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Middle Layer foil PP-R pipe Technical Data

Polypropylene Tubes with Middle Layer Aluminium Foil

This pipe consists of three layers: the pipe inside and outside layer are made of PPR-Type 3 with an aluminum foil

inbetween. The foil is attached with wrapping welding and by using a special PP film to establish the mechanical connection between the aluminum foil and the PP-layer.

Characteristics

-hygenic, resistance to chemicals (ISO 10358)

-high resistance to pressure and heat

-low heat loss

-low pressure loss due to the smoothness

-low thermal expansion

-oxygen impermeability

Advantages

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

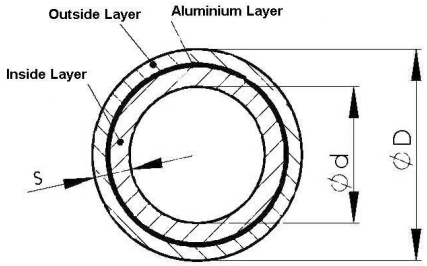


Figure- 1: supperoxy pipe

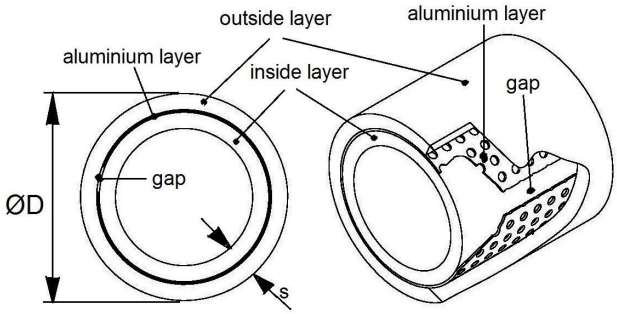


Figure-2 : supper pipe

Note: supperoxy pipe has a completely close aluminium foil layer, but the supper pipe has not completely close aluminium foil layer, there is a gap aproxmity 3-4mm, and the foil layer is perforated or unperforated.

Pipe Dimensions according to 8077 (PN 20)

Outer Diameter and Tolerance ØD, mm		Wall Thickness and Tolerance S, mm		Aluminium Thickness (micron)	Approxmitly Weight kg/m
20	+0,3	2,8	+0,4	120	0,165
25	+0,3	3,5	+0,5	120	0,245
32	+0,3	4,4	+0,6	120	0,405
40	+0,4	5,5	+0,7	120	0,594
50	+0,5	6,9	+0,8	120	0,940

63	+0,6	8,6	+1,0	120	1,490
75	+0,7	10,3	+1,2	120	2,030
90	+0,9	12,3	+1,4	120	2,950
110	+1,1	15,1	+1,7	120	4,400

Pipe Dimensions according to 8077 (PN 25)

Outer Diameter and Tolerance ØD, mm		Wall Thickness and Tolerance S, mm		Aluminium Thickness (micron)	Approxmitly Weight kg/m
20	+0,3	3,4	+0,5	120	0,176
25	+0,3	4,2	+0,6	120	0,265
32	+0,3	5,4	+0,7	120	0,430
40	+0,4	6,7	+0,8	120	0,675
50	+0,5	8,3	+1,0	120	1,035
63	+0,6	10,5	+1,2	120	1,704
75	+0,7	12,5	+1,4	120	2,371
90	+0,9	15,0	+1,6	120	3,393
110	+1,1	18,3	+1,8	120	5,008

Oxygen Impermeability

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

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

Polypropylene pipes with an aluminum folio have lower expansion coefficients.

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

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

Pipe length (m)	Temperature variation ΔT in K								
	10	20	30	40	50	60	70	80	90
	Linear expansion ΔL (mm)								
1.0	0.30	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70
2.0	0.60	1.20	1.80	2.40	3.00	3.60	4.20	4.80	5.40
3.0	0.90	1.80	2.70	3.60	4.50	5.40	6.30	7.20	8.10
4.0	1.20	2.40	3.60	4.80	6.00	7.20	8.40	9.60	10.80

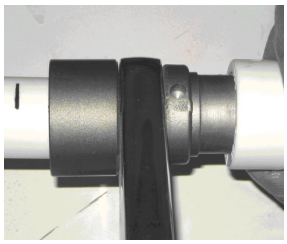
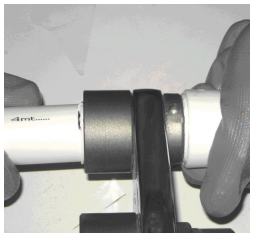
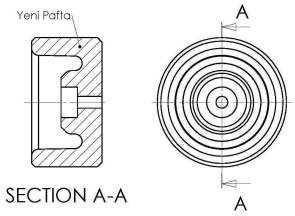
5.0	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00	13.50
6.0	1.80	3.60	5.40	7.20	9.00	10.80	12.80	14.40	16.20
7.0	2.10	4.20	6.43	8.40	10.50	12.60	14.70	16.80	18.90
8.0	2.40	4.80	7.20	9.60	12.00	14.40	16.80	19.20	21.60
9.0	2.70	5.40	8.10	10.80	13.50	16.20	18.90	21.60	24.30
10.0	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00

Welding Techniques of the PPR foil Pipe (middle layer)

Welding operation of the pipe and fittings must be done according to the following steps.

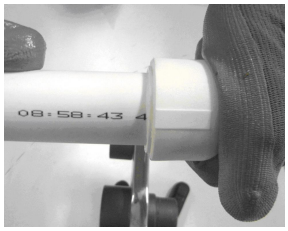
1. Firstly pipe must be cuted perpendicular and marked welding length.


2. Both pipe and fittings (these must be clean) are heated with the welding machine (please using special part for pipe heating. See section A-A) (generally up to 260° ±10° C)

3. Before welding be sure that pipe has a circular form at the front face and foil covered well with melded inner and outer layers of the pipe.

4. You can combine pipe and fittings until the mark.



Outer Diameter (mm)	Heating Secs	Joining Secs	Cooling Time (minutes)	Welding length mm
20	7	4	2	14,5
25	7	4	3	16
32	8	6	4	18
40	12	6	4	20,5
50	18	6	5	23,5
63	24	8	6	27,5
75	30	10	8	30
90	40	11	8	33
110	50	12	8	37

Installation

Pipes can be installed under or above the floor and the plaster. The installation is very easy. However, one has to pay attention to the following simple points when installing polypropylene pipes:

Pipes have to discharge the radial and axial expansions: compensations shall be done using fixed points, supporting bracket sleeve (allowing pipe to slide).

Thermal Tensıons

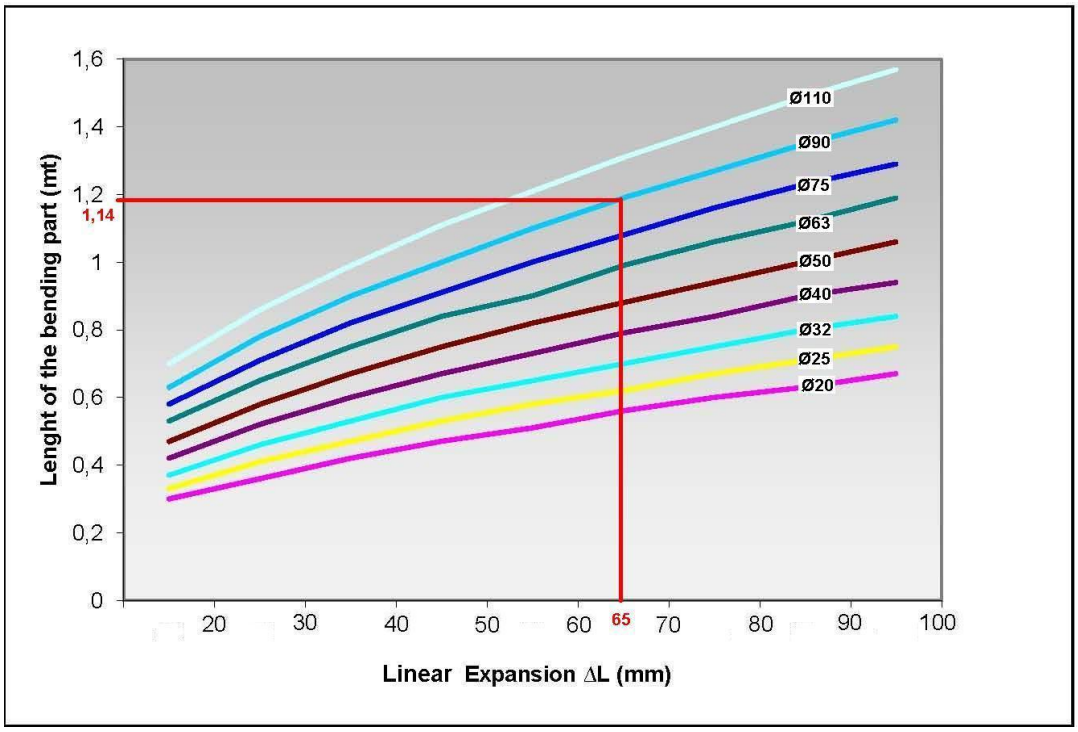
8.1 Introductıon

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 piping systems, the most important elements that require taking measures are temperature and external forces as well as the weight of pipe itself, 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.

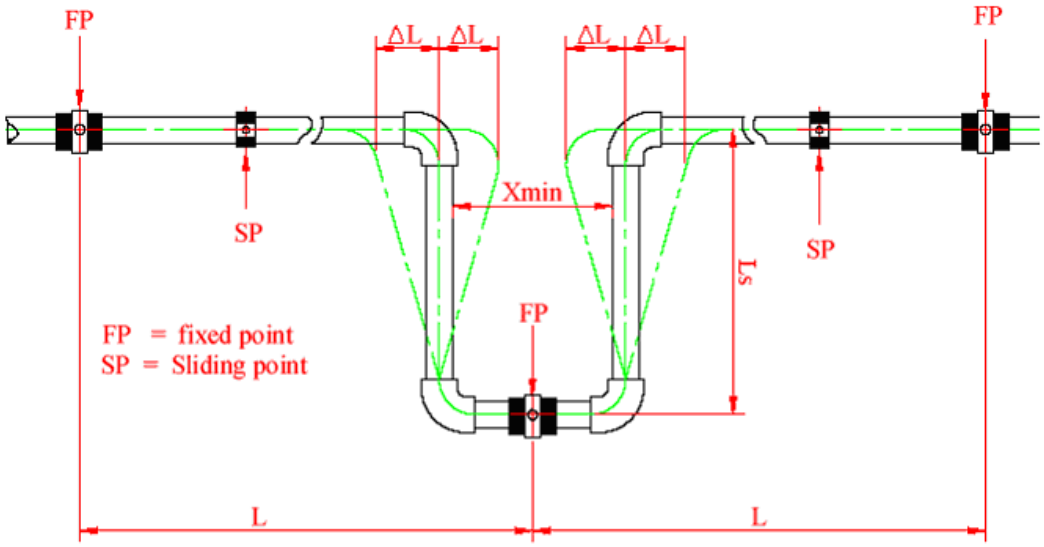
Amount of thermal tension in piping is determined upon temperature difference in the pipeline, pipe length and material characteristics. Amount of thermal tension of PPR pipe can be determined using the thermal expansion diagram below.

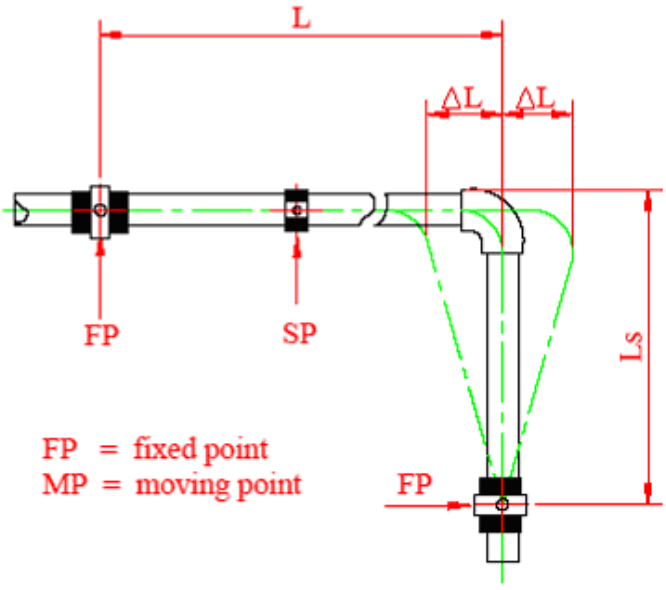


8.2 Removing Expansions From Installation

8.2.1 Omega and (U) Elements

They are designed for using within certain hot pipes. They are used to remove expansions from straight pipes. A twisted pair pipe with Ω shape has a longer life. Each pipe diameter requires using separate tables to design an omega component and calculate force and moments exerted on static points.





Calculation of elongation

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

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

Ls =Lenght of the bending part. mm
d= Outer dimater of the Kalde pipe. mm
ΔL = variation of length. mm

K = 15 (material based constant of Kalde pipe)
FP= Fixed Point
MP= Moving Point

Table 15 - Kalde length of the bending part

Pipe out diameter mm	Lineer Expansion ΔL (mm)								
	20	30	40	50	60	70	80	90	100
	Length of the bending part in (mt)								
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
λ= 0.15 mm/m-K
L= 12 meter
ΔT= 40 ºC

Required
ΔL= λ xΔT x L
ΔL= 0.15x 40x12 = 72mm

2.The calculation of the bending length
d= 63 mm
ΔL= 72 mm
K=15

Ls=Kx √dx ΔL
Ls=15x√ 63x72= 1010mm

Insulation of pipes

PPR 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 complied with.
b) İnsulation 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. Opencell and

fibrous insulating materials shall be provided with a vapour barrier bonded to the outher surface of the insulation.

Condensation can form on any insulating material if the cold water pipes are inadequately lagged; in the case of unsuitable material, 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.

İf 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 shall, 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 table A shall be used, assuming normal service conditions. insulation will not provide permanent protection of the water against warmth.

The specifications of table A 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).

Table A - Recommended minimum thickness of insulation for cold water pipes

Location of pipe	Insulation Thickness λ=0,040 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	4mm
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. Decree for energy saving (EnEV) regulates the thermal insulation of pipes and fittings in Germany.

Table B - Minimum Thickness of insulation warm water pipes

line	Type of pipe / fitting	Minimum Thickness of insulation refered to thermal conductivity of λ=0,035 W/mK
1	İnner diameter up to 22 mm	20 mm
2	İnner diameter more than 22 mm up to 35 mm	30 mm
3	İnner diameter more than 35 mm up to 100 mm	Same as inner diameter
4	İnner diameter more than 100 mm	100 mm

Insulation Thickness

Pipe Outer Diameter	Available Thickness Acc.to 2 HAVO λ=0,035 W/mK	Insulation Thickness in Kalde Pipes λ=0,035 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

Test conditions after mounting

Whilst still accessible, the finished pipework shall be filled with filtered water and completely vented.

Pressure testing shall be carried out in two stages, the first stage being sufficient for smaller sections of the system (e.g. for the test of supply pipes 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 pipe work shows any signs of leakage.

Points to pay attention to when installing PPR pipes and fittings

- Do not expose the pipes and fittings to the sun. Protect the pipes against hard and sharp objects. Do not use accidentally damaged pipes.
- Never use fire when heating the pipes. Bend the pipes with hot air.
- The pipes and the fittings to be installed should be clean.
- Cut the pipes perpendicularly with a proper scissor, do not use other sharp objects that can cause impurity in the pipes.
- Mark the welding length on the pipe before welding.
- When welding follow the instructions (temperature, heating time, etc.) in the manufacturer's catalogue.
- Do not turn neither the pipes nor the fittings during the welding.
- Do not polypropylene pipes and fittings where water may freeze. The expansion can break the pipe.
- With pipes with folio, clean the rests generated when the folio was sharpened.
- Do not use polypropylene pipes and fittings where water may freeze. The expansion can break the pipe.
- After shaving the aluminum layer make sure that there is no aluminum rests 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.
- The maximum angle you can turn the pipe and the fitting after welding is 5°.
- To prevent leaks in your installation use teflon tapes with threaded fittings.