



 **ALMATHERM**
PPR Pipes & Fittings



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1.1 General

Raw Material

ALMATHERM PP-R pipes and fittings are manufactured from high quality, and Polypropylene Random Co-polymer resins. Its physical chemical properties make ALMATHERM a versatile piping system in a wide range of applications in different industries.

Its advantages over other PP type 1 or 2 and other thermoplastic pipes in the potable water industries are its high impact strength and resistance to high temperatures.

1.2 Mechanical & Thermal Properties

Polypropylene Random Co-polymer (PP Type 3)

Property	Test Method	Unit	Value
Viscosity Number J	ISO 1628 T3	cm ³ /g	430
Melt Flow Rate	MFR 190/5 MFR 230/2.16 MFR 230/5	ISO 1133 Condition 18 ISO 1133 Condition 12	g/10 min g/10 min g/10 min
Density at 23°C	ISO 1183	g/cm ³	0.898
Crystalline Melting Temperature	DIN 53736 B2	°C	150-154
Tensile Stress At Yield	ISO 527	N/mm ²	23
Tensile Strength At Break	Speed 50 mm/min	N/mm ²	40
Elongation at Break	Test Specimen 1B	%	>50
Ball Indentation Hardness	ISO 2039 T1 (132N)	N/mm ²	43
Flexural Stress at 3.5% Outer Fiber Strain	DIN 53452	N/mm ²	20
Modulus of Elasticity, Tensile Test	ISO 527	N/mm ²	700
Shear Modulus	-10°C 0°C 10°C 20°C 30°C 40°C 50°C 60°C	ISO 537 Method A	N/mm ² N/mm ² N/mm ² N/mm ² N/mm ² N/mm ² N/mm ² N/mm ²
Mechanical Strength Properties Determined by Impact Strength at 0°C	DIN 8078		no failure
Impact Strength (Charpy)	RT 0°C -10°C	ISO 179/1eU	kJ/m ² kJ/m ² kJ/m ²
Notched Impact Strength (Charpy)	RT 0°C -20°C	ISO 179/1eA	kJ/m ² kJ/m ² kJ/m ²
Coefficient of Linear Thermal Expansion	VDE 0304 Part 1&4	K-1	1.5x10 ⁻⁴
Thermal Conductivity at 20°C	DIN 52612	W/mK	0.24
Specific Heat at 20°C	Adiabatic Calorimeter	kJ/kg K	2.0

ISO = International Organization for Standardization VDE=Verband Deutscher Elektrotechniker
The test specimens were made and the test methods selected in accordance with DIN 16774,Part 2.

1.3 Application Areas

Potable Water, Hot & Cold Water, Chemical, Irrigation

- Residential apartments, Condominiums, Public Housing
- Commercial shopping centres, Office Buildings
- Industrial factories dealing with chemicals, food processing, Semi Conductors
- Hospitals
- Schools-Laboratories and chemical sewerage
- Hotels & Resorts

1.4 Behaviour of ALMATHERM According to DIN 8078 under Long Term Hoop Stress

The service life of ALMATHERM depends on the internal hoop stress over time subject to the temperature.

Hoop stress is given as follows:

$$\delta = \frac{P \times (d-s)}{20 \times s}$$

where

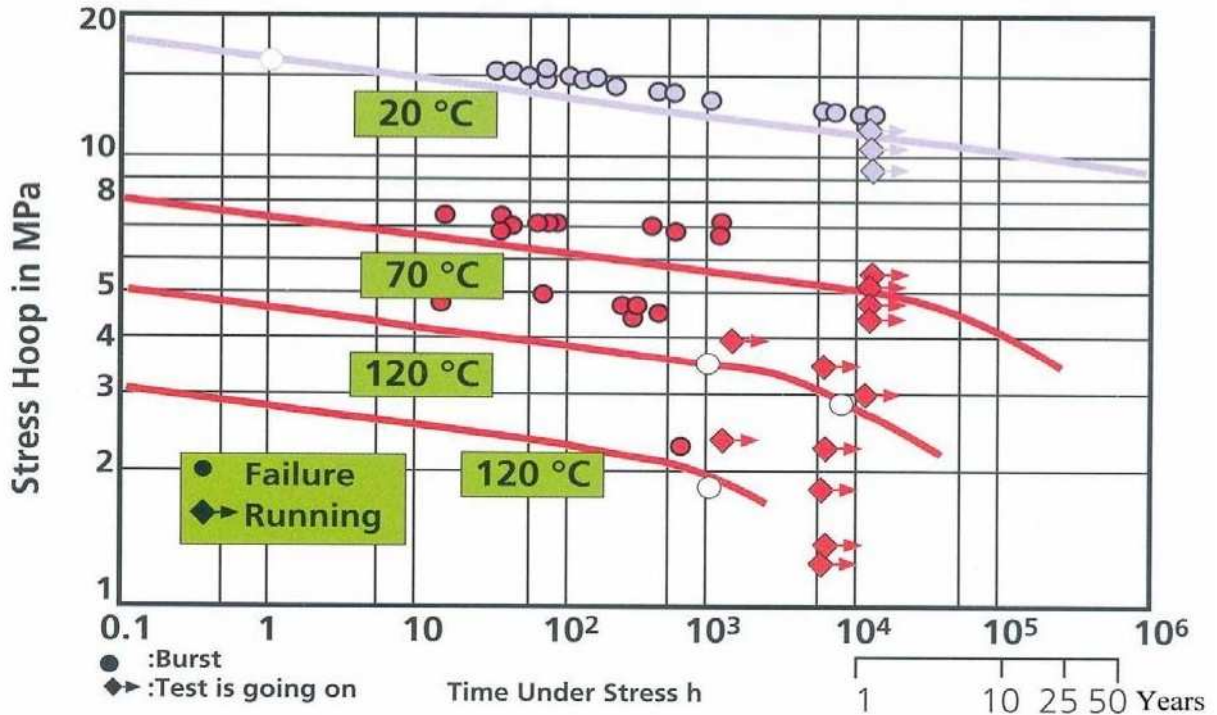
δ = hoop stress (N/mm² or MPa)

P = Internal pressure (Bar)

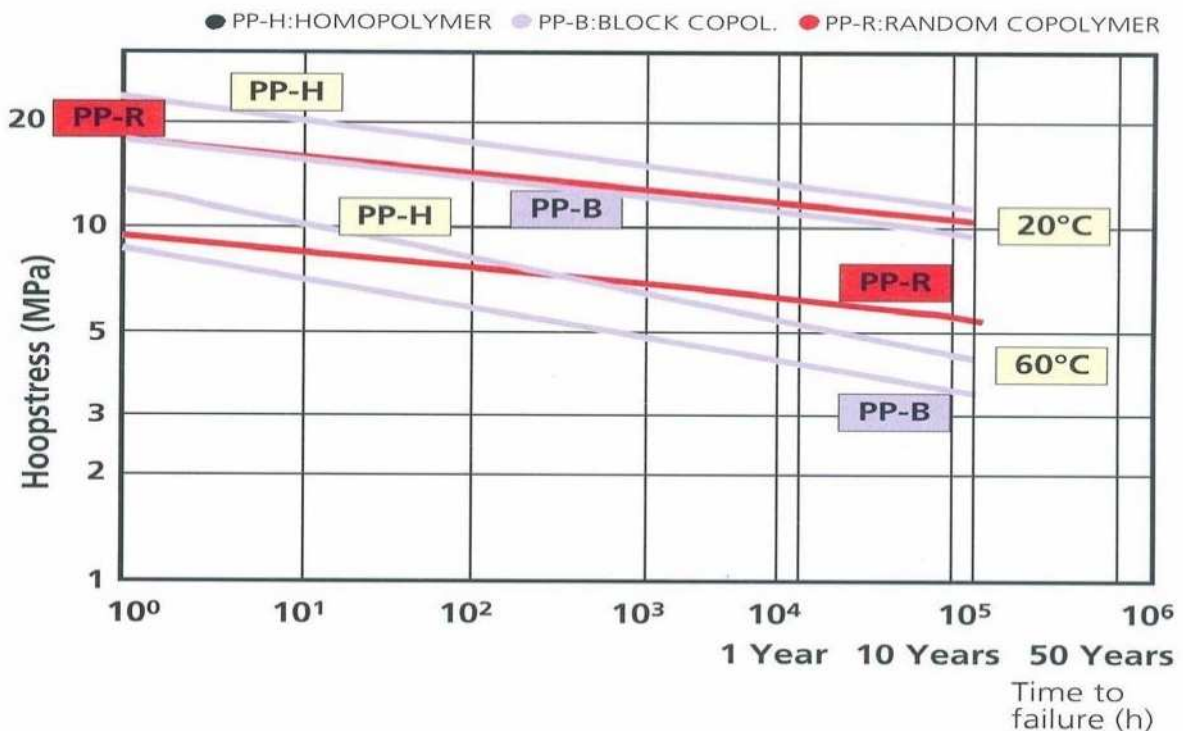
d = Outer diameters of pipe (mm)

s = Wall thickness of pipe (mm)

Break Strength for PP-R Pipes according to DIN 8078:



The Comparison of the Failure Time (h) and the Design Stress (MPa) for the PP pressure pipes at 20°C and 60°C:



Temperature	Service Life, Yrs	For water Installations, According to DIN 2000 Safety-Factor of 1.5		
		almatherm Pipe, ALM10	almatherm Pipe, ALM20	almatherm STABI Pipe
		Nominal Pressure in Bars		
		PN 10, Cold Water	PN 20, Hot&Cold Water	PN 20, Hot&Cold Water
		Permissible Working Pressure at Various Temperatures		
20°C	1	15.1	30.7	37.7
	5	14.0	28.0	35.0
	10	13.5	27.1	33.8
	25	13.2	26.4	33.0
	50	12.9	25.9	32.3
30°C	1	12.8	25.6	32.0
	5	12.0	24.0	30.0
	10	11.7	23.5	29.3
	25	11.3	22.7	28.3
	50	11.1	22.1	27.7
40°C	1	11.1	22.1	27.7
	5	10.4	20.8	26.0
	10	10.1	20.3	25.3
	25	9.7	19.5	24.3
	50	9.2	18.4	23.0
50°C	1	9.5	18.9	23.7
	5	8.9	17.9	22.3
	10	8.7	17.3	21.7
	25	8.0	16.0	20.0
	50	7.3	14.7	18.3
60°C	1	8.3	16.5	20.7
	5	7.6	15.2	19.0
	10	7.2	14.4	18.0
	25	6.1	12.3	15.3
	50	5.5	10.9	13.7
70°C	1	6.7	13.3	16.7
	5	6.0	12.0	15.0
	10	5.3	10.7	13.3
	25	4.5	9.1	11.3
	30	4.4	8.8	11.0
	50	4.3	8.5	10.7
80°C	1	8.7	12.3	13.7
	5	4.3	10.7	10.8
	10	3.9	9.3	9.8
	25	3.7	7.5	9.2
95°C	1	3.8	7.6	8.4
	5	2.9	5.7	6.3

1.5 Permissible Operating Pressure Projected Service Life

The table shown provides more detailed information with regards to the permissible pressure of various pipe pressures rating at various temperatures. These values derived from the hoop stress chart and formula.

Under normal working pressures and conditions, the average service life of ALMATHERM pipes is projected to be 50 years or more.

Example

A PN 10, cold water pipe, transporting water at a Temperature of 30°C can last for more than 50 years under normal conditions with an operating pressure of 11.1 Bars or 161 P.S.I

A PN 20, cold water pipe, transporting water at a Temperature of 70°C can last for more than 50 years under normal conditions with an operating pressure of 8.5 Bars or 123 P.S.I

SDR = Standard Dimension Ratio (Diameter/Wall Thickness Ratio)

SDR = d/s (s = Pipes series index from ISO 4065)

1.6 Hygiene & Health Concerns

ALMATHERM products are manufactured with health concerns in mind.

* Connection of pipes does not require additives such as cement solvent or fluxes or solder.

To ensure the safety of ALMATHERM pipes and fittings for usage relating to human contact and consumption with potable water, the following are strictly adhered to:

- DIN 1988 Part 2 D
Drinking Water Supply Systems Materials Components Appliances Design and Installation.
- KTW-Recommendations
Federal Health Office, Germany
- DVGW
Test Certificate based on KTW recommendations for Materials in Contact with Drinking Water

1.7 UV Resistance

ALMATHERM products are produced with UV stabilisers. However, like all other piping systems including metals, pipe work should not be left exposed under direct sunlight without insulating or protection from direct sunlight or UV radiation.

1.8 Fire Classification

ALMATHERM pipes and fittings comply and are classified under the requirements of the fire classification, B2 (Normally inflammable) according to DIN 4102. In case of a fire outbreak of temperature 800°C under ideal conditions with sufficient oxygen only carbon dioxide and water vapour are produced as the raw material of Polypropylene random co-polymer is a hydrocarbon chain. Toxic fumes or dioxin will not be emitted.

1.9 Sound Insulation

Compared to metallic pipes, an ALMATHERM product does not need further insulation to decrease the decibel level when water flows at relatively high speeds. The reason is simply that metals transmit noises quicker and louder, whereas, plastics dampen the noises. Hence whistling and noises resulting from water hammer effect are largely reduced to nonexistence.

1.10 Advantages of Using ALMATHERM

From the above properties of ALMATHERM system and application areas, compared to other conventional metal or plastic piping systems ALMATHERM has the following advantages which makes it THE SYSTEM OF THE FUTURE.

- Not Detrimental to Human Health
- Rust and Corrosion Free
- Rupture Free
- No Scaling
- High Resistance to Acids And Chlorides
- Noise Free At High Flow Rates
- High Pressure Tolerances And Rating
- Insulation Is Not Necessary For Interior Applications
- Light Weight
- Speed and Ease of Fusion Technology
- Extensive Savings in Time and Labour
- PN 20 System Bursting Pressure 106 Bars
- PN 10 System Bursting Pressure 33 Bars

3.1 Fusion Tool Operating Guidelines

- Socket Fusion Welding Tool
- Electro fusion Welding Kit
- Desktop Welding Machine

Please refer to the operating manual of various welding tools



3.2 Four-Step Fusion Process

Step 1

Cut pipe to the required length using a cutter, mark the welding depth on the pipe, ensure that the indicator light on the welding tool signals that the tool is hot enough (260°C) for welding.



Step 2

The tip of pipe to be welded is shaved by a special shaver to remove outside PP-R layer and aluminium foil. (applicable only to PN 25 Stable pipes with Aluminium foil)



Step 3

Push the pipe and fitting into the welding adaptors, applying even strength at both ends. Do not twist or turn the pipe and fitting while pushing. Wait until heating time is reached.



Step 4

When the welding heating time is reached, remove both pipe and fittings together, again without twisting or turning while pulling out of the welding adaptor. Almost immediately, push both pipe and fitting together until the depth is reached. It is possible to adjust the joints for more than 5 degrees during this time. Joint is now completed.

3.3 Welding Depth, Heating, Welding and Cooling Time

The table below provides the necessary information for a good welding joint for various ALMATHERM pipe and fitting size (applies to Stable pipes also).

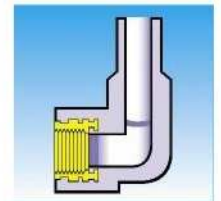
Pipe Diameter (mm)	Welding Depth (mm)	Heating Time (sec.)	Welding Time (sec.)	Cooling Time (min.)
20	14.0	5	4	2
25	15.0	7	4	2
32	16.5	8	6	4
40	18.0	12	6	4
50	20.0	18	6	4
63	24.0	24	8	6
75	26.0	30	8	8
90	29.0	40	8	8
110	32.5	50	10	8

Note: Heating time starts when both pipe and fitting are pushed into correct depth. Welding time begins when joints are connected. Cooling time is the time taken for the joint to be completely cured. Never reduce cooling time by pouring water or by other means

3.4 Homogeneous Joint

The result of socket fusion or electro fusion joint is a homogeneous joint. Such, is one of the biggest advantage of using ALMATHERM system.

- 100 % Leak-proof
- No maintenance
- Visual Inspection Possible
- Perfect for Concealed installation that needs corrosion free joining system.

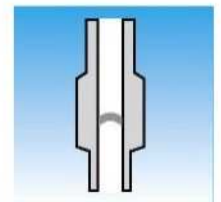


3.5 Pipe Repair

Pipe repair may be carried out by one of the following methods depending on the following:

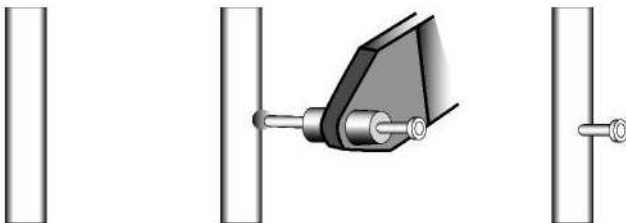
Pipe with nail holes (not concealed)

If the damaged part of the pipe is not concealed yet (before the pressure test is conducted), the recommended procedure is to cut out that part and replace it by a new part through normal welding of a socket.



Pipe with one nail hole (concealed)

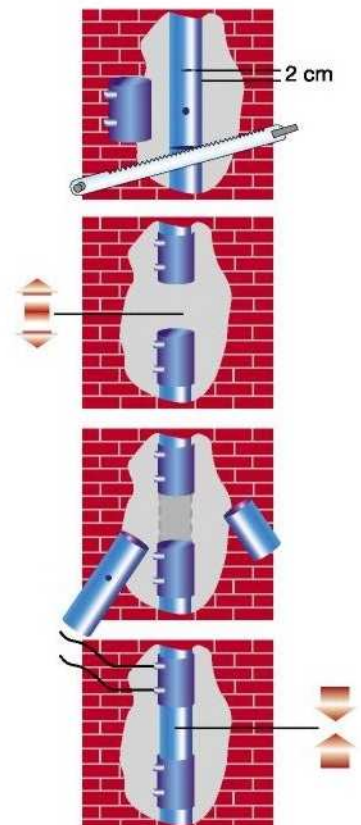
Using a Repair Patching Stick (see the pictures below)



Pipe concealed with two through holes (concealed)

Using Electro fusion Fittings (see the pictures on the right)

- Cut the damaged pipe perpendicularly, by a length equal to that of the corresponding electric socket plus 2 cm.
- Remove the section of the damaged pipe.
- Carefully clean the surfaces of the two pipe sections to be joined, using sandpaper and solvent liquid and wait until the parts of the pipe are perfectly dry.
- Remove the inner stops from 2 electric sockets.
- Fully insert the electric sockets into the pipe sections.
- Cut a pipe section having the same diameter and length as the damaged one.
- Fit in the place of the previous one. Make the 2 electric sockets slide towards the middle of the new pipe piece, by a section equal to half the length of the socket.
- Weld the socket using an electro fusion welding kit.



Installation

Installation for ALMATHERM piping system is not different from any other conventional piping systems, except for the superior leak proof fusion joining system.

However, there are some finer points and guidelines that need special attention when installing ALMATHERM.

4.1 Support Intervals

For visible pipe works that need aesthetics, proper support intervals are necessary. This will prevent unsightly but common “snaking” or sagging found in plastic pipe systems.

Pipe Support Intervals (mm) for ALMATHERM Pipes PN 10,PN16 & Pn20

Temperature Difference (°C)	ALMATHERM Pipe Diameter (mm)								
	20	25	32	40	50	63	75	90	110
20	600	750	900	1000	1200	1400	1500	1600	1800
30	600	750	900	1000	1200	1400	1500	1600	1800
40	600	700	800	900	1100	1300	1400	1500	1700
50	600	700	800	900	1100	1300	1400	1500	1700
60	550	650	750	850	1000	1150	1250	1400	1600
70	500	600	700	800	950	1050	1150	1250	1400

Pipe Support Intervals (mm) for ALMATHERM Pipes PN 20 (Stabi Pipes)

Temperature Difference (°C)	ALMATHERM Pipe Diameter (mm)								
	20	25	32	40	50	63	75	90	110
20	1200	1300	1500	1700	1900	2100	2200	2300	2500
30	1200	1300	1500	1700	1900	2100	2200	2300	2400
40	1100	1200	1400	1600	1800	2000	2100	2200	2300
50	1100	1200	1400	1600	1800	2000	2100	2200	2100
60	1000	1100	1300	1500	1700	1900	2000	2100	2000
70	900	1000	1200	1400	1600	1800	1900	2000	2000

4.2 Exposed Installation

Ducts

Cold Water Risers

There is no need for expansion joint as there will be no linear expansion for ALMATHERM cold water pipes. Vertical Support is necessary like all other piping system.

Ceiling Walls

During the planning and laying of visible pipes for hot water on ceiling or walls, besides taking into account the support intervals, special attention must be given to the linear expansion due to temperature. This will also prevent sagging and “snaking” of pipe lines. No consideration is necessary for Stabi pipes. Hence, to prevent unsightly installation, the following appropriate procedure must be observed:

4.3 Linear Expansion

For transportation of hot water, like all metal or plastic pipes, we have to deal with its linear expansion. This applies only to PN 20 pipes for hot water applications. No consideration is necessary for PN 20 Stabi pipes as the coefficient of linear expansion is $3.0 \times 10^{-5} (K^{-1})$

The coefficient of linear expansion for ALMATHERM PN 20 pipes is $15.0 \times 10^{-5} (K^{-1})$

Step 1. Determine the Linear Expansion.

By calculation formula:

$$\Delta l = \infty \times L \times \Delta t$$

Where:

Δl = linear expansion, mm

∞ = coeff. of linear expansion, constant for ALMATHERM pipes 0.15 mm/mK

L = pipe length, m

Δt = temperature difference between normal water temperature & desired operating hot water temperature, K

Example

Pipe diameter 25mm, length of 1.5m, normal cold water temperature is 25°C and hot water from water heater is set at 60°C.

$$\Delta l = \infty \times L \times \Delta t$$

$$= 0.15 \times 1.5 \times 35$$

Linear expansion is 7.88~8mm

By reading off table PN 20

Linear Expansion Table, Δt (K)

Pipe Length L(m)	Difference in Temperature, Δt (K)							
	10	20	30	40	50	60	70	80
0.1	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20
0.2	0.30	0.60	0.90	1.20	1.50	1.80	2.10	2.40
0.3	0.45	0.90	1.35	1.80	2.25	2.70	3.15	3.60
0.4	0.60	1.20	1.80	2.40	3.00	3.60	4.20	4.80
0.5	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00
0.6	0.90	1.80	2.70	3.60	4.50	5.40	6.30	7.20
0.7	1.05	2.10	3.15	4.20	5.25	6.30	7.35	8.40
0.8	1.20	2.40	3.60	4.80	6.00	7.20	8.40	9.60
0.9	1.35	2.70	4.05	5.40	6.75	8.10	9.45	10.80
1.0	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00
1.5	2.25	4.50	6.75	9.00	11.25	13.50	15.75	18.00
2.0	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00
2.5	3.75	7.50	11.25	15.00	18.75	22.50	26.25	30.00
3.0	4.50	9.00	13.50	18.00	22.50	27.00	31.50	36.00
3.5	5.25	10.50	15.75	21.00	26.25	31.50	36.75	42.00
4.0	6.00	12.00	18.00	24.00	30.00	36.00	42.00	48.00

Pipe Length L(m)	Difference in Temperature, Δt (K)							
	10	20	30	40	50	60	70	80
4.5	6.75	13.50	20.25	27.00	33.75	40.50	47.25	54.00
5.5	8.25	16.50	24.75	33.00	41.25	49.50	57.75	66.00
6.0	9.00	18.00	27.00	36.00	45.00	54.00	63.00	72.00
6.5	9.75	19.50	29.25	39.00	48.75	58.50	68.25	78.00
7.0	10.50	21.00	31.50	42.00	52.50	63.00	73.50	84.00
7.5	11.25	22.50	33.75	45.00	56.25	67.50	78.75	90.00
8.0	12.00	24.00	36.00	48.00	60.00	72.00	84.00	96.00

Linear Expansion Table, Δl(mm)

Note: For PN20, Stabi pipes, the above can be obtained by dividing by 5.

Step 2. Once the Linear Expansion is established, compensation for this expansion can be made by either an **Expansion Elbow** or **Expansion Loop**.

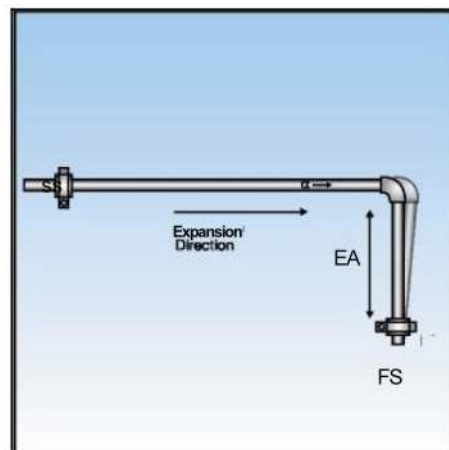
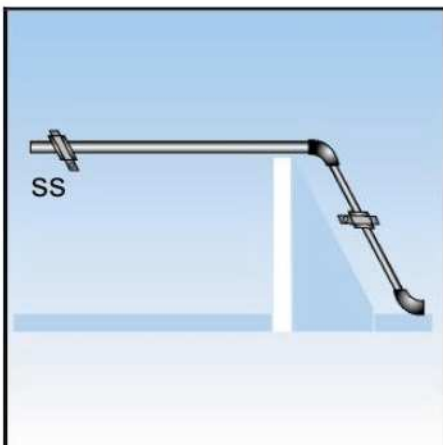
The expansion Elbow method uses the principle of directional change (elbow joint), to compensate for linear expansion. In cases where compensation with direction change is not possible, i.e. a straight pipe length passing through pipe sleeves and in between 2 beams, an Expansion Loop is then used.

Expansion Elbow

FS= Fixed Support

SS= Sliding Support

EA=Elbow Arm



Formula to Determine the length of Elbow Arm EA:

$$EA = k \times (d \times \Delta l)^{1/2}$$

where k = constant, 15
 Δl = linear expansion
 d = pipe diameter

Example

Pipe of diameter 25 mm length of 1.5m normal cold water temperature is 25°C and hot water from water heater is set at 60°C.

$$\begin{aligned} EA &= k \times (d \times \Delta)^{1/2} \\ &= 15 \times (25 \times 8)^{1/2} \\ &= 212.13 \sim 212 \text{ mm} \end{aligned}$$

Note:

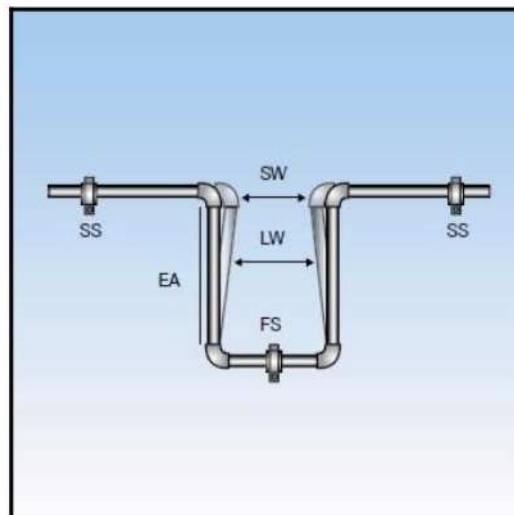
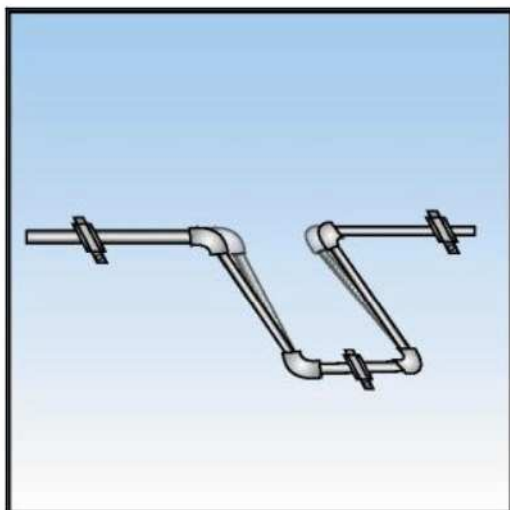
In an elbow expansion joint the FS must be located at the EA section and the EA perpendicular to direction of expansion

Expansion Loop.

FS = Fixed Support

SS = Sliding Support

EA = Elbow Arm



Formula to determine the Loop Width LW

$$LW = (2 \times \Delta l) + SW$$

Where SW = Safety Width, assigned as 150 mm

Δl = Linear expansion

Note: In an expansion loop, the FS is located at the pipe section of LW. All other pipe supports must be SS. Calculation of EA is the same as above Expansion elbow example.

Example:

Pipe of diameter 25 mm Length of 1.5 m normal cold water temperature is 25°C and hot water from water heater is set at 60°C

$$LW = (2 \times \Delta l) + SW$$

$$= (2 \times 8) + 150$$

The loop width is 166 mm

4.4 Concealed Installation

In concealed installation, for both cold and hot water pipe lines, it is not necessary to take into account linear expansion. Pipes can be encased or embedded in walls, concrete and plaster as with other metal pipes.

The expansion of pipe due to temperature will not damage the wall plastering as the linear expansion is prevented by the compressive strain and tensile stress of concrete and plaster, it will be absorbed through the material itself.

4.5 Insulation Hot Water System

Normally for hot water systems, it may not be necessary to insulate ALMATHERM pipes in tropical countries for interior or concealed installation. This is due to the low thermal conductivity property of ALMATHERM (0.24 W/mK) Heat loss will be minimum. However, for application where central boiler is used for distribution of hot water and the circulation of hot water being continuous, it is necessary to insulate distribution lines to prevent excessive loss heat and energy wastage. Because of the low thermal conductivity of ALMATHERM Pipes, insulation thickness is greatly reduced. Following is the recommended insulation thickness.

Insulation Thickness for Exposed Hot Water Pipes.

THERMAL CONDUCTIVITY (W/mk)of INSULIAN MATERIAL	0.030	0.035
DIMENSION (mm)	Recommended Minimum Insulation Thickness	
20	6 mm or 1/4"	10 mm or 3/8"
25	6 mm or 1/4"	10 mm or 3/8"
32	10 mm or 3/8"	13 mm or 1/2"
40	10 mm or 3/8"	13 mm or 1/2"
50	10 mm or 3/8"	13 mm or 1/2"
63	13 mm or 1/2"	20 mm or 1/2"
75	20 mm or 1/2"	20 mm or 1/2"
90	20 mm or 1/2"	25 mm or 3/4"
110	25 mm or 3/4"	32 mm or 1"

Chilled Water System

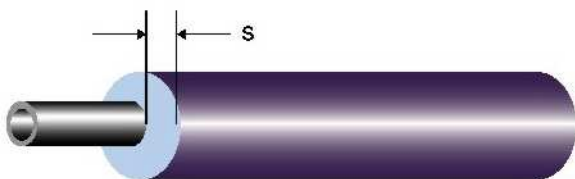
For chilled water of temperature less than 10°C, due to condensation that may take place, insulation is necessary but reduced considerably in thickness as compared to metal pipes. Heat loss for hot water pipe is reduced to a minimum.

Table shows the insulation thickness for ALMATHERM pipes in cold countries and chilled water systems so as prevent condensation.

S = Insulation Thickness, mm (0.038 W/mK Conductivity)

Te = Outside surrounding temperature, °C

Ti = Internal water temperature °C



4.6 Pressure Test

After installing ALMATHERM piping system, it is necessary to go through a pressure test. Unlike metal pipes, ALMATHERM like all other plastic pipe systems, has to follow different pressure test procedure owing to their mechanical properties of expansion when subject to pressure, temperature difference and coefficient of expansion.

A change in temperature of 10 K corresponds to a pressure change of 0.5-1.0 bar. Thus, the test medium shall as far as possible, be kept at a constant temperature throughout the test.

Test Procedure (According to DIN 1988 Part 2 or BS 6700: 1977)

Preparation for Filling Testing the System

For pressure testing, pressure gauges that allow reading of changes in pressure of 0.1 bar shall be used, fitted at the lowest possible point in the system.

Pressure testing for leakages must be conducted while pipe works are still accessible and before concealing or plastering.

Finished pipe work must be completely fitted with filtered water and vented.

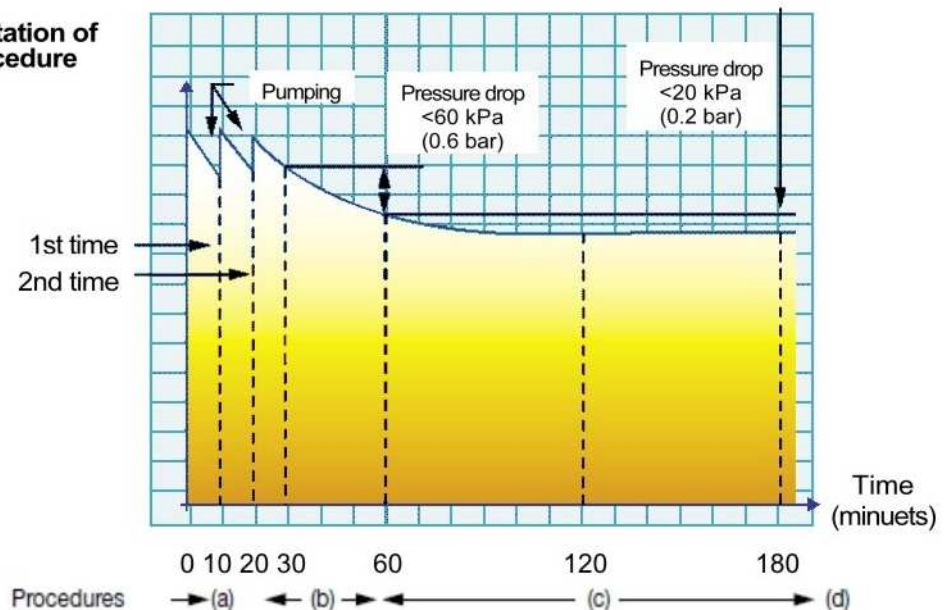
Procedure

After pipe work is filled with water and completely vented to release air locks in the system, testing can begin:

1. Test pressure = (permissible working pressure + 5 bars) shall be produced 2 times within 30 minutes at 10 minute intervals.
Note: Restore by hand pump to required test pressure after the 10 minute interval if the pressure drops. If leakage is detected, rectify the leakage area and repeat procedure.
2. If no leakage is detected, for the next 30 minutes, check if the pressure has dropped by more than 0.6 bars and if there is any visible signs of leakage.
Note: If leakage is detected, rectify the leakage area and repeat procedure.
If pressure drops by more than 0.6 bars within this period, leakage must have occurred. Detect and rectify.
3. If pressure drop is within 0.6 bars and no leakage detected, continue the test without restoring the required pressure for the next 60 minutes. During this time, it shall be checked if the pressure drop is more than 0.2 bars and no leakage is detected.
Note: If leakage is detected, rectify the leakage area and repeat procedure.
If pressure drops by more than 0.2 bars within this period, leakage must have occurred. Detect, rectify and repeat procedure.
4. Pressure test is successful when all the above are met and the readings should be recorded.

Graphical Representation of Pressure Test Procedure

Graphical Representation of Pressure Test Procedure



Test Record

	Pressure Reading	Results	Test Criteria	Remarks
Test Procedure (a)	Bar/P.S.I	Pass/Fail		
Pump to required test pressure check for leakage			Check for leakage	
1 st 10 min. record reading restore to test pressure			Check for leakage	
2 nd 10 min. record reading restore to test pressure			Check for leakage	
Test Procedure (b)				
Next 30 min. record reading do not restore to test pressure			Pressure drop <0.6 Bars and no leakage	
Test Procedure (c)				
Next 120 min.record reading			Pressure drop <0.2 Bars and no leakage	

4.7 Precautionary Measures during Installation

1. To reduce from a large diameter pipe to a smaller diameter pipe, a socket must be used in conjunction with a reducer. For example, to reduce from pipe diameter of 50 mm to 25 mm, a socket 50 mm must first be attached to the 50 mm pipe followed by a reducer 50/25 mm and followed by the 25 mm pipe.
2. When using ALMATHERM fittings with metal threaded parts, white Teflon sealing tapes must be applied adequately to prevent leakage from threads.
3. Over tightening of fixtures to ALMATHERM fittings with metal parts may cause damages and leakage problems. Care must be taken to prevent over tightening.
4. During fusion welding:
 - Fusion parts must be free from sand and particles.
 - Welding time and depths must be observed.
 - Do not twist and turn pipes and fittings while inserting and detaching from welding machine.
5. Metal plugs must be used during pressure tests.
6. Pressure test must be conducted BEFORE concealing pipe works.

5.1 Product Specification

Materials:

POLYPROPYLENE RANDOM CO-POLYMER (PP-R TYPE 3); BE P9421, OPAK

Materials for the pipe and fitting for cold and hot water supply shall be Polypropylene Random Co-polymer (PP-R).

Pipes and fittings are supplied in the colours Gray and Green (applicable for most items).

Type 3 which shall comply with the following standards.

Standards:

DIN 8077 BS 4991
DIN 8078 BS 6920 : Part 2 & 3
DIN 16962 Part 1 to 12

To interface with other fittings, ALMATHERM PP-R threaded male or female with brass inserts complying with BS 6920 for use on drinking water. These fittings are injection moulded and threads are of BS parallel and plated with nickel and chrome. All fittings shall be in accordance with the description in the prescribed standards.

Description and Dimension of Pipes:

APPLICATION : HOT AND COLD WATER
DESCRIPTION : PN 20 PIPE
PRESSURE RATING : 20 BAR or 290 p.s.i.

APPLICATION : COLD WATER
DESCRIPTION : PN 10 PIPE
PRESSURE RATING : 10 BAR or 145 p.s.i.

Dimension OD (mm)	Thickness (mm)
20 mm	3.4
25 mm	4.2
32 mm	5.4
40 mm	6.7
50 mm	8.4
63 mm	10.5
75 mm	12.5
90 mm	15.0
110 mm	18.4

Dimension OD (mm)	Thickness (mm)
20 mm	1.9
25 mm	2.3
32 mm	3.0
40 mm	3.7
50 mm	4.6
63 mm	5.8
75 mm	6.9
90 mm	8.2
110 mm	10.0

Fittings:

All ALMATHERM pipes must be used in conjunction with ALMATHERM PP-R fittings and ALMATHERM PP-R fittings with brass inserts.

Thermal Conductivity:

The thermal conductivity of the pipes and fittings shall not exceed 0.24 W/mK at 20 °C for water.

Installation:

ALMATHERM PP-R pipes and fittings must be installed in accordance with the instructions given by the manufacturer's recommendations and that as stated in:

DN 16928: Pipes of thermoplastic, pipe fittings, elements of pipes laying
DVS 2207, PART 11 -Welding of thermoplastic materials, PP pipes and fittings
DVS 2208, PART 1 - Machines and equipment for welding of PP

Pressure Test and Requirements:

Before commissioning of pipe works, procedures and requirements specified by relevant local water authorities must be adhered to. For Pressure test DIN 1988 Part 2 or BS 6700 is used.

5.2 Other Pipe Equivalent

ALMATHERM PIPES O.D.(mm)	Equivalence (inches)	COPPER TUBES NOM. DIA (mm)
20	1/2	15
25	3/4	22
32	1	28
40	1 1/4	35
50	1 1/2	42
63	2	54
75	2 1/2	67
90	3	76
110	4	108

5.3 Pipe Sizing

During the design stage, consideration for pipe sizes to be used is determined by the type of pipe used, flow rate required, pressure loss due to the piping system for both pipe and fitting. The following information will assist the engineer to optimise the usage of ALMATHERM system.

Product range

The ALMATHERM pipe system is constantly being extended and updated to meet the requirements of the industry.

Please refer to current ALMATHERM price list for the complete product range.

The abbreviated references, e.g.
PN20 pipe or
Elbow 90°, simplify the administration.

Please refer to the ALMATHERM article numbers when you place your order.

On request and subject to minimum quantities and capacities we can manufacture special types of fittings.

ALMATHERM PIPES PN10



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x2,0	103020	0,12	0,44	100
25x2,3	103025	0,16	0,73	60
32x2,9	103032	0,27	1,10	40
40x3,7	103040	0,41	1,83	24
50x4,6	103050	0,64	2,75	16
63x5,8	103063	1,00	4,07	12
75x6,8	103075	1,40	5,50	8
90x8,2	103090	2,00	9,17	4
110x10	103110	3,01	10,31	4

ALMATHERM PIPES PN16



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16x2,2	102016	0,10	0,28	160
20x2,8	102020	0,15	0,44	100
25x3,5	102025	0,23	0,73	60
32x4,4	102032	0,38	1,10	40
40x5,5	102040	0,58	1,83	24
50x6,9	102050	0,90	2,75	16
63x8,6	102063	1,40	4,07	12
75x10,3	102075	2,00	5,50	8
90x12,3	102090	2,90	9,17	4
110x15,1	102110	4,30	10,31	4

ALMATHERM PIPES PN20



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16x2,7	101016	0,11	0,28	160
20x3,4	101020	0,17	0,44	100
25x4,2	101025	0,27	0,73	60
32x5,4	101032	0,43	1,10	40
40x6,7	101040	0,67	1,83	24
50x8,3	101050	1,10	2,75	16
63x10,5	101063	1,70	4,07	12
75x12,5	101075	2,30	5,50	8
90x15	101090	3,40	9,17	4
110x18,3	101110	5,04	10,31	4

ALMATHERM STABI PIPES PN20



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16x2,5	106016	0,17	0,28	160
20x3	106020	0,21	0,44	100
25x3,7	106025	0,31	0,73	60
32x4,7	106032	0,47	1,10	40
40x5,8	106040	0,69	1,83	24
50x7,1	106050	1,04	2,75	16
63x8,9	106063	1,57	4,07	12
75x10,6	106075	2,25	5,50	8
90x12,7	106090	3,37	9,17	4
110x15,4	106110	5,00	10,31	4

ALMATHERM GLASS FIBER PIPES PN20



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x3,4	107020	0,19	0,44	100
25x4,2	107025	0,28	0,73	60
32x5,4	107032	0,45	1,10	40
40x6,7	107040	0,69	1,83	24
50x8,3	107050	1,07	2,75	16
63x10,5	107063	1,74	4,07	12
75x12,5	107075	2,41	5,50	8
90x15	107090	3,47	9,17	4
110x18,3	107110	5,17	10,31	4

ALMATHERM PIPES IN ROLLS PN10



Size mmxm	Article Number	Weight kg/m	Volume l/m	Package Unit
16x2x200m	105016	0,09	2,00	200
20x2x200m	105020	0,11	3,14	200
20x2,8x200m	104021	0,15	3,14	200
20x3,4x200m	104022	0,17	3,14	200

ALMATHERM

COUPLING / SOCKET



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16	201016	0,01	0,03	400
20	201020	0,01	0,05	200
25	201025	0,03	0,10	100
32	201032	0,04	0,19	50
40	201040	0,06	0,24	50
50	201050	0,11	0,60	20
63	201063	0,19	0,87	10
75	201075	0,27	1,50	5
90	201090	0,42	1,60	5
110	201110	0,67	1,80	5

ALMATHERM

REDUCER MALE/FEMALE JOINT



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x16	210020016	0,01	0,02	500
25x16	210025016	0,01	0,03	500
25x20	210025020	0,01	0,05	300
32x20	210032020	0,03	0,13	150
32x25	210032025	0,03	0,12	200
40x20	210040020	0,02	0,13	150
40x25	210040025	0,03	0,16	150
40x32	210040032	0,04	0,24	100
50x32	210050032	0,05	0,27	50
50x40	210050040	0,05	0,27	30
63x32	210063032	0,07	0,32	50
63x40	210063040	0,08	0,40	30
63x50	210063050	0,12	0,60	20
75x50	210075050	0,12	0,05	20
75x63	210075063	0,21	1,37	10
90x63	210090063	0,23	0,80	10
90x75	210090075	0,27	0,80	5
110x75	210110075	0,30	0,13	1
110x90	210110090	0,50	0,95	5

ALMATHERM REDUCER



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x16	209020016	0,01	0,48	500
25x20	209025020	0,02	0,11	300
32x20	209032020	0,02	0,13	150
32x25	209032025	0,03	0,13	150
40x32	210040032	0,07	0,32	50
50x40	209050040	0,09	0,60	20
63x50	209063050	0,17	0,80	20

ALMATHERM CROSS



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20	235020	0,03	0,16	100
25	235025	0,04	0,24	100
32	235032	0,08	0,04	50

ALMATHERM CROSS OVER



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16	233016	0,03	0,24	50
20	233020	0,07	0,32	50
25	233025	0,09	0,64	25
32	233032	0,16	0,80	20
40	233040	0,33	1,60	10

ALMATHERM EXPANSION LOOP



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16	232016	0,07	1,60	10
20	232020	0,11	1,60	5
25	232025	0,21	3,20	5
32	232032	0,43	8,00	2
40	232040	0,67	8,00	2

ALMATHERM

ELBOW 90°



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16	202016	0,01	0,03	400
20	202020	0,02	0,07	200
25	202025	0,03	0,12	100
32	202032	0,06	0,24	50
40	202040	0,11	0,53	30
50	202050	0,19	0,96	20
63	202063	0,37	1,92	10
75	202075	0,52	3,20	5
90	202090	0,79	4,80	5
110	202110	1,38	5,50	4

ALMATHERM

ELBOW 90° MALE / FEMALE



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20	204020	0,01	0,05	300
25	204025	0,03	0,14	100
32	204032	0,06	0,24	100

ALMATHERM

ELBOW 45°



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16	203016	0,01	0,04	400
20	203020	0,01	0,07	200
25	203025	0,03	0,12	100
32	203032	0,05	0,24	50
40	203040	0,09	0,53	30
50	203050	0,15	0,96	20
63	203063	0,30	1,92	10
75	203075	0,45	0,24	6
90	203090	0,73	0,32	6

ALMATHERM

TEE-PIECE



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16	208016	0,02	0,08	300
20	208020	0,03	0,12	100
25	208025	0,04	0,24	100
32	208032	0,08	0,40	30
40	208040	0,13	0,96	20
50	208050	0,25	1,60	10
63	208063	0,46	2,74	5
75	208075	0,62	3,20	5
90	208090	0,99	4,80	5
110	208110	1,78	5,50	2

ALMATHERM

TEE-PIECE REDUCED



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x16x20	212020016	0,03	0,10	200
20x25x20	212025025	0,03	0,00	100
25x20x20	212025021	0,05	0,24	100
25x20x25	212025020	0,04	0,24	100
32x20x32	212032020	0,07	0,38	50
32x25x32	212032025	0,07	0,38	50
40x20x40	212040020	0,09	0,46	30
40x25x40	212040025	0,13	0,64	30
40x32x40	212040032	0,13	0,64	30
50x25x50	212050025	0,18	0,96	20
50x32x50	212050032	0,19	0,96	20
50x40x50	212050040	0,21	0,96	20
63x32x63	212063032	0,35	1,92	10
63x40x63	212063040	0,34	1,92	10
63x50x63	212063050	0,39	1,92	10
90x63x90	212090063	0,77	4,80	5
90x75x90	212090075	0,85	4,80	5

ALMATHERM END CAP



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16	229016	0,01	0,02	200
20	229020	0,01	0,04	400
25	229025	0,01	0,05	300
32	229032	0,03	0,12	100
40	229040	0,05	0,24	50
50	229050	0,09	0,30	20
63	229063	0,15	0,40	10

ALMATHERM WELDING SADDLE



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
63x32	238063032	0,04	0,01	50
75x32	238075032	0,04	0,01	50
90x32	238090032	0,04	0,01	50
110x32	238110032	0,04	0,01	50

ALMATHERM FLANGE SOCKET



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
40	230040	0,07	0,35	20
50	230050	0,10	0,55	20
63	230063	0,15	0,67	10
75	230075	0,26	1,20	10
90	230090	0,37	1,35	5
110	230110	0,62	2,45	5

ALMATHERM SLEEVE FOR FLANGE SOCKET



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
40	231040	1,42	0,35	1
50	231050	1,82	0,38	1
63	231063	2,31	0,45	1
75	231075	2,48	0,55	1
90	231090	3,25	0,80	1
110	231110	3,60	0,97	1

ALMATHERM END STOP LONG



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
1/2"	91402	0,02	0,10	100

ALMATHERM END STOP



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
1/2"	91403	0,02	0,10	100

ALMATHERM ELBOW MALE THREADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x1/2"	216020	0,09	0,16	50
20x3/4"	216021	0,14	0,32	30
25x1/2"	216026	0,15	0,32	30
25x3/4"	216025	0,15	0,32	30
32x1"	216032	0,22	0,60	20

ALMATHERM ELBOW FEMALE THREADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x1/2"	218020	0,06	0,16	50
20x3/4"	218021	0,13	0,32	30
25x1/2"	218026	0,10	0,25	30
25x3/4"	218025	0,13	0,32	30
32x1"	218032	0,20	0,60	20

ALMATHERM WALL ELBOW FEMALE THREADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16x1/2"	219016	0,07	0,21	50
20x1/2"	219020	0,07	0,21	50
25x3/4"	219025	0,13	0,36	30
25x1/2"	219026	0,13	0,36	10

ALMATHERM ADAPTOR MALE THREADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16x1/2"	215016	0,09	0,10	100
20x1/2"	215020	0,08	0,10	100
20x3/4"	215021	0,14	0,16	50
25x1/2"	215026	0,10	0,15	50
25x3/4"	215025	0,14	0,16	50
32x1"	215032	0,19	0,27	30
40x5/4"	215040	0,31	0,46	30
50x6/4"	215050	0,34	0,69	20
63x2"	215063	0,73	1,37	5
75x2,5"	215075	1,11	2,74	5
90x3"	215090	1,64	3,20	5

ALMATHERM ADAPTOR FEMALE THREADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16x1/2"	217016	0,06	0,10	100
20x1/2"	217020	0,06	0,10	100
20x3/4"	217021	0,11	0,16	50
25x1/2"	217026	0,06	0,16	50
25x3/4"	217025	0,10	0,16	50
32x1"	217032	0,18	0,27	30
40x5/4"	217040	0,31	0,46	30
50x6/4"	217050	0,37	0,69	20
63x2"	217063	0,66	1,37	5
20x3/4"	217021	0,11	0,16	50

ALMATHERM ADAPTOR THREADED NUT



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16x1/2"	223016	0,05	0,05	50
16x3/4"	223017	0,08	0,06	50
20x1/2"	223020	0,05	0,05	50
20x3/4"	223021	0,08	0,06	50
20x1"	223022	0,24	0,10	50
25x1"	223025	0,26	0,10	50
32x5/4"	223032	0,35	0,20	30

ALMATHERM TEE MALE THERADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x1/2"	222520	0,09	0,19	50
25x1/2"	222526	0,10	0,24	30
25x3/4"	222525	0,17	0,32	30

ALMATHERM TEE FEMALE THERADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x1/2"	222020	0,07	0,19	50
25x1/2"	222026	0,08	0,24	30
25x3/4"	222025	0,13	0,32	50
32x1"	222032	0,22	0,60	20

ALMATHERM TEE THERADED NUT



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x3/4"	228021	0,07	0,24	5
25x3/4"	228025	0,08	0,32	5
32x3/4"	228033	0,11	0,38	5
32x1"	228032	0,13	0,38	5
20x3/4"	228021	0,07	0,24	5

ALMATHERM ELBOW THERADED NUT



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x1/2"	227020	0,04	0,02	100
20x3/4"	227021	0,06	0,02	100
25x3/4"	227025	0,07	0,10	10

ALMATHERM SCREW UNION MALE THREADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x1/2"	237020	0,11	0,09	125
25x3/4"	237025	0,19	0,17	65
32x1"	237032	0,25	0,22	50
40x5/4"	237040	0,36	0,44	25
50x6/4"	237050	0,59	0,55	20
63x2"	237063	1,03	1,37	8
20x1/2"	237020	0,11	0,09	125

ALMATHERM SCREW UNION FEMALE THREADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x1/2"	236020	0,10	0,07	150
25x3/4"	236025	0,16	0,15	75
32x1"	236032	0,19	0,22	50
40x5/4"	236040	0,32	0,36	30
50x6/4"	236050	0,48	0,55	20
63x2"	236063	0,82	1,37	8
20x1/2"	236020	0,10	0,07	150

ALMATHERM WALL ELBOW FEMALE THREADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x1/2"	220020	0,08	0,21	50
25x1/2"	220026	0,08	0,21	10 / 50

ALMATHERM WALL ELBOW DOUBLE SET FEMALE THREADING



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x1/2"	221020	0,20	1,37	10
25x1/2"	221025	0,27	1,45	10

ALMATHERM

BALL VALVE



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
16	301016	0,09	0,17	20
20	301020	0,12	0,34	20
25	301025	0,21	0,69	20
32	301032	0,36	0,69	10
40	301040	0,36	1,60	10
50	301050	0,65	1,60	5
63	301063	1,12	4,80	5
75	301075	1,83	4,80	5

ALMATHERM

STRAIGHT VALVE



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20	304020	0,15	0,60	20
25	304025	0,21	0,60	20
32	304032	0,32	0,96	10
40	304040	0,40	1,07	10
50	304050	0,77	1,92	10
63	304063	1,29	2,10	1

ALMATHERM

BACK CHOKE



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20	308020	0,19	0,25	1
25	308025	0,19	0,25	1
32	308032	0,19	0,25	1

ALMATHERM STOP COCK WITH HANDLE



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20	322020	0,21	0,25	1
25	322025	0,20	0,25	1

ALMATHERM STOP COCK WITH CAP



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20	313020	0,17	0,60	20
25	313025	0,25	0,80	20

ALMATHERM BALL VALVE WITH UNION CONNECTION



Size mm	Article Number	Weight kg/m	Volume l/m	Package Unit
20x1/2"	375020	0,17	0,60	10
25x3/4"	375025	0,25	0,70	10

ALMATHERM

WELDING SET



Pipe welding machine 220 Volt, 1500 Watt Includes case, floor rest, measuring tools, gloves and fixing tools.
Heating elements: d20 - 63 mm
Pipe cutters d16 - 40 mm.

ALMATHERM

WELDING MACHINE



Pipe welding machine 220 Volt, 1000 Watt
Includes case,
Heating elements: d20 - 90 or d25 - 125
Pipe cutters d20 - 75 or d50 - 140
Special gloves and pipe rests
Packaged in transport crate.
Type A: d20 - 90
Type B: d25 - 125

ALMATHERM

OVERHAD WELDING MACHINE



For making polyfusion joints in areas that cannot be accessed with the table welding machine.
Includes hand welding machine (1200 Watt),
d50 - 110 welding tools, d16 - 75 and d50 - 140 pipe cutters, timer and special gloves.
Packaged in transport crate.
Weight of machine: approx. 12 kilos

ALMATHERM

BUTT WELDING MACHINE



Hydraulic butt welding machine 220 Volt, 1000 Watt
Includes plane cutter, welding plate,
d40 - 160 welding tools.
Packaged in transport crate.

ALMATHERM

WELDING TOOL



Heating elements for polyfusion welding,
In the sizes: d20 - 110 welding tools.

ALMATHERM

PIPE CUTTER



Cutter for pipe sizes: d16 - 40

ALMATHERM

WHEEL PIPE CUTTER



Wheel Cutter

Tape A: for pipe sizes: d16 – 75

Type B: for pipe sizes: d50 - 140

ALMATHERM


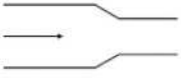


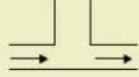
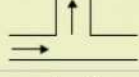
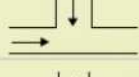



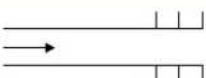
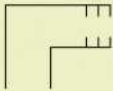
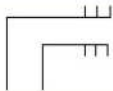
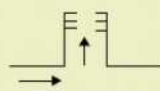

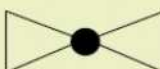
ALU PEELER



For peeling ALMATHERM ALU composite pipes before
welding.

For pipe sizes: d20-25, d32-40, d50, d63mm

ALMATHERM Fittings
Coefficient of Loss; ζ

Fittings	Symbol	Consideration	Coeff. of Loss,
Socket			0.25
Reducer		Reduce by 1 size Reduce by 2 size Reduce by 3 size	0.40 0.50 0.60
90° Elbow			1.20
45° Elbow			0.50
T Part		Passage	0.25
		Separation	1.20
		Conjunction	0.80
		Counter Separation	1.80
		Counter Conjunction	3.00
Unequal T	Sum of T part and Reducer values		
Adaptor Female			0.50
Adaptor Male			0.70
Elbow Female			1.40
Elbow Male			1.60
T Part Female		20 x 3/4 x 20	1.40
		20 x 1/2 x 20	1.60
		25 x 3/4 x 25	1.60
		25 x 1/2 x 25	1.80
T Part Male		20 x 1/2 x 20	1.80
Valve		20 mm	9.50
		25 mm	8.50
		32 mm	7.60

6.1 General

ALMATHERM pipes and fittings has high resistance to various acids and chlorides due to the chemical properties of polypropylene. As such, ALMATHERM is highly suitable for transportation of hard or soft water or potable water with consumable amount of chlorine, fluids, DI water or industrial chemicals.

6.2 Chemical Resistance Chart

The following chart provides a general chemical resistance of PP-R pipes and fittings.

- + = resistant
- ⊕ = less resistant
- 0 = limited chemical resistance
- θ = poor resistance
- = not resistant
- aq = aqueous solution
- sat. = saturated solution at room temperature
- c = colour
- Δ = products of HÜLS AG.
- = products of VEBA OEL AG
- Ghc = products of GAF HÜLS – CHEMIE GmbH

Conc. %	ALMATHERM P(°C)		
	20	60	100

Conc. %	ALMATHERM P(°C)		
	20	60	100

A					
Acetic acid (Glacial acetic acid)	Δ	100	+	0	-
Acetic acid aq (see also vinegar)	Δ	50 10	+	+	+
Acetic anhydride		100	+		
Acetone*		100	+	0	
Alcoholic iodine			+	0	
Alum		sat.	+	+	
Alums aq.		any	+	+	
Aluminium salts aq.		any	+	+	+
Ammonia gaseous		100	+	+	
Ammonia aq.		conc	+	+	
		10	+	+	
Ammonium acetate aq.		any	+	+	+
Ammonium carbonate aq.		any	+	+	+
Ammonium chloride aq.		any	+	+	+
Ammonium nitrate aq.		any	+	+	+
Ammonium phosphate aq.		any	+	+	+
Ammonium sulphate aq.		any	+	+	+
Amly alcohol, pure			+	+	

Aniline		100	+	⊕	
Antifreeze agent (cars)**	Δ		+	+	
Apple Juice			+	+	
Apple sauce			+	+	⊕
Aqua regia			+	-	
Asphalt**			+	0	
ASPIRIN®			+		
B					
Barium salts		any	+	+	+
Beef suet			+	+	
Beer			+		
Benzaldehyde		100	+		
Benzaldehyde aq.		sat.	+		
		(0.3)			
Benzene	□	100	θ	-	
Benzoic acid		100	+	+	
Benzoic acid aq.		sat.	+	+	+
Bleaching solution (12.5% active chlorine)			0	0	
Bone oil			+	⊕	
Borax aq.		sat.	+	+	

CHEMICAL RESISTANCE

ALMATHERM
PP-R Pipes & Fittings

Conc. %	ALMATHERM P(°C)		
	20	60	100

		Conc. %	20	60	100
Boric acid		100	+	+	
Boric acid aq.		sat. (4.9)	+	+	
Brake fluid*	Δ		+	+	
Brendly			+		
Bromine, liquid		100	-		
Bromine, vapours		high low	- 0	- +	
Bromine, water		sat.	-	-	
Butene, gassous		100	+	+	
Butane, liquid	□	100	+		
Butter			+	+	
Buttermilk			+		
Butylacetate	Δ	100	+	0	
n-Butyl alcohol (n-butanol)	Δ	100	+	+	
C					
Cake			+	+	⊕
Calcium chloride aq.		sat.	+	+	+
Calcium nitrate aq.		sat.	+	+	
Camphor			+		
Carbon bisulphide**		100	0		
Carbon tetrachloride	Δ	100	0		
Caustic potash solution		50 25 10	+	+	+
Caustic soda solution	Δ	50 25 10	+	+	
Cheese			+		
Chloride of lite (aqueous suspension)			+	+	
Chlorine, gas, dry		100	-	-	-
Chlorine, gas humid		10	0	-	-
Chlorine, liquid		100	-		
Chlorine, water		sat.	0	-	
Chlorobenzene		100	-		
Chloroform	Δ	100	θ	-	
Chlrosulphonic acid		100	-	-	
Chromic acid		sat. 20	+	-	0
Chromic/sulphuric acid			-	-	
Chromium plating solution*			+	+	

Conc. %	ALMATHERM P(°C)		
	20	60	100

		Conc. %	20	60	100
Chromium salts (bi-and trivalent) aq.		sat.	+	+	
Cinnamon (cane)			+		
Cinnamon (ground)			+		
Citric acid aq.		sat.	+	+	+
Clove Oil			+	0	
Coca-cola®			+		
Cocoa (powdered)			+		
Cocoa (ready-to-drink)			+	+	⊕
Coconut oil			+	⊕	
Cod-liver oil			+	+	
Coffee (beans and ground)			+		
Coffee (ready-to-drink)			+	+	+
Common salt, dry			+	+	+
Copper salts aq.			+	+	+
Com seed oil		sat.	+	+	+
Cream whipped cream			+		
Cresol onion			+		
Cresol		100	+	0	
Cresol aq.		sat. (0.25)	+	0	
Curds			+		
Cyclohexane	□	100	+		
Cyclohexanol	Δ	100	+	+	
Cyclohexanone		100	+	-	
D					
Decahydronaphthalene		100	0	-	-
Detergents, synthetic**	Δ	high ready-for-use	+	+	+
Dibutylphthalate (see plasticizers)	Δ				
Diesel oil, see Fuels					
Dimethylformamide		100	+		
1.4-Dioxane		100	+	0	-
Dish-washing agents liquid*			+	+	+
DIXAN®		ready-for-use	+	+	+

CHEMICAL RESISTANCE

Conc. %	ALMATHERM P(°C)		
	20	60	100

E					
Eggs (uncooked & cooked)		100	+	+	⊕
Ether* (diethylene ether)		100	0		
Ethyl acetate			0	0	
Ethyl alcohol not denatured	Δ	100	+		
Ethyl alcohol aq. not denatured		96	+	+	
		50	+	+	
		10	+	+	
Ethyl benzene	Δ	100	0	-	
Ethyl chloride***	Δ	100	-		
Ethylene chloride	Δ	100	θ	θ	
2-Ethyl hexanol	Δ	10	+		
F					
Fixing salt (see also Sodium thiosulphat)		100	+	+	
Floor wax***			+	0	
Flour			+		
Flouric acid		40	+	+	
Folmaldehyde aq.	GhC	40	+	+	
		30	+	+	
		10	+	+	
FORMALIN®			+	+	
Formic acid	Δ	98	+	0	
		90	+		
		50	+	+	
		10	+	+	+
Fruit Juice			+	+	
Fruit Salad			+		
Fuel	□				
Petrol normal According to DIN 51635	□		+	0	
Petrol, regular			⊕	-	
Petrol, super	□		0	-	
Diesel oil*	□		+	0	
Fuel oil*	□		+	0	
Furniture polish*			+	0	
G					
Gin		40	+		
Glycerine		100	+	+	
Glycerine aq.		high	+	+	
		low	+	+	+

Conc. %	ALMATHERM P(°C)		
	20	60	100

Glycol	Δ	100	+	+	
Glycol aq.	Δ	high	+	+	
		low	+	+	+
Grapefruit juice			+	+	
Gravy			+	+	⊕
H					
Hair shampoo*			+	+	
Heptane		100	+	0	
Hexane		100	+	0	
Honey			+	+	
Horse-radish, ready-to-eat			+		
Hydrochloric acid	Δ	conc. 10	+	+	
			+	+	
Hydrogen, chloride gaseous (see also Hydrochloric acid)		high low	+	+	
			+	+	
Hydrogen Peroxide aq.		90 30 10 3	+	0	
			+	+	
			+	+	
			+	+	
Hydrogen sulphide**		low	+	+	
I					
Ink*			+	+	
Iron salts aq.		sat.	+	+	+
Isooctone		100	+	0	
Isopropyl alcohol	Δ	100	+	+	
J					
Jam			+	+	⊕
Jelly			+	+	⊕
L					
Lactic acid aq.		90 90 10	+	+	
			+	+	
			+	+	+
LANOLIN®			+	0	
Lard			+	+	0
Lemonadas			+		
Lemon arome			+		
Lemon peel			+	+	
Lemon peel oil			+		
Linseed oil			+		
LITEX®	Δ		+	+	
Liqueur		any	+		

Conc. %	ALMATHERM P(°C)		
	20	60	100

LYSOL			+	0	
M					
Magnesium salts aq.		sat.	+	+	+
Margarine			+	+	
MARLIPAL MG	Δ	50	+	+	
MARLON (42% active detergent)	Δ Δ	100	+	+	
MARLOPHEN 83		20	+		
MARLOPHEN 89		100 5	+	+	
MARLOPHEN 810	Δ	100 20 5	+	+	
Mashed Potatoes			+	+	⊕
Mayonnaise			+		
Menthol			+		
Mercurie salta aq.		salt	+	+	
Mercury		100	+	+	
Methyl alcohol		100	+	+	
Methyl alcohol aq.		50	+	+	
Methylene chloride*	Δ	100	0		
Methyl ethyl ketone		100	+	0	
Milk			+	+	⊕
Milk Food			+	+	⊕
Mineral oil (whitout aromatic hydrocarbons)**	Δ		+	0	-
Moth balls***			+		
Motor oil(cars)** (see also Two-stroke oil and oil according to ASTM)			+	0	
Mustard			+		
N					
Nail polish*			+	0	
Nail polish remover*			+	0	
Naphtalane		100	+		
Nickel salts aq.		sat.	+	+	
Nitric acid		50 25 10	0 + +	- + +	
Nitrobenzene		100	0	0	

Conc. %	ALMATHERM P(°C)		
	20	60	100

O					
Octane (see leoctane)					
Oil no.3 according To ASTM D380-59		100	+	0	
Oil of bitter almonds			+		
Oleic acid		100	+		
Olive Oil			+	+	
Orange Juice			+	+	
Orange Peel			+		
Orange peel oil			+		
Oxalix acid aq.		sat	+	+	+
Ozone (<0.5 ppm)			+	-	
P					
Pal m oil			+	0	
Paperika			+	+	
Paraffin	□	100	+	+	
Paraffin oil		100	+	0	
Peanut oil			+	⊕	⊖
Pectin		sat	+	+	
Pepper			+	+	
Peppermint oil			+		
Perchlorethylene (see Tetrachloretylene)			+		
Perfume**			+		
Petrol (see Fuels)					
Petroleum		100	+	0	
Petroleum ether		100	+	0	
Phenol (aqueous phase)		sat. (appr.9)	+	+	
(Phenolic Phase)		sat. (appr. 70)	+		
Phosphoric acid		sat.(85) 50 10	+	0 + +	
Phosphorous pentoxide		100	+		
Photographic developers*		comm. ready- for- use	+	+	
Pickled cabbage, ready-to-sat			+	+	⊕
Pickled fish			+	+	⊕
Pickled heming					

	Conc. %	ALMATHERM P(°C)			
		20	60	100	
Pineapple juice			+	+	
Pine needle oil	100		+	⊕	
Plasticizers					
Dibuthylphthalate	Δ		+	0	
Dibuthyleebacate			+		
Dihexylphthalate			+		
Dinonyladipate			+		
Dleonylphtalase	Δ		+	0	
Dloctyladipate	Δ				
Dloctylphthalate	Δ		+		
Tricresylphoapate			+		
Tricotylphosphate			+		
Porridge			+	+	⊕
Potassium carbonate aq. (Potash)	sat.	+	+		
Potassium chlorate aq.	sat (7.3)		+	+	
Potassium chloride aq.	sat. (12)		+	+	+
Potassium Iodide aq.	sat.		+	+	
Potassium nitrate aq.	sat.		+	+	
Potassium	sat.		+	⊕	
Permanagate aq.	(6.4)				
Potassium Persulphate aq.	sat.		+		
Potassium sulphate aq.	sat.		+	+	+
Potato salad			+		
Propane, gassous	100		+	+	
Propane, liquid	□ 100		+		
Pudding			+	+	0
Pyridine	100		+	0	
Q					
Quinine					
R					
Rum	40		+	+	
Rum aroma			+		
S					
SAGRATON			+	0	
Salad oil animal			+	0	
Salad oil vegetable			+	+	+
Salted water	any		+	+	
Sausage			+	+	+
Sea water			+	0	
Shoe polish*			+	⊕	

	Conc. %	ALMATHERM P(°C)			
		20	60	100	
Silicone oil*			+	+	
Silver salts aq.	sat.		+	+	
Soap solution	sat. 10		+	+	+
Soda (see Sodium Carbonate)					
Soda water			+		
Sodium bicarbonate aq.	sat.		+	+	+
Sodium busilphite aq.	sat.		+	+	
Sodium carbonate aq.	sat. 10		+	+	
Sodium chlorate aq. (common salt)	sat.		+	+	+
Sodium chlorate aq.	5		+		
Sodium hydroxide (caustic soda)					
Sodium hypochlorite aq.	5		+	+	
Sodium nitrate aq.	sat.		+	+	
Sodium nitride aq.	sat.		+		
Sodium parbrot aq.	sat. (1.4)		+	+	+
Sodium phosphates aq.	sat.		+	+	+
Sodium sulphate aq. (Glauber's salt)	sat.		+	+	+
Sodium sulphite aq.**	sat.		+	+	
Sodium sulphite	sat.		+	+	
Sodium thlosulphate aq. (Photographic fixer)	sat.		+	+	+
Soft soap			+	+	
Soybean oil			+	0	
Stannous chloride	sat.		+	+	
Starch, starch solution aq.	any		+	+	
Stearic acid	100		+		
Storage-battery acid			+	+	
Sugar (dry)			+	+	+
Sugar Beet sirup			+	+	⊕
Sugar solution aq.	any		+	+	⊕
Sulphur	100		+	+	+
Sulphur dioxide (Sulphurous anhydride)	low		+	+	
Sulphuric acid	96 50 25 10		+	0 + + +	

CHEMICAL RESISTANCE

ALMATHERM
PP-R Pipes & Fittings

	Conc. %	ALMATHERM P(°C)			
		20	60	100	
T					
Tar*			+	0	
Tartaric acide aq.	sat.		+	+	
Tea (leaves)			+	+	
Tea (ready-to-drink)			+	+	⊕
Tetrachlorethane	100		θ	-	
Tetrachloorethylene (Perchlorethylene)	Δ 100		0	-	
Tetrahydrofuran Ghc	100		0	-	
Tetrahydronaphtlens	Δ 100		0	-	
Thick(semolina) gruel			+	+	0
Thlophene	0		-		
Toluene			0	-	
Tomato juice			+	+	
Tomato ketchup			+	+	
Toothpastes			+	+	
Transformer oil*			+	0	
Trichlorsthylene	Δ 100		0	θ	
Turpentine oil			0	-	
Two-stroke oil			0	0	
Typewriter oil			+	⊕	
U					
Uree aq.	sat.		+	+	
V					
Vanills			+	+	
Vaseline			+	0	
Vegetables (ready-to-set)			+	+	⊕
Vinegar	comm..		+	+	
Vinegar essence**	Δ comm..		+	+	
W					
Water	100		+	+	+
Water glass			+	+	
Whlaks	40		+		
White spirit			+	0	
Wine, mulled claret			+	+	
X					
Xylene	□ 100		0	-	
Z					
Zinc salts aq.	sat.		+	+	



Avoid sharp impacts and stokes to the pipes, especially at low temperatures. Do not throw when unloading. Protect pipes from falling objects.



Put down pipes or pipe bundles carefully. Cover pipes in areas of falling rocks, etc.



Do not use cracked or damaged pipes.



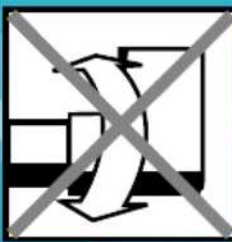
Only cut pipes with shears cutters.



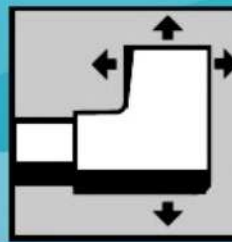
Do not expose pipes to UV radiation for extended periods of time.



Shelter stored pipes from sun and rain.



During polyfusion welding, do not twist the pipe or fitting; push the pipe and fitting joint together in a straight manner.



Minor corrections can only be made immediately during jointing.



Protect pipes filled with water from freezing.



Drain lines in danger of freezing.





almanit sanitary fittings

almanit sanitary gmbh

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