مصنع التقنية العصرية للبلاستيك

MODERN TECHNOLOGY FACTORY FOR PLASTIC

M.T.P.

The quality you can trust

THERMO PIPES & FITTINGS

PPr Pipe & Fitting Systems

Potable hot & cold water systems

CONTENTS

Introduction

Plastics and it's characteristics : Plastics is a class of substance which is hard and tough. The usage of plastics is widely accepted throughout the world because it is light in weight and has relatively higher strength than most metals and other materials.

Classification of plastics:
Plastics can be classified into two types. (a) Thermoplastics and (b) Thermos setting Plastic .

(b). Thermoplastics: The characteristics of thermoplastics is that they get softened under heat and again get hardened when cooled. This process can be repeated several times without any appreciable loss in physical properties. Due to this reason thermoplastics are not subjected to chemical change by heating.

Thermoplastics

- Commodity plastics
  - LDPE
  - HDPE
  - Polypropylene (PP)
  - Polystyrene.
  - PVC, etc.
- Engineering plastics (Performance plastics)
  - Polystyrene Co-Acrylonitrile (SAN)
  - Acrylonitrile Butadiene Styrene (ABS)
  - Poly methyl Methacrylate (PMMA)
  - Polybutylene Teraphthalate (PBT)
  - Polyacetal
  - Poly carbonate
  - Poly tetra fluoro Ethylene (PTFE), etc.

(b) Thermos setting Plastics: This kind of plastics get softened by the application of heat and undergo an internal change which makes them hard and is resistant to any further application of heat.

Polypropylene (PP) - This type of thermoplastic has an increasing crystallinity which is stabilized to higher temperature, from the polyoelfines group. It has higher melting point .

Polypropylene is in three different forms. Type 1-Poly propylene homopolymer (PP-H) Type 2-polypropylene block polymer (PP-B) & Type 3-poly propylene random copolymer (PP-r).

Polypropylene random copolymer (PP-r) - It is a modified copolymer with greater resistance to impact and the lower crystinity prevents the forming of hair cracks in the internal surface of the pipe.

PPr is not subjected to any restriction for use with food stuffs, and so it can be used for applications evolving edible substances. Because of its outstanding chemical resistance, high residential applications.

The basic material used for the production of MTP thermopipe system is polypropylene random Copolymer (PPr), - type 3.

Why PPr is introduced for Potable Hot & Cold water systems?

The compound PPr has gained major relevance in the world market because of its remarkable properties of mechanical resistance, inertia to chemical aggression impact strength, corrosion resistance and higher working temperature. PPr has the general properties of low density, good balance of stiffness to toughness low tendency to stress cracking and is easy to process and installation.

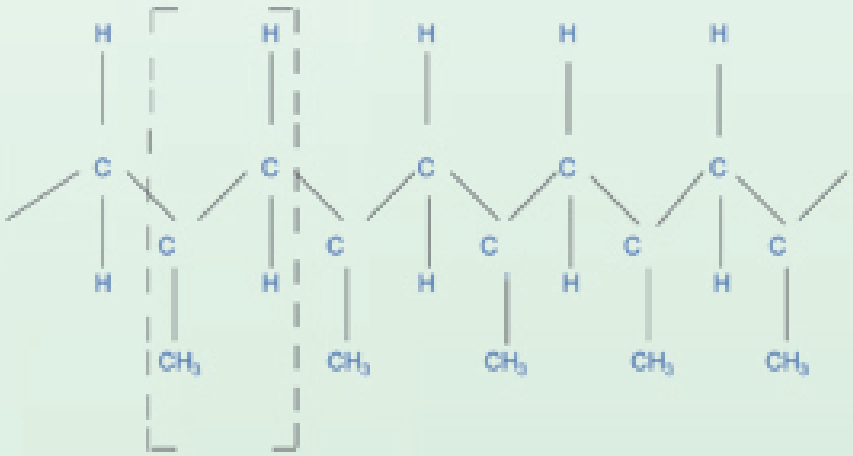
PPR is one of the thermoplastic material obtained by the polymerization of ethylene and propylene.

-P-P-P-E-P-P-P-E-P-_ _ _-P-P-E-P-P-P

P= Propylene, E = Ethylene (Comonomer)

Density	0.895g/cm^2
Molecular weight	500000
Modulus of elasticity	800N/mm^2
Expansion coefficient	0.15mm/m.K
Thermal conductivity	0.24W/mK (at 20°C)

Isotactic polypropylene



The most evident advantages which arise by comparing MTP PPr Pipes with the one made up of other traditional materials are.....

1. Corrosion Resistance:
The pipe system such as galvanized steel used for industrial and household application suffers a serious drawback of corrosion which is either by chemical reaction or by atmospheric action. Corrosion results elimination of metal ions from corroded pipes which affects health.

MTP PPr Pipe system overcomes the above factor since it is 100% resistive against corrosion when the flow substances having pH value between 1 to 14. ie, PPr pipe system can withstand acid and alkaline substances within a specified concentration and temperature range.

2. Frictional loss & Reduction in flow rate.
MTP PPr pipes has fine & smooth inside surface, frictional value is very low compared to other water conveying systems, which leads to better flow characteristics such as smooth uniform & laminar flow with less energy loss and pressure head.

3. Low pressure loss.
The PPr pipe is smooth and non porous which prevents lime scale formation and low pressure loss throughout the system.

4. Noise of flow.
PPr pipe systems has less noise of flow than metallic pipes.

5. Knocking and Water hammer:
PPr has a very good elastic property and is to have a good balance of stiffness to toughness it can withstand more compared to metallic and PVC pipes. PPr pipes system reduces noise and vibration due to water hammer.

6. Thermal conductivity & condensation.
MTP PPr possess the coefficient of thermal conductivity equal to 0.24W/mK. that means a very low thermal leakage, low condensation and less energy loss.

7. Easy Installation.
PPr pipes offers an easy installation methods for all conventional applications. PPr pipes and fittings are joined only by fusion, the system never faces any troubles throughout its life period. The further advantages of PPr pipe system is installations are quick and safe, high mechanical flexibility and is easy for repair and handling.

8. Life period.
The life period for PPr pipes can be calculated in advance for any working pressure and working temperature within the specified limits. In theoretical and practical experience the life period for the ppr pipes with an operating pressure of 12 bar and working temperature of 60^{0}C exceeds more than 50years.

9. Drinking water Approval.
MTP has achieved drinking water approval from (SASO) Saudi Arabian Standard Organization.

Mechanical & Thermal Properties

THERMO PIPE

PROPERTY	TEST METHOD	UNIT	VALUE
Viscosity number J Molecular weight average	ISO 1191 Solution viscosity C=0.001g/cm^3	Cm^3/g	420 500.00
Melt flow index MFI 190/5 MFI 230/5 MFI 230/2.16	ISO 1133 Condition 18 Condition 20 Condition 12	 G/10min G/10min G/10min	 0.5 1.5 0.35
Density	ISO / R 1183	G/cm^3	0.895
Melting Range	Polarization Microscope	^{0}C	140-150
Tensile stress at yeild Tensile strength at break Elongation at break	ISO / R 527 Speed D Test specimen	N/mm^2 N/mm^2 %	21 40 800
Ball indentation hardness	ISO 2039 (H 358/30)	N/mm^2	40
Flexural stress at 3.5% Outer fibre strain	ISO 178 Test Piece 5.1	N/mm^2	20
Modulus of elasticity	ISO 178	N/mm^2	800
Shear Modulus -10^0 0^0 10^0 20^0 30^0 40^0 50^0 60^0	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	 1100 770 500 370 300 240 180 140
Mechanical strength properties Determined by impact strength 0^{0}C	 Din 8078		 No failure
Impact strength (Charpy) RT ^{0}C -10^{0}C	ISO 179 Test specimen	 KJ/m^2 KJ/m^2 KJ/m^2	 No failure No failure No failure
Notched impact strength (Charpy) RT ^{0}C -20^{0}C	ISO 179 Test specimen	 KJ/m^2 KJ/m^2 KJ/m^2	 25 7 3
Coefficient of linear thermal expansion	VDE 0304 Part 1 & 4	 K^{-1}	 1.5X10^{-4}
Thermal conductivity at 20^{0}C	DIN 52612	W/mK	0.24
Specific heat at 20^{0}C	Adiabatic Calorimeter	KJ/kg K	2.0

During the production of thermopipes and fittings M T P is always one step ahead and comply with DIN standards and specifications. The general quality requirements and test condition is based on DIN 8078 and the dimensions are based on 8077.

The main factors which should be considered on designing and selection of net works are,

1. Working pressure & Creep rupture at different temperature:
Various tests were carried out to determine the internal pressure resistance and creep rupture strength of the pipe material. Sample pieces of both straight and bend pipes were tested in accordance with DIN 8078 : 1996-04 using the following test conditions as show .

Table - 1

Test temperature in °C	Contact medium	Period of stressing in hrs (minimum time to failure)	Proof stress σ_0 in N/mm²
20	Air or Water	1	16
95	Air or Water	1000	3.5
110	Air	8760	1.9

The proof pressure is calculated as p_0 $p = \frac{2.S_{min}.\sigma_0}{\bar{d} - S\ min}$

$\bar{d}$ = mean outside diameter

S_{min} - minimum wall thickness

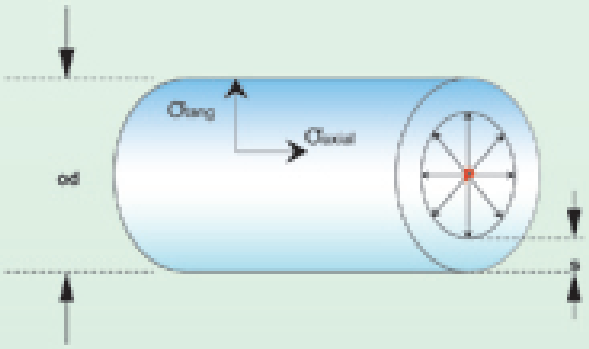
σ_0 - proof stress

The result of the test is that pipe shall neither burst nor leak during the prescribed period ofstressing.

2. Pipe under Internal pressure :

p = Internal pressure
d_m = mean diameter
s = wall thickness

$\sigma_{tangential} = 2.\sigma_{axial}$



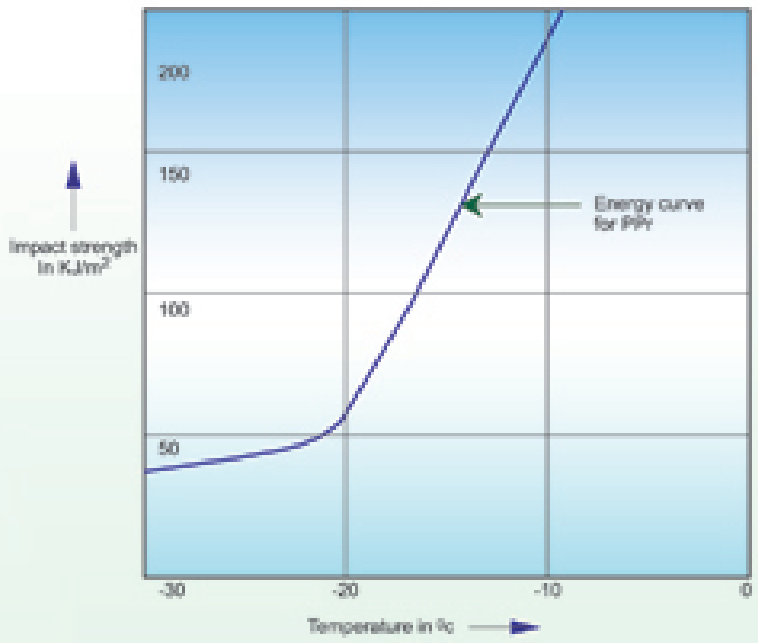
The Impact strength of PPr is more, compared to other plastic materials.

The impact resistance of PPr and the energy capacity is tested as per sample methods. Impact resistance of un notched specimens is tested at temperature of $(0 \pm 1)^0C$.

EXPANSION FORCE

The expansion forces are subjected to the pipe dimension and variation in temperature irrespective of the length of pipe. The expansion will be compensated by a corresponding supporting force. Due to this expansion compressive stress is developed. Pipe clamps will absorbs this compressive stress.

Fig. - 2



Calculation of Expanding force (Ft)

Ft = ExA x α_1 al x ΔT ;

E - Modulus of elasticity in N/m^2

A - Area of cross section of pipe in m^2

α_1 - Specific Coefficient of thermal expansion in K^{-1}

ΔT - Difference between service temperature and temperature during installation.

For MTP, PN 20 standard pipe $a = 0,15$

Note: 1). If the pipe is installed in brickwork or floor no compensation is necessary.

2). Pipes which are not installed in brickwork or floor compensating force should be provided

.

LINEAR EXPANSION AND CALCULATION

If the pipes are installed outside the wall or floor. The liner expansion of the pipe should be considered at higher operating temperature. Due to increase in temperature all materials are subjected to an increase in volume.
The expansion of PPr pipes is more than that of metallic pipes, so compensation measures should be provided.

Calculation of linear expansion;

Linear expansion , $\Delta L = \alpha \times L \times \Delta T$;

ΔT - Temperature difference between hot water and external temperature.

L - Pipe length in m

α - Linear expansion coefficient (mm/m K)

The linear expansion depends on length and temperature but is not influenced by the diameter of pipe. In cold water systems the pipes practically do not under go any linear expansion if only the installation temperature and that of operating temperature do not differ significantly to create ΔT.

Linear Expansion : MTP PN 20 Standard pipes

Pipe 1(m) Long	Temperature Difference 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	10.8
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	18.0	21.00	24.0
3,0	4.50	9.00	13.50	18.00	22.50	27.0	31.50	36.00
4,0	6.00	12.0	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	108.0
10,0	15.00	30.00	45.00	60.00	75.00	90.00	105.00	120.0

Table - 3

Calculation of Compensation with bending legs

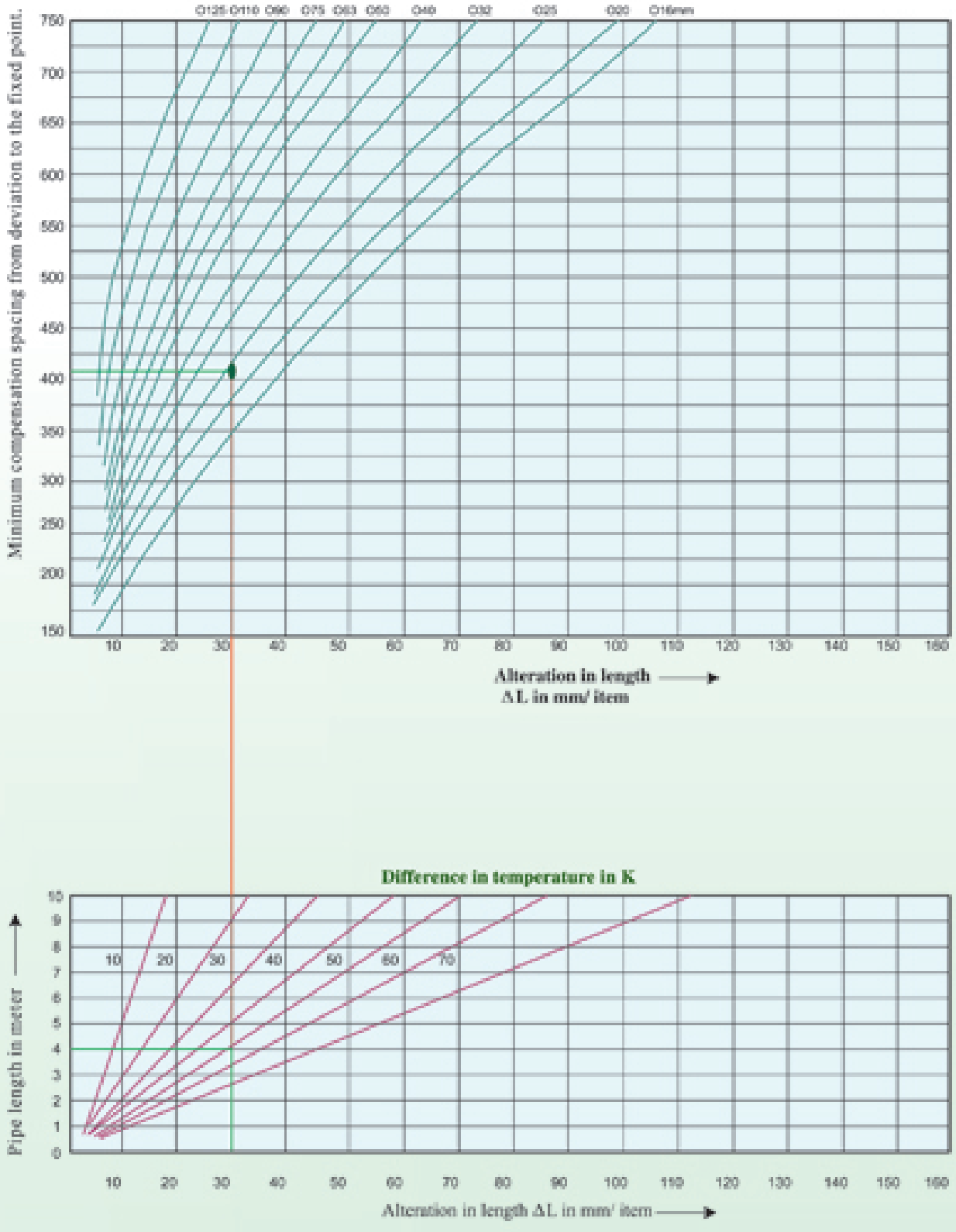


Fig - 5

Length between support intervals:
Spacing between support intervals depend on the difference in temperature between installation temperature and operating which based on pipe diameter (as shown in table -4) The following table shows the recommended support intervals for MTP PN - 20 standard pipe.

Determination of minimum length of bending legs & Compensation with bending legs.

Difference in temperature Δt (K)	Pipe diameter in mm										
	16	20	25	32	40	50	63	75	90	110	125
	Distance between support intervals in cm										
0	70	80	100	120	135	160	185	200	220	245	270
20	60	65	75	90	110	125	140	155	165	180	205
30	60	65	75	90	110	120	135	150	160	180	200
40	55	60	70	85	105	115	130	145	155	170	185
50	55	60	70	85	100	110	125	135	145	170	185
60	45	55	65	80	90	105	120	130	140	160	180
70	45	50	55	75	90	100	115	125	130	140	155
80	40	50	55	70	85	90	105	115	120	130	140

Table - 4

Thermal insulation for hot & cold water pipes

The thermal conductivity factor for MTP type - 3 PN 20 standard pipe is 0.24 W/mK. This means that according to heat transfer is considered, the pipe and fittings offers a higher degree of self insulation compared to metallic pipes and fittings. (table - 5) PPr cold water pipe lines eliminates almost completely the creation of condensation on the external surface of pipe lines.

Comparison of thermal conductivity

PP	0,24 W/mK
PE	0,35 W/mK
Steel	50 w / mK
Copper	400 w / mK

Table - 5

For cold water carrying system the insulation depends on the temperature of flow of water, room temperature, type of installation relative humidity and the condensation point. The thickness of insulation is based on the degree of condensation, thermal conductivity of insulating material and the threshold Δt above which the PPr pipe begins to form condensation.

In hot water carrying system the thickness of insulation depends on the temperature of flow of water, type of installation, thermal leakage , O.D of pipe and thermal conductivity of insulating material . The table shows the minimum thickness of insulation required for MTP - PN20 Standard pipes.

Required insulation thickness for hot water pipe lines as shown in table - 6

Nominal width (t) of pipe lines in mm	Un covered pipe line	Pipe and fittings in wall or ceiling passages, in cross sections of Pipe lines at pipe connections, for central pipe net distributors & radiator connecting pipes with maximum 8m length
Up to t = 20	20 mm	10 mm
From t = 22 to 35	30 mm	15 mm
From t = 40 to 100	equal to t	0.5 t
t is above 100	100 mm	50 mm

Table - 6

Minimum thickness of insulation for cold water lines shown in table - 7

Type of insulation	Insulation thickness
Open installation in non heated rooms	4mm
Open installation in the heated rooms	9mm
Installation in ducts without neighboring hot water pipes	4mm
Installation in ducts with neighboring hot water pipes	13mm
Concealed installation, pipe chase risers	4mm
Installation in the walls nearing the hot water pipes	13mm
Installation on the concrete flooring	4mm

Table - 7

Condensation factor

Following table - 8 shows the sensitivity threshold t above which MTP thermopipes begins to form condensation.

Pipe outside diameter/c	Δt
20x3.4mm	7.2°C
25x4.2mm	7.4°C
32x5.4mm	8.0°C
40x6.7mm	8.5°C
50x8.3mm	10.0°C
63x10.5mm	10.5°C
75x12.5mm	10.8°C
90x15.0mm	11.0°C
110x18.3mm	11.5°C
125x20.8mm	12.0°C

Table - 8

Clamping devices :

Pipe clamping of PPr Pipes depends on the fastening material which should not damage the surface of pipe.

The ideal fastening material for MTP PPr pipes are rubber lined pipe clamp. The fixed points are selected in such a way that the forces of expansion should be neutralized by the clamping force . Furthermore the additional loads are absorbed by the clamping.

The selection of clamping depends on, Fixed point or Sliding point as shown in fig - 4 .

Fixed Point : Fixed point clamps absorb the additional loads and act as supports for the pipe line. While selecting fixed points the linear expansion of pipe should be considered.

Sliding points: Sliding points clamps allow axial movement of pipe without any damage. Sliding point clamps act as supports and does not allow deformation of pipe line. On installing a sliding support it has to be observed that the movements of the pipe lines are not hindered by fittings installed next to them.

Calculation of Linear expansion: For finding the distance between clamps the following are to be calculated.

- Linear expansion.
- Length of bending side.
- Breadth of expansion loop.

Length of bending side : is the change in direction to compensate linear expansion in pipe. Its value depends on the pipe outer diameter.

Breadth of Expansion loop: Expansion loop is provided if the linear expansion can not be compensated by change in direction.

Consider B_{min} is the minimum width of the expansion loop.

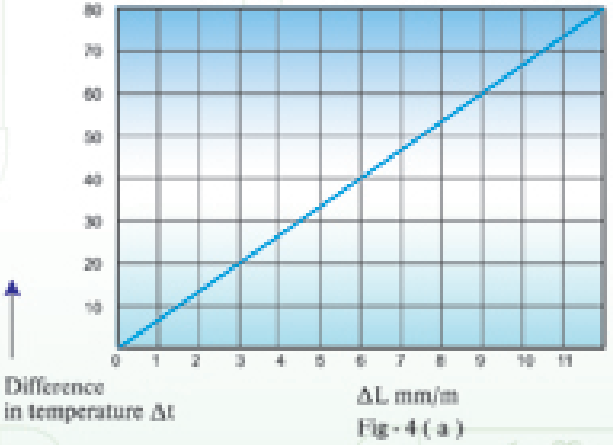


Fig - 4 (a)

Linear expansion , $\Delta L = a \times L \times \Delta t$

Consider , pipe length of 4m ie, L = 4m

For MTP PN20 standard pipe , $\alpha = 0.15$ mm/mK

Δt = Difference between working temperature and installation.

Let, Working temperature = 70^0C

Installation temperature = 20^0C

then, ΔL = 30mm [as shown in fig - 4 (a)]

Length of bending side, $L_S = K\sqrt{d \times \Delta L}$

ΔL - linear expansion.

d - Outside diameter.

K = 15 for MTP PN20

(material specific constant)

ie, $L_S = 15\sqrt{25 \times 30}$

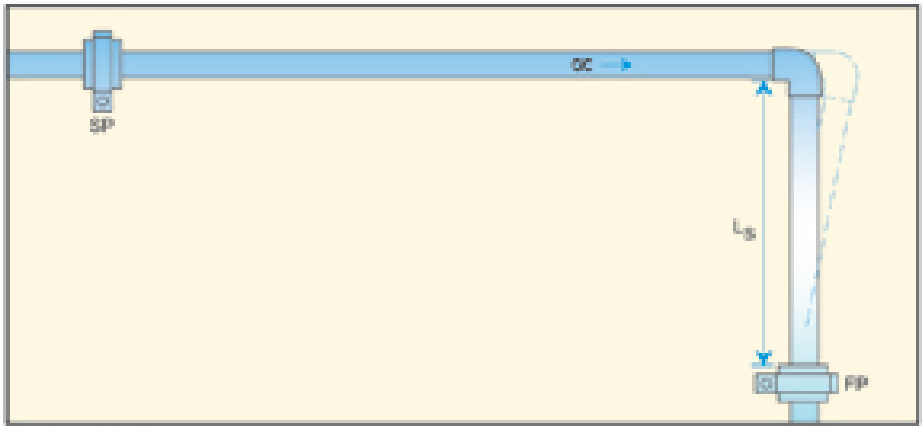
= 410mm

The minimum pipe bend, $B_{min} = 2 \times \Delta L$ + Safe distance.

ie, B_{min} = (2 x 30 + 150)m

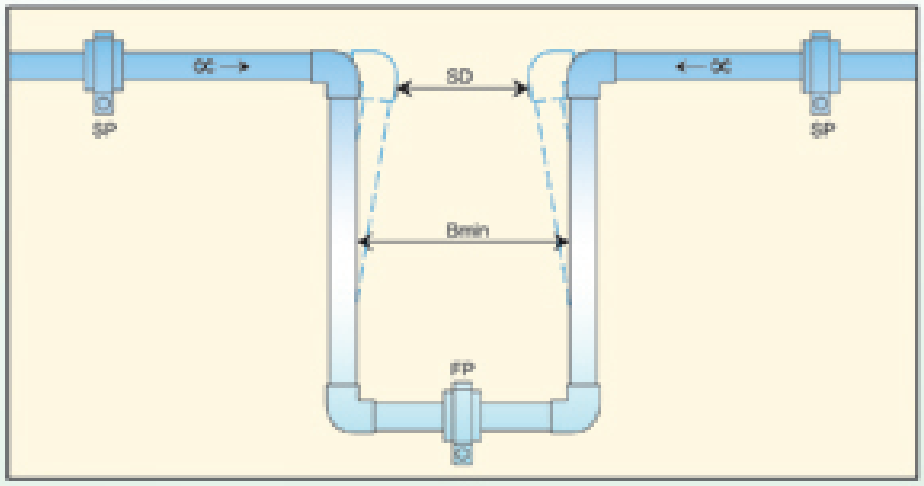
= 210mm

a . Bending Side



SP = Sliding Point
FP = Fixed Point

b. Expansion Loop



SP = Sliding Point
FP = Fixed Point

Joining of MTP Pipes and fittings.

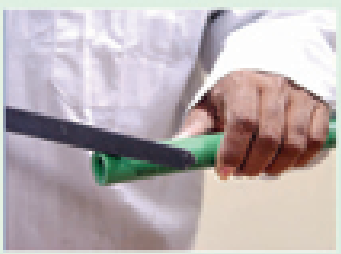
Reliability of MTP Pipe system depends on the joining of the pipe and fittings as well as the material used and process quality. MTP Pipes and fittings can be joined either by socket welding or by electro fusion method. The efficiency of the joint is more, because (1) In PPr pipes and fittings no solvent is used (2) The surface of pipe and fittings melted together and results a 100% molecular bond which can withstand the required operating conditions of pressure and temperature.

To make sure a better quality installation MTP recommends the following techniques for fusion welding.

1. Pipes are measured and cut to the required length. The cutting edge should be perpendicular to the axis of the pipe. The outer corner of the pipe is rounded off by a file and the inner corner is rounded off by using a knife. The surface of pipe and fitting to be joined should be cleaned and make sure that no inhomoginities are present. The socket depth of the welding distance should be marked to the end of the pipe.

2. Welding machine is connected to power and if thermostat is installed on the machine, set the temperature at 260^{0}C. The red light is on during warming up , and when the light is off the welding machine is ready for welding. If no thermostat is installed on the machine the welding machine is connected to power, and welding machine will get ready for welding when the red light is off.

3. The pipe end and the socket of fitting are pushed to welding bushing in axial direction. Pipe and fitting should be heated at the same time at the end of heating period that means, till the marked portion of pipe and the end of socket of fitting get melted the pipe and fitting is removed from the bushing.



4. The pipe and fitting which is removed from the heating element , is quickly joined together in axial direction. During joining the pipe should not be turned around its axis in the socket of fitting. It is permitted to turn the pipe only a small degree (10^0 . 15^0) in order to make co axial direction.

5. After joining the joined part should be kept for the required cooling time.

Notes :

1. For each welding process, always make sure that the welding machine has required temperature.

2. Do not push the pipe on the welding bushing, more faster than fitting. [Since for pipes the melted material is coming out from the bushing, it is easier to push the pipe more faster than fitting.]

3. Any tests on the assembled parts should be done only after

one hour of the last welding.

4. Always make sure that welding bushing used are MTP's recommended types.

5. After the whole welding process is finished, the welding machine is allowed to cool naturally.

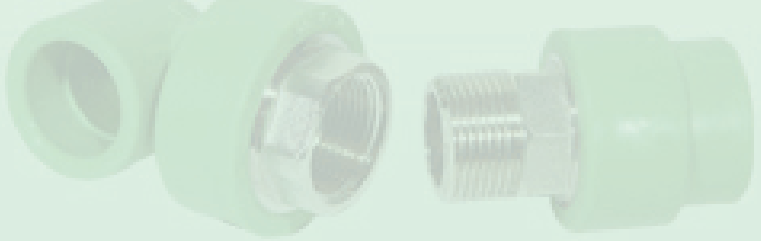
The following table shows the recommended welding processing time for MTP products.

Pipe size in mm	Heating time Sec.	Joining time in Sec.	Cooling time for Joined parts in Min.
O 16mm	7	4	2
O 20mm	7	4	2
O 25mm	7	4	2
O 32mm	8	6	4
O 40mm	12	6	4
O 50mm	18	6	4
O 63mm	24	8	6
O 75mm	30	8	6
O 90mm	40	8	6
O 110mm	50	10	8
O 125mm	60	10	8

Chemical Resistance of MTP Thermo Pipe

THERMO PIPE

Flow substance	Content %	Behavior at different temperature		
		20°C	60°C	100°C
Waste gases/gas mixture				
- containing hydrogen fluoride	Traces	R	R	-
- Containing CO2	any	R	R	-
- Containing CO	any	R	R	-
- Contain hydrochloric acid	any	R	R	-
Caustic soda	up to 60%	R	R	R
Formic acid, aqueous	10 %	R	R	C
Formic acid, aqueous	85 %	R	C	NR
Ammonia				
- Liquid	TR	R	-	-
- Gaseous	TR	R	R	-
Ammonia solution	GL	R	R	-
Ammonium chloride	GL	R	R	-
Ammonium nitrate	GL	R	R	R
Benzene	TR	C	NR	NR
Beer	H	R	R	R
Bleaching liquor (sodium hypochlorite)	20 %	C	C	NR
Borax	L	R	R	-
Boric acid	GL	R	R	R
All type of spirits	H	R	R	-
Calcium carbonate	GL	R	R	R
Calcium chloride	GL	R	R	R



Chemical Resistance of MTP Thermo Pipe

Flow substance	Content %	Behavior at different temperature		
		20°C	60°C	100°C
Drinking water (chlorinated)	TR	R	R	R
Magnesium chloride.	GL	R	R	R
Magnesium hydroxide carbonate	GL	R	R	R
Magnesium salts	GL	R	R	–
Magnesium sulphate	GL	R	R	R
Sea water	H	R	R	R
Milk	H	R	R	R
Mineral water	H	R	R	R
Naphtha	H	R	NR	NR
Sodium acetate	GL	R	R	R
Sodium carbonate , aqueous	50%	R	R	C
Sodium Chloride	VL	R	R	R
Sodium dichromate	GL	R	R	R
Sodium bicarbonate	GL	R	R	R
Sodium bisulphate	GL	R	R	–
Sodium bisulphite	L	R	–	–
Sodium nitrate	GL	R	R	–
Sodium hydroxide solution	Up to 60%	R	R	R
Mercury	TR	R	R	–
Hydrochloric acid, aqueous	Up to 20%	R	R	–
Sulphuric acid , aqueous	10%	R	R	R
Silicone oil	TR	R	R	R
Detergents	VL	R	R	R
Water (pure)	H	R	R	R
Citric acid	VL	R	R	R
Wine vinegar, table vinegar	H	R	R	R
Sugar syrup	H	R	R	–

Note :

VL - aqueous solution , weight content is less than 10%

L - aqueous solution , weight content is greater than 10%

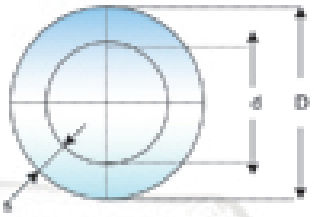
GL - Saturated aqueous solution (at 20°C)

TR - Flow substance is at least technically pure

H - Commercially available composition

THERMO PIPE

Nominal pressure	- 20 bar
Pipe series	- 2.5
Std : dimension ratio	- 6
Std : Reference	- Acc. DIN 8077/78 : 1999-07
MTP standard colour	- Green



MTP THERMOPIPES

Ref; acc. to DIN 8078/8077

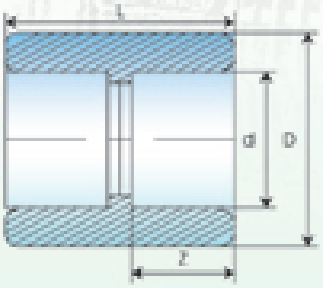
Pipe dimension	Outside diameter (D) mm	Wall thickness (S) mm	Internal diameter (d) mm	Weight Kg/m
20 mm	20.0	3.40 - 4.00	13.20	0.172
25 mm	25.0	4.20 - 4.90	16.60	0.266
32 mm	32.0	5.40 - 6.20	21.20	0.434
40 mm	40.0	6.70 - 7.60	26.60	0.671
50 mm	50.0	8.30 - 9.40	33.40	1.040
63 mm	63.0	10.50 - 11.80	42.00	1.650
75 mm	75.0	12.50 - 14.00	50.00	2.340
90 mm	90.0	15.00 - 16.70	60.00	3.360
110 mm	110.0	18.3 - 20.4	73.20	5.010
125 mm	125.0	20.80 - 23.10	83.40	6.470

18.3 - 20.4

MTP THERMO FITTINGS (25 bar)

MTP COUPLER

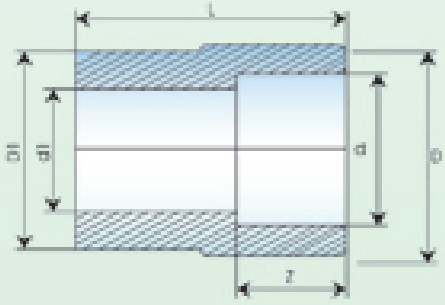
Ref; acc. to DIN 16962



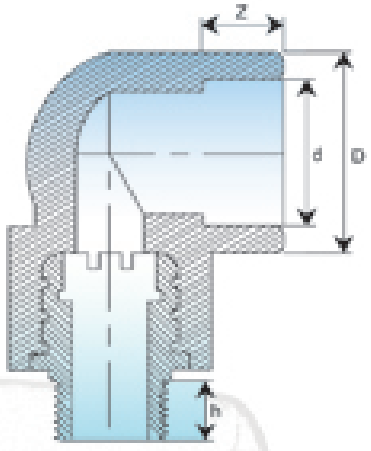
ITEM	D	d	L	Z
	in mm	in mm	in mm	in mm
O20	29.00	19.00	31.00	14.50
O25	34.00	24.00	39.00	16.00
O32	42.00	31.00	43.00	18.00
O40	52.00	39.00	49.00	20.50
O50	67.00	49.00	53.00	23.50
O63	83.00	62.00	60.00	27.50
O75	100.00	74.00	68.00	30.00
O90	120.00	89.00	78.00	33.00
O110	146.00	109.00	88.00	37.00
O125	168.00	124.00	96.00	40.00

MTP REDUCER (Bush Type)

Ref; acc. to DIN 16962



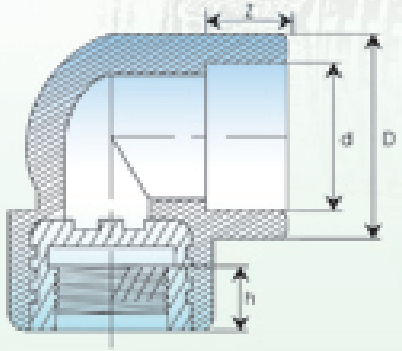
ITEM	d	D	d1	D1	Z	L
	in mm	in mm	in mm	in mm	in mm	in mm
O25/20	19.00	29.00	16.00	25.00	14.50	35.00
O25/20	21.00	32.00	19.00	29.00	14.50	42.00
O32/25	24.00	34.00	19.00	32.00	16.00	44.00
O40/20	26.00	40.00	19.00	29.00	14.50	50.00
O40/25	26.00	40.00	24.00	35.00	16.00	50.00
O40/32	31.00	43.00	24.00	40.00	22.00	53.00
O50/25	33.00	50.00	24.00	34.00	16.00	55.00
O50/32	30.00	50.00	31.00	43.00	19.00	55.00
O50/40	39.00	54.00	30.00	50.00	21.00	55.00
O63/25	42.00	63.00	24.00	35.00	16.00	65.00
O63/32	42.00	63.00	31.00	43.00	18.00	65.00
O63/40	39.00	55.00	42.00	63.00	20.50	65.00
O63/50	49.00	68.00	42.00	63.00	23.50	65.00
O75/63	62.00	84.00	50.00	75.00	27.50	68.80
O90/63	62.00	84.00	60.00	90.00	27.50	76.20
O90/75	74.00	100.00	60.00	90.00	30.00	76.20
O110/90	89.00	119.00	74.00	110.00	33.00	86.60
O125/63	62.00	84.00	85.00	125.00	27.50	94.70
O125/75	74.00	100.00	85.00	125.00	33.00	94.70
O125/90	89.00	119.00	85.00	125.00	33.00	94.70



MTP 90^0 ELBOW WITH MALE INSERT

Ref; acc to DIN 16962

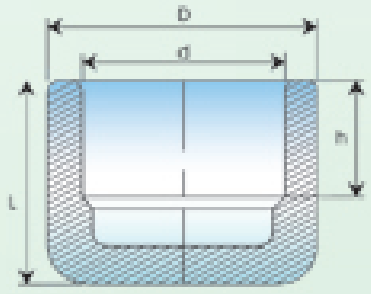
ITEM	d	D	Z	h
	in mm	in mm	in mm	in mm
O20x1/2"	19.00	29.00	14.50	13.00
O25x1/2"	24.00	34.00	16.00	13.00
O25x3/4"	24.00	34.00	16.00	14.00
O32x3/4"	31.00	42.00	18.00	14.00
O32x1"	31.00	42.00	18.00	20.00



MTP 90^0 ELBOW WITH FEMALE INSERT

Ref; acc to DIN 16962

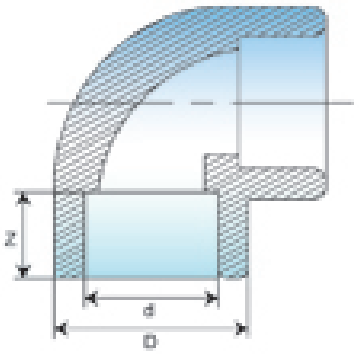
ITEM	d	D	Z	h
	in mm	in mm	in mm	in mm
O20x1/2"	19.00	29.00	14.50	13.00
O25x1/2"	24.00	34.00	16.00	13.00
O25x3/4"	24.00	34.00	16.00	14.00
O32x3/4"	31.00	42.00	18.00	14.00
O32x1"	31.00	42.00	18.00	20.00



MTP END CAP

Ref; acc to DIN 16962

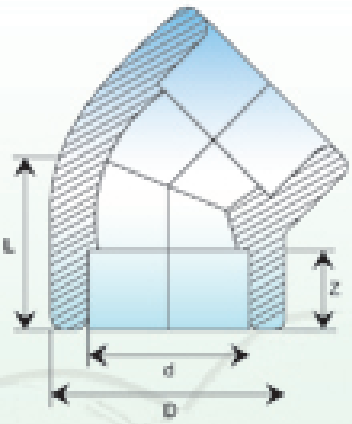
ITEM	d	D	Z	L
	in mm	in mm	in mm	in mm
O20	19.00	29.00	14.50	26.00
O25	24.00	34.00	16.00	26.00
O32	31.00	43.00	18.00	31.50
O40	39.00	53.00	20.50	34.00
O50	49.00	69.00	23.50	39.00
O63	62.00	86.00	27.50	46.00
O73	74.00	100.00	30.00	56.30
O90	89.00	120.00	33.00	67.20
O110	109.00	146.00	37.00	78.60
O125	124.00	168.00	40.00	85.70



MTP 90° ELBOW

Ref; acc to DIN 16962

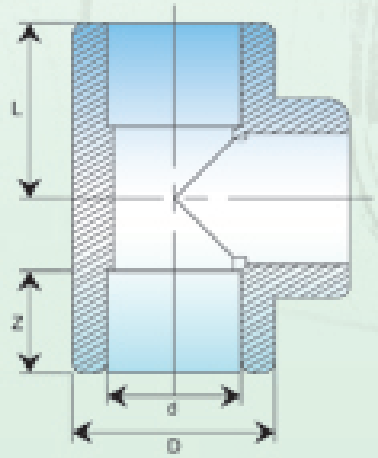
ITEM	d	D	Z
	in mm	in mm	in mm
O20	19.00	29.00	14.50
O25	24.00	34.00	16.00
O32	31.00	43.00	18.00
O40	39.00	53.00	20.50
O50	49.00	69.00	23.50
O63	62.00	86.00	27.50
O75	74.00	100.00	30.00
O90	89.00	120.00	33.00
O110	109.00	146.00	37.00
O125	124.00	168.00	40.00



MTP 45° ELBOW

Ref; acc to DIN 16962

ITEM	d	D	Z	L
	in mm	in mm	in mm	in mm
O20	19.00	29.00	14.50	18.00
O25	24.00	34.00	16.00	21.00
O32	31.00	43.00	18.00	26.00
O40	39.00	53.00	20.50	29.00
O50	49.00	69.00	23.50	35.00
O63	62.00	86.00	27.50	42.00
O75	74.00	100.00	30.00	46.50
O90	89.00	120.00	33.00	53.00
O110	109.00	146.00	37.00	60.50
O125	124.00	168.00	40.00	67.00



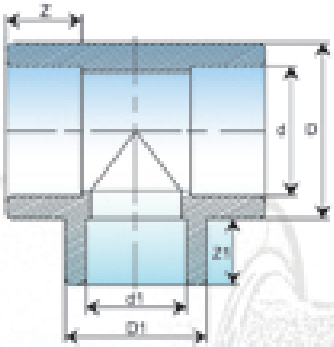
MTP TEE

Ref; acc to DIN 16962

ITEM	d	D	Z	L
	in mm	in mm	in mm	in mm
O20	19.00	29.00	14.50	25.50
O25	24.00	34.00	16.00	31.00
O32	31.00	43.00	18.00	35.00
O40	39.00	53.00	20.50	42.00
O50	49.00	69.00	23.50	50.00
O63	62.00	86.00	27.50	60.50
O75	74.00	100.00	30.00	68.00
O90	89.00	120.00	33.00	80.00
O110	109.00	146.00	37.00	92.00
O125	124.00	168.00	40.00	116.00

MTP REDUCING TEE

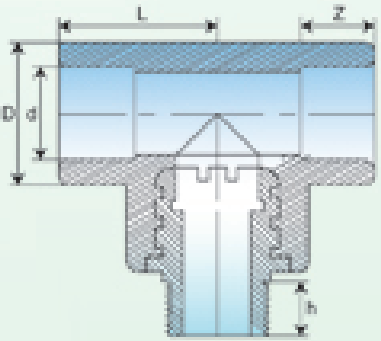
Ref; acc. to DIN 16962



ITEM	d	D	d1	D1	Z	Z1
	in mm	in mm	in mm	in mm	in mm	in mm
O 25/20	24.00	34.00	19.00	29.00	16.00	14.50
O 32/20	31.00	42.00	19.00	29.00	18.00	14.50
O 32/25	31.00	42.00	24.00	34.00	18.00	16.00
O 40/25	39.00	52.00	24.00	34.00	20.50	16.00
O 40/32	39.00	52.00	31.00	42.00	20.50	18.00
O 50/25	49.00	67.00	24.00	34.00	23.50	16.00
O 50/32	49.00	67.00	31.00	42.00	23.50	18.00
O 50/40	49.00	67.00	39.00	52.00	23.50	20.50
O 63/25	62.00	84.00	24.00	34.00	27.50	16.00
O 63/32	62.00	84.00	31.00	42.00	27.50	18.00
O 63/40	62.00	84.00	39.00	52.00	27.50	20.50
O 63/50	62.00	84.00	49.00	67.00	27.50	23.50
O 75/63	74.00	100.00	62.00	84.00	30.00	27.50
O 90/63	89.00	120.00	62.00	84.00	33.00	27.50
O 90/75	89.00	120.00	74.00	100.00	33.00	30.00
O 110/90	109.00	146.00	89.00	120.00	37.00	33.00
O 125/63	124.00	168.00	62.00	84.00	40.00	27.50
O 125/75	124.00	168.00	74.00	100.00	40.00	30.00
O 125/90	124.00	168.00	89.00	120.00	40.00	33.00

MTP TEE WITH MALE INSERT

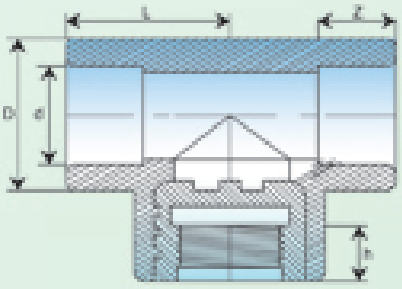
Ref; acc to DIN 16962



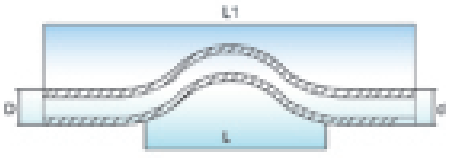
ITEM	d	D	Z	L	h
	in mm	in mm	in mm	in mm	in mm
O20x1/2"	19.00	29.00	14.50	25.50	13.00
O25x1/2"	24.00	34.00	16.00	31.00	13.00
O25x3/4"	24.00	34.00	16.00	31.00	14.00
O32x3/4"	31.00	42.00	18.00	35.00	14.00
O32x1"	31.00	42.00	18.00	35.00	20.50

MTP TEE WITH FEMALE INSERT

Ref; acc to DIN 16962



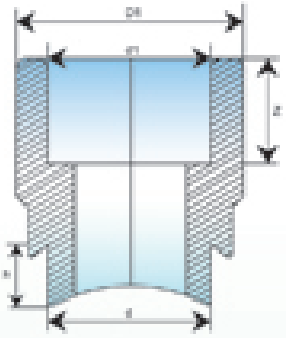
ITEM	d	D	Z	L	h
	in mm	in mm	in mm	in mm	in mm
O20X1/2"	19.00	29.00	14.50	25.50	17.00
O25x1/2"	24.00	34.00	16.00	31.00	17.00
O25x3/4"	24.00	34.00	16.00	31.00	17.00
O32x3/4"	31.00	42.00	18.00	35.00	17.00
O32x1"	31.00	42.00	18.00	35.00	22.00



MTP CROSS OVER

Ref; acc. to DIN 16962

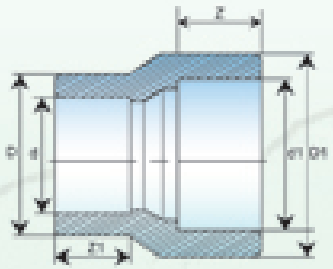
ITEM	d	L1	L
	in mm	in mm	in mm
O20	20.00	354.00	190.00
O25	25.00	357.00	210.00
O32	32.00	357.00	210.00



MTP SADDLE

Ref; acc. to DIN 16962

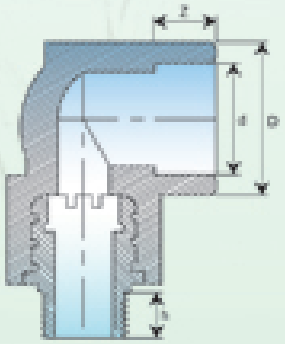
ITEM	d	d1	D1	Z	h
	in mm	in mm	in mm	in mm	in mm
O 50/25	25.00	24.00	34.00	16.00	8.30
O 63/25	25.00	24.00	34.00	16.00	10.50
O 50/32	32.00	31.00	43.00	18.00	8.30
O 63/32	32.00	31.00	43.00	18.00	10.50
O 75/32	32.00	31.00	43.00	18.00	12.50
O 90/32	32.00	31.00	43.00	18.00	15.00
O 110/32	32.00	31.00	43.00	18.00	18.30
O 125/32	32.00	31.00	43.00	18.00	20.80



MTP REDUCER (Coupler type)

Ref; acc. to DIN 16962

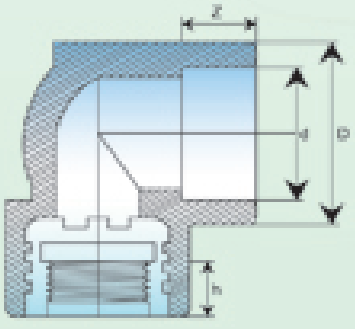
ITEM	d	D	d1	D1	Z	Z1
O 25/20	19.00	29.00	24.00	34.00	16.00	14.50
O 32/25	24.00	34.00	31.00	42.00	18.00	16.00



MTP 90° ELBOW WITH MALE INSERT AND DOUBLE FIXING BRACKET

Ref; acc. to DIN 16962

ITEM	d	D	Z	h
	in mm	in mm	in mm	in mm
O 20x1/2"	19.00	29.00	14.50	13.00
O 25x1/2"	24.00	34.00	16.00	14.00



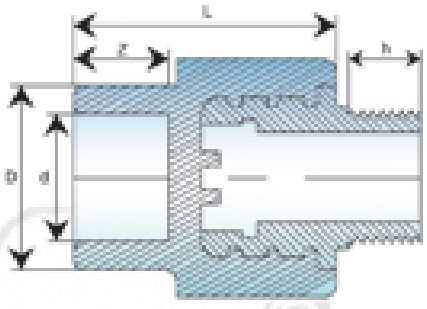
MTP 90° ELBOW WITH FEMALE INSERT AND DOUBLE FIXING BRACKET

Ref; acc. to DIN 16962

ITEM	d	D	Z	h
	in mm	in mm	in mm	in mm
O 20x1/2"	19.00	29.00	14.50	13.00
O 25x1/2"	24.00	34.00	16.00	14.00

MTP ADAPTER WITH MALE INSERT

Ref; acc. to DIN 16962

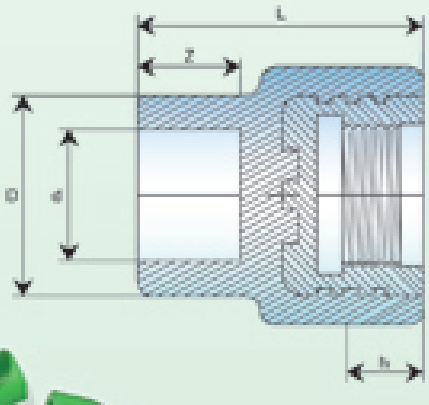


ITEM	d	D	Z	L	h
	in mm	in mm	in mm	in mm	in mm
O 20x1/2"	19.00	29.00	14.50	41.00	13.00
O 20x3/4"	19.00	29.00	14.50	41.00	14.00
O 25x1/2"	24.00	34.00	16.00	42.00	13.00
O 25x3/4"	24.00	34.00	16.00	41.00	14.00
O 32x3/4"	31.00	42.00	18.00	43.00	14.00
O 32x1"	31.00	42.00	18.00	44.00	20.00
O 40x11/4"	39.00	52.00	20.50	46.00	20.00
O 50x11/2"	49.00	67.00	23.50	51.00	20.00
O 63x2"	62.00	83.00	27.50	57.00	23.00
O 75x21/2"	74.00	100.00	30.00	58.00	28.00
O 90x3"	89.00	120.00	33.00	60.00	30.00
O 110x4"	109.00	146.00	37.00		
O 125x41/2"	124.00	168.00	40.00		

MTP ADAPTER WITH FEMALE INSERT

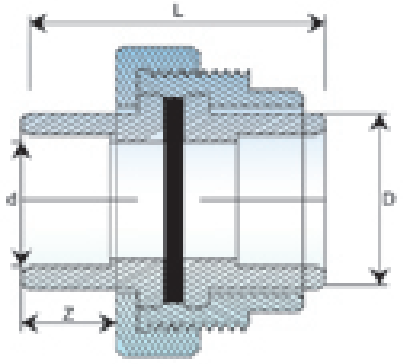
Ref; acc. to DIN 16962

ITEM	d	D	Z	L	h
	in mm	in mm	in mm	in mm	in mm
O 20x1/2"	19.00	29.00	14.50	41.00	13.00
O 20x3/4"	19.00	29.00	14.50	41.00	14.00
O 25x1/2"	24.00	34.00	16.00	42.00	13.00
O 25x3/4"	24.00	34.00	16.00	41.00	14.00
O 32x3/4"	31.00	42.00	18.00	43.00	14.00
O 32x1"	31.00	42.00	18.00	44.00	20.00
O 40x11/4"	39.00	52.00	20.50	46.00	20.00
O 50x11/2"	49.00	67.00	23.50	51.00	20.00
O 63x2"	62.00	83.00	27.50	57.00	23.00
O 75x21/2"	74.00	100.00	30.00	58.00	28.00
O 90x3"	89.00	120.00	33.00	60.00	30.00
O 110x4"	109.00	146.00	37.00		
O 125x41/2"	124.00	168.00	40.00		



MTP UNION ADAPTER WITH SHORT NECK

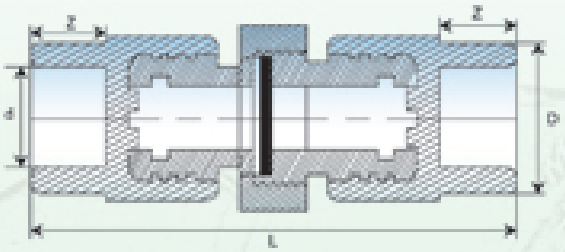
Ref; acc. to DIN 16962



ITEM	d	D	Z	L
	in mm	in mm	in mm	in mm
O 20x1/4"	19.00	29.00	14.50	48.00
O 25x1/2"	24.00	34.00	16.00	55.00
O 32x2"	31.00	29.00	18.00	72.00
O 40x21/2"	39.00	53.00	20.50	75.00
O 50x3"	49.00	69.00	23.50	86.00
O 63x4"	62.00	86.00	27.50	105.0
O 75	74.00	100.00	30.00	
O 90	89.00	120.00	33.00	
O 110	109.00	146.00	37.00	
O 125	124.00	168.00	40.00	

MTP UNION ADAPTER WITH LONG NECK

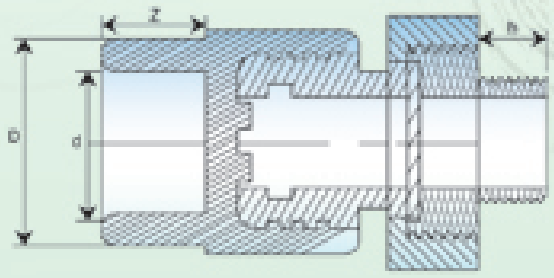
Ref; acc. to DIN 16962



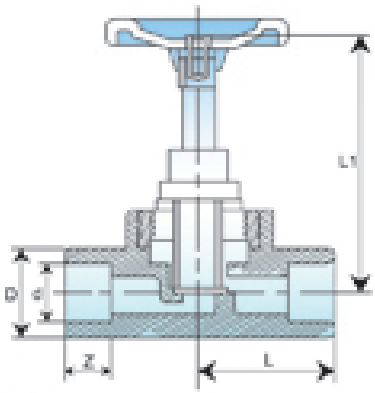
ITEM	d	D	Z	L
	in mm	in mm	in mm	in mm
O 20x1/2"	19.00	29.00	14.50	118.00
O 25x1/2"	24.00	34.00	16.00	120.00
O 32x1"	31.00	42.00	18.00	150.00
O 40x11/4"	39.00	52.00	20.50	158.00
O 50x11/2"	49.00	67.00	23.50	166.00
O 63x2"	62.00	83.00	27.50	180.00
O 75x21/2"	74.00	100.00	30.00	
O 90x3"	89.00	120.00	33.00	
O 110x4"	109.00	146.00	37.00	
O 125x41/2"	124.00	168.00	40.00	

MTP UNION ADAPTER WITH LONG NECK MALE

Ref; acc. to DIN 16962



ITEM	d	D	Z	h
	in mm	in mm	in mm	
O 20x1/2"	19.00	29.00	14.50	13.00
O 25x1/2"	24.00	34.00	16.00	13.00
O 32x1"	31.00	42.00	18.00	20.00
O 40x11/4"	39.00	52.00	20.50	20.00
O 50x11/2"	49.00	67.00	23.50	20.00
O 63x2"	62.00	83.00	27.50	23.00
O 75x21/2"	74.00	100.00	30.00	28.00
O 90x3"	89.00	120.00	33.00	30.00
O 110x4"	109.00	146.00	37.00	
O 125x41/2"	124.00	168.00	40.00	

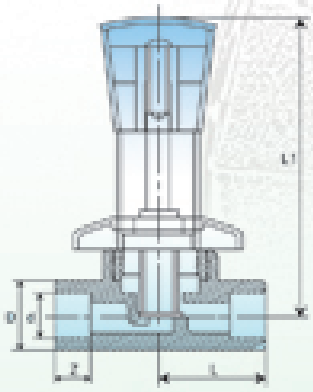


MTP VALVES

MTP GATE VALVE

Ref; acc. to DIN 16962

ITEM	d	D	Z	L	L1
	in mm	in mm	in mm	in mm	in mm
O 20	19.00	34.00	14.50	44.00	67.00
O 25	24.00	34.00	16.00	44.00	67.00
O 32	31.00	43.00	18.00	49.00	77.00

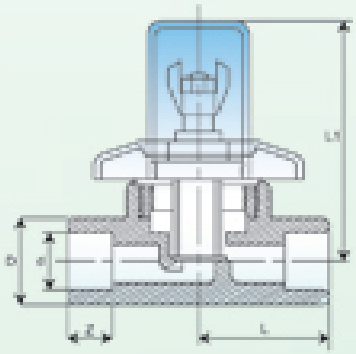


MTP CONCEALED NORMAL VALVE

WITH CHROMED UPPER PART

Ref; acc. to DIN 16962

ITEM	d	D	Z	L	L1
	in mm	in mm	in mm	in mm	in mm
O 20	19.00	34.00	14.50	44.00	126.50
O 25	24.00	34.00	16.00	44.00	126.50
O 32	31.00	43.00	18.00	49.00	126.50

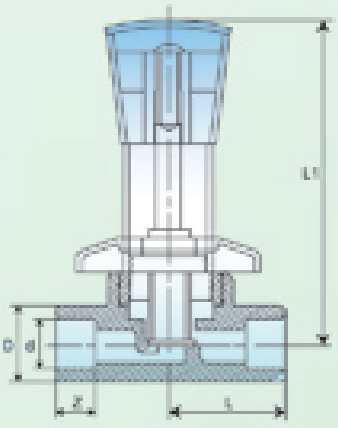


MTP CLOSED COVER VALVE

WITH CHROMED UPPER PART

Ref; acc. to DIN 16962

ITEM	d	D	Z	L	L1
	in mm	in mm	in mm	in mm	in mm
O 20	19.00	34.00	14.50	44.00	92.00
O 25	24.00	34.00	16.00	44.00	92.00
O 32	31.00	43.00	18.00	49.00	104.00



MTP CONCEALED MTP VALVE

WITH CHROMED UPPER PART

Ref; acc. to DIN 16962

ITEM	d	D	Z	L	L1
	in mm	in mm	in mm	in mm	in mm
O 20	19.00	34.00	14.50	44.00	126.50
O 25	24.00	34.00	16.00	44.00	126.50
O 32	31.00	43.00	18.00	49.00	126.50

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