

**PPR WATER SUPPLY SOLUTION  
TECHNICAL CATALOGUE**



**A MEMBER OF ROXY FOR METAL  
AND PLASTIC PRODUCTS**

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# Chairman's Message

## Roxy For Modern Water Systems

**Roxy** for metal and plastic products, a member of **Momen Group** holding, was established in 2005 due to the tremendous development in the piping industry to cover the needs of national and international markets.

Our main products include UPVC, HDPE, PP and PPR (pipes & fittings) in all types, colors, and different standards (ASTM, DIN, BS, EN, ISO, IQS, AND EGYPTIAN) depending on the client's needs.

Our head office is in Heliopolis, Cairo, Egypt, and our productions facilities and warehouses are in Obour city, and 10th of Ramadan City.

A team of quality assurance specialists in laboratory affairs carry out continuous monitoring processes on the plastic pipes and all the other related parts of the system, such as fittings and related accessories.

We also have a developed quality assurance system that uses a series of advanced devices that allow us to ensure that the production process is up to the international standards and special requirements contracted with our customers.

There is a series of experiments conducted on our plant's production process that include chemical, physical, and mechanical properties.

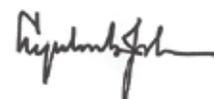
Adding to that, there is a full range of specialists in the field of plastic pipe installation who are fully equipped to provide our customers with technical advice.

Today **Roxy** is considered as one of the largest market leader companies that produces and processes pipes and its accessories in the Egyptian market as well as the Arab world and Africa.

Our products are accredited in different regions, such as: Egypt, Africa, the Arab world, Europe, and Latin America.

Not only are our distribution channels in Africa and the MENA region, but we have also opened new markets in the last two years in north Asia and south America

Chairman



# Why Roxy ?

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## Roxy for Modern water systems

(pipe systems) is an Egyptian company under the umbrella of the holding company

**Momen Group**, which has been established in **1989**. One of our several fields of investments is water systems manufacturing.

Our mission is to establish a circle of trust for every client by providing the best quality, service and price.

**We feel proud** to be able to produce Egyptian products with the latest German technologies.

**Roxy for metal and plastic products** is producing a full complete solution for Non-Metal Piping systems according to all international and national standards such as:

- 1. HDPE** (Drainage, Potable water supply, Irrigation, Fire Fighting, industrial applications, Cable ducting, Marine services, offshore application, oil, and gas applications).
- 2. UPVC** (Pressurized and Non-Pressurized systems), (Infrastructure Application such as Drainage, Water Supply, Irrigation), (Domestic Application such as Soil, Wastewater, Vent and Plumbing Solutions).
- 3. PP-R & PPR-CT** for Potable Water Supply Application.
- 4. PP** for Non-Pressure Drainage Applications.
- 5. Gully Traps and Manholes.**

**RoxyPlast** is using German technological innovations in its manufacturing process in addition to the usage of the best European and American materials such as Borealis, Borouge, Basell, Shintech and Topilene.

**RoxyPlast** is following the continuous developments and changes to improve the quality of its products, due to its laboratories designed with the latest equipment.

**RoxyPlast** gives a warranty on all its systems for up to 50 years.

**RoxyPlast** has very large quantities of all produced materials that are suitable for any project, whatever its size, due to the availability of large production capacity in its factories. Such massive production capacity enables us to deliver our products in a very short period of time with the best quality and competing prices. We work on a stock basis, not by order production so we can maintain fast delivery.

**RoxyPlast** has a large business history and deals with both large and small companies, global and local.

**RoxyPlast** is the only Egyptian company with Egyptian products in the market that has been able to balance between the quality of its products and competitive pricing, which is why we compete with products that are imported from abroad.

# Features & Advantages of ROXY PPR System

## Roxy For Modern Water Systems

### Features of Roxy Plast PPR Pipes and Fittings

Poly propylene is a thermoplastic addition polymer made from the combination of propylene monomers. It's used in variety of applications to include packaging for consumer products, plastic parts for various industries including the automotive industry.



### Advantages

The reliability and durability of the pipeline system directly depends on the quality and properties of the basic substance. The invention of poly propylene random copolymer (PPR) was the result of the unique research, which make it the best selection for pressurized water and heating systems.

Deposits and corrosion don't build up on the surface, having direct contact with water. The internal pipe size does not reduce over time, Preserving the purity of water.

The **Roxy** Plast PPR material is absolutely non-toxic and chemical resistant (inert), and therefore does not affect the quality of the pipeline water, and absolutely has no rust release.

Roxy Plast PPR endures high pressure and temperature drops. Due to the elasticity of the material, an important advantage of polypropylene pipes is as follows: water in the polypropylene pipes may freeze without destroying them.

If water freezes in the polypropylene pipes and fittings, they are not destroyed, but only slightly increase in size and come back to the previous size after thawing.

**Roxy** Plast PPR pipeline water supply system can withstand a certain amount of freezing / thawing. Basic normative document on polypropylene indicates that it is possible to do. Low heat loss.

**Roxy** Plast PPR systems are economical-to-operate, and their heat conductivity is much lower as compared with the metal pipes (heat economy up to 35%). Noise & vibration damping capacity Roxy Plast PPR systems maintain noise suppression much better as compared to the metal pipelines.

Convenient & fast installation. Installation of **Roxy** Plast PPR pipes and fittings requires minimal skills, time and effort. Fusion welding method allows to ensure a long- life tight joint for only a few seconds.

Low cost, good value for money factor is achieved due to the low cost of raw materials and technological ease of installation. Furthermore, the durability of polypropylene plumbing compares favourably with metal plumbing (about 5 times).

# Features & Advantages of ROXY PPR System

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**Roxy** Roxy Plast PPR pipes are light and easily moved and transported; therefore the handling charges are reduced. They are easy to install, and safe for the health ( no risk to get an injury), so that the total cost of the installation is lower than when you use pipes and fittings made of other materials ( carbon steel, copper, PVC and etc.).

1. **Roxy** Plast PPR, used for the pipes and fittings manufacture, is tested to elevated temperatures and chemicals. It is durable and more stable than other materials, which are used in this field.

2. The absence of rust, corrosion, decomposition, decay, dirt, bacteria and calcareous deposits in the pipes and fittings prevents the internal pipe size reduction, and thus, their capacity is not reduced over time.

3. since polypropylene is not a corrosive material, there is no electrochemical or abrasive reaction or wear. Plastic pipes can be easily attached to the fittings, they are widely used for different purposes; their installation requires minimal time and effort.

4. **Roxy** Plast PP-R exhibits high stability to a wide range of organic and inorganic compounds. Due to smooth inner surface it is not subject to the action of timescale, thereby, the internal pipe size remains constant.

## Why Roxy Plast PPR system:

### **Chemical Resistance**

Diluted bases and acids don't react readily with polypropylene, which makes it a good choice for containers of such liquids, such as cleaning agents and more.

### **Elasticity and toughness**

Polypropylene will act with elasticity over a certain range of deflection (like all materials),but it will also exert plastic deformation early in the deformation process, so it is generally considered a tough material, so that it is not Elastic.

### **Resistance to stress and pressure**

Polypropylene retains its shape after a lot of torsion, bending, and flexing

### **Insulation**

Polypropylene has a very high resistance to electricity and is very useful for electronic components.

### **Conclusion**

Roxy Plast PPR (is the most competitive material for our conditions as compared to copper, steel and other polymeric materials. Besides, its random copolymer family is the most suitable for cold and hot water supply systems (drinking water, heating, process pipelines, etc.).

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GERMAN TECHNOLOGY

**POLYPROPYLENE**  
**MATERIAL**  
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# POLYPROPYLENE MATERIAL



Polypropylene systems have been successfully applied to a wide variety of applications.

Polypropylene is used in double containment systems, chemical piping, and pure water systems.

It is chemically resistant to many strong and weak acids, In addition to being one of the few materials that is recommended for strong bases such as Sodium Hydroxide.

It is not ideal for strong oxidizing acids, aromatics, and chlorinated hydrocarbons.

Polypropylene has an extended operating range up to a maximum temperature of 200° F ~ 90°-95° C

Polypropylene is a fairly ductile material at ambient temperatures and it demonstrates good impact strength.

Copolymer polypropylene is a blend of (6%) ethylene and (94%) propylene Copolymer resins generally exhibit better mechanical strength and offer higher safety factors into a system design. Moreover, copolymer PP shows a greater purity level when tested in a static leak test, making it the ideal material for pure water systems.

# POLYPROPYLENE MATERIAL

Roxy For Modern Water Systems

## TECHNICAL DATA SHEET

### **Topilene® R200P**

#### **Polypropylene Random Copolymer**

#### **Product Description**

For PP R Pipes and Fittings(Pressure Pipes Systems)

**Topilene® R200P** is a specially designed polypropylene random copolymer (PP-R, natural colored) that features excellent long-term hydrostatic pressure resistance and heat stability. It is suitable for hot & cold water supply pipes and fittings as well as radiator connecting pipes. It is the outcome of HYOSUNG's integrated polymerization and crystallization technology with advanced PP manufacturing process technique.

#### **Characteristics**

**Typical Application** Hot & cold water supply pipes and fittings / Radiator connecting pipes

**Features** Excellent long-term hydrostatic pressure resistance and heat stability (PPR 125, MRS 12.5 MPa, CRS 3.3 MPa) / Excellent stiffness and impact strength balance / Chemical stability / Environment-friendly / Enhanced processability

**Compliance** The pipes produced with **Topilene® R200P** complies with the hydrostatic pressure requirements according to DIN 8078 and ISO/DIS 15874. It complies with the requirements of NSF/ANSI 14, FDA 21 CFR 177.1520 and (EU) No 10/2011 for food contact. This product corresponds to the DVGW W270/KTW guidelines and GB/T17219 - 1998 for drinking water system.

#### **Typical Properties**

Resin Properties	Method	Value	Unit
Melt Index(230°C, 2.16kg)	ASTM D1238	0.25	g/10min
Density	ASTM D792	0.90	g/cm <sup>3</sup>
Tensile Strength at Yield	ASTM D638	270	kg/cm <sup>2</sup>
Flexural Modulus	ASTM D790	9,000	kg/cm <sup>2</sup>
Notched Izod Impact Strength(23°C / -10°C)	ASTM D256	N.B / 5.0	kg-cm/cm
Rockwell Hardness	ASTM D785	75	R-Scale
Heat Deflection Temperature	ASTM D648	90	°C
Vicat Softening Point	ASTM D1525	130	°C
Mean Coefficient of Linear Thermal Expansion(0°C -80°C)	Dilatometer	1.5*10 <sup>-4</sup>	K <sup>-1</sup>

The values listed above are typical values for reference purpose only and shall not be construed as specifications.

#### **Storage and Handling**

This product should be stored in dry condition at temperature below 40°C and protected from UV-light. When condensation is visible or can be expected, pre-drying is recommended. (Drying condition: 80~100°C/2~4hours at air circulated condition)

**HYOSUNG** PP/DH Performance Unit



# POLYPROPYLENE MATERIAL

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## TECHNICAL DATA SHEET

**Topilene® R200P**

**Polypropylene Random Copolymer**  
For PP-R Pipes and Fittings(Pressure Pipes Systems)

### Process Guidelines

The actual extrusion conditions will depend on the type of equipment and the SDR of pipes produced. The below conditions may be used as guidelines for this material.

Cylinder feeding zone	160-180°C
Cylinder melting zone	180-210°C
Cylinder mixing zone	180-220°C
Head	180-220°C
Die	180-220°C
Melt temperature	200-220°C
Cooling temperature	20-30°C

### Disclaimer

All information, including product characteristics, applications and properties are for reference purpose only and shall not be construed as specifications. Before using this product, customers should carefully review the instructions for use of the product to determine whether the product is suitable for the customer's particular purpose. The customer is responsible for the appropriate, safe and legal use, processing and handling of this product. HYOSUNG CORPORATION assumes no legal responsibility or liability for the contents of this document. We reserve the right to change the contents of this document without prior notice. This document is copyrighted by HYOSUNG CORPORATION.

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**HYOSUNG** PP/DH Performance Unit



# POLYPROPYLENE MATERIAL

Roxy For Modern Water Systems



## PRODUCT DATA SHEET POLYPROPYLENE Borstar® RA140E

POLYPROPYLENE RANDOM COPOLYMER FOR PRESSURE PIPE SYSTEMS

### DESCRIPTION

**Borstar® RA140E** is a BNT Nucleated high molecular weight, low melt flow rate polypropylene random copolymer (PP-R) natural colored.

### APPLICATIONS

**Borstar® RA140E** together with the appropriate additive package is recommended for the production of PP-R pipes and fittings used in: Heating, Plumbing, Domestic water, Relining, and Industrial applications

### SPECIFICATIONS

**Borstar® RA140E** is intended to fulfill the following standards and regulations, providing the appropriate industrial manufacturing standard procedures are used and a continuous quality system is implemented: DIN 8078, DIN 8077 and EN ISO 15874.

### SPECIAL FEATURES

**Borstar® RA140E** is a natural grade used for production of pipes and fittings. The material is in pellet form and includes selected additive package which ensure:

Enhanced process ability	High temperature resistance
Economical pipe production	Low incidence on taste and odour
Excellent product consistency	Good impact strength

The pipe systems will show high durability, no corrosion, good weldability, homogeneous joints, low tendency to incrustations and fast and easy installation.

### PHYSICAL PROPERTIES

Property	Typical Value	Test Method
Density	905kg/m <sup>3</sup>	ISO 1183
Melt Flow Rate (230°C/2.16kg)	0.30g/10min	ISO 1133
Flexural Modulus (2mm/min)	850MPa	ISO 178
Tensile Modulus (1mm/min)	800MPa	ISO 527
Tensile Strain at Yield (50mm/min)	13.5%	ISO 527-2
Tensile Stress at Yield (50mm/min)	25MPa	ISO 527-2
Thermal Conductivity	0.24W/(m K)	DIN 52612
Coefficient of Thermal Expansion (0°C/70°C)	1.8*10E-4/K	DIN 53752
Charpy Impact Strength, notched (23°C)	60 kJ/m <sup>2</sup>	ISO 179/1eA
Charpy Impact Strength, notched (0°C)	6.0kJ/m <sup>2</sup>	ISO 179/1eA
Charpy Impact Strength, unnotched (23°C)	No break	ISO 179/1eU
Charpy Impact Strength, unnotched (0°C)	No break	ISO 179/1eU

\*Data should not be used for specification work

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# POLYPROPYLENE MATERIAL

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## PROCESSING CONDITIONS

The actual conditions will depend on the type of the equipment used and the diameter and wall thickness of the pipes produced.

Following parameters should be used as guidelines for extrusion:

Cylinder	180-210°C
Head	210-220°C
Die	210-220°C
Melt temperature	200-220°C

Following parameters should be used as guidelines IM Machines:

Holding Pressure	200-500bar
Mould Temperature	10-40°C
Melt temperature	200-220°C
Injection Speed	As high as possible

Specific recommendations for processing conditions can be determined only when the application and type of equipment are known. Please contact your local Borouge representative for such particulars.

## STORAGE

**Borstar® RA140E** should be stored in dry conditions at temperature below 50°C and protected from UV-light. Improper storage can initiate degradation, which results in odour generation and colour changes and can have negative effects on physical properties of this product.

More information on storage can be found in Safety Information Sheet (SIS) for this product.

## SAFETY

The product is not classified as a hazardous preparation.

Please see our Safety Information Sheet (SIS) for details on various aspects of safety, recovery and disposal of the product, for more information contact your Borouge representative.

## RECYCLING

The product is suitable for recycling using modern methods of shredding and cleaning. In-house production waste should be kept clean to facilitate direct recycling.

## RELATED DOCUMENTS

The following related documents are available on request, and represent various aspects on the usability, safety, recovery and disposal of the product.

Safety Information Sheet  
Statement on chemicals, regulations and standards  
Statement on compliance to regulations for drinking water pipes

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# POLYPROPYLENE MATERIAL

Roxy For Modern Water Systems



## DISCLAIMER

The product(s) mentioned herein are not intended to be used for medical, pharmaceutical or healthcare applications and we do not support their use for such applications.

To the best of our knowledge, the information contained herein is accurate and reliable as of the date of publication, however we do not assume any liability whatsoever for the accuracy and completeness of such information.

Borouge makes no warranties which extend beyond the description contained herein. Nothing herein shall constitute any warranty of merchantability or fitness for a particular purpose.

It is the customer's responsibility to inspect and test our products in order to satisfy itself as to the suitability of the products for the customer's particular purpose.

The customer is responsible for the appropriate, safe and legal use, processing and handling of our products.

No liability can be accepted in respect of the use of Borouge products in conjunction with other materials. The information contained herein relates exclusively to our products when not used in conjunction with any third party materials.

Jan 2018

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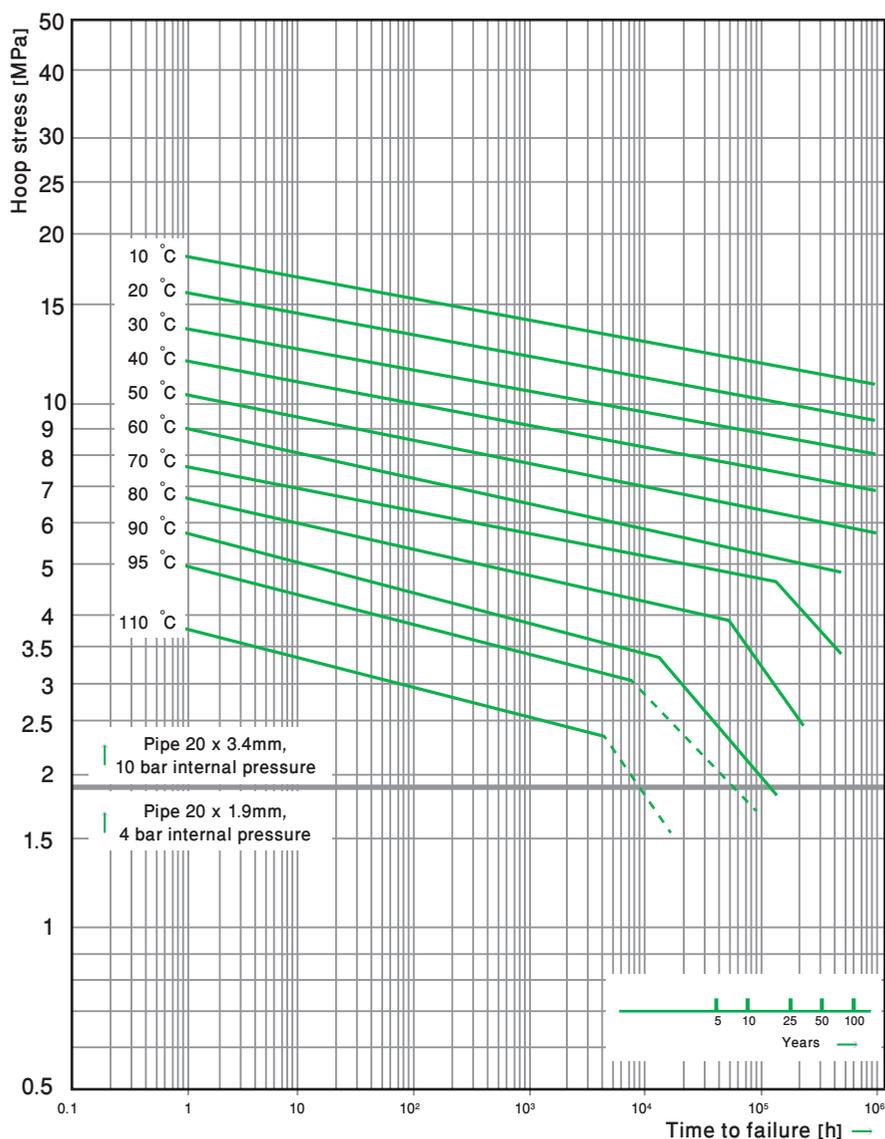
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# POLYPROPYLENE PROPERTIES

Typical value	Test Method	Main Value	Unit
<b>PHYSICAL PROPERTIES</b>			
Density 23° c	ISO 11 83	0.895	g / cm <sup>2</sup>
Vicat softening temperature (0.98 n)	ISO 306	130	° c
<b>RHEOLOGY</b>			
Melt Mass Flow Rate MFR ( 230° C/2.16 KG )	ISO 1133	0.3	g/10 min
<b>MECHANICAL PROPERTIES</b>			
Tensile modulus (1mm/min )	ISO 527 – 1.2	900	MPA
Tensile stress yield (50mm/min)	ISO 527 – 1.2	27	MPA
Tensile strain yield ( 50 mm / min )	ISO 527 – 1.2	13	%
Charpy impact strength At 23 ° c	ISO 179/1eu	N.B	KJ/M2
Charpy impact strength At – 20 ° c	ISO 179/1eu	30	KJ/M2
Charpy impact strength Notched at 23 ° c	ISO 179/1eu	38	KJ/M2
Charpy impact strength Notched at - 20 ° c	ISO 179/1eu	2	KJ/M2
<b>THERMAL PROPERTIES</b>			
Heat deflection (temperature 0.45 mpa "HTD/b")	ISO 75 – 1.2	88	° c
Mean coefficient of linear (Thermal Expansion 0:110° c )	Din 53752	1.5 x 10 <sup>-4</sup>	K <sup>-1</sup>
Thermal conductivity	Din 52612 - 1	0.23	K <sup>-1</sup> m <sup>-1</sup>
<b>ELECTRICAL PROPERTIES</b>			
Surface resistance	Din 53482	>10 <sup>13</sup>	Ohm. cm

# BEHAVIOR OF PPR PIPE

According to DIN 8078, the service life of PP-R pipe depends on the time the internal hoop stress is subjected to a specific temperature. Hoop stress is given as follows:



Where

$\delta$  = Hoop Stress (N/mm<sup>2</sup> or MPa)

P = Internal Pressure (Bar)

d = Outer Diameters of Pipe (mm)

S = Wall Thickness of Pipe (mm)

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

# BEHAVIOR OF PPR PIPE

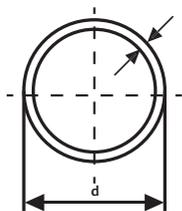
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## Maximum Operating Pressure

The Maximum Operating Pressure is calculated according to the following equation:

$$MOP = \frac{20 \text{ MRS}}{SF (SDR-1)}$$

- The MRS is the minimum required strength at a design life time of 50 years at constant temperature of 20°C for PP-R material is 10 N/mm<sup>2</sup> (1MPa = 10 bar = 1 N/mm<sup>2</sup>).
- The SF is the safety (design) factor at DIN8077:1989 is 2,0 and at DIN8077:2008 is 1,25.
- The SDR is the Standard Dimension Ratio = Outer diameter / Wall of thickness.



$$SDR = 25 + 1 \approx \frac{d}{e} \quad e = \frac{d}{25 + 1}$$

### PN rating

The historic PN rating in DIN8077:1989 was based on a safety (design) factor 2,0 for various applications, and the design stress was set on 5 N/mm<sup>2</sup>.

This resulted in the well know PN rating PN20, PN16 and PN10. The maximum operating pressures of 20 bar, 16 bar and 10 bar only applies at 50 years design life time at constant temperature of 20°C at elevated temperatures the maximum operating pressure is lower. All together a matter of definition which can lead to confusion. This is the reason why the PN rating was abandoned. This PN rating has been replaced by SDR value to established Maximum Operating Pressures for different applications.

SDR Value	PP-R Maximum Operating Pressure (bar)		
	DIN8077:1989 SF = 2,0	ISO 15874:2010 SF = 1,5"	DIN8077:2008 SF = 1,25"
SDR 6	20,0 (PN 20)	25,7	30,9
SDR 7,4	15,6 (PN 16)	20,4	24,5
SDR 11	10,0 (PN 10)	12,9	15,4

### Projected Service Life

The following table provides more detailed information with regards to the permissible pressure at various temperatures:

# BEHAVIOR OF PPR PIPE

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Allowable operating pressures for PP-R pipes with safety factor (SF) = 1,25					
Temperature °C	Years of service	Pipe series S			
		5	3.2	2.5	2
		Standard dimension ratio SDR			
		11	7.4	6	5
Allowable operating pressure bar					
10	1	21.1	33.4	42.1	53.0
	5	19.8	31.5	39.7	49.9
	10	19.3	30.7	38.6	48.7
	25	18.7	29.7	37.4	47.0
	50	18.2	28.9	36.4	45.9
	100	17.8	28.2	35.5	44.7
20	1	18.0	28.5	35.9	45.2
	5	16.9	26.8	33.7	42.5
	10	16.4	26.1	32.8	41.4
	25	15.9	25.2	31.7	39.9
	50	15.4	24.5	30.9	38.9
	100	15.0	23.9	30.1	37.8
30	1	15.3	24.2	30.5	38.5
	5	14.3	22.7	28.6	36.0
	10	13.9	22.1	27.8	35.0
	25	13.4	21.3	26.8	33.8
	50	13.0	20.7	26.1	32.9
	100	12.7	20.1	25.4	31.9
40	1	13.0	20.6	25.9	32.6
	5	12.1	19.2	24.2	30.5
	10	11.8	18.7	23.5	29.6
	25	11.3	18.0	22.6	28.5
	50	11.0	17.4	22.0	27.7
	100	10.7	16.9	21.4	26.9
50	1	11.0	17.4	21.9	27.6
	5	10.2	16.2	20.4	25.7
	10	9.9	15.7	19.8	25.0
	25	9.5	15.1	19.0	24.0
	50	9.2	14.7	18.5	23.3
	100	9.0	14.2	17.9	22.6

# BEHAVIOR OF PPR PIPE

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...Continued

**Allowable operating pressures for PP-R pipes with safety factor (SF) = 1,25**

Temperature	Years of service	Pipe series S			
		5	3.2	2.5	2
		Standard dimension ratio SDR			
		11	7.4	6	5
Allowable operating pressure bar					
60	1	9.2	14.7	18.5	23.3
	5	8.6	13.6	17.2	21.6
	10	8.3	13.2	16.6	21.0
	25	8.0	12.7	16.0	20.1
	50	7.7	12.3	15.5	19.5
70	1	7.8	12.3	15.5	19.6
	5	7.2	11.4	14.4	18.1
	10	7.0	11.1	13.9	17.5
	25	6.0	9.6	12.1	15.2
	50	5.1	8.1	10.2	12.8
80	1	6.5	10.3	13.0	16.4
	5	5.7	9.1	11.5	14.5
	10	4.8	7.7	9.7	12.2
	25	3.9	6.2	7.8	9.8
95	1	4.6	7.3	9.2	11.6
	5	3.1	4.9	6.2	7.8
	(10) <sup>a</sup>	(2,6)	(4,1)	(5,2)	(6,6)

<sup>a</sup> The values in brackets apply where testing can be shown to have been carried out for longer than one year at 110 °C.

# BEHAVIOR OF PPR PIPE

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## BEHAVIOR PP-R PIPE

### Hygiene & Health Concerns

PP-R Pipes are manufactured with health concerns in mind. The connection of pipes does not require any additives such as Solvent cement, fluxes or solder. To ensure the safety of people who come in contact with or consume the potable water, the following are strictly adhered to: DIN 1988 Part 2 Drinking Water Supply Systems Materials Components Appliances Design and Installation.

### Sound Insulation

Compared to metallic pipes, PP-R pipes do not need further insulation to decrease the decibel level when water flows at relatively high speeds. The reason is simple. Metals transmit noises quicker and louder than plastics. Hence, whistling noises that result from the water hammer effect are non-existent.

### Advantages of Using PP-R Pipes & Fittings

In comparison to either one of the conventional piping systems (metal or plastic), the PP-R pipe has the following advantages that make it the system of the new millennium:

- It is safe for human health
- It is resistant to rust and corrosion
- Rupture-free
- It has high resistance to acids and chlorides
- High-pressure tolerance and rating
- Speed and ease of fusion technology
- Extensive reduction in money, time and labor.
- No scaling
- Noise-free at high flow rates
- Light-weight

# CHEMICAL PROPERTIES

## Definitions, symbols and abbreviations

The criteria of classification, definitions, symbols and abbreviations adopted in this document are as follows:

- **S = Satisfactory**

The chemical resistance of polypropylene exposed to the action of a fluid is classified as 'satisfactory' when the results of test are acknowledged to be 'satisfactory' by the majority of the countries participating in the evaluation.

- **L = Limited**

The chemical resistance of polypropylene exposed to the action of a fluid is classified as 'limited' when the results of tests are acknowledged to be 'limited' by the majority of the countries participating in the evaluation. Also classified as 'limited' is the resistance to the action of chemical fluids for which judgements 'S' and 'NS' or 'L' are pronounced to an equal extent.

- **NS = Not satisfactory**

The chemical resistance of polypropylene exposed to the action of a fluid is classified as 'not satisfactory' when the results of tests are acknowledged to be 'not satisfactory' by the majority of the countries participating in the evaluation. Also classified as 'not satisfactory' are materials for which judgements 'L' and 'NS' are pronounced to an equal extent.

- **Sat. sol** Saturated aqueous solution, prepared at 20°C
- **Sol** Aqueous solution at a concentration higher than 10%, but not saturated
- **Dil.sol** Dilute aqueous solution at a concentration equal to or lower than 10%
- **Work.sol** Aqueous solution having the usual concentration for industrial use

Solution concentrations reported in the text are expressed as a percentage by mass. The aqueous solutions of sparingly soluble chemicals are considered, as far as chemical action towards polypropylene is concerned, as saturated solutions. In general, common chemical names are used in this document

# CHEMICAL PROPERTIES

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Chemical or product	Concentration	Temperature °C		
		20°C	60°C	100°C
Acetic acid	Up to 40%	S	S	-
Acetic acid	50%	S	S	-
Acetic acid, glacial	greater than 96%	S	L	NS
Acetic anhydride	100%	S	-	-
Acetone	100%	S	S	-
Acceptophenone	100%	S	L	-
Acrylonitrile	100%	S	-	-
Air		S	S	S
Almond oil		S	-	-
Alum	Sol	S	-	-
Ammonia, aqueous	Up to 30%	S	-	-
Ammonia, dry gas	100%	S	-	-
Ammonia, liquid	100%	S	-	-
Ammonium acetate	Sat sol	S	S	-
Ammonium chloride	Sat sol	S	-	-
Ammonium fluoride	Sol	S	S	-
Ammonium hydrogen carbonate	sat sol	S	S	-
Ammonium hydroxide	Sat sol	S	-	-
Ammonium metaphosphate	Sat sol	S	S	-
Ammonium nitrate	Sat sol	S	S	S
Ammonium phosphate	Sat sol	S	-	-
Ammonium sulphate	Sat sol	S	S	S
Amyl acetate	100%	L	-	-
Amyl alcohol	100%	S	S	S
Aniline	100%	S	S	-
Apple juice		S	-	-
Aqua regia	HCl/HNO <sub>3</sub> -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	-	-
Benzyl alcohol	100%	S	L	-
Borax	sol	S	S	-
Boric acid	sat sol	S	-	-
Bromine, gas		L	NS	NS
Bromine, liquid	100%	NS	NS	NS

# CHEMICAL PROPERTIES

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Chemical or product	Concentration	Temperature °C			
		20°C	60°C	100°C	
Butane	100%	S	-	-	
Butanol	100%	S	L	L	
Butyl acetate	100%	S	L	L	
Butyl glycol	100%	S	-	-	
Butyl phenol	Cold satsol	S	-	-	
Butyl phthalate	100%	S	L	L	
Calcium carbonate	Satsol	S	S	S	
Calcium chloride	Satsol	S	S	S	
Calcium hydroxide	Satsol	S	S	-	
Calcium hypochlorite	Sol	S	-	-	
Calcium nitrate	Satsol	S	S	-	
Camphor oil		NS	NS	NS	
Carbon dioxide, dry gas	Carbon dioxide, wet	100%	S	S	-
Carbon disulphide	100%	S	NS	NS	
Carbon tetrachloride	100%	NS	NS	NS	
Castor oil	100%	S	S	-	
Caustic soda	Up to 50%	S	L	L	
Chlorine, aqueous	Sat sol	S	L	-	
Chlorine, dry gas	100%	NS	NS	NS	
Chlorine, liquid	Sol	NS	NS	NS	
Chloroacetic acid	100%	NS	NS	NS	
Chloroethanol	100%	S	-	-	
Chloroform	100%	L	NS	NS	
Chlorosulphonic acid	100%	NS	NS	NS	
Chrome alum	Sol	S	-	-	
Chromic acid	Up to 40%	S	L	N	
Citric acid	10%	S	S	S	
Coconut oil		S	-	-	
Con oll		S	L	-	
Cottonseed oil		S	L	-	
Cresol	Greater than 90%	S	-	-	
Copper (11) Chloride	Sat Sol	S	s	-	
Copper (11)nitrate	30%	S	S	S	
Copper (11) sulphate	Sat Sol	S	S	-	
Cyclonexane	100%	S	-	-	
Cyclohexanol	100%	S	L	-	
Cyclohexanone	100%	L	NS	NS	

# MATERIAL PROPERTIES

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Hostile Environment	Concentration	Chemical resistance		
		20°C	60°C	100°C
Dekalin (decahydro-naphthalene)	100%	NS	NS	NS
Dextrin	Sol	S	S	-
Dextrose	Sol	S	S	-
Dibutyl phthalate	100%	S	L	NS
Dichloroacetic acid	100%	L	-	-
Dichloroethylene (A and B)	100%	L	-	-
Diethanolamine	100%	S	-	-
Diethyl ether	100%	S	L	-
Diethylone glycol	100%	S	S	-
Diglycolic acid	Sat Sol	S	-	-
Disooctyl phthalate	100%	S	L	-
Dimethyl amine	100%	S	-	-
Dimethyl formamide	100%	S	S	-
Dioctyl phthalate	100%	L	L	-
Dioxane	100%	L	L	-
Distilled water	100%	S	S	S
Ethanolamine	100%	S	-	-
Ethyl acetate	100%	L	NS	NS
Ethyl alcohol	Up to 95%	S	S	S
Ethyl chloride	100%	NS	NS	NS
Ethylene chloride (mono and di)		L	L	-
Ethylene glycol	100%	S	S	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
Gasoline, petrol (aliphatic hydrocarbons)		NS	NS	NS
Gelatine		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	-	NS
Hydrochloric acid	From 2 to 7 %	S	S	S
Hydrochloric acid	From 10 to 20%	S	S	-
Hydrochloric acid	30%	S	L	L
Hydrochloric acid	From 35 to 36%	S	-	-
Hydrofluoric acid	Dilsol	S	-	-

# CHEMICAL PROPERTIES

Roxy For Modern Water Systems

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...Continued

Hostile Environment	Concentration	Chemical resistance		
		20°C	60°C	100°C
Hydrofluoric acid	40%	S	-	-
Hydrogen	100%	S	-	-
Hydrogen chloride, dry gas	100%	S	S	-
Hydrogen peroxide	Up to 30%	S	L	-
Hydrogen sulphide, dry gas	100%	S	S	-
Iodine in alcohol		S	-	-
Isopropyl alcohol	100%	S	S	S
Isopropyl ether	100%	L	-	-
Isoctane	100%	L	NS	NS
Lactic acid	Up to 90%	S	S	-
Linseed oil		S	S	S
Magnesium carbonate	Sat Sol	S	S	S
Magnesium chloride	Sat Sol	S	S	-
Magnesium sulphate	Sat Sol	S	S	-
Malic acid	Sol	S	S	-
Mercury chloride	Sat Sol	S	S	-
Mercury cyanide	Sat Sol	S	S	-
Mercury nitrate	Sol	S	S	-
Mercury	100%	S	S	-
Methyl acetate	100%	S	S	-
Methyl alcohol	5%	S	L	L
Methyl amine	Up to 32%	S	-	-
Methyl bromide	100%	NS	NS	NS
Methyl ether ketone	100%	S	-	-
Methylene chloride	100%	L	NS	NS
Milk		S	S	S
Monochloroacetic acid	Greater than 85%	S	S	-
Naphtha		S	NS	NS
Nickel chloride	Sat sol	S	S	-
Nickel nitrate	Sat sol	S	S	-
Nickel sulphate	Sat sol	S	S	-
Nitric acid	10%	S	NS	NS
Nitric acid	30%	S	-	-
Nitric acid	From to 50 %	L	NS	NS
Nitric acid, fuming (with nitrogen dioxide)		NS	NS	NS
Nitrobenzene	100%	S	L	-
Oleic acid	100%	S	L	-
Oleum (sulphuric acid with 60% of SO <sub>2</sub> )		NS	NS	NS
Olive oil		S	S	L
Oxalic acid	Sat Sol	S	L	NS
Oxygen	100%	S	-	-

# MATERIAL PROPERTIES

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Hostile Environment	Concentration	Chemical resistance		
		20°C	60°C	100°C
Paraffin oil (FL 65)		S	L	NS
Peanut oil		S	S	-
Peppermint oil		S	-	-
Perchloric acid	2N	S	-	-
Petroleum ether (ligroine)		L	L	-
Phenol	5%	S	S	-
Phenol	90%	S	-	-
Phosphoric acid	25%	S	S	S
Phosphoric acid	From 25 to 85%	S	S	S
Phosphoric oxychloride	100%	L	-	-
Picric acid	Sat Sol	S	-	-
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 fluoride	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	Greater than 50%	S	-	-
Pyridine	100%	L	-	-
Sea water		S	S	S
Silicone oil		S	S	S
Silver nitrate	Sat Sol	S	S	L
Sodium acetate	Sat Sol	S	S	S
Sodium benzoate	35%	S	-	-
Sodium carbonate	Up to 50%	S	S	L
Sodium chlorate	Sat Sol	S	-	-
Sodium chloride	Sat Sol	S	S	S
Sodium chlorite	2%	S	L	NS
Sodium chlorite	20%	S	L	NS
Sodium dichromate	Sat Sol	S	S	S

# MATERIAL PROPERTIES

Roxy For Modern Water Systems

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...Continued

Hostile Environment	Concentration	Chemical resistance		
		20°C	60°C	100°C
Sodium hydrogen carbonate	Sat Sol	S	S	S
Sodium hydrogen sulphate	Sat Sol	S	S	-
Sodium hydrogen sulphite	Sol	S	-	-
Sodium hydroxide	1%	S	S	S
Sodium hydroxide	From 10 to 60%	S	S	S
Sodium hypochlorite	5%	S	-	-
Sodium hypochlorite	10%	S	-	-
Sodium hypochlorite	20%	S	-	-
Sodium metaphosphate	Sol	S	-	-
Sodium nitrate	Sat Sol	S	S	-
Sodium perborate	Sat Sol	S	S	S
Sodium phosphate (neutral)	Sat Sol	S	S	S
Sodium silicate	Sol	S	S	-
Sodium sulphate	Sat Sol	S	S	-
Sodium sulphide	Sat Sol	S	-	-
Sodium sulphite	40%	S	S	S
Sodium thiosulphate (hypo)	Sat Sol	S	-	-
Soybean oil		S	L	-
Succinic acid	Sat Sol	S	S	-
Sulphur acid	Up to 10%	S	S	S
Sulphur dioxide, dry or wet	100%	S	S	-
Sulphur acid	From 10 to 30%	S	S	-
Sulphuric acid	50%	S	L	L
Sulphuric acid	96%	S	L	NS
Sulphuric acid	98%	L	NS	NS
Sulphurous acid	Sol	S	-	-
Tartaric acid	10%	S	S	-
Tetrahydrofuran	100%	L	NS	NS
Tetralin	100%	NS	NS	NS
Thiophene	100%	S	L	-
Tin IV chloride	Sat Sol	S	S	-
Tin 00 chloride	Sat Sol	S	S	-
Toluene	100%	L	NS	NS
Trichloroacetic acid	Up to 50%	S	S	-
Trichloroethylene	100%	L	NS	NS
Triethanolamine	Sol	S	-	-
Turpentine		NS	NS	NS
Urea	Sat Sol	S	-	-
Vinegar		S	S	-
Water brackish, mineral,potable		S	S	S
Whiskey		S	-	-
Wines		S	-	-
Xylene	100%	NS	NS	NS
Yeast	Sol	S	S	S
Zinc chloride	Sat Sol	S	S	-
Zinc sulphate	Sat Sol	S	S	-

# FOLLOWED STANDARD

## According to:

DIN 8077 Polypropylene Pipes and Dimensions

DIN 8078 Polypropylene Pipes, General Quality Requirements and Testing

DIN 16962 Pipe Joints and Elements for Polypropylene Pressure Pipes

DIN 1988 PART 2 Drinking Water Supply Systems, Material Components, Appliance Design and Installation

BS 6700 Design Installation, Testing and Maintenance of Services Supplying Water for Domestic Use within Buildings and their Curtilages

DVS 2207 Welding of Thermoplastic

DVS 2208 Welding Machines and Devices for Thermoplastic

ES 3703 PART 1 2002 Polypropylene Pipe dimensions and Testing

## What are DIN Standards

Deutsches Institut für Normung (DIN) is a German institute for standardization. It is a technical and scientific association recognized by the German government as the National Standards body representing German interests at International and European levels.

DIN provides a forum where representatives from the manufacturing industries, consumer organizations, commerce, trades, and service industries, science and technical inspectorates as well as the Government can gather to discuss and define their specific standardization requirements and to record their results as German standards.

## What does PN stand for, and what does it mean to be PN10, PN16, PN20 or PN24.5 ?

PN stands for Nominal Pressure. It is a numerical designation used for referencing purposes related to mechanical characteristics of the components of a piping system.

A PN 24.5 Pipe means that the pipe can withstand pressure up to 24.5 bar at 20 C for 50 years.

## Why are fittings categorized under PN- 25 types?

Fittings can withstand any temperature above 90/95°C and pressure up to 25 kg/cm<sup>2</sup>. Hence, they are categorized under PN-25.

# FOLLOWED STANDARD

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## How are pipes categorized as PN-10, PN-12, PN-16, PN-20 & PN-25?

It is done by matching them with the SDR (Standard Dimension Ratio) conventional pipes. A PPR Pipe with a wall thickness of  $OD / SDR$  is matched as the equivalent of a PPR Pipe for a SDR Pipe.

PN -10 is regarded as the equivalent of a SDR 11 because the PN 10 Pipe of 20 mm OD has an approximate thickness of  $20/11=1.8$ .

PN-10 160 mm has an approximate thickness of  $160/11 = 14.55$  Likewise, SDR 9 is matched with PN - 12, SDR 7.4 with PN - 16, SDR 6 with PN - 20 and SDR 5 as PN - 25.

## How are the PP-R pipes & fittings joined together?

The process of jointing the PP-R pipes and fittings is very simple and results in inseparable water joints.

It is carried out by using a simple welding machine that melts the internal surface of the fittings and the external surface of the pipe at  $270^{\circ}\text{C}$  to the point of melting. Since the pipes and fittings are produced from the same material, the connection is homogeneous.

## Can the pipe's alignment be adjusted after the welding process?

Any alignment up to  $5^{\circ}$  degrees relative to the axis of the pipe can be adjusted immediately after jointing.

## How are the sizes of the pipes and fittings measured?

A pipe's size is obtained by measuring its Outer Diameter (OD) in millimeters (mm).

As for the PP-R fittings, they are obtained by measuring Inner Diameter (ID) also in millimeters (mm).

And the metal threaded fittings are measured in inches (").

## How can stressing of the pipe be avoided?

Possible linear thermal expansion and contraction needs to be taken care of during designing and installing. Stressing of the pipes can be avoided by providing flexible length and proper supporting.

## Why is the joining of pipes without using sockets not recommended?

This is because such joining results in blockage or reduction in the inner diameter at the joining point. Hence, it is recommended to avoid it as it can affect the functioning of the entire system.

## Is joining the pipes & fittings using the glue recommended?

It is not recommended because glue cannot stop the pipes from leaking. It resembles a termite attack and requires frequent maintenance, thus affecting the pipe's hygiene and shelf-life.

## Which method of pressure testing is recommended?

Before any pipes are filled or cemented in concealed application, they are to be hydrostatically tested for any pressure loss or leakage. Start by closing all ends of the pipe with end caps and pipe plugs. Then proceed with loading water and pressure in the closed pipes up to 25 Bar pressure in PN - 16, PN - 20 and PN - 25 pipes, and up to 15 bar pressure for PN - 10 and PN - 12 at room temperature.

The pressure should be maintained for at least 8 hours to check for any drop in pressure and repeated to dismiss the minute chance of any leakage. In the event of any considerable pressure drop, the particular area of leakage has to be identified and redone.

# PP-RCT MATERIAL

## PP-RCT:

**PPRCT** is a new generation of Polypropylene material. Thanks to its structure, pipes and fittings can be produced with higher hydraulic capacity or with higher compressive strength. This means that – for the same application case – if the pipes are produced with thinner walls, they have higher flow capacity with a consistent diameter. With the conception of the pipe systems, the outer diameter can therefore be reduced by one dimension with virtually the same inner diameter.

The compressive strength of PP-RCT is significantly higher than with PP-R; e.g. with an application Temperature of 70°C higher pressure of up to 60% is possible.

## Properties:

- Good resistance to chemicals
- Corrosion resistance
- Excellent processing capability

## Material:

The symbols used for PP-RCT indicate the fact that these are random copolymers (R = random), with modified crystalline structure (C = crystalline). In addition, PP-RCT is characterized by improved long-term hydrostatic strength, particularly at elevated temperatures (T = temperature (resistance)).

## Joining technology:

- Socket - welding
- Butt - welding
- Electrofusion socket - welding
- Flange connection

## PP-RCT Pipes Range:

- **COMPOSITION:** Available in Single Layer and Multi-layer (UV, Fiberglass and UV+Fiberglass).
- **Standard Dimension Ratios:** Available in SDR5, SDR6 and SDR7.4.
- **Pressure rating:** please refer to table page from 55 to 61.
- **Sizes and Dimensions:** The Outside diameter, wall thickness, Inner Diameter and weight of the PP-RCT Pipes are identical to PP-R Pipes.

# PP-RCT LONG TERM HYDROSTATIC PRESSURE

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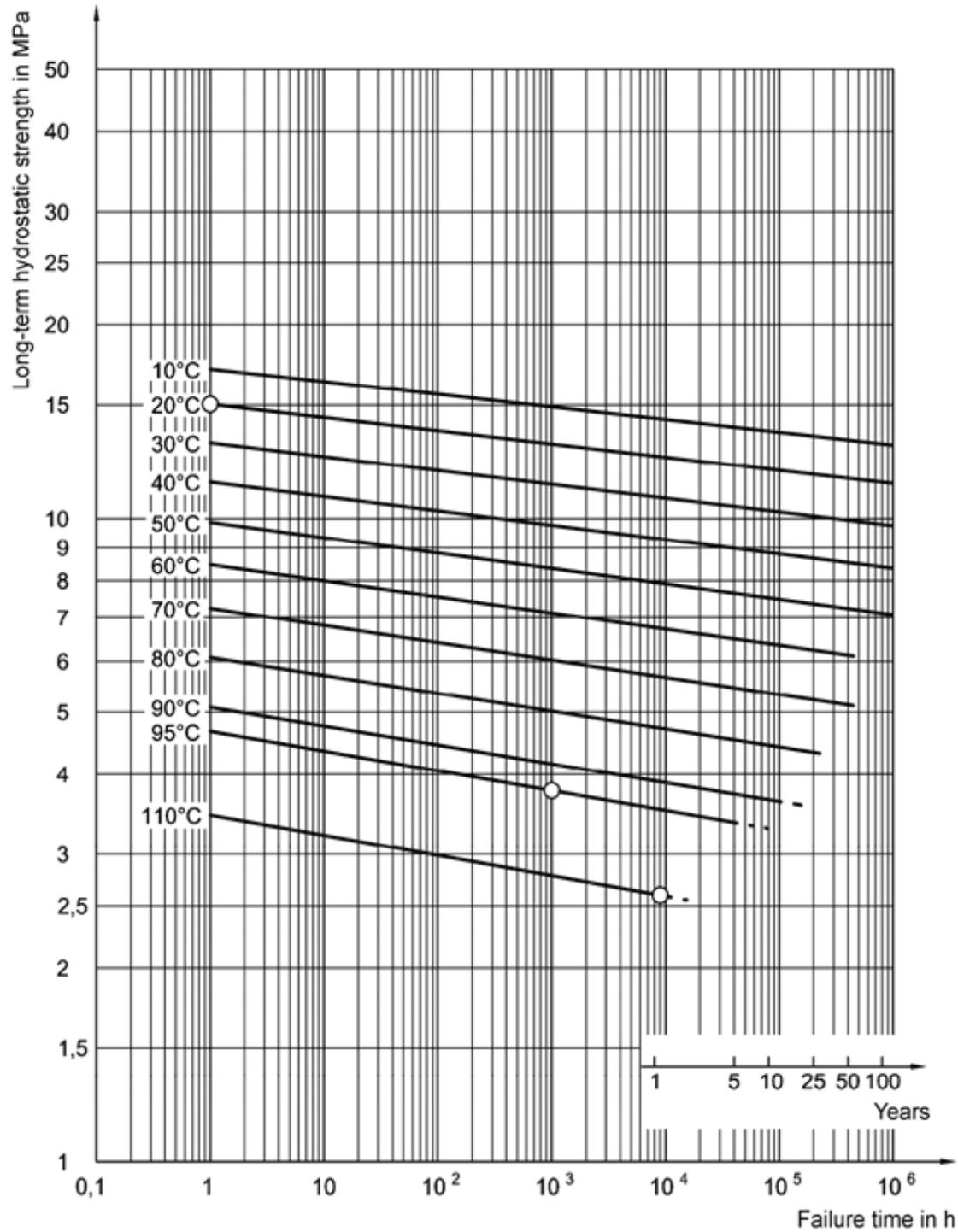


Figure 4 — Reference characteristic curves of the long-term hydrostatic strength (minimum curves) for PP-RCT pipes

# ALLOWABLE OPERATING PRESSURE

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**Table - Allowable operating pressures**  
for PP-RCT pipe conveying Water, safety factor (SF) = 1,25

Temperature °C	Years of service	Pipe series S									
		20	16	12.5	8.3	8	5	4	3.2	2.5	2
		Standard dimension ratio SDR									
		41	36	26	17.5	17	11	9	7.4	6	5
Allowable operating pressures bar											
10	1	5,7	7,2	9,1	13,7	14,4	22,8	28,8	36,2	45,6	57,4
	5	5,5	7	8,8	13,3	14,0	22,1	27,9	35,1	44,2	55,7
	10	5,5	6,9	8,7	13,1	13,8	21,9	27,5	34,7	43,7	55,0
	25	5,4	6,8	8,5	12,9	13,5	21,5	27,1	34,1	42,9	54,0
	50	5,3	6,7	8,4	12,7	13,4	21,2	26,7	33,6	42,3	53,3
	100	5,2	6,6	8,3	12,6	13,2	20,9	26,3	33,2	41,8	52,6
20	1	5,0	6,3	7,9	11,9	12,5	19,9	25,0	31,5	39,7	50,0
	5	4,8	6,1	7,6	11,6	12,1	19,3	24,2	30,5	38,5	48,8
	10	4,7	6,0	7,5	11,4	12,0	19,0	23,9	30,1	37,9	47,8
	25	4,6	5,9	7,4	11,2	11,7	18,6	23,5	29,6	37,2	46,9
	50	4,6	5,8	7,3	11,0	11,6	18,4	23,1	29,2	36,7	46,2
	100	4,5	5,7	7,2	10,9	11,4	18,1	22,8	28,8	36,2	45,6
30	1	4,3	5,4	6,8	10,3	10,8	17,2	21,7	27,3	34,4	34,3
	5	4,1	5,2	6,6	10,8	10,5	16,6	20,9	26,4	33,2	41,8
	10	4,1	5,1	6,5	9,8	10,3	16,4	20,6	26,0	32,7	41,2
	25	4,0	5,0	6,4	9,6	10,1	16,1	20,2	25,5	32,1	40,4
	50	3,9	5,0	6,3	9,5	10,0	15,8	19,9	25,1	31,6	39,8
	100	3,9	4,9	6,2	9,4	9,8	15,6	19,7	24,8	31,2	39,3
40	1	3,7	4,6	5,9	8,9	9,3	14,8	18,6	23,5	29,6	37,2
	5	3,5	4,5	5,7	8,6	9,0	14,3	18,0	22,6	28,5	35,9
	10	3,5	4,4	5,6	8,4	8,8	14,1	17,7	22,3	28,1	35,4
	25	3,4	4,3	5,4	8,3	8,7	13,8	17,3	21,8	27,5	34,6
	50	3,4	4,3	5,4	8,1	8,5	13,6	17,1	21,5	27,1	34,1
	100	3,3	4,2	5,3	8,0	8,4	13,3	16,8	21,2	26,7	33,6
50	1	3,1	0,4	5,0	7,6	8,0	12,6	15,9	20,1	25,3	31,8
	5	3,0	3,8	4,8	7,3	7,7	12,2	15,3	19,3	24,3	30,6
	10	3,0	3,7	4,7	7,2	7,5	12,0	15,1	19,0	23,9	30,1
	25	2,9	3,7	4,6	7,0	7,4	11,7	14,7	18,6	23,4	29,5
	50	2,9	3,6	4,6	6,9	7,2	11,5	14,5	18,3	23,0	29,0
	100	2,8	3,5	4,5	6,8	7,1	11,3	14,3	18,0	22,6	28,5

# ALLOWABLE OPERATING PRESSURE

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Table 11 (Concluded)

Temperature °C	Years of service	Pipe series S										
		20	16	12.5	8.3	8	5	4	3.2	2.5		
		Standard dimension ratio SDR										
		41	36	26	17.5	17	11	9	7.4	6		
Allowable operating pressures bar												
60	1	2,7	3,4	4,2	6,4	6,7	10,7	13,5	17,0	21,4	27,0	
	5	2,5	3,2	4,1	6,2	6,5	10,3	13,0	16,3	20,6	25,9	
	10	2,5	3,2	4,0	6,1	6,4	10,1	12,7	16,0	20,2	25,5	
	25	2,4	3,1	3,9	5,9	6,2	9,9	12,4	15,7	19,8	24,9	
	50	2,4	3,0	3,8	5,8	6,1	9,7	12,2	15,4	19,4	24,5	
70	1	2,2	2,8	3,6	5,4	5,7	9,0	11,3	14,3	18,0	22,7	
	5	2,1	2,7	3,4	5,2	5,4	8,6	10,9	13,7	17,3	21,7	
	10	2,1	2,6	3,3	5,1	5,3	8,5	10,7	13,5	16,9	21,3	
	25	2,0	2,6	3,3	5,0	5,2	8,3	10,4	13,1	16,5	20,8	
	50	2,0	2,5	3,2	4,9	5,1	8,1	10,2	12,9	16,2	20,5	
80	1	1,8	2,3	3,0	4,5	4,7	7,5	9,5	11,9	15,0	18,9	
	5	1,8	2,2	2,8	4,3	4,5	7,2	9,0	11,4	14,4	18,1	
	10	1,7	2,2	2,8	4,2	4,4	7,0	8,9	11,2	14,1	17,7	
	25	1,7	2,1	2,7	4,1	4,3	6,9	8,6	10,9	13,7	17,3	
	1	1,4	1,7	2,2	3,4	3,5	5,6	7,1	8,9	11,2	14,2	
	5	1,3	1,7	2,1	3,2	3,3	5,3	6,7	8,5	10,7	13,5	
	(10)	(1,3)	(1,6)	(2,1)	(3,1)	(3,3)	(5,2)	(6,6)	(8,3)	(10,5)	(13,2)	

The Values in brackets apply where testing can be shown to have been carried out of longer than one year at 110 °C



# ALLOWABLE OPERATING PRESSURE

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## Polypropylene Beta-PPR™ RA7050-GN Polypropylene Random Copolymer for Pressure Pipe Systems

### Description

**Beta-PPR™ RA7050-GN** is a PP-RCT<sup>(1)</sup>, a Polypropylene-Random-Copolymer with an enhanced Crystalline structure brought about by a special  $\beta$ -nucleation and with an improved Temperature resistance. Proof of the excellent performance characteristics of **Beta-PPR™ RA7050-GN** is, for example, a categorised required strength (CRS) of 5 MPa at 70°C and 50 years (according to ISO 12162) in comparison to a value of 3.21 MPa for standard PP-R. The colour of **Beta-PPR™ RA7050-GN** is green similar to RAL 6024.

### Applications

In general **Beta-PPR™ RA7050-GN** is intended to be used in applications for plumbing and heating, such as in-house hot and cold water pipes and fittings, floor and wall heating systems and radiator connections.

### Physical Properties\*\*

		Typical Value*	Unit	Test Method
Density		905	kg/m <sup>3</sup>	ISO 1183
Melt Flow Rate	(230°C/2.16 kg)	0.3	g/10 min	ISO 1133
Tensile Stress at Yield	(50 mm/min)	25	MPa	ISO 527-2
Tensile Strain at Yield	(50 mm/min)	10	%	ISO 527-2
Modulus of Elasticity in Tension	(1 mm/min)	900	MPa	ISO527
Charpy Impact Strength, notched	(+23°C)	40	kJ/m <sup>2</sup>	ISO 179/1eA
Charpy Impact Strength, notched	(0°C)	4	kJ/m <sup>2</sup>	ISO 179/1eA
Charpy Impact Strength, notched	(-20°C)	2	kJ/m <sup>2</sup>	ISO 179/1eA
Mean Linear Thermal Coefficient of Expansion from 0°C to 70°C		1.5	*10 <sup>-4</sup> K <sup>-1</sup>	DIN 53752
Thermal Conductivity		0.24	WK <sup>-1</sup> m <sup>-1</sup>	DIN 52612 Part 1
Surface Resistance		> 10 <sup>12</sup>	Ohm	DIN 53482/VDE 0303 Part 2

\* Data should not be used for specification work.

\*\* Measured on standard moulded specimens.

### Processing guidelines

#### Pipe Extrusion

Pipes made of **Beta-PPR™ RA7050-GN** are produced on single screw extruders of 30D or more in length. They are preferably equipped with a grooved and intensely cooled feed zone. Conventional die heads, like spider mandrel, spiral melt distributor or screen cage dies, can be used as forming tools. The use of a screen pack (sieve 60 to 100 mesh) is recommended to ensure quality during production.

In general, vacuum tank calibration is used with a sizing sleeve or disc calibrator. A sizing sleeve with integrated water ring is recommended to prevent the melt from sticking in the sizing sleeve. Alternatively, a separate spray ring can be connected prior to the vacuum tank.

The cold temperature impact performance of **Beta-PPR™ RA7050-GN** pipes depends on the processing. Diagram 1 illustrates the influence of different processing conditions on the impact behaviour at 0°C.

<sup>(1)</sup>For further information about the abbreviation see also ISO 1043-1:2001

Beta-PPR is a trademark of Borealis group.

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## Polypropylene Beta-PPR™ RA7050-GN

In order to avoid the manufacture of pipes that show a brittle behaviour at the freezing temperature the following recommendations shall be followed. It is essential that the melt temperature of the material leaving the die head lies between 220–230°C. This is achieved by setting the extruder cylinder temperatures in the range of 215–230°C and the tool temperatures in the range of 220–230°C. The specified melt temperature range provides a homogeneously and thoroughly molten polymer; a prerequisite to achieve an optimum crystal structure. Furthermore, the defined melt temperature level results in a favourable heat transfer rate for the development of the right form and degree of crystallinity.

In addition to the appropriate extruder settings the impact performance can further be enhanced by an arrangement of cooling tanks that allow for an in-line annealing or by a post-extrusion annealing process. These measures to optimise the impact performance are optional.

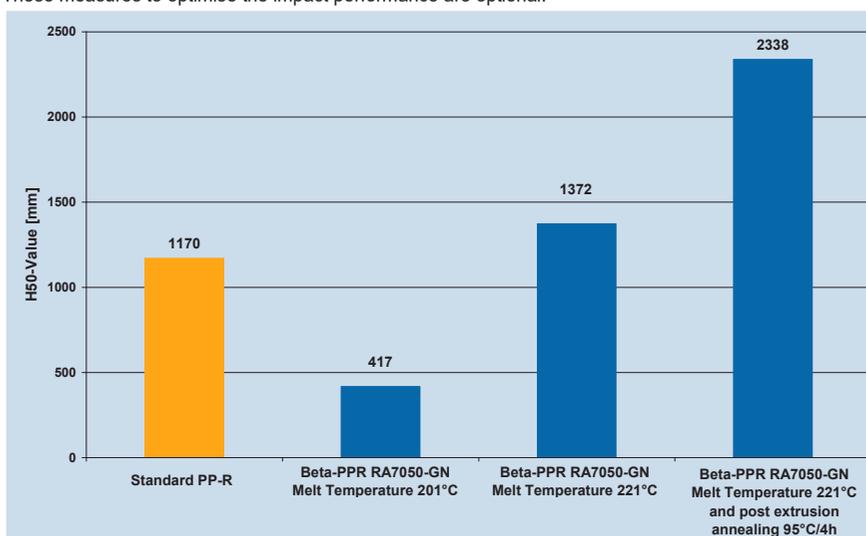


Diagram 1: Impact performance of pipes 25 x 3,5 mm measured at 0°C according to the EN 1411

### Injection Moulding of Fittings

**Beta-PPR™ RA7050-GN** can be processed on every modern injection moulding equipment with screw plasticators. Machine parameters and processing conditions used for standard PP-R can be applied to **Beta-PPR™ RA7050-GN**. The temperature settings shall be selected such that the polymer temperature increases uniformly; ideally from 200°C at the feed hopper to 220–250°C at the injection nozzle. At no time should the mass temperature exceed 250°C as degradation of the material will start to take place. As the melt temperature during injection moulding of fittings is usually above 220°C the right form and degree of crystallinity is attained thereby a good low temperature impact behaviour level is achieved. To obtain a stable and homogeneous melt it is best to choose a dosing volume between 1D and 3D. Outside these limits irregular filling of the mould, air inclusions or surface streaks may arise.

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# ALLOWABLE OPERATING PRESSURE

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## Polypropylene Beta-PPR™ RA7050-GN

### Storage and handling

Beta-PPR™ RA7050-GN should be stored in dry conditions at temperatures below 50°C and protected from UV-light.

Improper storage can initiate degradation, which results in odour generation and colour changes and can have negative effects on the physical properties of the product.

### Safety

Beta-PPR™ RA7050-GN is not classified as dangerous preparation.

Dust and fines from the product carry a risk of dust explosion. All equipment should be properly earthed. Inhalation of dust should be avoided as it may cause irritation of the respiratory system. Small amounts of fumes are generated during processing of the product. Proper ventilation is therefore required.

### Recycling

The product is suitable for recycling using modern methods of shredding and cleaning. In-house production waste should be kept clean to facilitate direct recycling.

A Safety Data Sheet is available on request. Please contact your Borealis representative for more details on various aspects of safety, recovery and disposal of the product.

### Limitation of use

This product is not sold for pipe applications in North America.

### Related documents

The following related documents are available on request, and represent various aspects on the usability, safety, recovery and disposal of the product.

Recovery and disposal of Polyolefins  
Information on Emissions from Processing and Fires  
Safety Data Sheet, SDS  
Environmental Fact Sheet

Liability Statements on:

- Compliance to regulations for drinking water pipes
- Statements on chemicals and certain regulations and norms

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## Polypropylene Beta-PPR™ RA7050-GN

### Legal disclaimer

**The product(s) mentioned herein are not intended to be used for medical, pharmaceutical or healthcare applications and we do not support their use for such applications.**

To the best of our knowledge, the information contained herein is accurate and reliable as of the date of publication, however we do not assume any liability whatsoever for the accuracy and completeness of such information.

**Borealis makes no warranties which extend beyond the description contained herein. Nothing herein shall constitute any warranty of merchantability or fitness for a particular purpose.**

**It is the customer's responsibility to inspect and test our products in order to satisfy itself as to the suitability of the products for the customer's particular purpose. The customer is responsible for the appropriate, safe and legal use, processing and handling of our products.**

No liability can be accepted in respect of the use of any Borealis product in conjunction with any other products and/or materials. The information contained herein relates exclusively to our products when not used in conjunction with any other material unless as specifically provided for in the test methods stated above.

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PPR PIPES AND FITTINGS **ROXYPLAST** [www.ROXYPLAST.com](http://www.ROXYPLAST.com)

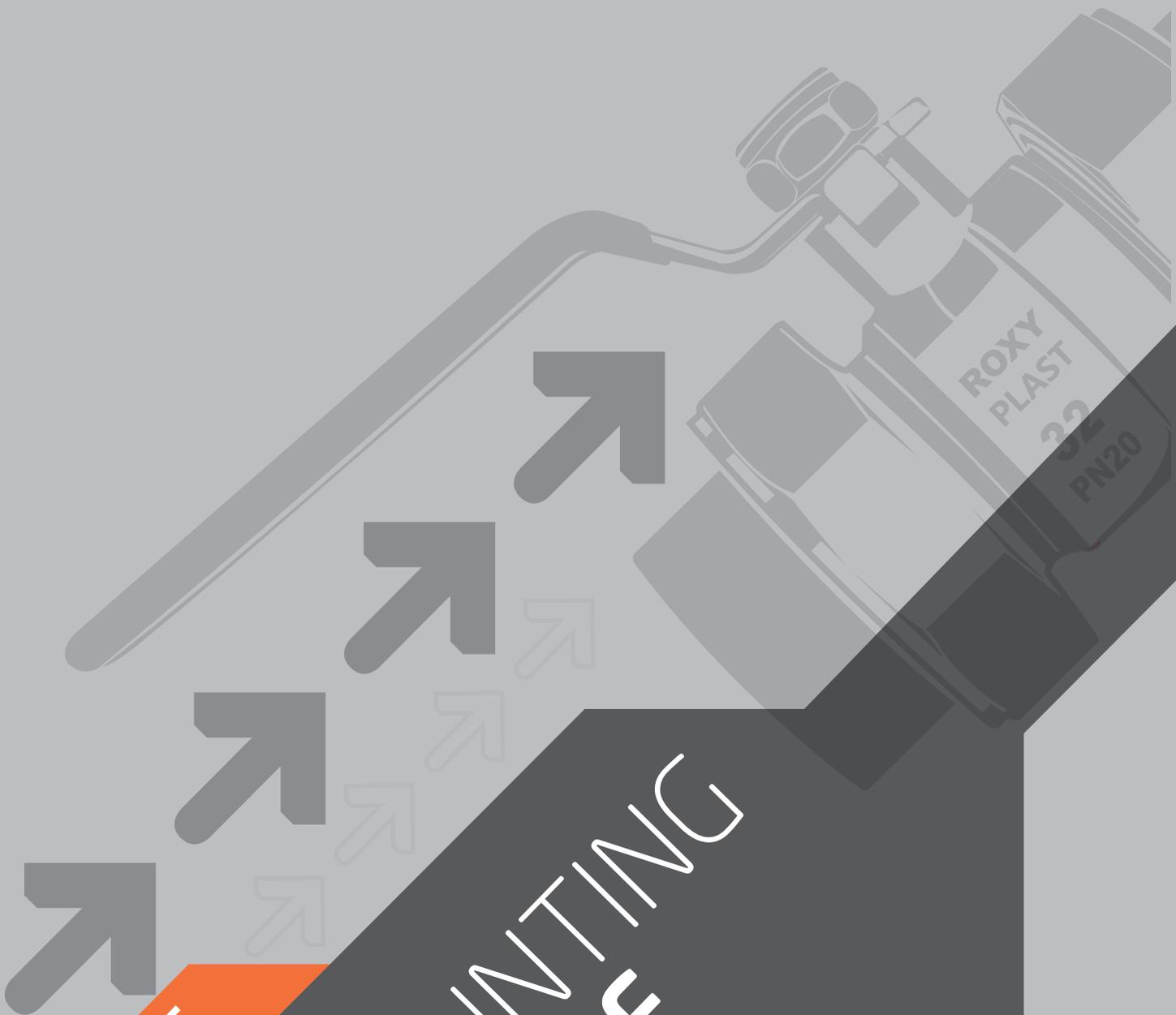
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# THE MOUNTING PROCEDURE

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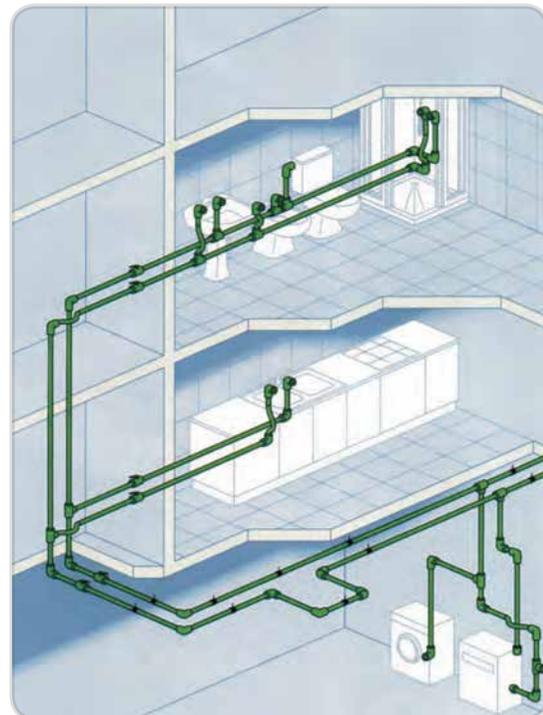
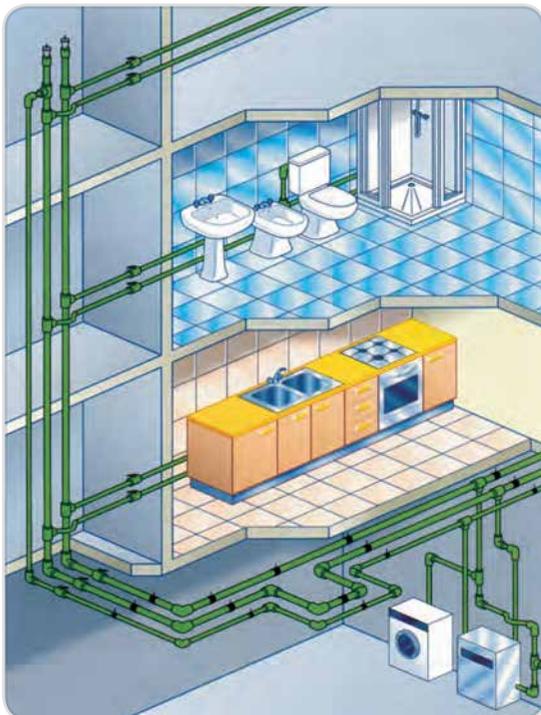
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# THE MOUNTING PROCEDURE

## PP-R PIPES & FITTINGS APPLICATION AREAS

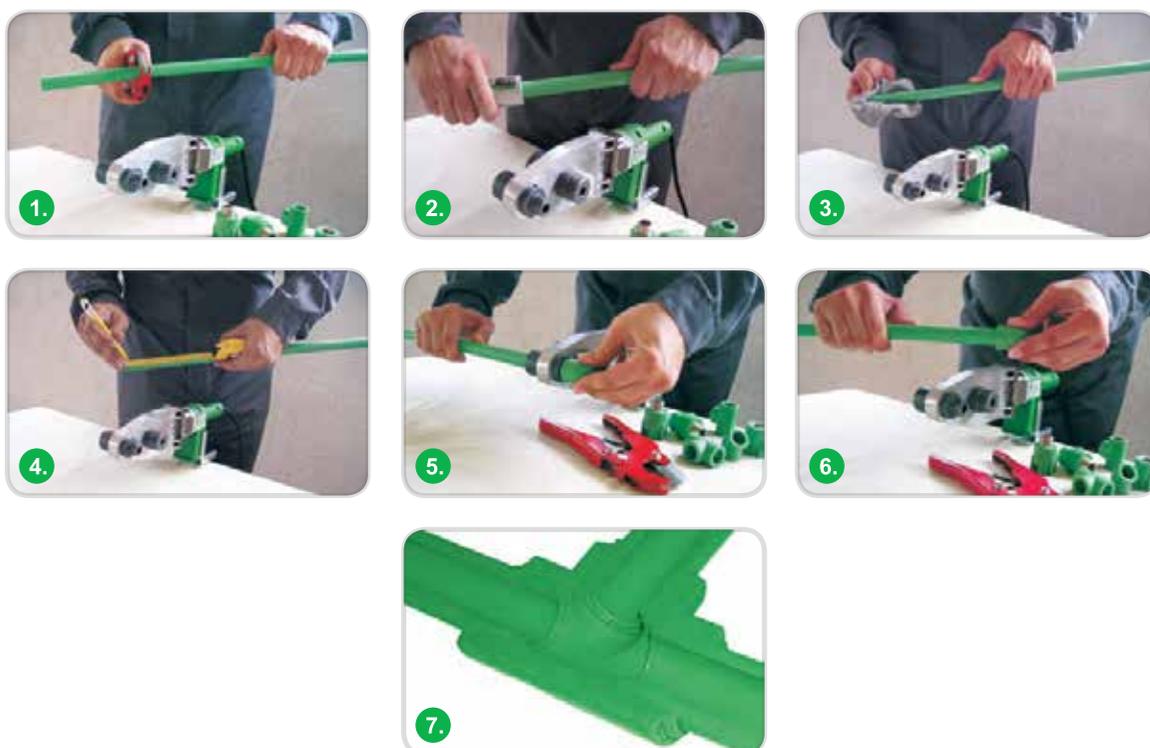
- Potable (or drinking) water
- Hot & cold water in residential apartments, public housing, commercial shopping centers, office buildings, hospitals, schools, hotels & resorts, etc.
- Industrial factories dealing with chemicals
- Irrigation
- HVAC (Heating, Ventilating and Air Conditioning)
- Food processing
- Laboratories and chemical sewerage
- Boilers as well as radiator connections and networks
- Risers for water delivery, ventilation and pressure relief



# HOW TO CONNECT

You can use a hacksaw or any other sharp instrument to cut the pipe segments. However, it is more preferable to apply special scissors and cutters. For different pipe diameters, special types of tools are developed.

The cutting should be made at a right angle strictly, especially for pipes with a diameter of 40 mm or more.



If contortion of the pipe occurs, then this means that your instrument is not sharp enough. Then you should clear burrs off the sheared edges by using a cutter or a knife.

# HOW TO CONNECT..

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It is also advisable to scrape off the edge's outer layer at the jointing places of the pipes with big diameters.

Damaged and cracked pipes cannot be used. Moreover, if the pipe and the fitting can be joined easily when not heated, they should also not be used. The common rule for jointing is that the inner diameter of the unheated part of the faucet should be just a little smaller than the outer diameter of the pipe.

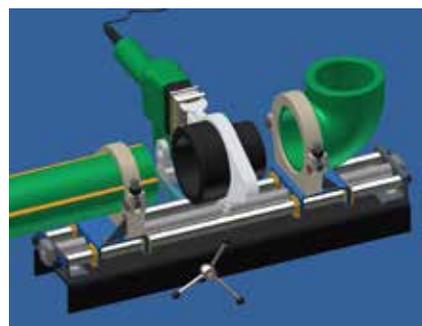


The same rule also applies to the welding adaptors. They should not be fixed easily with the welded parts in a cool state.

In the process of welding the adaptor, the welded component should be closely connected.

The parts that do not meet the requirements cannot be used! Welding parts should be cleaned in the joint area from any kind of dirt and degreased with the help of a specific cleaner.

Mark the welding depth according to the table below:



Pipe $\Phi$	Heating Phase S (seconds)	Maximum Interval S (seconds)	Cooling Time Min. (minutes)	Push Depth mm
20	5	4	2	14.5
25	7	4	2	16
32	8	6	4	18
40	12	6	4	20.5
50	18	6	4	23.5
63	24	8	6	27.5
75	30	8	6	31
90	40	8	6	35.5
110	50	10	8	41.5

Fix the welding dies of the proper diameters, the bushing and the draw bar, on the welding machine. When switched to the power supply socket, the machine warms up to the essential working temperature (260 °C) automatically.

# HOW TO CONNECT..

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You can settle the heat regulator on the desired temperature if necessary.

Put the pipe into the heating bushing and the spigot part on the draw bar.

This process should be done smoothly.

Radial rotation is prohibited and the pipe axis line should not deviate from the bushing axis line by more than 5°.

For welding pipes with diameters more than 40 mm and lengths more than 2 meters, a specific welding device is applied with centration to gain coaxially of the jointing.

After the stipulated heating time, remove the welded parts and join them immediately.

Push the pipe into the fitting up to the end of the welded area. Do not turn the jointing and keep the coaxially of the parts.

**Note:** a pipe pushed too deep into the fitting can trample and reduce the inner section.

Overheating may result in the pipe diameter becoming too narrow and the fitting diameter increasing.

It is recommended to keep the parts fixed strongly during welding time. Do not align the parts together or use cold water during cooling time. After cooling, the jointing may be used under moderate mechanical stress.

The piping system may be filled with water within 1 hour after welding.

Jointing may have the axial deviation of the pipe and fitting below 5°.

There should not be any cracks, folds or other damages caused by overheating on the fitting part.

There should be an even all-around bead of welded plastic material around the joint.

Polypropylene pipes welding should be held at ambient temperature, 23 °C or higher.

Consider also the cool down of the surface of the welding machine.

It is best to use heat light signal to make sure that the welding surface temperature has reached between 255-265 °C, Welding dies and welding machines should be kept clean.

Remove the left over material with the help of a rough napkin and avoid the damaging of the Teflon surface of welding dies.

# HOW TO CONNECT..

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## Connection technique using heated-tool socket welding

When the pipe and the fitting are welded, their plastic materials fuse together to form a homogeneous, firmly bonded whole. Special tools are used to heat up pipe and fitting, which are then just joined together. This connection is lastingly leak proof.

## System components

### Fittings

the PP-R-metal connection of the **ROXY** fitting excels by its leakproofness and resistance to torsion.

This connection withstands decades of operational loads without any difficulty.

Thanks to the specific geometry of their inserts, which are made of high-grade brass, the moulded parts meet the highest safety standards and guarantee safe laying.

The metal threads of the **ROXY** brass components meet the requirements of the years of service EN 10226 standard and are manufactured from high-quality brass.

Moreover, the material complies with the current version of the recommendations (as at 2014) of the federal Environment Agency on "Materials suitable from a drinking water hygiene point of view".

This guarantees that the limit values of the "Deutsche Trinkwasser-verordnung (TrinkwV 2001)" (German Drinking Water Ordinance) are reliably observed. All **ROXY** fittings are compatible with all **ROXY** pipes

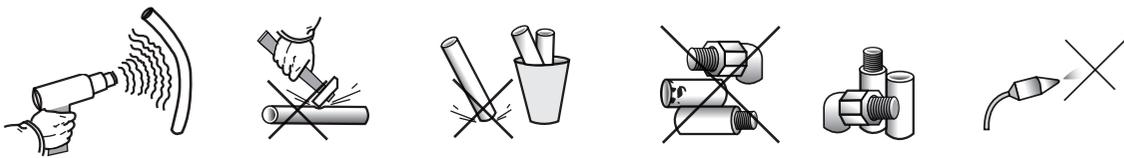
### Pipes and Fittings

All pipes and fittings of the **ROXY** installation system are made of PP-R, with only high-quality raw materials being used. This raw material is equipped with high-grade stabilizers. The stabilizer package protects the polymer from oxidation, which may occur, for example, following long-term exposure to high temperatures > 70°C and high pressure.

# HANDLING AND STORAGE



Prevent PP-R pipes and fittings from impacts and mechanical shocks. During transportation, the packs of pipes should be stored flat on a firm leveled ground, Protect them from any sharp metal angles and edges of the transport platform.



Pipes should be stored on shelves or other firm surfaces. The height of the bundle of pipes should not exceed 1 meter and at least 1 meter away from any heating body.



Loading on and off of polypropylene pipes should be held at ambient temperatures (at least  $-10^{\circ}\text{C}$ ). If special support handles are used, pipes can be transported at temperature below  $-20^{\circ}\text{C}$ .

The delivered pipes and fittings should be kept in place for about 2 hours at a temperature above zero, Polypropylene pipes and fittings are to be stored inside, sheltered from ultraviolet radiation with a minimum temperature of  $5^{\circ}\text{C}$ .

They should be kept in their boxes until they ready for use. Do not store them with solvents, oil, paints and like substances.

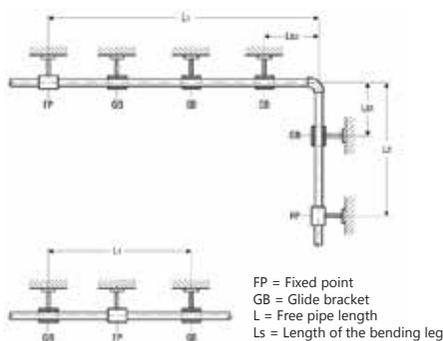
# CHANGE IN PPR PIPE LENGTH

## LONGITUDINAL EXPANSION

Polypropylene pipe systems extend when subjected to heat in accordance with their material characteristics. The longitudinal expansion of the fiber pipe is considerably less than 100% plastic pipe experiences. The method of calculating the longitudinal expansion theoretically can be found in an example. For practical use the longitudinal expansion to be expected with the three different materials is shown in tables. In these tables you will find the longitudinal expansion to be expected for a particular free length of pipe. Critical for the determination of the longitudinal expansion is the difference between the temperature at which the pipe work is installed and the maximum operating temperature to be expected. After the expected longitudinal expansion has been determined, a decision can be made if any of the possible measures should be taken to compensate it.

### Definition of free pipe length

The free pipe length is the length of the pipe between two points at which the pipe is secured or clamped in a fixed manner.



Type of laying	Longitudinal expansion compensation yes/no	Comments
Laying in shafts Rising mains	no	Free length less than 3 m
Buried laying in plaster Laying in floor topping Laying in concrete	no	Expansion is absorbed by the insulation or by the pipe material
Exposed laying	yes	Take expansion compensation measure

### Calculation example of longitudinal expansion:

$$\Delta t = \alpha \times L \times \Delta t$$

$\Delta t$  = Longitudinal expansion in mm

$\alpha$  = linear expansion factor

for standard pipe 0,150 mm/m . K

for reinforced fiber pipe 0,035 mm/m . K

L = Length of pipe in m

$\Delta t$  = temperature difference between assembly temperature and operation temperature

# CHANGE IN PPR PIPE LENGTH

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## Calculation example of longitudinal expansion of Normal & Fiber pipe:

$\alpha = 0,15 \text{ mm/m} \cdot \text{K}$

Pipe length (m)	Longitudinal expansion Temperature difference $\Delta t$ (K)							
	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C
0,1	0,15	0,30	0,45	0,60	0,75	0,90	1,05	1,10
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

$\alpha = 0,035 \text{ mm/m} \cdot \text{K}$

Pipe length (m)	Longitudinal expansion Temperature difference $\Delta t$ (K)							
	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C
0,1	0,04	0,07	0,11	0,14	0,18	0,21	0,25	0,28
0,2	0,07	0,14	0,21	0,28	0,35	0,42	0,49	0,56
0,3	0,11	0,21	0,32	0,42	0,53	0,63	0,74	0,84
0,4	0,14	0,28	0,42	0,56	0,70	0,84	0,98	1,12
0,5	0,18	0,35	0,53	0,70	0,88	1,05	1,23	1,40
0,6	0,21	0,42	0,63	0,84	1,05	1,26	1,47	1,68
0,7	0,25	0,49	0,74	0,98	1,23	1,47	1,72	1,96
0,8	0,28	0,56	0,84	1,12	1,40	1,68	1,96	2,24
0,9	0,32	0,63	0,95	1,26	1,58	1,89	2,21	2,52
1,0	0,35	0,70	1,05	1,40	1,75	2,10	2,45	2,80
2,0	0,70	1,40	2,10	2,80	3,50	4,20	4,90	5,60
3,0	1,05	2,10	3,15	4,20	5,25	6,30	7,35	8,40
4,0	1,40	2,80	4,20	5,60	7,00	8,40	9,80	11,20
5,0	1,75	3,50	5,25	7,00	8,75	10,50	12,25	14,00
6,0	2,10	4,20	6,30	8,40	10,50	12,60	14,70	16,80
7,0	2,45	4,90	7,35	9,80	12,25	14,70	17,15	19,60
8,0	2,80	5,60	8,40	11,20	14,00	16,80	19,60	22,40
9,0	3,15	6,30	9,45	12,60	15,75	18,90	22,05	25,20
10,0	3,50	7,00	10,50	14,00	17,50	21,00	24,50	28,00

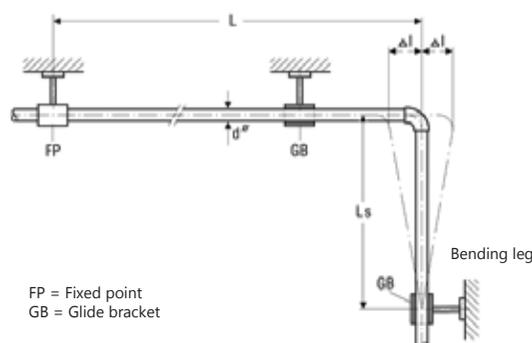
# CHANGE IN PPR PIPE LENGTH

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## Expansion compensation constructions

### Bending legs

Frequent changes in the direction of a pipe, which are in any case necessary, will enable bending legs to be planned, which can compensate for the previously determined longitudinal expansion.



### Calculation example of the minimum length $L_s$ of the bending leg:

The minimum length  $L_s$  of the bending leg can be calculated with the following formula:

$$L_s = Kt \times \sqrt{d \cdot \frac{\Delta l}{2}}$$

#### 1. Calculation of the longitudinal expansion $\Delta l$

For a temperature difference of  $\Delta t$  40 K between the hot water temperature and the ambient temperature.

$$\alpha = 0,15 \text{ mm/m} \cdot \text{K}$$

$$L = 10,0 \text{ m}$$

$$\Delta t = 40 \text{ K (}^\circ\text{C)}$$

To be calculated:  $\Delta l$

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

$$0,15 \times 10,0 \times 40 = 60 \text{ mm}$$

#### 2. Calculation of the minimum length of $L_s$ of the bending leg

$$d = 40 \text{ mm}$$

$$\Delta l = 60 \text{ mm}$$

$$K = 15 \text{ mm}$$

To be calculated:  $L_s$

$$K \times \sqrt{d \times \Delta l}$$

$$15 \times \sqrt{40 \times 60}$$

Equation 6.5

$L_s$  = length of the bending leg in mm

$d$  = external diameter pipe in mm

$\Delta l$  = longitudinal expansion in mm

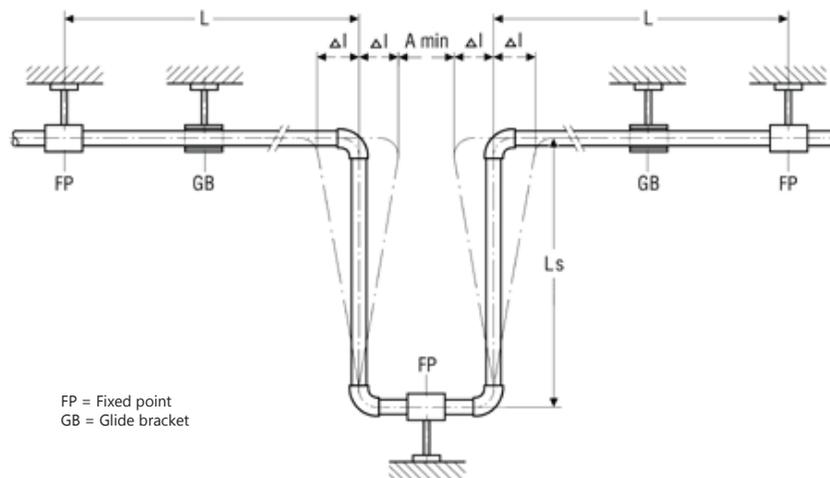
$K$  = constant for the material, for pipes = 15

# CHANGE IN PPR PIPE LENGTH

Roxy For Modern Water Systems

## Expansion bow

If the installation requires a 'U-shape', this can be used to provide compensation for longitudinal expansion. Here the width of the pipe bow  $A_{min}$  and the lengths of the two bending legs must be calculated.



## Calculation example of expansion bow width $A_{min}$ :

The width of the expansion bow  $A_{min}$  is calculated with the following formula:

$$2 \times \Delta l + SA = A_{min}$$

$$2 \times 60,0 \text{ mm} + 150 \text{ mm} = 270 \text{ mm}$$

Designation	Significance	Value	Unit
$A_{min}$	Width of expansion bow	?	mm
$\Delta l$	Longitudinal expansion	60,0	mm
SA	Safety distance	150,0	mm

## Pre-stressing

By pre-stressing of a bending leg the length of the leg might be shortened with narrow space. When exactly planned and carried out, preload assemblies offer an optically perfect image as expansion movement is not visible. The calculated  $\Delta l$  is negatively pre-stressed when being installed. After initial operation of a pipe system a correct 90° angle will arise.

## Calculation example of length of bending legs with pre-stressing:

The length of the bending leg with pre-stressing is calculated in accordance with the following formula (U-shape):

$$K \times \sqrt{d \cdot \frac{\Delta l}{2}} = L_s \quad 15 \times \sqrt{40 \text{ mm} \cdot \frac{60 \text{ mm}}{2}} = 520 \text{ mm}$$

# CHANGE IN PPR PIPE LENGTH

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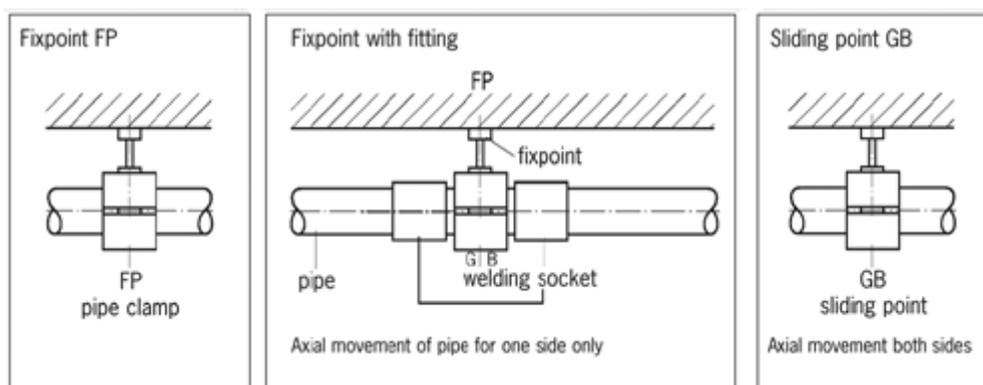
Designation	Significance	Value	Unit
$L_{sv}$	Length of the bending leg with prestressing	?	mm
K	Material-specific constant for pipes	15	
d	External diameter pipes	40,0	mm
$\Delta l$	Longitudinal expansion	60,0	mm

In accordance with the above stated starting values the length of bending leg is 520 mm.

## Mounting and bracketing

### Techniques for mounting pipe work

When considering the techniques for mounting pipe work, one must differentiate fundamentally between fixed point mountings (hereafter fixed points) and loose or sliding point mountings (hereafter sliding points). By definition the fixed point or fixed clamp holds the pipe in a fixed manner, in which in contrast a sliding point will permit the pipe to move in the axial direction of the pipe. An optimally satisfactory installation can be ensured by appropriate selection of these two different methods of mounting. Rubber clamp inserts for plastic pipe prevent the pipe surface from being damaged at the clamp and ensure the required guiding and holding of the pipe.



### Fix points

Fix points (fixed point mountings) divide a pipe network into sections. The free lengths from a fixed point must be measured and the possible longitudinal expansion that can take place in this free length must be calculated. Fixed point mountings with a long distance between the part of the clamp, holding the pipe and the ceiling or wall to which the clamp is mounted, should be avoided, since in these cases the clamps can act in a self-aligning manner and will not provide a fixed point. Sliding point clamps positioned on each side of the fittings, will act as fixed points! Vertical distribution lines (shaft mounting) and pipework laid beneath plaster or in concrete or floor topping, can also be laid in a rigid manner. Branch points, where the pipe branching off passes through a wall, must be mounted in a fixed manner since otherwise the pipe branching off could be cut off.

# CHANGE IN PPR PIPE LENGTH

## **Loose or sliding mounting points**

Axial movement of a pipe produced by longitudinal expansion should not be influenced by loose or sliding point mountings. The clamps should have suitable inserts (e.g. rubber) to prevent the pipe surface from being damaged and allow movement. Fittings must be at a sufficient distance from the sliding point clamps since otherwise these will act as fixed points.

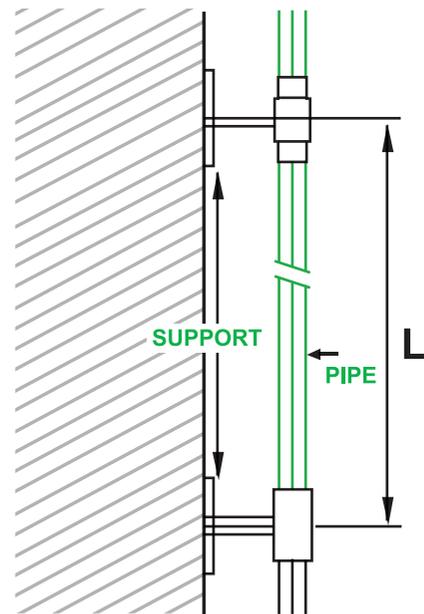
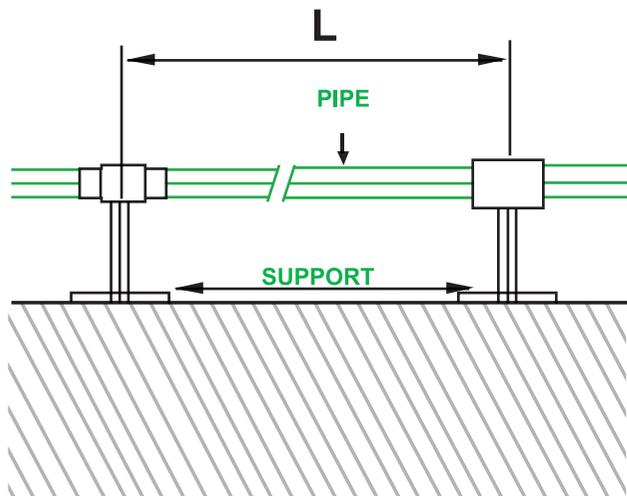
## **Principles for the layout and construction of fixed points**

- Fixed points are to be arranged so that direction changes in the pipe route can be used to absorb length changes.
- They are also to be designed in considering all the loads that might arise. In addition to reaction forces from friction at bracket contact points and deformation of bends, large forces are produced by fixed restraints of pipe lengths.
- The pipe must have the appropriate retainer rings to transfer the forces to the construction of the fixed point. Insufficient consideration of the restraint of the pipe in the bracket alone will, in many cases, cause deformation of the pipe cross section or damage to the pipe surface.
- Fixing pipe systems at fixed points should, if possible, be done at low ambient temperatures, giving rise to predominantly compressive stresses when heated (operating state).
- If flange connections occur in pipe lengths between fixed points, tensile stresses can cause the joint pre-tension forces to decrease, resulting in leakage at the flange connections.
- In inclining pipe segments, fixed points are employed to absorb dead weight and dynamic loads. The design has to ensure that vertical length changes do not produce any unacceptable tensile loads on the horizontal connections.

# SPACING DISTANCE BETWEEN SUPPORTS

PIPE DIA. mm	Horizontal clamp spacing distance 'L' according to change in temperatures, in cm						
	20°C	30°C	40°C	50°C	60°C	70°C	80°C
20	65	63	61	60	58	53	48
25	75	74	70	68	66	61	56
32	90	88	86	83	80	75	70
40	110	110	105	100	95	90	85
50	125	120	115	110	105	100	90
63	140	135	130	125	120	115	105
75	155	150	145	135	130	125	115
90	165	160	155	145	140	130	120
110	175	175	170	165	155	145	135

PIPE DIA. mm	Vertical clamp spacing distance 'L' according to change in temperatures, in cm						
	20°C	30°C	40°C	50°C	60°C	70°C	80°C
20	85	82	78	78	75	69	62
25	98	96	91	88	86	79	73
32	117	114	112	108	104	98	91
40	143	143	137	130	124	117	111
50	163	156	150	143	137	130	117
63	182	176	169	163	156	150	137
75	202	195	189	176	169	163	150
90	215	208	202	189	182	169	156
110	228	228	215	215	202	189	176



# QUALITY CONTROL



It is our mission at **Roxy** Plast to maintain the highest level of quality through clear operating procedures, work instructions as well as forms and records. Statistical quality control and sound documentation ensure that traceability is maintained at anytime in the future.

This means that all corporate and plant functions within **Roxy** Plast, whether commercial or operational, are required to be clearly stated and documented, ensuring that the quality of our product is never compromised or coincidental.

**Roxy** Plast always maintains the highest standards of quality for its users. This is why it warrants a 50-year guarantee for all its piping network components starting from the date of purchase.



**Roxy** Plast maintains a comprehensive quality control system. From designing the required specifications and controlling the incoming raw materials, processing, packing, storing and shipping the product to the customer, to the after-sale service. This is accomplished in parallel to the Quality Assurance Program, with the objective to ensure that total quality, not only localized quality, is maintained as required.

The overall quality system operation and documented by **Roxy** Plast is implemented throughout the plant. It has been designed to exceed requirements stated by national and international authorities and institutions. Regular checks are done to further eliminate any chance of quality deviation.

Below you will find some of the tests done in our plants laboratory to ensure high **Roxy** Plast quality:

- Hydrostatic Pressure Test
- Impact Test (pendulum test)
- Density Measurement
- Heat reversion determination
- M.F.R For determination of melt flow rate of material
- Homogeneity test.
- Dry loss content.

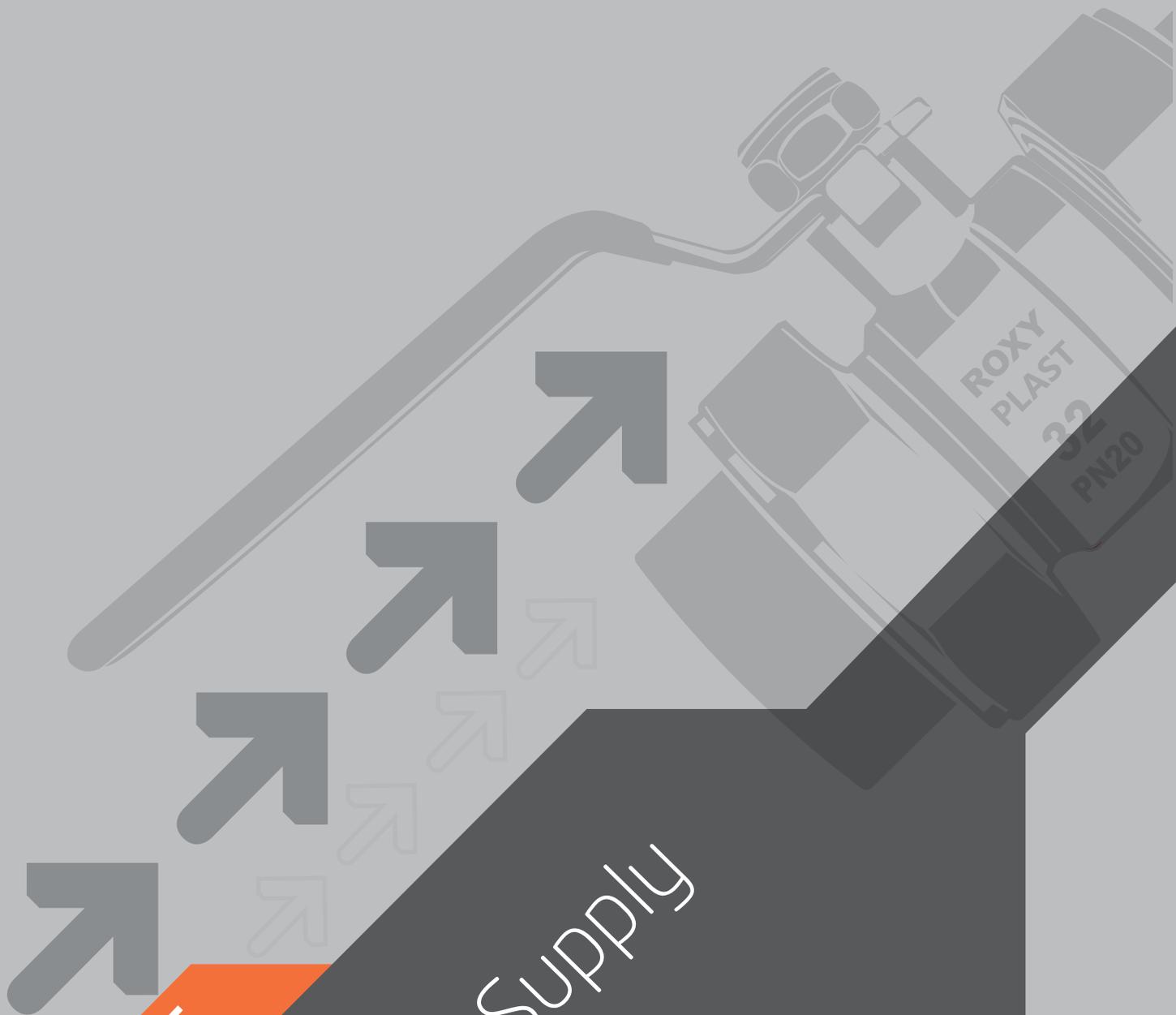


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PPR Water Supply  
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ROXY  
PLAST

32  
PN20



# PPR WATER SUPPLY SOLUTION

Roxy For Modern Water Systems

Circle Of Trust For Every Client

## PRODUCT SPECIFICATION:



### Material

POLYPROPYLENE RANDOM COPOLYMER (PPR)

### Standards & Regulations

Manufactured According to

DIN 8077: POLYPROPYLENE ( PP ) pipes-PP-H,PP-B,PP-R,PP-RCT-dimensions

ISO 15874 Part 1,2,3,5&7

Full range of pipes and fitting available from nominal diameters (20mm Up to 160mm) available in (single layer, Multi-layer fiberglass, multi-layer UV, multi-layer UV & fiberglass)

### Bends produced by

segment inserts for butt welding dimensions.

ISO 9001 – 2015: quality management system .

Working Temperature : up to 95°C

Working Pressure: PPR PIPES - 10 , 16 , 20 & 25 bar, PPR FITTINGS - 25 bar.

### Range

PN10- 20mm to 160 mm ( for cold application)

PN16- 20mm to 160 mm (Higher Pressure Hot and Cold Water)

PN20- 20mm to 160 mm (Higher Pressure Hot and Cold Water & all relevant Plain )

PN25- 20mm to 160 mm (Higher Pressure Hot and Cold Water & all relevant Plain )

Available in multi-layer (Fiber and Fiber UV)

All Fittings are PN 25 (Higher Pressure Hot and Cold Water) & all relevant Plain & Threaded Fittings)

# PPR WATER SUPPLY SOLUTION

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## Fields of Application

For more than 30 years, polypropylene has been successfully used in pressure water supply lines for buildings in many countries all over the World.

The combination of such excellent properties as chemical resistance, homogeneous connection, resistance to pressure and easy laying make it a reliable and lasting system suitable for various applications.

In many countries it is gradually replacing such traditional materials as copper and galvanized steel.

## Properties of ROXY

- Enormous durability thanks to high-quality materials and processing.
- Homogeneous connection guarantees high operational reliability.
- Good thermal load capacity, therefore high operational reliability.
- High chemical resistance guarantees high durability.
- Minor flow noise makes living highly comfortable.
- High dimensional accuracy and low weight, therefore time- and cost-saving pipe laying.

## Possible Uses

the ROXY installation system fulfils a variety of demands made on supply lines. It is suitable for universal use in:

- New buildings.
- Refurbishment.
- Repairs.

In drinking water installations for cold and hot water pipes in residential buildings, buildings, hospital, hotels, office buildings, schools, etc., example:

- Service connections.
- Boiler connections.
- Water distributing systems.
- Rising lines.
- Floor-level distributing systems.
- Fittings.

As well as piping networks for:

- Rainwater systems.
- Outside pipe laying.

# PPR WATER SUPPLY SOLUTION

## Roxy For Modern Water Systems

### Roxy piping PP-R system are used in:

- Potable installations inside houses, high, rise buildings, hotels, hospitals and virtually all types of commercial and residential buildings.
- Factories with high-pressure water and compressed air circuits.
- Rain drainage and collection systems.
- Indoor and outdoor swimming pools, gyms and their water filtration circuits and water installations.
- Piping networks for all types of irrigation and agriculture applications and pressurized networks.
- Piping networks for all types for industrial applications for the delivery of aggressive chemicals including many acidic, alkaline and other reactive and corrosive chemicals.
- Connections from municipality mains to the tanks and reservoirs.
- Boilers and radiator connections and networks.
- Risers for water delivery, ventilation, and pressure relief.
- Water transport from pumps to upper tanks and distribution points.
- Connections through meters, and distributor manifolds.
- Distributions inside flats, apartments, houses etc...
- Underfloor network distribution and underfloor heating networks.

### Roxy plast fiber composite pipe technology

**Roxy** plast pipes integrated with fiber layer developed for exposed hot& cold water installations.

**Roxy** composite pipes are convenient and reliable due to its superior characteristics

### Roxy (UV) layer-with fiber

for exposed and open air installations under direct sunlight or UV radiation, Roxy remains physically stable through a specially developed external black layer (UV resistant), in adherence with the UV layer.

**Roxy** plast composite pipe installations are applied from building connection points or distribution station to the very last endpoints of the installation.

For heating installations Roxy plast composite pipes are installed starting from the boiler outlets or water-heating unit, up to the individual radiators or heat exchangers.

In hot water application the use of Roxy plast pipe is always advisable due to reduced longitudinal expansion during heat load.

# PPR WATER SUPPLY SOLUTION

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## Roxy Plast Fiber

- Potable water pipe networks for cold and hot water installations, in residential buildings, hotels, hospitals, and shipbuilding and other buildings.
- Pipe networks for compressed air plants.
- Pipe networks for swimming pool facilities.
- Pipe networks for solar plants.
- Pipe networks in agriculture.
- Pipe networks for industry and application where transport of aggressive fluids is required.

## Advantages

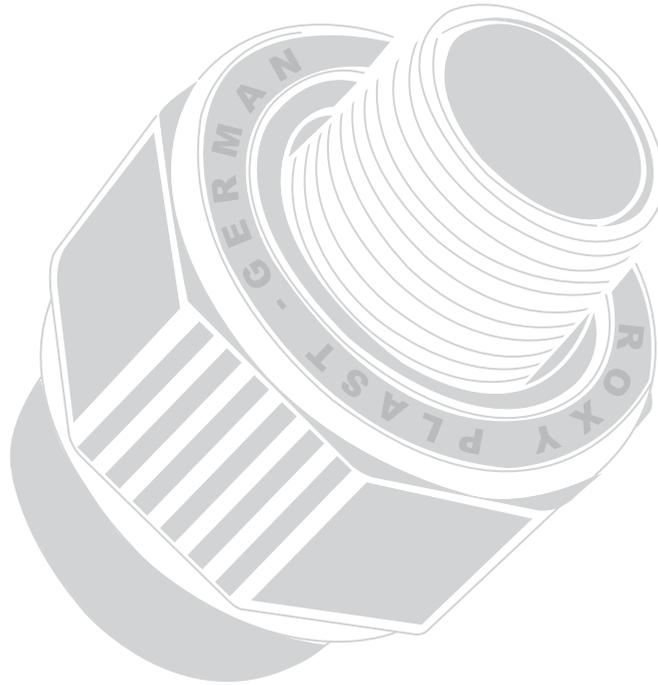
Roxy plast fiber composite with UV layer:

- Length extension reduced by at least 70% compared with single layer pipe.
- Impact rate higher than the standard pipe.
- Excellent internal pressure resistance even at high temperatures.
- Supports intervals can be increased with less of mounting clips are used compared with plastic pipes.
- UV-resistance, long service life.

# PPR WATER SUPPLY SOLUTION

Roxy For Modern Water Systems

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## Easy, reliable installation

Roxy plast system components are joined by simple-to-use butt fusion-welding techniques. Pure and consistent resins of the highest quality, used in the manufacture of our components, ensure reliable and repeatable and welding over and over again. No matter where or when, each junction can be joined in merely a few seconds.

## Through, simple-to-use instructions

Our manuals provide the highest degree step-by-step instructions guiding you to easily build up an impressive and complex network of efficient piping system, no matter what your application is supported & serviced by **Roxy**.

## Support & service

Our support team is available around the clock for your technical inquiries, providing you with technical experts team expertise to ensure your continuous success in the design and installation of your network.

## Roxy plast system...your unparalleled Advantages

- Durability for both hot and cold water delivery installations.
- Reliability and longevity in service life.
- Corrosion resistance, as compared with other systems.
- Quality and finishing of the products.
- Environmentally friendly.
- Ease and speed of installation.
- Adaptability of the system to the building's structure.
- Cost-competitiveness of the complete installation.
- Readily available support and through easy-to-use installations.



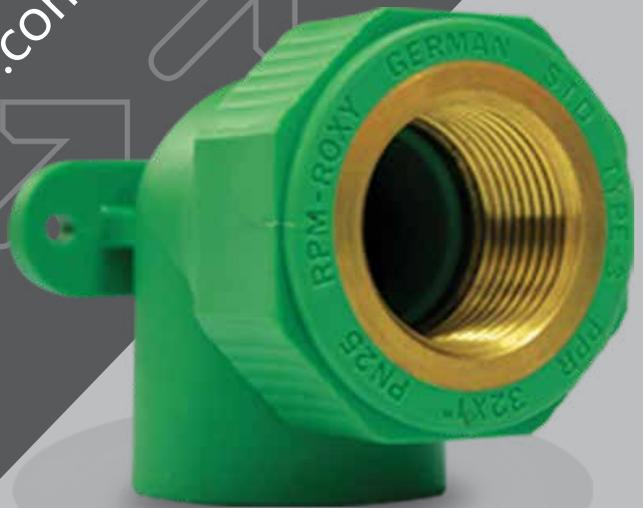
PPR PIPES AND FITTINGS

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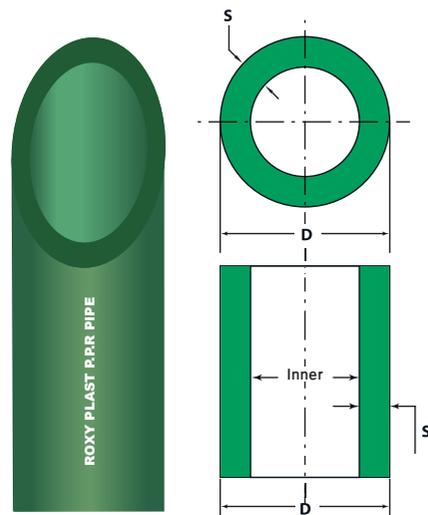
# ROXY PPR PIPE

## PPR PIPE SDR11

**COMPOSITION:** 1 LAYER PP-R  
**PRESSURE RATING:** PN10  
**PIPE SERIES(S):** 5  
**STANDARD DIMENSION RATIO (SDR):** 11  
**COLOR:** GREEN PIPE

**SUPPLY FORM:** 4M STRAIGHT LENGTH OR AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	1.9	2.3	2.9	3.7	4.6	5.8	6.8	8.2	10.0	11.4	12.7	14.6
Inner (mm)	16.2	20.4	26.2	32.6	40.8	51.4	61.4	73.6	90	102.2	114.6	130.8
Weight (kg/m)	0.107	0.164	0.261	0.412	0.638	1.010	1.410	2.030	3.010	3.910	4.870	6.380
Water Content	0.206	0.327	0.531	0.834	1.307	2.074	2.959	4.252	6.359	8.199	—	13.4

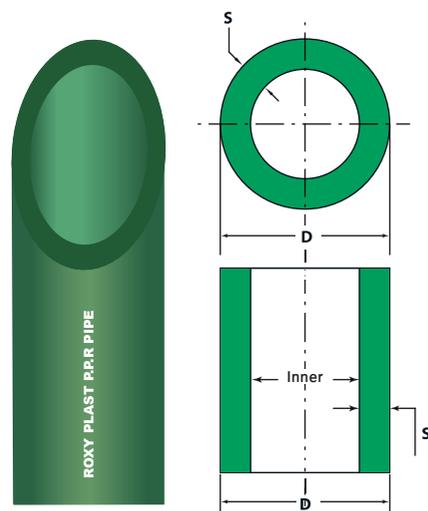


## PPR PIPE SDR7.4

**COMPOSITION:** 1 LAYER PP-R  
**PRESSURE RATING:** PN16  
**PIPE SERIES(S):** 3.2  
**STANDARD DIMENSION RATIO (SDR):** 7.4  
**COLOR:** GREEN PIPE

**SUPPLY FORM:** 4M STRAIGHT LENGTH OR AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	2.80	3.50	4.40	5.50	6.90	8.60	10.30	12.30	15.10	17.10	19.2	21.90
Inner (mm)	14.4	18	23.2	29	36.2	45.8	54.4	65.4	79.8	90.8	101.6	116.2
Weight (kg/m)	0.148	0.230	0.370	0.575	0.896	1.410	2.010	2.870	4.300	5.530	6.950	9.040
Water Content	0.163	0.254	0.423	0.66	1.029	1.647	2.323	3.358	4.999	—	—	—



# ROXY PPR PIPE

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## PPR PIPE SDR6

**COMPOSITION:** 1 LAYER PP-R

**PRESSURE RATING:** PN20

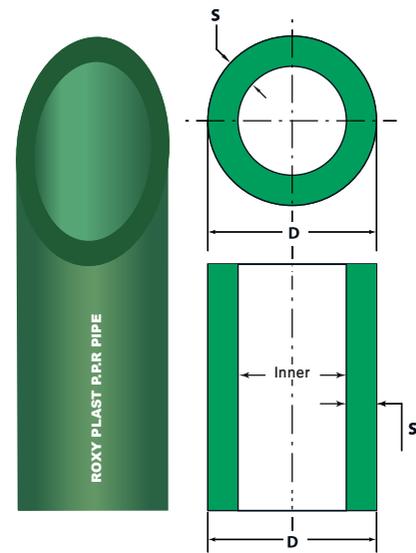
**PIPE SERIES(S):** 2.5

**STANDARD DIMENSION RATIO (SDR):** 6

**COLOR:** GREEN PIPE

**SUPPLY FORM:** 4M STRAIGHT LENGTH OR AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	3.40	4.20	5.40	6.70	8.30	10.50	12.50	15.00	18.30	20.80	23.3	26.60
Inner (mm)	13.2	16.6	21.2	26.6	33.4	42	50	60	73.4	83.4	83.8	106.8
Weight (kg/m)	0.172	0.266	0.434	0.671	1.040	1.650	2.340	3.360	5.010	6.470	8.12	10.600
Water Content	0.137	0.216	0.353	0.555	0.876	1.385	1.963	2.826	4.229	5.64	—	8.954



## PPR PIPE SDR5

**COMPOSITION:** 1 LAYER PP-R

**PRESSURE RATING:** PN25

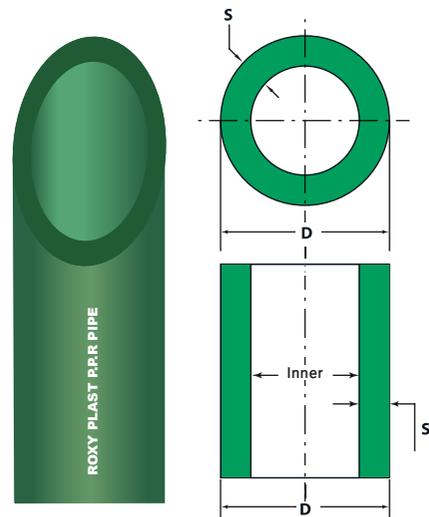
**PIPE SERIES(S):** 2

**STANDARD DIMENSION RATIO (SDR):** 5

**COLOR:** GREEN PIPE

**SUPPLY FORM:** 4M STRAIGHT LENGTH OR AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	4.1	5.1	6.5	8.1	10.1	12.7	15.1	18.1	22.1	25.1	28.1	32.1
Inner (mm)	11.8	14.8	19	23.8	29.8	37.6	44.8	53.8	65.8	74.8	83.8	95.8
Weight (kg/m)	0.198	0.307	0.498	0.775	1.210	1.910	2.700	3.880	5.780	7.460	9.350	12.200



# ROXY PPR PIPE

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## MULTI-LAYERS FIBER GLASS REINFORCED PIPE SDR 7.4

**COMPOSITION:** 2 LAYERS PP-R & MIDDLE LAYER OF FIBER GLASS  
**PIPE SERIES (S):** 3.2

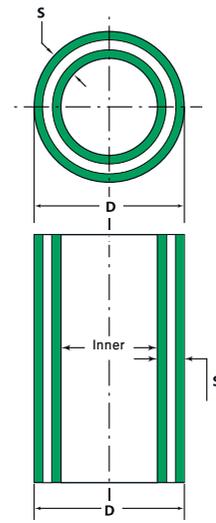
**STANDARD DIMENSION RATIO (SDR):** 7.4

\*FOR PIPE OPERATING PRESSURE PLEASE REFER TO TABLE PAGE (15, 16, 17)

**COLOR:** OUTER AND INNER LAYERS GREEN & MIDDLE LAYER ORANGE

**SUPPLY FORM:** 4M STRAIGHT LENGTH AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	2.80	3.50	4.40	5.50	6.90	8.60	10.30	12.30	15.10	17.10	19.2	21.90
Inner (mm)	14.4	18	23.2	29	36.2	45.8	54.4	65.4	79.8	90.8	101.6	116.2
Weight (kg/m)	0.148	0.230	0.370	0.575	0.896	1.410	2.010	2.870	4.300	5.530	6.950	9.040
Water Content	0.163	0.254	0.423	0.66	1.029	1.647	2.323	3.358	4.999	—	—	—



## MULTI-LAYERS FIBER GLASS REINFORCED PIPE SDR 6

**COMPOSITION:** 3 LAYERS PP-R & MIDDLE LAYER OF FIBER GLASS  
**PIPE SERIES (S):** 2.5

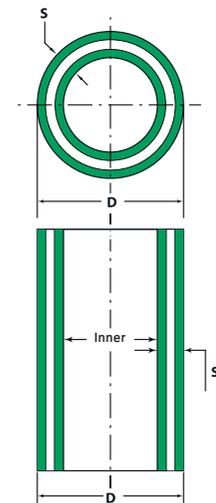
**STANDARD DIMENSION RATIO (SDR):** 6

\*FOR PIPE OPERATING PRESSURE PLEASE REFER TO TABLE PAGE (15, 16, 17)

**COLOR:** OUTER AND INNER LAYERS GREEN & MIDDLE LAYER ORANGE

**SUPPLY FORM:** 4M STRAIGHT LENGTH OR AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	3.40	4.20	5.40	6.70	8.30	10.50	12.50	15.00	18.30	20.80	23.3	26.60
Inner (mm)	13.2	16.6	21.2	26.6	33.4	42	50	60	73.4	83.4	83.8	106.8
Weight (kg/m)	0.172	0.266	0.434	0.671	1.040	1.650	2.340	3.360	5.010	6.470	8.12	10.600
Water Content	0.137	0.216	0.353	0.555	0.876	1.385	1.963	2.826	4.229	5.64	—	8.954



# ROXY PPR PIPE

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## MULTI-LAYERS FIBER GLASS REINFORCED PIPE SDR 5

**COMPOSITION:** 3 LAYERS PPR-C & MIDDLE LAYER OF FIBER GLASS  
**PIPE SERIES (S):** 2

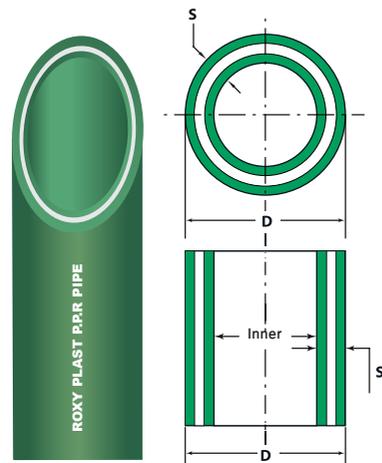
**STANDARD DIMENSION RATIO (SDR):** 5

\*FOR PIPE OPERATING PRESSURE PLEASE REFER TO TABLE PAGE (15, 16, 17)

**COLOR:** OUTER AND INNER LAYERS GREEN & MIDDLE LAYER ORANGE

**SUPPLY FORM:** 4M STRAIGHT LENGTH OR AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	4.1	5.1	6.5	8.1	10.1	12.7	15.1	18.1	22.1	25.1	28.1	32.1
Inner (mm)	11.8	14.8	19	23.8	29.8	37.6	44.8	53.8	65.8	74.8	83.8	95.8
Weight (kg/m)	0.198	0.307	0.498	0.775	1.210	1.910	2.700	3.880	5.780	7.460	9.350	12.200



## MULTI-LAYERS UV STABILIZED PIPE SDR7.4

**COMPOSITION:** 2 LAYERS (OUTER LAYER MIXTURE OF PP-R AND UV STABILIZER & INNER LAYER PP-R)

**PRESSURE RATING:** PN 16

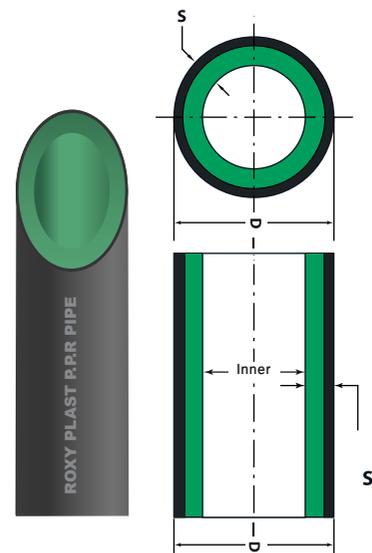
**PIPE SERIES (S):** 3.2

**STANDARD DIMENSION RATIO (SDR):** 7.4

**COLOR:** OUTER LAYERS BLACK & INNER LAYER GREEN

**SUPPLY FORM:** 4M STRAIGHT LENGTH AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	2.80	3.50	4.40	5.50	6.90	8.60	10.30	12.30	15.10	17.10	19.2	21.90
Inner (mm)	14.4	18	23.2	29	36.2	45.8	54.4	65.4	79.8	90.8	101.6	116.2
Weight (kg/m)	0.148	0.230	0.370	0.575	0.896	1.410	2.010	2.870	4.300	5.530	6.950	9.040
Water Content	0.163	0.254	0.423	0.66	1.029	1.647	2.323	3.358	4.999	—	—	—



# ROXY PPR PIPE

Roxy For Modern Water Systems

## MULTI-LAYERS UV STABILIZED PIPE SDR6

**COMPOSITION:** 2 LAYERS (OUTER LAYER MIXTURE OF PP-R AND UV STABILIZER & INNER LAYER PP-R)

**PRESSURE RATING:** PN 20

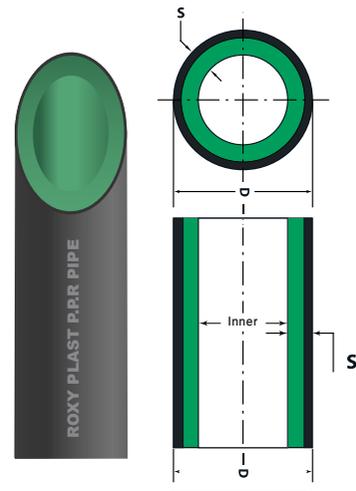
**PIPE SERIES (S):** 2.5

**STANDARD DIMENSION RATIO (SDR):** 6

**COLOR:** OUTER LAYERS BLACK & INNER LAYER GREEN

**SUPPLY FORM:** 4M STRAIGHT LENGTH AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	3.40	4.20	5.40	6.70	8.30	10.50	12.50	15.00	18.30	20.80	23.3	26.60
Inner (mm)	13.2	16.6	21.2	26.6	33.4	42	50	60	73.4	83.4	83.8	106.8
Weight (kg/m)	0.172	0.266	0.434	0.671	1.040	1.650	2.340	3.360	5.010	6.470	8.12	10.600
Water Content	0.137	0.216	0.353	0.555	0.876	1.385	1.963	2.826	4.229	5.64	—	8.954



## MULTI-LAYERS UV STABILIZED PIPE SDR5

**COMPOSITION:** 2 LAYERS (OUTER LAYER MIXTURE OF PP-R AND UV STABILIZER & INNER LAYER PP-R)

**PRESSURE RATING:** PN 25

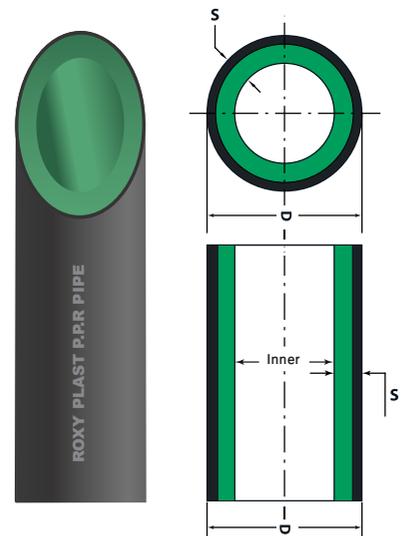
**PIPE SERIES (S):** 2

**STANDARD DIMENSION RATIO (SDR):** 5

**COLOR:** OUTER LAYERS BLACK & INNER LAYER GREEN

**SUPPLY FORM:** 4M STRAIGHT LENGTH AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	4.1	5.1	6.5	8.1	10.1	12.7	15.1	18.1	22.1	25.1	28.1	32.1
Inner (mm)	11.8	14.8	19	23.8	29.8	37.6	44.8	53.8	65.8	74.8	83.8	95.8
Weight (kg/m)	0.198	0.307	0.498	0.775	1.210	1.910	2.700	3.880	5.780	7.460	9.350	12.200



# ROXY PPR PIPE

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## MULTI-LAYERS UV STABILIZED & FIBER GLASS PIPE SDR 7.4

**COMPOSITION:** 4 LAYERS (OUTER LAYER MIXTURE OF PP-R AND UV STABILIZER & MIDDLE LAYER of fiber Glass)

**PIPE SERIES (S):** 3.2

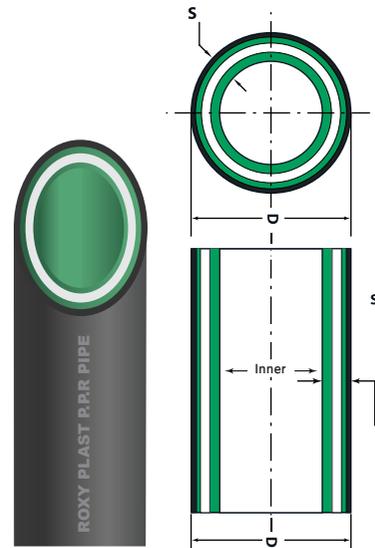
**STANDARD DIMENSION RATIO (SDR):** 7.4

\*FOR PIPE OPERATING PRESSURE PLEASE REFER TO TABLE PAGE (55)

**COLOR:** OUTER LAYERS BLACK, SECOND LAYER GREEN, THIRD LAYER ORANGE IN THE COLOR OF THIRD OR MIDDLE LAYER

**SUPPLY FORM:** 4M STRAIGHT LENGTH AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	2.80	3.50	4.40	5.50	6.90	8.60	10.30	12.30	15.10	17.10	19.2	21.90
Inner (mm)	14.4	18	23.2	29	36.2	45.8	54.4	65.4	79.8	90.8	101.6	116.2
Weight (kg/m)	0.148	0.230	0.370	0.575	0.896	1.410	2.010	2.870	4.300	5.530	6.950	9.040
Water Content	0.163	0.254	0.423	0.66	1.029	1.647	2.323	3.358	4.999	—	—	—



## MULTI-LAYERS UV STABILIZED & FIBER GLASS PIPE SDR 6

**COMPOSITION:** 4 LAYERS (OUTER LAYER MIXTURE OF PP-R AND UV STABILIZER & MIDDLE LAYER of fiber Glass)

**PIPE SERIES (S):** 2.5

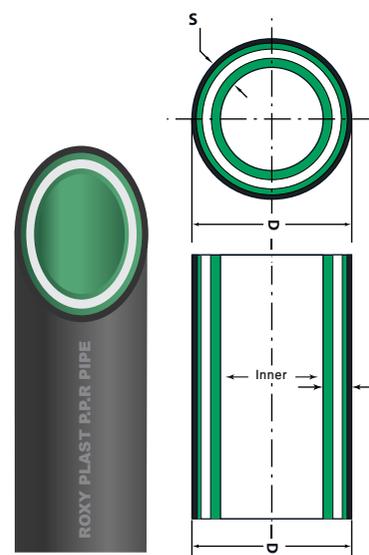
**STANDARD DIMENSION RATIO (SDR):** 6

\*FOR PIPE OPERATING PRESSURE PLEASE REFER TO TABLE PAGE (55)

**COLOR:** OUTER LAYERS BLACK, SECOND LAYER GREEN, THIRD LAYER ORANGE IN THE COLOR OF THIRD OR MIDDLE LAYER

**SUPPLY FORM:** 4M STRAIGHT LENGTH AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	3.40	4.20	5.40	6.70	8.30	10.50	12.50	15.00	18.30	20.80	23.3	26.60
Inner (mm)	13.2	16.6	21.2	26.6	33.4	42	50	60	73.4	83.4	83.8	106.8
Weight (kg/m)	0.172	0.266	0.434	0.671	1.040	1.650	2.340	3.360	5.010	6.470	8.12	10.600
Water Content	0.137	0.216	0.353	0.555	0.876	1.385	1.963	2.826	4.229	5.64	—	8.954



# ROXY PPR PIPE

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## MULTI-LAYERS UV STABILIZED & FIBER GLASS PIPE SDR 5

**COMPOSITION:** 4 LAYERS (OUTER LAYER MIXTURE OF PP-R AND UV STABILIZER & MIDDLE LAYER of fiber Glass)

**PIPE SERIES (S):** 2

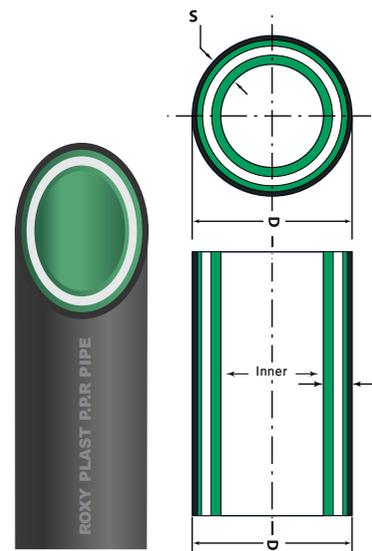
**STANDARD DIMENSION RATIO (SDR):** 5

\*FOR PIPE OPERATING PRESSURE PLEASE REFER TO TABLE PAGE (55)

**COLOR:** OUTER LAYERS BLACK, SECOND LAYER GREEN, THIRD LAYER ORANGE IN THE COLOR OF THIRD OR MIDDLE LAYER

**SUPPLY FORM:** 4M STRAIGHT LENGTH AS PER CUSTOMER REQUIREMENTS

Outer (mm)	20	25	32	40	50	63	75	90	110	125	140	160
S (mm)	4.1	5.1	6.5	8.1	10.1	12.7	15.1	18.1	22.1	25.1	28.1	32.1
Inner (mm)	11.8	14.8	19	23.8	29.8	37.6	44.8	53.8	65.8	74.8	83.8	95.8
Weight (kg/m)	0.198	0.307	0.498	0.775	1.210	1.910	2.700	3.880	5.780	7.460	9.350	12.200



\*Allowable Operating Pressures for PP-R/Fiber-PP-R/PP-R pipes Conveying Water, Safety Factor (SF) = 1,25 (PN20 °C,50 years)

Temperature	Years of service	Pipe series S									
		20	16	12.5	8.3	8	5	4	3.2	2.5	2
		Standard dimension ratio SDR									
		41	33	26	17.6	17	11	9	7.4	6	5
20	50	Allowable operating pressure(bar).....PN(20°C,50 years)									
		3.8	4.8	6.1	9.3	9.7	15.4	19.5	24.5	30.9	38.9

# ROXY PPR FITTINGS

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**ELBOW 90° - PP - R / PП 25**

Size (mm)	20	25	32	40	50	63	75	90	110	125	140	160
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**ELBOW 45° - PP-R/ PП 25**

Size (mm)	20	25	32	40	50	63	75	90	110	125	140	160
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**COUPLING - PP-R/ PП 25**

Size (mm)	20	25	32	40	50	63	75	90	110	125	140	160
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**TEE PP - R / PП 25**

Size (mm)	20	25	32	40	50	63	75	90	110	125	140	160
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**END CAP - PP-R / PП 25**

Size (mm)	20	25	32	40	50	63	75	90	110	125	140	160
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**SHORT CROSS OVER - PPR / PП 25**

Size (mm)	20	25	32	40
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**CROSS OVER - PP-R / PП 25**

Size (mm)	20	25	32	40
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**REDUCED TEE - PP-R/ PП 25**

Size (mm)	25	32	32	40	40	40	50	50	50	50	63	63	63	63	63
	20	20	25	20	25	32	20	25	32	40	20	25	32	40	50
	25	32	32	40	40	40	50	50	50	50	63	63	63	63	63



Size (mm)	75	75	75	75	75	75	90	90	90	110	110	110	110	160	160
	20	25	32	40	50	63	50	63	75	50	63	75	90	90	110
	75	75	75	75	75	75	90	90	90	110	110	110	110	160	160

**REDUCER - PP-R / PП 25**

Size (mm)	25	32	32	40	40	40	50	50	50	50	63	63	63	63	63
	20	20	25	20	25	32	20	25	32	40	20	25	32	40	50



Size (mm)	75	75	90	90	110	110	110	160	160
	50	63	63	75	63	75	90	90	110

# ROXY PPR FITTINGS

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**TEE CROSS**  
PPR / PN 25



Size (mm)

25

**BATTERY**  
PPR / PN 25



Size (mm/inch")

50 X 25

50 X 32

63 X 25

63 X 32

**TAIL ELBOW**  
PPR / PN 25



Size (mm)

25

32

**MALE UNION**  
PPR / PN 25



Size (mm/inch")

20 x 1/2"

25 x 3/4"

32 x 1"

40 x 1 1/4"

50 x 1 1/2"

63 x 2"

**CLAMP**  
PPR / PN 25



Size (mm)

20

25

32

**FEMALE UNION**  
PPR / PN 25



Size (mm/inch")

20 x 1/2"

25 x 3/4"

32 x 1"

40 x 1 1/4"

50 x 1 1/2"

63 x 2"

# ROXY PPR FITTINGS

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**ELBOW 90° MALE THREADED**  
PP-R / PN 25



Size (mm/inch)
20 / ½"
25 / ½"
25 / ¾"
32 / ¾"
32 / 1"

**ELBOW 90° FEMALE THREADED**  
PP-R / PN 25



Size (mm/inch)
20 / ½"
25 / ½"
25 / ¾"
32 / ¾"
32 / 1"

**TEE FEMALE THREADED**  
PP-R / PN 25



Size (mm/inch)
20 / ½"
25 / ½"
25 / ¾"
32 / ¾"
32 / 1"

**ADAPTOR MALE THREADED**  
PP-R / PN 25



Size (mm/inch)
20 / ½"
25 / ½"
25 / ¾"
32 / ¾"
32 / 1"
50 / 1 ½"
63 / 2"

**ADAPTOR FEMALE THREADED**  
PP-R / PN 25



Size (mm/inch)
20 / ½"
25 / ½"
25 / ¾"
32 / ¾"
32 / 1"
50 / 1 ½"
63 / 2"

**DOUBLE ELBOW**  
PP-R / PN 25



Size (mm/inch)
25 / ½"
25 / ¾"



**BALL VALVE - PP-R / PN 25**

Size (mm)	20	25	32	40	50	63	75	90	110



**END PLUG - PP-R**

Size (mm)	20	25



**ANGEL VALVE - PP-R / PN 25**

Size (mm)	20



**CONCEALED VALVE - PPR / PN 25**

Size (mm)	20	25	32	40



**WASHER VALVE - PPR / PN 25**

Size (mm)	20

# ROXY PPR FITTINGS

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**ELBOW 90° - PP - R / PП 25**

Size (mm)	20	25	32	40	50	63	75	90	110	125	140	160
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**ELBOW 45° - PP-R/ PП 25**

Size (mm)	20	25	32	40	50	63	75	90	110	125	140	160
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**COUPLING - PP-R/ PП 25**

Size (mm)	20	25	32	40	50	63	75	90	110	125	140	160
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**T PP - R / PП 25**

Size (mm)	20	25	32	40	50	63	75	90	110	125	140	160
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**END CAP - PP-R / PП 25**

Size (mm)	20	25	32	40	50	63	75	90	110	125	140	160
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**SHORT CROSS OVER - PP-R / PП 25**

Size (mm)	20	25	32	40
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**CROSS OVER - PP-R / PП 25**

Size (mm)	20	25	32	40
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**REDUCED TEE - PP-R/ PП 25**

Size (mm)	25	32	32	40	40	40	50	50	50	50	63	63	63	63	63
	20	20	25	20	25	32	20	25	32	40	20	25	32	40	50
	25	32	32	40	40	40	50	50	50	50	63	63	63	63	63



Size (mm)	75	75	75	75	75	75	90	90	110	110	110	110	160	160
	20	25	32	40	50	63	63	75	50	63	75	90	90	110
	75	75	75	75	75	75	90	90	110	110	110	110	160	160



**REDUCER - PP-R / PП 25**

Size (mm)	25	32	32	40	40	40	50	50	50	50	63	63	63	63	63
	20	20	25	20	25	32	20	25	32	40	20	25	32	40	50



Size (mm)	75	75	90	90	90	110	110	110	110	160	160
	50	63	50	63	75	50	63	75	90	90	110

# ROXY PPR FITTINGS

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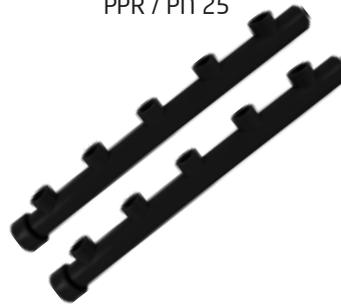
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**TEE CROSS**  
PPR / PN 25



Size (mm)
25

**BATTERY**  
PPR / PN 25



Size (mm/inch)
50 X 25
50 X 32
63 X 25
63 X 32

**TAIL ELBOW**  
PPR / PN 25



Size (mm)
25
32

**MALE UNION**  
PPR / PN 25



Size (mm/inch)
20 x 1/2"
25 x 3/4"
32 x 1"
40 x 1 1/4"
50 x 1 1/2"
63 x 2"

**CLAMP**  
PPR / PN 25



Size (mm)
20
25
32

**FEMALE UNION**  
PPR / PN 25



Size (mm/inch)
20 x 1/2"
25 x 3/4"
32 x 1"
40 x 1 1/4"
50 x 1 1/2"
63 x 2"

# ROXY PPR FITTINGS

Roxy For Modern Water Systems

**ELBOW 90° MALE THREADED**  
PP-R / PN 25



Size (mm/inch")

20 / 1/2"
25 / 1/2"
25 / 3/4"
32 / 3/4"
32 / 1"

**ELBOW 90° FEMALE THREADED**  
PP-R / PN 25



Size (mm/inch")

20 / 1/2"
25 / 1/2"
25 / 3/4"
32 / 3/4"
32 / 1"

**TEE FEMALE THREADED**  
PP-R / PN 25



Size (mm/inch")

20 / 1/2"
25 / 1/2"
25 / 3/4"
32 / 3/4"
32 / 1"

**ADAPTOR MALE THREADED**  
PP-R / PN 25



Size (mm/inch")

20 / 1/2"
25 / 1/2"
25 / 3/4"
32 / 3/4"
32 / 1"
50 / 1 1/2"
63 / 2"

**ADAPTOR FEMALE THREADED**  
PP-R / PN 25



Size (mm/inch")

20 / 1/2"
25 / 1/2"
25 / 3/4"
32 / 3/4"
32 / 1"
50 / 1 1/2"
63 / 2"

**DOUBLE ELBOW**  
PP-R / PN 25



Size (mm/inch")

25 / 1/2"
25 / 3/4"



**BALL VALVE - PP-R / PN 25**

Size (mm)

20	25	32	40	50	63	75	90	110
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# ROXY PP-R PRODUCTS

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## CONCEALED VALVE

PPR Concealed Valve. This valve is manufactured using optimum grade brass and cutting-edge techniques in compliance with set industry standards. It is widely used for controlling the pressure and flow of liquid in unique direction. Our offered valve is made available in different specifications for our clients to choose from. We offer this valve to our valuable clients at affordable rate as all our valves are Italian and German with all it's certificates.

### Features:

- Anti corrosive
- Smooth finishing
- Material PP-R

### Properties :

- Healthy and non-toxic,bacterogical natural, conforming to drinking water application
- Resistant to high temperature.
- Good impact strength.
- German connection technique.
- Excellent heat-insulation.
- Light weight.
- Smooth inner surface reduce pressure loss and increase flow speed.

## TECHNICAL DATA:

### Size Range:

- 20 to 32 mm

### Pressure Rating:

- PN25

### Joining Technology:

- Welding

### Materials

- Polypropylene
- Alloy



# ROXY PP-R PRODUCTS

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## BALL VALVES

Ball valves shut off the flow of water using a small sphere, or ball, inside the valve.

The sphere has an opening inside. When in the "on" position, the opening is in line with the pipe, allowing water to flow freely. When in the "off" position, the opening is perpendicular to the flow of water, stopping the flow completely.

In a ball valve, flow is controlled with a lever. Placing the lever perpendicular to the pipe allows water to flow. Moving it at 90-degree angle stops the flow.

### **Ball valves have several advantages.**

They are easy to turn on and off quickly, and can be used by individuals who cannot maneuver a wheel-operated valve due to disability.

They allow the user to tell at a glance if the valve is open or not.

They are durable, rarely freeze even with years of use, provide reliable service, and are extremely versatile. Ball valves are used in home plumbing, industrial applications, oil and gas applications, marine applications, pharmaceuticals, and many other fields as they are manufactured from pure brass and the ball is made from pure alloy to resistant corrosion.

### **So,**

The ball valves probably the most widely-used valve design, ball valves employ a cored, rotating ball to control flow. Usually operated by lever handle, they also offer a quick view of their status.

Their design makes them ideal for full-flow applications, and their easy, low-wear operation is also excellent for throttling.

## TECHNICAL DATA:

### **Size Range:**

From 20 to 110 mm

### **Pressure Rating:**

PN25

### **Joining Technology:**

Welding

### **Materials**

- Polypropylene
- Brass
- Alloy



# ROXY PP-R PRODUCTS

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## BRASS SPEC

The alloy of the brass insert that **Roxy Plast** uses in its products is made according to EN-12449, that ensures the safety of the user's health in regards to drinking water.

Also, the design of the brass inserts give very high fixation between Brass and PP-R materials to prevent any leakage that can cause damages.

Finally, by the use of Italian brass we can produce and offer a product with both high quality and high safety, because our mission is to build a circle of trust for every client.

### Featured

- Corrosion Resistance
- Impact Resistance
- Dimensional accuracy
- Can withstand high pressures for more than fifty years
- Non-toxic
- Optimal endurance
- Moisture resistance
- Sturdiness





PPR PIPES AND FITTINGS

ROXYPLAST

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**ROXYPLAST**  
GERMAN TECHNOLOGY

**GLOSSARY**  
[WWW.ROXYPLAST.COM](http://WWW.ROXYPLAST.COM)



# GLOSSARY

## ABRASION RESISTANCE

The measure of a material's ability to withstand erosion when subjected to rubbing, scraping, wearing, scouring, etc.

## AGING

The act or effect of exposed materials to an environment for a long period of time.

## ANTIOXIDANT

A substance added to a plastic compound to retard degradation due to contact with air (Oxygen).

## BEAM LOADING

The process of applying a specified force (load) to a piece of pipe that is supported at two points. It is usually expressed in pounds per the distance between the center of the supports.

## BELLED-END

A term used to describe a pipe end which has been enlarged to have the same inside dimensions as a fitting socket. It acts as a coupling when joining pipes.

## BLISTER

An undesirable air or gas bubble (bump) on the surface of a plastic part.

## BOND

To attach by the use of an adhesive.

## BURST STRENGTH

The maximum amount of internal pressure a piece of pipe or a fitting will withstand before breaking.

## CHEMICAL RESISTANCE

The ability of a plastic to withstand the effects of chemicals at various concentrations and temperatures.

## COLD FLOW

A change in the shape or the dimensions of a plastic part when subjected to a load (weight or pressure) at room temperature.

## COMPOUND

The mixture of ingredients, consisting of a plastic resin and specified additives, used to manufacture a plastic part.

## CONDENSATION

A chemical reaction involving the combination of two or more molecules that results in the elimination of a simple molecule, such as water, and the formation of a more complex compound of greater molecular weight.

## COPOLYMER

The product formed by the simultaneous polymerization of two or more polymerizes Chemicals (monomers).

## CREEP

The dimensional change, beyond the initial elastic elongation caused by the application of a load, over a specified period of time. It is normally expressed in inches per unit of time.

# GLOSSARY

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## CURE

To change the properties of a polymer to a stable and usable final state by the use of chemical agents, heat or radiation.

## DEFLECTION TEMPERATURE (HEAT DISTORTION)

The temperature which will cause a plastic specimen to deflect a certain distance when a specified load is applied.

## DEGRADATION

A detrimental change in the chemical structure, physical properties or appearance of a plastic.

## DELAMINATION

The separation of the layers of material in a laminate.

## DETERIORATION

A permanent change in the physical properties of a plastic piece evidenced by impairment of these Properties.

## DIELECTRIC STRENGTH

The force required to drive an electric current through a specific thickness of a material.

## DIFFUSION

The movement of gas or liquid particles or molecules in a body of fluid through or into a medium and away from the main body of fluid.

## DIMENSIONAL STABILITY

The capability of a plastic part to maintain its original shape and dimensions under conditions of use.

## ELASTICITY

The property of a plastic that allows it to return to its original dimensions after deformation.

## ELASTIC LIMIT

The load point at which a material will not return to its original shape and size after the load has been released.

## ELASTOMER

A substance which when stretched to approximately twice its length, at room temperature, will quickly return to its original length when the stretching load is relieved.

## ELECTRICAL PROPERTIES

The resistance of a plastic to the passage of electricity.

## ELONGATION

The lengthening of a material to an extent under tension without failing.

## ENVIRONMENTAL STRESS CRACKING

Cracks which develop when a plastic part is subjected to incompatible chemicals or put under stress.

## EXTRUSION

The process used to continuously form a shape by forcing a heated or unheated plastic through a shaping orifice (die).

## FILLER

A relatively inert material added to a plastic to modify its strength, permanence, working properties and other qualities, or merely to lower costs.

## FLEXURAL STRENGTH

The measure of a material's ability to withstand a specified deformation under a beam load (bending) at 73°F. Normally expressed in PSI.

# GLOSSARY

## Roxy For Modern Water Systems

### FORMING

A process in which the shape of plastic pieces such as sheets, rods or tubes are changed to a desired configuration.

### FORMULATION

The combination of ingredients used to make a finished plastic product. Also see "Compound".

### FUSE

To join together plastic parts by softening the material with heat or solvents.

### GATE

The constriction in the flow channel between the runner and the mold cavity in an injection mold.

### GLASS TRANSITION

The reversible change in an amorphous polymer from a viscous condition to a hard and relatively brittle one, and vice versa.

### GLASS TRANSITION TEMPERATURE

The approximate midpoint of the temperature range over which the glass transition takes place.

### GUSSET

A piece used to give additional size or strength to a plastic part at a particular location.

### HARDNESS

The measure of a material's ability to resist indentation.

### HEAT RESISTANCE

The ability of a material to withstand the effects of exposure to high temperatures.

### HOOP STRESS

The circumferential stress imposed on a pipe wall when exposed to an internal pressure load. Usually expressed in PSI.

### IMPACT STRENGTH

A measure of a plastic part's ability to withstand the effects of dropping and/or striking. There are two commonly used test methods, Notched Izod and Tup. Notched Izod uses a pendulum type machine to strike a notched specimen. Tup Testing uses a falling weight (tup) to strike a pipe or fitting specimen.

### INJECTION MOLDING

The process used to form a shape by forcing a heated plastic, in a fluid state and under pressure, into the cavity of a closed mold.

### ISO EQUATION

The equation which shows the relationship between stress, pressure and dimensions of a pipe.

### JOINT

The point where a pipe and its fitting or two separate pipes are connected together.

### LIGHT STABILITY

A feature of a plastic which allows it to retain its original color and physical properties when exposed to sun or artificial light.

### LIGHT TRANSMISSION

The amount of light which a plastic will allow to pass through.

### LONGITUDINAL STRESS

A tensile or compressive force placed upon the long axis of a plastic part.

### LUBRICANT

Any substance which reduces the friction between moving solid surfaces.

# GLOSSARY

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## MODULUS

A term used to describe the load required to cause a specified percentage of elongation. It is usually expressed in PSI or kilos per square centimeter.

## MONOMER

A low-molecular-weight substance whose molecules can react with other molecules to form a polymer.

## NON-FLAMMABLE

Incapable of igniting.

## NON-TOXIC

Non-poisonous.

## OLEFIN PLASTICS

A group of plastics based on polymers made by the polymerization or copolymerization of olefins with other monomers, with the olefins being at least 50% of the weight. For example, polypropylene, polyethylene and polybutylene.

## ORGANIC CHEMICAL

Any chemical that contains carbon.

## PLASTIC

A material that contains as an essential ingredient one or more organic polymeric substances of large molecular weight. It is solid in its finished state and, at some stage in its manufacturing process into finished articles, can be shaped by flow.

## PLASTICITY

The property of plastics, which allows them to be formed, without rupture, continuously and permanently by the application of a force, which exceeds the yield value of the material.

## PLASTICIZER

A substance incorporated into a plastic to increase its workability, flexibility, or dispensability.

## PLASTIC PIPE

A hollow cylinder of a plastic material in which the wall thickness is usually small compared to the diameter, and in which the inside and outside walls are essentially concentric.

## POLYBUTYLENE PLASTICS

Plastics based on polymers with butane as the sole monomer.

## POLYETHYLENE PLASTICS

Plastics based on polymers with ethylene as the sole monomer.

## POLYMER

A product formed by the chemical reaction of the addition of a large number of small molecules which have the ability to combine and reach high molecular weights.

## POLYMERIZATION

A chemical reaction in which the molecules of monomers are linked together to form polymers.

## POLYOLEFIN PLASTICS

Plastics based on polymers with olefin as the sole monomer.

## POLYPROPYLENE PLASTICS

Plastics based on polymers with propylene as the sole monomer.

## POLYSTYRENE

A polymer prepared by the polymerization of styrene as the sole monomer.

# GLOSSARY

## Roxy For Modern Water Systems

### POLYVINYL CHLORIDE PLASTICS

Plastics obtained by the polymerization of vinyl chloride. The addition of various ingredients, such as stabilizers, colorants, lubricants and fillers enhance the process-ability and performance.

### POROSITY

A term describing a plastic part that has many visible voids.

### PRESSURE RATING

The maximum pressure at which a plastic part can safely function without failing.

### QUICK BURST

A term used to describe the amount of internal pressure required to burst a pipe or fitting when the pressure is built up over a 60-70 second interval of time.

### REINFORCED PLASTIC

A plastic with high strength fillers imbedded in the composition, causing some mechanical properties to be superior to those of the base resin.

### RESIN

A solid or pseudo-solid organic material, often having a high molecular weight, which exhibits a tendency to flow when subjected to stress. It usually has a softening or melting range and usually fractures accordingly.

### RUNNER

The secondary feed channel in an injection mold that runs from the inner end of the spruce to the cavity gate. Also, the solidified piece of plastic, which forms in the feed channel when the injection's molded part, cools down.

### SAMPLE

A small part or portion of a material or product intended to be representative of the whole.

### SCHEDULE

A pipe sizing system for the outside diameter and wall thickness dimensions which was launched by the iron pipe industry; as the diameter increases, the pressure rating decreases for any given schedule of pipe.

### SELF-EXTINGUISHING

A term describing a plastic material that stops burning when the source of ignition is removed.

### SHRINK MARK

A depression in the surface of a molded plastic part where it has retracted from the mold.

### SOFTENING POINT

The temperature at which a plastic changes from rigid to soft.

### SOLVENT

A medium into which a substance is dissolved.

### SOLVENT CEMENT

An adhesive consisting of plastic dissolved into a solvent and used to bond plastic surfaces.

### SOLVENT CEMENTING

Using a solvent cement to make pipe joints.

### SPECIFIC GRAVITY

The ratio of the mass of a material to the mass of an equal volume of water.

### SPRUE

The primary feed channel that runs from the outer face of an injection mold to the runner or the gate.

# GLOSSARY

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## STABILIZER

An ingredient added to a plastic compound to inhibit or slow down any undesirable changes in the material.

## STANDARD DIMENSION RATIO (SDR) PIPE

A type of pipe in which the dimension ratios are constant for any given class. Unlike "schedule" pipe, as the diameter increases the pressure rating remains constant for any given class of pipe.

## STIFFNESS FACTOR

A term describing the degree of flexibility of a piece of pipe when subjected to an external load.

## STRESS-CRACK

An external or internal crack in a plastic caused by tensile stresses less than its short-time mechanical strength.

## SUSTAINED PRESSURE TEST

A test in which a plastic part is subjected to a constant internal pressure load for 1000 hours.

## TEAR STRENGTH

A measure of a material's ability to resist tearing.

## TENSILE STRENGTH

The measure of a plastic's ability to resist a stretching force. It requires rupturing a test specimen. It is normally expressed in the PSI.

## THERMAL CONDUCTIVITY

A measure of a plastic's ability to conduct heat.

## THERMAL CONTRACTION

The decrease in length of a plastic part due to a change in temperature.

## THERMAL EXPANSION

The increase in length of a plastic part due to a change in temperature.

## THERMOPLASTICS

A group of plastics which can repeatedly be softened by heating and hardened by cooling.

## THERMOSETTING PLASTICS

A group of plastics which, having been cured by heat, chemicals or other means, are substantially infusible and insoluble. They are permanently hardened.

## VINYL CHLORIDE PLASTICS

Plastics based on polymers or copolymers of vinyl chloride with other monomers, with the vinyl chloride being the greatest amount by weight.

## VISCOSITY

A term describing a material's resistance to flow.

## VOLATILE

A property of liquids in which they pass away by evaporating.

## WELD LINE (KNIT LINE)

A term used to describe a mark on a molded plastic part formed by the union of two or more streams of plastic flowing together.

## YIELD POINT

The point at which a plastic material will not withstand a stretching force. It will continue to elongate with no increase in load after reaching that point.

# UNIT CONVERSION TABLE

**Table 1** Multiples and Submultiples of SI units

Prefix	Symbol	Multiplying Factor
exa	E	10 <sup>18</sup> 1 000 000 000 000 000 000
peta	P	10 <sup>15</sup> 1 000 000 000 000 000
tera	T	10 <sup>12</sup> 1 000 000 000 000
giga	G	10 <sup>9</sup> 1 000 000 000
mega	M	10 <sup>6</sup> 1 000 000
kilo	k	10 <sup>3</sup> 1 000
hecto*	h	10 <sup>2</sup> 100
deca*	da	10 10
deci*	d	10 <sup>-1</sup> 0.1
centi	c	10 <sup>-2</sup> 0.01
milli	m	10 <sup>-3</sup> 0.001
micro	u	10 <sup>-6</sup> 0.000 001
nano	n	10 <sup>-9</sup> 0.000 000 001
pico	p	10 <sup>-12</sup> 0.000 000 000 001
femto	f	10 <sup>-15</sup> 0.000 000 000 000 001
atto	a	10 <sup>-18</sup> 0.000 000 000 000 000 001

**Table 2** Length units

Millimeters	Centimeters	Meters	Kilometers	Inches	Feet	Yards	Miles
mm	cm	m	km	in	ft	yd	mi
1	0.1	0.001	0.000001	0.03937	0.003281	0.001094	6.21e-07
10	1	0.01	0.00001	0.393701	0.032808	0.010936	0.000006
1000	100	1	0.001	39.37008	3.28084	1.093613	0.000621
1000000	100000	1000	1	39370.08	3280.84	1093.613	0.621371
25.4	2.54	0.0254	0.000025	1	0.083333	0.027778	0.000016
304.8	30.48	0.3048	0.000305	12	1	0.333333	0.000189
914.4	91.44	0.9144	0.000914	36	3	1	0.000568
1609344	160934.4	1609.344	1.609344	63360	5280	1760	1

**Table 3** Area Units

Millimeter square	Centimeter square	Meter square	Inch square	Foot square	Yard square
mm <sup>2</sup>	cm <sup>2</sup>	m <sup>2</sup>	in <sup>2</sup>	ft <sup>2</sup>	yd <sup>2</sup>
1	0.01	0.000001	0.00155	0.000011	0.000001
100	1	0.0001	0.155	0.001076	0.00012
1000000	10000	1	1550.003	10.76391	1.19599
645.16	6.4516	0.000645	1	0.006944	0.000772
92903	929.0304	0.092903	144	1	0.111111
836127	8361.274	0.836127	1296	9	1

# UNIT CONVERSION TABLEV

Roxy For Modern Water Systems

**Table 4** Volume Units

Centimeter cube	Meter cube	Liter	nch cube	Foot cube	US gallons	Imperial gallons	US barrel(oil)
cm <sup>3</sup>	m <sup>3</sup>	ltr	in <sup>3</sup>	ft <sup>3</sup>	US gal	Imp.gal	US brl
1	0.000001	0.001	0.061024	0.000035	0.000264	0.00022	0.000006
1000000	1	1000	61024	35	264	220	6.29
1000	0.001	1	61	0.035	0.264201	0.22	0.00629
16.4	0.000016	0.016387	1	0.000579	0.004329	0.003605	0.000103
28317	0.028317	28.31685	1728	1	7.481333	6.229712	0.178127
3785	0.003785	3.79	231	0.13	1	0.832701	0.02381
4545	0.004545	4.55	277	0.16	1.20	1	0.028593
158970	0.15897	159	9701	6	42	35	1

**Table 5** Mass Units

Grams	Kilograms	Metric tonnes	Short ton	Long ton	Pounds	Ounces
g	kg	tonne	sh-ton	L-ton	lb	oz
1	0.001	0.000001	0.000001	9.84-07	0.002205	0.035273
1000	1	0.001	0.001102	0.000984	2.204586	35.27337
1000000	1000	1	1.102293	0.984252	2204.586	35273.37
907200	907.2	0.9072	1	0.892913	2000	32000
1016000	1016	1.016	1.119929	1	2239.859	35837.74
453.6	0.4536	0.000454	0.0005	0.000446	1	16
28	0.02835	0.000028	0.000031	0.000028	0.0625	1

**Table 6** Density Units

Gram/milliliter	Kilogram/meter cube	Pound/foot cube	Pound/inch cube
g/ml	kg/m <sup>3</sup>	lb/ft <sup>3</sup>	lb/in <sup>3</sup>
1	1000	62.42197	0.036127
0.001	1	0.062422	0.000036
0.01602	16.02	1	0.000579
27.68	27680	1727.84	1

**Table 7** Volumetric Liquid Flow Units

Liter/second	Liter/minute	Meter cube/hour	Foot cube/minute	Foot cube/hour	US gallons/minute	US barrels (oil)/day
L/sec	L/min	M <sup>3</sup> /hr	ft <sup>3</sup> /min	ft <sup>3</sup> /hr	gal/min	US brl/d
1	60	3.6	2.119093	127.1197	15.85037	543.4783
0.016666	1	0.06	0.035317	2.118577	0.264162	9.057609
0.277778	16.6667	1	0.588637	35.31102	4.40288	150.9661
0.4719	28.31513	1.69884	1	60	7.479791	256.4674
0.007867	0.472015	0.02832	0.01667	1	0.124689	4.275326
0.06309	3.785551	0.227124	0.133694	8.019983	1	34.28804
0.00184	0.110404	0.006624	0.003899	0.2339	0.029165	1

# UNIT CONVERSION TABLEV

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**Table 8** Volumetric Gas Flow Units

Normal meter cube/hour	Standard cubic feet/hour	Standard cubic feet/minute
Nm <sup>3</sup> /hr.	Scfh	scfm
1	35.31073	0.588582
0.02832	1	0.016669
1.699	59.99294	1

**Table 9** Mass Flow Units

Kilogram/hour	Pound/hour	Kilogram/second	Ton/hour
kg/h	lb/hour	kg/s	t/h
1	2.204586	0.000278	0.001
0.4536	1	0.000126	0.000454
3600	7936.508	1	3.6
1000	2204.586	0.277778	1

**Table 10** High Pressure Units

Bar	Pound/square inch	Kilopascal	Mega Pascal	Kilogram force/centimeter square	Millimeter of mercury	Atmospheres
Bar	Psi	K Pa	MPa	Kg f /cm <sup>2</sup>	Mm Hg	Mm Hg
1	14.50326	100	0.1	1.01968	750.0188	750.0188
0.06895	1	6.895	0.006895	0.070307	51.71379	51.71379
0.01	0.1450	1	0.001	0.01020	7.5002	7.5002
10	145.03	1000	1	10.197	7500.2	7500.2
0.9807	14.22335	98.07	0.09807	1	735.5434	735.5434
0.001333	0.019337	0.13333	0.000133	0.00136	1	1
1.013	14.69181	101.3	0.1013	1.032936	759.769	759.769

**Table 11** Low Pressure Units

Meter of water	Foot of water	Centimeter of mercury	Inches of mercury	Inches of water	Pascal
M H <sub>2</sub> O	Ft H <sub>2</sub> O	Cm Hg	In Hg	In H <sub>2</sub> O	Pa
1	3.280696	7.356339	2.896043	39.36572	9806
0.304813	1	2.242311	0.882753	11.9992	2989
0.135937	0.445969	1	0.39368	5.351265	1333
0.345299	1.13282	2.540135	1	13.59293	3386
0.025403	0.083339	0.186872	0.073568	1	249.1
0.000102	0.000335	0.00075	0.000295	0.004014	1

# UNIT CONVERSION TABLE V

Roxy For Modern Water Systems

**Table 12** Speed Units

Meter/second	Meter/minute	Kilometer/hour	Foot/second	Foot/minute	Miles/hour
m/s	m/min	km/h	Ft /s	Ft /min	mi/h
1	59.988	3.599712	3.28084	196.8504	2.237136
0.01667	1	0.060007	0.054692	3.281496	0.037293
0.2778	16.66467	1	0.911417	54.68504	0.621477
0.3048	18.28434	1.097192	1	60	0.681879
0.00508	0.304739	0.018287	0.016667	1	0.011365
0.447	26.81464	1.609071	1.466535	87.99213	1

**Table 13** Torque Units

Newton meter	Kilogram force meter	Foot pound	Inch pound
Nm	kgfm	ftlb	inlb
1	0.101972	0.737561	8.850732
9.80665	1	7.233003	86.79603
1.35582	0.138255	1	12
0.112985	0.011521	0.083333	1

**Table 14** Dynamic Viscosity Units

Centipoise*	Poise	Pound /foot · second
Cp	poise	Lb / (ft·s)
1	0.01	0.000672
100	1	0.067197
1488.16	14.8816	1

**Table 15** Kinematic Viscosity Units

Centistoke*	Stoke	Foot square/second	Meter square /second
cs	St	ft <sup>2</sup> /s	m <sup>2</sup> /s
1	0.01	0.000011	0.000001
100	1	0.001076	0.0001
92903	929.03	1	0.092903
1000000	10000	10.76392	1

**Table 16** Temperature Conversion Formulas

Degree Celsius (°C)	$(^{\circ}\text{F} - 32) \times 5/9$
	$(\text{K} - 273.15)$
Degree Fahrenheit (°F)	$(^{\circ}\text{C} \times 9/5) + 32$
	$(1.8 \times \text{K}) - 459.67$
Kelvin (K)	$(^{\circ}\text{C} + 273.15)$
	$(^{\circ}\text{F} + 459.67) \div 1.8$

## CERTIFICATIONS



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# CERTIFICATES

**ZERTIFIKAT** **SKZ**

SKZ - Testing GmbH awards the following company  
**Roxy for metal and plastic products**  
 29 Mourad Bak St.  
 Helwanella Sq.,  
 Helwanopolis  
**CAIRO**  
**EGYPT**

Production site: Roxy for metal and plastic products, Helwan  
 The right to use the SKZ testing and inspection mark



**A 799**  
 for the following plastic products  
**Pressure pipes made of polypropylene PP-R**  
 Trade name: Roxy

SKZ specification for tests and inspection **NR 3, T0 2016-03**

Users of the SKZ mark are obliged to observe the required regulations for the production and testing of these products.  
 Date of last certification: —  
 Date of expiry: 12 May 2025



Winnburg, 14 May 2024  
 Dr.-Ing. Hans-Peter Krause  
 Head of Certification Body

The original language of this certificate is German. In case of doubt, the German version is obligatory.  
 SKZ - Testing GmbH, Pöschel-Strasse 49, 37079 Winnburg, Germany, Tel. +49 531 1395, info@skz.de, www.skz.de

**DVGW** **DVGW** **CERT**

**DVGW type examination certificate**  
**DVGW-Baumusterprüfzertifikat**

DW-4317008143  
 2024-02-19 10:52:00

**Field of Application** products of water supply  
 Produkte der Wasserversorgung

**Owner of Certificate** Roxy for Metal and Plastic Products  
 29 Mourad Bak St., Helwanella Sq., EG-11343 Helwanpolis, Kairo

**Manufacturer** Roxy for Metal and Plastic Products  
 29 Mourad Bak St., Helwanella Sq., EG-11343 Helwanpolis, Kairo

**Product Category** Plastic pipes for drinking water installations, PP-R, GDN 6 (3317)

**Product description** plastic pipes made of PP-R for the drinking water installation color green  
 Kunststoffleitungen

**Model** Roxy PP-R pipes

**Test reports** Type testing: 230317 from 02.05.2023 (SKZ)  
 Pressure: UBA-Guideline: 2001/852/1772/2174 from 16.10.2022 (DIN)  
 Hygiene testing: 2017476-02 from 13.12.2021 (SKZ)

**Test basis** DVGW W 544 (1:20 2007)  
 UBA-GTW-09/04, 01:13 2022  
 DIN EN W 273 (01:11 2008)

**Date of expiry / File No.** 03.05.2026 / 25-0100-WW0  
 48000000 - Administration




**Test Report** **ofi**

Report No.: 2001652 / 11722 / 04 Date: 2023-10-18

**Client / Producer:** Roxy for Metal and Plastic Products  
 29 Mourad Bak St., Helwanella Sq.,  
 Helwanpolis, Kairo  
 Egypt

**Subject:** PP-R pipe DN 25x1,2 mm made out of Storage Binister  
 RA1407

**Test:** Type test according to UBA Evaluation Criteria for plastics  
 and other organic materials in contact with drinking water  
 (Issue 23E1-03-01)

**Order:** 2020-02-05 by SKZ Testing GmbH

**Date of sampling:** —

**Location of sampling:** No samples taken by OFI staff  
 Samples analyzed by the client

**Receipt of samples:** 2020-02-05 and 2022-05-22




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 c/o H. P. Krause  
 Pöschel-Strasse 49  
 37074 Winnburg

**Reference Number:** 2001652 / 11722 / 04  
**Date:** 2023-10-18

**Test report: Basic requirements cold and warm water according to KTW-BWG.**

**Dear Mr. Krause:**  
 Please find enclosed the testing results for your order dated July 20<sup>th</sup>, 2023, regarding the examination of 142  
 of article number: 230706.

The test results refer only to the submitted sample as tested.

No part of the test report may be reproduced without the permission of the AnalytikService GmbH.

If you have any questions, do not hesitate to contact Mrs. Schwaner (to whom you are referred).

**With best regards**  
 AnalytikService GmbH

**Dr. R. Hehn** (Technical Director) **A. Schwaner** (Laboratory Manager)












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**Factory 3** : 10<sup>th</sup> of Ramadan City, Industrial Zone, Eastern - Egypt

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