SMART PIPE INDUSTRIES COMPANY

PP-R PIPING SYSTEMS

PRODUCT CATALOGUE



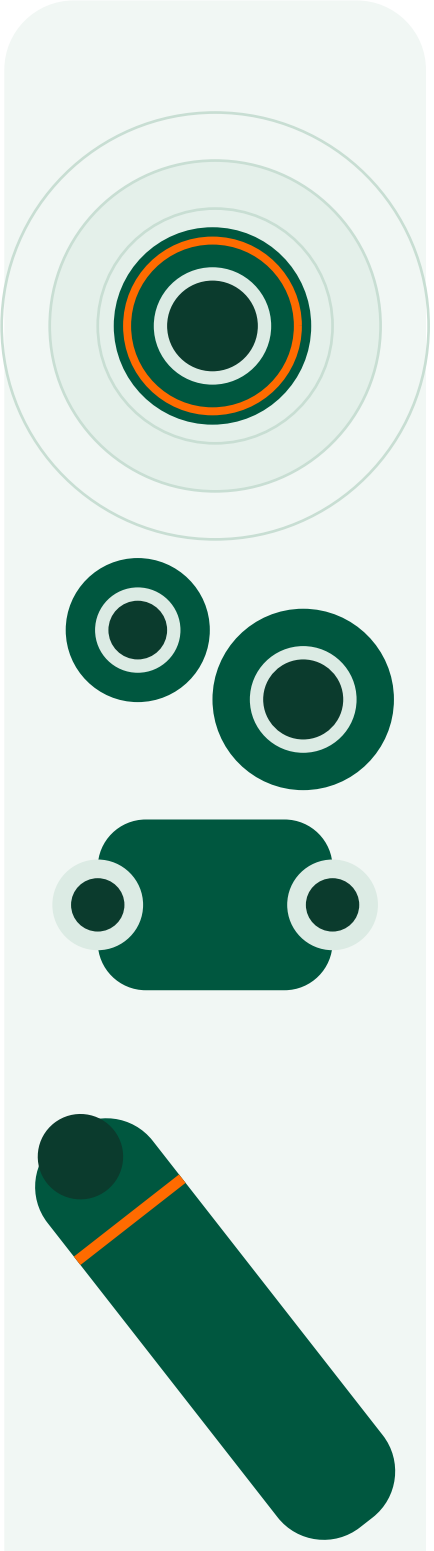
CONTENTS

SMART PIPE PP-R PRODUCT CATALOGUE

CATALOGUE SECTIONS

- Company Profile 01
- Vision, Mission & Values 02
- PP-R System Overview 03
- Material Characteristics & Performance 05
- Standards & Pipe Construction 11
- Technical Specifications 14
- Pipe Dimensions 29
- PP-R Thermal Fittings 32
- Brass-Insert Fittings 40
- PP-R Valves 47
- Concealed Valves 49
- APPENDEX - Chemical Resistance 51

SMART PIPE INDUSTRIES COMPANY



PP-R PIPING SYSTEMS

SMART PIPE INDUSTRIES COMPANY

COMPANY PROFILE

الملف التعريفي

ENGINEERED FOR CONFIDENCE

ABOUT SMART PIPE

Smart Pipe is a Saudi manufacturer of integrated plastic piping systems for residential, commercial, industrial, and infrastructure applications. Advanced manufacturing, selected raw materials, and rigorous quality control shape solutions built for safety, efficiency, durability, and long-term performance.

Our portfolio includes PP-R systems for hot and cold water, uPVC systems for drainage and wastewater networks, and HDPE solutions for firefighting, irrigation, utilities, and infrastructure.

From technical specification and product selection to installation and project support, Smart Pipe is a trusted technical partner to consultants, contractors, distributors, developers, and project owners.

نبذة عن سمارت بايب

سمارت بايب شركة صناعية سعودية متخصصة في تصنيع أنظمة الأنابيب البلاستيكية المتكاملة للمشروعات السكنية والتجارية والصناعية ومشروعات البنية التحتية. نجمع بين تقنيات التصنيع المتقدمة والمواد الخام المختارة بعناية والرقابة الصارمة على الجودة لنقدم حلولًا موثوقة تحقق السلامة والكفاءة والمتانة والأداء طويل الأمد.

لتطبيقات PP-R تشمل باقة منتجاتنا أنظمة uPVC المياه الساخنة والباردة، وأنظمة لشبكات الصرف الصحي وتصريف المياه لشبكات مكافحة HDPE العادمة، وحلول الحريق والري والمرافق والبنية التحتية.

بدءًا من إعداد المواصفات الفنية واختيار المنتجات وصولًا إلى التركيب ودعم المشروعات، تلتزم سمارت بايب بأن تكون شريكًا فنيًا موثوقًا للاستشاريين والمقاولين والموزعين والمطورين وملاك المشروعات.

MODERN SYSTEMS • CONSISTENT QUALITY • ENDURING PERFORMANCE

أنظمة حديثة • جودة ثابتة • أداء يدوم

VISION • MISSION • VALUES

SMART PIPE INDUSTRIES COMPANY

VISION رؤيتنا

To be the preferred regional partner for reliable, sustainable, and high-performance piping systems.

أن نكون الشريك الإقليمي المفضّل لأنظمة الأنابيب الموثوقة والمستدامة وعالية الأداء.

MISSION رسالتنا

To engineer and manufacture safe, innovative piping solutions that meet recognized standards, create value for our customers, and support sustainable development.

تصميم وتصنيع حلول أنابيب آمنة ومبتكرة تلبي المعايير المعتمدة،
وتحقق قيمة لعملائنا، وتسهم في التنمية المستدامة.

CORE VALUES قيمنا

QUALITY جودة
Consistent performance

INNOVATION ابتكار
Smarter solutions

COMMITMENT التزام
Promises delivered

TRANSPARENCY شفافية
Trust in every step

SUSTAINABILITY استدامة
Responsible growth



An integrated system engineered for reliable hot- and cold-water distribution.

SMART PIPE PP-R pipes and fittings provide a fully integrated solution for residential, commercial, and industrial buildings. The coordinated range of pipes, fittings, and transition components enables efficient system design, consistent jointing, and reliable long-term performance.

Engineered to withstand continuous operating pressure at temperatures of up to 70°C, SMART PIPE PP-R systems offer a projected service life exceeding 50 years when installed and operated in accordance with the specified conditions.

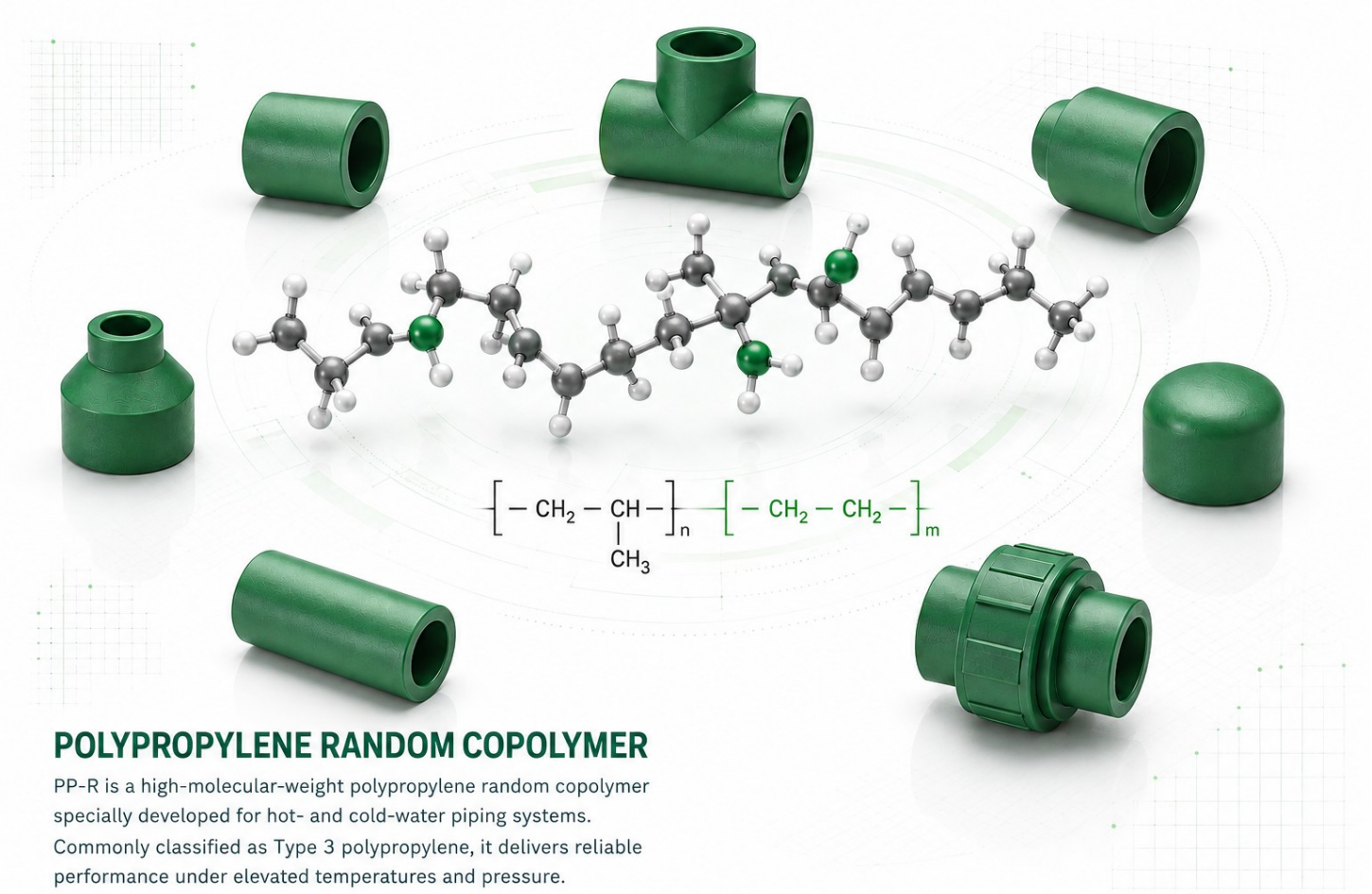
70°C	>50 YEARS	20–200 mm
CONTINUOUS OPERATING TEMPERATURE	PROJECTED SERVICE LIFE	COORDINATED SIZE RANGE

CONFIDENCE THROUGH EVERY LAYER

A coordinated PP-R system that combines hygienic water delivery, dependable fusion joints, corrosion resistance, and controlled long-term performance.

PP-R MATERIAL SCIENCE

POLYPROPYLENE RANDOM COPOLYMER



POLYPROPYLENE RANDOM COPOLYMER

PP-R is a high-molecular-weight polypropylene random copolymer specially developed for hot- and cold-water piping systems. Commonly classified as Type 3 polypropylene, it delivers reliable performance under elevated temperatures and pressure.

SMART PIPE INDUSTRIES COMPANY | PP-R PIPING SYSTEMS

WHY SMART PIPE PP-R

MATERIAL CHARACTERISTICS AND PRACTICAL ADVANTAGES

MATERIAL PROPERTY	PERFORMANCE ADVANTAGE
Lightweight	Easy to handle, transport, and install, helping reduce labor time and installation costs.
Corrosion and Scale Resistance	Does not rust or scale and is suitable for use across a wide range of pH conditions.
Non-Toxic and Hygienic	Suitable for potable-water applications and does not adversely affect water quality when used in accordance with applicable standards.
High Vicat Softening Temperature	Provides excellent dimensional and thermal stability in hot-water applications.
UV Resistance	Black, UV-stabilized pipes are suitable for outdoor installations exposed to sunlight, subject to the specified application conditions.
Thermal Insulation	Low thermal conductivity helps reduce heat loss and improve system energy efficiency.
Chemical Resistance	Resistant to a wide range of chemicals, making the system suitable for many industrial applications.
Impact Resistance	Withstands handling and installation stresses while maintaining dependable mechanical performance.
Heat-Fusion Jointing	Creates strong, homogeneous, and leak-resistant joints without solvents, reducing jointing time and supporting concealed or exposed installations.

WHY SMART PIPE PP-R

PERFORMANCE ADVANTAGES — CONTINUED

MATERIAL PROPERTY	PERFORMANCE ADVANTAGE
Acoustic Performance	Helps reduce flow noise and the transmission of water-hammer sound.
Bacteriologically Neutral	Does not support bacterial growth under normal operating conditions and is suitable for potable-water and underground applications.
Smooth Internal Surface	A very low coefficient of friction minimizes pressure loss, improves flow performance, and can reduce pumping requirements.
Flexibility and Resilience	Accommodates limited structural movement, making the system suitable for appropriately designed installations in seismic areas.
Abrasion Resistance	Provides dependable performance when conveying water and other approved fluids at the specified design velocities.
High Electrical Resistivity	Does not conduct electricity and is unaffected by electrochemical corrosion or stray electrical currents.
Long Service Life	Can exceed 50 years when installed and operated within the specified temperature and pressure limits.
Reduced Linear Expansion	Multilayer pipe construction can provide up to 75% less linear expansion than standard single-layer PP-R pipes.

Together, these properties make SMART PIPE PP-R a durable, hygienic, and cost-effective solution for modern hot- and cold-water distribution systems.

COMPARISON BETWEEN PIPING SYSTEMS

JOINTING, INSTALLATION AND MATERIAL PERFORMANCE

PROPERTY	Copper	CPVC	Galvanized Iron	HDPE	SMART PIPE PP-R
Jointing Method	Soldering, brazing, or press fittings	Solvent-cement welding	Threaded or mechanical joints	Butt or electrofusion welding	**Poly fusion welding; threaded metal-insert fittings are available for transition connections**
Installation	Requires skilled labor and specialized tools	Relatively quick and straightforward	Labor-intensive and time-consuming	Requires trained operators and fusion equipment	**Fast and straightforward, helping reduce installation time and labor requirements**
Corrosion Resistance	May corrode under certain water conditions	Corrosion-resistant	Susceptible to corrosion when the protective coating deteriorates	Corrosion-resistant	**Corrosion-resistant**
Chemical Resistance	Limited under aggressive conditions	Resistant to many commonly encountered chemicals	Limited under aggressive conditions	Resistant to a wide range of chemicals	**Excellent resistance to a wide range of chemicals, subject to temperature and concentration**
Scale Formation	Scale may develop depending on water quality	Smooth internal surface helps minimize scaling	Susceptible to scaling and internal deposits	Smooth, non-scaling internal surface	**Smooth, non-scaling internal surface**

COMPARISON BETWEEN PIPING SYSTEMS

ENVIRONMENTAL PERFORMANCE AND SERVICE LIFE

PROPERTY	Copper	CPVC	Galvanized Iron	HDPE	SMART PIPE PP-R
Performance at Sub-Zero Temperatures	Freezing water may cause pipe failure	Impact resistance decreases at low temperatures	Freezing water may cause pipe failure	Good low-temperature flexibility when correctly specified	**Requires appropriate insulation and freeze protection in sub-zero conditions**
Impact Resistance	Moderate	May become brittle, particularly at low temperatures	High but may be affected by corrosion	High	**Good impact resistance under the specified operating and installation conditions**
Insulation Requirements	Commonly required to control heat loss or condensation	Determined by the application and local requirements	Commonly required to control heat loss or condensation	Determined by the application and installation conditions	**Determined by the application; freeze protection is necessary in sub-zero conditions**
Expected Service Life*	Typically, 20–30 years	Typically, 30–40 years	Typically, 5–15 years, depending on corrosion exposure	Typically, 20–50 years, depending on the application	**Can exceed 50 years under the specified temperature, pressure, and operating conditions**
Behavior in Fire	Non-combustible, but strength decreases at elevated temperatures	Combustible and may release smoke and combustion gases	Non-combustible, but the protective coating and strength may be affected by heat	Combustible and melts when exposed to sufficient heat	**Combustible and melts under sufficient heat; fire performance depends on formulation and test classification**

* Indicative service-life ranges vary with material grade, water chemistry, installation quality, operating temperature and pressure.

PRODUCT RANGE & SYSTEM CONFIGURATION

COORDINATED PIPES, FITTINGS AND TRANSITION COMPONENTS

SMART PIPE PP-R PIPES

TECHNICAL PROPERTY	SPECIFICATION
Product Type	SMART PIPE PP-R Pipes
Size Range	20–200 mm
Pressure Classes	PN 10, PN 16 and PN 20
Applicable Standards	DIN 8077 / DIN 8078
Jointing Method	Poly fusion welding / Electrofusion welding
End Connection	Socket-fusion joint
Single-Layer Pipe Color	Green
Three-Layer Pipe Construction	Green outer layer, red glass-fiber-reinforced middle layer and green inner layer
UV Resistance	Applicable for all pipes

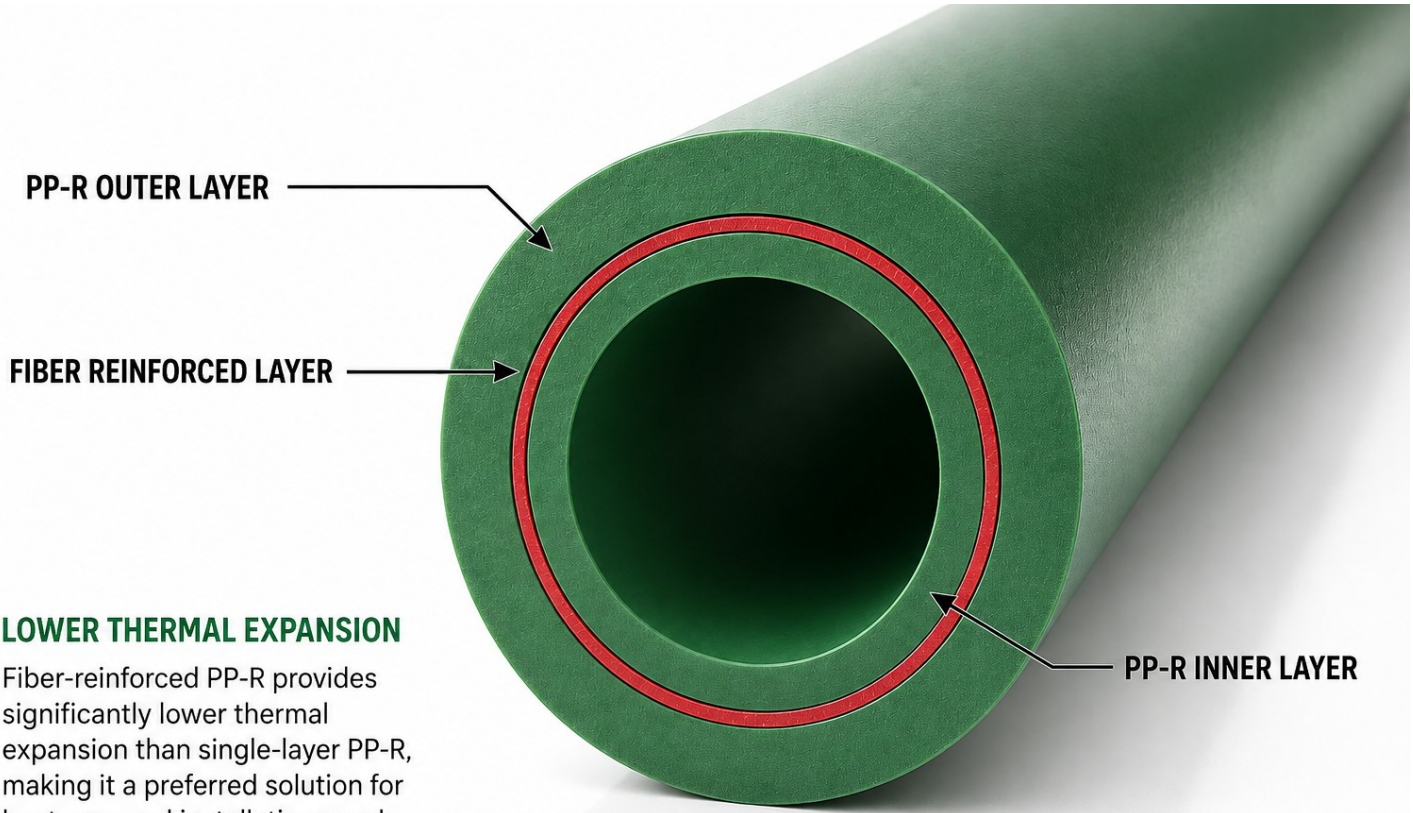
SDR CLASSIFICATION	NOMINAL PRESSURE
SDR 11	PN 10
SDR 7.4	PN 16
SDR 6	PN 20

SMART PIPE PP-R FITTINGS

TECHNICAL PROPERTY	SPECIFICATION
Product Type	SMART PIPE PP-R Fittings
Size Range	20–200 mm
Pressure Classes	PN 20 and PN 25
Applicable Standard	DIN 16962
Standard Color	Green
Standard End Connection	Socket ends suitable for poly fusion welding / Electrofusion welding
Transition Connections	Fittings with threaded metal inserts are available for connections to metal piping and components
UV Resistance	Applicable for all fittings

FIBER-REINFORCED PP-R

MULTILAYER PIPE TECHNOLOGY



LOWER THERMAL EXPANSION

Fiber-reinforced PP-R provides significantly lower thermal expansion than single-layer PP-R, making it a preferred solution for heat-exposed installations such as kitchens.

SMART PIPE INDUSTRIES COMPANY | PP-R PIPING SYSTEMS

STANDARDS & PIPE CONSTRUCTION

TECHNICAL REFERENCES AND AVAILABLE CONSTRUCTIONS

APPLICABLE TECHNICAL STANDARDS

STANDARD	SCOPE
DIN 1988 Series	Codes of practice for drinking-water installations in buildings.
DIN 8077	Polypropylene pipes—dimensions and dimensional requirements.
DIN 8078	Polypropylene pipes—general quality requirements and testing.
DIN 16962 Series	Polypropylene pressure pipe fittings and joint assemblies—dimensions, quality requirements and testing.
DVS 2207 Series	Welding procedures and requirements for thermoplastic pipes and fittings.
DVS 2203 Series	Testing and assessment of welded thermoplastic joints.
DVS 2208 Series	Machinery and equipment for heated-tool welding of thermoplastic pipes and fittings.
DIN 4726*	Plastic piping systems for water-based surface heating and radiator connections—general requirements and testing.

PIPE CONSTRUCTION OPTIONS

SINGLE-LAYER PP-R PIPES

Manufactured from polypropylene random copolymer (PP-R) in accordance with ISO 15874 and DIN 8077/8078. Homogeneous single-layer construction supports consistent fusion jointing and reliable long-term performance in hot- and cold-water applications.

GLASS-FIBRE MULTILAYER PP-R

A three-layer PP-R construction designed to improve dimensional stability and reduce thermal expansion while maintaining the reliable fusion-jointing characteristics of conventional PP-R systems.

PIPE LAYER	FUNCTION
Outer Layer	PP-R surface supports clean, consistent and dependable fusion welding.
Core Layer	Glass-fiber-reinforced PP-R increases rigidity and reduces thermal expansion.
Inner Layer	Smooth PP-R waterway promotes efficient flow and helps minimize internal deposits.

UV OPTIONS & MATERIAL CONTROL

LONG-TERM PERFORMANCE THROUGH CONTROLLED MATERIALS AND PROCESSING

UV-STABILIZED PP-R PIPE OPTIONS

UV-stabilized SMART PIPE PP-R pipes are available for exposed installations. Single-layer pipes are manufactured using a UV-stabilized black PP-R compound, while multilayer pipes incorporate a black, UV-stabilized PP-R outer layer. Both options maintain compatibility with standard PP-R fusion-welding procedures.

FITTINGS AND MATERIAL CONTROL

SMART PIPE PP-R fittings are manufactured in accordance with the applicable requirements of ISO 15874 and DIN 16962. Each fitting is designed to provide dimensional compatibility, consistent socket geometry, and dependable fusion performance across the SMART PIPE PP-R piping system.

Incoming raw materials are verified against established technical and quality criteria before being released for production. Throughout manufacturing, controlled processing conditions and routine inspections help maintain consistent dimensions, surface quality, mechanical performance, and jointing reliability. Finished fittings are subjected to the applicable visual, dimensional, and performance checks in accordance with the approved quality-control plan.

Fittings with threaded metal inserts are also available for transition connections to valves, equipment, and metallic piping components.

UV-STABILIZED FITTINGS OPTIONS

UV-stabilized fittings are available for exposed installations where additional protection from sunlight is required. These fittings incorporate a black, UV-stabilized PP-R compound while maintaining dimensional compatibility and standard fusion-welding performance with the corresponding SMART PIPE PP-R pipes.

Long-term exposure suitability depends on the installation environment, UV intensity, operating conditions, and the applicable product specification.

TECHNICAL SPECIFICATIONS

RAW-MATERIAL SPECIFICATIONS

SMART PIPE products are manufactured using high-quality raw materials sourced from internationally recognized and approved suppliers. Accredited laboratories evaluate their physical and mechanical properties.

Incoming-material inspections and routine in-house laboratory testing verify conformity with approved material specifications and applicable product standards.

TYPICAL RAW-MATERIAL PROPERTIES

CATEGORY	PROPERTY	TEST CONDITION	METHOD	UNIT	TYPICAL
General	Color	—	Visual	—	Natural
Physical	Density	—	ISO 1183	kg/m³	898
Rheological	Melt Flow Rate (MFR)	190°C / 5 kg	ISO 1133	g/10 min	0.50
Rheological	Melt Flow Rate (MFR)	230°C / 2.16 kg	ISO 1133	g/10 min	0.30
Mechanical	Tensile Stress at Yield	—	ISO 527	MPa	27
Mechanical	Tensile Stress at Break	—	ISO 527	MPa	32
Mechanical	Tensile Strain at Break	—	ISO 527	%	>50
Mechanical	Flexural Modulus	—	ASTM D790	MPa	900
Impact	Notched Charpy Impact Strength	23°C	ISO 179	kJ/m²	15
Impact	Notched Charpy Impact Strength	0°C	ISO 179	kJ/m²	—
Impact	Notched Charpy Impact Strength	−20°C	ISO 179	kJ/m²	—
Impact	Unnotched Charpy Impact Strength	23°C	ISO 179	kJ/m²	25
Impact	Unnotched Charpy Impact Strength	0°C	ISO 179	kJ/m²	—
Impact	Unnotched Charpy Impact Strength	−20°C	ISO 179	kJ/m²	—
Impact	Notched Izod Impact Strength	23°C	ISO 180/4A	kJ/m²	>60

CHEMICAL RESISTANCE & SUSTAINABILITY

APPLICATION GUIDANCE AND RESPONSIBLE MATERIAL USE

CHEMICAL RESISTANCE

SMART PIPE PP-R systems resist a wide range of chemicals and do not rust, pit, or suffer electrochemical corrosion. They are resistant to many acids, alkaline solutions, salts, and other approved chemical substances.

The smooth, non-porous internal surface helps minimize deposits and does not provide nutrients that promote microbiological growth under normal operating conditions.

APPLICATION CHECK

Compatibility must be assessed for chemical composition and concentration, operating temperature and pressure, exposure duration, and duty cycle. Special evaluation is required for strong oxidizers, stress-cracking substances, hydrocarbons, and certain solvents. Consult SMART PIPE before specifying chemical-service applications.

SUSTAINABILITY

SMART PIPE monitors manufacturing processes to reduce material waste and improve operational efficiency. PP-R is a recyclable thermoplastic; controlled production scrap may be recovered and reprocessed where product specifications and quality requirements permit.

Pressure-bearing and potable-water products remain subject to strict compliance controls. Lightweight construction can reduce handling and transportation requirements, while corrosion resistance, low maintenance, and long service life support efficient use of resources throughout operation.

RESOURCE EFFICIENCY

Recyclability • Lower handling weight • Corrosion resistance • Long service life

QUALITY ASSURANCE

CONTROL FROM RAW MATERIAL TO AFTER-SALES SUPPORT

A comprehensive quality-assurance programme maintains consistent product performance and conformity with applicable national and international standards.

01 **SUPPLIER APPROVAL**

Qualified sources and verified incoming raw materials.

02 **PROCESS CONTROL**

Modern production equipment operated under controlled conditions.

03 **DIMENSIONAL VERIFICATION**

Routine inspection of dimensions and surface quality.

04 **LABORATORY TESTING**

In-house performance testing before product release.

05 **TRACEABILITY & PACKAGING**

Controlled identification, packaging, storage and distribution.

06 **TECHNICAL SUPPORT**

After-sales assistance for dependable installation and operation.

QUALITY-MANAGEMENT PRACTICES ALIGNED WITH ISO 9001:2015

LONG-TERM TEMPERATURE & PRESSURE RESISTANCE

DESIGN STRESS, HOOP STRESS AND ALLOWABLE PRESSURE

Long-term performance curves relate operating temperature, internal pressure, hoop stress and expected service life. They are developed from long-duration hydrostatic testing and support pressure-bearing assessment over time.

HOOP STRESS

$$\sigma_h = p(d - s) / 2s$$

SYMBOL	DESCRIPTION	UNIT
σ_h	Hoop stress in the pipe wall	MPa
p	Internal pressure	MPa
d	Outside pipe diameter	mm
s	Pipe wall thickness	mm

DESIGN STRESS & ALLOWABLE PRESSURE

$$\sigma_D = \sigma^{LTHs} / C$$

$$p_{allow} = 2s\sigma_D / (d - s)$$

SYMBOL	DESCRIPTION
σ_D	Design stress
σ^{LTHs}	Long-term hydrostatic strength at the specified temperature and service period
C	Overall design coefficient
p_{allow}	Allowable operating pressure

Catalogue pressure tables apply design coefficient C = 1.5. Allowable pressure depends on temperature, dimensions, pressure class and required service life.

ADMISSIBLE OPERATING PRESSURE

10°C TO 40°C • LONG-TERM TEMPERATURE AND PRESSURE RESISTANCE

PIPE SERIES TO DIN 8077 / 8078 • DESIGN COEFFICIENT C = 1.5 • PRESSURE (kg/cm²)

TEMP.	SERVICE LIFE (years)	SDR 11 / PN 10	SDR 7.4 / PN 16	SDR 6 / PN 20
10°C	1	17.6	27.8	35
10°C	5	16.6	26.4	33.2
10°C	10	16.1	25.5	32.1
10°C	25	15.6	24.7	31.1
10°C	50	15.2	24	30.3
10°C	100	14.8	23.4	29.5
20°C	1	15	23.8	30
20°C	5	14.1	22.3	28.1
20°C	10	13.7	21.7	27.3
20°C	25	13.3	21.1	26.5
20°C	50	12.9	20.4	25.7
20°C	100	12.5	19.8	24.9
30°C	1	12.8	20.2	25.5
30°C	5	12	19	23.9
30°C	10	11.6	18.3	23.1
30°C	25	11.2	17.7	22.3
30°C	50	10.9	17.3	21.8
30°C	100	10.6	16.9	21.2
40°C	1	10.8	17.1	21.5
40°C	5	10.1	16	20.2
40°C	10	9.8	15.6	19.6
40°C	25	9.4	15	18.8
40°C	50	9.2	14.5	18.3
40°C	100	8.9	14.1	17.8

Values indicate admissible internal operating pressure. Final design must consider application class, operating profile, jointing quality and applicable standards.

ADMISSIBLE OPERATING PRESSURE

50°C TO 95°C • LONG-TERM TEMPERATURE AND PRESSURE RESISTANCE

PIPE SERIES TO DIN 8077 / 8078 • DESIGN COEFFICIENT C = 1.5 • PRESSURE (kg/cm²)

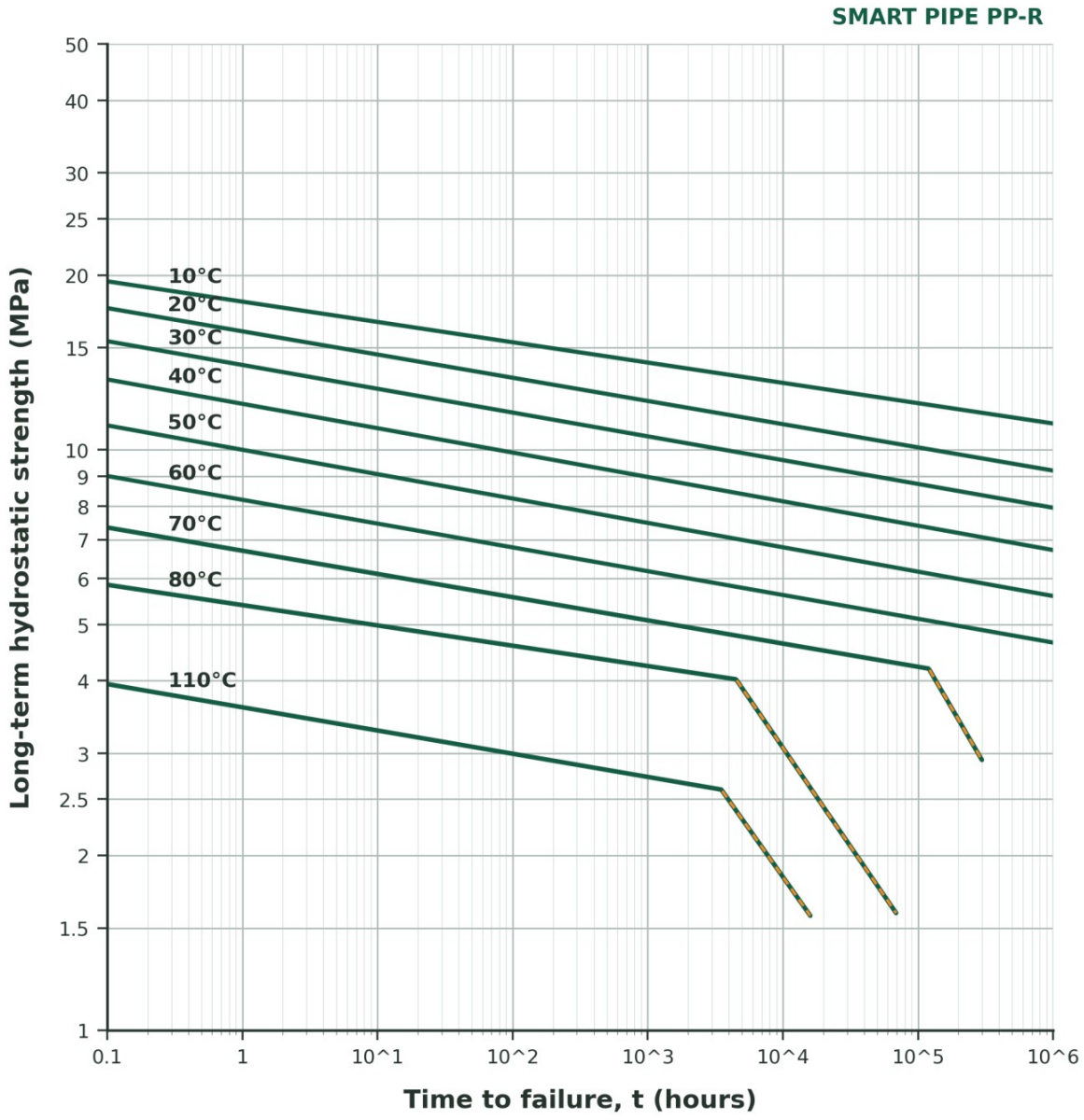
TEMP.	SERVICE LIFE (years)	SDR 11 / PN 10	SDR 7.4 / PN 16	SDR 6 / PN 20
50°C	1	9.2	14.5	18.3
50°C	5	8.5	13.5	17
50°C	10	8.2	13.1	16.5
50°C	25	8	12.6	15.9
50°C	50	7.7	12.2	15.4
50°C	100	7.4	11.8	14.9
60°C	1	7.7	12.2	15.4
60°C	5	7.2	11.4	14.3
60°C	10	6.9	11	13.8
60°C	25	6.7	10.5	13.3
60°C	50	6.4	10.1	12.7
70°C	1	6.5	10.3	13
70°C	5	6	9.5	11.9
70°C	10	5.9	9.3	11.7
70°C	25	5.1	8	10.1
70°C	50	4.3	6.7	8.5
80°C	1	5.5	8.6	10.9
80°C	5	4.8	7.6	9.6
80°C	10	4	6.3	8
80°C	25	3.2	5.1	6.4
95°C	1	3.9	6.1	7.7
95°C	5	2.5	4	5
95°C	10*	(2.1)*	(3.4)*	(4.2)*

Values indicate admissible internal operating pressure. Final design must consider application class, operating profile, jointing quality and applicable standards.

LONG-TERM PRESSURE PERFORMANCE

TEMPERATURE, HYDROSTATIC STRENGTH AND DESIGN LIFE

Allowable operating pressure is determined by pipe geometry, material strength, operating temperature, required service life and the applicable design coefficient. Hoop-stress calculations and hydrostatic regression data establish design pressure for each operating condition.



Long-term hydrostatic-strength regression curves at selected operating temperatures

THERMAL EXPANSION & COMPENSATION

CALCULATING MOVEMENT AND SELECTING THE METHOD

PP-R pipes expand and contract with temperature changes. When free to move, the length change is proportional to pipe length, temperature difference and the material's coefficient of linear expansion.

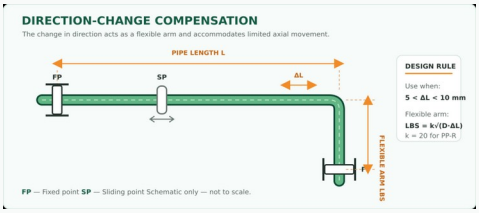
$$\Delta L = \alpha \times L \times \Delta T$$

SYMBOL	DESCRIPTION	UNIT
ΔL	Increase or decrease in pipe length	mm
α	PP-R single layer: 0.15 • Glass-fiber multilayer: 0.03	mm/m·°C
L	Initial pipe length	m
ΔT	Difference between installation and design temperatures	°C

SELECTING THE COMPENSATION METHOD

CALCULATED MOVEMENT	RECOMMENDED METHOD
ΔL ≤ 5 mm	Accommodation through the system's natural flexibility
5 < ΔL < 10 mm	Accommodation through changes in pipe direction
ΔL ≥ 10 mm	Provide a designed expansion loop

FLEXIBLE ARM FOR DIRECTION CHANGES



EXPANSION-LOOP DIMENSIONS

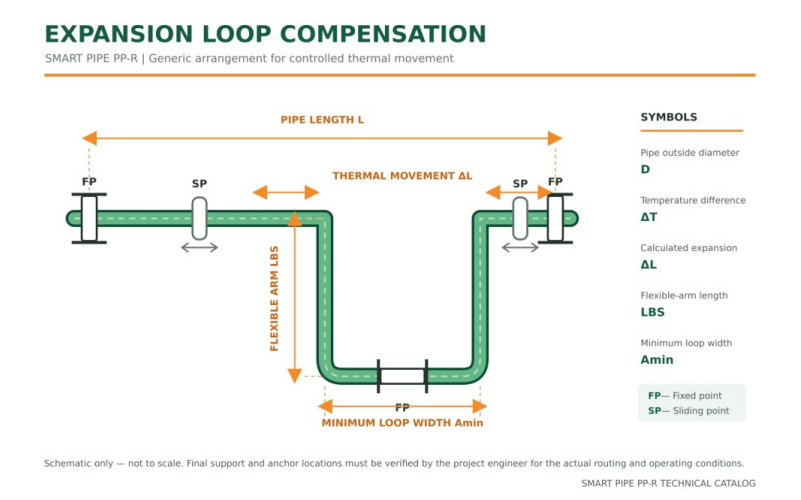
FLEXIBLE ARM AND MINIMUM LOOP WIDTH

For movement accommodated through a change in direction, the minimum flexible-arm length is calculated as:

$$L^{Bs} = k\sqrt{(D \times \Delta L)}$$

SYMBOL	DESCRIPTION	UNIT
L^{Bs}	Minimum flexible-arm length	mm
k	PP-R material constant: 20	—
D	Outside pipe diameter	mm
ΔL	Calculated thermal movement	mm

EXPANSION LOOP



When calculated movement is 10 mm or greater, an expansion loop should be provided. The minimum width must satisfy both conditions:

$$A_{min} = 2\Delta L + 150 \quad \bullet \quad A_{min} \geq 10D$$
$$A_{min} = \max(2\Delta L + 150,\ 10D)$$

WORKED EXAMPLE

THERMAL EXPANSION OF A 10 m, 32 mm PP-R PIPE

Installed at 20°C and operating at 60°C

GIVEN

L = 10 m • D = 32 mm • ΔT = 60 − 20 = 40°C

STEP 1 — MOVEMENT

$\Delta L = 0.15 \times 10 \times 40 = 60$ mm
Expansion exceeds 10 mm; an expansion loop is required.

STEP 2 — FLEXIBLE ARM

$L^{Bs} = 20\sqrt{(32 \times 60)} \approx 876$ mm

STEP 3 — LOOP WIDTH

2(60) + 150 = 270 mm • 10D = 320 mm
Use the greater value: A_{min} = 320 mm

DESIGN RESULT

Minimum flexible-arm length ≈ 876 mm • Minimum loop width = 320 mm

PRESSURE LOSS

DISTRIBUTED FRICTION AND LOCAL COMPONENT LOSSES

Total pressure loss combines distributed friction along straight pipe runs with local losses caused by fittings, valves, branches, direction changes and variations in flow area.

LOCAL PRESSURE LOSS

$$\Delta p_l = \zeta \times \rho \times V^2 / 2 \quad \bullet \quad h_l = \zeta \times V^2 / (2g)$$

SYMBOL	DESCRIPTION	UNIT
Δp_l	Local pressure loss	Pa
h_l	Local head loss	m
ζ	Local resistance coefficient	—
ρ	Fluid density	kg/m³
V	Mean fluid velocity	m/s
g	Gravitational acceleration: 9.81	m/s²

Several components: $\Delta p_{l,total} = \Sigma\zeta \times \rho \times V^2 / 2$

TOTAL SYSTEM PRESSURE LOSS

$$\Delta p_t = \Delta p_f + \Sigma \Delta p_l$$

Select pipe diameter for required flow, recommended velocity, available pressure and allowable total pressure loss.

LOCAL RESISTANCE COEFFICIENTS

REFERENCE VALUES FOR PRELIMINARY HYDRAULIC CALCULATIONS

Actual coefficients vary with fitting geometry, nominal diameter, Reynolds number, flow conditions and water temperature.

PP-R FITTING	COEFFICIENT, ζ
Coupler	0.25
Reducer	0.50
90° elbow	1.2
45° elbow	0.5
Equal tee	1.8
Male/female threaded tee	1.8
Reducing tee	3.0
Male/female threaded adaptor	0.5
Reducing male/female adaptor	0.8
Male/female threaded elbow adaptor	1.4
Valve — 20 mm	9.5
Valve — 25 mm	8.5
Valve — 32 mm	7.6
Union	8.3

STANDARD DIMENSION RATIO — SDR

RELATIONSHIP BETWEEN OUTSIDE DIAMETER AND WALL THICKNESS

The Standard Dimension Ratio classifies thermoplastic pipes according to the relationship between nominal outside diameter and nominal wall thickness.

$$SDR = d_a / s$$

SYMBOL	DESCRIPTION	UNIT
SDR	Standard Dimension Ratio	—
d_a	Nominal outside pipe diameter	mm
s	Nominal pipe wall thickness	mm
S	Pipe series number	—

RELATIONSHIP BETWEEN SDR AND PIPE SERIES

$$S = (SDR - 1) / 2$$
$$SDR = 2S + 1$$

INTERPRETATION

Lower SDR = thicker wall relative to diameter = generally greater internal-pressure resistance.
Higher SDR = thinner wall and generally lower pressure resistance.

RELATIONSHIP TO PRESSURE RESISTANCE

01 A thicker wall relative to outside diameter produces a lower SDR value.

02 A lower SDR generally provides greater resistance to internal pressure.

03 Pressure capability also depends on material strength, temperature, design life and design coefficient.

PIPE SERIES NUMBER — S

The pipe series number is a dimensionless classification used to relate nominal outside diameter and nominal wall thickness.

$$S = (SDR - 1) / 2 \quad \bullet \quad s = d_a / (2S + 1)$$

CALCULATION EXAMPLE — SDR 6

$$S = (6 - 1) / 2 = 2.5$$

An SDR 6 pipe corresponds to pipe series S 2.5.

NOMINAL PRESSURE & SOCKET FUSION

REFERENCE PRESSURES, HEATING, JOINTING AND COOLING TIMES

NOMINAL PRESSURE — PN

PN is a reference designation for pressure-bearing capability under defined conditions. It is not the allowable pressure under every operating condition; temperature, service life, SDR, material, design coefficient and operating cycle must be considered.

PRESSURE CLASS	REFERENCE PRESSURE
PN 10	10 bar
PN 16	16 bar
PN 20	20 bar

TEMPERATURE EFFECT

Reference pressure is generally based on water service at 20°C. As operating temperature increases, allowable operating pressure normally decreases.

SOCKET-FUSION PARAMETERS

PIPE DIAMETER (mm)	HEATING (sec.)	JOINTING (sec.)	COOLING (min.)
16	7	4	2
20	7	4	2
25	7	4	2
32	8	6	4
40	12	6	4
50	18	6	4
63	24	8	6
75	30	8	6
90	40	8	6
110	50	10	8

Apply the specified tool temperature, insertion depth, alignment and handling requirements of the approved installation procedure.

PP-R PIPES


SPC SMART PIPE
SPC SMART PIPE
SPC SMART PIPE
SPC SMART PIPE
SPC SMART PIPE

PIPE DIMENSIONS

SINGLE-LAYER PP-R PIPE DIMENSIONS



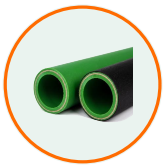
BORE (mm)	BORE (inch)	OD (mm)	SDR 7.4 ID (mm)	SDR 7.4 WALL (mm)	SDR 6 ID (mm)	SDR 6 WALL (mm)
20	1/2	20	14.4	2.8	13.2	3.4
25	3/4	25	18	3.5	16.6	4.2
32	1	32	23.2	4.4	21.2	5.4
40	1 1/4	40	29	5.5	26.6	6.7
50	1 1/2	50	36.2	6.9	33.4	8.3
63	2	63	45.8	8.6	42	10.5
75	2 1/2	75	54.4	10.3	50	12.5
90	3	90	65.4	12.3	60	15
110	4	110	79.8	15.1	73.4	18.3
125	5	125	90.8	17.1	83.4	20.8
160	6	160	116.2	21.9	106.8	26.6
200	8	200	145.2	27.4	133.6	33.2

Available with an optional UV-stabilized outer layer.

Material: PP-R Type 3 | Standard pipe lengths: 5.8 m and 4 m

PIPE DIMENSIONS

FIBRE-COMPOSITE PP-R PIPE DIMENSIONS



BORE (mm)	BORE (inch)	OD (mm)	SDR 7.4 ID (mm)	SDR 7.4 WALL (mm)	SDR 6 ID (mm)	SDR 6 WALL (mm)
20	1/2	20	14.4	2.8	13.2	3.4
25	3/4	25	18	3.5	16.6	4.2
32	1	32	23.2	4.4	21.2	5.4
40	1 1/4	40	29	5.5	26.6	6.7
50	1 1/2	50	36.2	6.9	33.4	8.3
63	2	63	45.8	8.6	42	10.5
75	2 1/2	75	54.4	10.3	50	12.5
90	3	90	65.4	12.3	60	15
110	4	110	79.8	15.1	73.4	18.3

Available with an optional UV-stabilized outer layer.

Material: PP-R Type 3 | Standard pipe lengths: 5.8 m and 4 m

PP-R THERMAL FITTINGS



PP-R THERMAL FITTINGS

REDUCING TEE PN25



SIZE (mm)	PACKING QUANTITY
25 x 20 x 25	75
32 x 20 x 32	50
32 x 25 x 32	40
40 x 20 x 40	30
40 x 25 x 40	30
40 x 32 x 40	30
50 x 20 x 50	12
50 x 25 x 50	12
50 x 32 x 50	12
50 x 40 x 50	15
63 x 20 x 63	8
63 x 25 x 63	8
63 x 32 x 63	8
63 x 40 x 63	8
63 x 50 x 63	8
75 x 20 x 75	6
75 x 25 x 75	6
75 x 32 x 75	6
75 x 40 x 75	6
75 x 50 x 75	6
75 x 63 x 75	6
90 x 20 x 90	6
90 x 25 x 90	6
90 x 32 x 90	6
90 x 40 x 90	6
90 x 50 x 90	3
90 x 63 x 90	3
90 x 75 x 90	3
110 x 20 x 110	3

Available with an optional UV-stabilized outer layer.

PP-R THERMAL FITTINGS

REDUCING TEE PN25 - CONTINUED



SIZE (mm)	PACKING QUANTITY
110 x 25 x 110	3
110 x 32 x 110	3
110 x 40 x 110	3
110 x 50 x 110	3
110 x 63 x 110	2
110 x 75 x 110	2
110 x 90 x 110	2
125 x 90 x 125	2
125 x 110 x 125	2
160 x 90 x 160	1
160 x 110 x 160	1
160 x 125 x 160	1

Available with an optional UV-stabilized outer layer.

COUPLING PN25



SIZE (mm)	PACKING QUANTITY
20	180
25	150
32	80
40	40
50	20
63	15
75	10
90	8
110	4
125	2
160	1

Available with an optional UV-stabilized outer layer.

PP-R THERMAL FITTINGS

REDUCER PN25



SIZE (mm)	PACKING QUANTITY
25 x 20	200
32 x 20	125
32 x 25	125
40 x 20	70
40 x 25	70
40 x 32	75
50 x 20	50
50 x 25	50
50 x 32	50
50 x 40	40
63 x 20	60
63 x 25	30
63 x 32	25
63 x 40	30
63 x 50	25
75 x 20	32
75 x 25	32
75 x 32	20
75 x 40	20
75 x 50	20
75 x 63	15
90 x 20	16
90 x 25	16
90 x 32	15
90 x 40	15
90 x 50	12
90 x 63	10
90 x 75	8
110 x 20	8
110 x 25	8

Available with an optional UV-stabilized outer layer.

PP-R THERMAL FITTINGS

REDUCER PN25 - CONTINUED



SIZE (mm)	PACKING QUANTITY
110 x 32	8
110 x 40	8
110 x 50	8
110 x 63	6
110 x 75	6
110 x 90	6
125 x 90	4
125 x 110	4
160 x 90	2
160 x 110	2
160 x 125	2

Available with an optional UV-stabilized outer layer.

EQUAL TEE PN25



SIZE (mm)	PACKING QUANTITY
20	120
25	60
32	40
40	20
50	10
63	5
75	5
90	3
110	2
125	1
160	1

Available with an optional UV-stabilized outer layer.

PP-R THERMAL FITTINGS

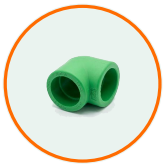
90° ELBOW PN25



SIZE (mm)	PACKING QUANTITY
20	160
25	100
32	60
40	30
50	15
63	8
75	6
90	3
110	2
125	1
160	1

Available with an optional UV-stabilized outer layer.

45° ELBOW PN25



SIZE (mm)	PACKING QUANTITY
20	160
25	140
32	60
40	35
50	15
63	8
75	6
90	3
110	2
125	1
160	1

Available with an optional UV-stabilized outer layer.

PP-R THERMAL FITTINGS

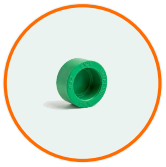
UNION PN25



SIZE (mm)	PACKING QUANTITY
20	100
25	80
32	50
40	30
50	8
63	5
75	4

Available with an optional UV-stabilized outer layer.

END CAP PN25



SIZE (mm)	PACKING QUANTITY
20	200
25	150
32	100
40	80
50	40
63	15
75	20
90	12
110	6
125	4
160	2

Available with an optional UV-stabilized outer layer.

PP-R THERMAL FITTINGS

TEST PLUG



SIZE (mm)	PACKING QUANTITY
1/2"	100
3/4"	60
1"	40

Available with an optional UV-stabilized outer layer.

CROSSOVER PN20



SIZE (mm)	PACKING QUANTITY
20	300
25	250
32	200
40	50

Available with an optional UV-stabilized outer layer.

BRIDGE BEND PN25



SIZE (mm)	PACKING QUANTITY
20	60
25	40
32	20

Available with an optional UV-stabilized outer layer.

SADDLE CONNECTION PN25



SIZE (mm)	PACKING QUANTITY
63 x 32	60
90 x 32	75

Available with an optional UV-stabilized outer layer.

PP-R BRASS INSERT FITTINGS



BRASS-INSERT FITTINGS

MALE ADAPTOR WITH BRASS THREAD PN25



SIZE (mm)	PACKING QUANTITY
20 x 1/2"	100
20 x 3/4"	80
25 x 1/2"	80
25 x 3/4"	70
32 x 1/2"	50
32 x 3/4"	50
32 x 1"	40
40 x 1"	20
40 x 1 1/4"	20
50 x 1 1/2"	15
63 x 2"	10
75 x 2 1/2"	6
90 x 3"	4
110 x 4"	2
125 x 5"	1
160 x 6"	1

Available with an optional UV-stabilized outer layer.

HEXAGONAL FEMALE ADAPTOR PN25



SIZE (mm)	PACKING QUANTITY
32 x 1"	30
40 x 1 1/4"	20
50 x 1 1/2"	12
63 x 2"	8
75 x 2 1/2"	6
90 x 3"	4
110 x 4"	2

Available with an optional UV-stabilized outer layer.

BRASS-INSERT FITTINGS

FEMALE ADAPTOR WITH BRASS THREAD PN25



SIZE (mm)	PACKING QUANTITY
20 x 1/2"	100
20 x 3/4"	100
25 x 1/2"	80
25 x 3/4"	80
32 x 1/2"	80
32 x 3/4"	80
32 x 1"	40
40 x 1"	15
40 x 1 1/4"	15
50 x 1 1/2"	15
63 x 2"	10
75 x 2 1/2"	6
90 x 3"	4
110 x 4"	2
125 x 5"	1
160 x 6"	1

Available with an optional UV-stabilized outer layer.

FEMALE THREADED TEE PN25



SIZE (mm)	PACKING QUANTITY
20 x 1/2"	60
20 x 3/4"	60
25 x 1/2"	60
25 x 3/4"	60
32 x 3/4"	40
32 x 1"	30
40 x 1 1/4"	15

Available with an optional UV-stabilized outer layer.

BRASS-INSERT FITTINGS

FEMALE THREADED TEE PN25 - CONTINUED



SIZE (mm)	PACKING QUANTITY
50 x 1 1/2"	10
63 x 2"	6

Available with an optional UV-stabilized outer layer.

HEXAGONAL MALE ADAPTOR PN25



SIZE (mm)	PACKING QUANTITY
25 x 3/4"	70
32 x 1"	40
40 x 1 1/4"	20
50 x 1 1/2"	12
63 x 2"	10
75 x 2 1/2"	6
90 x 3"	4
110 x 4"	2

Available with an optional UV-stabilized outer layer.

BRASS-INSERT FITTINGS

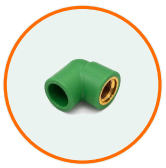
90° MALE THREADED ELBOW PN25



SIZE (mm)	PACKING QUANTITY
20 x 1/2"	80
20 x 3/4"	70
25 x 1/2"	70
25 x 3/4"	60
32 x 3/4"	30
32 x 1"	30

Available with an optional UV-stabilized outer layer.

90° FEMALE THREADED ELBOW PN25



SIZE (mm)	PACKING QUANTITY
20 x 1/2"	80
20 x 3/4"	80
25 x 1/2"	70
25 x 3/4"	70
32 x 3/4"	30
32 x 1"	30
40 x 1 1/4"	15
50 x 1 1/2"	10
63 x 2"	6

Available with an optional UV-stabilized outer layer.

90° FEMALE WALL ELBOW PN25



SIZE (mm)	PACKING QUANTITY
20 x 1/2"	60
25 x 1/2"	60
32 x 1"	20

Available with an optional UV-stabilized outer layer.

BRASS-INSERT FITTINGS

DOUBLE-SOCKET UNION PN25



SIZE (mm)	PACKING QUANTITY
20 - 20	40
25 - 25	30
32 - 32	15
40 - 40	10
50 - 50	6
63 - 63	4

Available with an optional UV-stabilized outer layer.

WALL-MOUNT GROUP PN25



SIZE (mm)	PACKING QUANTITY
25 x 1/2"	15

Available with an optional UV-stabilized outer layer.

MALE-THREADED UNION PN25



SIZE (mm)	PACKING QUANTITY
20 x 1/2"	50
25 x 3/4"	50
32 x 1"	30
40 x 1 1/4"	20
50 x 1 1/2"	15
63 x 2"	10
75 x 2 1/2"	4
90 x 3"	2
110 x 4"	1

Available with an optional UV-stabilized outer layer.

BRASS-INSERT FITTINGS

MALE-THREADED UNION PN25 - CONTINUED



SIZE (mm)	PACKING QUANTITY
125 x 5"	1
160 x 6"	1

Available with an optional UV-stabilized outer layer.

FEMALE-THREADED UNION PN25



SIZE (mm)	PACKING QUANTITY
20 x 1/2"	50
25 x 3/4"	50
32 x 1"	30
40 x 1 1/4"	20
50 x 1 1/2"	15
63 x 2"	10
75 x 2 1/2"	4
90 x 3"	2
110 x 4"	1
125 x 5"	1
160 x 6"	1

Available with an optional UV-stabilized outer layer.

PP-R VALVES



VALVES

PLASTIC BALL VALVE PN25



SIZE (mm)	PACKING QUANTITY
20	40
25	20
32	15
40	10
50	8
63	5
75	1
90	1
110	1
125	1
160	1

Available with an optional UV-stabilized outer layer.

DOUBLE-UNION BALL VALVE PN25



SIZE (mm)	PACKING QUANTITY
20	30
25	20
32	15
40	10
50	8
63	5
75	1
90	1
110	1

Available with an optional UV-stabilized outer layer.





VALVES

CONCEALED VALVE PN25



SIZE (mm)	PACKING QUANTITY
20	25
25	25
32	15

Available with an optional UV-stabilized outer layer.

APPENDEX

CHEMICAL RESISTANCE

PP-R resistance to chemical agents

SMART PIPE INDUSTRIES COMPANY

CHEMICAL RESISTANCE

PP-R resistance to chemical agents

PRODUCT	SOLUTION	CONC. %	20°C	60°C	100°C
Bromine		100	n		
Bromine	liquids	high	n	n	
Bromine	vapour	low	n	n	
Bromine water	vapour	s.s.	n	n	
Butane	liquids	100	v.r.		
Butane	gas	100	v.r.	v.r.	
Butter			v.r.	v.r.	
Butyol alcohol		100	v.r.	v.r.	
Calciumnitrate	w.s.	s.s	v.r.	v.r.	
Camphor			v.r.		
Carbon tetrachloride		100	a.b.r.	n	
Chlorine	liquids	100	n		
Chlorine (dry)	gas	100	n	n	n
Chlorine (wet)	gas	10	a.b.r.	n	n
Chlorine lime		aq .sosp.		v.r.	
Chlorine water		s.s	a.b.r.	n	
Chlorosulphanic		100	n	n	
Chloroform		1000	a.b.r.	n	
Chromic acid	w.s.	s.s	v.r.	n	
Chromium (3) salts					
Chromium (6) salts					
Citric acid	w.s.	s.s	v.r.	v.r.	v.r.
Cocoa			v.r.	v.r.	r
Cod liver oil			v.r.		
Copper salts					
Cresol		100	v.r.	a.b.r.	
Cresol oil			v.r.		
Cyclohexane		100	v.r.		
Cyclohexanol		100	v.r.	v.r.	
Cycloexanon		100	v.r.	n	
Decahydronahtalene		100	a.b.r.	n	
Dioxin		100	v.r.	a.b.r.	n
Distilled water		100	v.r.	v.r.	n
Engine oil			v.r.	a.b.r.	v.r.
Ethers		100	v.r.	a.b.r.	
Ethyl alcohol		w.s.	100	v.r.	
Ethyl alcohol		w.s.	96	v.r.	v.r.
Ethyl alcohol		w.s.	50	v.r.	v.r.
Ethyl alcohol (denatured)	s.s.		v.r.	v.r.	

PRODUCT	SOLUTION	CONC. %	20°C	60°C	100°C
Accumulator			v.r.	v.r.	
Acetic glacial acid		100	v.r.	a.b.r.	n
Acetic acid	w.s.	50	v.r.	v.r.	
Acetic acid	w.s.	10	v.r.	v.r.	
Acetic anhydride		100	v.r.		
Acetone		100	v.r.	a.b.r.	n
Acrylonitrile		100	r		
Aluminum salts					
Allum	w.s.	all	v.r.	v.r.	
Ammonia	w.s.	high	v.r.	v.r.	
Ammonia	w.s.	10	v.r.	v.r.	
Ammonia	gas	100	v.r.	v.r.	
Ammonium acetate	w.s.	all	v.r.	v.r.	v.r.
Ammonium carbonate	w.s.	all	v.r.	v.r.	v.r.
Ammonium chloride		all	v.r.	v.r.	v.r.
Ammonium metaphosphate		s.s	r	r	r
Ammonium nitrate	w.s.	all	v.r.	v.r.	v.r.
Ammonium phosphate	w.s.	all	v.r.	v.r.	v.r.
Ammonium sulphate		s.s	r	r	r
Ammonium bicarbonate		s.s	r	r	
Animal cooking oil			v.r.	a.b.r.	
Anti-freeze car			v.r.	v.r.	
Aqua regia			v.r.	n	
Barium chloride		all	v.r.	v.r.	v.r.
Barium salts					
Beer			v.r.		
Benzaldehyde			v.r.	v.r.	
Benzaldehyde	w.s.	s.s	v.r.	v.r.	v.r.
Benzene			a.b.r.	n	
Benzoic acid	w.s.	s.s	v.r.	v.r.	v.r.
Benzole chloride		100	n		
Bitter almonds fragrance			v.r.		
Bleach		12.50%	a.b.r.	a.b.r.	
Borax	w.s.				
Boric acid		100	v.r.	v.r.	
Boric acid	w.s.	s.s	v.r.	v.r.	
Brandy			v.r.		

RATING KEY

w.s. water solution | s.s. saturated solution

v.r. very resistant | r resistant | a.b.r. a bit resistant | n not resistant

CHEMICAL RESISTANCE

PP-R resistance to chemical agents

PRODUCT	SOLUTION	CONC. %	20°C	60°C	100°C
Potassium nitrate	w.s.	s.s.	v.r.	v.r.	
Potassium permanganate	w.s.	s.s.			
Potassium sulphate	w.s.	s.s.	v.r.	v.r.	v.r.
Propane	Gas	100	v.r.	v.r.	v.r.
Propane	Liquids	100	v.r.	v.r.	v.r.
Pyridine		100	v.r.	a.b.r.	
Quinine			v.r.		
Sea water			v.r.	v.r.	
Shampoo			v.r.	v.r.	
Silicone oil			v.r.	r	
Silver salts					
Soap solution		s.s.	v.r.	v.r.	
Soap solution		10	v.r.	v.r.	v.r.
Sodium bicarbonate	w.s.	s.s.	v.r.	v.r.	v.r.
Sodium carbonate	w.s.	s.s.	v.r.	v.r.	
Sodium carbonate	w.s.	10	v.r.	v.r.	v.r.
Sodium chlorate	w.s.	5	v.r.		
Sodium chlorite	w.s.	25	v.r.	v.r.	
Sodium chloride	w.s.	s.s.	v.r.	v.r.	v.r.
Sodium disulphite	w.s.	s.s.	v.r.	v.r.	v.r.
Sodium hydroxide		100	v.r.	v.r.	
Sodiumhydroxide		50	v.r.	v.r.	
Sodium hydroxide		25	v.r.	v.r.	
Sodium hydroxide		10	v.r.	v.r.	
Sodium nitrate	w.s.	s.s.	v.r.	v.r.	
Sodium nitrite	w.s.	s.s.	v.r.		
Sodium perborate	w.s.	s.s.	v.r.	v.r.	v.r.
Sodium phosphate	w.s.	s.s.	v.r.	v.r.	v.r.
Sodium sulphate	w.s.	s.s.	v.r.	v.r.	v.r.
Sodium sulphite	w.s.	s.s.	v.r.		
Soluble coffee			v.r.	v.r.	v.r.
Soy-bean oil			v.r.	a.b.r.	
Spirits			v.r.		
Stannus chloride	w.s	s.s.	v.r.	v.r.	
Starch		All	v.r.	v.r.	
Stearic acid		100	v.r.		
Succinic acid	w.s	s.s.	v.r.	v.r.	
Sulphochromic acid		100	n	n	
Sulphur		100	v.r.	v.r.	v.r.
Sulphur			v.r.	v.r.	v.r.
Sulphuric acid		96	v.r.	a.b.r.	

PRODUCT	SOLUTION	CONC. %	20°C	60°C	100°C
Ethyl chlorides		100	n		
Ethylene chlorides		100	a.b.r.	a.b.r.	
Ethylene tetrachloride		100	a.b.r.	n	
Ethylene tetrachloride			v.r.	a.b.r.	
Floor wax			v.r.	a.b.r.	
Formaldehyde		40	v.r.	v.r.	
Formaldehyde		30	v.r.	v.r.	
Formaldehyde		10	v.r.	v.r.	
Formic acid		98	v.r.	a.b.r.	v.r.
Formic acid		90	v.r.		
Formic acid		50	v.r.	v.r.	
Formic acid		10	v.r.	v.r.	
Fruit-juice			v.r.	v.r.	
Fumic sulfuric acid			n	n	n
Galvanic solutions			v.r.	v.r.	
Glycerol		100	v.r.	v.r.	
Glycerol		w.s. high	v.r.	v.r.	v.r.
Glycerol		w.s. low	v.r.	v.r.	
Glycol		100	v.r.	v.r.	
Glycol		w.s. high	v.r.	v.r.	
Glycol		w.s. low	v.r.	v.r.	v.r.
Heptan		100	v.r.	a.b.r.	
Hexan		100	v.r.	a.b.r.	
Honey			v.r.	v.r.	
Hydrobromic acid		high	v.r.	v.r.	
Hydrobrmic acid		10	v.r.	v.r.	
Hydrofluoric acid		40	v.r.	v.r.	
Hydrogen peroxide water		w.s. 30	v.r.	a.b.r.	
Hydrogen peroxide water		w.s. 10	v.r.	v.r.	
Hydrogen peroxide water		w.s. 3	v.r.	v.r.	v.r.
Ink			v.r.	v.r.	
Iron salts					
Iso propanol		100	v.r.	v.r.	
Isooctane		100	v.r.	a.b.r.	
Lactic acid		w.s. 90	v.r.	v.r.	v.r.
Lactic acid		w.s. 50	v.r.	v.r.	v.r.
Lactic acid		w.s. 10	v.r.	v.r.	v.r.
Lactual water		100	v.r.	v.r.	
Limestone					
Linseed oil					

RATING KEY

w.s. water solution | s.s. saturated solution

v.r. very resistant | r resistant | a.b.r. a bit resistant | n not resistant

CHEMICAL RESISTANCE

PP-R resistance to chemical agents

PRODUCT	SOLUTION	CONC. %	20°C	60°C	100°C
Magnesium salts					
Mercury		100	v.r.	v.r.	
Mercury salts					
Methyl alcohol		100	v.r.	v.r.	
Methyl alcohol	w.s.	50	v.r.	v.r.	
Methyl chloride		100	a.b.r.		
Methym ethyl ketone		100	v.r.	a.b.r.	
Methylene diformammyde		100	v.r.		
Milk			v.r.	v.r.	r
Mineral water			v.r.	v.r.	v.r.
Naphtha			v.r.	a.b.r.	
Naphthalene		100	v.r.		
Nikel salts					
Nitric acid		50	a.b.r.	n	
Nitric acid		25	v.r.	v.r.	
Nitric acid		10	v.r.	v.r.	
Nitro benzene		100	r	a.b.r.	
Normal gasoline			r	n	
Oil			n	n	
Oil of peanut			v.r.	v	a.b.r.
Oleic acid		100	v.r.		
Olive oil			v.r.	v.r.	
Oxalic acid	w.s.	s.s.	v.r.	v.r.	v.r.
Ozone		<0.5 ppm	r	a.b.r.	
Paraffine		100	v.r.	v.r.	n
Petroleum		100	v.r.	a.b.r.	
Phenylamine			v.r.	r	
Phenylmethylketone		100	r	a.b.r.	
Phosphoric acid	w.s.	s.s.	v.r.	a.b.r.	
Phosphoric acid	w.s.	50	v.r.	v.r.	
Phosphoric acid	w.s.	10	v.r.	v.r.	v.r.
Potassium carbonate	w.s.	s.s.	v.r.	v.r.	
Potassium chlorate	w.s.	s.s.	v.r.	v.r.	
Potassium chloride	w.s.	s.s.	v.r.	v.r.	v.r.
Potassium dichromate	w.s.	s.s.	v.r.	v.r.	v.r.
Potassium hydroxide		50	v.r.	v.r.	
Potassium hydroxide		25	v.r.	v.r.	
Potassium hydroxide		10	v.r.	v.r.	
Potassium hypochloride	w.s.	5	v.r.		
Potassium iodide	w.s.	s.s.	v.r.	v.r.	

PRODUCT	SOLUTION	CONC. %	20°C	60°C	100°C
Sulphuric acid		50	v.r.	v.r.	
Sulphuric acid		25	v.r.	v.r.	
Sulphuric acid		10	v.r.	v.r.	v.r.
Sulphurous anhydride		low	v.r.	v.r.	
Super gasoline			v.r.	n	
Syntetic detersive			v.r.	v.r.	v.r.
Tar			v.r.	a.b.r.	
Tartaric acid	w.s.	s.s.	v.r.	v.r.	
Tartaric acid		10	r	r	
Tetrahydrifurane		100	a.b.r.	n	
Tetrahydronaphtalene		100	a.b.r.	n	
Thea			v.r.	v.r.	r.
Thiopene		100	a.b.r.	n	
Toluen		100	a.b.r.	n	
Tomatoes-juice			v.r.	v.r.	
Tooth paste			v.r.	v.r.	
Trichlorcethylene		100	a.b.r.	a.b.r.	
Turpentine			n	n	n
Turpentone oil			a.b.r.	n	
Two stroke engine oil			a.b.r.	a.b.r.	
Typewriter oil			v.r.	r	
Urea	w.s.	s.s.	v.r.	v.r.	
Vaseline			v.r.	a.b.r.	
Vegetable cooking oil			v.r.	a.b.r.	
Vine			v.r.	v.r.	
Water		100	v.r.	v.r.	v.r.
Whipper cream			v.r.		
whisky		40	v.r.		
xylene or xylol		100	a.b.r.	n	
Zinc salts					

RATING KEY

w.s. water solution | s.s. saturated solution

v.r. very resistant | r resistant | a.b.r. a bit resistant | n not resistant

Data reference: UNI/ISO 7471.

Valid for PP-R not subjected to mechanical stress.

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