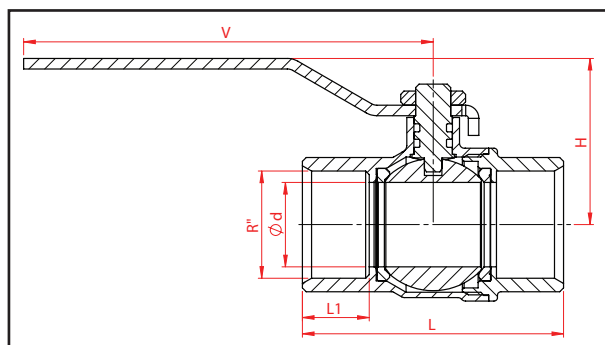
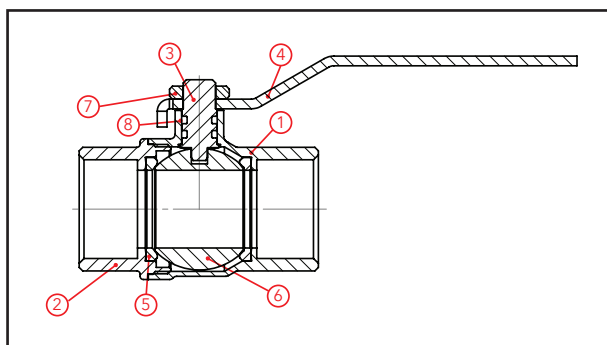




Valves

Valves

Standard Type Gas Ball Valve



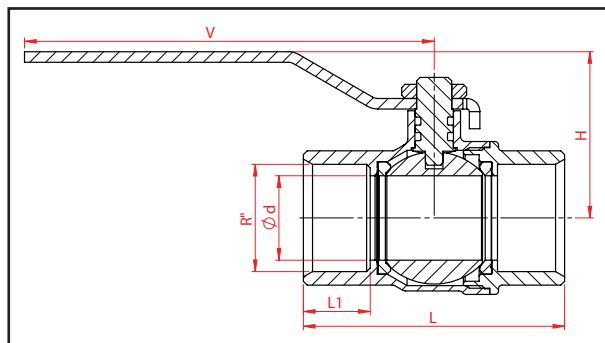
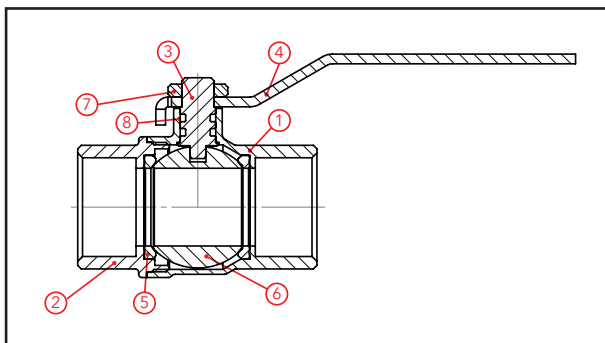
No	Part Name	Material
1	Body	CuZn40Pb2 (Nickel Coated)
2	Bonnet	CuZn40Pb2 (Nickel Coated)
3	Stem	CuZn39Pb3
4	Lever	St37
5	Seals	PTFE / TEFLON
6	Ball	CuZn40Pb2 (Nickel Coated)
7	Nut	St37
8	O-Ring	NBR

Nominal Pressure	MOP 0,5						
Nominal Diameter	DN	15	20	25	32	40	50
Valve Dimensions	R''	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
	L	53,5	62	73,8	84,5	98	117
	L1	15	16,5	18,5	21,5	21,5	26
	Ød	14	19	24	30	40	50
	H	33,7	37,7	47,3	52,3	65	72
	V	89	89	116,5	116,5	124,5	124,5
Flow Rate, m³/h		9,5	16,6	22,8	35,5	60	99,4

Temperature	Pressure	Applications
°C	PN (Bar)	Natural Gas Systems LPG Systems Pressurized Air Systems
-20.....+60	MOP 0,5	

Valves

Locking Type Gas Ball Valve



No	Part Name	Material
1	Body	CuZn40Pb2 (Nickel Coated)
2	Bonnet	CuZn40Pb2 (Nickel Coated)
3	Stem	CuZn39Pb3
4	Lever	St37
5	Seals	PTFE / TEFLON
6	Ball	CuZn40Pb2 (Nickel Coated)
7	Nut	St37
8	O-Ring	NBR
9	Lock	CuZn39Pb3

Nominal Pressure	MOP 0,5			
Nominal Diameter	DN	15	20	25
Valve Dimensions	R''	1/2"	3/4"	1"
	L	53,5	62	73,8
	L1	15	16,5	18,5
	Ød	14	19	24
	H	33,7	37,7	47,3
	V	89	89	116,5
Flow Rate, m³/h		9,5	16,6	22,8

Temperature	Pressure	Applications
°C	PN (Bar)	Natural Gas Systems LPG Systems Pressurized Air Systems
-20.....+60	MOP 0,5	

EN 331 Gas Ball Valve Assembly And Operating Instructions

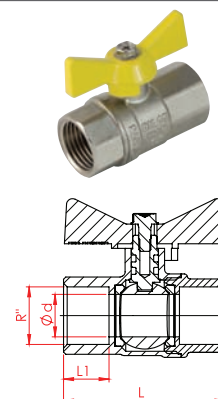
- 1- Before assembly, remove all foreign material (sand, gravel, dirt, etc.) from the installation.
- 2- First connect one side of the valve to the installation. Then, without allowing the other side to cause tensile stress connect the other side as well.
- 3- The thread length at the end of the metal 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- In natural gas, air and LPG installations, distribution and service valves are used. Arm color should be yellow.
- 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- Manually operated ball valve, deterioration of any part or is damaged, the valve will be replaced with a new one. Changes made in any part of the valve, the valve no longer be according to the rules of this standard means that performance.
- 11- Ball valves, as intended because it allows sufficient flow must be assured.
- 12- Malfunctions caused by not following operating instructions in the User's Guide are not covered by the warranty.
- 13- The maximum working pressure of kalde ball gas valves (MOP 0,5) is 0,5 bars. The minimum operating temperature is -20 °C, and the maximum operating temperature is 60 °C. Do not use the valves at higher pressures and outside of this temperature range.
- 14- In installation applications: existing local installation regulations and codes of practice should observed and be taken into consideration.
- 15- Use teflon for sealing when assembling threaded parts and do not overload to screw it. If linen is used as sealing material; care should be taken not to over wrap, In case of excessive use, other brass parts may cause fatigue cracking or breakage over time and separation of plastic and metal from each other.
- 16- Before installation, the products to be used must be visually checked, if there are cracks, broken etc. defects should be returned to our company for replacement without using the product.
- 17- After the installation is finished, the products in the system should be tested for leakage. If there are leaking products should be returned to our company to be replaced with a new one.

Note: After the installation process is completed, check the connections for leaks with soap bubbles. Do not use the valve if it is leaking. Use Filter fittings the installation for valve security.

Note: Products that have not been checked and tested before and after installation are excluded from the warranty. Any damages arising from this reason are the responsibility of the implementing company.

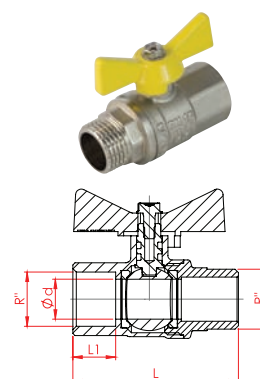
Metallic Ball Valve Female Butterfly Handle

Code	Size	d	R"	L1	L	Pcs.
3391-lgv-0b0002	1/2"	14	1/2"	17	58	80
3391-lgv-0c0002	3/4"	19	3/4"	19	67	50
3391-lgv-100002	1"	24	1"	22	79,8	30
3391-lgv-1a0002	1 1/4"	30	1 1/4"	24,5	92	15



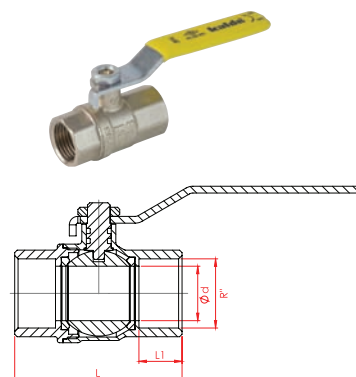
Metallic Ball Valve Male Butterfly Handle

Code	Size	d	R"	L1	L	Pcs.
3391-lgm-0b0002	1/2"	14	1/2"	17	60	80
3391-lgm-0c0002	3/4"	19	3/4"	19	67	50
3391-lgm-100002	1"	24	1"	22	78,8	30
3391-lgm-1a0002	1 1/4"	30	1 1/4"	24,5	90	15



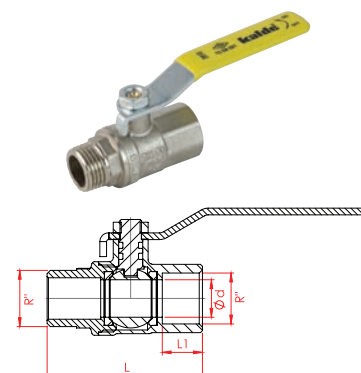
Metallic Ball Valve Female

Code	Size	d	R"	L1	L	Pcs.
3391-lgv-0b0000	1/2"	14	1/2"	17	58	50
3391-lgv-0c0000	3/4"	19	3/4"	19	67	40
3391-lgv-100000	1"	24	1"	22	79,8	20
3391-lgv-1a0000	1 1/4"	30	1 1/4"	24,5	92	15
3391-lgv-1b0000	1 1/2"	40	1 1/2"	24,5	104,3	10
3391-lgv-200000	2"	50	2"	29	124,3	5



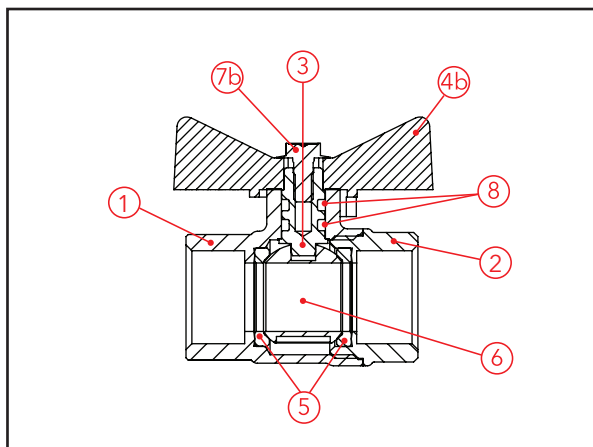
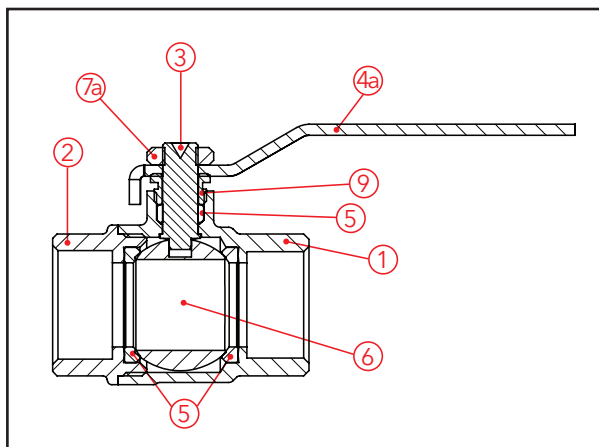
Metallic Ball Valve Male

Code	Size	d	R"	L1	L	Pcs.
3391-lgm-0b0000	1/2"	14	1/2"	17	60	50
3391-lgm-0c0000	3/4"	19	3/4"	19	67	40
3391-lgm-100000	1"	24	1"	22	78,8	20
3391-lgm-1a0000	1 1/4"	30	1 1/4"	24,5	90	15
3391-lgm-1b0000	1 1/2"	40	1 1/2"	24,5	106	10
3391-lgm-200000	2"	50	2"	29	122	5



Valves

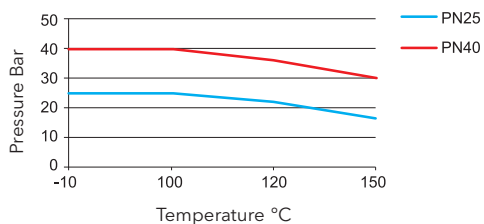
Water Ball Valve



No	Part Name	Material
1	Body	CW617N
2	Bonnet	CW617N
3	Stem	CW614N
4a	Lever	St37
4b	Butterfly Arm	Al
5	Seals	PTFE
6	Ball	CW614N
7a	Bold Nut	St37
7b	Screw	St37
8	O Ring	EPDM
9	Pressure Nut	CW614N

Temperature	Pressure	Applications
°C	PN (Bar)	Ball valves, widely used in water distribution systems as industrial and domestic heating systems, hydraulic, pneumatic and agricultural plants.
-10.....+100	25 - 40	

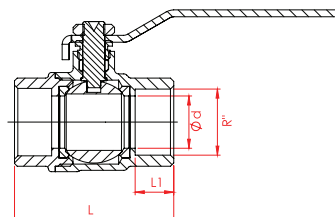
Pressure /Temperature Chart for Brass Ball Valves



Size	Nominal Pressure (Bar)	Test Pressure (Bar)	Maximum Operating Pressure, Bar Under Temperature, (°C)			
			100°C	120°C	150°C	180°C
1/2"	40	60	40	36	30	24
3/4"	40	60	40	36	30	24
1"	40	60	40	36	30	24
1 1/4"	25	38	25	21,8	16,5	11,3
1 1/2"	25	38	25	21,8	16,5	11,3
2"	25	38	25	21,8	16,5	11,3

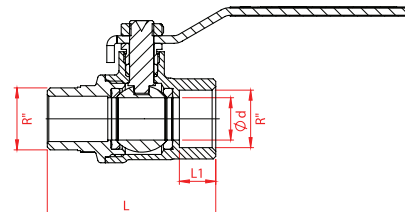
Ball Valve Female

Code	Size	d	R"	L1	L	Pcs.
3391-bfp-0b0001	1/2"	14	1/2"	12	48,5	50
3391-bfp-0c0001	3/4"	19	3/4"	14	58	30
3391-bfp-100001	1"	24	1"	16,5	69	20
3391-bfp-1a0001	1 1/4"	30	1 1/4"	18	78,5	15
3391-bfp-1b0001	1 1/2"	40	1 1/2"	21	98	8
3391-bfp-200001	2"	50	2"	26	118	5



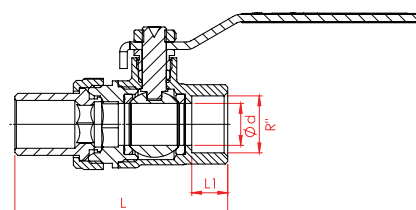
Ball Valve Male

Code	Size	d	R"	L1	L	Pcs.
3391-bmp-0b0001	1/2"	14	1/2"	12	55	50
3391-bmp-0c0001	3/4"	19	3/4"	14	65	30
3391-bmp-100001	1"	24	1"	16,5	75	20
3391-bmp-1a0001	1 1/4"	30	1 1/4"	18	85	15
3391-bmp-1b0001	1 1/2"	40	1 1/2"	21	102	8
3391-bmp-200001	2"	50	2"	26	122	5



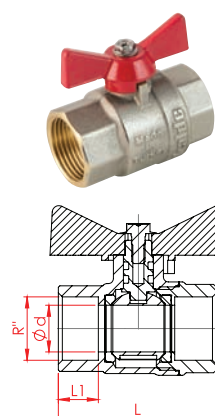
Transition Ball Valve

Code	Size	d	R"	L1	L	Pcs.
3391-bap-0b0001	1/2"	14	1/2"	12	76	30
3391-bap-0c0001	3/4"	19	3/4"	14	83	25
3391-bap-100001	1"	24	1"	16,5	96,8	15
3391-bap-1a0001	1 1/4"	30	1 1/4"	18	107,5	10



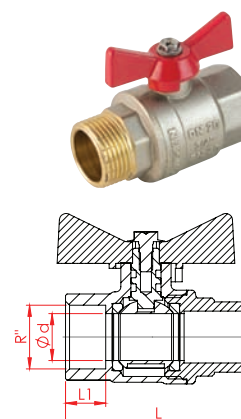
Ball Valve Female Butterfly Handle

Code	Size	d	R"	L1	L	Pcs.
3391-bfp-0b0000	1/2"	14	1/2"	12	48,5	60
3391-bfp-0c0000	3/4"	19	3/4"	14	58	50
3391-bfp-100000	1"	24	1"	16,5	69	30
3391-bfp-1a0000	1 1/4"	30	1 1/4"	18	78,5	20



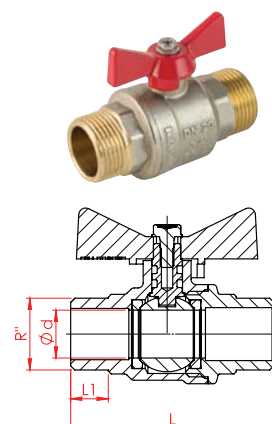
Ball Valve Male Butterfly Handle

Code	Size	d	R"	L1	L	Pcs.
3391-bmp-0b0000	1/2"	14	1/2"	12	55	60
3391-bmp-0c0000	3/4"	19	3/4"	14	65	40
3391-bmp-100000	1"	24	1"	16,5	75	25
3391-bmp-1a0000	1 1/4"	30	1 1/4"	18	85	20



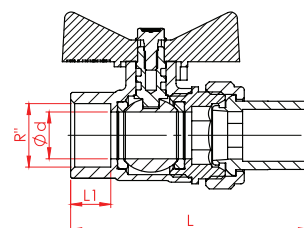
Ball Valve Male-Male Butterfly Handle

Code	Size	d	R"	L1	L	Pcs.
3391-bpm-0b0000	1/2"	14	1/2"	11	55	70
3391-bpm-0c0000	3/4"	19	3/4"	13	73	40
3391-bpm-100000	1"	24	1"	15	80	25



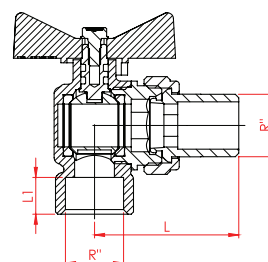
Transition Ball Valve Butterfly Handle

Code	Size	d	R"	L1	L	Pcs.
3391-bap-0b0000	1/2"	14	1/2"	12	76,6	50
3391-bap-0c0000	3/4"	19	3/4"	14	83	40
3391-bap-100000	1"	24	1"	16,5	96,8	20
3391-bap-1a0000	1 1/4"	30	1 1/4"	18	107,5	15



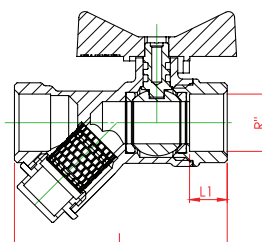
Radiator Valve Elbow Butterfly Handle

Code	Size	R"	L1	L	Pcs.
3391-bep-0b0000	1/2"	1/2"	12	47,2	50
3391-bep-0c0000	3/4"	3/4"	14	55,5	30



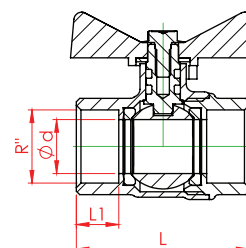
Ball Valve With Filter Butterfly Handle

Code	Size	R"	L1	L	Pcs.
3391-bvf-0b0001	1/2"	1/2"	12,5	70,6	50



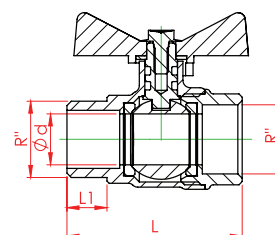
Ball Valve ECO Female - Female Butterfly

Code	Size	d	R"	L1	L	Pcs.
3391-bfe-0b0000	1/2"	14	1/2"	11	45	60
3391-bfe-0c0000	3/4"	19	3/4"	12	53	50
3391-bfe-100000	1"	24	1"	14	63,5	30



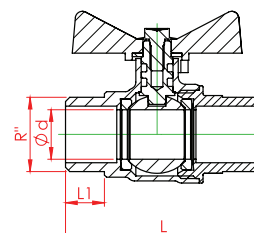
Ball Valve ECO Male - Female Butterfly

Code	Size	d	R"	L1	L	Pcs.
3391-bme-0b0000	1/2"	14	1/2"	11	48,2	60
3391-bme-0c0000	3/4"	19	3/4"	12	54	40
3391-bme-100000	1"	24	1"	14	65	30



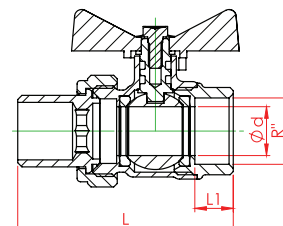
Ball Valve ECO Male - Male Butterfly

Code	Size	d	R"	L1	L	Pcs.
3391-bpe-0b0000	1/2"	14	1/2"	11	57	60
3391-bpe-0c0000	3/4"	19	3/4"	12	62	50
3391-bpe-100000	1"	24	1"	14	75	30



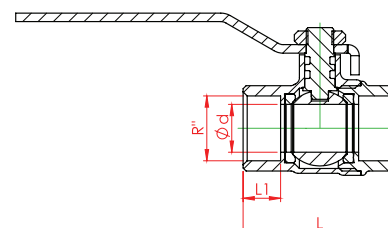
Transition Ball Valve ECO Butterfly

Code	Size	d	R"	L1	L	Pcs.
3391-bae-0b0000	1/2"	14	1/2"	11	63	50
3391-bae-0c0000	3/4"	19	3/4"	12	69	40
3391-bae-100000	1"	24	1"	14	88	25



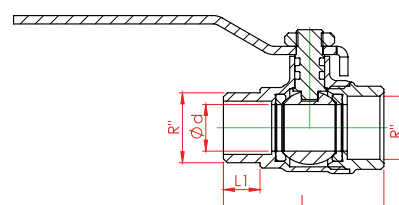
Ball Valve ECO Female - Female

Code	Size	d	R"	L1	L	Pcs.
3391-bfe-0b0001	1/2"	14	1/2"	11	45	50
3391-bfe-0c0001	3/4"	19	3/4"	12	53	40
3391-bfe-100001	1"	24	1"	14	63,5	20



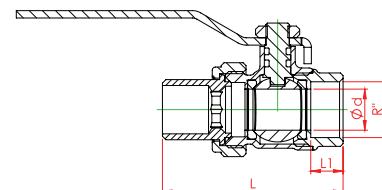
Ball Valve ECO Male - Female

Code	Size	d	R"	L1	L	Pcs.
3391-bme-0b0001	1/2"	14	1/2"	11	48	50
3391-bme-0c0001	3/4"	19	3/4"	12	54	40
3391-bme-100001	1"	24	1"	14	65	25



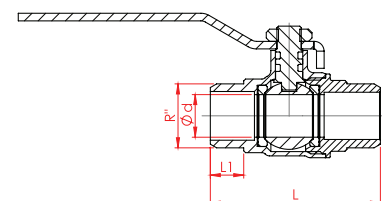
Transition Ball Valve ECO

Code	Size	d	R"	L1	L	Pcs.
3391-bae-0b0001	1/2"	14	1/2"	11	63	30
3391-bae-0c0001	3/4"	19	3/4"	12	69	20
3391-bae-100001	1"	24	1"	14	88	15



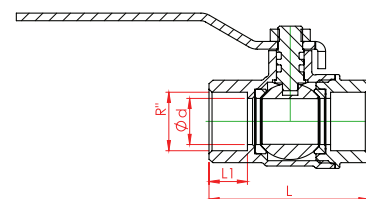
Ball Valve ECO Male - Male

Code	Size	d	R"	L1	L	Pcs.
3391-bpe-0b0001	1/2"	14	1/2"	11	57	50
3391-bpe-0c0001	3/4"	19	3/4"	12	62	40
3391-bpe-100001	1"	24	1"	14	75	20



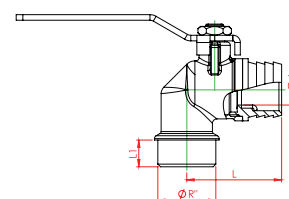
Ball Valve PN10 / Drinking Water / TS EN 13828

Code	Size	d	R"	L1	L	Pcs.
3391-bdv-0b0002	1/2"	15	1/2"	17,5	61,5	50
3391-bdv-0c0002	3/4"	19	3/4"	19	70,5	40
3391-bdv-100002	1"	25	1"	22	80	20
3391-bdv-1a0002	1 1/4"	32	1 1/4"	24,5	97	15
3391-bdv-1b0002	1 1/2"	40	1 1/2"	24,5	106	10
3391-bdv-200002	2"	50	2"	29	124	5



Ball-Tap

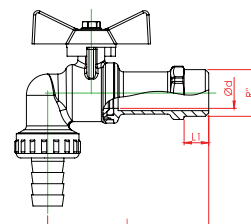
Code	Size	d	R"	L1	L	Pcs.
3391-beb-0c0000	3/4"	14	3/4"	12	42,5	45



Valves

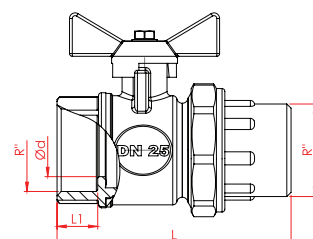
Ball Tap with Union

Code	Size	d	R"	L1	L	Pcs.
3391-bev-0b0000	1/2"	14	1/2"	12	77	30
3391-bev-0c0000	3/4"	14	3/4"	13	78	30



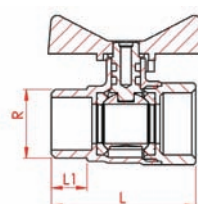
Ball Valve with Union

Code		R"	d	L1	L	Pcs.
3391-bvb-100000	●	1"	21,5	14,5	83,5	30
3391-bvr-100000	●	1"	21,5	14,5	83,5	30



Mini Ball Valve

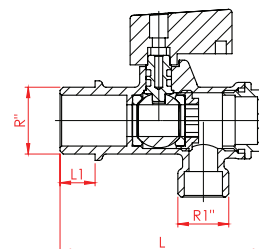
Code	Size	d	R"	L1	L	Pcs.
3391-vlm-0b0000	1/2"	14	1/2"	11	45	100
3391-vlm-0b0001	1/2"	14	1/2"	11	45	100



Valves

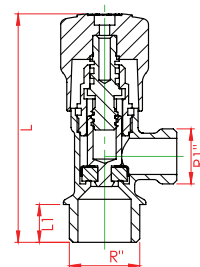
Angle Stop Valve with Filter

Code	Size	R1"	R"	L1	L	Pcs.
3391-bef-0d0000	1/2"	3/8"	1/2"	11	64	100



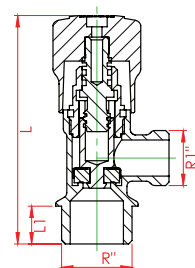
Bidet Tap - Grey Handle

Code	Size	R1"	R"	L1	L	Pcs.
3391-vlp-0d0000	1/2"	3/8"	1/2"	11	66,5	125



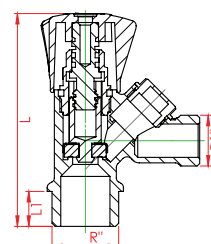
Bidet Tap - Chrome Handle

Code	Size	R1"	R"	L1	L	Pcs.
3391-vlp-0d0001	1/2"	3/8"	1/2"	11	66,5	100

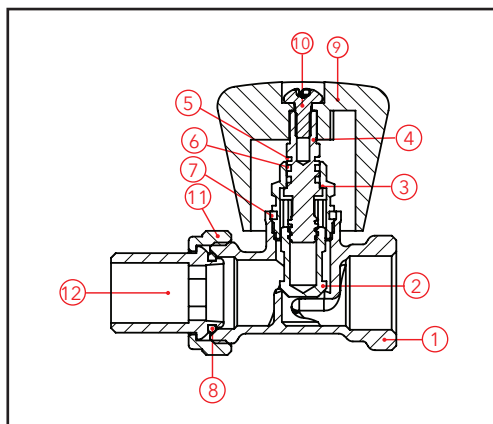
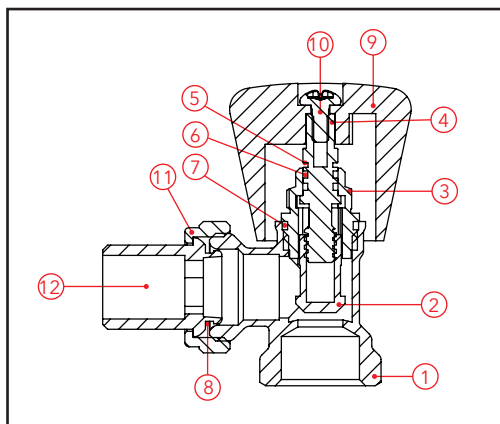


Bidet Tap with Filter

Code	Size	R1"	R"	L1	L	Pcs.
3391-vfp-0d0000	1/2"	3/8"	1/2"	11	67	100



Radiator Valves

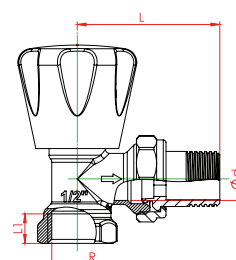


No	Part Name	Material
1	Body	CW617N
2	Bearer	CW614N
3	Stuffing Body	CW614N
4	Stem	CW614N
5	Piston Ring	CW614N
6	O Ring	EPDM
7	O Ring	EPDM
8	O Ring	EPDM
9	Flywheel	ABS
10	Screw	St37
11	Tail Nut	CW617N
12	Tail	CW617N

Temperature	Pressure	Applications
°C	PN (Bar)	It is used as the radiator inlet and outlet valves.
-20.....+120	10	

Valve for Radiator - Elbow - TS 579 Hexagonal Handle

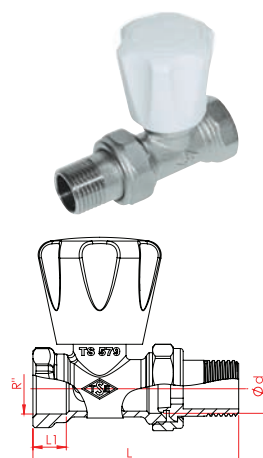
Code	Size	d	R"	L1	L	Pcs.
3391-vrg-0b0010	1/2"	16	1/2"	12,5	53,5	40
3391-vrg-0c0000	3/4"	16	3/4"	12,5	57,2	30



Valves

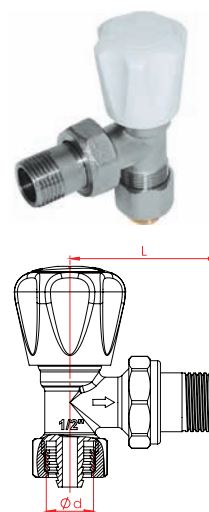
Valve for Radiator - Straight - TS 579 Hexagonal Handle

Code	Size	d	R"	L1	L	Pcs.
3391-vrr-0b0010	1/2"	17	1/2"	12,5	74,5	40
3391-vrr-0c0000	3/4"	17	3/4"	12,5	79,5	30



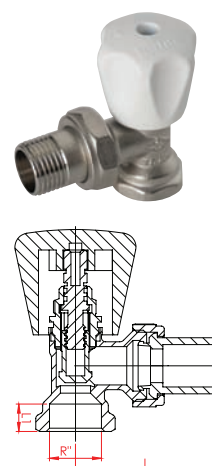
Valve for Radiator - PE-X Hexagonal Handled

Code	Size	d	L	Pcs.
3391-vrg-0b0011	1/2"	17	55	40



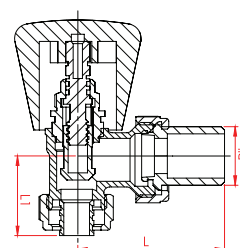
Valve for Radiator - Elbow - Light

Code	Size	R"	L1	L	Pcs.
3391-rel-0b0010	1/2"	1/2"	10	52	50



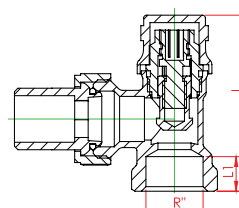
Valve for Radiator - PE-X - Light

Code	Size	R"	L1	L	Pcs.
3391-rel-0b0011	1/2"	1/2"	28	52	50



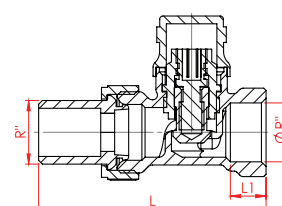
Valve for Radiator Return - Elbow

Code	Size	R"	L1	L	Pcs.
3391-vrg-0b0020	1/2"	1/2"	12	50	60



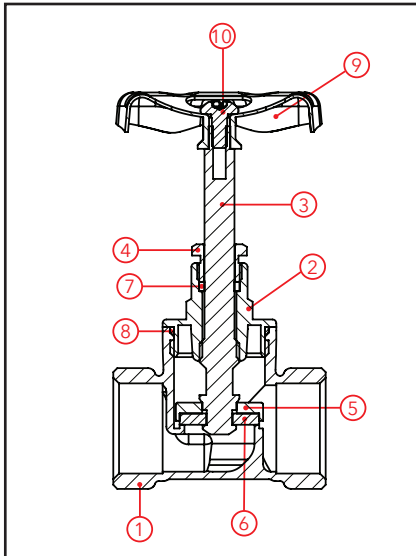
Valve for Radiator Return - Straight

Code	Size	R"	L1	L	Pcs.
3391-vrr-0b0020	1/2"	1/2"	11,5	73	60



Valves

Stop Valve

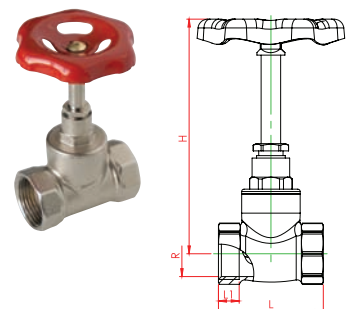


No	Part Name	Material
1	Body	CW617N
2	Bonnet	CW617N
3	Stem	CW614N
4	Pressure Nut	CW614N
5	Washer	CW614N
6	Seals	EPDM
7	Seals	EPDM
8	O-Ring	EPDM
9	Wheel	St37
10	Screw	St37

Temperature	Pressure	Applications
°C	PN (Bar)	Hot and cold water applications.
-20.....+100	25 - 40	

Stop Valve

Code	Size	R"	L1	L	H	Pcs.
3811-vlf-0b0000	1/2"	1/2"	11	48	101	25
3811-vlf-0c0000	3/4"	1/2"	12	56	101	25
3811-vlf-100000	1"	3/4"	14	70	101	15



Ball Valve Assembly And Operating Instructions

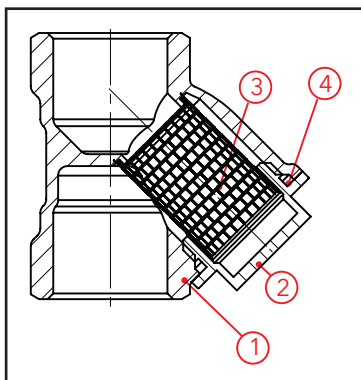
- 1- Prior to assembly, remove all foreign material (sand, gravel, dirt, etc.) from the installation.
- 2- First connect one side of the valve to the installation. Then, without allowing the other side to cause tensile stress connect the other side as well.
- 3- The thread length at the end of the metal 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 bosfor 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.
- 13- Use teflon for sealing when assembling threaded parts and do not overload to screw it. If linen is used as sealing material; care should be taken not to over wrap, In case of excessive use, other brass parts may cause fatigue cracking or breakage over time and separation of plastic and metal from each other.
- 14- Before installation, the products to be used must be visually checked, if there are cracks, broken etc. defects should be returned to our company for replacement without using the product.
- 15- After the installation is finished, the products in the system should be tested for leakage. If there are leaking products should be returned to our company to be replaced with a new one.

Note: After the installation process is completed, check the connections for leaks with soap bubbles. Do not use the valve if it is leaking. Use Filter fittings the installation for valve security.

Note: Products that have not been checked and tested before and after installation are excluded from the warranty. Any damages arising from this reason are the responsibility of the implementing company.

Valves

Metal (Brass) Filter



Kalde filters have a wide application area. Filters installed in the entrance of the installation it filters rust, lime and other solid particles, inside the fluids by the stainless steel filter. So it protect especially such as ball valve fittings and such as washing machine, dishwasher, boiler, etc. It prevents malfunction of electronic devices.

Filters have a functional design and provide enhancing performance of your installations. It can be opened and clean easily only by removing the stopend. It have a wide range of use like 25 bar pressure, 95 °C operating temperature, so you can use safely. Filters consist with these parts; Body (brass)- Filter (Stainless Steel Filter Part) - Seal - stopend.

Sandblasted surface of the filter body, the treaded of the connection complies with EN 10226-1. Stainless steel filters consist with welded roller. It sit on the surface of sits in the stopend and which is mounted to the body and can be opened easily to maintenance.

There is an EPDM O-Ring between the body and stopend.

No	Part Name	Material
1	Body	CW617N
2	Stopend	CW617N
3	Filter	AISI 304
4	O-ring	EPDM

Specification

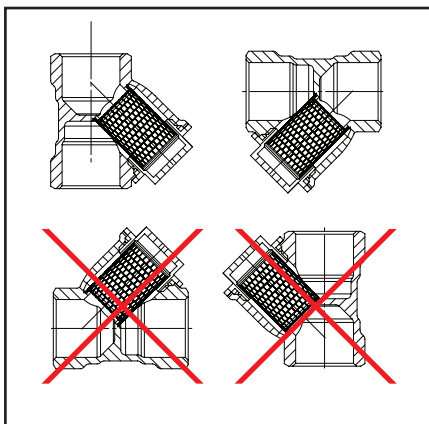
Filter Wire Thickness	Filter Hole Diameter
0,20mm	450 micron

Chemical Composition of the Stainless Steel Filter

	C	Si	Mn	P	S	Ni	Cr
Maximum	≤ 0,08	≤ 1	≤ 2	≤0,045045	≤0,03	8-10,5	18-20
Value	0,063	0,51	1,18	0,029	0,006	8,01	18

Temperature	Pressure	Applications
°C	PN (Bar)	
0.....+90	25	Hot and cold water applications.

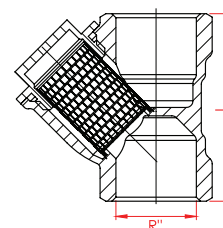
Filter Mounting To Be Considered:



- While cleaning, the deformed seal (o-rings) should not be used on stopend, should be replaced with a new one.
- Teflon tape should be used for leakproofing on screw thread connections.
- Before mounting the filter on the pipeline be sure that there is no burrs, rust, foreign parts and debris.
- It should be use suitable tools on hexagonal edge of the body while mounting.
- Filter must cleaned certain periods by removing stopend.
- Direction arrow on the body must appropriate with flow direction while mounting.

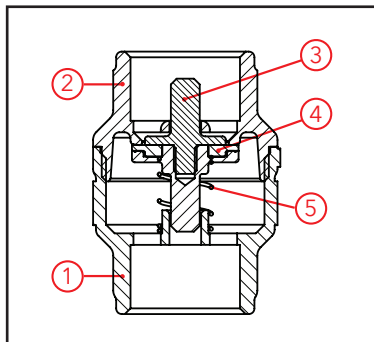
Filter

Code	R"	L	Pcs.
3811-flt-0b0000	1/2"	46	70
3811-flt-0c0000	3/4"	56	40
3811-flt-100000	1"	70	25
3811-flt-1a0000	1 1/4"	84	15
3811-flt-1b0000	1 1/2"	98	8
3811-flt-200000	2"	114	6



Valves

Straight Check - Valve

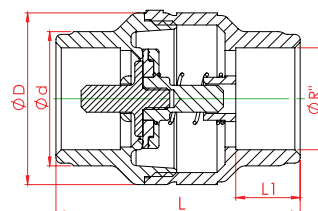


No	Part Name	Material
1	Body	CW617N
2	Bonnet	CW617N
3	Internal	CW617N
4	Seals	EPDM
5	Spring	AISI 304

Temperature	Pressure	Applications
°C	PN (Bar)	Hot and cold water applications.
0.....+95	10	

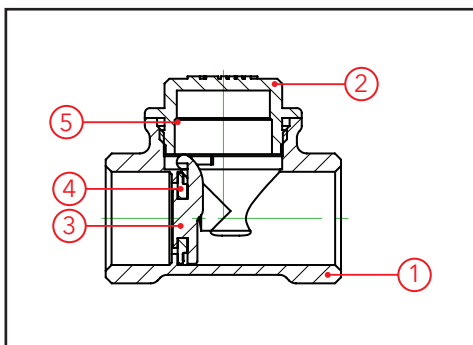
Check-Valve

Code	R"	d	D	L1	L	Pcs.
3811-cvl-0b0000	1/2"	25	32	12	45.5	80
3811-cvl-0c0000	3/4"	33	37	13	47.5	60
3811-cvl-100000	1"	41	46	16	58.5	40
3811-cvl-1a0000	1 1/4"	53	56.5	17	61.5	25
3811-cvl-1b0000	1 1/2"	58	65	18	66	20
3811-cvl-200000	2"	71	74.5	20	76	8
3811-cvl-2b0000	2 1/2"	91	95	24	90.5	4
3811-cvl-300000	3"	103	111	26	96	2



Valves

Check-Valve

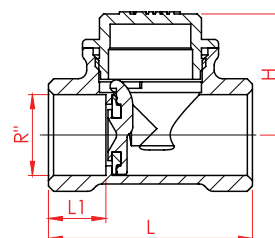


No	Part Name	Material
1	Body	CW617N
2	Bonnet	CW617N
3	Clack	CW617N
4	Gasket	EPDM
5	O Ring	EPDM

Temperature	Pressure	Applications
°C	PN (Bar)	Hot and cold water applications. only can be used for the horizontal line
0.....+95	10	

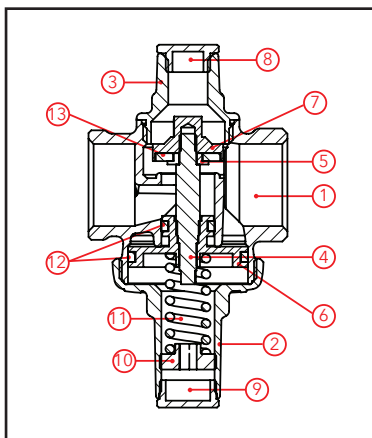
Check-Valve

Code	R"	L1	L	H	Pcs.
3811-cvs-0b0000	1/2"	12	48	27,5	60
3811-cvs-0c0000	3/4"	12,5	57	33	50
3811-cvs-100000	1"	14	62	35	30
3811-cvs-1a0000	1 1/4"	15	70	40	20
3811-cvs-1b0000	1 1/2"	18	78	45	20
3811-cvs-200000	2"	21	97	56	5



Valves

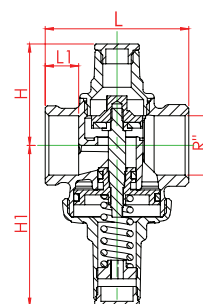
Pressure Reducing Valve



No	Part Name	Material
1	Pressure Valve Body	CuZn40Pb2 Hot Pressed
2	Spring Bonnet	CuZn40Pb2 Hot Pressed
3	Manometer Bonnet	CuZn40Pb2 Hot Pressed
4	Piston Shaft	CuZn39Pb3 Automat
5	Washer Of Piston	CuZn39Pb3 Automat
6	Big Piston	CuZn40Pb2 Hot Pressed
7	Small Piston	CuZn40Pb2 Hot Pressed
8	Stopend	CuZn39Pb3 Automat
9	Stopend	CuZn39Pb3 Automat
10	Pressure Adjustment Nut	CuZn39Pb3 Automat
11	Spring	Stainless Stell
12	O Ring	EPDM
13	Gasket	EPDM

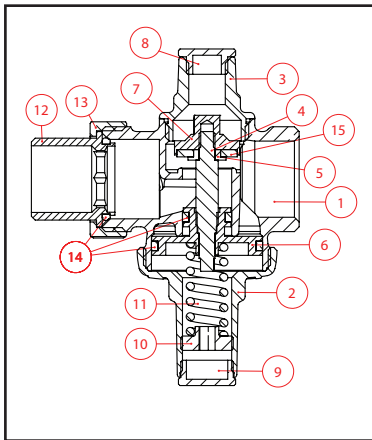
Pressure Reducing Valve

Code	R"	L1	L	H1	H	Pcs.
3811-pvd-0b0000	1/2"	13	58	65	41	20
3811-pvd-0c0000	3/4"	13	58	65	41	20



Valves

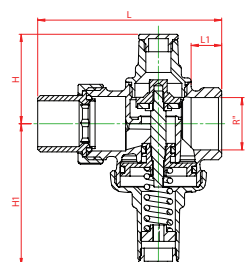
Pressure Valve With Tail



No	Part Name	Material
1	Pressure Valve Body	CuZn40Pb2 Hot Pressed
2	Spring Bonnet	CuZn40Pb2 Hot Pressed
3	Manometer Bonnet	CuZn40Pb2 Hot Pressed
4	Piston Shaft	CuZn39Pb3 Automat
5	Washer Of Piston	CuZn39Pb3 Automat
6	Big Piston	CuZn40Pb2 Hot Pressed
7	Small Piston	CuZn40Pb2 Hot Pressed
8	Stopend	CuZn39Pb3 Automat
9	Stopend	CuZn39Pb3 Automat
10	Pressure Adjustment Nut	CuZn39Pb3 Automat
11	Spring	Stainless Stell
12	3/4" Tail	CuZn40Pb2 Hot Pressed
13	3/4" Tail Nut	CuZn40Pb2 Hot Pressed
14	O Ring	EPDM
15	Gasket	EPDM

Pressure Valve With Tail

Code	R"	L1	L	H1	H	Pcs.
3811-pvd-0b0001	1/2"	14	84,5	65	41	20
3811-pvd-0c0001	3/4"	14	84,5	65	41	20



Pressure Reducing Valve Assembly and Operating Instructions

- 1- Before assembly, remove all foreign material (sand, gravel, dirt, etc.) from plumbing.
- 2- Unpack the regulator only when you are going to connect it to the plumbing.
- 3- First connect one side of the regulator to the plumbing. Then, without allowing tensile stress connect the other side as well.
- 4- When assembling or disassembling the regulator valve, use wrench openings on the valve body. Do not assemble by applying force to the body of the regulator valve.
- 5- All regulator parts have 2 year warranty. In case of malfunction, valve will be replaced free of charge during its warranty period.
- 6- Malfunctions caused by not following operating instructions in the User's Guide are not covered by the warranty.
- 7- In plumbing applications: existing local installation regulations and codes of practice should be observed and be taken into consideration.
- 8- The maximum working pressure of regulator is 10 bar. The maximum operating temperature is 90° C. Do not use the valves over at this pressures and temperature.
- 9- Connect the pressure regulator after the water meter, with pay attention the arrow direction.
- 10- After the installation, if needed to reduce system pressure, remove the plug (part No.9) at the bottom of the valve body and decrease the tension of the spring (- direction) with 5mm Allen key, set the desired value.

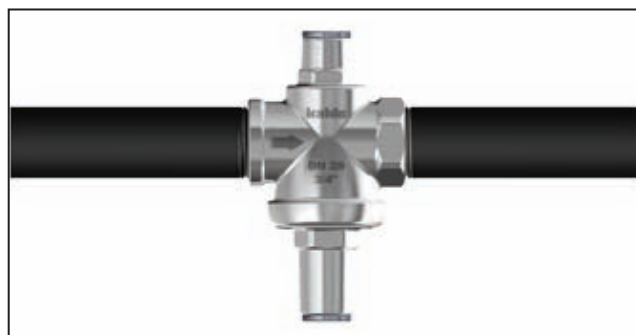
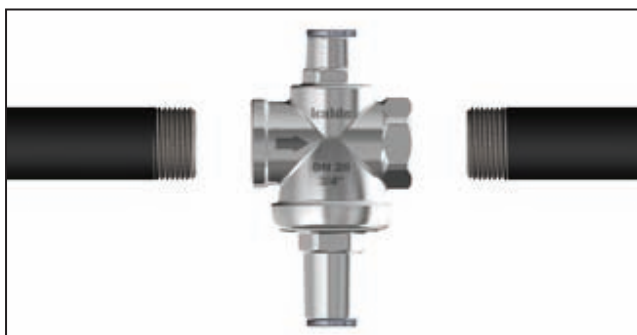
Note: For read the pressure value, put a manometer at upper side of the valve body by removing upper plug (part No. 8).

Note: 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 at the plumbing for regulator valve security.

Schematic Showing of Montage

Wrap a sufficient amount of Teflon tape on the threads of the pipe to which the pressure regulator is screwed. Use the wrench on the regulator when screwing.

To prevent tensile stress on the pressure regulator body, the thread length of the pipes to be connected should not be longer than the thread length of the regulator.



Valves

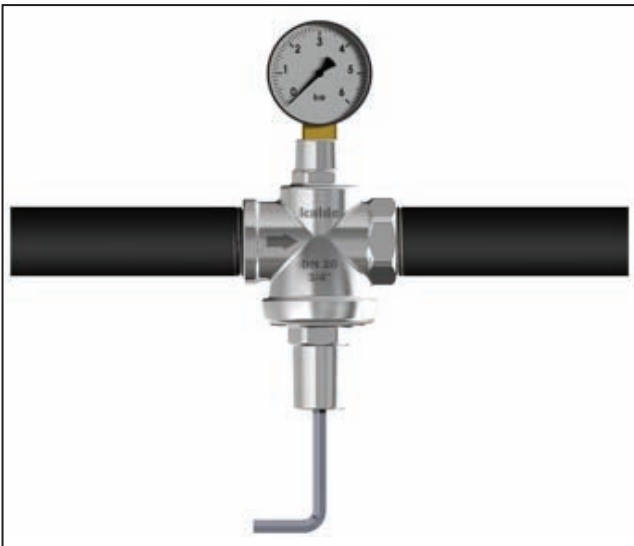
In order to monitor the pressure set with the regulator, it is necessary to install a manometer, the upper stopend (part 8) on the body is removed and the manometer is installed. Make sure that there is no water in the system when the stopend is removed and the manometer will be installed. There is pressurized water at this point of the regulator.



After the necessary measurements and settings are made, it is recommended to disassemble and re-install the stopend. Since there will be continuous pressure in the system, the stopend will provide better sealing than the manometer



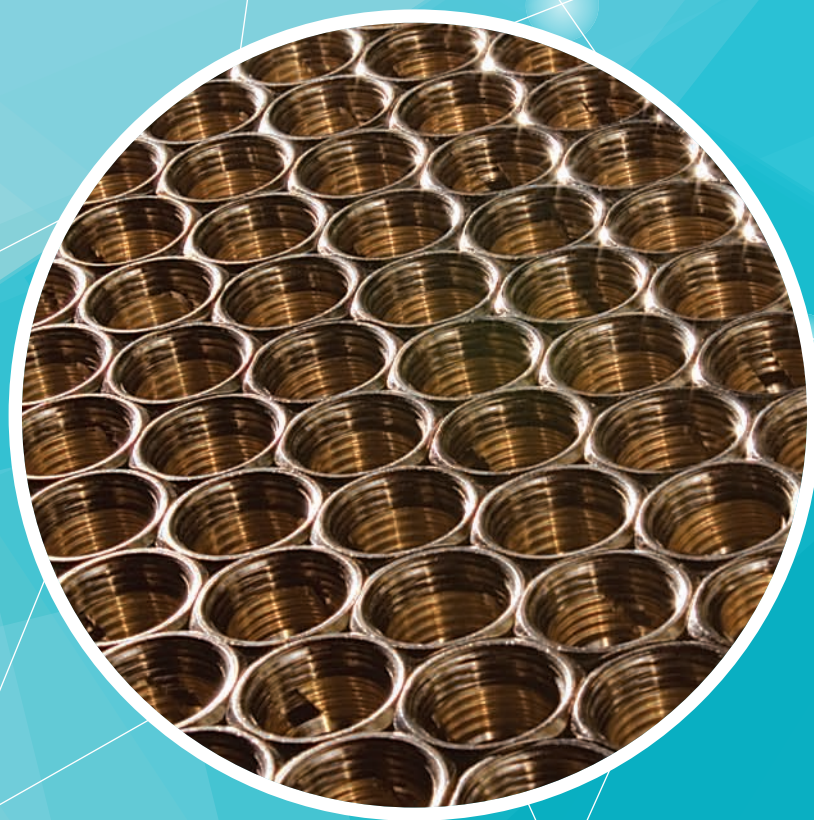
By removing the lower stopend (part 9), the pressure can be adjusted with a 5 mm allen key. There is no pressurized water at this point of the regulator. can be opened and adjusted at any time.



By turning the 5mm allen wrench in the (+) direction, the spring tension is increased and the pressure is increased or by turning in the (-) direction, the spring tension is reduced by decreasing. In the installation after the regulator, while the water is flowing, the wrench is adjusted by turning it, while the water is closed, the value is read from the manometer. Replacing the blind plug after pressure adjustment protects the regulator's adjustment section against external influences.



Note: Because of regulator valve can not increase the pressure, water system needs to use water pressure booster if water system pressure lower than 3 bar.



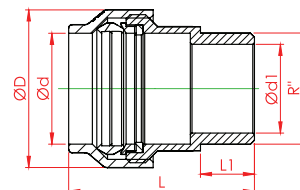


General Brass Fittings

General Brass Fittings

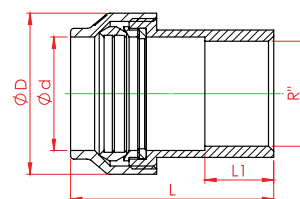
Male Securing

Code	Size	d	d1	D	R"	L1	L	Pcs.
3451-sec-160000	ø16	17	15	29	1/2"	12	40	250
3451-sec-200000	ø20	21	15	33	1/2"	12	43	200
3451-sec-250000	ø25	26	20	39	3/4"	13	46	100
3451-sec-320000	ø32	33	26,5	47	1"	14	49	60
3451-sec-400000	ø40	41,5	34,5	57	1 1/4"	16	59	35



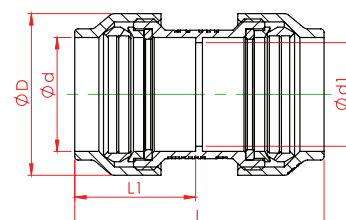
Female Securing

Code	Size	d	d1	D	R"	L1	L	Pcs.
3451-sef-160000	ø16	17	15	29	1/2"	12	40	250
3451-sef-200000	ø20	21	15	33	1/2"	12	43,5	200
3451-sef-250000	ø25	26	20	39	3/4"	13	46	100
3451-sef-320000	ø32	33	26,5	47	1"	15	49	60
3451-sef-400000	ø40	41,5	34,5	57	1 1/4"	17	62	35



Securing

Code	Size	d	d1	D	R"	L1	L	Pcs.
3451-see-160000	ø16	17	15	29	1/2"	26	53	150
3451-see-200000	ø20	21	18	33	1/2"	29	59	100
3451-see-250000	ø25	26	22	39	3/4"	32	65	70
3451-see-320000	ø32	33	31	47	1"	33	68	45
3451-see-400000	ø40	41,5	38	57	1 1/4"	40	82	20



General Brass Fittings

Brass Fittings

Part Name	Material
Body	CW617N
Screw Of The Fittings	EN ISO 228-1
Brass fittings, 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 25 - 40 bar.	

Brass Fittings Assembly And Operating Instructions

- 1- Be aware to use excessive teflon and linen at the joints, causes to cracks on the body.
- 2- The maximum working pressure of Kalde brass fittings is 25 - 40 bar and the maximum operating temperature is +100 °C. Minimum operating temperature is -10°C . Do not use the brass fittings at higher pressures and outside of this temperature range.
- 3- In installation applications: existing local installation regulations and codes of practice should observed and be taken into consideration.

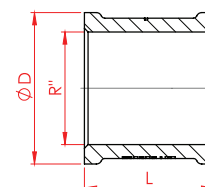
After the installation was completed, check for water leaks at the joints. Do not use the fittings if it is leaking.

Size	Nominal Pressure (Bar)	Test Pressure (Bar)	Maximum Operating Pressure, Bar Under Temperature, (°C)			
			100°C	120°C	150°C	180°C
1/2"	40	60	40	36	30	24
3/4"	40	60	40	36	30	24
1"	40	60	40	36	30	24
1 1/4"	25	38	25	21,8	16,5	11,3
1 1/2"	25	38	25	21,8	16,5	11,3
2"	25	38	25	21,8	16,5	11,3

General Brass Fittings

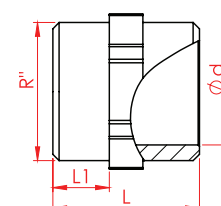
Coupling

Code	R"	D	L	Pcs.
3811-muf-0b0000	1/2"	28,5	29	200
3811-muf-0c0000	3/4"	35	31	150
3811-muf-100000	1"	41	35	80
3811-muf-1a0000	1 1/4"	51,5	40	45
3811-muf-1b0000	1 1/2"	58	42	36
3811-muf-200001	2"	69	48	18



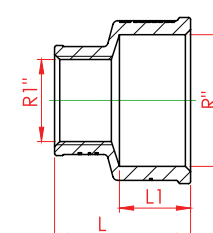
Nipple

Code	R"	d	L1	L	Pcs.
3811-npl-0d0000	3/8"	12	9	23	500
3811-npl-0b0000	1/2"	14,5	10,5	28	300
3811-npl-0c0000	3/4"	20	12	31	200
3811-npl-100000	1"	25	13,5	35	100
3811-npl-1a0000	1 1/4"	34	16	40,5	60
3811-npl-1b0000	1 1/2"	40	17	43	36
3811-npl-200000	2"	50	17	44	25



Reducing Coupling

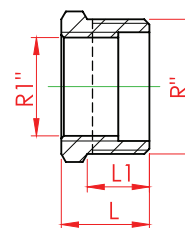
Code	R1"	R"	L1	L	Pcs.
3811-mur-0b0d00	3/8"	1/2"	14	27,5	200
3811-mur-0c0b00	1/2"	3/4"	13	27,5	150
3811-mur-100b00	1/2"	1"	15	31,5	100
3811-mur-100c00	3/4"	1"	15	32	100
3811-mur-1a0b00	1/2"	1 1/4"	15	32	80
3811-mur-1a0c00	3/4"	1 1/4"	15	32	80
3811-mur-1a1000	1"	1 1/4"	15	33	80
3811-mur-1b1000	1"	1 1/2"	19	37,5	50
3811-mur-1b1a00	1 1/4"	1 1/2"	17,5	36,5	45
3811-mur-201000	1"	2"	17,5	36	40
3811-mur-201a00	1 1/4"	2"	18,5	40,5	30
3811-mur-201b00	1 1/2"	2"	18,5	40,5	30



General Brass Fittings

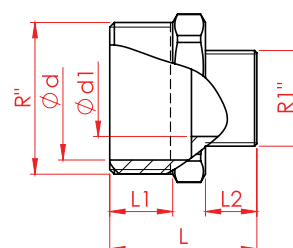
Reducing

Code	R1"	R"	L1	L	Pcs.
3811-rdc-0a0b00	1/4"	1/2"	15	18	400
3811-rdc-0d0b00	3/8"	1/2"	15	18	400
3811-rdc-0b0c00	1/2"	3/4"	15	18	300
3811-rdc-0b1000	1/2"	1"	21	25	150
3811-rdc-0c1000	3/4"	1"	21	25	150
3811-rdc-0b1a00	1/2"	1 1/4"	16	24,5	70
3811-rdc-1a0c00	3/4"	1 1/4"	16	24,5	80
3811-rdc-1a1000	1"	1 1/4"	16	24,5	100
3811-rdc-0b1b00	1/2"	1 1/2"	15	24,5	70
3811-rdc-0c1b00	3/4"	1 1/2"	15	24,5	80
3811-rdc-1b1000	1"	1 1/2"	15	24,5	65
3811-rdc-1b1a00	1 1/4"	1 1/2"	15	24,5	65
3811-rdc-200b00	1/2"	2"	16	26	35
3811-rdc-200c00	3/4"	2"	16	26	35
3811-rdc-201000	1"	2"	16	26	30
3811-rdc-1a2000	1 1/4"	2"	16	26	40
3811-rdc-1b2000	1 1/2"	2"	16	26	40



Reducing Nipple

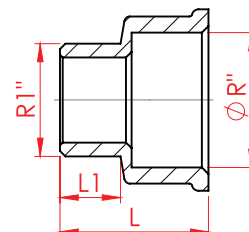
Code	d1	d	R1"	R"	L2	L1	L	Pcs.
3811-rdn-0b0d00	12	16,5	3/8"	1/2"	9	11	26	300
3811-rdn-0c0d00	12	20,5	3/8"	3/4"	8,5	12	27,5	300
3811-rdn-0c0b00	16,5	21	1/2"	3/4"	11	12	29	200
3811-rdn-100b00	16,5	26,5	1/2"	1"	11	13,5	31,5	120
3811-rdn-100c00	21,5	26,5	3/4"	1"	12	14	32,5	100
3811-rdn-1a0b00	16,5	34,5	1/2"	1 1/4"	11	16	35	70
3811-rdn-1a0c00	21,5	34,5	3/4"	1 1/4"	13	16	36	70
3811-rdn-1a1000	26,5	34,5	1"	1 1/4"	13,5	16	37,5	60
3811-rdn-0b1b00	16,5	40,5	1/2"	1 1/2"	11	16,5	36	60
3811-rdn-0c1b00	21,5	40,5	3/4"	1 1/2"	12	16,5	39	50
3811-rdn-1b1000	26,5	40,5	1"	1 1/2"	13,5	16,5	38,5	60
3811-rdn-1b1a00	35	40,5	1 1/4"	1 1/2"	16,5	16,5	41,5	50
3811-rdn-200b00	16,5	50,5	1/2"	2"	11	17	39	40
3811-rdn-200c00	21,5	50,5	3/4"	2"	12	17	43	40
3811-rdn-201000	26,5	50,5	1"	2"	13,5	17	41,5	40
3811-rdn-201a00	35	50,5	1 1/4"	2"	14	17	42	32
3811-rdn-201b00	40,5	50,5	1 1/2"	2"	16,5	17	44,5	30



General Brass Fittings

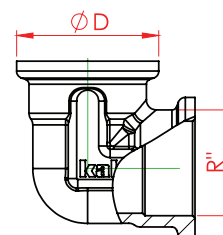
Invert Reducing

Code	R1"	R"	L1	L	Pcs.
3811-ird-0c0b00	1/2"	3/4"	11	27	200
3811-ird-100b00	1/2"	1"	11	30,5	100
3811-ird-100c00	3/4"	1"	13	32,5	100
3811-ird-1a0c00	3/4"	1 1/4"	13	32	90
3811-ird-1a1000	1"	1 1/4"	15	33	80
3811-ird-1b1000	1"	1 1/2"	15	35	60
3811-ird-0b0d00	3/8"	1/2"	10	27	250
3811-ird-1a0b00	1/2"	1 1/4"	11	32	75
3811-ird-1b0b00	1/2"	1 1/2"	11	32	80
3811-ird-1b0c00	3/4"	1 1/2"	13	34	60
3811-ird-1b1a00	1 1/4"	1 1/2"	16	38	60
3811-ird-201000	1"	2"	15	39	40
3811-ird-201a00	1 1/4"	2"	16	41	30
3811-ird-201b00	1 1/2"	2"	18	42	25



Elbow Female / Female

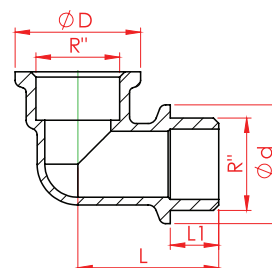
Code	R"	D	Pcs.
3811-efo-0b0000	1/2"	28,5	125
3811-efo-0c0000	3/4"	35	65
3811-efo-100000	1"	41	35
3811-efo-1a0000	1 1/4"	51,5	20
3811-efo-1b0000	1 1/2"	55	20
3811-efo-200000	2"	68	12



General Brass Fittings

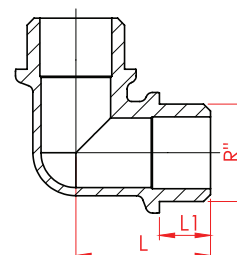
Elbow Female / Male

Code	R"	d	D	L1	L	Pcs.
3811-emo-0b0000	1/2"	27	28,5	11	32	120
3811-emo-0c0000	3/4"	31	35	13	38	80
3811-emo-100000	1"	39	41	15	45	40
3811-emo-1a0000	1 1/4"	50,5	51,5	16	53	20
3811-emo-1b0000	1 1/2"	56	58	19	59	15
3811-emo-200000	2"	68	69	22	73	10



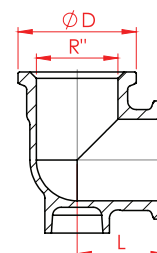
Elbow Male / Male

Code	R"	L1	L	Pcs.
3811-emm-0b0000	1/2"	11	29	100
3811-emm-0c0000	3/4"	13	34,5	80
3811-emm-100000	1"	15	41	45



Wall Plate Elbow

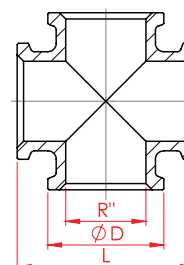
Code	R"	D	L	Pcs.
3811-fle-0b0000	1/2"	28,5	20,5	120
3811-fle-0c0000	3/4"	35	25,5	50



General Brass Fittings

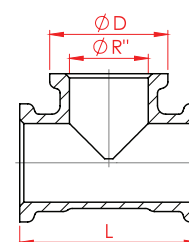
Cross

Code	R"	D	L	Pcs.
3811-crs-0b0000	1/2"	28,5	43	80
3811-crs-0c0000	3/4"	35	51	50
3811-crs-100000	1"	41	61	25



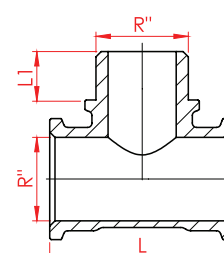
Tee Female / Female / Female

Code	R"	D	L	Pcs.
3811-tfo-0b0000	1/2"	28,5	43	100
3811-tfo-0c0000	3/4"	35	51	50
3811-tfo-100000	1"	41	61	25
3811-tfo-1a0000	1 1/4"	51,5	72	18
3811-tfo-1b0000	1 1/2"	57,5	81	16
3811-tfo-200000	2"	68,5	96	8



Tee Female / Male / Female

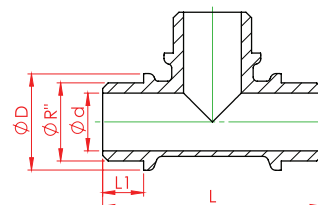
Code	R"	L1	L	Pcs.
3811-tfm-0b0000	1/2"	11	42	100
3811-tfm-0c0000	3/4"	12,5	52	60
3811-tfm-100000	1"	15	61	30



General Brass Fittings

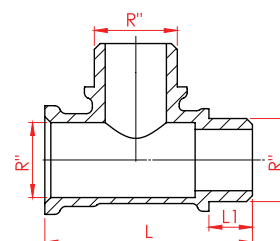
Tee Male / Male / Male

Code	R"	d	D	L1	L	Pcs.
3811-tmo-0b0000	1/2"	16	27	11	59	80
3811-tmo-0c0000	3/4"	21	31	12,5	67	60
3811-tmo-100000	1"	26	39,5	15	82	30



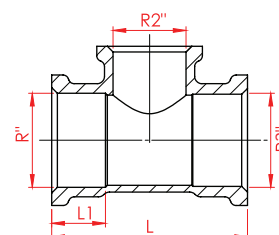
Tee Male / Male / Female

Code	R"	L1	L	Pcs.
3811-tdm-0b0000	1/2"	11	52,5	80



Inegal Tee

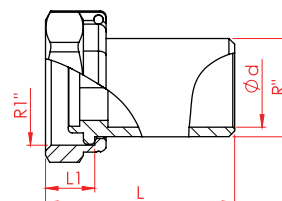
Code	R"	R2"	R3"	L1	L	Pcs.
3811-tio-0c0b0c	3/4"	1/2"	3/4"	14	51	60
3811-tio-100b10	1"	1/2"	1"	14	59	35
3811-tio-100c10	1"	3/4"	1"	14	59	35



General Brass Fittings

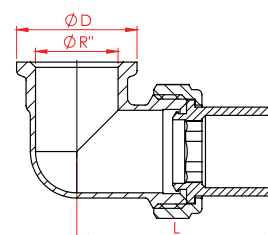
Water Meter Union

Code	R"	R1"	d	L1	L	Pcs.
3811-wmt-0c1000	3/4"	1"	21	13	50	80



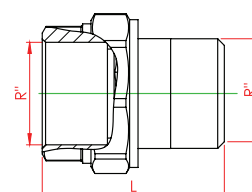
Union-Elbow

Code	R"	D	L	Pcs.
3811-tue-0b0000	1/2"	28,5	57,87	80
3811-tue-0c0000	3/4"	35	58	50
3811-tue-100000	1"	41	68	30
3811-tue-1a0000	1 1/4"	51,5	76,2	15



Union-Straight

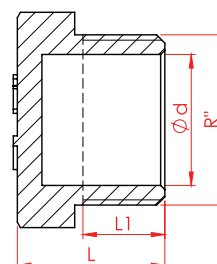
Code	R"	L	Pcs.
3811-tun-0b0000	1/2"	44,5	150
3811-tun-0c0000	3/4"	49,5	80
3811-tun-100000	1"	54	40
3811-tun-1a0000	1 1/4"	62	25
3811-tun-160000	1 1/2"	62,5	20
3811-tun-200000	2"	66,5	16



General Brass Fittings

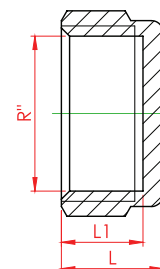
Male Stopend

Code	R"	d	L1	L	Pcs.
3811-stm-0b0000	1/2"	16	10	18	400
3811-stm-0c0000	3/4"	21	12	17	250
3811-stm-100000	1"	25,5	14	20	170
3811-stm-1a0000	1 1/4"	33	16	23	80
3811-stm-1b0000	1 1/2"	41	16,5	24,5	75
3811-stm-200000	2"	52	17	25	30



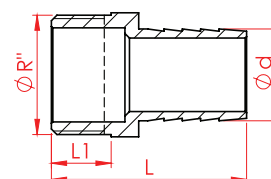
Female Stopend

Code	R"	L1	L	Pcs.
3811-stf-0d0000	3/8"	9	11	1050
3811-stf-0b0000	1/2"	10	12,5	500
3811-stf-0c0000	3/4"	11	13	250
3811-stf-100000	1"	12,5	15	150
3811-stf-1a0000	1 1/4"	14,5	17	120
3811-stf-1b0000	1 1/2"	15	18	90
3811-stf-200000	2"	15,5	18	50



Hose Connection - Male

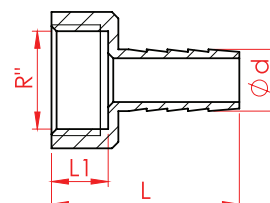
Code	R"	d	L1	L	Pcs.
3811-uch-0b0010	1/2"	10			250
3811-uch-0b0012	1/2"	12	11	36.5	300
3811-uch-0b0014	1/2"	14	11	36.5	250
3811-uch-0b0016	1/2"	16	11	36.5	250
3811-uch-0b0018	1/2"	18	11	36.5	250
3811-uch-0b0020	1/2"	20	11	36.5	200
3811-uch-0c0020	3/4"	20	11	40	150
3811-uch-100025	1"	25	13	46.5	80



General Brass Fittings

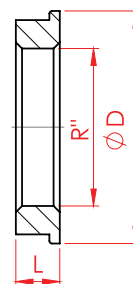
Hose Connection - Female

Code	R"	d	L1	L	Pcs.
3811-ucf-0b0010	1/2"	10	11	36,5	250
3811-ucf-0b0012	1/2"	12	11	36,5	250
3811-ucf-0b0014	1/2"	14	11	36,5	250
3811-ucf-0b0016	1/2"	16	11	36,5	200
3811-ucf-0b0018	1/2"	18	11	36,5	150
3811-ucf-0b0020	1/2"	20	11	36,5	150



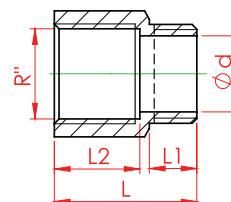
Nut with Flange

Code	R"	D	L	Pcs.
3811-fsm-0b0000	1/2"	31	7,5	500
3811-fsm-0c0000	3/4"	38	8,5	400
3811-fsm-100000	1"	45	8,5	250
3811-fsm-1a0000	1 1/4"	52,5	10	150
3811-fsm-1b0000	1 1/2"	59,5	12	100
3811-fsm-200000	2"	72,5	13	60



Plated Connection to Wrench

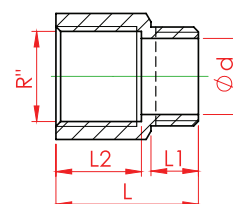
Code	R"	d	L2	L1	L	Pcs.
3811-ext-0b0010	1/2"	16	8	10	20	300
3811-ext-0b0015	1/2"	16	13	15	25	250
3811-ext-0b0020	1/2"	16	18	20	30	200
3811-ext-0b0025	1/2"	16	23	25	35	150
3811-ext-0b0030	1/2"	16	28	30	40	150
3811-ext-0b0040	1/2"	16	38	40	50	120
3811-ext-0b0050	1/2"	16	48	50	60	100



General Brass Fittings

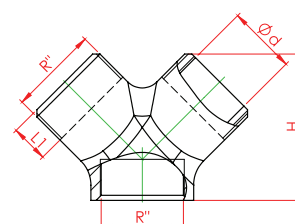
Plated Connection - Chrome

Code	R"	d	L2	L1	L	Pcs.
3811-nex-0b0010	1/2"	16	8	10	20	300
3811-nex-0b0015	1/2"	16	13	15	25	300
3811-nex-0b0020	1/2"	16	18	20	30	250
3811-nex-0b0025	1/2"	16	23	25	35	200
3811-nex-0b0030	1/2"	16	28	30	40	200
3811-nex-0b0035	1/2"	16	33	35	45	150
3811-nex-0b0040	1/2"	16	38	40	50	150
3811-nex-0b0050	1/2"	16	48	50	60	100



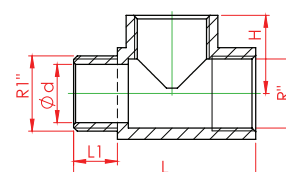
Half Cross

Code	R"	d	L1	H	Pcs.
3811-ned-0c0000	3/4"	20	11	42,8	75



Tap Connection- Holed

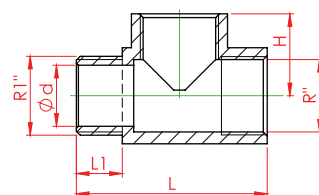
Code	R"	R1"	d	L1	L	H	Pcs.
3811-net-0b0000	1/2"	1/2"	8	12	50	21,5	100



General Brass Fittings

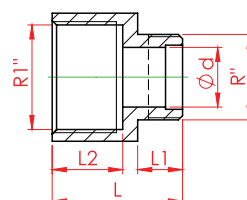
Tap Connection

Code	R"	R1"	d	L1	L	H	Pcs.
3811-bet-0c0000	3/4"	3/4"	20	12	50	21	80
3811-bel-0c0000	3/4"	3/4"	20	12	50	21	100



Tap Connection

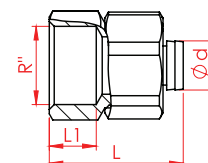
Code	R"	R1"	d	L2	L1	L	Pcs.
3811-neb-0c0000	1/2"	3/4"	14	16,5	10,5	30,5	200



General Brass Fittings

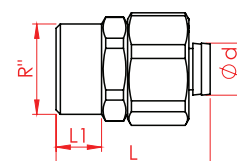
Mini Union

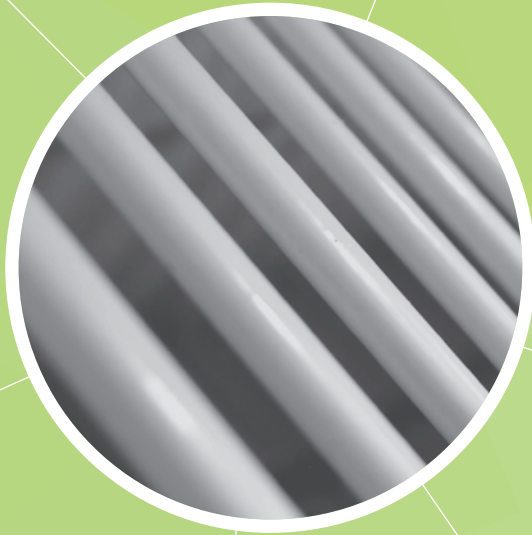
Code	R"	d	L1	L	Pcs.
3411-nff-160b01	1/2"	12	11,4	32,5	225

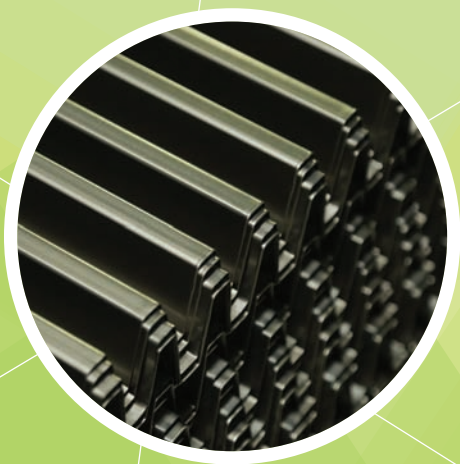


Male Return - Union

Code	R"	d	L1	L	Pcs.
3411-nmf-160b00	ø16 x 1/2"	12	10,5	35,5	225







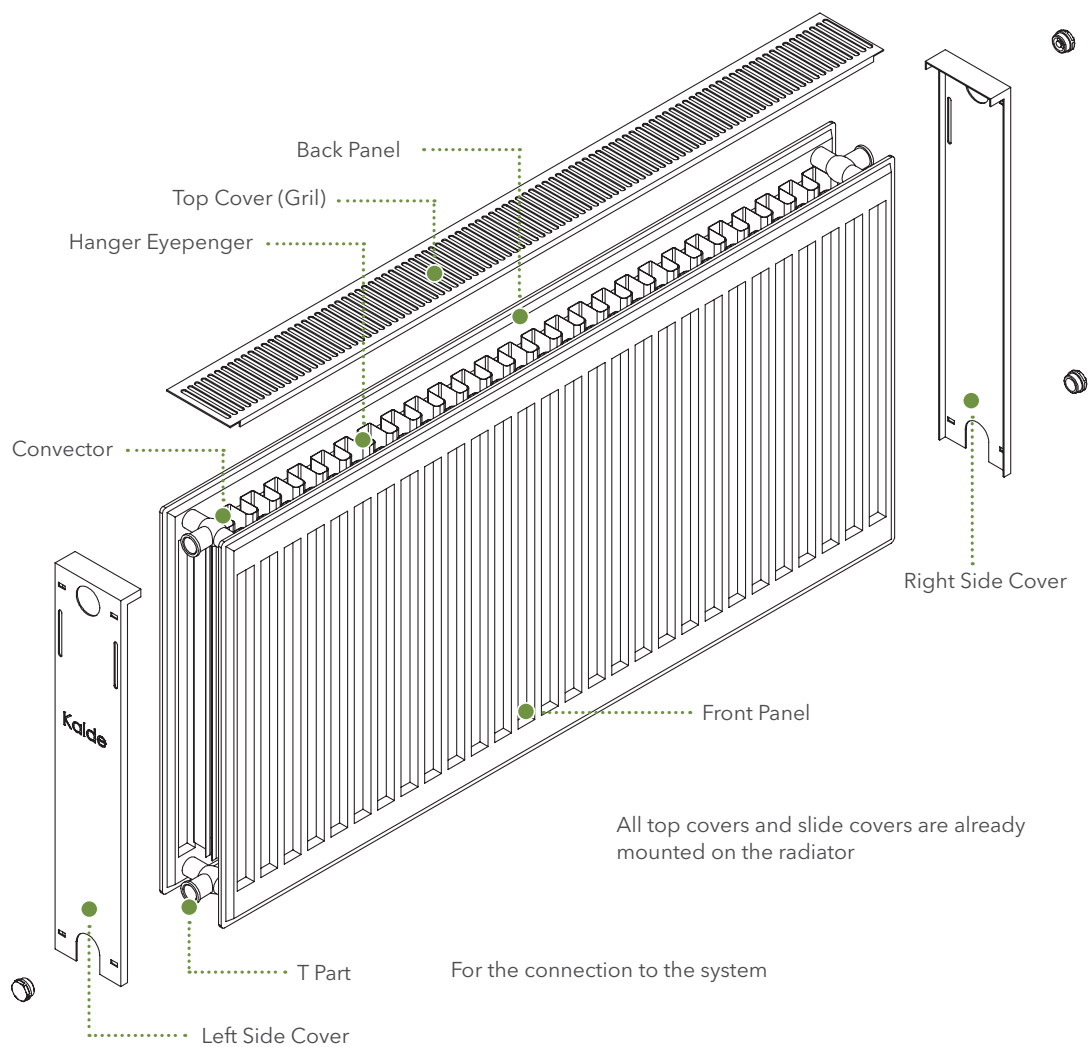
Radiators

Radiators

Kalde Steel Panel Radiator

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 (300 mm, 400 mm, 500 mm, 600 mm and 900 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 radiators 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 cabins by robotic pistols with electrostatic powder paint and are furnace again.

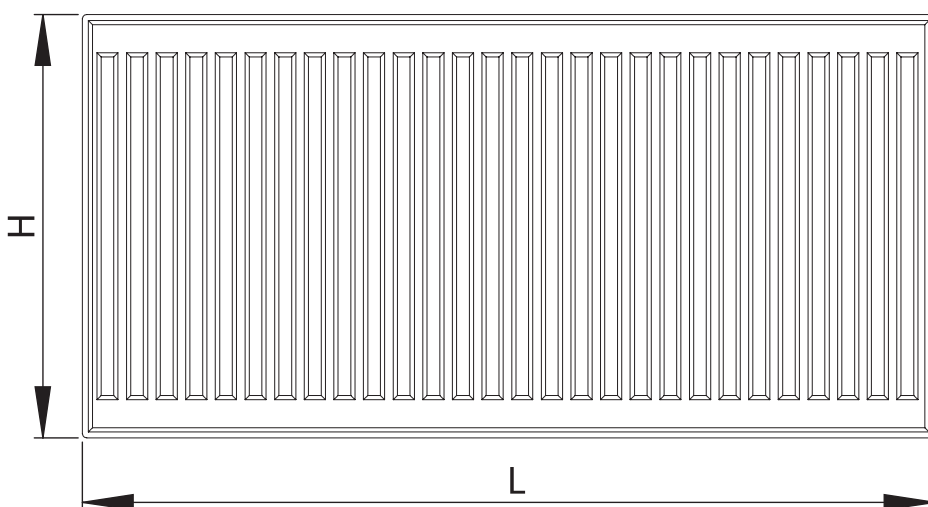
Thickness of the panel steel plate	1,11 ± 0,09 mm
Thickness of the convector steel plate	0,30 ± 0,09 mm
Thickness of the grill and side cover steel plate	0,50 ± 0,09 mm
Maximum working temperature	120 °C
Maximum working pressure	10 Bars
Test pressure	13 Bars

Dimensions

Standart heights are (H) 300 - 400 - 500 - 600 and 900 mm

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

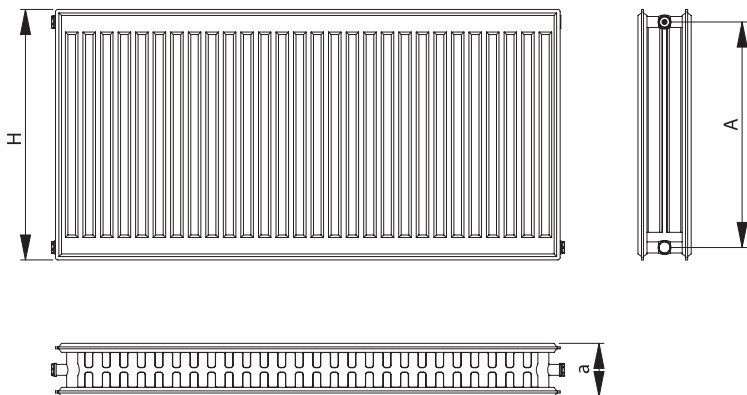
Produced with fully automated Italian robot welding machinery, each radiator is tested fully under 13 bars.



Radiators

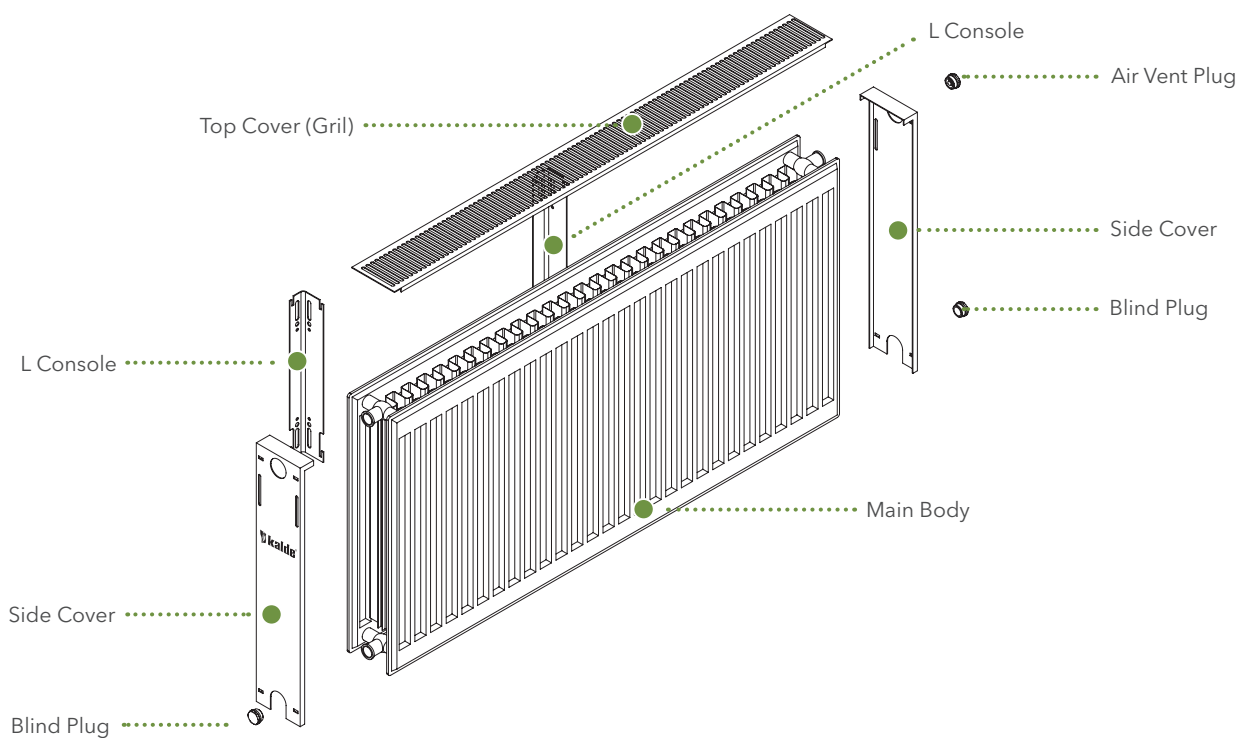
Type

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.



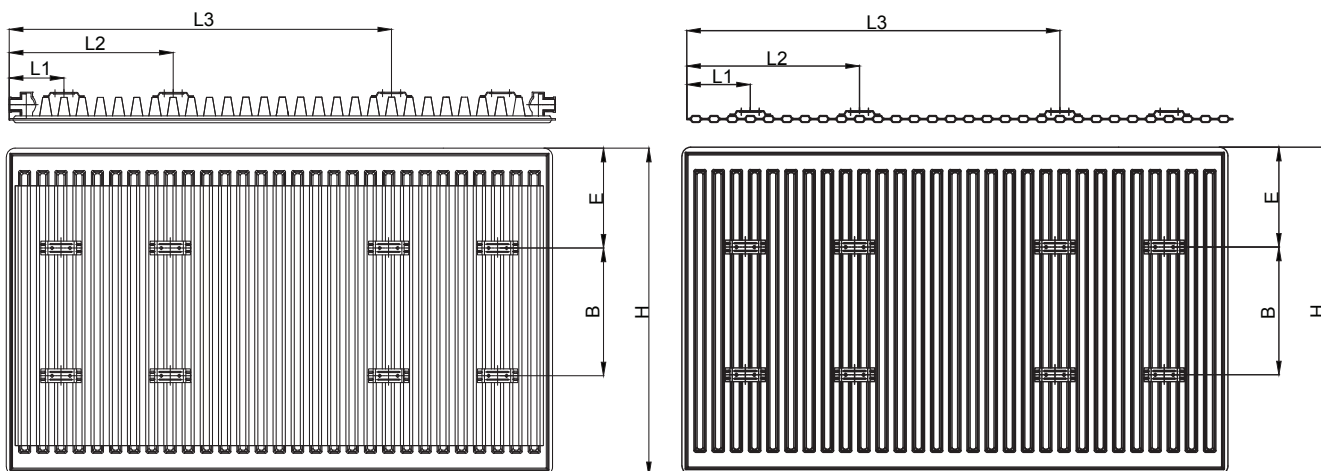
Type 22 DPDC

Height H (mm)	Axis Range A (mm)	Width a (mm)	Weight (kg/m)	Water Content (mt/lt)
300	245	100	15,30	3,25
400	345	100	20,15	4,10
500	450	100	25,10	5,25
600	545	100	29,90	6,10
900	845	100	44,95	8,30



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 air vent plug, blind plug, screws, dowels, 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.



Type 10 - 20 - 21 - 22 - 33				
L	Pcs.	L1	L2	L3
400	4	116.5	283.5	—
500	4	116.5	383.5	—
600	4	116.5	483.5	—
700	4	116.5	583.5	—
800	4	116.5	683.5	—
900	4	116.5	783.5	—
1000	4	116.5	883.5	—
1100	4	116.5	983.5	—
1200	4	116.5	1083.5	—
1300	4	116.5	1183.5	—
1400	4	116.5	1283.5	—
1500	4	116.5	1383.5	—
1600	6	116.5	800	1483.5
1700	6	116.5	850	1583.5
1800	6	116.5	916.5	1683.5
1900	6	116.5	950	1783.5
2000	6	116.5	1016.5	1883.5
2100	6	116.5	1050	1983.5
2200	6	116.5	1116.5	2083.5
2300	6	116.5	1150	2183.5
2400	6	116.5	1216.5	2283.5
2500	6	116.5	1250	2383.5
2600	8	116.5	916.5	1833
2700	8	116.5	950	1900
2800	8	116.5	983.5	1967
2900	8	116.5	1016.5	2033
3000	8	116.5	1050	2100

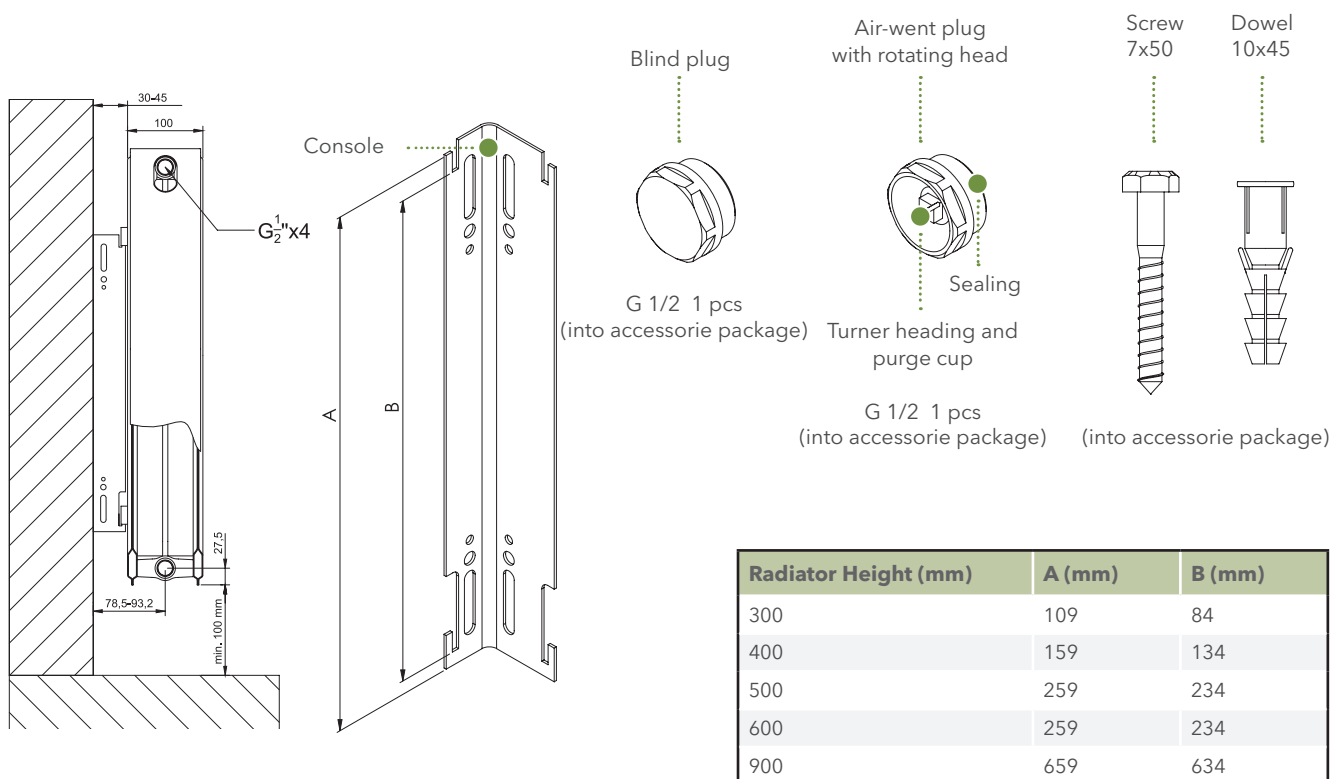
Type 11				
L	Pcs.	L1	L2	L3
400	4	100	300	—
500	4	100	400	—
600	4	100	500	—
700	4	100	600	—
800	4	100	700	—
900	4	100	800	—
1000	4	100	900	—
1100	4	100	1000	—
1200	4	100	1100	—
1300	4	100	1200	—
1400	4	100	1300	—
1500	4	100	1400	—
1600	6	100	800	1500
1700	6	100	866.5	1600
1800	6	100	900	1700
1900	6	100	966.5	1800
2000	6	100	1000	1900
2100	6	100	1066.5	2000
2200	6	100	1100	2100
2300	6	100	1166.5	2200
2400	6	100	1200	2300
2500	6	100	1266.5	2400
2600	8	100	900	1800
2700	8	100	933.5	1867
2800	8	100	966.5	1933
2900	8	100	1000	2000
3000	8	100	1033.5	2067

Radiators

Assembly Dimensions & Accessories

Assembly Dimensions Type 10 - 20 - 21 - 22 - 33		
H	B	E
300	84	108
400	134	133
500	234	133
600	234	183
900	634	133

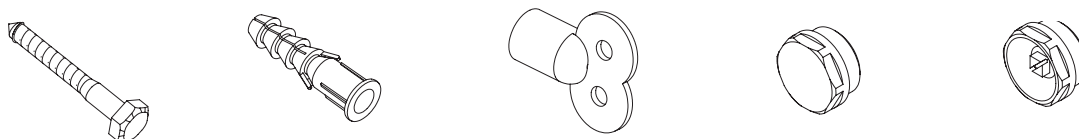
Assembly Dimensions Type 11		
H	B	E
300	84	108
400	134	133
500	234	133
600	234	183
900	634	133

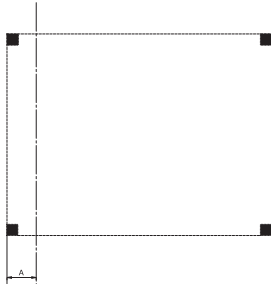
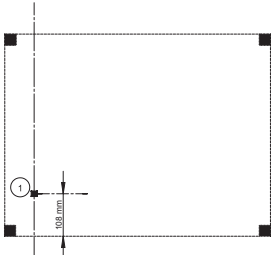
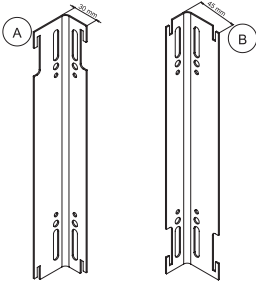
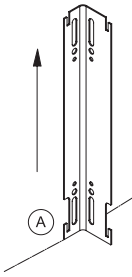
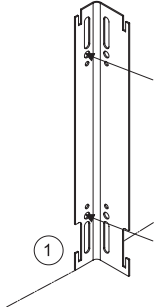
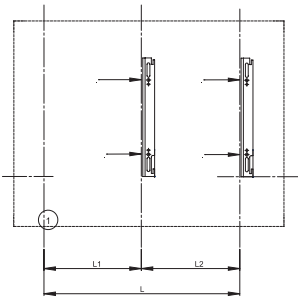
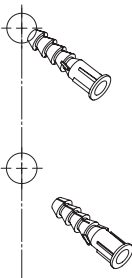
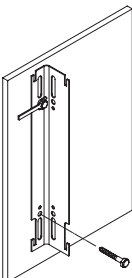
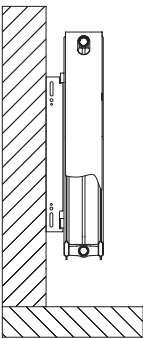
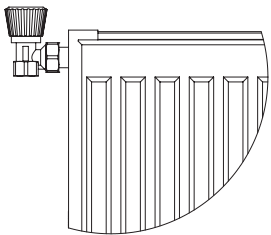
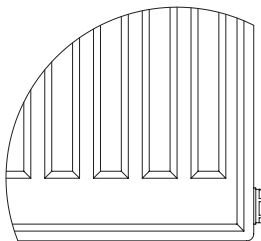
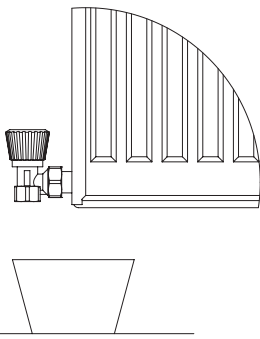


Assembly

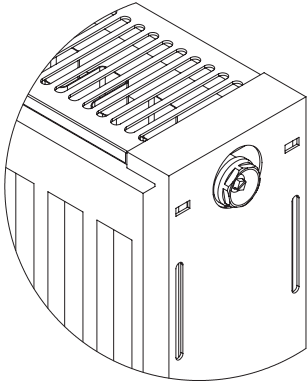
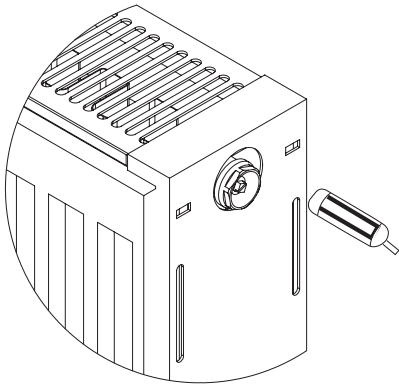
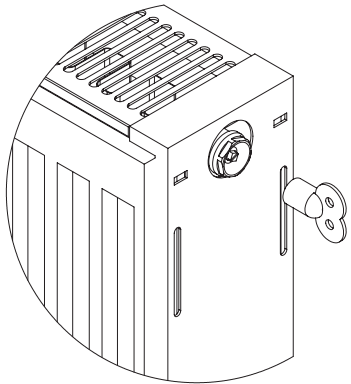
Step 1

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



Step 2	Step 3	Step 4	Step 5
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.	Mark the wall 107.5 mm below the bottom edge of the radiator on suspension brace clamp axis.	The suspension brace clamp can be mounted on the wall so that either the wide or the narrow part can be on the wall.	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	Step 7	Step 8	Step 9
Mark the wall where the suspension brace clamps will be screwed to the wall.	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.	Using a suitable drill make the holes in the wall and place the dowels inside the holes.	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	Step 11	Step 12	Step 13
Hang the radiator on the suspension brace clamps.	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.	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.	Do not use the radiator before filling water into the system and controlling if there is any leakage.
			

Removing the Air From the Radiator

Step 1	Step 2	Step 3
In order to evacuate the air from the radiator, turn the plastic part inside the air vent plug to down position.	Put a container pot below while evacuating the air out because water and air will both come out at the same time. Start your boiler which will also let the pump to work. With the pressure inside the radiator, air will be evacuated from the radiator.	Put the air vent key inside it's nest and loosen the air vent. Air flow will leave out from the air vent. When the air noise stops and only water comes out; it means that the air has been evacuated from the radiator. Tighten the air vent with the key, control the water content in the whole system, and if needed, complete the water.
		

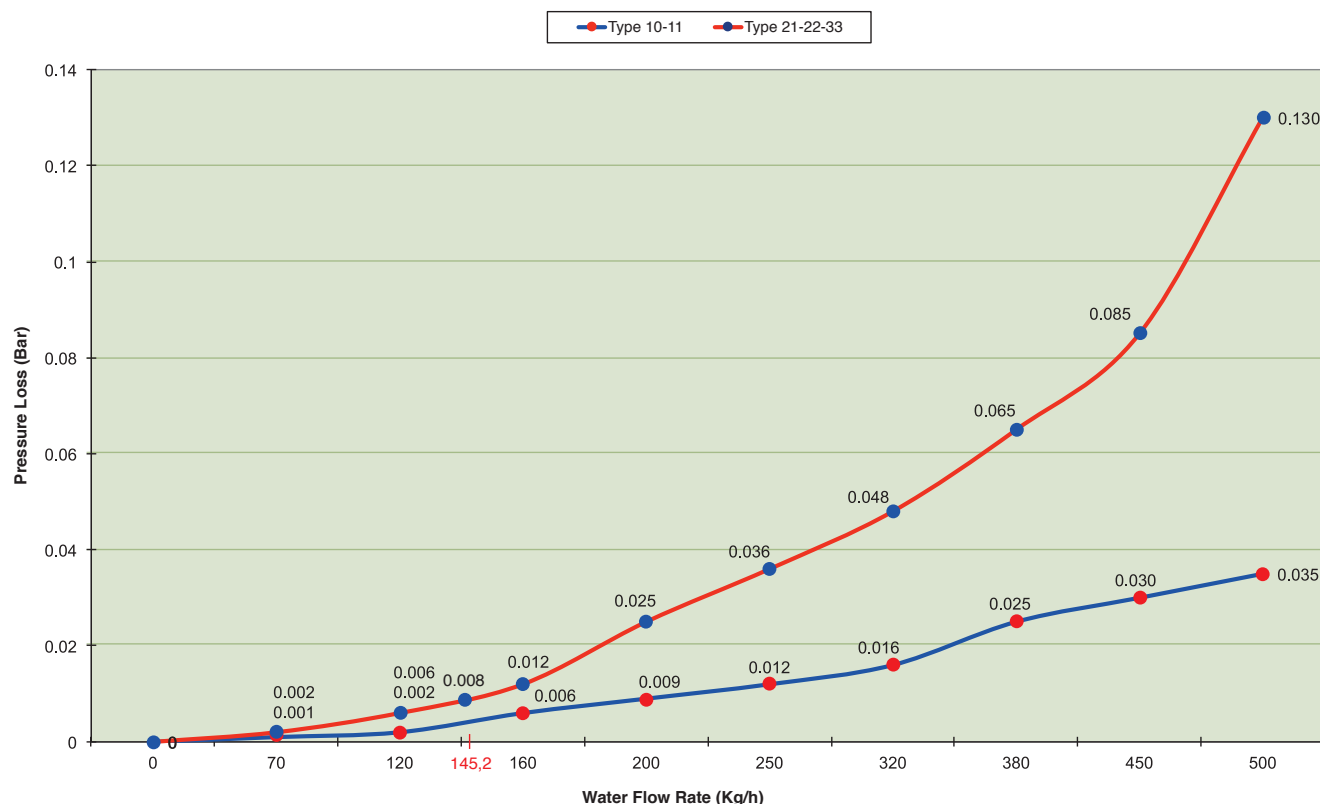
Radiator Choice Calculations

In order to get the maximum 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.

Pressure loss table



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

$Q_n = 1688 \text{ watt}$ = for one radiator of size 600/22DPDC/1000; it is 1452 kcal/h (1 watt = 0,86 kcal/h)

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

Water flow percentage = $1452 / (75 - 65)$ Water flow percentage = 145,2 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 0,008 bars.

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

Capacity of the Radiators Under Different Water and Room Temperatures

Radiator temperature outputs are linear. Heat output tables show the heat output of a one-meter (length) radiator. According to the Table 1, a one meter long radiator's output is 1,200 watts, and a 70 cm long radiator's output will be 840 watts (0,70 x 1200) and 2,200 mm long radiator's output will be 2,640 watts (2,2 x 1200)

Radiator heat outputs vary depending on differences of water and room temperatures.

In Table 2, you will find the heat outputs of radiator according to 90/70, 75/65, 70/55, 55/45 °C (water in and out temperatures), and in Table 1 you will find the heat outputs of radiator according to 90/70 °C at the different room temperature. (water in and out temperatures).

If you need other heat output values you can use the F factor values on Table 3. There are two examples below.

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: $Q=Q_n/F$

$$Q = 1688/1.17 = 1,443 \text{ watts}$$

Q = Needed heat output

Q_n = 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_n=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.

Table 1

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

Table 2

Heat Output Table (Watt)											
20°C		TYPE 11					TYPE 21				
L (mm)	t1/ t2 (°C)	H (mm)					H (mm)				
		300	400	500	600	900	300	400	500	600	900
400	90/70	227	294	357	428	609	342	433	518	619	858
	75/65	178	231	281	336	482	270	341	408	487	675
	70/55	155	201	244	293	420	235	298	356	424	587
	55/45	90	117	143	171	249	139	175	209	249	344
500	90/70	284	367	446	535	762	427	541	648	773	1073
	75/65	223	288	351	421	602	337	427	510	608	844
	70/55	194	251	305	366	526	294	372	445	530	734
	55/45	113	146	179	214	312	174	219	261	311	430
600	90/70	341	441	535	642	914	513	650	778	928	1287
	75/65	268	346	421	505	722	405	512	612	730	1012
	70/55	233	301	366	439	631	353	446	533	636	881
	55/45	136	176	215	257	374	209	263	314	373	516
700	90/70	398	514	624	749	1066	598	758	907	1083	1502
	75/65	312	403	491	589	843	472	597	714	852	1181
	70/55	271	351	428	512	736	412	521	622	742	1028
	55/45	158	205	251	300	436	244	307	366	435	602
800	90/70	455	587	713	856	1219	683	866	1037	1237	1716
	75/65	357	461	561	673	963	540	683	817	973	1350
	70/55	310	401	489	585	841	471	595	711	847	1175
	55/45	181	234	287	342	499	278	351	418	497	688
900	90/70	512	661	803	963	1371	769	975	1166	1392	1931
	75/65	401	519	631	757	1084	607	768	919	1095	1518
	70/55	349	451	550	659	946	530	670	800	953	1321
	55/45	204	263	322	385	561	313	394	471	559	774
1000	90/70	569	734	892	1070	1523	854	1083	1296	1547	2146
	75/65	446	576	701	841	1204	675	854	1021	1217	1687
	70/55	388	501	611	732	1051	588	744	889	1059	1468
	55/45	226	293	358	428	623	348	438	523	621	860
1100	90/70	625	808	981	1177	1676	940	1191	1426	1701	2360
	75/65	490	634	772	925	1325	742	939	1123	1338	1856
	70/55	427	551	672	805	1156	647	818	978	1165	1615
	55/45	249	322	394	471	686	383	482	575	684	946
1200	90/70	682	881	1070	1284	1828	1025	1299	1555	1856	2575
	75/65	535	692	842	1009	1445	809	1024	1225	1460	2025
	70/55	465	602	733	878	1261	706	893	1067	1271	1762
	55/45	271	351	430	514	748	417	526	627	746	1033
1400	90/70	796	1028	1248	1499	2132	1196	1516	1814	2165	3004
	75/65	624	807	982	1177	1686	944	1195	1429	1704	2362
	70/55	543	702	855	1024	1471	824	1042	1245	1483	2056
	55/45	317	410	502	599	872	487	613	732	870	1205
1600	90/70	910	1175	1427	1713	2437	1367	1733	2074	2475	3433
	75/65	713	922	1122	1346	1927	1079	1366	1633	1947	2700
	70/55	620	802	977	1171	1682	942	1190	1423	1695	2349
	55/45	362	468	573	685	997	557	701	836	994	1377
1800	90/70	1023	1322	1605	1927	2742	1538	1949	2333	2784	3862
	75/65	803	1037	1263	1514	2167	1214	1536	1837	2190	3037
	70/55	698	902	1099	1317	1892	1059	1339	1600	1907	2643
	55/45	407	527	645	770	1122	626	789	941	1119	1549
2000	90/70	1137	1468	1783	2141	3046	1708	2166	2592	3093	4291
	75/65	892	1153	1403	1682	2408	1349	1707	2041	2434	3374
	70/55	776	1003	1221	1463	2102	1177	1488	1778	2119	2937
	55/45	452	586	717	856	1246	696	876	1046	1243	1721

Heat Output Table (Watt)											
20°C		TYPE 11					TYPE 21				
L (mm)	t1/ t2 (°C)	H (mm)					H (mm)				
		300	400	500	600	900	300	400	500	600	900
2200	90/70	1251	1615	1962	2355	3351	1879	2382	2851	3403	4720
	75/65	981	1268	1543	1850	2649	1484	1878	2245	2677	3712
	70/55	853	1103	1344	1610	2312	1295	1637	1956	2331	3230
	55/45	498	644	788	941	1371	765	964	1150	1367	1893
2400	90/70	1364	1762	2140	2569	3656	2050	2599	3110	3712	5149
	75/65	1070	1522	1852	2220	3179	1781	2253	2695	3212	4454
	70/55	931	1323	1612	1932	2775	1553	1964	2347	2797	3876
	55/45	543	773	946	1130	1645	918	1157	1380	1640	2272
2600	90/70	1478	1909	2318	2783	3960	2221	2815	3369	4021	5579
	75/65	1159	1498	1824	2187	3131	1754	2219	2654	3164	4387
	70/55	1008	1303	1588	1902	2733	1530	1934	2312	2754	3818
	55/45	588	761	931	1113	1620	905	1139	1359	1616	2237
2800	90/70	1592	2056	2497	2997	4265	2392	3032	3629	4331	6008
	75/65	1249	1614	1964	2355	3371	1889	2390	2858	3407	4724
	70/55	1086	1404	1710	2049	2943	1648	2083	2490	2966	4111
	55/45	633	820	1003	1198	1745	974	1227	1464	1740	2409
3000	90/70	1706	2203	2675	3211	4570	2563	3249	3888	4640	6437
	75/65	1338	1729	2104	2523	3612	2024	2561	3062	3650	5062
	70/55	1163	1504	1832	2195	3153	1765	2232	2667	3178	4405
	55/45	679	878	1075	1284	1870	1044	1315	1568	1864	2581

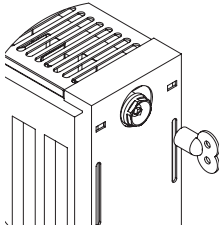
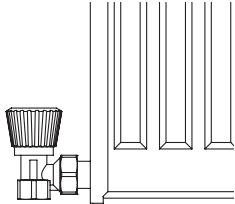
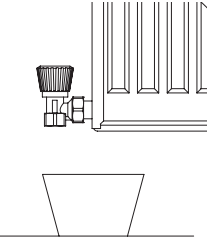
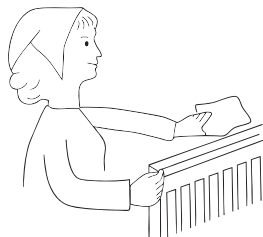
Heat Output Table (Watt)											
20°C		TYPE 22					TYPE 33				
L (mm)	t1/ t2 (°C)	H (mm)					H (mm)				
		300	400	500	600	900	300	400	500	600	900
400	90/70	445	569	679	820	1117	620	789	946	1132	1575
	75/65	351	448	535	644	878	489	620	743	885	1233
	70/55	306	390	466	561	763	426	539	646	768	1070
	55/45	181	229	273	328	447	252	316	377	445	621
500	90/70	556	711	849	1025	1396	774	986	1183	1415	1968
	75/65	438	560	668	806	1097	611	775	928	1107	1541
	70/55	382	488	582	701	954	533	674	807	961	1338
	55/45	226	287	342	410	559	315	395	471	557	777
600	90/70	667	853	1019	1230	1675	929	1183	1419	1697	2362
	75/65	526	672	802	967	1316	733	930	1114	1328	1850
	70/55	459	585	698	841	1145	640	809	968	1153	1606
	55/45	271	344	410	492	670	378	473	565	668	932
700	90/70	778	995	1189	1435	1954	1084	1380	1656	1980	2755
	75/65	614	784	936	1128	1536	855	1085	1300	1550	2158
	70/55	535	683	815	981	1336	746	944	1130	1345	1873
	55/45	316	401	478	574	782	440	552	659	779	1088
800	90/70	889	1137	1359	1640	2233	1239	1577	1893	2263	3149
	75/65	702	896	1069	1289	1755	978	1240	1485	1771	2466
	70/55	612	780	931	1121	1527	853	1079	1291	1537	2141
	55/45	361	459	547	656	894	503	631	753	891	1243

Heat Output Table (Watt)											
20°C		TYPE 22					TYPE 33				
L (mm)	t1/ t2 (°C)	H (mm)					H (mm)				
		300	400	500	600	900	300	400	500	600	900
900	90/70	1000	1279	1529	1845	2512	1394	1775	2129	2546	3543
	75/65	789	1007	1203	1450	1975	1100	1395	1671	1992	2774
	70/55	688	878	1047	1261	1718	959	1213	1453	1729	2409
	55/45	406	516	615	738	1005	566	710	847	1002	1398
1000	90/70	1111	1421	1699	2050	2792	1549	1972	2366	2829	3936
	75/65	877	1119	1337	1688	2194	1222	1549	1856	2214	3083
	70/55	765	975	1164	1402	1909	1066	1348	1614	1921	2676
	55/45	452	573	683	820	1117	629	789	942	1113	1554
1100	90/70	1222	1563	1868	2255	3071	1704	2169	2602	3112	4330
	75/65	965	1231	1470	1772	2413	1344	1704	2042	2435	3391
	70/55	841	1073	1280	1542	2099	1172	1483	1775	2113	2944
	55/45	497	631	751	902	1229	692	868	1036	1225	1709
1200	90/70	1334	1706	2038	2460	3350	1859	2366	2839	3395	4724
	75/65	1052	1343	1604	1933	2633	1467	1859	2228	2656	3699
	70/55	918	1170	1397	1682	2290	1279	1618	1937	2305	3211
	55/45	542	688	820	984	1340	755	947	1130	1336	1864
1400	90/70	1556	1990	2378	2870	3908	2168	2760	3312	3961	5511
	75/65	1228	1567	1871	2256	3072	1711	2169	2599	3099	4316
	70/55	1070	1365	1629	1962	2672	1492	1888	2260	2690	3747
	55/45	632	803	956	1148	1564	881	1105	1318	1559	2175
1600	90/70	1778	2274	2718	3280	4466	2478	3155	3785	4527	6298
	75/65	1403	1791	2139	2578	3510	1955	2479	2970	3542	4932
	70/55	1223	1560	1862	2243	3054	1705	2157	2582	3074	4282
	55/45	722	917	1093	1312	1787	1007	1262	1507	1781	2486
1800	90/70	2000	2558	3057	3690	5025	2788	3549	4258	5092	7086
	75/65	1578	2015	2406	2900	3949	2200	2789	3342	3984	5549
	70/55	1376	1755	2095	2523	3435	1919	2427	2905	3458	4817
	55/45	813	1032	1230	1477	2011	1133	1420	1695	2004	2797
2000	90/70	2223	2843	3397	4100	5583	3098	3943	4731	5658	7873
	75/65	1754	2239	2674	3222	4388	2444	3099	3713	4427	6165
	70/55	1529	1950	2328	2803	3817	2132	2697	3228	3842	5352
	55/45	903	1147	1366	1641	2234	1259	1578	1883	2226	3107
2200	90/70	2445	3127	3737	4510	6141	3408	4338	5204	6224	8660
	75/65	1929	2463	2941	3544	4827	2689	3409	4084	4870	6782
	70/55	1682	2145	2560	3084	4199	2345	2966	3551	4226	5887
	55/45	993	1261	1503	1805	2458	1384	1736	2071	2449	3418
2400	90/70	2667	3411	4077	4920	6700	3717	4732	5678	6790	9447
	75/65	2315	2955	3529	4253	5792	3226	4091	4901	5844	8138
	70/55	2019	2574	3072	3700	5039	2814	3560	4261	5072	7065
	55/45	1192	1514	1803	2166	2949	1661	2083	2486	2939	4102
2600	90/70	2889	3696	4416	5330	7258	4027	5126	6151	7356	10235
	75/65	2280	2911	3476	4189	5704	3177	4029	4827	5755	8015
	70/55	1988	2535	3026	3644	4962	2771	3506	4196	4995	6958
	55/45	1174	1491	1776	2133	2904	1636	2052	2448	2894	4039
2800	90/70	3112	3980	4756	5740	7816	4337	5521	6624	7921	11022
	75/65	2455	3134	3743	4511	6143	3422	4339	5198	6198	8631
	70/55	2141	2730	3259	3925	5344	2985	3775	4519	5379	7493
	55/45	1264	1605	1913	2297	3128	1762	2209	2636	3117	4350
3000	90/70	3334	4264	5096	6150	8375	4647	5915	7097	8487	11809
	75/65	2631	3358	4010	4833	6582	3666	4648	5569	6641	9248
	70/55	2294	2925	3491	4205	5726	3198	4045	4842	5763	8028
	55/45	1355	1720	2049	2461	3351	1888	2367	2825	3340	4661

Table 3

F Factor Table								
Entrance Water Temp. t1 (°C)	Exit Water Temp. 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
85	50	0.83	0.87	0.93	1.01	1.07	1.14	1.21
	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
80	55	0.81	0.85	0.91	0.98	1.04	1.10	1.16
	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
75	50	0.91	0.96	1.04	1.13	1.20	1.28	1.37
	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
70	50	0.96	1.01	1.10	1.20	1.28	1.37	1.47
	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
65	45	1.10	1.16	1.28	1.42	1.52	1.64	1.79
	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
60	40	1.28	1.37	0.52	1.71	1.87	2.05	2.27
	55	1.07	1.13	1.23	1.36	1.45	1.56	1.68
	50	1.15	1.22	1.34	1.48	1.60	1.73	1.87
	45	1.25	1.33	1.47	1.65	1.78	1.94	2.13
55	40	1.37	1.47	1.64	1.86	2.03	2.24	2.50
	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
50	35	1.64	1.78	2.03	2.36	2.64	2.99	3.43
	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
45	30	2.03	2.24	2.64	3.20	3.70	4.39	5.39
	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
40	30	2.24	2.48	2.96	3.63	4.25	5.11	6.38
	35	2.17	2.40	2.83	3.41	3.93	4.62	5.54
40	30	2.50	2.79	3.37	4.21	5.01	6.14	7.87

Pay Attention to the Following for an Appropriate Operation

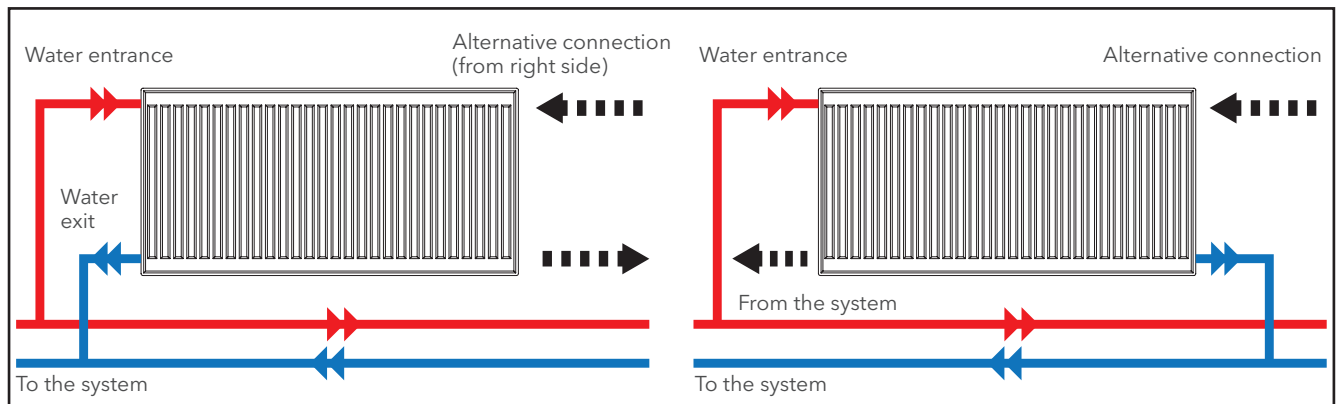
1.	ACCURATE CHOOSING	In order to get the maximum efficiency from the radiator, you need to choose the appropriate one and place it in a suitable location. Here, we give the necessary criteria, graphics and tables to help choosing the appropriate radiator. We explain the necessary precautions for the location of the radiator as well. Please examine these parts before choosing a radiator.
2.		In order to let the radiator to work and with high efficiency, you should take out the jammed air from the radiator.
3.	PMA 10 BAR	Maximum operational working pressure is 10 bars. You should not apply more than 10 bars operationally.
4.		Please install valves at the water entrance and exit of the radiator. This way, if there is a problem in the radiator, you can easily take the radiator out of the circulation system.
5.		Even if you do not use the radiator for a long time, please do not evacuate the water from the radiator. During system maintenance, close the valves in order to leave the water inside the radiator. Otherwise, corrosion will start inside the radiator which will harm the whole system. If there is any leakage in the radiator or in the connection points, it should be repaired immediately.
6.	0°C	Do not install the radiator externally where freezing danger is available. The radiator's installation environment temperature should not be less than 0°C. Frozen water inside the radiator might harm both the radiator and the whole system. If the radiator environment temperature is below 0°C; then please add anti-freeze to the water inside the system.
7.	120°C	Maximum operational working temperature of a radiator is 120 °C. You should not use the radiator above this temperature.
8.		Do not use any chemicals to wipe and clean the surfaces of the radiators. You can use moist cloth to clean the surface of the radiator.

Installation Suggestions

You can install the radiator to the system depending on the location and features of the radiator. We propose to use water entrance valve and water exit valve. This will allow you separate the radiator from the system without emptying the water or when the system is operating. Information on the radiator connection shape and efficiency is below.

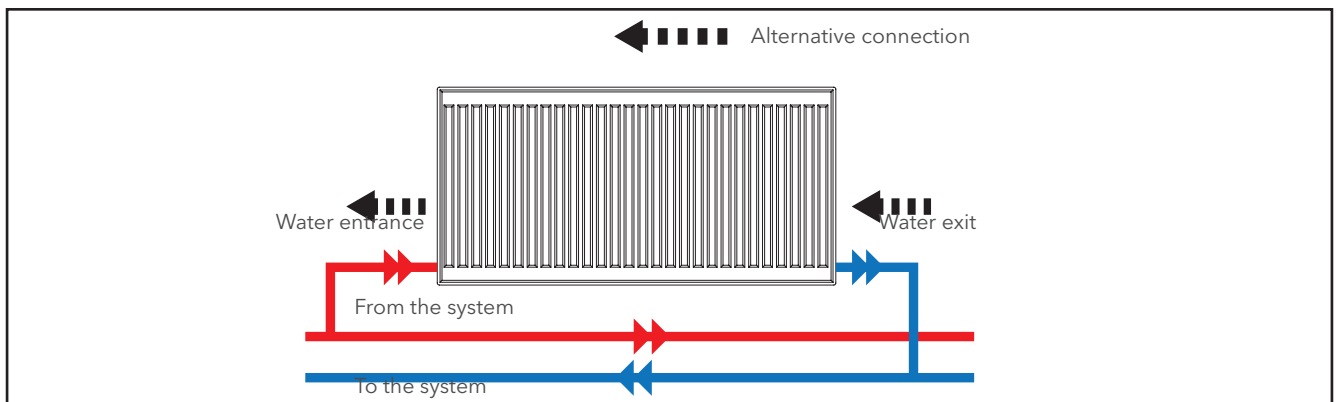
1. Hot water entrance from the top and exit from below:

Water entrance and exit can be from the same sides or opposite sides. Entrance or exit can be done both from right or left sides. This commonly used feature enables assembly according to the connections. Connection from the same side or other side effects the efficiency of the radiator due to change of water flow. Our experiments indicate the efficiency does not change much in different heights and different lengths even upto 3,000 mm. Hence, with our radiators, you can connect using both sides since there is almost no efficiency change.



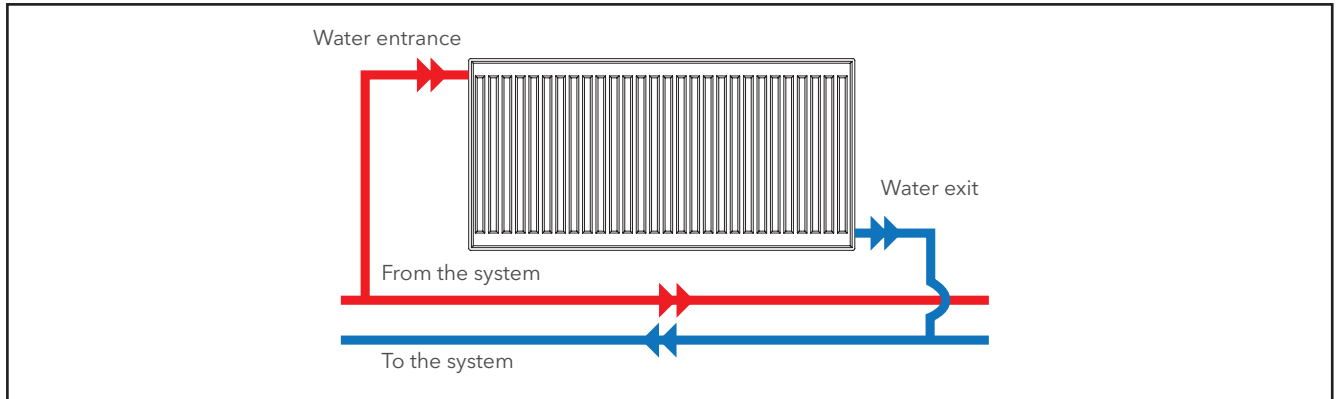
2. Water entrance and exit from below:

Although not preferred, when connecting from above is not possible, you can make the connections from below. When the entrance connection is made from the top, the water is spread evenly on the radiator body and leave the radiator from the bottom connection which leaves a homogenous distribution of heat on the surface. But when both connections are made from below, some water flows directly to the exit and some goes up and falls down and mixes up with the water flowing. Therefore the efficiency is 10 to 20% lower on radiators where both connections are made from below. Entrance and exit can be changed when conditions change.



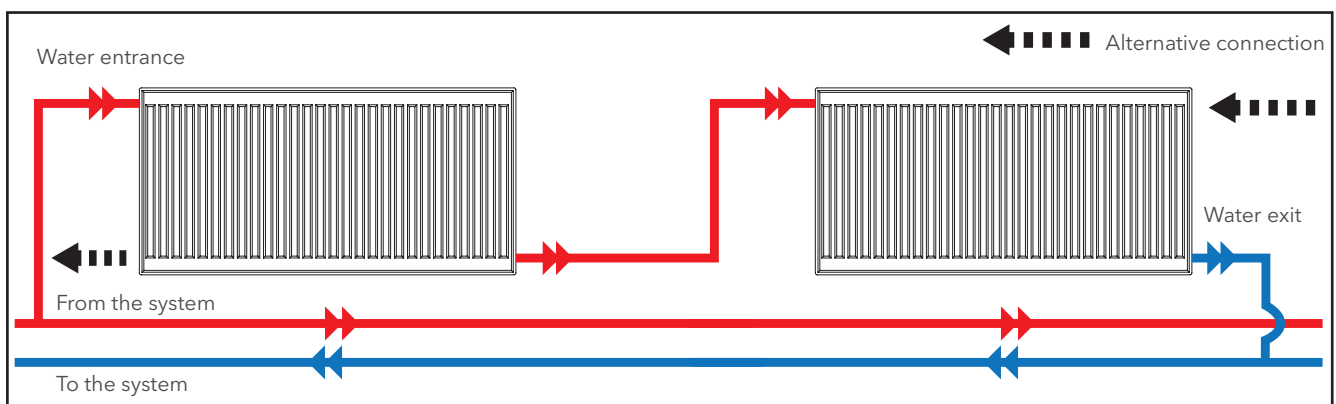
3. Connection to single pipe system:

In this type of connection the heat is reduced by discharged chilled water from a radiator due to mixing with hot water, the heat in each radiator will be different. For an efficient heating the pipe diameter is very important. The radiator inlet pipe should be chosen larger than the plumbing pipe. The radiator outlet pipe should be chosen smaller than the plumbing pipe for complete circulation of water. In addition, to ensure the water supply, the adjustment of radiator valves and the flow rate should be done, while the flow rate of the first radiator is reduced towards the end radiators the flow should be increased.



4. Connection of the serial (side by side) radiators:

This kind of connection is used in very rare conditions where, due to the construction features, the wall is divided by the columns. In this connection, water exit of the radiator goes to water entrance of the other radiator. Therefore, heat output of each radiator changes. Water entrance and exit can be done from the same or different sides. When different sides are used, radiators connected serially have a total heat output that is a little bit less than when the radiators (same quantity) are connected individually. When the same sides are used for entrance and exit, then radiators connected serially give a total heat output that is 8 to 10 % less than when the radiators (same quantity) are connected individually. During implementation, the first choice should be preferred. Otherwise, please take care of the efficiency loss in the other option. Depending on the circulation pump, total heat output load should not be more than 7,000-8,000 Kcal/hour.

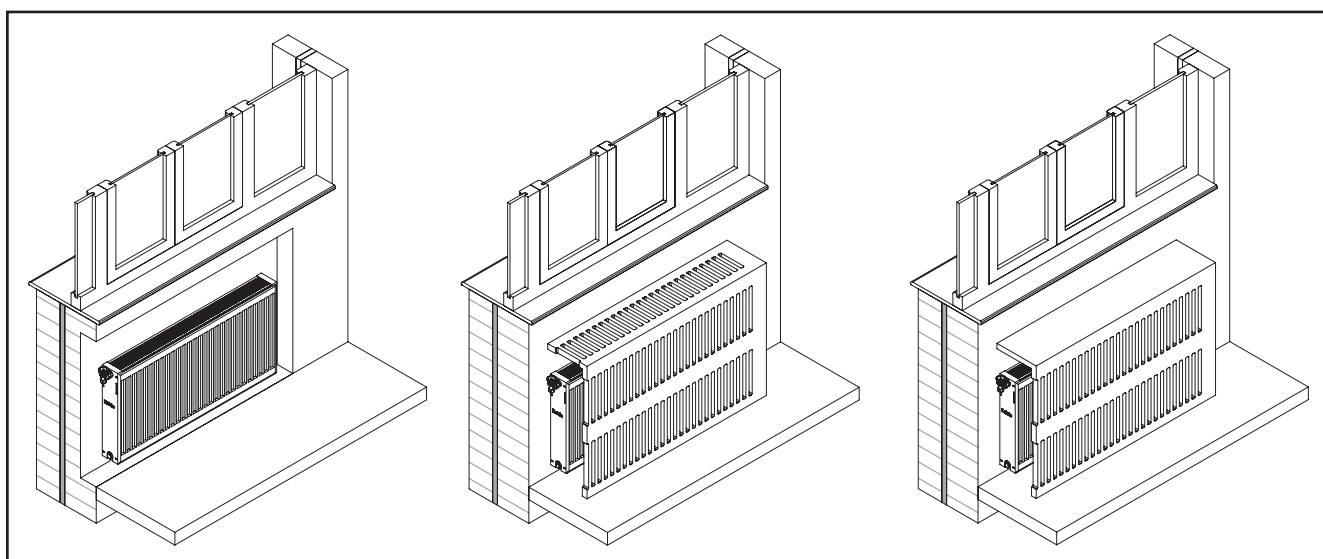


Points to Get Maximum Comfort During the Placement of the Radiator

In some rooms there can be indentation below the window where the radiator is to be located. In this case, the radiator should be placed inside this indentation. In some environments, the radiator is covered with wooden furniture for aesthetic reasons. However, it is better not to cover the top and other sides of the radiator for more efficiency. TS 1499 and TS 2164/2 publications show how the efficiency of the radiator is effected negatively based on the location of the radiator. To increase efficiency, one should pay attention to the below points.

If the top of the radiator is covered; heated air will pass through to the room before reaching the window. Hence, window and the glasses will stay cold. In this case, the cold air flow will effect the environment temperature.

If top cover is essential, then use a grilled cover to leave some gap for air circulation.



Radiator Efficiency Calculation

Example 1

Radiator Type: 22 DPDC

Height = 600 mm

Length = 1,000 mm

Location: a = 100 mm b = 40 mm c = 80 mm

Find the efficiency of the radiator on Table 4 plan location no. 4 = 90 %

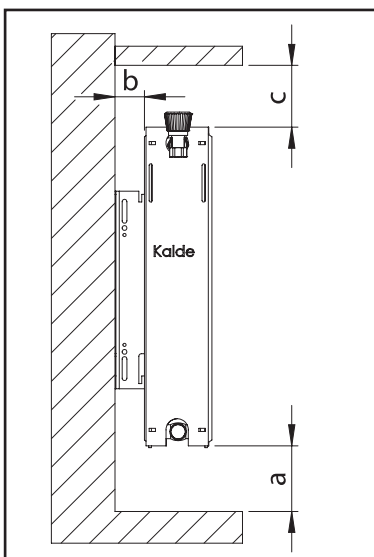
Room Temperature: 20 °C

Water entrance Exit Temperature: 90/70 °C

On Table 1 Heat output = 2110 watts

Capacity = Nominal capacity x efficiency

= 2110 x 0,90 = 1900 watt



Example 2

Height = 600 mm

Length = 1,000 mm.

Location: b = 40 mm, c = 80 mm, d = 104 mm.

Find the efficiency of the radiator on Table 5 plan location no. 4 = 105 %

Room Temperature = 20 °C

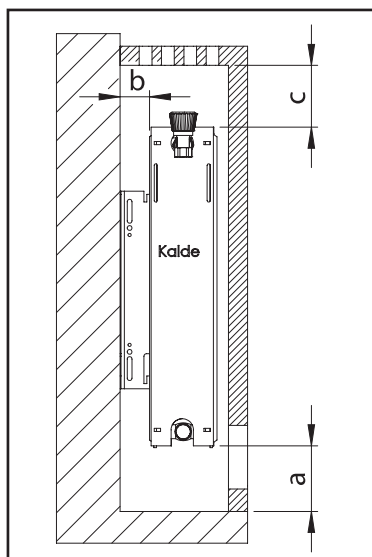
Water entrance Exit Temperature = 90/70 °C

On Table 5 a = 0,70 x d = 0.70 x 104 = 73,5 mm

Heat output = 2110 watts

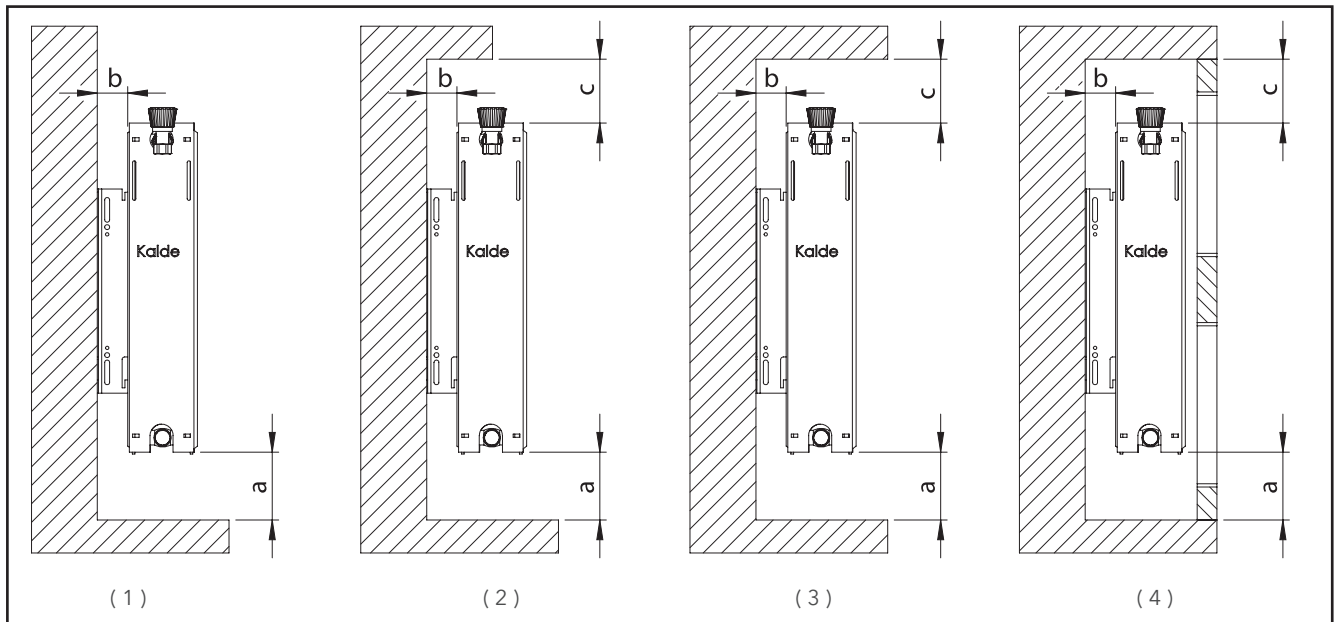
Capacity = Nominal capacity x efficiency

= 2110 x 1.05 = 2215 watt



Points to Take Care During Mounting In Order to Get Maximum Efficiency:

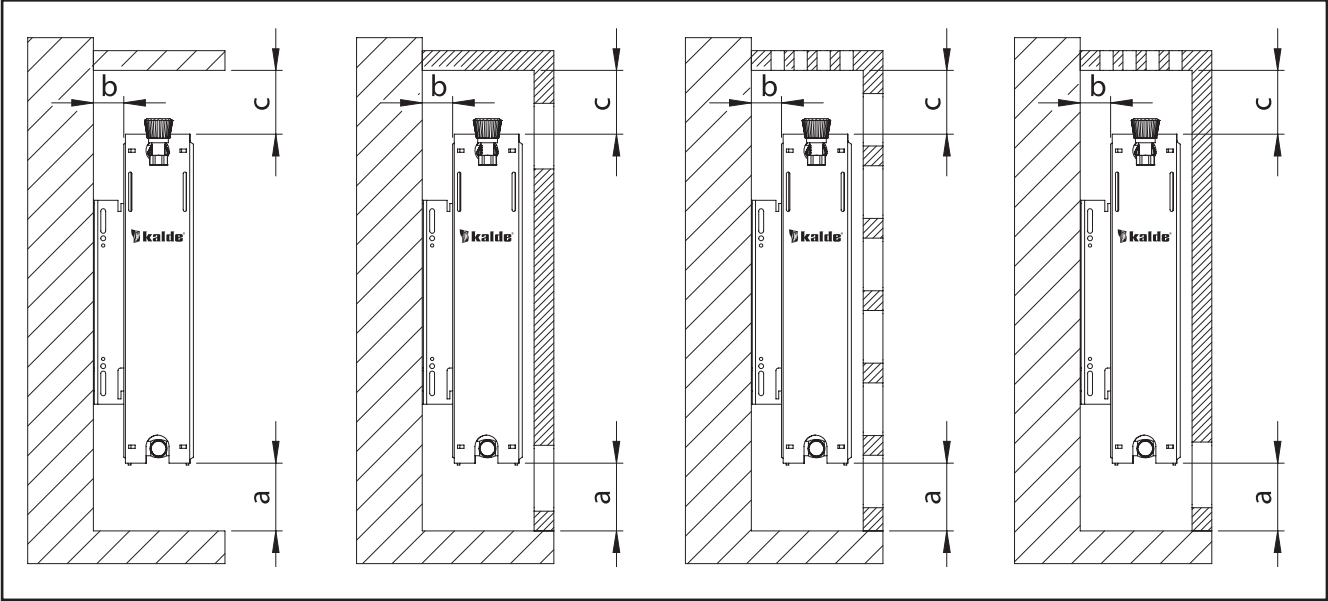
If the surrounding and top part are covered, the efficiency of the radiator goes down when air flow is banned. In this case the choice of the radiator should be done according to efficiency loss. Ideal position of a radiator as indicated in TS 2164/2- is that where the top and surrounding are not covered and it is placed 40 mm away from the wall and 100 mm above the floor.



R The base width of the window also effects the distribution of the air flow inside the room. The base of the window should fully, at least partially, the top of the radiator.

Table 4

Dimensions (mm)	a (min)	100	100	100	100
	b (min)	40	40	40	40
	c	-	80	80	80
Efficiency (%)		100	96	90	75



The efficiency changes depending on how the radiator is covered can be seen from the figure.

Table 5

Dimensions (mm)	a (min)	100		100		100	a=0.70 d
	b (min)	40		40		40	40
	c	100	50	100	50	80	80
Efficiency (%)		97	95	90	85	90	105

Points to Take Into Consideration And Warranty Conditions

- 1- Our Warranty does not apply for the following problems and defects:
 - Incorrectly located radiators; incorrect pipe connections; incorrect capacity and type choice; more than 5 bars installation pressure; incorrectly designed and made installation; physical (impacts, cracks, scratches) and chemical changes made after the sales; any problems that may be born from loading, unloading, transportation, or storage conditions; damage from fire or thunderbolt or flood, or other natural disasters; freezing due to climate conditions; any sytem which does not comply with the installation instructions indicated in our manual; using electric plugs without earthening; any problem or damage born from faulty electrical installation
 - Destruction on the certificate, and acts against the instructions stated in the instruction manual and related problems and damages caused because of these reasons
 - Scratches on painted surfaces, impacts and related problems caused by these defects
 - If you can not submit a Warranty Certificate together with an invoice of your purchase
 - Any damages resulting from not regularly maintaining and checking the product
 - Use of unauthorized personnel for radiators with damages or defects
 - Damages caused by the components and boilers connected to the radiator and installation
- 2- Please fill in the warranty certificate while purchasing our product, and have it stamped from the dealer. Please keep your invoice and warranty certificate together.
- 3- Please follow the instructions in the instruction manual given with the product while using the product.
- 4- Please consult to your dealer or our company for any problems.
- 5- The warranty begins with the sales date on the warranty card. As to benefit from warranty you should inform your distributor about the defect immediately as it occurs and you should follow your distributor's instructions. Warranty conditions are as per warranty certification of the seller.
- 6- During the assembly, if the fittings are tightened to the radiator too firmly, leakages may occur. Do not tighten the fittings to the radiator too firmly.
- 7- After the assembly, fittings should be free from dust and sawdust. If necessary, please clean the surfaces of the fittings before the installation test.
- 8- Please control the connection points of the system during the water transmission. The pressure of the transmission should comply with the operational pressure of the system.
- 9- Radiators should be protected against impacts and scratches during transportation. Scratches and impacts on the surface of the radiator can result in problems not covered by our warranty
- 10- Please use moisty cloth while cleaning the surface of your radiator. Do not use any chemical substances or a completely wet cloth for cleaning.
- 11- There can be air inside the radiator after the installation or during the operation of the system. This will prevent the radiator from working efficiently. Use the purjor key to evacuate the air.
- 12- Never evacuate the water inside your radiator. In time, changing the radiator water might cause corrosion inside. If you do not use your radiator for a long time, in order not to lose water out of your radiator, please tighten the valves.
- 13- Please do not install the radiator externally where freezing danger is available. The radiator's installation environment temperature should not be less than 0°C. Frozen water inside the radiator might harm both the radiator and the whole system. If the radiator environment temperature is below 0°C, then add anti-freeze to the water inside the system.
- 14- Maximum operational working temperature of a radiator is 120 °C. You should not use the radiator above this temperature.
- 15- Please use only water for the circulation inside your radiator. Do not use any other liquid substances otherwise stated.
- 16- You should not use your radiator in acidic environments and environments containing chemical substances. Such environments might cause corrosion on surface paint and steel surface of the radiator.
- 17- Do not dry, wet clothing or any wet dresses on the radiator surface. Do not use the surfaces for heating food or a tea pot. Radiators have been designed as devices to transmit the heat which is circulating inside.
- 18- Do not cover the surface and top of the radiators. Leave enough space for air circulation. Do not cover the radiator with furniture, cabinet, cloth, or marble since you can not get maximum efficiency from the radiator.
- 19- If water circulating inside the system is hard or acidic, use anti-corrosives (oxygen removing agent or PH organizer for aborting hardness) in your system.
- 20- Panel radiator should be used in closed circuit systems. Never use them in open circuit systems (steam, thermal, boiling water, or network water system).
- 21- Panel radiators should not be installed in humid environments (swimming pool, sauna, parks, winter gardens, closed areas where the humidity is very high).
- 22- Panel radiators should not be used in environments exposed to acids, or environments with low PH values (pickles factory or canned food factory), or near seas with salty conditions. They should not be exposed to breeze of salty conditions, to acid rain, or to acidic climate and places.
- 23- Our products should be installed according to standards accepted by EN 442; otherwise, the warranty is not valid.
- 24- Any urgent necessary repairs should be carried out by the authorised services of the distributor. The approval of the distributor is compulsory.
- 25- A leakage test at maximum 5 Atu should be applied to radiators and to its components after installation completed properly. Before starting up the system, it should be cleaned from every kind of dust and dirt.
- 26- The water installation systems are subject to a 24 hours testing period before taking in use as indicated in Kalde catalogs. (Please keep the test reports for any requirements)

Type 22 / H 300

Code	Size	Pcs.
0322-rad-300400	300 x 400	1
0322-rad-300500	300 x 500	1
0322-rad-300600	300 x 600	1
0322-rad-300700	300 x 700	1
0322-rad-300800	300 x 800	1
0322-rad-300900	300 x 900	1
0322-rad-301000	300 x 1000	1
0322-rad-301100	300 x 1100	1
0322-rad-301200	300 x 1200	1
0322-rad-301300	300 x 1300	1
0322-rad-301400	300 x 1400	1
0322-rad-301500	300 x 1500	1
0322-rad-301600	300 x 1600	1
0322-rad-301700	300 x 1700	1
0322-rad-301800	300 x 1800	1
0322-rad-301900	300 x 1900	1
0322-rad-302000	300 x 2000	1
0322-rad-302100	300 x 2100	1
0322-rad-302200	300 x 2200	1
0322-rad-302300	300 x 2300	1
0322-rad-302400	300 x 2400	1
0322-rad-302500	300 x 2500	1
0322-rad-302600	300 x 2600	1
0322-rad-302700	300 x 2700	1
0322-rad-302800	300 x 2800	1
0322-rad-302900	300 x 2900	1
0322-rad-303000	300 x 3000	1



Type 22 / H 400

Code	Size	Pcs.
0322-rad-400400	400 x 400	1
0322-rad-400500	400 x 500	1
0322-rad-400600	400 x 600	1
0322-rad-400700	400 x 700	1
0322-rad-400800	400 x 800	1
0322-rad-400900	400 x 900	1
0322-rad-401000	400 x 1000	1
0322-rad-401100	400 x 1100	1
0322-rad-401200	400 x 1200	1
0322-rad-401300	400 x 1300	1
0322-rad-401400	400 x 1400	1
0322-rad-401500	400 x 1500	1
0322-rad-401600	400 x 1600	1
0322-rad-401700	400 x 1700	1
0322-rad-401800	400 x 1800	1
0322-rad-401900	400 x 1900	1
0322-rad-402000	400 x 2000	1
0322-rad-402100	400 x 2100	1
0322-rad-402200	400 x 2200	1
0322-rad-402300	400 x 2300	1
0322-rad-402400	400 x 2400	1
0322-rad-402500	400 x 2500	1
0322-rad-402600	400 x 2600	1
0322-rad-402700	400 x 2700	1
0322-rad-402800	400 x 2800	1
0322-rad-402900	400 x 2900	1
0322-rad-403000	400 x 3000	1



* Sipariş üzerine üretilmektedir.

Type 22 / H 500

Code	Size	Pcs.
0322-rad-500400	500 x 400	1
0322-rad-500500	500 x 500	1
0322-rad-500600	500 x 600	1
0322-rad-500700	500 x 700	1
0322-rad-500800	500 x 800	1
0322-rad-500900	500 x 900	1
0322-rad-501000	500 x 1000	1
0322-rad-501100	500 x 1100	1
0322-rad-501200	500 x 1200	1
0322-rad-501300	500 x 1300	1
0322-rad-501400	500 x 1400	1
0322-rad-501500	500 x 1500	1
0322-rad-501600	500 x 1600	1
0322-rad-501700	500 x 1700	1
0322-rad-501800	500 x 1800	1
0322-rad-501900	500 x 1900	1
0322-rad-502000	500 x 2000	1
0322-rad-502100	500 x 2100	1
0322-rad-502200	500 x 2200	1
0322-rad-502300	500 x 2300	1
0322-rad-502400	500 x 2400	1
0322-rad-502500	500 x 2500	1
0322-rad-502600	500 x 2600	1
0322-rad-502700	500 x 2700	1
0322-rad-502800	500 x 2800	1
0322-rad-502900	500 x 2900	1
0322-rad-503000	500 x 3000	1



Type 22 / H 600

Code	Size	Pcs.
0322-rad-600400	600 x 400	1
0322-rad-600500	600 x 500	1
0322-rad-600600	600 x 600	1
0322-rad-600700	600 x 700	1
0322-rad-600800	600 x 800	1
0322-rad-600900	600 x 900	1
0322-rad-601000	600 x 1000	1
0322-rad-601100	600 x 1100	1
0322-rad-601200	600 x 1200	1
0322-rad-601300	600 x 1300	1
0322-rad-601400	600 x 1400	1
0322-rad-601500	600 x 1500	1
0322-rad-601600	600 x 1600	1
0322-rad-601700	600 x 1700	1
0322-rad-601800	600 x 1800	1
0322-rad-601900	600 x 1900	1
0322-rad-602000	600 x 2000	1
0322-rad-602100	600 x 2100	1
0322-rad-602200	600 x 2200	1
0322-rad-602300	600 x 2300	1
0322-rad-602400	600 x 2400	1
0322-rad-602500	600 x 2500	1
0322-rad-602600	600 x 2600	1
0322-rad-602700	600 x 2700	1
0322-rad-602800	600 x 2800	1
0322-rad-602900	600 x 2900	1
0322-rad-603000	600 x 3000	1



Type 22 / H 900

Code	Size	Pcs.
0322-rad-900400	900 x 400	1
0322-rad-900500	900 x 500	1
0322-rad-900600	900 x 600	1
0322-rad-900700	900 x 700	1
0322-rad-900800	900 x 800	1
0322-rad-900900	900 x 900	1
0322-rad-901000	900 x 1000	1
0322-rad-901100	900 x 1100	1
0322-rad-901200	900 x 1200	1
0322-rad-901300	900 x 1300	1
0322-rad-901400	900 x 1400	1
0322-rad-901500	900 x 1500	1
0322-rad-901600	900 x 1600	1
0322-rad-901700	900 x 1700	1
0322-rad-901800	900 x 1800	1
0322-rad-901900	900 x 1900	1
0322-rad-902000	900 x 2000	1
0322-rad-902100	900 x 2100	1
0322-rad-902200	900 x 2200	1
0322-rad-902300	900 x 2300	1
0322-rad-902400	900 x 2400	1
0322-rad-902500	900 x 2500	1
0322-rad-902600	900 x 2600	1
0322-rad-902700	900 x 2700	1
0322-rad-902800	900 x 2800	1
0322-rad-902900	900 x 2900	1
0322-rad-903000	900 x 3000	1



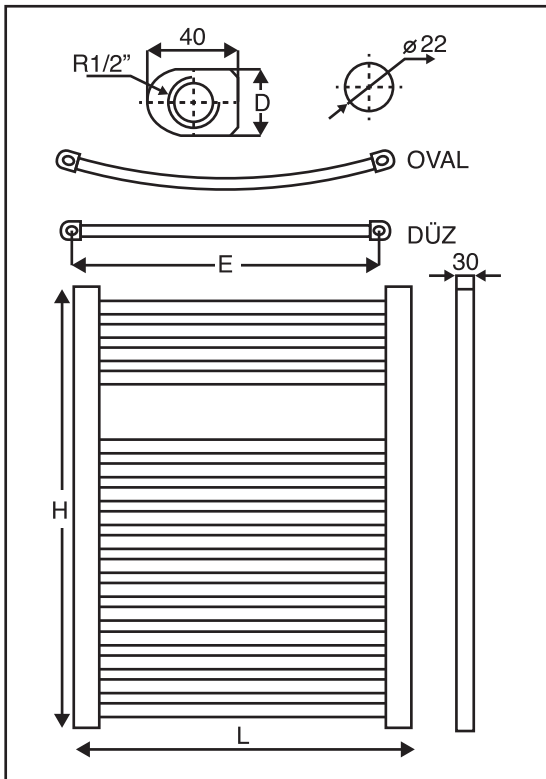
Radiators

Kalde Towel Radiator

Kalde Towel Radiators can be used for both heating and decorating purposes in bathrooms, kitchens, rooms or anywhere with great performance. Just choose one for warmer rooms. Our Towel Radiators which are produced in fully automated factory according to EN 442; offer great comfort with different heights, lengths, colors, plating and types. Our curved types and chrom plated towel radiators makes a good harmony with the armature system of the bathrooms. We give 2 years guarantee to our towel radiators.

Models:

- Electrostatic Painted (White) Flat Type
- Electrostatic Painted (White) Oval Type
- Chrome Plated Flat Type
- Chrome Plated Oval Type



Width, L mm	Height, H mm	Depth, D mm	Axis Range, E mm
400	800	30	355
400	1000	30	355
400	1200	30	355
400	1400	30	355
400	1600	30	355
400	1800	30	355
500	800	30	455
500	1000	30	455
500	1200	30	455
500	1400	30	455
500	1600	30	455
500	1800	30	455
600	800	30	555
600	1000	30	555
600	1200	30	555
600	1400	30	555
600	1600	30	555
600	1800	30	555

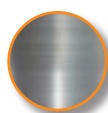
Test Pressure	: 13 bars
Max. working pressure	: 10 bars
Max. Working temperature	: 120 °C
Min wall thickness tube	: 1 mm
Diameter of tube (Ø)	: 22mm
Paint	: Epoxy electrostatic powder paint
Chromation	: Chrome Plated
Packaging	: First wrapped by nylon, and to be sleeved by double layer.
Installation	: All installation accessories are in a small box inside the carton box with simple instruction manuel.

● Radiators

Colors :



White



Chrome plated

Technical Information

Towel Radiators White (Straight)								
Code	Size (LxH) mm	Axis Distance (E) mm	Pcs.	Number of Pipes	Water Content (lt)	Weight (Kg)	Heat Output Value $\Delta T:50$ (TS EN 442 75°/65°C)	
							Watt	Kcal/h
0322-pan-400700	400x700	355	1	14	2.7	4.29	260	224
0322-pan-400800	400x800	355	1	15	2.98	4.73	287	247
0322-pan-401000	400x1000	355	1	21	3.95	6.3	385	331
0322-pan-401100	400x1100	355	1	23	4.34	6.91	423	364
0322-pan-401200	400x1200	355	1	25	4.72	7.52	459	395
0322-pan-401600	400x1600	355	1	31	6.06	9.63	584	502
0322-pan-500700	500x700	455	1	14	3.14	5.02	303	260
0322-pan-500800	500x800	455	1	15	3.45	5.51	330	282
0322-pan-501000	500x1000	455	1	21	4.61	7.39	465	400
0322-pan-501100	500x1100	455	1	23	5.06	8.11	510	439
0322-pan-501200	500x1200	455	1	25	5.51	8.82	550	473
0322-pan-501600	500x1600	455	1	31	7.03	11.24	702	604
0322-pan-501800	500x1800	455	1	37	8.19	13.12	822	707
0322-pan-600700	600x700	555	1	14	3.58	5.74	359	309
0322-pan-600800	600x800	555	1	15	3.92	6.29	401	345
0322-pan-601000	600x1000	555	1	21	5.27	8.48	544	468
0322-pan-601100	600x1100	555	1	23	5.78	9.3	597	513
0322-pan-601200	600x1200	555	1	25	6.29	10.12	643	553
0322-pan-601600	600x1600	555	1	31	8.01	12.86	819	704
0322-pan-601800	600x1800	555	1	37	9.36	15.05	963	828

Towel Radiators White (Curved)								
Code	Size (LxH) mm	Axis Distance (E) mm	Pcs.	Number of Pipes	Water Content (lt)	Weight (Kg)	Heat Output Value $\Delta T:50$ (TS EN 442 75°/65°C)	
							Watt	Kcal/h
0322-pao-400700	400x700	355	1	14	2.71	4.32	259	223
0322-pao-400800	400x800	355	1	15	3	4.76	287	247
0322-pao-401000	400x1000	355	1	21	3.98	6.34	381	327
0322-pao-401100	400x1100	355	1	23	4.37	6.96	418	360
0322-pao-401200	400x1200	355	1	25	4.75	7.57	459	395
0322-pao-401600	400x1600	355	1	31	6.1	9.7	589	507
0322-pao-500700	500x700	455	1	14	3.15	5.05	304	262
0322-pao-500800	500x800	455	1	15	3.47	5.54	334	287
0322-pao-501000	500x1000	455	1	21	4.64	7.43	465	400
0322-pao-501100	500x1100	455	1	23	5.09	8.15	510	439
0322-pao-501200	500x1200	455	1	25	5.54	8.87	555	477
0322-pao-501600	500x1600	455	1	31	7.07	11.31	702	604
0322-pao-501800	500x1800	455	1	37	8.24	13.2	822	707
0322-pao-600700	600x700	555	1	14	3.59	5.77	358	308
0322-pao-600800	600x800	555	1	15	3.94	6.32	401	345
0322-pao-601000	600x1000	555	1	21	5.3	8.52	539	464
0322-pao-601100	600x1100	555	1	23	5.81	9.35	591	509
0322-pao-601200	600x1200	555	1	25	6.32	10.17	643	553
0322-pao-601600	600x1600	555	1	31	8.05	12.92	819	705
0322-pao-601800	600x1800	555	1	37	9.4	15.12	957	823

Towel Radiators Chrome (Straight)								
Code	Size (LxH) mm	Axis Distance (E) mm	Pcs.	Number of Pipes	Water Content (lt)	Weight (Kg)	Heat Output Value $\Delta T:50$ (TS EN 442 75°/65°C)	
							Watt	Kcal/h
0422-pan-400700	400x700	355	1	14	2.7	4.29	169	146
0422-pan-400800	400x800	355	1	15	2.98	4.73	187	161
0422-pan-401000	400x1000	355	1	21	3.95	6.3	250	215
0422-pan-401100	400x1100	355	1	23	4.34	6.91	275	236
0422-pan-401200	400x1200	355	1	25	4.72	7.52	299	257
0422-pan-401600	400x1600	355	1	31	6.06	9.63	384	330
0422-pan-500700	500x700	455	1	14	3.14	5.02	199	171
0422-pan-500800	500x800	455	1	15	3.45	5.51	218	188
0422-pan-501000	500x1000	455	1	21	4.61	7.39	292	251
0422-pan-501100	500x1100	455	1	23	5.06	8.11	320	275
0422-pan-501200	500x1200	455	1	25	5.51	8.82	349	300
0422-pan-501600	500x1600	455	1	31	7.03	11.24	445	383
0422-pan-501800	500x1800	455	1	37	8.19	13.12	518	446
0422-pan-600700	600x700	555	1	14	3.58	5.74	227	195
0422-pan-600800	600x800	555	1	15	3.92	6.29	248	213
0422-pan-601000	600x1000	555	1	21	5.27	8.48	334	287
0422-pan-601100	600x1100	555	1	23	5.78	9.3	366	315
0422-pan-601200	600x1200	555	1	25	6.29	10.12	398	342
0422-pan-601600	600x1600	555	1	31	8.01	12.86	507	436
0422-pan-601800	600x1800	555	1	37	9.36	15.05	592	509

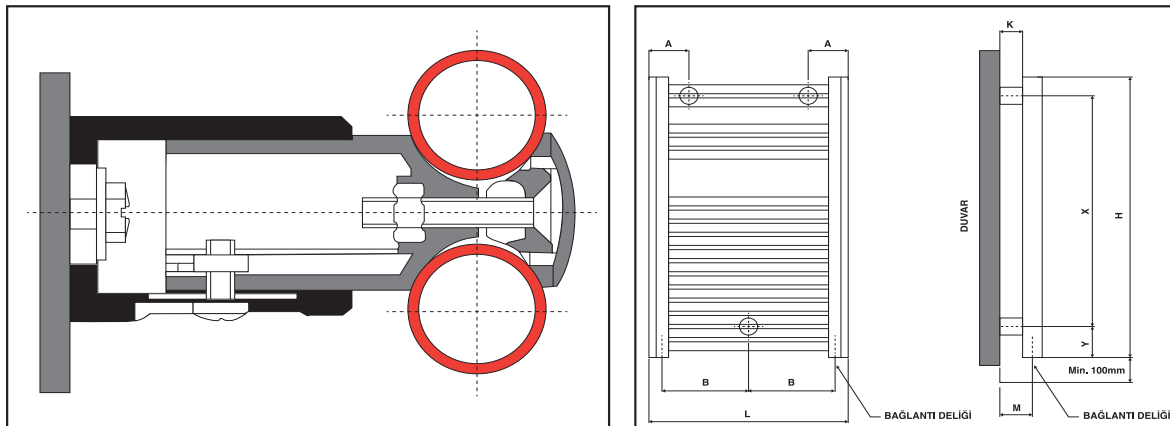
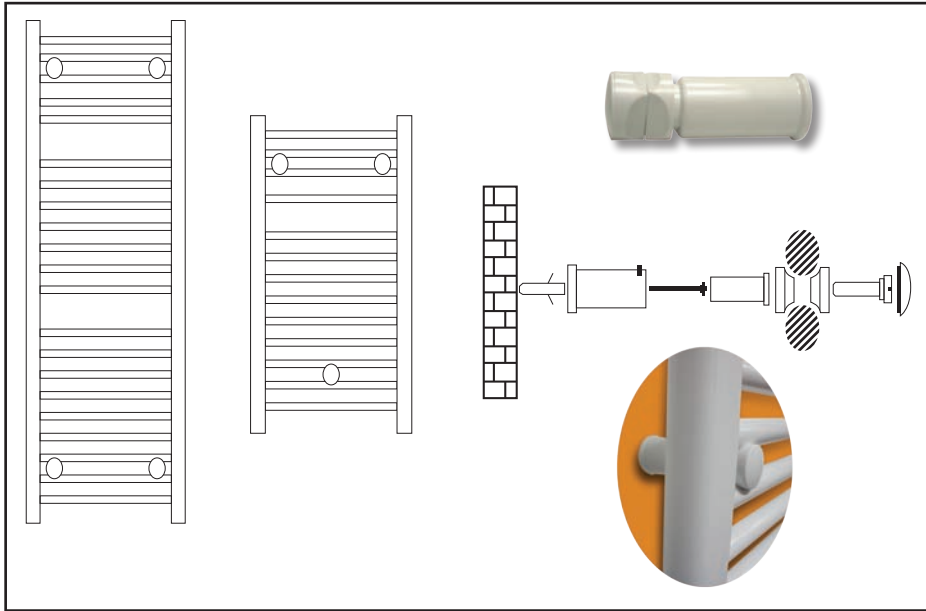
Towel Radiators Chrome (Curved)								
Code	Size (LxH) mm	Axis Distance (E) mm	Pcs.	Number of Pipes	Water Content (lt)	Weight (Kg)	Heat Output Value $\Delta T:50$ (TS EN 442 75°/65°C)	
							Watt	Kcal/h
0422-pao-400700	400x700	355	1	14	2.71	4.32	169	145
0422-pao-400800	400x800	355	1	15	3	4.76	187	161
0422-pao-401000	400x1000	355	1	21	3.98	6.34	248	213
0422-pao-401100	400x1100	355	1	23	4.37	6.96	272	234
0422-pao-401200	400x1200	355	1	25	4.75	7.57	296	255
0422-pao-401600	400x1600	355	1	31	6.1	9.7	380	327
0422-pao-500700	500x700	455	1	14	3.15	5.05	196	169
0422-pao-500800	500x800	455	1	15	3.47	5.54	216	186
0422-pao-501000	500x1000	455	1	21	4.64	7.43	289	249
0422-pao-501100	500x1100	455	1	23	5.09	8.15	317	273
0422-pao-501200	500x1200	455	1	25	5.54	8.87	345	297
0422-pao-501600	500x1600	455	1	31	7.07	11.31	441	379
0422-pao-501800	500x1800	455	1	37	8.24	13.2	514	442
0422-pao-600700	600x700	555	1	14	3.59	5.77	224	192
0422-pao-600800	600x800	555	1	15	3.94	6.32	246	211
0422-pao-601000	600x1000	555	1	21	5.3	8.52	330	284
0422-pao-601100	600x1100	555	1	23	5.81	9.35	362	311
0422-pao-601200	600x1200	555	1	25	6.32	10.17	394	339
0422-pao-601600	600x1600	555	1	31	8.05	12.92	502	432
0422-pao-601800	600x1800	555	1	37	9.4	15.12	586	504

Radiators

Assembly

- 1- Open the cardboard package of the towel radiator.
- 2- Remove the rack box (assembly parts) from its nylon package.
- 3- Do not remove the nylon package unless the assembly, painting and cleaning processes end in order not to have the towel radiator got damaged.
- 4- Assemble your towel radiator at least 10 cm high from the surface.
- 5- Mark the 4 points on the wall according to the measurements of your towel radiator (assembly chart)
- 6- Locate the dowels by opening M10 holes from the marked locations.
- 7- Assemble the rack body on the wall by a screw.
- 8- Insert the rack thimble inside the rack body.
- 9- Fix the rack thimble with an M8 screw.
- 10- Locate the pipes of the towel radiator in the way that they will be connected to the rack thimble.
- 11- Fix your towel radiator by tightening your rack stud.

Assembly Diagram



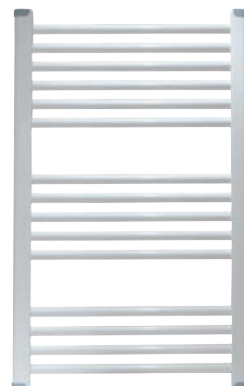
Size	A (mm)	B (mm)	L (mm)	K (mm)	Y (min)
400	100	177.5	400	65	100
500	100	227.5	500	65	100
600	100	277.5	600	65	100

Points to Take Into Consideration and Guarantee Conditions

- 1- Assemble the racks of your towel radiator to its location at the suitable locations.
- 2- Especially be careful in order not to damage the coating (paint/chrome) during the assembly.
- 3- Before assembling the purger cap and the blind cap which are used for deflating your towel radiator, affix them on the radiator. Do not disassemble the nylon package of your radiator until usage if possible.
- 4- Please gain information from the technical people about the installation of the towel radiator.
- 5- The towel radiators are produced in order to be used in closed circuit hot water installations. They should not be used with hot spa water, groundwater or extremely acidic water.
- 6- If you are trying the installation for the first time, you should prevent the materials such as cinders, dirt etc. in the installation which can block the water circulation.
- 7- If you need to deflate the installation after the start up process, prevent the water discharge inside the radiator by closing the inlet and outlet valves of the towel radiator. Changing the closed circuit water inside your installation will create a life-reducing effect for the towel radiator. Thus you should change the installation water as less as possible and if you need to change it, you should prevent your towel radiator not to be left without any water.
- 8- While cleaning your towel radiator, do not clean with chemical themed cleaning materials which can damage the surface of the radiator and with hard materials such as the steel wool, scotch brite etc. You can clean your towel radiator with hot water and a soft cloth.
- 9- You should not expose your towel radiators to the temperatures which will cause the water to freeze.
- 10- In order to have any air inside your towel radiator will cause your towel radiator not to warm the towel radiator because of these regions will not be heated and this situation will decrease the heating capacity of the towel radiator. Deflate the air inside the towel radiator by the purger cap and provide a complete warm water circulation.
- 11- Do not use your towel radiator at the open spaces and external environment. ambient temperature should not fall below zero. frozen water in installations could damage the radiator.
- 12- The working pressure of Kalde towel radiators is maximum 10 bars and maximum working temperature is 95°C. Do not use at higher pressures and temperatures.
- 13- In order to agree with the assembly instructions on the rack box during the assembly process, this will help you to use the radiator efficiently.
- 14- The product including all of its parts is covered under guarantee for 2 years. In case the product fails within the guarantee period, the replacement process will be done free of charge. For the replacement process you must provide the serial number on the one end of the towel radiator which you will see by scratching the painting (the serial number is hot stamped under the painting). It is a number like KAL-SP-0439 and secondly you must provide also the delivery serial number on the packaging which is like "KC1001-000001"
- 15- The faults arising from incorrect usage of the product according to the instructions manual are not included in the guarantee.

Pipe Diameter 22 mm / White - Straight

Code	Size	Pcs.
0322-pan-400700	400x700	1
0322-pan-400800	400x800	1
0322-pan-401000	400x1000	1
0322-pan-401100	400x1100	1
0322-pan-401200	400x1200	1
0322-pan-401600	400x1600	1
0322-pan-500700	500x700	1
0322-pan-500800	500x800	1
0322-pan-501000	500x1000	1
0322-pan-501100	500x1100	1
0322-pan-501200	500x1200	1
0322-pan-501600	500x1600	1
0322-pan-501800	500x1800	1
0322-pan-600700	600x700	1
0322-pan-600800	600x800	1
0322-pan-601000	600x1000	1
0322-pan-601100	600x1100	1
0322-pan-601200	600x1200	1
0322-pan-601600	600x1600	1
0322-pan-601800	600x1800	1



Pipe Diameter 22 mm / White - Curved

Code	Size	Pcs.
0322-pao-400700	400x700	1
0322-pao-400800	400x800	1
0322-pao-401000	400x1000	1
0322-pao-401100	400x1100	1
0322-pao-401200	400x1200	1
0322-pao-401600	400x1600	1
0322-pao-500700	500x700	1
0322-pao-500800	500x800	1
0322-pao-501000	500x1000	1
0322-pao-501100	500x1100	1
0322-pao-501200	500x1200	1
0322-pao-501600	500x1600	1
0322-pao-501800	500x1800	1
0322-pao-600700	600x700	1
0322-pao-600800	600x800	1
0322-pao-601000	600x1000	1
0322-pao-601100	600x1100	1
0322-pao-601200	600x1200	1
0322-pao-601600	600x1600	1
0322-pao-601800	600x1800	1



Pipe Diameter 22 mm / Chrome Plated - Straight

Code	Size	Pcs.
0422-pan-400700	400x700	1
0422-pan-400800	400x800	1
0422-pan-401000	400x1000	1
0422-pan-401100	400x1100	1
0422-pan-401200	400x1200	1
0422-pan-401600	400x1600	1
0422-pan-500700	500x700	1
0422-pan-500800	500x800	1
0422-pan-501000	500x1000	1
0422-pan-501100	500x1100	1
0422-pan-501200	500x1200	1
0422-pan-501600	500x1600	1
0422-pan-501800	500x1800	1
0422-pan-600700	600x700	1
0422-pan-600800	600x800	1
0422-pan-601000	600x1000	1
0422-pan-601100	600x1100	1
0422-pan-601200	600x1200	1
0422-pan-601600	600x1600	1
0422-pan-601800	600x1800	1



Pipe Diameter 22 mm / Chrome Plated - Curved

Code	Size	Pcs.
0422-pao-400700	400x700	1
0422-pao-400800	400x800	1
0422-pao-401000	400x1000	1
0422-pao-401100	400x1100	1
0422-pao-401200	400x1200	1
0422-pao-401600	400x1600	1
0422-pao-500700	500x700	1
0422-pao-500800	500x800	1
0422-pao-501000	500x1000	1
0422-pao-501100	500x1100	1
0422-pao-501200	500x1200	1
0422-pao-501600	500x1600	1
0422-pao-501800	500x1800	1
0422-pao-600700	600x700	1
0422-pao-600800	600x800	1
0422-pao-601000	600x1000	1
0422-pao-601100	600x1100	1
0422-pao-601200	600x1200	1
0422-pao-601600	600x1600	1
0422-pao-601800	600x1800	1







Gas Systems

Gas Systems

Inflex Stainless Steel Flex Hoses and Fittings (EN 15266)

EN 15266 European Standard, used in indoor gas installations; It is arranged to determine the material, design, manufacture and test methods of corrugated stainless steel pliable hose assemblies. This standard; It is applied to corrugated stainless steel flexible hose sets used for 1st, 2nd and 3rd family gases in residences, commercial and industrial gas installations.

High Flexibility and Strength

Kalde EN 15266 corrugated stainless steel pliable hose; has high flexibility; It consists of 2 basic layers of stainless steel hose and outer PVC coating.

Hose:

Stainless steel AISI 316L (1.4404), with a high degree of corrosion resistance, high flexible structure provides safe transportation of gas.

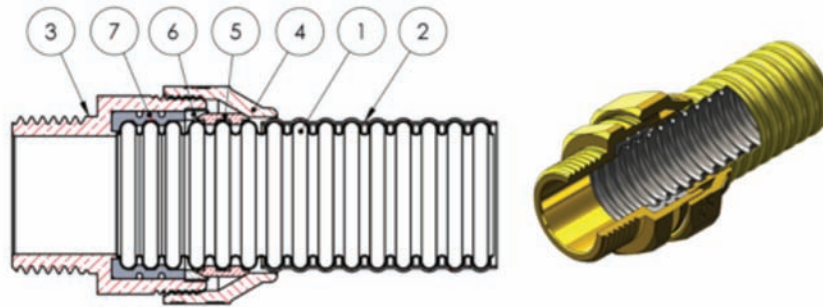
PVC Coating:

Yellow color PVC coating, hose protection from harmful external influences such as cleaning purposes.

Product Features

- Hose Type** : Parallel-necked (corrugated) stainless steel hose
- Hose Material** : According to EN ISO 10380 stainless steel AISI 316L (1.4404)
- Coating** : Soft yellow color PVC protects from household cleaners, and other harmful effects
- Fittings** : Copper alloy CW617N(CuZn40Pb2), CW614N(CuZn39Pb3) TS EN 12164, TS EN 12165

EN 15266 Corrugated Stainless Steel Pliable Hose Set



No	Part Name	Material
1	Hose	Stainless Steel 316L
2	Plastic Coating	Soft PVC
3	Fittings Body	Copper Alloy CW617N (CuZn40Pb2), CW614N (CuZn39Pb3), CW602N(CuZn36Pb2As)
4	Nut	Copper Alloy CW617N (CuZn40Pb2), CW614N (CuZn39Pb3), CW602N(CuZn36Pb2As)
5	Slotted Ring	Copper Alloy CW617N (CuZn40Pb2), CW614N (CuZn39Pb3), CW602N(CuZn36Pb2As)
6	Gasket Press Ring	Copper Alloy CW617N (CuZn40Pb2), CW614N (CuZn39Pb3), CW602N(CuZn36Pb2As)
7	Gasket	NBR

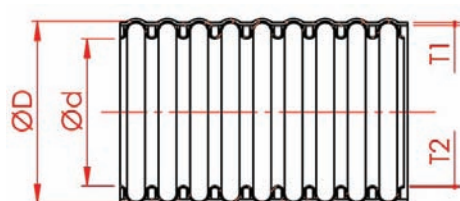
Kalde EN 15266 Stainless Steel Pliable Hoses Set Advantages

- It provides easy and flexible connection opportunity in indoor natural gas installation applications..
- It provides economy with its high service life.
- Thanks to its highly flexible structure allows for ease of installation and labor.
- All products used in this system (hose, fitting and PVC ducts, etc.) are resistant to corrosion, external influences and fire.
- PVC coating provides easy cleaning and hygienic cleaning with house cleaners.
- It guarantees the highest level of security for users in terms of features.
- Thanks to its minimum bending radius, it can be installed without cross sectional contraction.

Superiority of Inflex Hose Tools Against Iron Pipe Gas Installation

- INFLEX indoor gas installation is an economical connection system that saves time and labor. This connection system; compared to iron pipe applications; It provides great advantages in subjects that require extra workmanship such as carrying, cutting, fixing pipes to the wall. INFLEX hoses and fittings connections can be made more safely and quickly than iron pipe installation.
- This system; It consists of stainless steel flexible hose, fittings, carrier PVC channels, fixing and supporting elements and cutting tools. The inflex indoor gas installation is used comfortably and safely in both new buildings and modified indoor gas installations.
- Many 90 ° elbows and T-pieces are used on iron (rigid) pipe gas installations, providing corner turns. All these joints increase the possibility of gas leakage. It also increases the pressure drop. There is no need to use elbows in corner turns by means of inflex. This both reduces the possibility of gas leakage and prevents pressure drop.
- iron pipes and fittings used in iron pipe gas installations; In terms of their weight, they shorten the life of the building compared to the inflex hose sets.
- In buildings that are not destroyed and damaged during the earthquake, the flexible structure of the inflex hose does not break, but since the iron pipe installation is rigid, breaks and joints are easier to separate by the movement of the building. So they can cause gas leaks and fires.
- Another disadvantage of iron pipe gas installations; In case of an intervention in any part of the installation, the installation must be completely dismantled. This is not necessary in the inflex system.

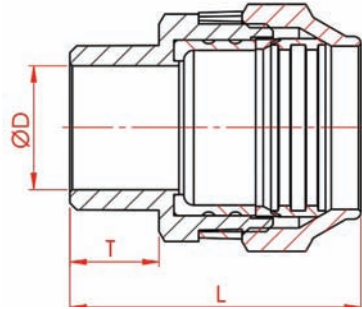
EN 15266 Pliable Stainless Steel Flex Hose



EN 15266 Pliable Stainless Steel Flex Hose					
Nominal Pressure, bar	MOP 0,5				
Nominal Diameter	DN	15	20	25	32
Hose Dimensions	Outside Diameter, ØD (mm)		26,5	31,4	
	Inside Diameter, Ød (mm)		20,7	25,2	
	Coating Thickness, T1 (mm)		0,50	0,50	
	Sheet Thickness, T2 (mm)		0,20	0,25	
Flow Rate of the Hose, m³/h			7,7	15,2	
Hoses Bending Radius, R min (mm)			25	30	

Temperature	Pressure	Applications
°C	PN (Bar)	In door Natural Gas Applications
-20.....+60	0.5	

EN 15266 Pliable Stainless Steel Flex Hose Fittings



EN 15266 Pliable Stainless Steel Flex Hose Fittings					
Nominal Pressure, bar	MOP 0,5				
Nominal Diameter	DN	15	20	25	32
Dimensions	Inside Diameter, ØD (mm)		20	25	
	Nominal Treaded, R"		3/4"	1"	
	Treaded Length, T (mm)		16.3	19.1	
Flow Rate of the Fittings m³/h			7,7	15,2	
Fittings Sıkma Torkları, Nm			120	160	

Inflex Flex Hose Sets Mounting and Consideration Points

- 1- Take the inflex hose and fittings out of the package when you start the assembly.
Firstly, mount the carrier PVC channels where the hose will be placed on the wall. (Marking is recommended for proper installation of ducts.) These carrier ducts should be mounted on the wall with screws at intervals of max.75cm.
- 2- TS EN 15266 inflex hose sets can be used inside the building, in gas installations after the gasmeter. The installation must be made using pipes and fittings of the same brand.
Note: Do not use Kalde brand inflex hoses and fittings with other brands.
- 3- Application to be made with these hose sets; Valid for residences or installations with gas pressure of 21 mbar and domestic appliances (combi, stove, water heater, cooker).
- 4- The diameter of the corrugated pipe should not be changed with additional and / or reduction. Until T separation, installation should be one piece. Diameter can be changed if desired from T separation.
- 5- The valves used in the installation should be fixed with a clamp in order not to make an angular cycle.
- 6- Wall transitions should be made with a special PVC cover. The corrugated pipe should not be passed through the wall nakedly
- 7- The hose should not be bent to angles less than 90° . Min. bükme yarıçapları: DN20: 25 mm. DN25: 30 mm.

- 8- After the gasmeter, the hose should be mounted to the installation so as not to prevent the gasmeter from being disassembled.
- 9- In all other buildings, except for detached buildings (buildings with 1 independent unit number 1), the corrugated pipe should not pass through the area open from the atmosphere (outside the building) (except balcony, terrace).
- 10- In places where there is a passage of installations from open spaces such as balconies, terraces or from the outer surface of individual buildings, the T-piece should not be exposed outside the building.
- 11- After the gasmeter, the line should enter the house from the shortest distance. However, in mandatory cases, corrugated pipe application in the stairwell and / or shaft can only be done with the approval of the gas distribution company.
- 12- If corrugated pipe is used in the installation after the meter, steel or copper pipe cannot be used in the same installation.
- 13- In the flexible hose application, while the pipe and fittings are being mounted; linen, natural gas paste, teflon, liquid gasket etc. additional materials should not be used.
- 14- Check the tightness of the joints of the hose and fittings as follows:
 - a) Test the installation with a pressure of 500 mbar using air with the help of a U manometer.
 - b) Air the gas installation, cover the joints with water and neutral soap bubbles.
 - c) If there is not any bubble, the connection is valid otherwise, close the gas valve, check the gasket for damage, if necessary change the gaskets (gasket EN 549), screw the connections and make those steps again till the bubbles are not occurred.

After proper connection Kalde guaranteed the daily usage of the hose. Kalde suggest that to cleaning the hose with non-metallic brush, water and soap. Avoid from corrosive material. Inflex hose does not need to maintenance.

- 15- Hoses sets have a 2-year warranty. In case of malfunction, hoses sets each part will be replaced free of charge during its warranty period. (Valid for manufacturing faulty.)
- 16- Hoses sets, as intended because it allows sufficient flow must be assured.
- 17- The maximum working pressure of kalde inflex hoses is 0,5 bars. The minimum operating temperature is -20 °C, and the maximum operating temperature is 60 °C. Do not use the valves at higher pressures and outside of this temperature range.
- 18- In installation applications: existing local installation regulations and codes of practice should observed and be taken into consideration. (TS 7363).

Not 1: It is an obligation to make the earthing for if gas burner device with electric connections. Improper assembly/disassembly or misuse of the inflexhose assembly will void any warranty of the manufacturer.. It is suggested that the installation is done by only qualified and certified installers. Kalde inflexhoses must not exposed to any mechanical torsion.

Not 2: The damage of any part of the hoses sets, makes changing the whole hoses sets as an obligation. Modification on any part of hose makes fails the compilation of the standard (EN 15266).

Inflex Pliable Flex Hoses with Fittings Connecting



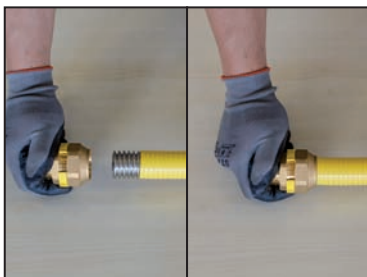
- 1- Cut the inflex hose properly with a special cutting scissors (without burr and deformation at the end of the hose). Twist the scissors around the hose, tightening a little more each turn.

Note 1: Cut the inflex hose only with special scissors. Jet stone, saw etc. never use tools.

Note 2: Do not pull the inflex hose out. Otherwise, the product will be out of warranty as its geometry will be damaged.



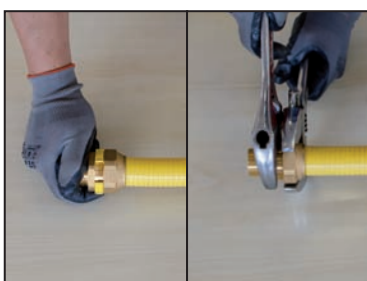
- 2- Cut the plastic cover on the inflex hose (as the 6th node is outside) with a scraper tool. (by turning around the hose) Then remove the plastic cover by cutting parallel to the axis of the hose with a utility knife.



- 3- Fit the inflex hose to the end by pushing it into the body of the fitting. (as in the figure, up to the ring where the sheath is cut)



- 4- Remove the yellow plastic ring on the fittings.



- 5- Screw the nut onto the body by hand first and take the gap. Then fix the body and screw the nut with a wrench.

Note: Do not deform the fittings by applying too much force.

Max. tightening torques; DN32: 250Nm, DN25: 160Nm, DN20: 120Nm, DN15: 90Nm



- 6- After the connection process is completed, gas the installation and check all the joints with soapy soap. If there is no leak, the installation can be used safely. Connection points with leakage should be disassembled and made to be leakproof again.

- 7- After the test control is completed, T fitting, nipple and gas valves should be fixed to the wall with a U clamp.

Gas Systems

Inflex Stainless Steel Flex Hoses and Fittings (EN 15266)

Flex Hose (EN 15266)

Code	Size	Pcs.
3871-ish-200000	ø20	50 m
3871-ish-250000	ø25	50 m



Nipple

Code	Size	Pcs.
3871-ign-200b00	ø20 x 1/2"	
3871-ign-200c00	ø20 x 3/4"	
3871-ign-250b00	ø25 x 1/2"	
3871-ign-250c00	ø25 x 3/4"	



Tee

Code	Size	Pcs.
3871-igt-202020	ø20 x 20 x 20	
3871-igt-252525	ø25 x 25 x 25	



Inegal Tee

Code	Size	Pcs.
3871-igt-202520	ø20 x 25 x 20	
3871-igt-252020	ø25 x 20 x 20	
3871-igt-252025	ø25 x 20 x 25	
3871-igt-252520	ø25 x 25 x 20	



Gas Systems

Gas Counter Union with Test Nipple

Code	Size	Pcs.
3871-itn-251a00	ø25 x 1 1/4"	



Fittings Clamp

Code	Size	Pcs.
3871-ifk-200000	ø20	
3871-ifk-250000	ø25	



Valf Clamp

Code	Size	Pcs.
3871-ivk-0b0000	1/2"	
3871-ivk-0c0000	3/4"	



Hoses Cutter

Code	Size	Pcs.
3871-ibm-000000	6 - 42 mm	



Gas Systems

PVC Tube and Fittings

Inflex Hoses Profile

Code	Size	Pcs.
3871-itp-002000	50x42 / 2000	



PVC L Corner

Code	Pcs.
3871-lks-000000	



PVC Inside Corner

Code	Pcs.
3871-iks-000000	



PVC Outside Corner

Code	Pcs.
3871-dks-000000	



PVC Perforated Te Cover

Code	Pcs.
3871-itk-000000	



Gas Systems

PVC Profile Coupling Cover

Code	Pcs.
3871-bks-000000	



PVC Wall Passing Cover (Open)

Code	Pcs.
3871-lda-000000	



PVC Wall Passing Cover (Close)

Code	Pcs.
3871-idk-000000	



PVC Counter Test Nipple Cover

Code	Pcs.
3871-lsk-000000	



PVC Wall Passing Part

Code	Pcs.
3871-ldp-000000	



Boiler Flex DN16 Fitting - Nipel Connection (TS 13890)

Kalde flexible corrugated metal hose; in building, gas burning appliances (natural gas or LPG) is used to secure connections

High Flexibility and Strength

Kalde flexible corrugated metal hoses; Manufactured from stainless steel with high elasticity.

Hose:

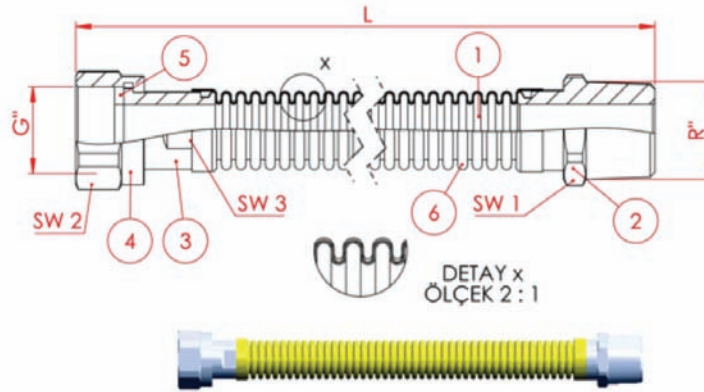
Stainless steel AISI 316L (1.4404), with a high degree of corrosion resistance, high flexible structure provides safe transportation of gas.

Product Features

Hose Type	: Parallel-necked (corrugated) metal hose
Hose Material	: According to EN 10088-2 stainless steel AISI 316L (1.4404)
Fittings	: AISI 303 Stainless Steel (TS EN 10088-2)
Unions Parts	: Nickel Coated Steel (TS EN 1562) or according to EN 12164 CW167N, CW614N

Advantages of Kalde Flexible Corrugated Metal Hoses

- Indoor use natural gas boiler as well as all applications, offer excellent connections.
- High service life thanks to provide affordability.
- Thanks to its highly flexible structure allows for ease of installation and labor.
- Features for users in terms of the highest level of security guarantees.
- Minimum bending radius can be installed without the contraction section, thanks.



No	Part Name	Material	Size
1	Hose Material	Stainless Steel 316L (1.4404)	3/4" x DN16
2	Nipple	AISI 303 Stainless Steel (TS EN 10088-2)	3/4"
3	Fittings	AISI 303 Stainless Steel (TS EN 10088-2)	3/4"
4	Nut	Nickel Coated Steel (TS EN 1562) or According to EN 12164 CW167N, CW614N	3/4"
5	Gasket	NBR	Ø24 x 7 x 3mm
6	Cover	Polyolefin Material	Yellow

Gas Systems

Stainless Steel Flex Hose	
Nominal Pressure	MOP 0,4
Flow Rate of The Hose, m³/h	6,0

Size	Connection Type; Male - Female	Length (mm)
DN 16	3/4"x 3/4"	400
		500
		600
		900

Boiler Flex DN16 Fitting - Nipel Connection (TS 13890)

Code	Size	Pcs.
3470-ffs-0c0400	3/4" x 400	60
3470-ffs-0c0500	3/4" x 500	60
3470-ffs-0c0600	3/4" x 600	60
3470-ffs-0c0900	3/4" x 900	60



Counter Flex DN25 SBFG4 Fitting - Nipel Connection

Kalde flexible corrugated metal hose; in building, gas counter devices (natural gas or LPG) is used to secure connections.

High Flexibility and Strength

Kalde flexible corrugated metal hoses; Manufactured from stainless steel with high elasticity.

Hose:

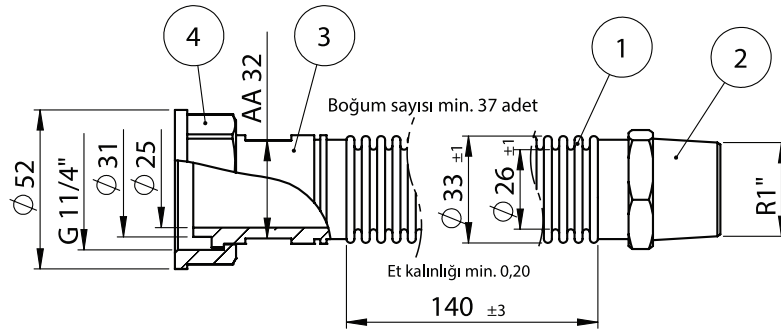
Stainless steel AISI 316L (1.4404), with a high degree of corrosion resistance, high flexible structure provides safe transportation of gas.

Product Features

Hose Type	: Parallel-necked (corrugated) metal hose
Hose Material	: According to EN 10088-2 stainless steel AISI 316L (1.4404)
Fittings	: AISI 303 Stainless Steel (TS EN 10088-2)
Unions Parts	: Nickel Coated Steel (TS EN 1562) or according to EN 12164 CW167N, CW614N

Advantages of Kalde Flexible Corrugated Metal Hoses

- Indoor use natural gas counter applications, offer excellent connections.
- High service life thanks to provide affordability.
- Thanks to its highly flexible structure allows for ease of installation and labor.
- Features for users in terms of the highest level of security guarantees.
- Minimum bending radius can be installed without the contraction section, thanks.



No	Part Name	Material	Size
1	Hose Material	Stainless Steel 316L (1.4404)	1" x DN25
2	Nipple	AISI 303 Stainless Steel (TS EN 10088-2)	1"
3	Fittings	AISI 303 Stainless Steel (TS EN 10088-2)	1"
4	Nut	Nickel Coated Steel (TS EN 1562) or According to EN 12164 CW167N, CW614N	1 1/4"
5	Gasket	NBR	Ø38 x 31,5 x 3mm
6	Cover	Polyolefin Material	Yellow

Stainless Steel Gas Counter Flex Hose	
Nominal Pressure	MOP 0,4
Flow Rate of The Hose, m ³ /h	22,8

Size	Connection Type; Male - Female	Lenght (mm)
DN 25	1" x 1 1/4"	235

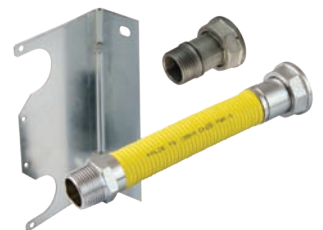
Gas Counter Flex Hose

Code	Size	Pcs.
3470-psh-100000	1" x 1 1/4"	40



Gas Counter Mountage Set (with Test Hole)

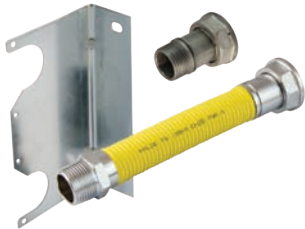
Code	Size	Pcs.
3470-psd-100000	1" x 1 1/4"	20



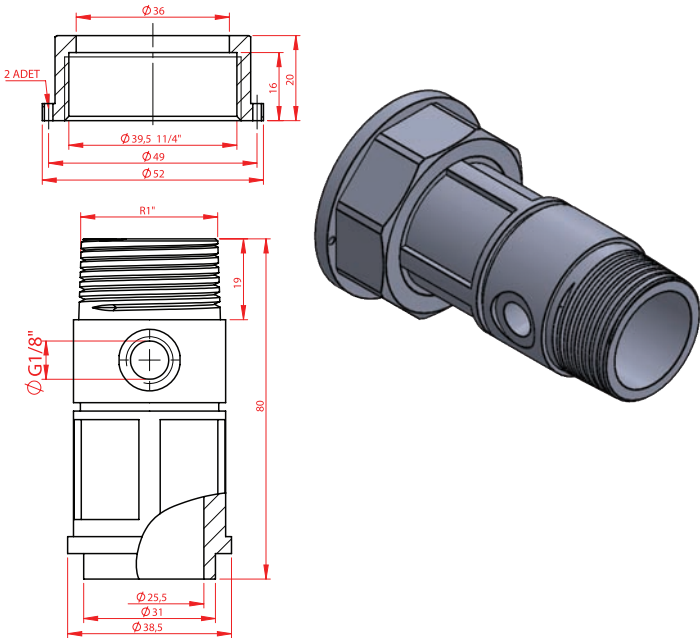
Gas Systems

Gas Counter Mountage Set

Code	Size	Pcs.
3470-pst-100000	1" x 1 1/4"	20



SBFG4 1" Gas Counter Unions with Test Hole



No	Part Name	Material	Size
1	Body Material	Stainless Steel	1" x 1 1/4"
2	Nut	Nickel Coated Steel	1"

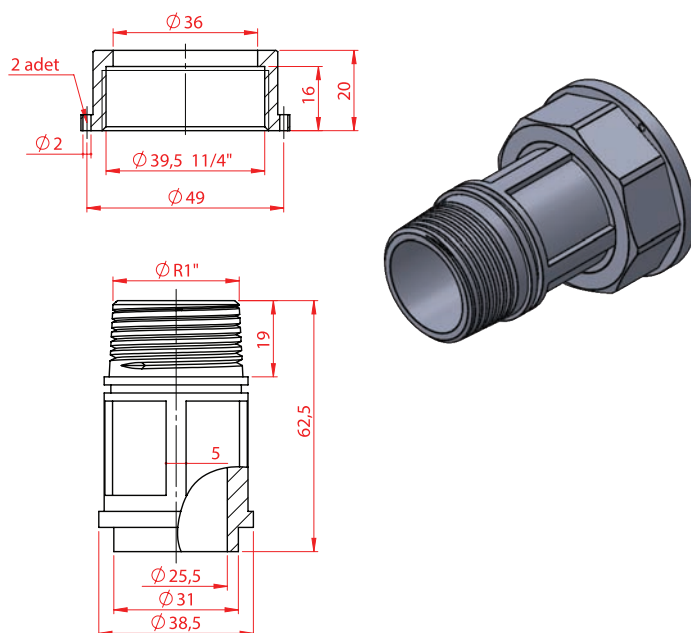
Gas Counter Unions with Test Hole

Nominal Pressure

MOP 0,4

Size	Connection Type; Male - Female	Lenght (mm)
DN 25	1" x 1 1/4"	80

SBFG4 1" Gas Counter Unions



No	Part Name	Material	Size
1	Body Material	Stainless Steel	1" x 1 1/4"
2	Nut	Nickel Coated Steel	1"

Gas Counter Unions with Test Hole

Nominal Pressure

MOP 0,4

Size	Connection Type; Male - Female	Lenght (mm)
DN 25	1" x 1 1/4"	80

Boiler and Gas Counter Flex Hose Assembly and Operating Instructions

- 1- Please install the boiler and Gas counter flex hoses according to limits length of hose. Unpack the hose only when you are going to connect it to the installation.
- 2- Wrap Teflon tape in accordance with the threads of the boiler and gasmeter hose on the nipple side. Then screw the boiler or gasmeter hose to the gas valve with a wrench. Then, screw the union on the other side of the hose to the device using the movable nut. (to the male thread on the boiler and the gasmeter) Excessive teflon or linen should not be used on the connection threads.
Note: When the flex hose is installed between the counter and the valve or boiler and valve, it should not be subjected to torsion. The hose should be located freely and easily accessible, in cases where any remove is required.
- 3- Check the tightness of the union and nipple connections as follows:
 - a) Cover the fittings with water and neutral soap foam.
 - b) Open the gas valve.
 - c) If there is not any bubble, the connection is valid otherwise, close the gas valve, check the gasket for damage, if necessary change the gaskets (gasket EN 549), screw the connections and make those steps again till the bubbles are not occurred.

After proper connection Kalde guaranteed the daily usage of the gas counter hose. Kalde suggest that to cleaning the hose with non-metallic brush, water and soap. Avoid from corrosive material. Boiler and Gas counter hose does not need to maintenance

- 4- Hose have a 2 year warranty. In case of malfunction, hose will be replaced free of charge during its warranty period.
- 5- The maximum working pressure of kalde boiler and gas counter hoses is 0,4 bars. The min. operating temp. is -20 °C, and the max. operating temperature is 60 °C. Do not use the gas counter hoses at higher pressures and outside of this temperature range
- 6- In installation applications; existing local installation regulations and codes of practice should observed and be taken into consideration.
Note 1: It is an obligation to make the earthing for if gas burner device with electric connections. Improper assemblage/disassemblage or usage makes the manufacturer guarantee invalid. It is suggested that the installation is done by only qualified installers.
Kalde N-Gas counter hoses must not exposed to any mechanical torsion.
Note 2: The damage of any part of the hose makes changing the whole hose as an obligation. Modification on any part of hose makes fails the compilation of the standard.

Stainless Steel Flex Hose (EN 14800)

European Standard EN 14800, used in building, gas appliances (natural gas or LPG) used for safe connection of corrugated flexible metal hose assembly performance, the material is arranged to identify and test methods.

High Flexibility and Strength

Kalde EN 14800 flexible metal hoses; highly flexible stainless steel tube, stainless steel wire mesh, and which comprises the outer PVC coating consists of 3 main layers.

Hose:

stainless steel AISI 316L (1.4404), AISI 304L (1.4306) with a high degree of corrosion resistance, high flexible structure provides safe transportation of gas.

Wire Mesh:

Stainless steel mesh AISI 304 (1.4301), which prevents overload and structure constitutes the second layer that protects them from mechanical damage.

PVC Coating:

Transparent PVC coating, hose protection from harmful external influences such as cleaning purposes.

Product Features

Hose Type	: Parallel-necked (corrugated) metal hose
Hose Material	: According to EN ISO 10380 Stainless Steel AISI 316L (1.4404), AISI 304L (1.4306)
Mesh Material	: Stainless Steel AISI 304 (1.4301)
Coating	: PVC protects from household cleaners, and other harmful effects.
Fittings	: Stainless Steel AISI 304 (1.4301)- AISI 303 (1.4305)
Standard	: EN 14800

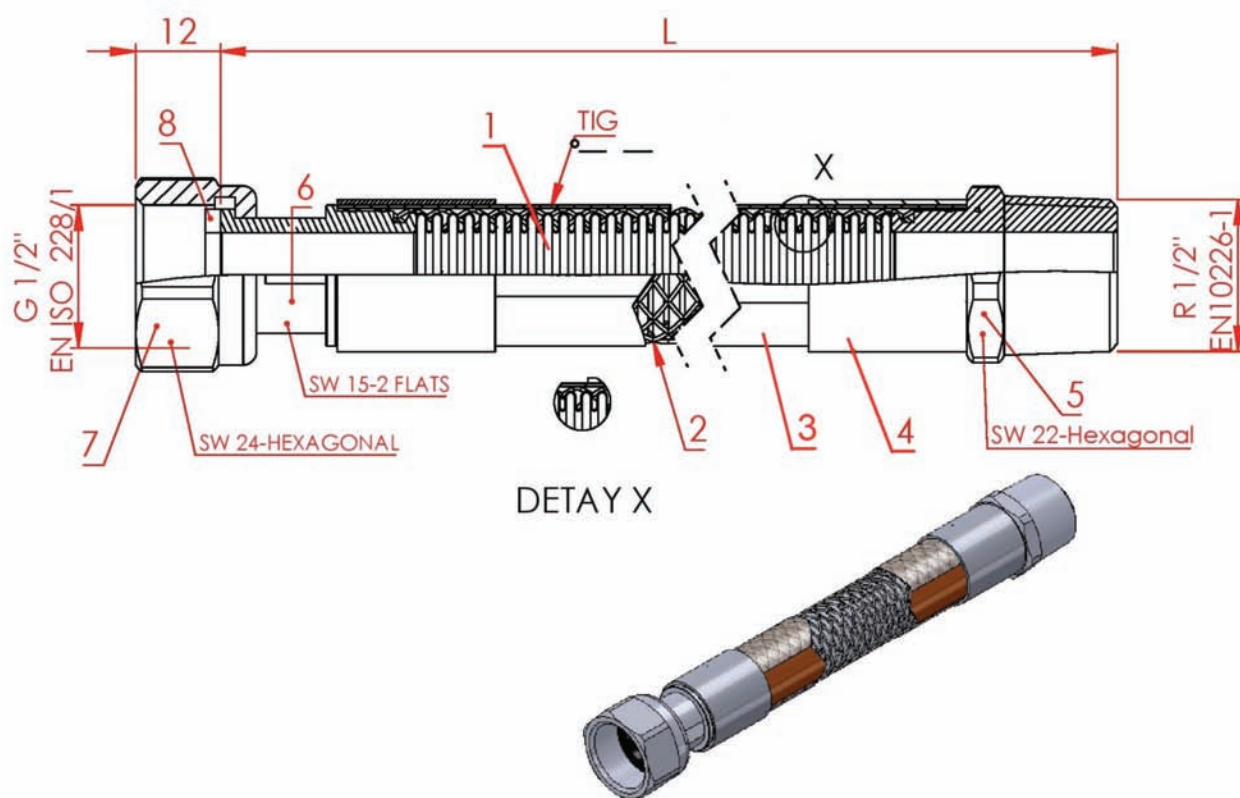
Advantages of EN 14800 Kalde Hose

- Indoor use natural gas burning stoves, furnaces and ovens, as well as all applications, offer excellent connections.
- High service life thanks to provide affordability.
- Thanks to its highly flexible structure allows for ease of installation and labor.
- Features for users in terms of the highest level of security guarantees.
- 3-layer design, the corrosion and is resistant to external influences.
- PVC coating on the outer surface, hygienic and easy to clean with household cleaner keeps.
- Features for users in terms of the highest level of security guarantees.
- CE certified.
- Minimum bending radius can be installed without the contraction section, thanks.

Connection Types and Models

Kalde EN 14800 each country has its own natural gas flexible metal hose connectors are made of a variety specified by the institution.

Stainless Steel Flex Hose							
Nominal Pressure	MOP 0,5						
Nominal Diameter	DN	12					
Hose Dimensions	L (mm)	500	750	1000	1250	1500	2000
	R"	1/2"					
Flow Rate of The Hose, m³/h		2,75					



No	Part Name	Material	Size
1	Hose Material	Stainless Steel 316L -304L (1.4404 - 1.4306)	1/2" × DN 12
2	Mesh Material	Stainless Steel 304 (1.4301)	0,24×4
3	Plastic Coating	Soft PVC	DN12
4	Rings	Stainless Steel 303-304 (1.4305 - 1.4301)	21×20
5	Nipple	Stainless Steel 303-304 (1.4305 - 1.4301)	1/2"× DN 12
6	Fittings	Stainless Steel 303-304 (1.4305 - 1.4301)	1/2"
7	Loaf	Stainless Steel 303-304 (1.4305 - 1.4301) and CuZn39Pb3 (NICKEL COATED)	1/2" × DN 12
8	Gasket	NBR	18×12×2

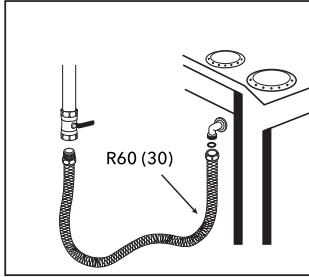
Temperature	Pressure	Applications
°C	PN (Bar)	Natural Gas Systems (N-Gas) LPG Systems
-20.....+60	0.5	

GASFlex (EN 14800)

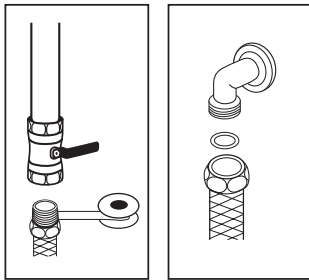
Code	Size	Pcs.
3470-gmp-0b0500	1/2" x 500	50
3470-gmp-0b0750	1/2" x 750	50
3470-gmp-0b1000	1/2" x 1000	50
3470-gmp-0b1250	1/2" x 1250	25
3470-gmp-0b1500	1/2" x 1500	25
3470-gmp-0b2000	1/2" x 2000	20



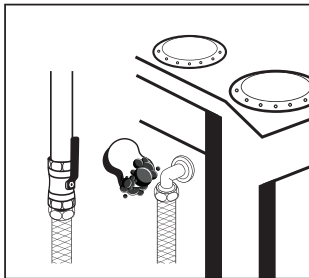
N-Gas Flex Hose Assembly and Operating Instructions (EN 14800)



1- Please install the N-Gas hose according to written limits on the hose. Please choose the suitable hose between gas valves and gas burner device. Unpack the hose only when you are going to connect it to the installation.



2- Please assemble the fittings to the suitable connection. For nipple connections, use enough teflon tape and screw it manually. For male connections, insert the gasket first and then screw it manually. Make the gas burner device connection like as valve connection and use screw-wrench to tightness. Teflon or linen should not be used on the connection screw.



3- Check the leakage by following those steps:
a. Cover the fittings with water and neutral soap foam.
b. Open the gas valve.
c. If there is not any bubble, the connection is correct otherwise, close the gas valve, check the gasket for damage, if necessary change the gaskets (gasket EN 549), screw the connections and make those steps again till the bubbles do not occurred.

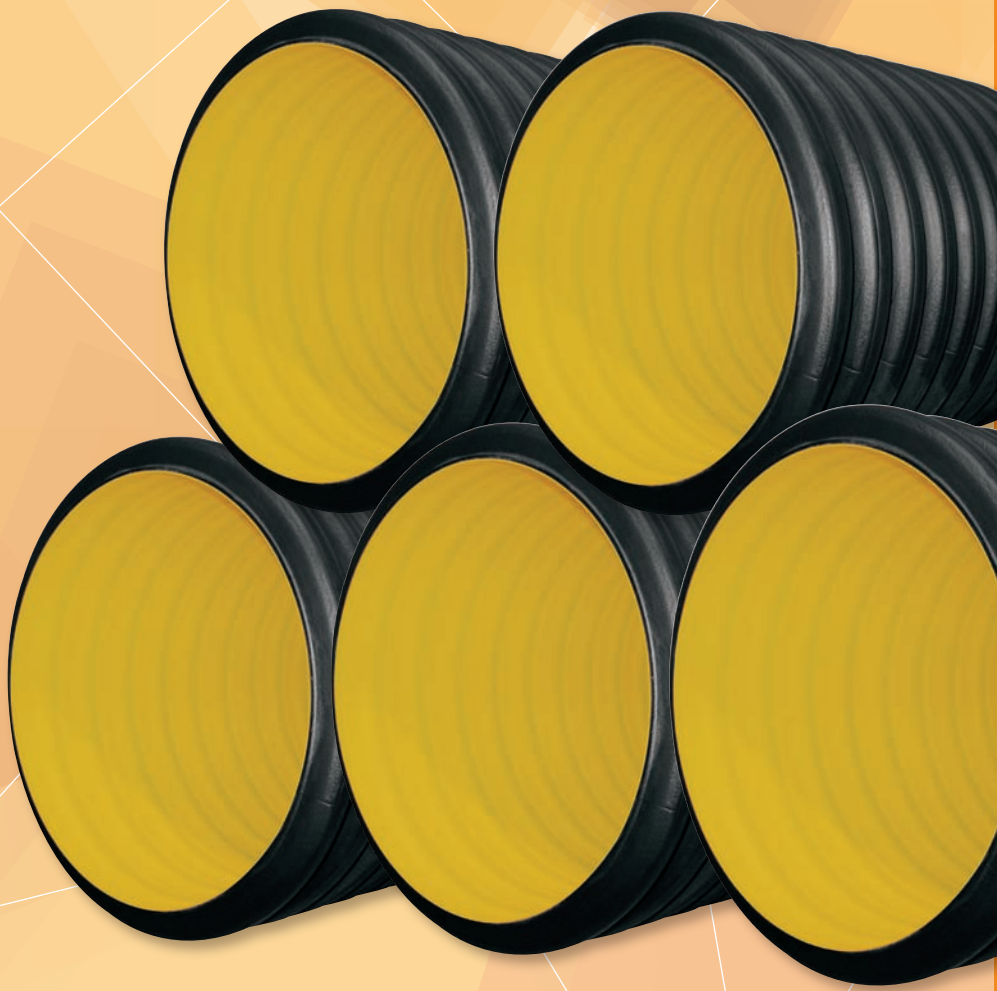
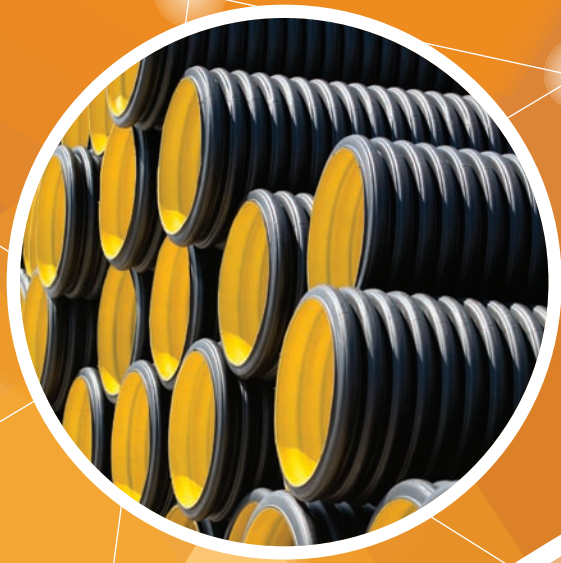
After proper connection Kalde guaranteed the daily usage of the hose. Kalde suggest to clean the hose with sponge, water and soap. Avoid from corrosive material. Hose does not need any maintenance.

- 4- The hose has a 2-years warranty. In case of malfunction, the hose will be replaced free of charge during its warranty period.
- 5- Please avoid the hose torsion and assemble the hose to gas burner and then screw it in by tools. Start the connection from fixed fittings side and finish it with swiveling side.
- 6- Flexible metal hoses, as intended because it allows sufficient flow must be assured.
- 7- The maximum working pressure of kalde flexible metal hoses is 0,5 bars. The minimum operating temperature is -20 ° C, and the maximum operating temperature is 60 ° C. Do not use the valves at higher pressures and outside of this temperature range.
- 8- Installation applications: existing local installation regulations and codes of practice should observed and be taken into consideration.

Note 1: It is an obligation to make the grounding for the gas burner if the device is with electric connections. Improper assembly or disassembly or usage makes the manufacturer guarantee invalid. It is suggested that the installation is done by only qualified installers. Kalde N-Gas natural gas connection hoses should never be subjected to any mechanical torsion.

Note 2: The damage of any part of the hose requires the change the whole hose as an obligation. Modification on any part of the hose makes fail the compilation of the standard (EN 14800).

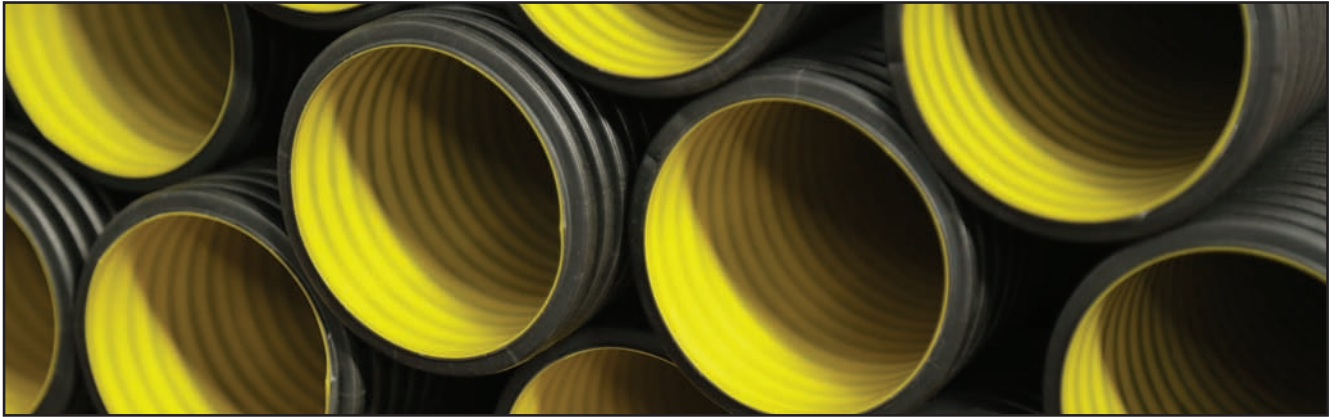




Corrugated Pipes

Corrugated Pipes

Kalde Corrugated Pipe Systems



Kalde Corrugated Pipe Systems are manufactured using polyethylene (PE) raw material in accordance with TS EN 13476-3 standards and complying with SN4 and SN8 ring stiffness having inner diameter of DN100, DN150, DN200, DN250, DN300 and length of 6 meters and being extruded.

Corrugated Pipe Systems are used in sewage systems, rain water drainage lines, water transportation lines, and drainage lines because of their superior characteristics against corrosion, chemicals, abrasion and can be easily used.

Advantages of Kalde Corrugated Pipes

- 1- Because of its flexibility property they are not affected negatively from ground activities such as earthquakes (because they are in harmony with ground activities), traffic load etc.
- 2- Corrugated pipes are connected using coupling-elastomeric gasket connection method, as a result of this; it provides tightness at 0.5 bar pressure, which is stated in related standards. By being known as environment friendly, it helps for the prevention of the environment.
- 3- It does not require heavy equipment's in installation of pipes as big as DN300, because of it is being light and its connection easiness.
- 4- The inner surfaces of Corrugated pipes are manufactured in yellow color, as a result of this it can be easily traced via camera.
- 5- Outer surface is in black color, which is UV contributed and it cannot affect from sunshine.
- 6- Life of Corrugated pipes are minimum 50 years.
- 7- Because of being light, Corrugated pipes are providing easiness in transportation and stowage. It can be put as nested and as a result of this telescopic stowage and transportation can be done.
- 8- It provides laminar flow because its inner surfaces are less rough than other materials and this minimizes the friction surface of fluid. And also it removes the risk of cut shrinkage.

Applied Norms

- 1- TS EN 13476-3 - Plastic pipe systems- it is for unpressurized, underground, drainage and waste waters - not contributed plasticizer polyvinylchloride (PVC-U), Polypropylene (PP), and Polyethylene (PE) pipes which is walls are pipe systems with profile and not contributed any plasticizer - part 3: inner surfaces are smooth and outer surfaces are type B pipes with profile, properties for joint parts and system.
- 2- EN ISO 1133 - Plastics - Assignment of spherical flow rate (MFR) and volumetric flow rate (MVR) of melted thermoplastic.
- 3- EN ISO 1183-1 - Nonporous plastics - density assignment methods- part 1- immersion method, liquid pycnometer method and titration method.
- 4- ISO 12091 - Thermoplastic pipes - profiled - stove experiment
- 5- EN ISO 580 - Plastic pipe and channel systems - thermoplastic joint parts manufactured by injection molding - eye check methods for temperature effects.
- 6- EN ISO 9969 - Thermoplastic pipes - Assignment of ring rigid
- 7- EN 744 - Plastic pipes and channel systems- Thermoplastic pipes - resistance experiment for outer impacts along circle.
- 8- EN 1446 - Plastic pipes and channel systems - Thermoplastic pipes - assignment of ring flexibility

Corrugated Pipes

- 9- EN 1277 - Plastic pipes systems - thermoplastic pipes systems used in unpressurized applications in underground - tightness experiment for elastomeric ring type coupling- gasket
- 10- EN 12061 - Plastic pipes systems - assignment of thermoplastic joint's resistance for impact
- 11- EN 12256 - Plastic pipes systems - thermoplastic joint parts- experiment for mechanical resistance or flexibility of joints that are fabrication manufactured.
- 12- EN 1053 - Plastic piping systems - thermoplastics piping systems for non-pressure applications - test method for water tightness.

Material:

The material is manufactured from polyethylene (PE) raw material. Additives are included to this material in accordance with TS EN 13476-3 standards for the easiness of manufacturing process . Type B pipes in Spiral, can contain a support profile made of other than polymers except PE.

Table-1 Material Characteristics of Pipes and Joints

Polyethylene (PE) Material			
Characteristics	Standard	Unit	Value
Melt flow rate (MFI) 190°C, 5Kg	EN ISO 1133	gr /10 min	≤ 1,6
Thermal Stability (OIT1) 200°C	EN 728	Min.	≥ 20
Density	EN ISO 1183-1	Kg/m3	≥ 930
Tensile stress	ISO 527	Mpa	22-27
Elasticity module	ISO 527	Mpa	900
Elongation at rupture	ISO 527	%	>600
Hardness	ISO 868	Shore D	63
(OIT1): This characteristic is only applied for verifying installation of butt weld or fusion welding with pipe and joints.			

Table-2 Physical Characteristics of PE Pipes and Joints

Pipes			
Characteristics	Standard	Unit	Value
Thermal durability, (150 ±2) °C	ISO 12091	Heating time: e ≤ 3 mm 30 min e > 8 mm 60 min	Delamination, cracking, bubbles in pipe shall not be seen.
Fittings			
Heating effect, (150 ±2) °C	EN ISO 580 Method A, air	Immersion time: e ≤ 3 mm 15 min 3<e≤10mm 30 min 10<e≤20mm 60 min	Cracking and bubbles in joints shall not be seen.
e: Wall thickness			

Mechanical and Performance Characteristics of PE Pipes and Joints

1- Ring stiffness (SN):

Kalde Corrugated pipes, are providing SN4 and SN8 values when SN (Ring stiffness) value, that is stipulated by TS EN 13476-3 standards, are tested in accordance with ISO 9969 standards which is referenced by this standard.

Characteristics	Standard	Unit	Value
Ring stiffness, SN 4	ISO 9969	KN /M2	≥ 4
Ring stiffness, SN 8	ISO 9969	KN /M2	≥ 8

Corrugated Pipes

Nominal Diameter -ID (mm)	Inside Diameter (mm)	Outside Diameter (mm)	Ring Stiffness -SN (kN/m ²)	
100	101.6	118	4	8
150	149.6	174	4	8
200	199	233	4	8
250	249	290.5	4	8
300	300.9	353.5	4	8

2- Ring flexibility:

Outer diameter of Kalde Corrugated pipes are stretched with 30% pressure in accordance with EN 1446 standards and as a result of this there will be no cracking, breaking and deformation in pipes.

3- Impact strength:

When Kalde Corrugated pipes are tested in accordance with EN 744 standards, the pipes can stand without being broken when a load, which is suitable for every diameter that is referenced in standard concerning pipe samples conditioned at 0°C, is applied on it.

4- Tightness of elastomeric ring seal joint:

Tightness experiment that is applied to a system consisting of elastomeric ring type pipes and joints in accordance with EN 1277 standards and is tested for 0,5 bar water and for 15 minutes, the system will stand without any leakage.

5- Chemical resistance:

Chemical resistance of Polyethylene and Polypropylene are in good level.

(For details please see table 3)

Table 3 - Polyethylene and Polypropylene Chemical Resistance 20, 60 and 100°C

PE		Temperature °C		
		20	60	100
Acetaldehyde	Ts-s	d	sd	-
Acetic acid	50%	d	-	-
Acetic acid	80%	d	-	-
Ace anhydride	TVs-s	d	sd	-
Acetone	Ts-s	sd	sd	-
Ally alcohol	TVs-s	d	d	-
Ammonium nitrate	Saturated Solution	d	d	-
Ammonium chloride	Saturated Solution	d	d	-
Amyl acetate	Ts-s	d	sd	-
Amyl alcohol	Ts-s	d	sd	-
Aniline	Ts-s	d	sd	-
Antimony (III) chloride	Saturated Solution	d	d	-
Arsenic acid	Saturated Solution	d	d	-
Benzene	Ts-s	sd	sd	-
Benzoic acid	Saturated Solution	d	d	-
Beer	Working Solution	d	d	-
Boric acid	Saturated Solution	D	d	-
Butane, gas	Ts-g	d	d	-
Butyl acetate	Ts-s	-	-	-
Mercury	Ts-s	d	d	-

Table 3 - Polyethylene and Polypropylene Chemical Resistance 20, 60 and 100°C

PE		Temperature °C		
		20	60	100
Mercury (I) nitrate	Saturated Solution	d	d	-
Mercury (II) chloride	Saturated Solution	d	d	-
Mercury (II) cyanide	Saturated Solution	d	d	-
Dextrin	Solution	d	d	-
Ferric (III) chloride	Saturated Solution	d	d	-
Ethanol	95%	-	-	-
Ethylene glycol	Ts-s	d	d	-
Formic acid	50%	d	d	-
Formic acid	Ts-s	d	d	-
Formaldehyde	%30-40	d	d	-
Phosphoric acid	Up to %50	d	d	-
Phosphoric acid	%25-85	-	-	-
Natural gas, dry	Ts-g	d	d	-
Natural gas, wet	Ts-g	d	-	-
Gasoline (petroleum)	Working Solution	D	sd	-
Glycerin	Ts-s	d	d	-
Silver Cyanide	Saturated Solution	d	d	-
Glucose	Solution	d	d	-
Air	Ts-g	d	d	-
Hydro bromic acid	Up to % 48	d	d	-

Table 3 - Polyethylene and Polypropylene Chemical Resistance 20, 60 and 100°C

PE		Temperature °C		
		20	60	100
Hydrofluoric acid	Up to %10	d	d	-
Hydrogen	Ts-g	d	d	-
Hydrochloric acid	%10-20	d	d	-
Hydrochloric acid	% >30	d	d	-
Urine		d	d	-
Calcium hydroxide	Saturated Solution	d	d	-
Calcium carbonate	Suspension	d	d	-
Calcium chloride	Saturated Solution	d	d	-
Calcium nitrate	Saturated Solution	d	d	-
Carbon dioxide, dry gas	Ts-g	d	d	-
Lactic acid	%10-90	d	d	-
Fruit juice	Working Solution	-	-	-
Mineral Oils	Working Solution	d	sd	-
Nitric acid	5%	d	d	-
Nitric acid	10%	d	d	-
Nitric acid	>%50	ds	dz	dz
Ozone, gas	Ts-g	sd	dz	-
Potassium hydroxide	10%	d	d	-
Potassium chloride	Saturated Solution	d	d	-

Table 3 - Polyethylene and Polypropylene Chemical Resistance 20, 60 and 100°C

PE		Temperature °C		
		20	60	100
Potassium nitrate	Saturated Solution	d	d	-
Potassium sulfate	Saturated Solution	d	d	-
Silicon oil	Ts-s	-	-	-
Citric acid	Saturated Solution	d	d	-
Sodium hydroxide	%10-35	d	d	-
Water, distilled		d	d	-
Water, sea		d	d	-
Water, utilization		d	d	-
Water, mineral		d	d	-
Sulfuric acid	Up to %10	d	d	-
Sulfuric acid	50%	d	d	-
Sulfuric acid	98%	d	dz	-
Wines	Working Solution	d	d	-
Milk	Working Solution	d	d	-
Aqua vitae(Alcohol)	Working Solution	d	d	-
Urea	Solution	d	d	-
Whiskey	Working Solution	d	d	-
Oil (vegetable and animal)	Ts-s	d	sd	-
Olive oil	Working Solution	-	-	-

Ts-s	In technical purity, liquid
Ts-g	In technical purity, gas
Saturated Solution	Saturated Solution with water at 20°C
Working Solution	Working Solution, most used concentration in second
Solution	Solution, Concentrated more than %10 but unsaturated aqueous solution
Suspension	Suspension. Prepared in saturated solution at 20°C
D	Resistant
Sd	Limited resistant
Dz	Not resistant

Subjects That Shall Be Paid Attention During Storage and Transportation

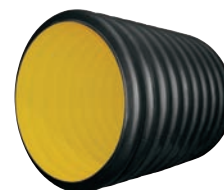
- The storage location of Corrugated pipes shall be purified from specular materials such as rock, stone, and metals etc., which can harm pipes
- Corrugated pipes shall be stowed up to not more than 3 meters height.
- Corrugated pipes shall not be exposed to sunshine. If possible it shall be stored in places, where its top is closed with penthouse. As a result of this it long term storage can be done.
- Elastomeric gaskets in Corrugated pipes shall not be exposed to direct sunshine.
- Stowage shall be done in the form that the pipe muffs are cross stowed over and over.
- During loading higher loads, the ropes shall be tensed without giving any damage for pipes.
- During transportation, loading and locating pipes to the ditch, the pipes shall be prevented from damages by lifting after being hanged on hanger..
- Hanging using forklift, the pipes shall be centered from its middle and than lifted.
- In open vehicle loadings, necessary precautions should be taken for damages that can be arisen from the side stands of vehicle body.
- Pipes shall not be carried by creeping but in smooth surfaces it can be carried by rolling without damaging it.
- In telescopic loadings, when loading pipes having small diameter into big diameter pipes, please pay attention not to damage the muffs and welding parts of pipes.

Corrugated Pipes

Corrugated Pipe Set

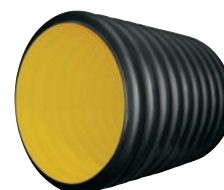
Corrugated Pipe Set SN4

Code	Size	Pcs.
8302-set-100004	100 Lenght / 1 Coupling + 2 joint	1
8302-set-150004	150 Lenght / 1 Coupling + 2 joint	1
8302-set-200004	200 Lenght / 1 Coupling + 2 joint	1
8302-set-250004	250 Lenght / 1 Coupling + 2 joint	1
8302-set-300004	300 Lenght / 1 Coupling + 2 joint	1



Corrugated Pipe Set SN8

Code	Size	Pcs.
8302-set-100008	100 Lenght / 1 Coupling + 2 joint	1
8302-set-150008	150 Lenght / 1 Coupling + 2 joint	1
8302-set-200008	200 Lenght / 1 Coupling + 2 joint	1
8302-set-250008	250 Lenght / 1 Coupling + 2 joint	1
8302-set-300008	300 Lenght / 1 Coupling + 2 joint	1



Corrugated Pipes

HDPE Coupling SN4

Code	Size	Pcs.
8312-muf-100004	100	1
8312-muf-150004	150	1
8312-muf-200004	200	1
8312-muf-250004	250	1
8312-muf-300004	300	1

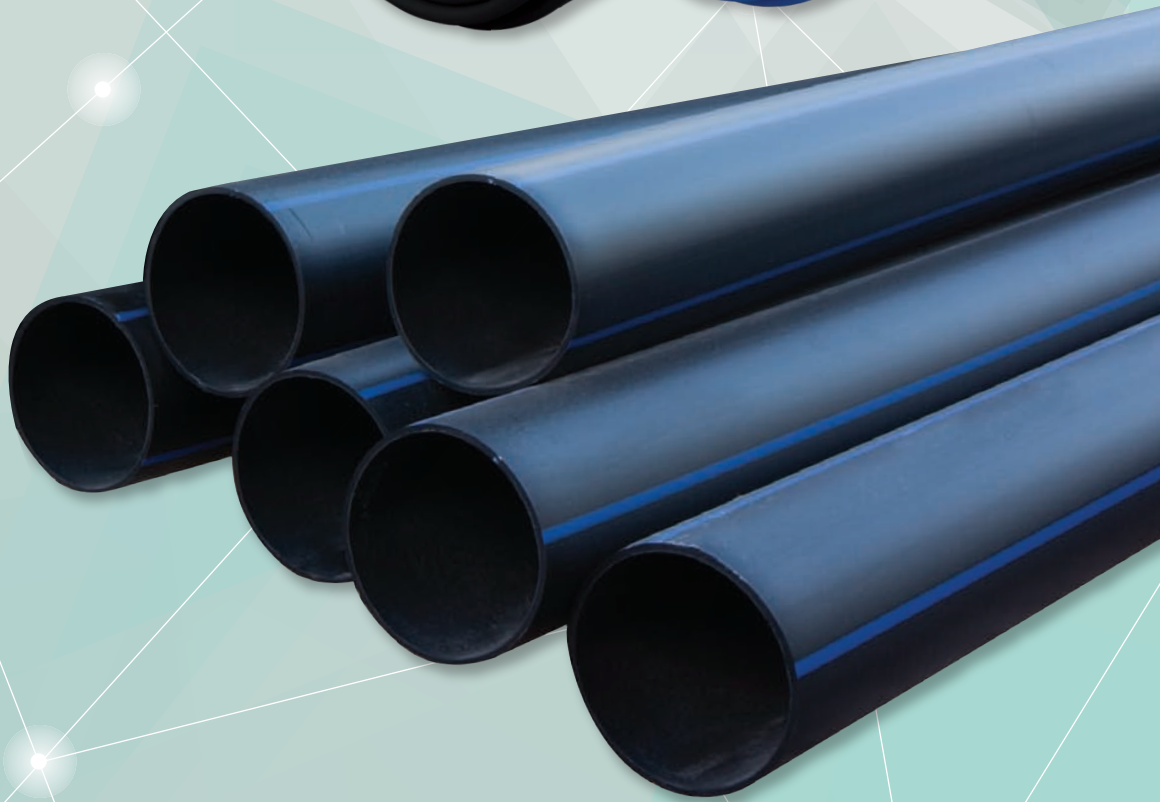
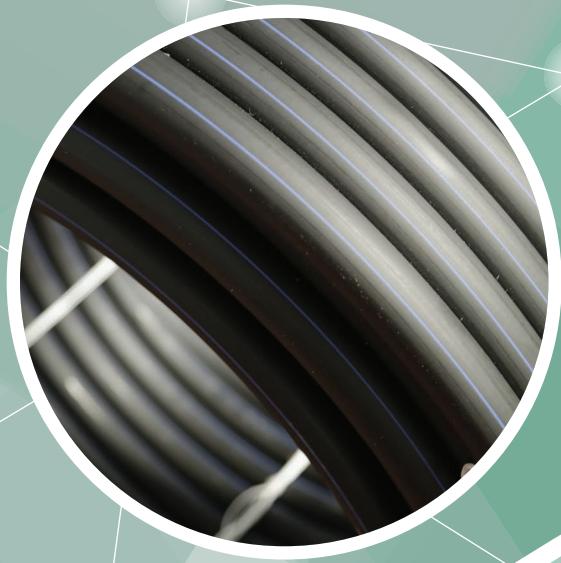


Corrugated Joint

Code	Size	Pcs.
7302-sel-100000	100	1
7302-sel-150000	150	1
7302-sel-200000	200	1
7302-sel-250000	250	1
7302-sel-300000	300	1







PE-100 Systems

PE-100 System

Kalde Polyethylene Water Pipes

Kalde polyethylene pipes are produced the HDPE 100 raw material, For use in pressurized water mains lines.

HDPE Pipes Technical Specifications

- Kalde HDPE 100 pipes are manufactured according to standard 12201-2.
- UV stabilized raw materials to increase the strength of the sun's rays are used in the pipes.
- Pipes butt welding, electro fusion welding is suitable.
- The relevant pressure class produced pipes, pipes and joints after you merge at the apply test pressure, tear and does not leak.
- Pipe material, chemical resistance is high, is not affected by corrosion, decay, wear-resistant.
- Lightweight. laid quickly and easily.
- Welding properties are well.
- Flexible to be not affected by soil movements.
- Impact resistance are well.
- Kalde polyethylene pipes produced PN4, PN5, PN6, PN8, PN10, PN12.5, PN16, PN20, PN25 and DN20-DN630 diameter range.

Material	HDPE 100 (=PE-100)
Product Color	Black
Product Standard	EN 12201-2
Product Range	Ø20 - Ø630 mm
Pressure Class	PN4 - PN25
Pipe Dimensions	Ø20 - Ø125 (coil)
	Ø75 - Ø630 (6 - 11,8 pipe lenght)

Physical Properties	Value	Unit	Test Method
Density	0.950	g/cm ³	ISO 1183
Melt flow index (190°/5kg)	0.23	g/10 sec.	ISO-1133
Mechanical Properties			
Yield strength (23°C v=50mm/min)	23	MPa	ISO 527-1-2
Yield elongation (23°C v=50mm/min)	9	%	ISO 527-1-2
Modulus of elasticity (23° v=1mm/min,secant)	900	MPa	ISO 527-1-2
Charpy Impact Strength (Notched)			
23°C	26	kJ/m ²	ISO 179
-30°C	13	kJ/m ²	ISO 179
Other Features			
Oxidation induction time (OIT) (at 210°C)	≥20	Sec.	EN 728
Ratio of carbon black	2,3±0,1	%	ISO 6964
Elongation at break	≥350	%	EN 638

PE-100 System

PE-100 Size Table

SDR:41; PN 4			SDR:33; PN 5			SDR:26; PN 6			SDR:21; PN 8			SDR:17; PN 10		
DN/ mm	S/mm	Weight kg/m	DN/ mm	S/mm	Weight kg/m	DN/ mm	S/mm	Weight kg/m	DN/ mm	S/mm	Weight kg/m	DN/ mm	S/mm	Weight kg/m
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	32	2,0*	0.19
40	-	-	-	-	-	-	-	-	40	2,0*	0.24	40	2.4	0.30
50	-	-	-	-	-	50	2.0	0.31	50	2.4	0.37	50	3.0	0.45
63	-	-	63	2.0	0.40	63	2.5	0.49	63	3.0	0.58	63	3.8	0.72
75	-	-	75	2.3	0.55	75	2.9	0.68	75	3.6	0.83	75	4.5	1.02
90	2,3*	0.64	90	2.8	0.79	90	3.5	0.98	90	4.3	1.18	90	5.4	1.46
110	2.7	0.94	110	3.4	1.17	110	4.2	1.43	110	5.3	1.77	110	6.6	2.17
125	3.1	1.23	125	3.9	1.51	125	4.8	1.84	125	6.0	2.27	125	7.4	2.76
140	3.5	1.54	140	4.3	1.88	140	5.4	2.32	140	6.7	2.83	140	8.3	3.46
160	4.0	2.00	160	4.9	2.42	160	6.2	3.04	160	7.7	3.72	160	9.5	4.52
180	4.4	2.49	180	5.5	3.07	180	6.9	3.79	180	8.6	4.67	180	10.7	5.71
200	4.9	3.05	200	6.2	3.84	200	7.7	4.69	200	9.6	5.78	200	11.9	7.05
225	5.5	3.86	225	6.9	4.77	225	8.6	5.89	225	10.8	7.30	225	13.4	8.93
250	6.2	4.83	250	7.7	5.92	250	9.6	7.30	250	11.9	8.93	250	14.8	11.00
280	6.9	5.98	280	8.6	7.40	280	10.7	9.10	280	13.4	11.30	280	16.6	13.70
315	7.7	7.52	315	9.7	9.37	315	12.1	11.60	315	15.0	14.20	315	18.7	17.40
355	8.7	9.55	355	10.9	11.80	355	13.6	14.60	355	16.9	18.00	355	21.1	22.10
400	9.8	12.10	400	12.3	15.10	400	15.3	18.60	400	19.1	22.90	400	23.7	28.00
450	11.0	15.30	450	13.8	19.00	450	17.2	23.50	450	21.5	28.90	450	26.7	35.40
500	12.3	19.00	500	15.3	23.40	500	19.1	28.90	500	23.9	35.70	500	29.7	43.80
560	13.7	23.60	560	17.2	29.40	560	21.4	36.20	560	26.7	44.70	560	33.2	54.80
630	15.4	29.90	630	19.3	37.10	630	24.1	45.90	630	30.0	56.30	630	37.4	69.40
710	17.4	38.00	710	21.8	47.20	710	27.2	58.33	710	33.9	71.70	710	42.1	88.00
800	19.6	48.10	800	24.5	59.70	800	30.6	73.85	800	38.1	90.90	800	47.4	112.00
900	22.0	60.90	900	27.6	75.60	900	34.4	93.40	900	42.9	115.00	900	53.3	141.00
1000	24.5	75.20	1000	30.6	93.10	1000	38.2	115.20	1000	47.7	142.10	1000	59.3	175.00
1200	29.4	108.00	1200	36.7	134.00	1200	45.9	165.90	1200	57.2	204.50	1200	70.6	247.10
1400	34.3	147.00	1400	42.9	183.00	1400	53.5	225.70	1400	66.7	278.10	1400	82.4	336.30
1600	39.2	192.00	1600	49.0	238.00	1600	61.2	295.00	1600	76.2	361.90	1600	94.1	430.20

* The s value calculated according to ISO 4065 is rounded to the nearest 2.0, 2.3, or 3.0.

- For SDR groups not included in the table, the wall thicknesses are found by the calculation method.

■ Values found by the calculation method.

SDR : Standard aspect ratio (outer diameter / wall thickness)

DN : Nominal diameter

S : Wall thickness

PE-100 System

SDR:13,6; PN 12,5			SDR:11; PN 16			SDR:9; PN 20			SDR:7,4; PN 25			SDR:6; PN 32		
DN/mm	S/mm	Weight kg/m	DN/mm	S/mm	Weight kg/m	DN/mm	S/mm	Weight kg/m	DN/mm	S/mm	Weight kg/m	DN/mm	S/mm	Weight kg/m
-	-	-	-	-	-	16	2,0*	0.09	16	2,3*	0.10	16	3,0*	0.14
-	-	-	20	2,0*	0.11	20	2.3	0.13	20	3,0*	0.16	20	3.4	0.18
25	2,0*	0.14	25	2.3	0.17	25	3,0*	0.27	25	3.5	0.24	25	4.2	0.28
32	2.4	0.23	32	3,0*	0.27	32	3.6	0.33	32	4.4	0.39	32	5.4	0.45
40	3.0	0.36	40	3.7	0.43	40	4.5	0.51	40	5.5	0.60	40	6.7	0.70
50	3.7	0.55	50	4.6	0.66	50	5.6	0.79	50	6.9	0.94	50	8.3	1.09
63	4.7	0.87	63	5.8	1.05	63	7.1	1.26	63	8.6	1.47	63	10.5	1.73
75	5.6	1.24	75	6.8	1.47	75	8.4	1.76	75	10.3	2.09	75	12.5	2.44
90	6.7	1.77	90	8.2	2.12	90	10.1	2.54	90	12.3	3.00	90	15.0	3.51
110	8.1	2.62	110	10.0	3.14	110	12.3	3.78	110	15.1	4.50	110	18.3	5.24
125	9.2	3.37	125	11.4	4.10	125	14.0	4.87	125	17.1	5.77	125	20.8	6.75
140	10.3	4.22	140	12.7	5.10	140	15.7	6.11	140	19.2	7.25	140	23.3	8.47
160	11.8	5.50	160	14.6	6.70	160	17.9	7.96	160	21.9	9.44	160	26.6	11.00
180	13.3	6.98	180	16.4	8.40	180	20.1	10.10	180	24.6	11.90	180	29.9	14.00
200	14.7	8.56	200	18.2	10.40	200	22.4	12.40	200	27.4	14.80	200	33.2	17.20
225	16.6	10.90	225	20.5	13.10	225	25.2	15.80	225	30.8	18.60	225	37.4	21.80
250	18.4	13.40	250	22.7	16.20	250	27.9	19.40	250	34.2	23.00	250	41.5	27.00
280	20.6	16.80	280	25.4	20.30	280	31.3	24.30	280	38.3	28.90	280	46.5	33.80
315	23.2	21.20	315	28.6	25.60	315	35.2	30.80	315	43.1	36.50	315	52.3	42.70
355	26.1	26.90	355	32.2	32.50	355	39.7	39.10	355	48.5	46.30	355	59.0	54.30
400	29.4	34.10	400	36.3	41.30	400	44.7	49.60	400	54.7	58.80	400	66.7	68.90
450	33.1	43.20	450	40.9	52.30	450	50.3	62.70	450	61.5	74.40	450	75.0	87.36
500	36.8	53.30	500	45.4	64.50	500	55.8	77.30	500	67.6	91.80	500	83.3	107.67
560	41.2	66.90	560	50.8	80.80	560	62.2	97.00	560	75.7	113.61	560	93.3	134.94
630	46.3	84.60	630	57.2	102.00	630	70.0	121.48	630	85.1	143.70	630	105.0	170.83
710	52.2	107.00	710	64.5	130.00	710	78.8	154.14	710	95.9	182.51	710	118.3	217.07
800	58.8	136.00	800	72.7	163.90	800	88.9	195.91	800	108.1	231.79	800	133.3	275.41
900	66.2	171.00	900	81.8	207.40	900	100.0	247.90	900	121.6	289.40	900	150.0	348.64
1000	73.5	211.10	1000	90.9	256.10	1000	111.1	306.05	1000	135.1	362.11	1000	166.7	430.48
1200	88.2	310.35	1200	109.1	368.80	1200	133.3	440.65	1200	162.2	521.65	1200	200.0	619.80
1400	102.9	413.60	1400	127.3	502.10	1400	155.5	599.71	1400	189.2	709.92	1400	233.3	843.51
1600	117.7	540.60	1600	145.5	655.80	1600	177.8	783.63	1600	216.2	927.15	1600	266.7	1082

* The s value calculated according to ISO 4065 is rounded to the nearest 2.0, 2.3, or 3.0.

- For SDR groups not included in the table, the wall thicknesses are found by the calculation method.

Values found by the calculation method.

SDR : Standard aspect ratio (outer diameter / wall thickness)

DN : Nominal diameter

S : Wall thickness

● PE-100 System

● Chemical Resistance Table

D	Resistant
SD	Resistant adequately
DZ	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

D : Resistant

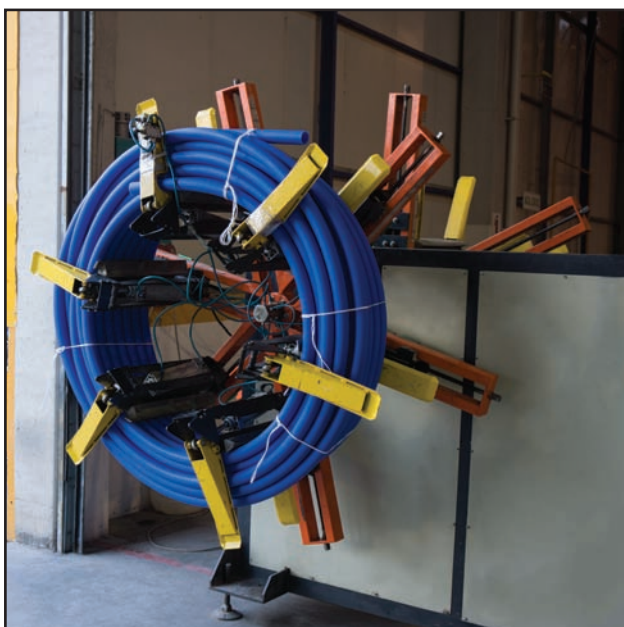
The plastic pipes and fittings indicated with the 'D' symbol in the table do not have any negative effects on their properties when the internal pressure is not applied and there is no external mechanical effect and when used with the chemicals at the specified temperatures and concentrations. This type of pipe and fittings should not be used in pressurized applications without additional tests and controls under pressure.

SD : Resistant adequately

The plastic pipes and fittings indicated with the 'SD' symbol in the table, when internal pressure is not applied and there is no external mechanical effect and when used with chemicals at the specified temperatures and concentrations, some corrosion occurs. It may come. Therefore, pipes indicated with SD can be used in applications where a small amount of corrosion is acceptable. This type of pipe and fittings should not be used in pressurized applications without additional tests and controls under pressure.

DZ : Poor resistance

Plastic pipes and fittings, indicated by 'DZ' in the table, are not used because they are affected by chemical substances in pressurized or non-pressurized applications.



Chemical Resistance Table

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	ts-s	D	D
Hydrogen peroxide	30	D	D
Hydrofluoric acid gas	ts-g	YD	ZD
Hydrofluoric acid	≤10	D	D
Hydrofluoric acid	40	YD	ZD
Urine		D	YD
Calcium carbonate	Suspension	D	D
Calcium chloride	Saturated solution	D	D
Carbon dioxide, gas	ts-g	D	D
Carbon monoxide, gas	ts-g	D	D

Chemical Material	Concentration (%)	Temperature (°C)	
		20	60
Carbon tetrachloride	ts-s	ZD	ZD
Chlorine, dry gas	ts-g	YD	ZD
Chloroform	ts-s	ZD	ZD
Sulphur dioxide, dry gas	Süsp.	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	≤ 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
Toluene	ts-s	ZD	ZD
Trichlorethylene	ts-s	ZD	ZD
Oils plant and animal	ts-s	D	D

PE-100 System

HDPE-100 Drinking Water Pipe (Black) (SDR:17) (PN 10)

Code	Size	S (mm)	Weight (kg/m)
8202-tbh-032110	ø32 ●	2,0	0,187
8202-tbh-040110	ø40 ●	2,4	0,295
8202-tbh-050110	ø50 ●	3,0	0,450
8202-tbh-063110	ø63 ●	3,8	0,720
8202-tbh-075110	ø75 ●	4,5	1,020
8202-tbh-090110	ø90 ●	5,4	1,460
8202-tbh-110110	ø110 ●	6,6	2,170
8202-tbh-125110	ø125 ●	7,4	2,760
8202-tbh-140110	ø140 ●	8,3	3,460
8202-tbh-160110	ø160 ●	9,5	4,520
8202-tbh-180110	ø180 ●	10,7	5,710
8202-tbh-200110	ø200 ●	11,9	7,050
8202-tbh-225110	ø225 ●	13,4	8,930
8202-tbh-250110	ø250 ●	14,8	11,000
8202-tbh-280110	ø280 ●	16,6	13,700
8202-tbh-315110	ø315 ●	18,7	17,400
8202-tbh-350110	ø355 ●	21,1	22,100
8202-tbh-400110	ø400 ●	23,7	28,000
8202-tbh-450110	ø450 ●	26,7	35,400
8202-tbh-500110	ø500 ●	29,7	43,800
8202-tbh-560110	ø560 ●	33,2	54,800
8202-tbh-630110	ø630 ●	37,4	69,400



HDPE-100 Drinking Water Pipe (Blue) (SDR:17) (PN 10)

Code	Size	S (mm)	Weight (kg/m)
8208-tbh-032110	ø32	2,0	0,187
8208-tbh-040110	ø40	2,4	0,295
8208-tbh-050110	ø50	3,0	0,450
8208-tbh-063110	ø63	3,8	0,720
8208-tbh-075110	ø75	4,5	1,020
8208-tbh-090110	ø90	5,4	1,460
8208-tbh-110110	ø110	6,6	2,170
8208-tbh-125110	ø125	7,4	2,760
8208-tbh-140110	ø140	8,3	3,460
8208-tbh-160110	ø160	9,5	4,520
8208-tbh-180110	ø180	10,7	5,710
8208-tbh-200110	ø200	11,9	7,050
8208-tbh-225110	ø225	13,4	8,930
8208-tbh-250110	ø250	14,8	11,000
8208-tbh-280110	ø280	16,6	13,700
8208-tbh-315110	ø315	18,7	17,400
8208-tbh-350110	ø355	21,1	22,100
8208-tbh-400110	ø400	23,7	28,000
8208-tbh-450110	ø450	26,7	35,400
8208-tbh-500110	ø500	29,7	43,800
8208-tbh-560110	ø560	33,2	54,800
8208-tbh-630110	ø630	37,4	69,400



PE-100 System

HDPE-100 Drinking Water Pipe (Black) (SDR:11) (PN 16)

Code	Size	S (mm)	Weight (kg/m)
8202-tbh-020116	ø20 ●	2,0	0,112
8202-tbh-025116	ø25 ●	2,3	0,17
8202-tbh-032116	ø32 ●	3,0	0,27
8202-tbh-040116	ø40 ●	3,7	0,43
8202-tbh-050116	ø50 ●	4,6	0,66
8202-tbh-063116	ø63 ●	5,8	1,05
8202-tbh-075116	ø75 ●	6,8	1,47
8202-tbh-090116	ø90 ●	8,2	2,12
8202-tbh-110116	ø110 ●	10,0	3,14
8202-tbh-125116	ø125 ●	11,4	4,1
8202-tbh-140116	ø140 ●	12,7	5,1
8202-tbh-160116	ø160 ●	14,6	6,7
8202-tbh-180116	ø180 ●	16,4	8,4
8202-tbh-200116	ø200 ●	18,2	10,4
8202-tbh-225116	ø225 ●	20,5	13,1
8202-tbh-250116	ø250 ●	22,7	16,2
8202-tbh-280116	ø280 ●	25,4	20,3
8202-tbh-315116	ø315 ●	28,6	25,6
8202-tbh-355116	ø355 ●	32,2	32,5
8202-tbh-400116	ø400 ●	36,3	41,3
8202-tbh-450116	ø450 ●	40,9	52,3
8202-tbh-500116	ø500 ●	45,4	64,5
8202-tbh-560116	ø560 ●	50,8	80,8
8202-tbh-630116	ø630 ●	57,2	102

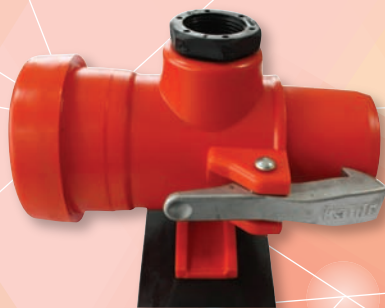


HDPE-100 Drinking Water Pipe (Blue) (SDR:11) (PN 16)

Code	Size	S (mm)	Weight (kg/m)
8208-tbh-020116	ø20 ●	2,0	0,112
8208-tbh-025116	ø25 ●	2,3	0,17
8208-tbh-032116	ø32 ●	3,0	0,27
8208-tbh-040116	ø40 ●	3,7	0,43
8208-tbh-050116	ø50 ●	4,6	0,66
8208-tbh-063116	ø63 ●	5,8	1,05
8208-tbh-075116	ø75 ●	6,8	1,47
8208-tbh-090116	ø90 ●	8,2	2,12
8208-tbh-110116	ø110 ●	10,0	3,14
8208-tbh-125116	ø125 ●	11,4	4,1
8208-tbh-140116	ø140 ●	12,7	5,1
8208-tbh-160116	ø160 ●	14,6	6,7
8208-tbh-180116	ø180 ●	16,4	8,4
8208-tbh-200116	ø200 ●	18,2	10,4
8208-tbh-225116	ø225 ●	20,5	13,1
8208-tbh-250116	ø250 ●	22,7	16,2
8208-tbh-280116	ø280 ●	25,4	20,3
8208-tbh-315116	ø315 ●	28,6	25,6
8208-tbh-355116	ø355 ●	32,2	32,5
8208-tbh-400116	ø400 ●	36,3	41,3
8208-tbh-450116	ø450 ●	40,9	52,3
8208-tbh-500116	ø500 ●	45,4	64,5
8208-tbh-560116	ø560 ●	50,8	80,8
8208-tbh-630116	ø630 ●	57,2	102







Irrigation

Kalde sprinkler pipes and fittings can be used efficiently for irrigation of fields of sugar beet, potato, clove, cereal, carrot, peanut, corn, wheat, legume, etc., tea and coffee fields, areas requiring dust control, pasture land, sports fields and golf courses. The sprinkler pipes and fittings are produced in accordance with TS EN 12734 standard. Kalde sprinkler pipes and fittings are offered with diameters of Ø75, Ø90, Ø110, Ø125, Ø140 and Ø160 mm. Produced with high quality and in accordance with high standards, Kalde sprinkler pipes and fittings are offered with a warranty of 5 years.



Average Outer Diameter (mm)	PN 6 = at 0,6 MPa (PE 63) Wall Thickness, Minimum (mm)
75	2.9
90	3.5
110	4.2
125	4.8
160	6.2

Important Issues in Assembly-Disassembly and Use of Kalde Sprinkler System

Kalde Sprinkler systems (pipes and fittings) are placed on sale for consumption after the highest quality design and production processes involving the most suitable materials. In order to get the most of our system and use it without any problems for a long time, the following matters should be taken into account.

Important Issues Before Installation of the Sprinkler System

- It is very important for the performance of the system to choose the main line pipe supplying water to the system and lateral pipes to be used in the sprinkler system with the right diameters. Particularly, the main pipe supplying water to the system should have a sufficient diameter.
- The project for the sprinkler system should be created by computer software or carried out by experts.
- During the project design process of the sprinkler system, it should be noted that the pressure in the pipe line will increase as the length of the main line pipe and the elevation difference between the source of water and the irrigated land increases. For each additional elevation difference of 10 meters, the pipe will have an extra pressure of 1 bar. Similarly, each additional horizontal length of 100 meters will cause an extra pressure of 1 bar for the pipe.
- During the project design process of the sprinkler system, it should be ensured that the flow rate of the water in the pipe doesn't exceed 2 meters/second. If this value cannot be achieved, higher diameters should be preferred for the pipes.
- Since the sand, mud, scum and similar foreign materials in the water would decrease the flow rate (thus the efficiency of the system) and also block sprinklers and nipples, the end of the pipe at the source of water should be fitted with a suitable filter.
- If there are broken/damaged parts in the sprinkler pipes, they should be repaired or replaced. Broken or cracked latches should never be used.
- Don't carry the pipes by pulling on the ground. The friction between the ground and the pipe can damage the pipe and the head.

Important Issues During Installation of the System

- Since the pipes would be softer at high temperatures, there might be folds and bends at the middle of the pipes during transport and the pipes might be damaged. So, the pipes should be carried by two people to avoid folds and bends.
- Avoid applying force or impact while assembling and disassembling the system.
- The gaskets at the joints should be cleaned thoroughly prior to assembly.
- Worn, torn or damaged gaskets shouldn't be used and they should be replaced.
- Lubricate the gaskets and male ends with soap and water, soft soap, etc. prior to joining pipes. This would allow easy assembly of the pipes.
- The joints of the pipes should be checked for defects and they should be perfect.

Important Issues During Operation of the System

- The pipe line should be cleaned by operating the sprinkler system at low flow rates and pressures and keeping the pipe stopper at the lateral or main pipe for a short period of time.
- When supplying the system with pressure, the initial pressure should be as low as 1-2 bars and increased gradually. Thus, the negative effects of the impacts known as water ram would be minimized.
- Polyethylene pipes are designed for operation at 20 °C. The performance of a polyethylene pipe would drop as the temperature rises. Therefore, when installing and commissioning a pipeline under sunlight (which would cause the pipe line temperature to rise up to 50-60 °C), the pressure of the pipe line should be maintained at low values such as 2-3 bars until the hot water in the pipes is discharged completely. The pressure value shouldn't exceed 1-2 bars until the hot water is discharged completely and the pipe has cooled with the cold water flowing through it.

Important Issues When the System is not Used

- The pipes should not be exposed to direct sunlight when not in use. Extended exposure to direct sunlight would shorten the service life of the pipes.
- Since driving tractors or other vehicles on the pipe heads would damage them, you should avoid doing it.
- Direct contact of polyethylene pipes with sharp objects should be avoided. They could scratch and damage the pipe.
- Polyethylene pipes should be kept away from heat and fire. If you are going to set a fire or burn stubble, the pipes and fittings should be taken away.
- Unused gaskets should be kept away from sunlight. They should not be exposed to sunlight for a long time.

Note:

Please keep in mind that the sprinkler system you purchased is yours. You can use the sprinkler system without any problems for a long period of time if you follow the instructions above. If you experience any unexpected problems, please contact KALDE sprinkling experts.

Tube - 5 Meters

Code	Size	Pcs.
8202-tip-750005	75	1
8202-tip-900005	90	1
8202-tip-110005	110	1
8202-tip-125005	125	1
8202-tip-140005	140	1
8202-tip-160005	160	1



Tube LATERAL - 5 Meters

Code	Size	Pcs.
8202-ltr-750005	75	1
8202-ltr-900005	90	1
8202-ltr-110005	110	1



Tube - 6 Meters

Code	Size	Pcs.
8202-tip-750006	75	1
8202-tip-900006	90	1
8202-tip-110006	110	1
8202-tip-125006	125	1
8202-tip-140006	140	1
8202-tip-160006	160	1



Tube LATERAL - 6 Meters

Code	Size	Pcs.
8202-ltr-750006	75	1
8202-ltr-900006	90	1
8202-ltr-110006	110	1



Cross

Code	Size	Pcs.
8212-crs-757500	75 x 75	1
8212-crs-907500	90 x 75	1
8212-crs-909000	90 x 90	1
8212-crs-110750	110 x 75	1
8212-crs-110900	110 x 90	1
8212-crs-110110	110 x 110	1
8212-crs-125750	125 x 75	1
8212-crs-125900	125 x 90	1
8212-crs-125110	125 x 110	1
8212-crs-125125	125 x 125	1
8212-crs-140750	140 x 75	1
8212-crs-140900	140 x 90	1
8212-crs-140110	140 x 110	1
8212-crs-140125	140 x 125	1
8212-crs-140140	140 x 140	1
8212-crs-160750	160 x 75	1
8212-crs-160900	160 x 90	1
8212-crs-160110	160 x 110	1
8212-crs-160125	160 x 125	1
8212-crs-160140	160 x 140	1
8212-crs-160160	160 x 160	1



Elbow

Code	Size	Pcs.
8212-elb-750000	75	1
8212-elb-900000	90	1
8212-elb-110000	110	1



Reduction

Code	Size	Pcs.
8212-rdc-907500	90 x 75	1
8212-rdc-110750	110 x 75	1
8212-rdc-110900	110 x 90	1
8212-rdc-125750	125 x 75	1
8212-rdc-125900	125 x 90	1
8212-rdc-125110	125 x 110	1
8212-rdc-140750	140 x 75	1
8212-rdc-140900	140 x 90	1
8212-rdc-140110	140 x 110	1
8212-rdc-140125	140 x 125	1
8212-rdc-160750	160 x 75	1
8212-rdc-160900	160 x 90	1
8212-rdc-160110	160 x 110	1
8212-rdc-160125	160 x 125	1
8212-rdc-160140	160 x 140	1



Tee

Code	Size	Pcs.
8212-tio-757500	75 x 75	1
8212-tio-907500	90 x 75	1
8212-tio-909000	90 x 90	1
8212-tio-110750	110 x 75	1
8212-tio-110900	110 x 90	1
8212-tio-110110	110 x 110	1
8212-tio-125750	125 x 75	1
8212-tio-125900	125 x 90	1
8212-tio-125110	125 x 110	1
8212-tio-125125	125 x 125	1
8212-tio-140750	140 x 75	1
8212-tio-140900	140 x 90	1
8212-tio-140110	140 x 110	1
8212-tio-140125	140 x 125	1
8212-tio-140140	140 x 140	1
8212-tio-160750	160 x 75	1
8212-tio-160900	160 x 90	1
8212-tio-160110	160 x 110	1
8212-tio-160125	160 x 125	1
8212-tio-160140	160 x 140	1
8212-tio-160160	160 x 160	1



Hydrant Tee With Latch

Code	Size	Pcs.
8212-abt-750000	75	1
8212-abt-900000	90	1



Stopend

Code	Size	Pcs.
8212-ste-630000	63	1
8212-ste-750000	75	1
8212-ste-900000	90	1
8212-ste-110000	110	1
8212-ste-125000	125	1
8212-ste-140000	140	1
8212-ste-160000	160	1



Motopomp Connection

Code	Size	Pcs.
8212-mtp-750000	75	1
8212-mtp-900000	90	1
8212-mtp-110000	110	1
8212-mtp-125000	125	1
8212-mtp-140000	140	1
8212-mtp-160000	160	1



Elongation Tube / ø32 mm.

Code	Size	Pcs.
8202-tbl-322500	25	1
8202-tbl-325000	50	1
8202-tbl-326000	60	1
8202-tbl-321000	100	1



Sprink

Code	Size	Pcs.
8212-spr-000000	Standart Type	1



Sprink Adapter

Code	Size	Pcs.
8212-spr-322501	32 x 25	1



Ball Valve

Code	Size	Pcs.
8242-vlb-320000	32 x 1"	1



Line Valve

Code	Size	Pcs.
8242-vlp-750000	75	1
8242-vlp-900000	90	1
8242-vlp-110000	110	1
8242-vlp-125000	125	1



Joint

Code	Size	Pcs.
8212-tup-630000	63	1
8212-tup-750000	75	1
8212-tup-900000	90	1
8212-tup-110000	110	1
8212-tup-125000	125	1
8212-tup-140000	140	1
8212-tup-160000	160	1



