



TECHNICAL CATALOGUE 2019

ADDUCTION SYSTEM FOR HOT AND COLD WATER



Made in Italy



Introducing Tctermo PP-R Pipe Systems

Tctermo ppr system, is a product made from the primary producer of PP-R Pipe in Italy is at the leading edge in new pipe technology for the management of hot and cold water, and for a wide range of other liquids .

The cost effectiveness of PP-R pipe, combined with its excellent physical and mechanical properties makes it the ideal pipe material for new installations and to replace traditional pipe materials.

PP-R pipe excels where high demands for water quality, consistency, excellent chemical resistance and non corrosive properties are required.

The unique properties of PP-R pipe makes it the pipe of choice for the demanding application.

Tctermo manufactures a full range of pipe diameters, and supplies a comprehensive range of fusion-weldable fittings together with a technical guide to assist you with your installation.

For further information on how you can benefit from Tctermo PP-R pipe systems, please contact our office.

Technical Catalogue

Index

Characteristics of PP-R	4
Product Range	5
Advantages of PP-R Pipe Systems	21
Handling Precautions	22
Permissible Working Pressures	23
Thermal Expansion	24
Expansion Arm	25
Expansion Loop	26
Linear Expansion of PP-R Pipe	27
Pipe Support Intervals	28
Pressure Loss Diagram	29
Fusion Welding	30
System Integrity	31
Operating parameters of PPR piping system	32
Chemical Resistance of PP-R	33
Certificated	36

Characteristics of PP-R



Tcetermo PP-R pipes and fittings are produced from Polypropylene random copolymer.

PP-R is a material with many unique properties making it an ideal for the manufacture of pipes and fittings for cold and hot water systems, and many other industrial and commercial applications where systems for the reticulation of liquids and gases are required.


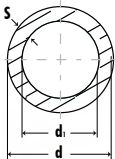

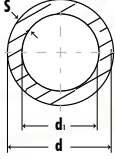

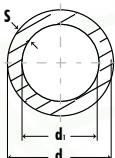
Physical and mechanical properties

PROPERTY	TYPICAL VALUES	UNIT	TEST METHOD
Mass per unit volume	0.905	g/cm ³	ISO/R1183
Tensile stress at yield	25	MPa	ISO/R527
Ultimate elongation	800	%	ISO/R527 method D
Flexural modulus	800	MPa	ISO 178
Tensile modulus of elasticity (1 /min)	900	MPa	ISO 527
Melt index	0.3	g/ 10 min	ISO/R1133
Thermal conductivity	0.24	W/m.K	DIN 52612
Coefficient of linear expansion	1.5 x 10 ⁻⁴	1/K	DIN 53752
Melting point	140 - 150	°C	Polarizing mic.
Specific heat	2	J/g.K	Calorimeter
Impact strength (Charpy) 20°C	40	KJ/m ²	ISO 179
0°C	4.0	KJ/m ²	ISO 179
-20°C	2	KJ/m ²	ISO 179
Volume resistivity	10 ¹⁶	W cm	DIN 53482
Dielectric strength	75	KV/	DIN 53481


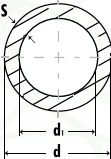

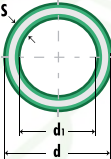

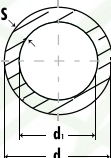
Product Range



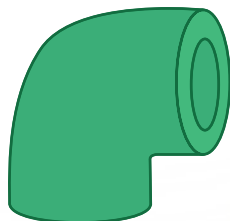
Bar lenght 4 meter

Pipe ppr 80 Tubo	SDR 11 - S5 (Pn10)						
 	Codice	d	S	d1	kg/m	€/mt	Box
	TUB01040	40	3,7	32,6	0,420		40
	TUB01050	50	4,6	40,8	0,640		20
	TUB01063	63	5,8	51,4	1,010		20
Pipe ppr 80 Tubo	SDR 7,4 - S3,2 (Pn16)						
 	Codice	d	S	d1	kg/m	€/mt	Box
	TUB01620	20	2,8	14,4	0,141		100
	TUB01625	25	3,5	18,0	0,238		100
	TUB01632	32	4,4	23,2	0,369		60
	TUB01640	40	5,5	29,0	0,587		40
	TUB01650	50	6,9	36,2	0,900		20
	TUB01663	63	8,6	45,8	1,377		20
Pipe ppr 80 Tubo	SDR 6- S2,5 (Pn20)				Best selling		
 	Codice	d	S	d1	kg/m	€/mt	Box
	TUB02020	20	3,4	13,2	0,176		100
	TUB02025	25	4,2	16,6	0,270		100
	TUB02032	32	5,4	21,2	0,434		60
	TUB02040	40	6,7	26,6	0,675		40
	TUB02050	50	8,3	33,2	1,040		20
	TUB02063	63	10,5	42,0	1,650		20

Bar lenght 4 meter

Pipe ppr 80 UV Stabi Tubo		SDR 6 - S2,5 (Pn20)					
 	Codice	d	S	d1	kg/m	€/mt	Box
	TUBN2020	20	3,4	13,2	0,186		100
	TUBN2025	25	4,2	16,6	0,285		100
	TUBN2032	32	5,4	21,2	0,450		60
	TUBN2040	40	6,7	26,6	0,690		40
	TUBN2050	50	8,3	33,2	1,065		20
	TUBN2063	63	10,5	42,0	1,685		20
	Pipe PPR Fiber Reinforced Tubo PPR Fibra Rinforzata		SDR 7,4 - S3,2				
 	Codice	d	S	d1	kg/m	€/mt	Box
	TFG02025	25	3,5	18,0	0,250		100
	TFG02032	32	4,4	23,2	0,400		60
	TFG02040	40	5,5	29,0	0,620		40
	TFG02050	50	6,9	36,2	0,970		20
	TFG02063	63	8,6	45,8	1,550		20
	Pipe PP-RCT Tubo		SDR 7,4 - S3,2 (Pn20)				
 	Codice	d	S	d1	kg/m	€/mt	Box
	TRCT2025	25	3,5	18,0	0,230		100
	TRCT2032	32	4,4	23,2	0,369		60
	TRCT2040	40	5,5	29,0	0,587		40
	TRCT2050	50	6,9	36,2	0,900		20
	TRCT2063	63	8,6	45,8	1,377		20

90° plain elbow
Gomito liscio 90°


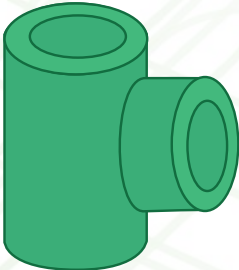
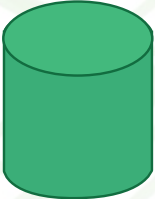


Codice	Φ	€ /pcs	Box
ELC02520	20		400
ELC02525	25		250
ELC02532	32		150
ELC02540	40		80
ELC02550	50		50
ELC02563	63		20

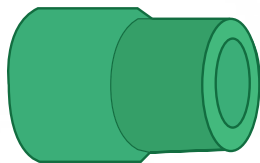
45° plain elbow
Gomito liscio 45°



Codice	Φ	€ /pcs	Box
ELO02520	20		500
ELO02525	25		300
ELO02532	32		150
ELO02540	40		100
ELO02550	50		50
ELO02563	63		25

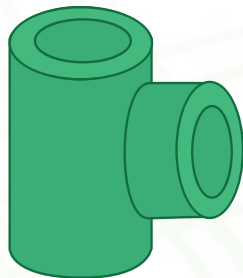
Socket <i>Manicotto</i>					
	Codice	Φ	€ /pcs	Box	
	MAN02520	20		500	
	MAN02525	25		400	
	MAN02532	32		200	
	MAN02540	40		120	
	MAN02550	50		100	
	MAN02563	63		50	
90° plain tee <i>Tee liscio 90°</i>					
	Codice	Φ	€ /pcs	Box	
	TEE02520	20		250	
	TEE02525	25		150	
	TEE02532	32		100	
	TEE02540	40		60	
	TEE02550	50		30	
TEE02563	63		20		
Cap <i>Tappo</i>					
	Codice	Φ	€ /pcs	Box	
	CAP02520	20		600	
	CAP02525	25		400	
	CAP02532	32		250	
	CAP02540	40		150	
	CAP02550	50		100	
CAP02563	63		50		

M-F reduction
Riduzione M-F



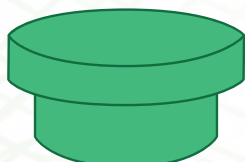
Codice	Φ	€ /pcs	Box
RED52520	25x20		600
RED53220	32x20		300
RED53225	32x25		300
RED54020	40x20		200
RED54025	40x25		200
RED54032	40x32		150
RED55020	50x20		150
RED55025	50x25		100
RED55032	50x32		100
RED55040	50x40		100
RED56320	63x20		100
RED56325	63x25		100
RED56332	63x32		100
RED56340	63x40		100
RED56350	63x50		50

Reduction tee
Tee ridotto



Codice	Φ	€ /pcs	Box
TE252020	25x20x20		150
TE252420	25x25x20		150
TE252520	25x20x25		150
TE253220	32x20x32		100
TE253225	32x25x32		100
TE254020	40x20x40		60
TE254025	40x25x45		60
TE254032	40x32x40		60
TE255020	50x20x50		40
TE255025	50x25x50		30
TE255032	50x32x50		30
TE255040	50x40x50		30
TE256320	63x20x63		25
TE256325	63x25x63		20
TE256332	63x32x63		15
TE256340	63x40x63		15
TE256350	63x50x63		15

Male stopper
Tappo maschio



Codice	Φ	€ /pcs	Box
STO02540	40		100
STO02550	50		50
STO02563	63		50

By-pass
Sorpasso



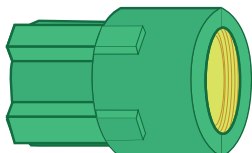
Codice	Φ	€ /pcs	Box
BYP02520	20		100
BYP02525	25		70
BYP02532	32		45

By-pass whit socket
Sorpasso c/manicotto



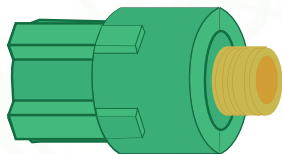
Codice	Φ	€ /pcs	Box
BPM02520	20		150
BPM02525	25		100

Joint female thread
Racc.fil. femmina



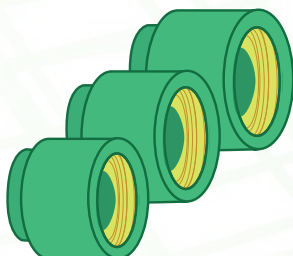
Codice	Φ	€ /pcs	Box
JOF02520	20x½		250
JOF02521	25x½		250
JOF02525	25x¾		250
JOF02531	32x¾		150
JOF02532	32x1		150
JOF02540	40x1¼		50
JOF02550	50x1½		50
JOF02563	63x2		25

Joint male thread
Racc.fil. Maschio



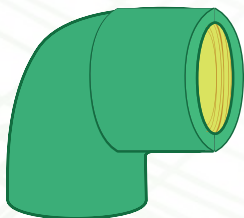
Codice	Φ	€ /pcs	Box
JOM02520	20x½		250
JOM02521	25x½		200
JOM02525	25x¾		200
JOM02531	32x¾		120
JOM02532	32x1		120
JOM02540	40x1¼		50
JOM02550	50x1½		40
JOM02563	63x2		25

Female adapter



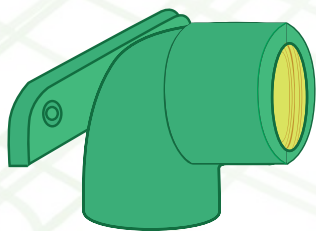
Codice	Φ	€ /pcs	Box
ADP02540	40x1¼		100
ADP02550	50x1½		50
ADP02563	63x2		50

Elbow female thread
Gomito fil. femmina



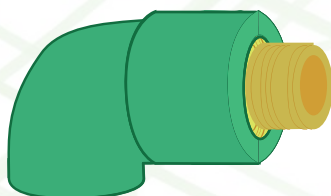
Codice	Φ	€ /pcs	Box
ELF02520	20x½		250
ELF02521	25x½		150
ELF02525	25x¾		150
ELF02531	32x¾		100
ELF02532	32x1		100

*Elbow female thread
with bracket*
Gomito fil. femmina con staffe



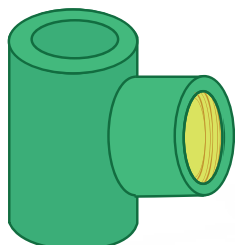
Codice	Φ	€ /pcs	Box
ELFB2520	20x½		200

Elbow male thread
Gomito fil. maschio



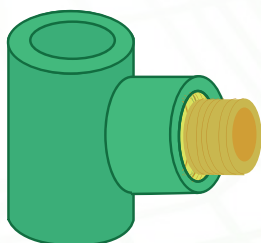
Codice	Φ	€ /pcs	Box
ELM02520	20x½		200
ELM02521	25x½		150
ELM02525	25x¾		150
ELM02531	32x1		60

Tee female thread
Tee fil. femmina



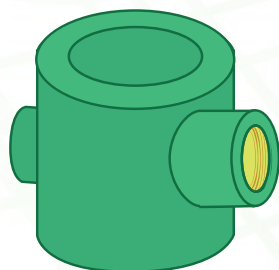
Codice	Φ	€ /pcs	Box
TEF02520	20x½		200
TEF02521	25x½		150
TEF02525	25x¾		150
TEF02532	32x1		60
TEF04025	40x¾		50
TEF05025	50x¾		40
TEF06325	63x¾		25

Tee male thread
Tee fil. maschio



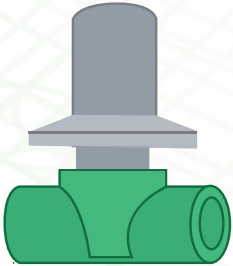
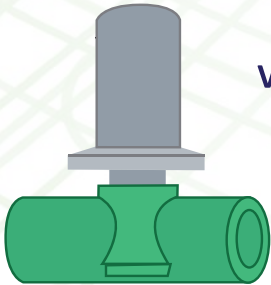
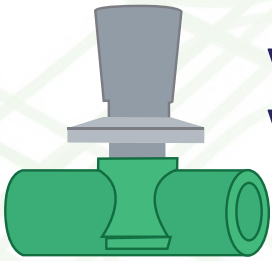
Codice	Φ	€ /pcs	Box
TEM02520	20x½		150
TEM02521	25x½		150
TEM02525	25x¾		150
TEM02532	32x1		60

Female double threaded tee



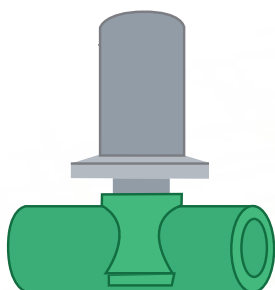
Codice	Φ	€ /pcs	Box
TED05025	50x¾x¾		30
TED06325	63x¾x¾		20

Viton Valve

<i>Stop tap with cap S/PP</i> Rubinetto a vitone con cappuccio S/PP					
	Vit 1/2 →	Codice	Φ	€ /pcs	Box
		RUC02520	20		75
<i>Stop tap with cap S/OT</i> Rubinetto a vitone con cappuccio S/OT					
	Vit 3/4 →	Codice	Φ	€ /pcs	Box
		RPC02520	20		50
		RPC02525	25		50
		RPC02532	32		40
<i>Stop tap with knob</i> Rubinetto a vitone con manopola					
	Vit 3/4 → Vit 1 →	Codice	Φ	€ /pcs	Box
		RUM02520	20		50
		RUM02525	25		40
		RUM02532	32		25

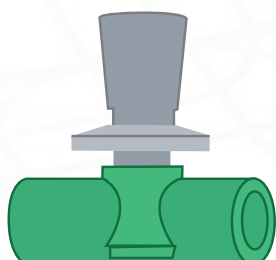
Ball Valve

Cap valve with extractable ball
Valvola a sfera con cappuccio



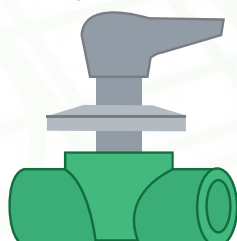
Codice	Φ	€ /pcs	Box
VSC02520	20		50
VSC02525	25		50
VSC02532	32		40

Knob valve with extractable ball
Valvola a sfera con manopola



Codice	Φ	€ /pcs	Box
VSM02520	20		50
VSM02525	25		50
VSM02532	32		40

Lever-valve with extractable ball
Valvola a sfera con leva



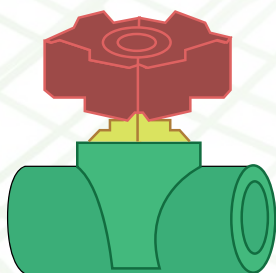
Codice	Φ	€ /pcs	Box
VSL02520	20		50
VSL02525	25		50
VSL02532	32		40

Tap with lever
Rubinetto con leva



Codice	Φ	€ /pcs	Box
VPL02020	20		100
VPL02525	25		100
VPL03232	32		50
VPL04040	40		50
VPL05050	50		30
VPL06363	63		15

Tap with plastic knob
Rubinetto a vitone con manopola



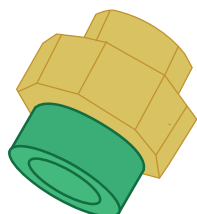
Codice	Φ	€ /pcs	Box
RPM02020	20		75
RPM02525	25		50
RPM03232	32		40

Extension for tap
Prolunga per rubinetto



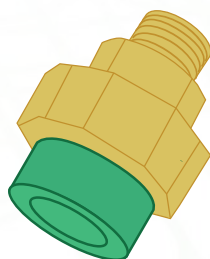
Codice	Φ	€ /pcs	Box
PLRU00010			1
PLVS00010			1

Union female
Bocchettone femmina



Codice	Φ	€ /pcs	Box
UNF02020	20		
UNF02525	25		
UNF03232	32		
UNF04040	40		
UNF05050	50		
UNF06363	63		

Union male
Bocchettone maschio



Codice	Φ	€ /pcs	Box
UNM02020	20		
UNM02525	25		
UNM03232	32		
UNM04040	40		
UNM05050	50		
UNM06363	63		

Union PP
Bocchettone in PP

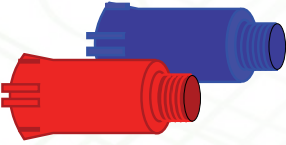


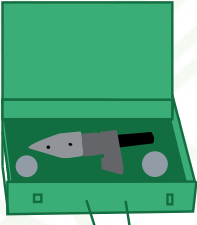


Codice	Φ	€ /pcs	Box
UNP02020	20		
UNP02525	25		
UNP03232	32		
UNP04040	40		
UNP05050	50		
UNP06363	63		

Bracelet
Fermatubi



Codice	Φ	€ /pcs	Box
BRA02020	20		
BRA02525	25		
BRA03232	32		

Cap for circuit test <i>Tappo prova impianto</i>					
	Codice	Φ	€ /pcs	Box	
	TAPR02520	20		300	
	TAPR02525	25		300	
	TAPB02520	20		300	
	TAPB02525	25		300	
Pipe cutter <i>Forbice tagliatubo</i>					
	Codice	Φ	€ /pcs	Box	
	CUT02032	20		20	
Heating tool <i>Matrice per polifusore</i>					
	Codice	Φ	€ /pcs	Box	
	MAT02520	20		1	
	MAT02525	25		1	
	MAT02532	32		1	
	MAT02540	40		1	
	MAT02550	50		1	
	MAT02563	63		1	
Melting equipment case <i>Polifusore in cassetta</i>					
	Codice	Φ	€ /pcs	Box	
	POL02032	20/32	CAP	1	

Technical Information

Advantages of Tctermo PP-R Pipe Systems

In comparison with traditional pipe systems PP-R provides the following advantages:

Electrical Conductivity:

A high level of resistivity (10 ohm. cm) assures a very low electrical conductivity. The possibility of perforating the pipe due to electrical discharge is highly unlikely.

Chemical resistance:

PP-R pipe is resistant to most chemicals and the minerals present in water have no corrosive effect. Although PP-R is resistant to chemicals with a pH of 1 to 14, the chemical resistance table attached should always be referred to.

Absence of mineral deposits:

PP-R due to its molecular structure, does not permit the build-up of mineral deposits on the pipe wall, thereby maintaining low-rates.

Low friction loss:

The smooth bore of PP-R pipe results in reduced friction losses and therefore increased pipe carrying capacity.

Reduced system noise:

The good noise suppression qualities of PP-R pipe reduce noise levels in the system, even when under stress due to high working pressures.

Low thermal conductivity:

PP-R's low thermal conductivity of 0.24 w/m.k results in low heat transfer through the pipe wall, thereby retaining heat within the system. This also leads to less condensation on the pipe surface.

Working life:

The PP-R pipe system is designed for a life in excess of fifty years under the conditions of temperature and pressure specified in the accompanying table (see regression curves).

Toxicity:

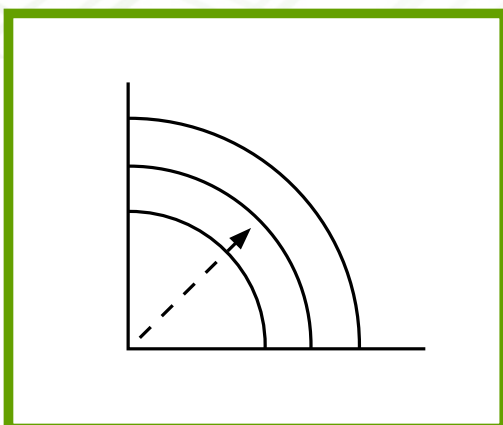
PP-R pipes and fittings are completely non-toxic and conform to the required international standards and regulations for water quality.

Handling:

PP-R pipes and fittings are light in weight and allow quick and safe installation for industrial, civil and domestic applications.

BENDING RADIUS TABLE

Pipe diameter	R max
16	128
20	160
25	200
32	256
40	320
50	400
63	500



Handling Precautions

Exposure to UV:

PP-R pipes and fittings must not be installed or stored in such a way that they are exposed to sunlight (UV radiation). Exposure to UV causes the material to degrade with the consequent loss of physical and chemical properties. Tctermo add sufficient UV – stabiliser to provide protection for one year.

Pipe bending:

PP-R pipes can be bent by “cold working” providing that the bend does not exceed 8 times the pipe outside diameter. Do not bend the pipe by applying heat, such as by gas flame or other heating device.

Low temperature characteristics:

As temperatures approach zero the impact strength of PP-R pipe is reduced. Therefore care should be taken to avoid impact when handling the pipe. Water freezing in pipes may also cause breaks due to stresses which develop as a result of volume increase.

Care in handling the pipe:

Contact with sharp objects and implements should be avoided during installation and when stored.

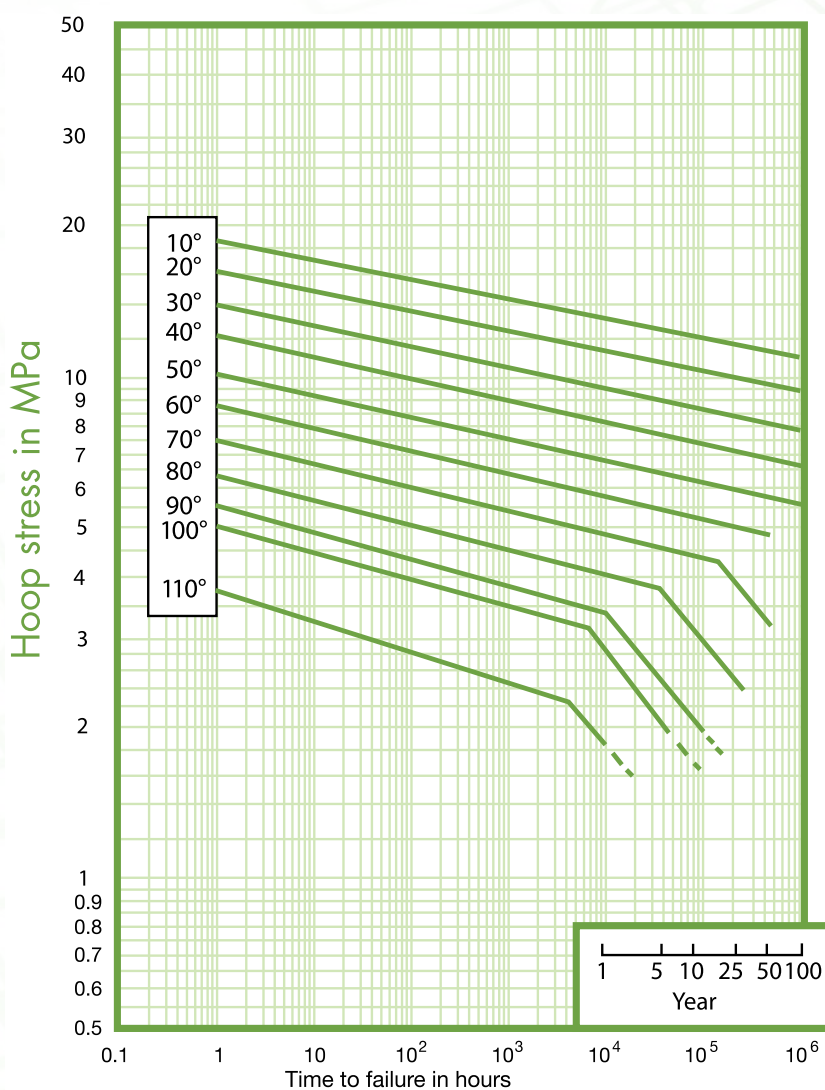
Welding:

To achieve excellent welds all surfaces of both pipe and fittings must be clean. Ensure that the fusion welding equipment is calibrated and set to the correct temperature.

Temp ° C	Time (years)	Pressure max.	Safety factor
20°	50	26.1	1.5
30°	50	22.1	1.5
40°	50	18.7	1.5
50°	50	15.5	1.5
60°	50	13.1	1.5
70°	25	10.2	1.5
80°	25	6.5	1.5
90°	15	4.8	1.5
100°	10	4.3	1.5

Permissible Working Pressures

The factors determining PPR pipe behavior are pressure, temperature and time. The regression curves shown demonstrate the effect of these factors on the performance and long term behavior of PPR pipe systems. Based on these regression curves, the permissible working pressures for PN20 pipes are calculated and provided in the following table.



Long term behaviour of PP-R pipes

Thermal Expansion of PP-R Pipes

When installing PP-R pipes the linear expansion of the pipe material must be taken into consideration during the planning and design stage. The pipe layout needs to be planned and installed in such a way that the pipes are free to expand within pre-determined parameters. Linear expansion can be accommodated in various ways by:

- Changes in direction of the pipe route.
- Expansion arms.
- Expansion loops.

Formula for calculating linear expansion.

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

DESIGNATION	DEFINITION	VALUE	UNIT
ΔL	Linear expansion	?	
a	Coefficient of linear expansion	0.15	/mK
L	Pipe length	25.0	m
TW	Working temperature	60	oC
TI	Installation temperature	20	oC
ΔT	Temp difference between working and installation temperatures $\Delta T (T_w - T_i)$	40	K

Expansion Arm

In most cases direction changes can be used to compensate linear expansion in pipes. If not it may be necessary to install an expansion arm. The following example illustrates how the length of the expansion arm is calculated using the formula given.

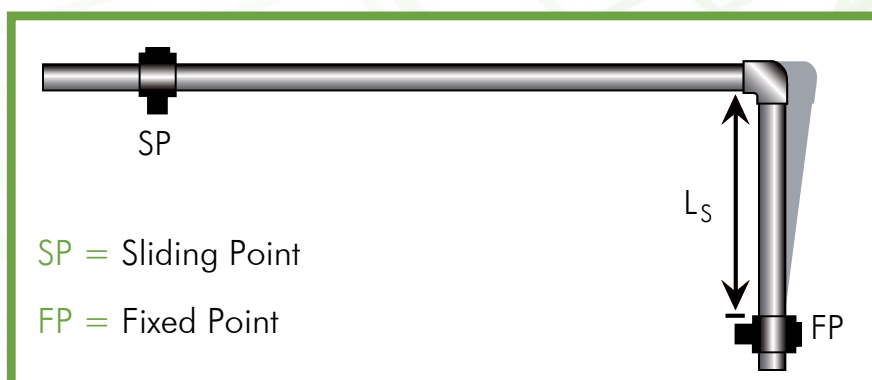
DESIGNATION	MEASURING	VALUE	MEASURING UNIT
L_s	Length of the expansion arm	7	
K	Material Constant	15	–
d	Outside Diameter	40.0	
Δ L	Linear Expansion	30.0	

$$L_s = k \times \sqrt{d} \times \Delta l$$

$$L_s = 15 \times \sqrt{40} \times 30$$

$$L_s = 579.6 \text{ mm} \approx 580 \text{ mm}$$

Based on the above values the expansion arm is 580 mm

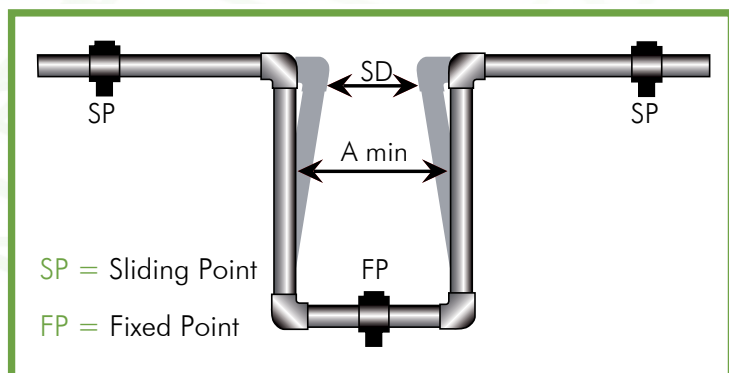


Expansion Loop

As with the expansion arm if the linear expansion cannot be compensated by a change in pipe direction, an expansion loop will be necessary. Consider the length of the bending side L_s as well as the width of the pipe bend A_{min} on the expansion loop.

DESIGNATION	DESCRIPTION	VALUE	MEASURING UNIT
A_{min}	Width of the expansion loop	?	
ΔL	Linear Expansion	30.0	
SD	Safe distance	150.0	

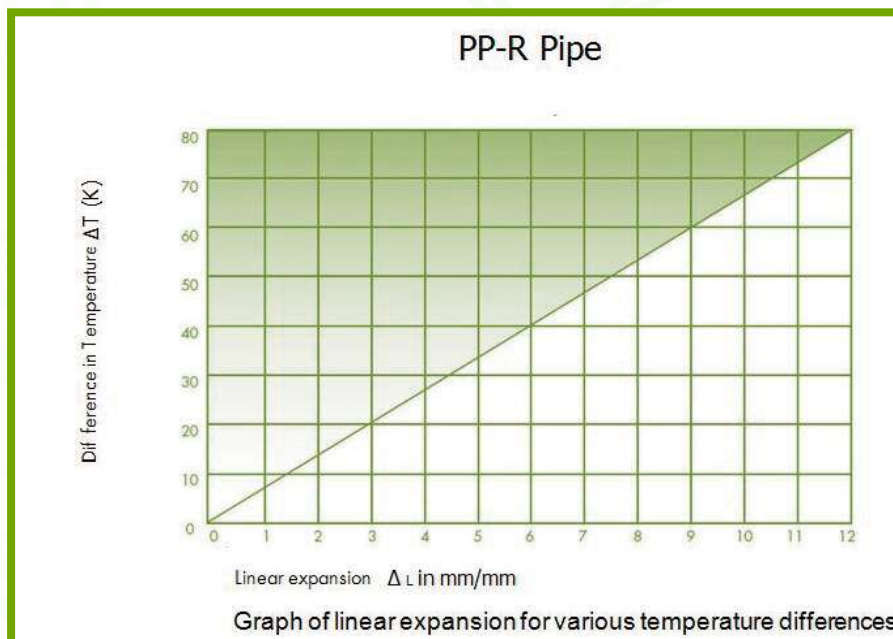
The width of the expansion loop A_{min} is calculated according to the following formula
 $a_{min} = 2 \times \Delta L + SD$
 $a_{min} = 2 \times 30.00 + 150$
 $a_{min} = 210.0$
 A_{min} should not be less than 210.



Linear Expansion of PP-R Pipe

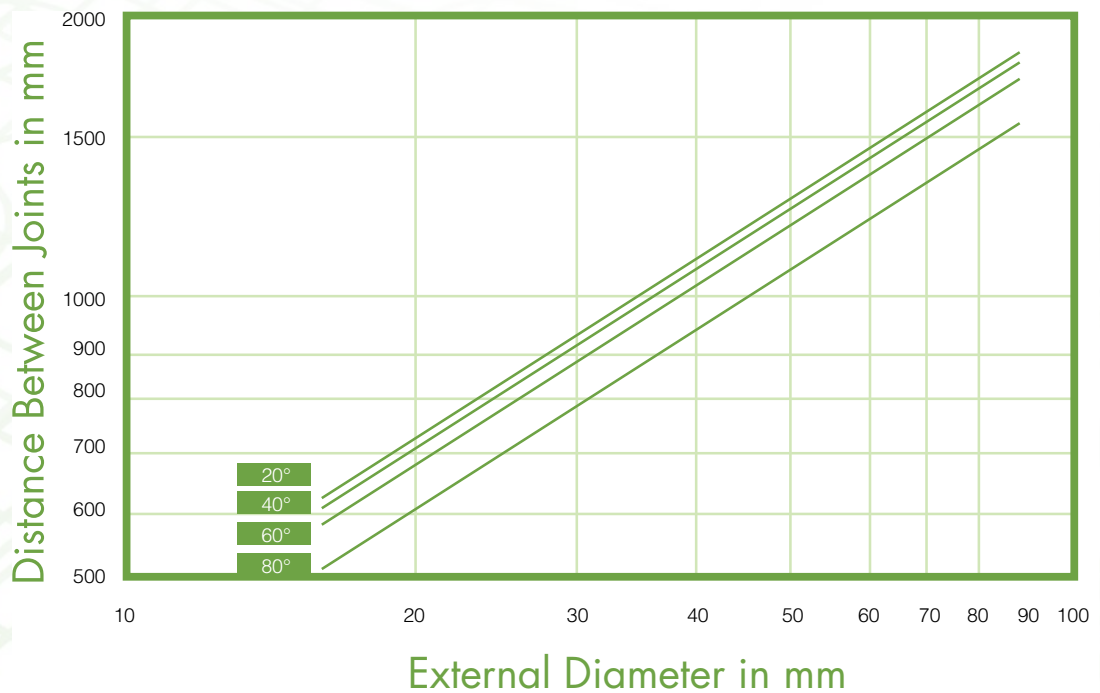
Quick Reference Table:

LINEAR EXPANSION OF PP-R PIPE								
Pipe-Length in meter 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
2.0	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00
3.0	4.50	9.00	13.50	18.00	22.50	27.00	31.50	36.00
4.0	6.00	12.00	18.00	24.00	30.00	36.00	42.00	48.00
5.0	7.50	15.00	22.50	30.00	37.50	45.00	52.50	60.00
6.0	9.00	18.00	27.00	36.00	45.00	54.00	63.00	72.00
7.0	10.50	21.00	31.50	42.00	52.50	63.00	73.50	84.00
8.0	12.00	24.00	36.00	48.00	60.00	72.00	84.00	96.00
9.0	13.50	27.00	40.50	54.00	67.50	81.00	94.50	108.00
10.0	15.00	30.00	45.00	60.00	75.00	90.00	105.00	120.00



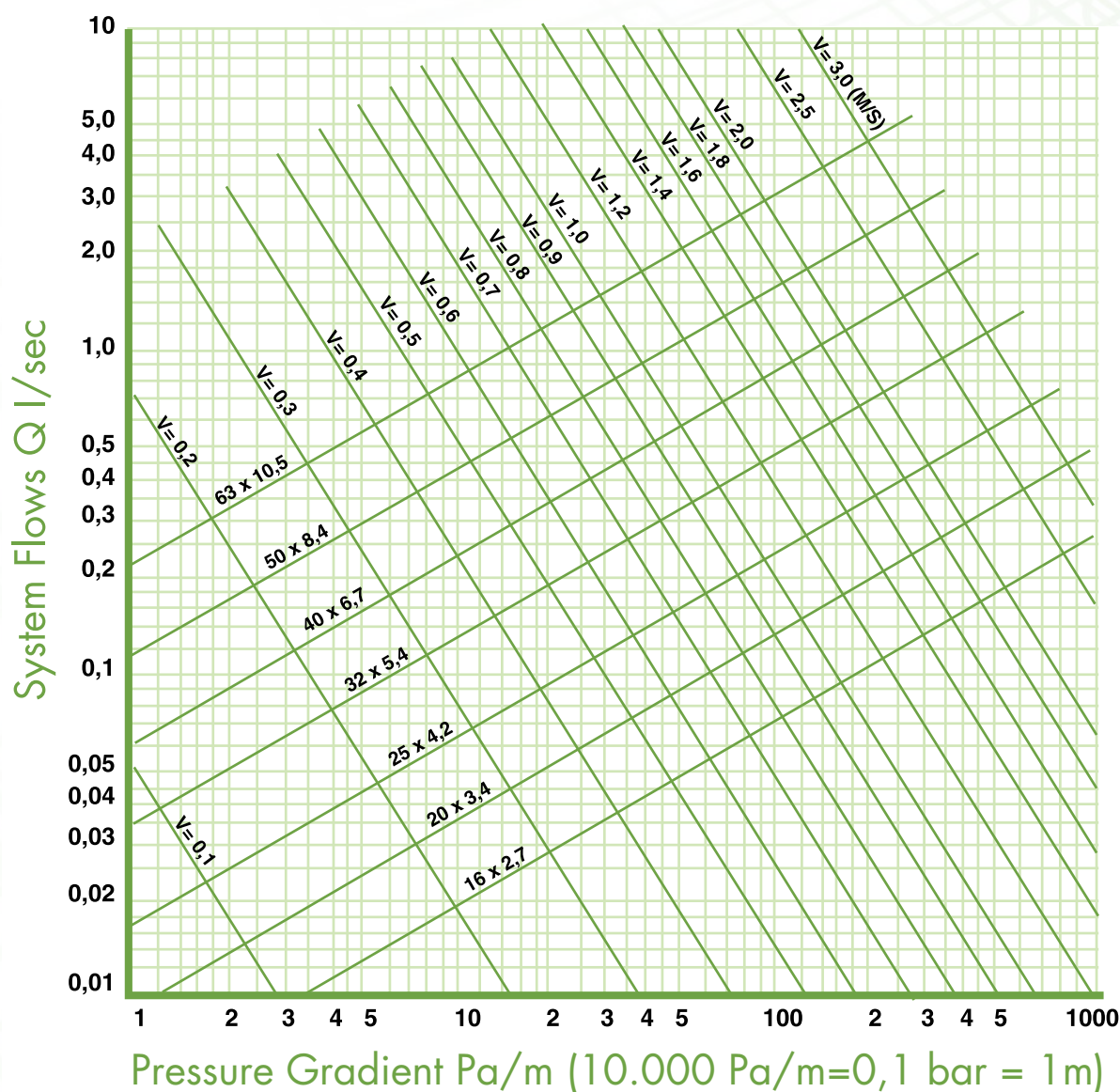
Pipe Support Intervals

Pipe supports should be installed at regular intervals to prevent the pipe from sagging. The recommended pipe support intervals for a range of system operating temperatures can be determined from the graph below.

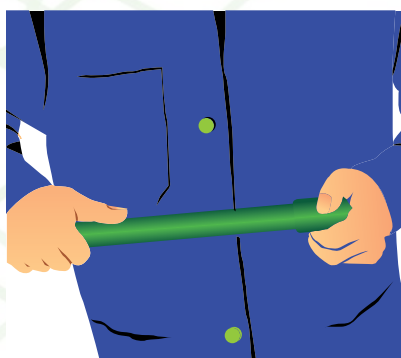
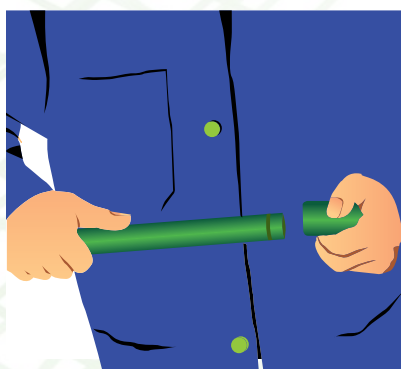
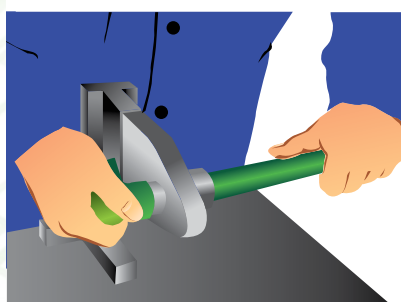


Pressure Loss Diagram

Pressure losses for a series of PN20 Pipe Diameters.
To determine refer to the following graph.

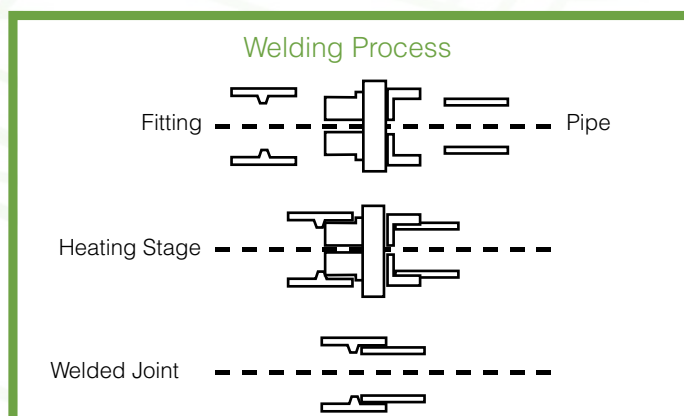


Fusion Welding



- The welding unit is set to a temperature of 260°C.
- The pipe, which must be cut square, and the fitting are both inserted into the welding tool.
- After the appropriate heating time (see following table) the pipe and fitting are removed simultaneously from the tool.
- The pipe is then inserted into the fitting, taking care to avoid rotating either pipe or fitting.
- Care must be taken to insert the pipe to the correct welding depth. If depth is exceeded an internal bead of material may form and act as a restriction to flow.
- The welding conditions for each pipe size are shown below.

Diameter D	Heating Time sec.	Change over Time sec.	Cooling time min.
16	5	4	2
20	5	4	2
25	7	4	3
32	8	6	4
40	12	6	4
50	18	6	4
63	24	8	6
75	30	8	6
90	40	8	6
110	50	10	8



System Integrity

Before the system is put into service, it is important to check the integrity of the pipes and fittings by:

- Visual inspection of the system.
- Hydraulic pressure testing. The system is pressurised for 24 hours at the required working pressure and inspected for leaks.

Standards and regulations

Then Tctermod PP-R SYSTEM pipes and fittings have been designed and tested according to the following standards:

EN ISO 15874 Plastic piping system for hot and cold water installations - Polypropylene (PP).

DIN 8077 Polypropylene (PP); pipes and sizes.

DIN 1988 Codes of practice for drinking water installations.

DIN 4109 Noise insulation and prevention in buildings.

DIN 8076 Metal threaded joints test methods.

DIN 16928 Pipes of thermoplastic materials: pipe joints, elements of pipe, laying of pipes; general directions.

DIN 16962 Pipe joints and their elements for pipes of polypropylene (PP) under pressure; manufacture and testing.

DIN 8078 Polypropylene (PP) pipes. General quality requirements and testing.

DIN 2999 Fittings with threaded metal insert.

DVS 2206 Welding of thermoplastic materials by means of heating tools.

Operating parameters of PPR piping system (according to EN ISO 15874)

This standard uses a slightly different method of defining operating parameters than DIN 8077 standard, based however on the same strength isotherms.

According to this standard, four different application classes are specified, all for 50 years duration.

Appl. class	Design temperature T _D	Time at T _D	Max. design temperature T _{max}	Time at T _{max}	Temperature of malfunction T _{mal}	Time at T _{mal}	Typical use
	°C	years	°C	years	°C	hrs	
1	60	49	80	1	95	100	Hot water supply (60°C)
2	70	49	80	1	95	100	Hot water supply (70°C)
4	20	2,5	70	2,5	100	100	Floor heating and low temperature radiators
	40	20					
	60	25					
5	20	14	90	1	100	100	High temperature radiators
	60	25					
	80	10					

Design pressure P _D	Application			
	Class1	Class2	Class4	Class5
Bar	S _{col.max} values			
4	6,9	5,3	6,9	4,8
6	5,2	3,6	5,5	3,2
8	3,9	2,7	4,1	2,4
10	3,1	2,1	3,3	1,9

Example:

Pressure lines PN 20 = s 2.5 series: according to the table, $S \leq S_{col.max}$ must apply. With use for hot water (max. temp. of hot water of 60 °C – scald protection) – Class 1: can be operated at the pressure of 10 bar ($2.5 \leq 3.1$), 49 years durability at a temp. of 60 °C, one year at a temperature of 80 °C (sudden temp. increase) and 100 hours at a temperature of 95 °C (emergency conditions). The same applies to other classes. This information is indicated on pipes as class 1/10 bars, 2/8 bars, 4/10 bars, 5/6 bars.

Chemical Resistance of PP-R

Rating System - This Chart rates the chemical resistance of polypropylene according to the following Code:

S = Satisfactory

L = Limited Absorption Or Attack -

NS = Not Satisfactory

Sat. Sol. = Saturated aqueous solution prepared at 20° Celsius

Sol. = Aqueous solution with a concentration over 10% but not yet saturated

Dil. Sol. = Diluted solution having a max concentration of 10%

CHEMICALS	CONCENTRATION	20°C	60°C	100°C
acetic anhydride	100%	S	-	-
acetic acid (concentrate)	over 96%	S	L	NS
acetic acid	up to 40%	S	S	-
acetic acid	50%	S	S	L
acetone	100%	S	S	-
acetophenone	100%	S	L	-
acrylonitrile	100%	S	-	-
air		S	S	S
aliphatic hydrocarbons		NS	NS	NS
alum	sol	S	-	-
amyl acetate	100%	L	-	-
amyl alcohol	100%	S	S	S
ammonia (gas)	100%	S	-	-
ammonia (saturated)	100%	S	-	-
ammonia liquor	up to 30%	S	-	-
ammonium acetate	sat. sol.	S	S	-
ammonium biocarbonate	sat. sol.	S	S	-
ammonium chloride	sat. sol.	S	-	-
ammonium fluoride	sol.	S	S	-
ammonium hydroxide	sol.	S	-	-
ammonium metaphosphate	sat. sol.	S	S	S
ammonium nitrate	sat. sol.	S	S	S
ammonium phosphate	sat. sol.	S	-	-
ammonium sulphate	sat. sol.	S	S	S
aniline	100%	S	S	-
anisole	100%	L	-	-
apple juice		S	-	-

CHEMICALS	CONCENTRATION	20°C	60°C	100°C
aqua regia (HCl/HNO ₃ =3/1)		NS	NS	NS
barium carbonate	sat. sol.	S	S	S
barium chloride	sat. sol.	S	S	S
barium hydroxide	sat. sol.	S	S	S
barium sulphate	sat. sol.	S	S	S
benzene	100%	L	NS	NS
benzoic acid	sat. sol.	S	-	-
benzoyl chloride	100%	L	-	-
benzyl alcohol	100%	S	L	-
borax	sol.	S	S	-
boric acid	sat. sol.	S	-	-
bromine (dry vapour)	-	S	NS	NS
bromine (liquid)	100%	NS	NS	NS
bromine (water)	sol.	NS	NS	NS
bufane	100%	S	-	-
butyl acetate	100%	L	NS	NS
butanol	100%	S	L	L
butylglycol	100%	S	-	-
butylphenol	cold sat. sol.	S	-	-
butyl phtaiate	100%	S	L	L
calcium carbonate	sat. sol.	S	S	S
calcium chloride	sat. sol.	S	S	S
calcium hydroxide	sat. sol.	S	S	S
calcium hydrochlorite	sol.	S	-	-
calcium nitrate	sat. sol.	S	S	-
carbon dioxide gaseous, dry	100%	S	S	-
carbon dioxide gaseous, wet		S	S	-
carbon disulphide	100%	S	NS	NS
carbon tetrachloride	100%	NS	NS	NS
chorine (gaseous, dry)	100%	NS	NS	NS
chorine (liquid)	100%	NS	NS	NS
chlorine water	sat. sol.	S	L	-
chloroacetic acid	sol.	S	-	-
choroethanol	100%	S	-	-
chloroform	100%	L	NS	NS
chlorosulphonic acid	100%	NS	NS	NS
chrome alum	sol.	S	S	-
chromic acid	up to 40%	S	L	NS
citric acid	10%	S	S	S
copper sulphide	sat. sol.	S	S	-
cresol	over 90%	S	-	-
cupric nitrate	30%	S	S	S
cupric sulphate	sat. sol.	S	S	-
cyclohexane	100%	S	-	-
cyclohexanol	100%	S	L	-
cyclohexanone	100%	S	L	-
dekalin (decahydronaphthalene)	100%	NS	NS	NS
dextrin	sol.	S	S	-

CHEMICALS	CONCENTRATION	20°C	60°C	100°C
dextrose	sol.	S	S	-
dibutyl phthalate	100%	S	L	NS
dichloroacetic acid	sat. sol.	L	-	-
a.B.dichloroethylene	100%	L	-	-
diethanolamine	100%	S	-	-
diethylene glycol	100%	S	S	-
diethyl ether	100%	S	L	-
diglycolic acid	sat. sol.	S	-	-
diisooctyl phthalate	100%	S	L	-
dimethylamine	100%	S	-	-
dimethylformamide	100%	S	S	-
diethyl phthalate	100%	L	L	-
dioxan	100%	L	L	-
ethanolamine	100%	S	-	-
ethyl acetate	100%	L	NS	NS
ethylalcohol	up to 95%	S	S	S
ethyl chloride	100%	NS	NS	NS
ethylene chloride (mono. di)	100%	L	L	-
ethylene glycol	100%	S	S	S
formaldehyde	40%	S	-	-
formic acid	10%	S	S	L
formic acid	85%	S	NS	NS
formic acid (anhydrous)	100%	S	L	L
fructose	sol.	S	S	S
fruit juice		S	S	S
gelatin		S	S	-
glucose	20%	S	S	S
glycerine	100%	S	S	S
glycolic acid	30%	S	-	-
heptane	100%	L	NS	NS
hexane	100%	S	L	-
hydrobromic acid	up to 48%	S	L	NS
hydrochloric acid	2-7%	S	S	S
hydrochloric acid	10-20%	S	S	-
hydrochloric acid	30%	S	L	L
hydrochloric acid	35-36%	S	-	-
hydrochloric acid (gaseous dry)	100%	S	S	-
hydrofluoric acid	dil. sol.	S	-	-
hydrofluoric acid	40%	S	-	-
hydrogen	100%	S	-	-
hydrogen peroxide	up to 10%	S	-	-
hydrogen peroxide	up to 30%	S	L	-
hydrogen sulphide, gaseous, dry	100%	S	S	-
iodine (alcoholic solution)		S	-	-
isooctane	100%	L	NS	NS
isopropylalcohol	100%	S	S	S
isopropylether	100%	L	-	-
lactic acid	up to 90%	S	S	-
lanolin		S	L	-
magnesium carbonate	sat. sol.	S	S	S

CHEMICALS	CONCENTRATION	20°C	60°C	100°C
magnesium chlorid	sat. sol.	S	-	-
magnesium sulphate	sat. sol.	S	-	-
malic acid	sol.	S	-	-
mercuric cyanide	sat. sol.	S	-	-
mercuric chloride	sat. sol.	S	-	-
mercuric nitrate	sol.	S	-	-
mercury	100%	S	-	-
methyl acetate	100%	S	-	-
methyl alcohol	5%	S	L	L
methylamine	up to 32%	S	-	-
methyl bromide	100%	NS	NS	NS
methylene chloride	100%	L	NS	NS
methyl ethyl ketone	100%	S	-	-
milk		S	S	S
monochloroacetic acid	over 85%	S	S	-
naphtha		S	NS	NS
nickel chloride	sat. sol.	S	S	-
nickel nitrate	sol.	S	S	-
nickel sulphate	sat. sol.	S	S	-
nitric acid	10%	S	NS	NS
nitric acid	30%	S	-	-
nitric acid	40-50%	L	NS	NS
nitric acid fuming (w nitric oxide)		NS	NS	NS
nitrobenzene	100%	S	L	-
Oils:				
almond		S	-	-
camphor		NS	NS	NS
castor	100%	S	S	-
coconut		S	-	-
corn		S	L	-
cotton		S	S	-
linseed		S	S	S
olive		S	S	L
paraffin (FL 65)		S	L	NS
peanut		S	S	-
peppermint		S	-	-
silicone		S	S	S
soybean		S	L	-
oleic acid		S	L	-
oleum (sulphuric acid contain, 60% SO ₂)		S	NS	NS
oxalic acid	sat. sol.	NS	L	NS
oxygen				
perchloric acid	2N	S	-	-
petroleum ether (ligroin)		L	L	-
phenol	5%	S	S	-
phenol	90%	S	-	-
phosphoric acid	25%	S	S	S
phosphoric acid	25/85%	S	S	S
phosphoric oxychloride	100%	L	-	-
picric acid	sat. sol.	S	-	-

CHEMICALS	CONCENTRATION	20°C	60°C	100°C
potassium bicarbonate	sat. sol.	S	S	-
potassium borate	sat. sol.	S	S	-
potassium bromate	up to 10%	S	S	-
potassium bromide	sat. sol.	S	S	-
potassium carbonate	sat. sol.	S	-	-
potassium chlorate	sat. sol.	S	S	-
potassium chloride	sat. sol.	S	-	-
potassium chromate	sat. sol.	S	S	-
potassium cyanide	sol.	S	-	-
potassium flouride	sat. sol.	S	S	-
potassium hydroxide	up to 50%	S	S	S
potassium iodide	sat. sol.	S	-	-
potassium nitrate	sat. sol.	S	S	-
potassium perchlorate	10%	S	S	-
potassium permanganate	2N	S	-	-
potassium persulphate	sat. sol.	S	-	-
potassium sulphate	sat. sol.	S	-	-
propane	100%	S	-	-
propionic acid	over 50%	S	-	-
pyridine	100%	L	-	-
silver nitrate	sat. sol.	S	S	L
sodium acetate	sat. sol.	S	S	S
sodium benzoate	35%	S	-	-
sodium bicarbonate	sat. sol.	S	S	S
sodium bisulfite	sol.	S	-	-
sodium bisulphate	sat. sol.	S	S	-
sodium carbonate	up to 50%	S	S	L
sodium chlorate	sat. sol.	S	-	-
sodium chloride	10%	S	S	S
sodium chlorite	2%	S	S	NS
sodium dichromate	sat. sol.	S	S	S
sodium hydroxide	up to 60%	S	S	S
sodium hypochlorite	5%	S	S	-
sodium hypochlorite	10%	S	S	-
sodium hypochlorite	20%	S	S	-
sodium mataphosphate	sol.	S	S	-
sodium nitrate	sat. sol.	S	S	-
sodium orthophosphate	sat. sol.	S	S	S
sodium perborate	sat. sol.	S	S	-
sodium silicate	sol.	S	S	-
sodium sulfide	sat. sol.	S	S	-
sodium sulfite	40%	S	S	S
sodium sulphate	sat. sol.	S	S	-
sodium thiosulphate (hypo)	sat. sol.	S	S	-
stannic chloride	sat. sol.	S	S	-
stannous chloride	sat. sol.	S	S	-
succinic acid	sat. sol.	S	S	-
sulphur dioxide, dry & wet	100%	S	S	-
sulphuric acid	up to 10%	S	S	S
sulphuric acid	10 to 30%	S	S	-

CHEMICALS	CONCENTRATION	20°C	60°C	100°C
sulphuric acid	50%	S	S	S
sulphuric acid	96%	S	S	NS
sulphuric acid	98%	L	L	NS
sulphurous acid	sol.	S	S	-
tartanic acid	10%	S	S	-
tetrahydrofuran	100%	L	NS	NS
tetrahydronaphthalene	100%	NS	NS	NS
triphenene	100%	S	L	-
toluene	100%	L	NS	NS
trichroecetic acid	up to 50%	S	S	-
trichroethylene	100%	NS	NS	NS
triethanolamine	sol.	S	-	-
turpentine		NS	NS	NS
urea	sat. sol.	S	-	-
water, brackish				
mineral - drinkable		S	S	S
water - distilled	100%	S	S	S
water - sea water		S	S	S

The Following Fluids To Be Avoided	Concentration
aliphatic hydrocarbons	100%
aqua regia	HCl/HNO ₃ = 3/1
benzol	100%
bromine water	sol.
bromine (dry vapour)	dil.
bromine (liquid)	100%
butyl acetate	100%
camphor oil	
chlorine, gaseous dry	100%
chlorine (liquid)	100%
chloroform	100%
chlorosulfonic acid	100%
cyclohexanone	100%
dekalin	100%
ethylacetate	100%
ethylchloride	100%
heptane	100%
isooctane	100%
nitric acid	over 40%
methyl bromide	100%
methyane chloride	100%
oleic acid	100%
oleum (sulphuric acid with 60% SO ₃)	
parafin oil	100%
sufuric acid	100%
tetrahydrofuran	100%
tetrahydronaphthalene	100%
totuene	100%
trichloroethylene	100%
turpentine	
xilene	100%

Certificated



Disclaimer

The information contained in this Technical Manual are general guidelines only. Tctermo cannot guarantee the performance of the processes or calculation procedures outlined. Any process and/or procedure should be validated prior planning, designing and installation by skill personnel well trained in plumbing trades. Building local codes and rules always have priority.

Product specifications are subject to change without notice. If you have any question, please contact Tctermo Technical Team at following address: **info@tctermo.com**

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