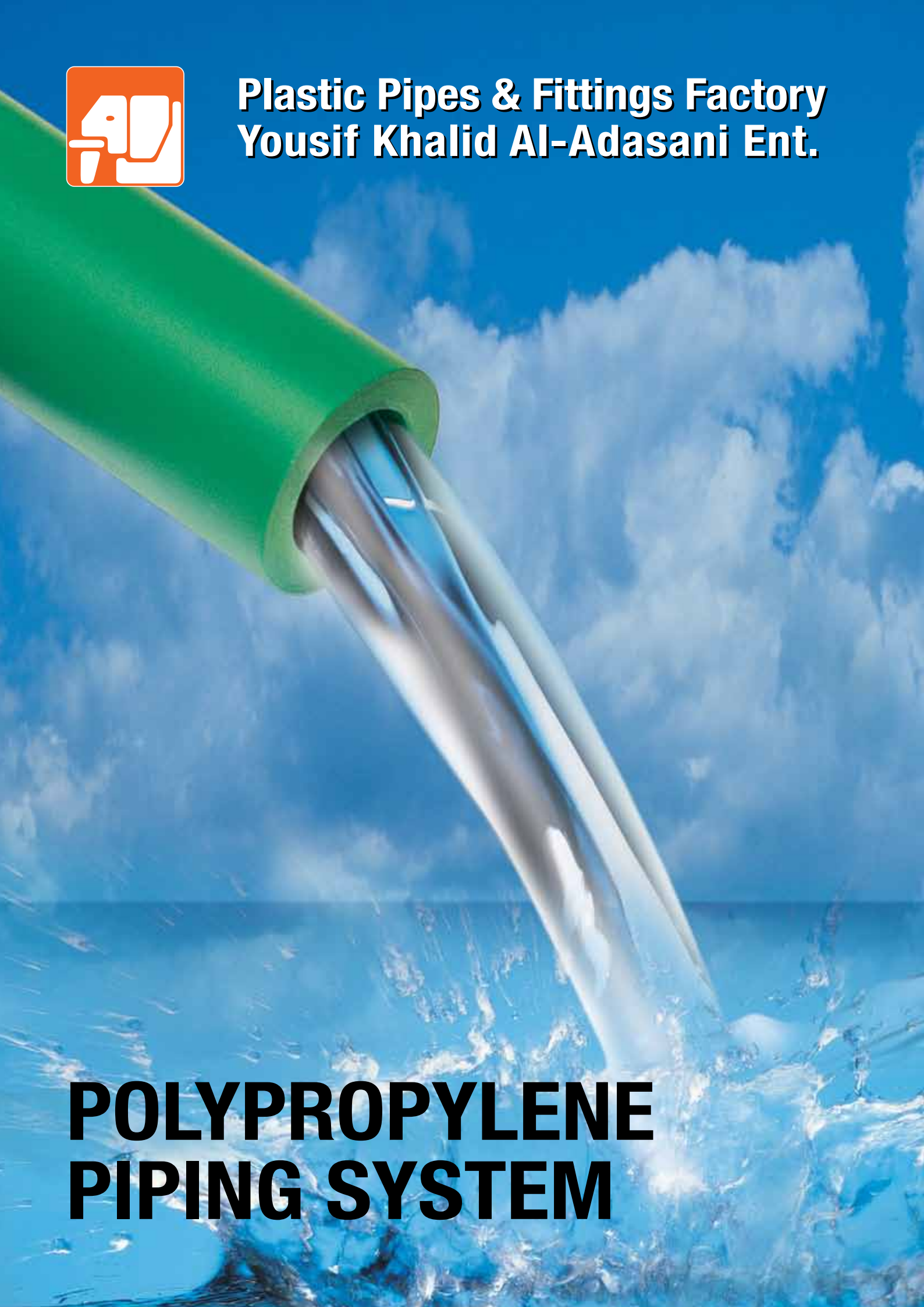
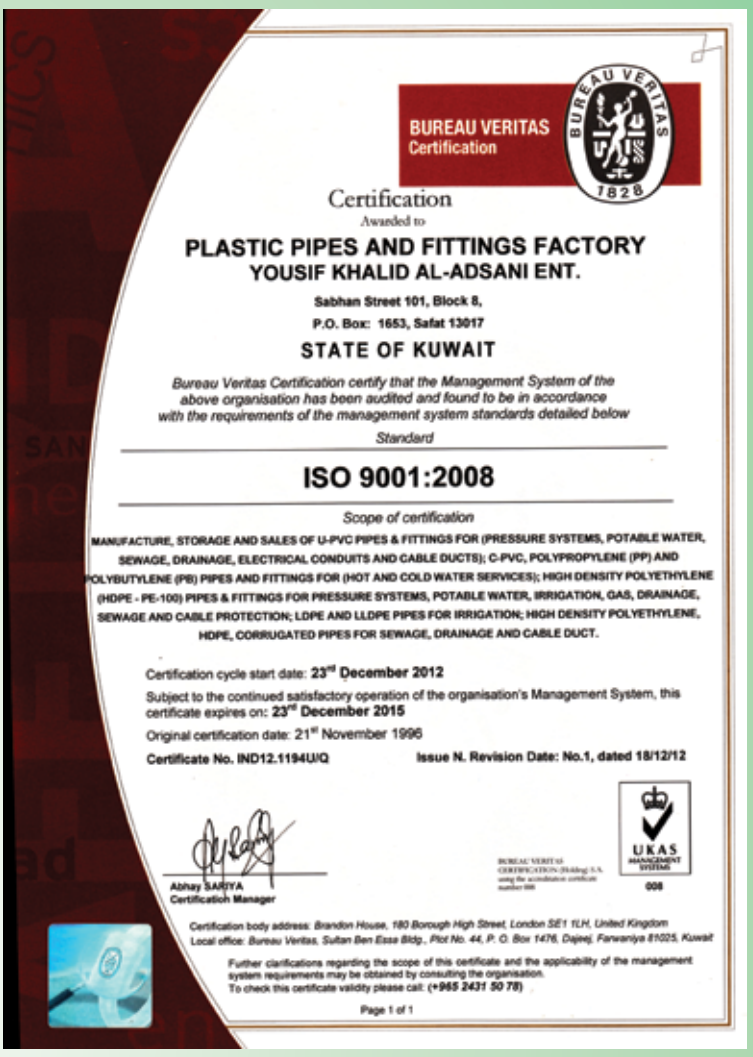
Plastic Pipes & Fittings Factory
Yousif Khalid Al-Adasani Ent.



POLYPROPYLENE PIPING SYSTEM



BUREAU VERITAS
Certification

Certification
Awarded to

PLASTIC PIPES AND FITTINGS FACTORY
YOUSIF KHALID AL-ADSANI ENT.

Sabhan Street 101, Block 8,
P.O. Box: 1653, Safat 13017

STATE OF KUWAIT

Bureau Veritas Certification certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

Standard

ISO 9001:2008

Scope of certification

MANUFACTURE, STORAGE AND SALES OF U-PVC PIPES & FITTINGS FOR (PRESSURE SYSTEMS, POTABLE WATER, SEWAGE, DRAINAGE, ELECTRICAL CONDUITS AND CABLE DUCTS); C-PVC, POLYPROPYLENE (PP) AND POLYBUTYLENE (PB) PIPES AND FITTINGS FOR (HOT AND COLD WATER SERVICES); HIGH DENSITY POLYETHYLENE (HDPE - PE-100) PIPES & FITTINGS FOR PRESSURE SYSTEMS, POTABLE WATER, IRRIGATION, GAS, DRAINAGE, SEWAGE AND CABLE PROTECTION; LDPE AND LLDPE PIPES FOR IRRIGATION; HIGH DENSITY POLYETHYLENE, HDPE, CORRUGATED PIPES FOR SEWAGE, DRAINAGE AND CABLE DUCT.

Certification cycle start date: 23rd December 2012

Subject to the continued satisfactory operation of the organisation's Management System, this certificate expires on: 23rd December 2015

Original certification date: 21st November 1996

Certificate No. IND12.1194U/Q — Issue N. Revision Date: No.1, dated 18/12/12

Abhay SARIYA
Certification Manager

UKAS MANAGEMENT SYSTEMS 008

Certification body address: *Brandon House, 180 Borough High Street, London SE1 1LH, United Kingdom*
Local office: *Bureau Veritas, Sultan Ben Essa Bldg., Plot No. 44, P. O. Box 1476, Dajeej, Farwaniya 81025, Kuwait*

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation.
To check this certificate validity please call: (+965 2431 50 78)

Page 1 of 1

مركز تنمية مصادر المياه
Water Resources Development Center

شهادة اعتماد
Approval Certificate

وزارة الطاقة
Ministry of Energy

Total analysis of non-metallic materials used in contact with potable water

الفحوصات الشاملة للمواد الغير معدنية المستخدمة في استعمالات مياه الشرب

Requested by: الجهة المتقدمة بطلب الفحص:
Plastic pipes & fittings Factory of Yousif Khalid Al-Adsani (ENT)
مصنع الأنابيب البلاستيكية وتوازمها (مؤسسة يوسف خالد العدساني)

Name of product: اسم المنتج:
Green poly propylene (PP-R) plastic pipes sample.
عينات أنابيب مياه بلاستيكية تولبها الخضر من مادة البولي بروبلين (PP-R)

Type of product: نوع المادة المفحوصة:
poly propylene (PP-R)
مادة البولي بروبلين (PP-R)

Producing Country: بلد المنشأ:
State of Kuwait
دولة الكويت

Performed Tests: الفحوصات المطبقة:
According to the requirements of The National Water Council (UK) and National Sanitation Foundation (USA) with modifications suiting Kuwait conditions. And according to the limitations of The World Health Organization (WHO).
طبقت وفق متطلبات المجلس الوطني للمياه (بريطانيا) والهيئة الوطنية لتعزيز الصحة العامة (أو لايات المتحدة) مع بعض التغييرات التي تتوافق مع ظروف ومناخ دولة الكويت. ووفق معايير واشتراطات منظمة الصحة العالمية

1- Bacteriological analysis	Passed	Approved معتمد	ناجح	١- الفحوصات البكتريولوجية
2- Toxicity analysis	Passed		ناجح	٢- الفحوصات السمية

Conditions of the validity of this certificate: شروط صلاحية هذه الشهادة:
- This certificate concludes Toxicity test only. هذه الشهادة تتضمن الفحص السمية فقط
- This certificate is specified for the examined samples only. هذه الشهادة خاصة بالعينة المفحوصة فقط
- The ministry of Energy is not responsible towards any changes in the specifications of the material after the analysis. وزارة الطاقة غير مسؤولة عن أي تغيرات في مواصفات المنتج بعد الفحص

عن رئيس قسم البحث والتطوير
Head of Research & Development Section

مدير مركز تنمية مصادر المياه
Director of W.R.D.C.
مدير مركز تنمية مصادر المياه بالوكالة

رئيس قسم البكتريولوجي
Head of Bacteriological Lab

Water Resources Development Center – Jamal A. Nasser St. Against Shuwaikh Power Station – Tel: 4834810 – 4834819 – 4811361 Fax: 4834805

PP-R Pressure pipelines system

Material :

Polypropylene random copolymer which comprises thermoplastic propylene random copolymers having another olefinic monomer (or monomers) copolymerized with propylene.

Manufacturing standards :

DIN 8077, DIN 8078, DIN 16962, DIN EN ISO/ BS EN ISO 15874

Major advantages of Al-Adasani PP-R Piping system

- High chemical resistance
- Internal/ External corrosion resistance
- Non-toxic and resistant to microbiological attack
- Low friction loss
- Light weight end easy installation
- Has got good insulating properties (Low thermal conductivity)

Application field

- Drinking water systems
- Service Hot & Cold water systems
- Industrial projects
- Agricultural projects
- Central heating system
- House Connections

General properties of PP-R material

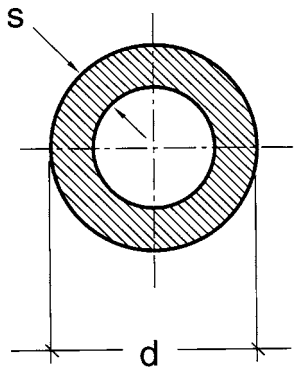
Properties	PP-R	Unit
Density	0.91	g/cm^3
Mean Coefficient of Linear Thermal Expansion	1.5×10^{-4}	K^{-1}
Vicat Softening Temperature	125	^{o}C
Thermal Conductivity	0.23	W/ K. M
Modulas of Elasticity	800	N/mm^2
Tenstile Strength	25	MPa
Heat Reversion	< 2%	-
Impact Resistance	Complies with DIN 8078	-
Surface Resistance	$>10^{12}$	Ω

PP-R Pressure Pipes:

DIN 8077 / 8078, DIN EN ISO/ BS EN ISO 15874

d (Outside Diameter in mm)	**Pipe Series**			
	2.5		2	
	Diameter - Wall thickness relationship (SDR)			
	6		5	
	Nominal Pressure			
	PN 20		PN 25	
	S (wall thickness in mm)	**Weight** kg/m	**S** (wall thickness in mm)	**Weight** kg/m
20	3.4	0.172	4.1	0.198
25	4.2	0.266	5.1	0.307
32	5.4	0.434	6.5	0.498
40	6.7	0.671	8.1	0.775
50	8.3	1.040	10.1	1.210
63	10.5	1.650	12.7	1.910
75	12.5	2.340	15.1	2.700
90	15.0	3.360	18.1	3.880
110	18.3	5.010	22.1	5.780
160	26.6	10.6	32.1	12.2

PN : Nominal Pressure in bar



d : outside diameter

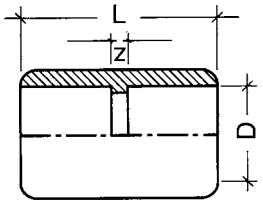
s : wall thickness

measurements in mm

PP-R Pipes Fittings

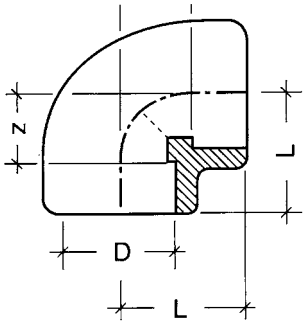
DIN 16962 - PN : 25 bars

DIN EN ISO/ BS EN ISO 15874



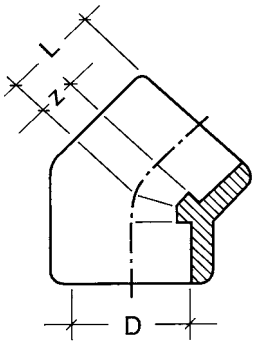
WELDING SOCKET (COPP)

D mm	L mm	Z mm
20	32	3
25	35	3
32	43	3
40	43	3
50	52	4
63	61	6
75	73	6
90	73	6
110	84	8



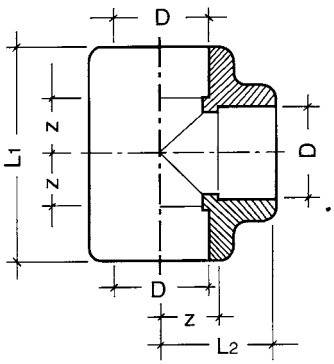
WELDING ELBOW (BEPP 90^0)

D mm	L mm	Z mm
20	29	14
25	33	17
32	40	21
40	47	26
50	51	28
63	60	32
75	59	28
90	79	46
110	94	58



WELDING ELBOW (BEPP 45^0)

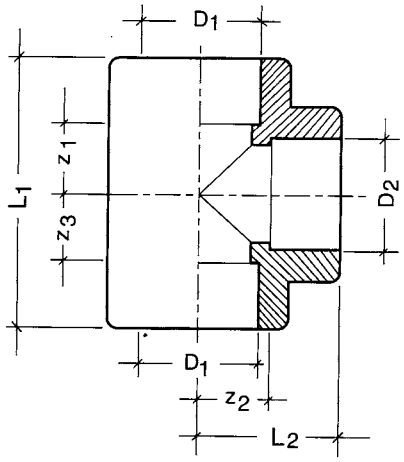
D mm	L mm	Z mm
20	22	4
25	26	7
32	30	9
40	34	12
50	34	12
63	42	14
75	46	16
90	65	35
110	74	42



WELDING TEE (TEPP)

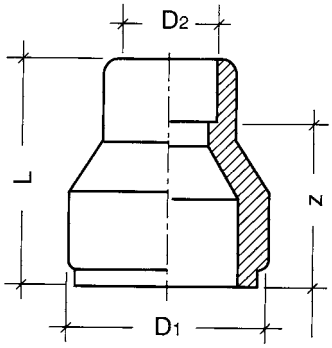
D mm	L_1 mm	L_2 mm	Z mm
20	54	27	12
25	63	31	13
32	75	38	16
40	86	44	21
50	105	52	26
63	122	62	33
75	139	70	39
90	159	82	49
110	179	94	59

REDUCED WELDING TEE (TRPP)



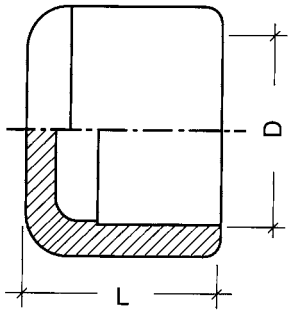
D_1 mm	D_2 mm	L_1 mm	L_2 mm	Z_1 mm	Z_2 mm	Z_3 mm
25	20	62	31	13	13	13
32	20	75	38	17	22	17
32	25	75	38	17	20	17
40	20	86.5	40.0	21.4	21.0	21.4
40	25	86.5	38.25	21.4	21.25	21.4
40	32	86	44	21	25	21
50	20	104	42.8	25.5	26.8	25.3
50	25	105	52	33	35	33
50	32	105	52	33	33	33
63	25	126	49.5	34	31.5	34
63	32	126	55.5	34	36.4	34
63	40	126	54.5	34	31.5	34
63	50	126	57.5	34	32.5	34
75	25	144	58	39.5	38.5	39.5
75	32	144	60	39.5	38	39.5
75	40	145	59.5	40.0	35.0	40.0
75	50	144	62	39.5	35.0	39.5
75	63	144	65	39.5	34.5	39.5

REDUCED WELDING SOCKET (REPP)



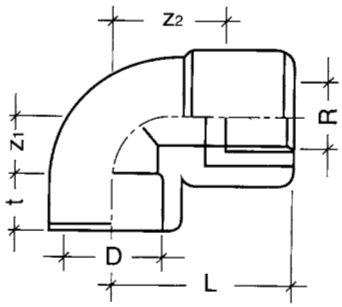
D_1 mm	D_2 mm	L mm	Z mm
25	20	39	23
32	20	42	26
32	25	43	26
40	20	50	30
40	25	50	30
40	32	50	30
50	20	55	35
50	25	55	35
50	32	55	37
50	40	54	34
63	25	65	48
63	32	65	45
63	40	65	44
63	50	72	45
75	32	65	45
75	40	67	45
75	50	68	43
75	63	72	44
90	40	65	41
90	50	76	51
90	63	79	51
90	75	82	52
110	63	88	60
110	75	92	60
110	90	95	63

WELDING END CAP (EPPP)



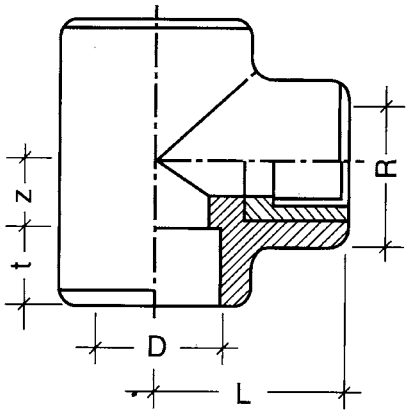
D mm	L mm
20	25
25	28
32	33
40	38
50	46
63	55
75	58
90	68

WELDING ELBOW ADAPTOR, (FEMALE THREAD (ABPP)



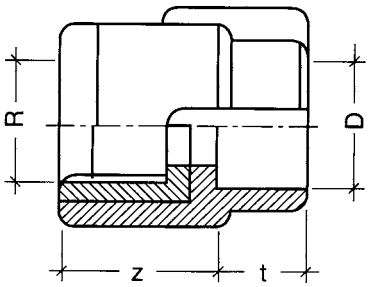
D mm	R Inch	t mm	Z_1 mm	Z_2 mm	L mm
20	1/2"	18	11	20	35
20	3/4"	18	17	24	39
25	1/2"	20	15	24	39
25	3/4"	20	15	24	39
32	3/4"	18	12	32	66
32	1"	18	12	32	66

WELDING TEE ADAPTOR FEMALE THREAD (ATPP)

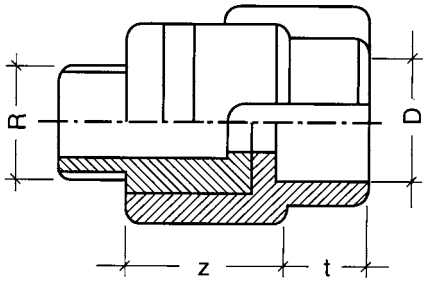


D mm	R Inch	t mm	Z mm	L mm
20	1/2"	16	11	36
20	3/4"	18	14	40
25	1/2"	16	15	44
25	3/4"	18	14	40
32	3/4"	18	12	65
32	1"	18	12	65

FEMALE ADAPTOR (FAPP)

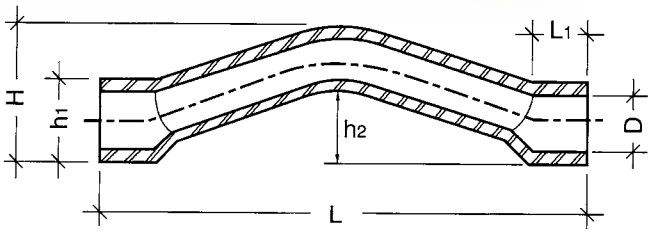


D mm	R Inch	t mm	Z mm
20	1/2"	16	25
20	3/4"	18	25
25	1/2"	16	26
25	3/4"	18	25
32	3/4"	20	40
32	1"	20	40
40	11/4"	20	46
50	11/2"	24	46
63	2"	28	48



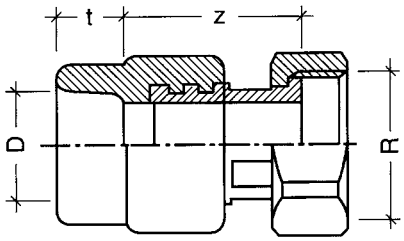
MALE ADAPTOR (MAPP)

D mm	R Inch	t mm	Z mm
20	1/2"	16	25
20	3/4"	18	25
25	1/2"	16	26
25	3/4"	18	25
32	3/4"	20	37
32	1"	20	37
40	11/4"	20	45
50	11/2"	24	42
63	2"	28	52
75	21/2"	29	50



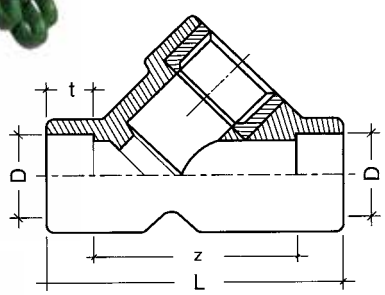
STEP-OVER BEND (SOPP)

D mm	H mm	h_1 mm	h_2 mm	L_1 mm	L mm
20	46	28.2	24	15.5	160
25	58.0	35	32	22	201
32	66	43	34.5	22.5	172
40	82	53	43	21.5	240



WELDING UNION PP TO BRASS (UBPP)

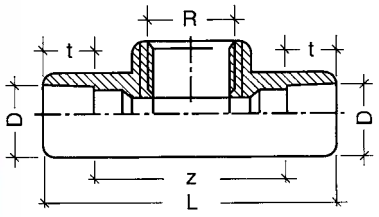
D mm	R Inch	t mm	Z mm
20	3/4"	16	44
25	3/4"	16	44
32	1"	19	45
40	11/4"	21	48
50	11/2"	24	54
63	2"	30	60



SLANTED SEAT VALVE (GVPP)

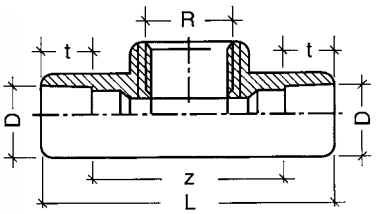
D mm	t mm	Z mm	L mm
25	16	86	118
32	18	82	118

GATE VALVE (TGVP)



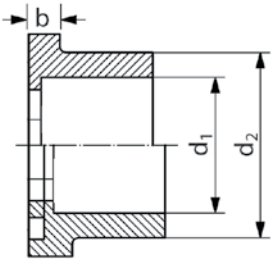
D mm	R Inch	t mm	Z mm	L mm
20	3/4"	15	66	96
25	3/4"	16	64	96
32	1"	18	80	116
40	1"	21	73	115

CONCEALED / SHUT OFF VALVE (CVPP)



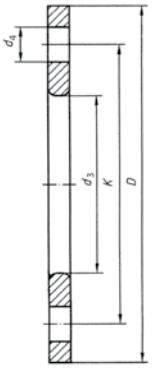
D mm	R Inch	t mm	Z mm	L mm
20	3/4"	15	66	96
25	3/4"	16	64	96
32	1"	18	80	116
40	1"	21	73	115

Flange Adapter, QRPP



Pipe out side diameter, mm	d_1	d_2	b
50	48.8	61	13
63	61.9	76.3	15
75	73.6	90	17.1
90	88.8	109.2	17.1
110	108.5	130	18

Backing Ring, ODV



Pipe out side diameter, mm	Nominal flang	d_3	D	K	d_4	Number of bolts
50	40	63	152	110	18	4
63	50	78	168	125	18	4
75	65	92	187	145	18	4
90	80	110	202.5	160	18	8
110	100	133	220	180	18	8

Note: The Backing Ring is made from C-PVC

WARH

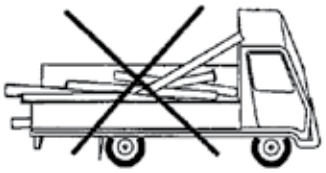
Welding plug for repair of holes up to ø8mm

WAPL

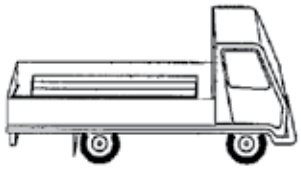
assembly plug for gauge “1/2

Handling and Storage

- Care should be exercised to avoid rough handling of PP-R pipes and fittings. They should not be dragged over sharp objects, stones or projections, dropped or have objects dropped upon them.
- Pipes and fittings should be stored on levelled ground which is free of any sharp objects.
- If different thickness classes are stacked together, the thickest pipe should be on bottom.
- The pipe should be protected from direct sunlight and stored in place with good venting and away from any heat sources.
- If the pipes are stored in racks, it should be continuously supported along their length. They should be stacked not more than 1.5 m height.
- Fittings must be stored in their original cartons to keep them free of dust and reduce the possibility of damage and must be stored inside.
- Vehicles with flat bed, which is free of any sharp objects, should be used for transporting pipe.

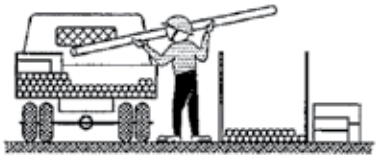


Incorrect way to load pipes

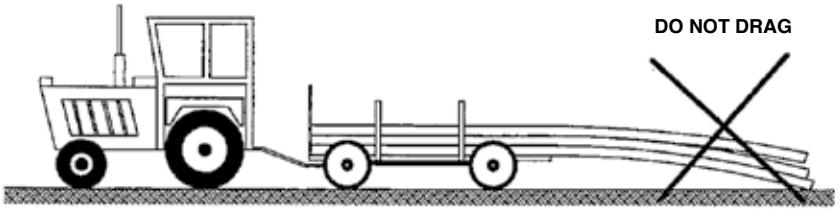


Correct way to load pipes

Incorrect way to off-load



Correct way to off-load



On-site-transport

Handling and Storing

Jointing Procedures.

Al-Adasani PP-R pipes can be jointed together or with fittings for different applications by means of two major methods: Socket fusion and Electrofusion methods.

Before starting welding, make sure that all required parts of welding machine are available, clean and in good condition.

1- Socket fusion jointing,

in which the outer surface of pipe end and inside surface of the fitting are melted simultaneously then the two components are joined by inserting one into other to become one piece.

- Cut the pipe end squarely using proper cutter and remove the burrs or ridges
- Clean and dry the pipe end and fitting , both inside and outside surfaces, by wiping with clean paper towel or cloth..
- Switch on welding machine and set the temperature of the heating plate to about 260 C^0.
- When required temperature is reached , pipe & fitting will be inserted in heating unit (plugs) simultaneously for heating for period shown in table (1).
- At the end of heating period , pipe and fitting will be removed from heating unit quickly and jointed together immediately , straight and holding them for period shown in table (1).

Notes:

– Do not twist during and after jointing.

– precautions must be taken while dealing with pipes and fittings in low temperature (Close to Zero) to avoid knocks which may happen while handling.

– Mecanical joining can be done using mechanical fitting as flanges, screwed fitting, etc.

Recommended welding time for PP-R pipes & fittings:

Pipe outside diameter, mm.	Length of melted section, mm.	Heating Time/Sec.	Jointing Time/Sec.	Cooling-Time/Min.
16	13.0	5	4	2
20	14.0	5	4	2
25	15.0	7	4	2
32	16.0	8	6	4
40	18.0	12	6	4
50	20.0	13	6	4
63	24.0	24	8	6
75	26.0	30	8	6
90	29.0	40	10	8
110	31	50	12	10

Table (1)

2- Electro fusion Jointing method :

Electro fusion is a heat fusion jointing process where a heat source is an integral part of fittings, where electric current is applied, heat is produced, melting and jointing the component.

- Cut the pipe end squarely using proper cutter and remove the burrs or ridges.
- Clean and dry the pipe by wiping with clean paper towel or cloth..
- Remove the fitting from its packaging and check the bore of fitting is clean and dry.
- Insert the pipe ends into the fittings until the center stop.
- Secure the fitting and the pipe in place to prevent movement during the fusion and cooling cycles using clamps.
- Connect the machine output leads to the fitting terminals.
- Operate the machine in accordance with the operating instructions.
- The joints must be left for cooling time, although the terminal lead may be removed carefully without disturbing the joint

Expansion and Contraction

PP-R pipes undergo length changes as a result of temperature variations above and below the installation temperature. Change in pipe length depends on the coefficient of linear expansion, length of the pipe and temperature variations.

Determination of length change

$\Delta L = L.\ \Delta T.\delta$

ΔL = Length change in mm

L = Length of pipe in m

ΔT = Difference between installation temperature and maximum or minimum working temperature in ^0C

δ = Coefficient of linear expansion of the pipe in mm/m.^0C = 0.15

Example of determining ΔL

Length of pipe, L = 10 m

Temperature difference $\Delta T = 40\ ^0C$

$\Delta L = 10 \times 40 \times 0.15 = 60$ mm

The expansion and contraction of the pipe should be considered in installing of hot lines which is not embedded in the wall. The relation between expansion/contraction of the pipe and its length and temperature difference shown in table (2).

Expansion/contraction length, mm

Pipe Length m	Temperature difference C^0							
	10	20	30	40	50	60	70	80
	Change of length, mm.							
1.0	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00
2.0	3.0	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

Table (2)

Allowing for length changes

The length change in open placed installation are compensated for by one of two means:

1 Flexible section (deflection leg).

2 Expansion loops

1-The length of flexible section can be measured by the following formula:

$a = c.\sqrt{dx\Delta L}$

a= length flexible section

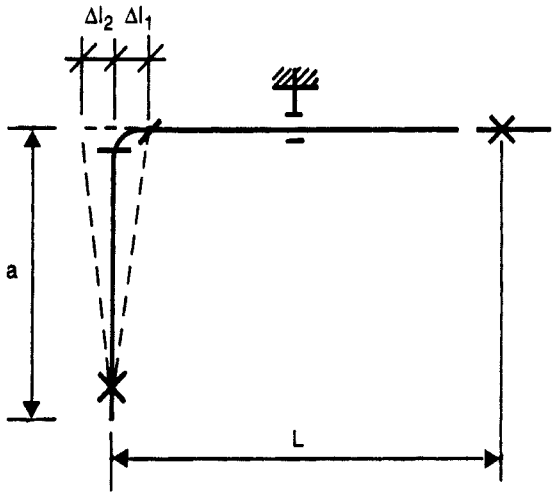
ΔL= change of length due to expansion or contraction.

d= outside diameter of pipe in mm.

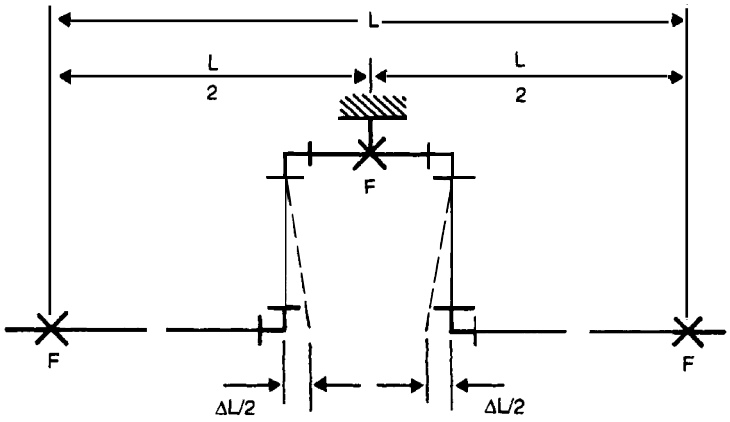
c= material dependent constant is 15.

2- For expansion loop, the length of flexible section will be calculated by the following formula

$a = C\sqrt{d \times \frac{\Delta L}{2}}$



Flexible section



Expansion loop

Insulation

Al-Adasani PP-R pipes have very low thermal conductivity, so no thermal insulation is required for cold lines bedded in the wall. For suspended hot lines, it is preferable to be thermally insulated.If the pipes are installed outdoor, they should be protected from direct sunlight.

Pipe clamps

PP-R pipelines need to be supported at specific intervals, depending on the temperature of the fluid being transported, the diameter and wall thickness of the pipe . (Table 3)

Pipe outside diameter d, mm	Cold water	Hot water
	Clamps intervals in horizontal, L, cm	
20	80	50
25	85	60
32	100	65
40	110	80
50	125	100
63	140	120
75	150	145
90	165	150
110	190	160

Note: For vertical pipes L should be multiplied by 1.3

Table (3)

Allowable Working Pressure for PP-R Pipes

Temperature in ^{0}C	Years of Service	Allowable working Pressure, bar, SDR 6 , PN 20
10	25	37.3
	50	36.3
	100	35.4
20	25	31.8
	50	30.9
	100	29.9
30	25	26.8
	50	26.1
	100	25.5
40	25	22.6
	50	22.0
	100	21.3
50	25	19.1
	50	18.5
	100	17.8
60	25	15.9
	50	15.3
70	25	12.1
	50	10.2
80	5	11.5
	10	9.6
	25	7.6
95	5	6.1
	10	5.1

PN = Nominal Pressure

Pressure Testing

- Hydrostatic pressure test will be carried out after completing the installation of a pipeline or a section of the pipeline.
- The pipeline should be suitable anchored at all changes of direction and at fixed points.
- The test shall be performed during periods of relatively stable atmospheric temperature.
- Each pipeline or section shall be filled slowly with water from the lowest point avoiding surge pressures, all air shall be allowed to escape from the line through air vents or suitable cocks located at high points.
- After filling and before application of the test pressure, maintain the test section for standing period at least 2 hours, to achieve conditions as stable as possible for testing.
- If no leakage has been observed during the standing period, the pressure shall be raised slowly to the test pressure which shall be 1.5 operating pressure for 2 hours..
- The test pressure should not exceed the maximum working pressure (which related to the temperature) of the lowest rated component

Chemical Resistance For PP-R Material

Chemicals	Concentration	Temperature	
		20° C	60° C
Acetic acid	(glacial)	+	(+)
Acetic acid	10%	+	+
Acetic anhydride	100%	+	
Acetone	100%	+	+
Adipic acid	Sat.sol.	+	+
Allylic alcohol	96%	+	+
Alum	Sol.	+	+
Aluminium chloride	Sat.sol.	+	+
Aluminum fluoride	Sat.sol.	+	+
Aluminum sulphate	Sat.sol.	+	+
Ammonia (gas)	100%	+	+
Ammonia(liquid)	100%	+	
Ammonia water	Sol.Dil.	+	+
Ammonium chloride	Sat.sol.	+	+
Aluminium fluoride	Sol.	+	+
Ammonium nitrate	Sat.sol.	+	+
Ammonium sulphate	Sat.sol.	+	+
Ammonium sulphide	Sol.	+	+
Amyl acetate	Sol.	(+)	
Amyl alcohol	tg	+	+
Aniline	tg	(+)	(+)
Antimony trichloride	90%	+	+
Aqua regia		-	-
Arsenic acid, ortho, aque	10, 80%	+	+
Barium carbonate	Sat. sol.	+	+
Barium chloride	Sat. sol.	+	+
Barium hydrate	Sat. sol.	+	+
Barium sulphate	Sat. sol.	+	+
Beer	100%	+	+
Benzaldehyde	Sat.sol.	+	+
Benzene	100%	(+)	-
Benzoic acid	Sat. sol.	+	+
Borax	Sat. sol.	+	+
Bromic acid	Sat. sol.	+	+
Bromine (gas & dry)	100%	-	-
Bromine (liquid)	100%	-	-
Butane (gas)	100%	+	
Butyl alcohol	tg	+	+

Chemicals	Concentration	Temperature	
		20° C	60° C
Calcium carbonate	Sat. sol.	+	+
Calcium chlorate	Sat. sol.	+	+
Calcium chloride	Sat. sol.	+	+
Calcium hydrate	Sat. sol.	+	+
Calcium hypochlorite	Sol.	+	
Calcium nitrate	Sat. sol.	+	+
Calcium sulphate	Sat. sol.	+	+
Carbon dioxide	100%	+	+
Carbon monoxide	100%	+	+
Carbon tetrachloride	100%	-	-
Chlorine (gas,dry)	100%	(+)	-
Chlorine water	Sat. sol.	+	+
Chloro acetic acid	Sol.	+	
Chloroform	100%	(+)	-
Citric acid	Sat. sol.	+	+
Copper chloride	Sat. sol.	+	+
Copper nitrate	Sat. sol.	+	+
Copper sulphate	Sat. sol.	+	+
Chromic acid,aqu	40%	(+)	(+)
Cyclohexanol	tg	+	(+)
Cyclohexanone	100%	(+)	-
Deca-hydro-naphthalene	tg	(+)	-
Dextrine	Sol.	+	+
Dioctyl phthalate	100%	(+)	(+)
Dioxane	100%	(+)	(+)
Ethanol	tg	+	+
Ethylene glycol	100%	+	+
Ferric chloride	Sat. sol.	+	+
Ferric nitrate	Sol.	+	+
Ferric sulphate	Sat. sol.	+	+
Ferrous chloride	Sat. sol.	+	+
Ferrous sulphate	Sat. sol.	+	+
Fluorine , dry	tg	(+)	-
Fluloro silicic acid, aqu	32%	+	+
Formaldehyde	40%	+	
Formic acid	50%	+	
Formic acid	98-100%	+	-
Gasoline (fuel)	work, sol.	-	-

Chemical Resistance For PP-R Material

Chemicals	Concentration	Temperature	
		20° C	60° C
Glucose	Sat. Sol.	+	+
Glycerine	100%	+	+
Glycolic acid	30%	+	(+)
Heptane	100%	(+)	-
Hydrocyanic acid	tg	+	+
Hydrochloric acid	20%	+	+
Hydrochloric acid	Conc.	+	
Hydrofluoric acid	10%	+	
Hydrogen sulphide , dry,gas	tg-g	+	+
Hydroquinone	Sat. sol.	+	+
Lactic acid	10-90%	+	+
Lead acetate	Sat. sol.	+	+
Magnesium carbonate	Sat. sol.	+	+
Magnesium chloride	Sat. sol.	+	+
Magnesium hydrate	Sat. sol.	+	+
Magnesium nitrate	Sat. sol.	+	+
Mercuric chloride	Sat. sol	+	+
Mercurous nitrate	Sol	+	+
Methanol	100%	+	+
Milk		+	+
Molasses	Conc. lav	+	+
Naphtha	work.sol.	+	(+)
Nickel cholirde	Sat. sol	+	+
Nitric acid	25%	+	-
Nitric acid	50%	(+)	-
Nitric acid	75%	-	-
Nitric acid	100%	-	-
Oleic acid	100%	+	(+)
Olive Oil	work.sol.	+	+
Orthophosphoric acid	50%,75%	+	+
Oxalic acid	Sat. sol	+	(+)
Oxygen	100%	+	
Oxigenated water	30%	+	+
Ozone	0.5ppm	+	(+)

Chemicals	Concentration	Temperature	
		20° C	60° C
Phenol, Aqua	5%	+	+
Phosphorous trichloride	100%	(+)	
Photo-developer	Conc. lav	+	+
Picric acid	Sat. sol	+	
Potassium bicarbonate	Sat. sol	+	+
Potassium bichromate	Sat. sol	+	+
Potassium bisulphate	Sat. sol	+	+
Potassium bromate	Sat. sol	+	+
Potassium bromide	Sat. sol	+	+
Potassium carbonate	Sat. sol	+	+
Potassium chlorate	Sat. sol	+	+
Potassium chloride	Sat. sol	+	+
Potassium chromate	Sat. sol	+	+
Potassium cynaide	Sol.	+	+
Potassium ferricynaide	Sat. sol	+	+
Potassium hydrate	50%	+	+
Potassium nitrate	Sat. sol	+	+
Potassium perchlorate	10%	+	+
Potassium permanganate	Sat. sol	+	-
Potassium persulphate	Sat. sol	+	+
Potassium sulphate	Sat. sol	+	+
Potassium sulphide	Sol.	+	+
Pyridine	100%	(+)	
Salicyclic acid	Sat. sol	+	
Silver acetate	Sat. sol	+	+
Silver cyanide	Sat. sol	+	+
Silver nitrate	Sat. sol	+	+
Sodium benzoate	35%	+	+
Sodium bicarbonate	Sat. sol	+	+
Sodium bromide	Sat. sol	+	+
Sodium carbonate	Sat. sol	+	+
Sodium chlorate	Sat. sol	+	+
Sodium chloride	Sat. sol	+	+
Sodium cyanide	Sat. sol	+	+

Chemical Resistance For PP-R Material

Chemicals	Concentration	Temperature	
		20° C	60° C
Sodium ferricyanide	Sat. sol	+	+
Sodium ferrocynaide	Sat. sol	+	+
Soidum fluoride	Sat. sol	+	+
Sodium hydrate	40%	+	+
Sodium hydrate	Sol.	+	+
Sodium hypochlorite	15% cloro	+	
Sodium nitrate	Sol.	+	+
Sodium nitrite	Sat. sol	+	+
Sodium orthophosfate	Sat. sol	+	+
Sodium sulphate	Sat. sol	+	+
Sodium sulphide	Sat. sol	+	
Sulphuric acid	10%	+	+
Sulphuric acid	50%	+	(+)
Sulphuric acid	98%	(+)	
Sulphuric acid	fuming	(+)	-
Sulphurous acid	30%	+	
Tannic acid	Sol.	+	+
Tartaric acid	Sol.	+	+
Toluene	100%	(+)	-
Trichloroethylene	100%	(+)	(+)
Triethanolamine	Sol.	+	
Urea	Sat.Sol.	+	+
Urine	-	+	+
Vinegar	-	+	+
Water	-	+	+
Xylene	100%	-	-
Zinc carbonate	Sat. sol	+	+
Zinc chloride	Sat. sol	+	+
Zinc oxide	Sat. sol	+	+
Zinc sulphate	Sat. sol	+	+

tg = At least technical - grade purity
Work Sol.= Work solution of concentration usually used in industry concerned
+ = Resistant, (+) = Limited Resistance, - = Not Resistant
Reference : ISO/TR 10358

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