

### Material:

PP-R (Polypropylene Random-Copolymerisate) of high molecular weight and stabilized to high temperature. The material corresponds to KTW-recommendation of the German Board of Health.

### Joining:

#### Welding joints

Socket-welding by heating-elements according to DVS (German Welding Inst.) specifications: leaflet 2207, part 11, section 3.2.

Tools and devices for socket-welding by heating-elements according to DVS leaflet 2208, part 1, section 5, schedule 2, type A.

#### Threaded joints:

The threaded joint of adaptor pipe-fittings correspond to the requirements of DIN 2999 resp. ISO 7, i. e. cylindrical female thread, conical male thread. Male threads for connecting backnuts correspond to the requirements of DIN-ISO 228, part 1.

### Dimensions:

Pipes: According to DIN 8077 (Pipes of polypropylene PP).

Fittings: According to DIN 16962, part 6 to 9 (Pipe connections and fittings for polypropylene PP) injection moulded fittings, z-dimensions tolerance  $\pm 3$  mm, we reserve the right to modify dimensions without previous notice.

### Quality:

Pipes: according to DIN 8078 for PP-R (polypropylene PP pipes).

General quality standards, test.

Fittings: according to DIN 16962 part 5 A (E type 3)

(Pipe connections and fittings for polypropylene PP pressure pipeline.)

General quality standards, test.

### Operating pressure:

For cold water at 20° C: up to 20 bar<sup>1,2</sup>

for hot water at 70° C: up to 10 bar<sup>1,2</sup>

for heating at 70° C: up to 3 bar.

The regulations and guide-lines-dealing with the different fields of application are to be observed.

### Chemical Resistance:

Detailed information on the chemical resistance of polypropylene pipes and pipelines is available in annex 1 to DIN 8078. Please note the explanations on page 1 of annex.

### Orders:

When ordering, kindly always state the dimensions and the order number in addition to the designation of the piece required.

Example: Elbow 90°, d 32, No. 8090

### Marking:

The fittings are marked as follows:

Example: **B•R**, d, PP-R, P

### Signs and Symbols:

d = nominal size = pipe diameter

R = male thread-conical

Rp = female thread-cylindric

Rc = female thread-conical

G = male thread-cylindric

Stp = standard packing

® = registered trade mark

AL = number of screw holes

### Utilization

The system of tubing of PP-R, as described in this catalogue, has primarily been developed for application in the sanitary field for cold and hot water.

This system can be applied as well in the industrial section.

Tubes and fittings are dimensioned in a way to assure, according to actual results of long-term tests a utilisation of at least 50 years, based on max. 10 bar and a constant temperature of 70 degrees Celsius.

For hot water piping, made according to DIN 1988, the tube row 6 (PN 20) according to DIN 8077 is valid, for dimensions according to table 1.

Tubes are available in lengths of 4 m.

Plastic pipes and fittings of PP-R generally have all advantages which have been registered in all sections of industry and of installation technics. Most of all the excellent resistance of corrosion gives proof of an extensively long utilization of installation tubing in the building technic, without risk of damages known from metallic materials.

Therefore PP-R as installation-material represents an excellent choice for piping of cold and hot water.

## Material properties of PP-R

Properties	Measuring technique	Unit	Value
coefficient of viscosity J.	ISO 1191	cm <sup>3</sup> /g	400
Average molar weight	solvent viscosity c = 0,001 g/cm <sup>3</sup>	--	500.000
Melting index	ISO / R 1133		
MFR 190/5		g/10 min.	0,5
MFR 230/2,16		g/10 min.	0,24 – 0,36
Density	ISO / R 1183	g/cm <sup>3</sup>	0,895
Melting range	polarizing microscope	°C	140 – 150
Yield stress	ISO / R 527	N/mm <sup>2</sup>	21
Tensile strength	feed speed	N/mm <sup>2</sup>	40
Tensile expansion	Test bar	%	600
Bending stress at 3,5%	ISO 178	N/mm <sup>2</sup>	20
Marginal fibre expansion	test specimen 5.1		
Modulus of elasticity	ISO 178	N/mm <sup>2</sup>	800
Mechanical properties following impact bending test at 0° C	DIN 8078		no fracture
Expansion coefficient	VDE 0304 Part 1 § 4	K <sup>-1</sup>	1,5 x 10 <sup>-4</sup>
Thermal conductivity at 20° C	DIN 52612	W/m K	0,24
Specific heat at 20° C	adiabatic calorimeter	kJ/kg K	2,0
Pipe friction factor	--		0,007

	Conc. %	TEMPERATURE				Conc. %	TEMPERATURE		
		20°C	60°C	100°C			20°C	60°C	100°C
Acetone	TR	+	+		Ethyl acetate	TR	+	•	-
Alum	GL	+	+		Butyl acetate	TR	•	-	-
Alum of all kinds, hydr.	all	+	+		Ether				
Formic acid		+	•		Ethyl benzene	TR	•	-	-
	85	+	•	-	Ethyl chloride	TR	-	-	-
	10	+	+	•					
Ammonia, gaseous	TR	+	+		Pine needle oil	H	+	•	
Ammonia, hydr.	conc.	+	+		Hydrofluoric acid solution	40	+	+	
Ammoniumacetate	GL	+	+		Formaldehyde, hydr.	40	+	+	
Ammonium carbonate	GL	+	+		Antifreezing solution (motor vehicles)	H	+	+	+
Ammonium chloride	GL	+	+		Fruit juices	H	+	+	+
Ammonium nitrate	GL	+	+	+					
Ammonium phosphate	GL	+	+	+	Glycerine	TR	+	+	+
Ammonium sulphate	GL	+	+	+					
Amyl alcohol, pure	TR	+	+	+	Urea, hydr.	GL	+	+	
Aniline	TR	•	•		Fuel oil	H	+	•	
Apple juice	H	+	+	+	Heptane	TR	+	•	-
					Hexane	TR	+	•	
Batterie acid		+	+						
Barium salts	GL	+	+	+	Iso-octane	TR	+	•	-
Benzaldehyde	GL	+	+						
Benzine	H	•	-	-	Jodine salution	H	+	•	
Benzoic acid	GL	+	+						
Benzene	TR	•	-	-	Caustic potash solution (potassium hydroxide)	50	+	+	+
Succinic acid, hydr.	GL	+	+		Potassium carbonate (Potash)	GL	+	+	
Beer	H	+	+	+	Potassium chlorate	GL	+	+	
Bleaching solution	20	•	•	-	Potassium chloride	GL	+	+	
Borax	L	+	+		Bichromate of potash	GL	+	+	
Boric acid	GL	+	+	+	Potassium iodide	GL	+	+	
Bromine, liquid	TR	-	-	-	Potassium nitrate, hydr.	GL	+	+	
Bromine, vapours	all	•	-	-	Potassium permanganate	GL	+	-	
Bromine water	GL	•	-	-	Potassium persulphate	GL	+	+	
Butane gas	TR	+	+		Coconut oil	TR	+		
Butyl acetate					Cresol	90	+	+	
Calcium chloride	GL	+	+	+	LANOLIN®	H	+	•	
Calcium nitrate	GL	+	+		Linseed oil	H	+	+	+
Corn oil	TR	+	•		Lactic acid	90	+	+	
Chlor, liquid	TR	-	-	-					
Chlorine, gaseous wet	1	-	-	-	Magnesium salts	GL	+	+	
Chlorobenzene	TR	•			Menthol	TR	+	•	
Chloride of lime	all	+	+		Methanol	TR	+	+	
Chloroform	TR	•	-	-	Methylene chloride	TR	•	-	-
Chlorosulphonic acid	TR	-	-	-	Methyl ethyl ketone	TR	+	•	
Chlorine water	GL	•	-	-	Milk	H	+	+	+
Hydrogen chloride, gaseous	TR	+	+		Motor oil (motor vehicles)	TR	+	•	
Chromic sulphuric acid		-	-	-	Nickle salts, hydr.	GL	+	+	
Cyclohexane	TR	+	•						
Cyclohexanol	TR	+	•		Sodium carbonate	50	+	+	•
Cyclohexanone	TR	•	-	-	Sodium chlorate	GL	+	+	
					Sodium chloride	VL	+	+	+
Dekahydronaphtaline	TR	•	-	-	Sodium chlorite, hydr.	2-20	+	•	-
Dibutyl phtalate	TR	•	-	-	Sodium hydrochlorite, hydr.	10	+		
Diesel oil	H	+	•		Sodium nitrate	GL	+	+	
Diethylether	TR	+	•		Sodium nitrite	G	+	+	
1,4-Dioxane	TR	•	•		Sodium phosphate	GL	+	+	+
					Sodium sulphate	GL	+	+	
Peanut oil	TR	+	+		Sodium sulphide	GL	+	+	
Vinegar	H	+	+	+	Sodium sulphite	40	+	+	+
Acetic acid (glacial acetic acid)	TR	+	•	-	Sodium thiosulphate	GL	+	+	
Acetic acid, hydr.	50	+	+	•	Caustic soda solution	up to 60	+	+	+
Acetic acid anhydride	TR	+							

# Chemical resistance

	Conc. %	TEMPERATURE				Conc. %	TEMPERATURE		
		20°C	60°C	100°C			20°C	60°C	100°C
Oleum	TR	-	-	-	Xylene	TR	•	-	-
Olive oil	TR	+	+	•	Zinc salts, hydr.	GL	+	+	
Oleic acid	GL	+	•	-	Stannous chloride	GL	+	+	
Oxalic	GL	+	+	•	Citric acid, hydr.	VL	+	+	+
Ozone	0,5 ppm	+	•		Sugar sirup	H	+	+	
Paraffin	H	+	+						
Paraffin oil	TR	+	•	-					
Perchloroethylene									
Petroleum ether	TR	+	•						
Petroleum	TR	+	•						
Peppermint oil	TR	+							
Phenol (hydr. phase)	5	+	+						
Phosphoric acid	85	+	+	+					
Photographic developer	H	+	+						
Propane, gaseous	TR	+	•						
Pyridine	TR	•	•						
Mercury	TR	+	+						
Mercury salts	GL	+	+						
Castor oil	TR	+	+						
Nitric acid, hydr.	10	+	•	-					
Hydrochloric acid, hydr.	up to 20	+	+						
	20 - 36	+	•						
Sulphur dioxide	TR	+	+						
Carbonum disulphide	TR	-	-	-					
Sulphuric acid, hydr.	80-TR	•	-						
	10 - 80	+	+						
	10	+	+	+					
Hydrogen sulphide	TR	+	+						
Sea water	H	+	+	+					
Silver salts	GL	+	+						
Silicone oil	TR	+	+	+					
Sodium carbonate (soda)	50	+	+	•					
Soybean oil	TR	+	•						
Starch solution, hydr.	all	+	+						
Turpentine oil	TR	-	-	-					
Turpentine substitute	TR	+	•	-					
Tetrachloroethane	TR	•	-	-					
Tetrachloroethylene (Perchloroethylen)	TR	•	•						
Carbon Tetrachloride	TR	-	-	-					
Tetrahydrofurane	TR	•	-	-					
Tetrahydronaphtalene (Tetralin)	TR	-	-	-					
Toluene	TR	•	-	-					
Transformer oil	TR	•	-						
Trichloroethylene	TR	-	-	-					
Petroleum jelly	TR	+	•						
Detergent	VL	+	+						
Water	H	+	+	+					
Hydrogen peroxide, hydr.	30	+	•						
Tricresyl phosphate	TR	+	•						
Triocetyl phosphate	TR	+							
Wine	H	+	+						
Tartaric acid, hydr.	10	+	+						

### Signs and symbols:

VL = moderate loosening, mass-part ≤ 10%

L = moderate loosening, mass-part > 10%

GL = Saturated(with 20°C), hydrous solution

TR = medium rate flow is minimum-technical pure

H = usual in trade composition

+ = resistant

• = limited resistant

- = inconstant

### Application areas for fittings and pipes made of PP-R and PP-R CT according to DIN 8077

#### Cold water pipelines:

Continuous operation temperature up to 20°C  
Continuous operation pressure up to 20 bar

#### Warm water pipelines:

Continuous operation temperature up to 70°C  
Continuous operation pressure up to 10 bar

#### Heating pipelines:

Continuous operation temperature up to 70°C  
Continuous operation pressure up to 3 bar  
(Installation pressure according to  
DIN EN 12828)

Temperature °C	Operating years					
	1	5	10	25	50	100
	<b>Max. Operating pressure (bar) according to DIN 8077</b>					

#### Field of application: Drinking water and sanitary installation

<b>G 8160 B</b> <b>PP-R CT Pressure Pipe</b> 20° C/1,6 MPa, 60° C/0,8 MPa	20	16,6	16,0	15,8	15,5	15,3	15,1
	40	12,3	11,9	11,7	11,5	11,3	11,1
	60	8,9	8,6	8,4	8,2	8,1	-
	70	7,5	7,2	7,0	6,9	6,8	-
	80	6,2	6,0	5,9	5,7	-	-
	95	4,7	4,4	4,3	-	-	-
<b>G 8200 B</b> <b>PP-R CT Pressure Pipe</b> 20° C/2,0 MPa, 70° C/1,0 MPa	20	26,3	25,4	25,1	24,6	24,3	24,0
	40	19,6	18,9	18,6	18,2	17,9	17,6
	60	14,2	13,6	13,4	13,1	12,8	-
	70	11,9	11,4	11,2	10,9	10,7	-
	80	9,9	9,5	9,3	9,1	-	-
	95	7,4	7,1	6,9	-	-	-
<b>G 8200</b> <b>PP-R Pressure Pipe</b> 20° C/2,0 MPa, 70° C/1,0 MPa	20	29,9	28,1	27,4	26,4	25,7	25,0
	40	21,6	20,2	19,6	18,8	18,3	17,8
	60	15,4	14,3	13,9	13,3	12,9	-
	70	12,9	12,0	11,6	10,0	8,5	-
	80	10,8	9,6	8,1	6,5	-	-
	95	7,6	5,2	4,3	-	-	-
<b>G 8215 B</b> <b>PP-R CT Stabi composite pipe</b> 20° C/2,0 MPa, 70° C/1,0 MPa	20	25,0	24,2	23,9	23,5	23,1	22,8
	40	18,6	18,0	17,7	17,3	17,1	16,8
	60	13,5	13,0	12,7	12,4	12,2	-
	70	11,3	10,9	10,7	10,4	10,2	-
	80	9,5	9,0	8,9	8,6	-	-
	95	7,1	6,7	6,6	-	-	-
<b>G 8200 FW</b> <b>PP-R CT Fiber composite pipe</b> <b>Watertec</b> 20° C/2,0 MPa, 70° C/1,0 MPa	20	25,0	24,2	23,9	23,5	23,1	22,8
	40	18,6	18,0	17,7	17,3	17,1	16,8
	60	13,5	13,0	12,7	12,4	12,2	-
	70	11,3	10,9	10,7	10,4	10,2	-
	80	9,5	9,0	8,9	8,6	-	-
	95	7,1	6,7	6,6	-	-	-

#### Field of application: Air conditioning, Industrial plants

<b>G 8160FC</b> <b>PP-R CT Fiber composite pipe</b> <b>Climatec</b> 20° C/1,6 MPa, 70° C/0,8 MPa	20	19,9	19,3	19,0	18,6	18,4	18,1
	40	14,8	14,3	14,1	13,8	13,6	13,3
	60	10,7	10,3	10,1	9,9	9,7	-
	70	9,0	8,6	8,5	8,3	8,1	-
	80	7,5	7,2	7,0	6,9	-	-
	95	5,6	5,3	5,2	-	-	-