VIALLI GERMANY GmbH
MÜNCHEN

PP-Rc

PIPES
&
FITTINGS

VIALLI Gmbh München Germany

Pipes & Fittings

VIALLI, a renowned German brand specializing in plastic piping systems, is proudly manufactured by VIALLI GmbhMünchen Germany. With over 15 years of experience, we have consistently delivered top-quality products utilizing cutting-edge German technology that adheres to DIN Standards, utilizing only the highest quality materials.

Our commitment to excellence extends beyond borders as we export our products to Europe, various parts of Asia, and the Middle East. Our overarching vision is to broaden our reach and make this exceptional product accessible to as many regions as possible.

Our comprehensive range of products includes:

VIALLI PP-Rc Pipes & Fittings, meticulously crafted in accordance with German DIN 8077 and DIN 8078 Standards. Our lineup includes PP-RcStabi pipes with an aluminum layer and PP-Rc Fiberglass Composite Pipes.

VIALLI PP-RCT Pipes & Fittings, similar to our standard PP-Rc offerings, our PP-RCT Pipes and Fittings meet the stringent requirements of German DIN 8077 and DIN 8078 Standards. This range also encompasses PP-RcStabi pipes with an aluminum layer and PP-Rc Fiberglass Composite Pipes.

VIALLI PEXa pipe & fittings products are engineered to meet the rigorous German standards of DIN 16892 and DIN 16893, ensuring the required Cross-link Degree for optimal performance.

At VIALLI, we prioritize the highest hygienic and quality standards. For more details and to explore our complete product catalogue, make sure to visit our website. Your satisfaction is our priority, and we look forward to serving you with excellence.

All of our products have undergone rigorous testing to ensure they meet the stringent Hygienic and Quality Test Requirements recommended by WRAS.

SYSTEM CHARACTERISTICS AND BENEFITS

1. Plastic piping for interior hot and cold water distribution systems in buildings, floor & Central Heating Systems.
2. Meeting all health requirements
3. No corrosion and / or encrustation
4. Exceptionally long service life while preserving high utility value
5. Trouble- Free operations with less noise
6. Less friction losses than with traditional materials
7. Less weight compared to traditional materials
8. Quick, easy and clean installation works
9. Resistance in aggressive environments.

ENVIRONMENTAL ASPECTS

Fully recyclable product; neither toxic nor otherwise harmful substances are used in its manufacture and/ or application.

INTENDED USE

It is intended for interior hot and cold water distribution systems in buildings and floor & central heating systems:

PN 10-cold water distribution and floor heating systems
PN 16-Higher Pressure cold water distribution and DHW Systems at lower Pressures
PN 20- Hot water distribution systems, Central Heating
PN 25- Hot water distribution systems, Central Heating

TECHNICAL SPECIFICATIONS

Material – statistical polypropylene copolymer (random – copolymer) for injection molding and extrusion processes with excellent welding ability; nickel – plated brass fittings
Manufacturing process – pipes are produced by extrusion, while fittings by injection molding

Shapes - pipe lengths 4 Meter

Assembly / Fixing – the product range covers all needs for interior water distribution systems and heating system routes

Transitions for other pipe material – implemented by threaded connection (i.e. by combined couplings) or flange connections.

Coupling – standard method is poly fusion welding or by electro fitting

Surface finish – elements are in green color without any finish, Separate metal element brass, alternatively, nickel plated, black identification printing on the surface.

PHYSIC CHEMICAL PROPERTIES

Density – 0.9 Kg/m^3

Thermal expansion coefficient- for VIALLI PP-Rc pipes 0.15mm/Mk

Thermal conductivity - 0.22 W/Mk, fire rating –Class C3

Resistance against Chemicals – PP-Rc piping systems are intended mainly for water distribution (drinking, cold, hot, irrigation, etc.) – it is also possible to use the system for other media, in which in case their concrete use is governed by DIN 8078 Bb-1 possible to consult the manufacturer.

LABORATORY OPERATION & TEST DEVISSES

1. MFI (Melt Flow Index) Test Device:

This device is used in simulating the material's flow behavior before being processed in the extruder. This device gives us information regarding the flow rate of the material in the unit temperature and time, this helps us to have information on the possible behavior of the material in the extruder. The quality Standard for this test is ISO 1133.

2. Precise Balance:

Using this balance, the weight of the material which was passed from MFI device is determined according to standard ISO 1183 separately in the air and in the liquid whose density is known. After having these weight figures, the material's density is determined by using the specific density formula.

3. IZOD-Charpy test Device:

With this device, the amount of the energy absorption and the possible applicable force on the unit area are determined by using free falling method using materials having different weights. By doing this test, we obtain information regarding material's behavior at the different loads with sudden impacts. The standards applied for this test are TS 1004, TS 1005, ISO 179 and ISO 180.

4. Pulling – Pressing Test Device:

Using this device, we obtain information's about the maximum load strength, elasticity module (the maximum force strength per unit area) maximum tension. Elongation in percentage, deformation, elongation at break point, tension at break point etc. of the product. By means of these test we can make forecasts on the possible behavior of the material in the working conditions. In these test ISO R 527 standard is applied.

5. Hallow Die Punch (sampling Device):

This device is used for the preparation of the sample which will be tested in the pulling test device. The sample is prepared in accordance with Standard No. ISO 527

6. Shore (Hardness Device):

This device is used to determine the material's Hardness. When we apply load on the sample, if the material is too soft then it will be pressed like paper, while if it is too hard then deformation will occur. For this reason, the hardness value of the product must be within the range of the values mention in the Standard No. DIN 53505.

7. Microtome Device:

This is a device used to cut small pieces which can be monitored under microscope for the purpose of inspecting the infrastructure of the material.

8. Microscope Image System:

This is a system used for monitoring the fibrous structure of the material. The aim of this test is to ensure that the material has a homogeneous infrastructure. If the fibrous image is not consistent, it indicates that there may be an issue either in the production stage or with the quality of the raw material itself.

9. Furnace-Deep Freezer:

These devices are used for rapid cooling or heating through shock testing. At specific intervals of time, an impact test is applied to the material held in the furnace or deep freezer, and its behavior is monitored at different test temperatures.

10. Furnace:

3

This device is used for thermal strength testing. The purpose of this test is to monitor whether the length of the material exceeds more than 3% when subjected to a specific temperature for a certain period. This test is important because at considerably higher temperatures, the material expands and elongates, while at lower temperatures, it contracts. However, after exposure to higher or lower temperatures, the material does not fully return to its normal size at normal temperatures. This characteristic leads to a change from a round shape to an oval shape in a closed pipe system. The standard applied for this test is TS 5450.

11. Pressure Test:

For the pipes produced according to the standard TS 5439, to monitor the strength of the pipes when subjected to pressure, a pressure test is administered under 100h (at 20 °C), and 165 and 1000h (at 80 °C). the standards used for this test are ISO 4427 (for PE 100), ISO 4437 (for 80) and TSE 10827.

12. Momentum Strength Test:

In addition to the leak test,a strength test is applied with the aim of testing the harmonical work of the metal fittings with plastic. In order to be able to apply a 95 °C temperature to the pipe it must resist 10 Bar pressure for short time test.

CERTIFICATES

Certificate No. DW- 8317CT0418

www.dvgw-cert.com

Certificate No. 1704528
(Glass Fiber Composite)

www.wras.co.uk/directory

Certificate No. 1704528
(Aluminum Composite)

www.wras.co.uk/directory

TECHNICAL SPECIFICATION

1. Mechanical Properties:

Property	Measuring Technique	Unit	Value
Coefficient of viscosity J. Average molar Weight	ISO 1191 Solvent viscosity C= 0.001 g/cm^3	Cm^3/g	400
Melting index MFI 190/5 MFI 230/s	ISO / R1133 Procedure 5 Procedure 14	g/10 min g/10 min	0.5 1.5
Density	SO/ R1183	g/cm^3	0.895
Melting range	Polarizing microscope	°C	140-150
Double voltage Ultimate tensible strength Expansion to at tear	ISO / R527 Char Speed D Test bar Fig. 2	N/mm^2 N/mm^2 %	21 40 800
Ball – pressure Hardness	ISO 2039 (H 358/30)	N/mm^2	40
Bending stress at 3.5% Edge Fiber expansion	ISO 178 Test Specimen 5.1	N/mm^2	20
Modulus of elasticity	ISO 178	N/mm^2	800
Modulus of transverse elasticity -10° C 0° C 10° C 20° C 30° C 40° C 50° C 60° C	ISO / R537 Method A	N/mm^2 N/mm^2 N/mm^2 N/mm^2 N/mm^2 N/mm^2 N/mm^2 N/mm^2	1,100 770 500 370 300 240 180 140
Tensile properties further to impact bending test at 0°C	DIN 8078		No Fracture
Impact Strength (according to Charpy) RT 0°C -10°C	ISO /R179 Test bar in conformity with fig. 2	mJ/mm^2 mJ/mm^2 mJ/mm^2	No Fracture No Fracture

TECHNICAL SPECIFICATION

Allowable operating pressure for PP-Rc pipes conveying water, safety factor **(SF) = 1.5**

Temperature °C	Years of Service	Standard dimension ratio SDR		
		9	7.4	6
10	1	22.1	27.8	35.1
	5	20.8	26.2	33.0
	10	20.3	25.6	32.2
	25	19.6	24.7	31.1
	50	19.1	24.1	30.3
	100	18.5	23.5	29.6
20	1	18.8	23.7	29.9
	5	17.7	22.3	28.1
	10	17.2	21.7	27.4
	25	16.6	21.0	26.4
	50	16.2	20.4	25.7
	100	15.8	19.9	25.0
30	1	16.0	20.2	25.4
	5	15.0	18.9	23.8
	10	14.6	18.4	23.2
	25	14.1	17.7	22.3
	50	13.7	17.2	21.7
	100	13.3	16.8	21.1
40	1	13.6	17.1	21.6
	5	12.7	16.0	20.2
	10	12.3	15.5	19.6
	25	11.9	15.0	18.8
	50	11.5	14.5	18.3
	100	11.2	14.1	17.8
50	1	11.5	14.5	18.2
	5	10.7	13.5	17.0
	10	10.4	13.1	16.5
	25	10.0	12.6	15.9
	50	9.7	12.2	15.4
	100	9.4	11.8	14.9
60	1	9.7	12.2	15.4
	5	9.0	11.3	14.3
	10	8.7	11.0	13.9
	25	8.4	10.5	13.3
	50	8.1	10.2	12.9
70	1	8..1	10.3	12.9
	5	7.5	9.5	12.0
	10	7.3	9.2	11.6
	25	6.3	8.0	10.0
	50	5.3	6.7	8.5
80	1	6.8	8.6	10.8
	5	6.0	7.6	9.6
	10	5.1	6.4	8.1
	25	4.1	5.1	6.5
95	1	4.8	6.1	7.6
	5	3.2	4.1	5.2
	(10)[a]	(2.7)	(3.4)	(4.3)

Consistency Properties

Consistency Properties PN 20

From the requirements of the temperature/pressure ratio in accordance with DIN 1988 T2 and the long term durability properties in accordance with DIN 16962 and DVS 2207, the Green pipes with a pressure degree PN20 meets the specified safety correction value of Safety Factor = 1.5

in accordance with DIN 1988 T2, the following requirements are stipulated as regards service on drinking water pipe systems.

Table 2: shows the admissible operation pressure depending on the temperature with a maximum number of years of operation for the transfer of water.

	Operational Excess pressure bar	Temp °C	Hours p.a h
Cold water	0 to 10 Fluctuating	To 25	8760
Hot Water	0 to 10 Fluctuating	Up 60 Up to 85	8760 50

Table 1: operation requirements for pipes

Temp. (°C)	Max. OP. (years)	Adm. Pressure
10	50	29.3
20	50	25.9
30	50	22.1
40	50	18.4
50	50	14.7
60	50	10.9
70	50	8.0
80	50	6.5
95	50	5.2

Table2: Adminisible operational pressure

Consistency properties PN25

With regard to the demands of the temperature/pressure ratio in accordance with DIN 1988 T2 and long-term durability properties in accordance with DIN 16962 & DVS 2207. The VIALLI pipe with pressure degree PN25 meets the specified safety correction value of safety Factor=1.5

Table 4: demonstrates the admissible operation pressure depending on the temperature for the flow media, taking into account a maximum number of years of operation.

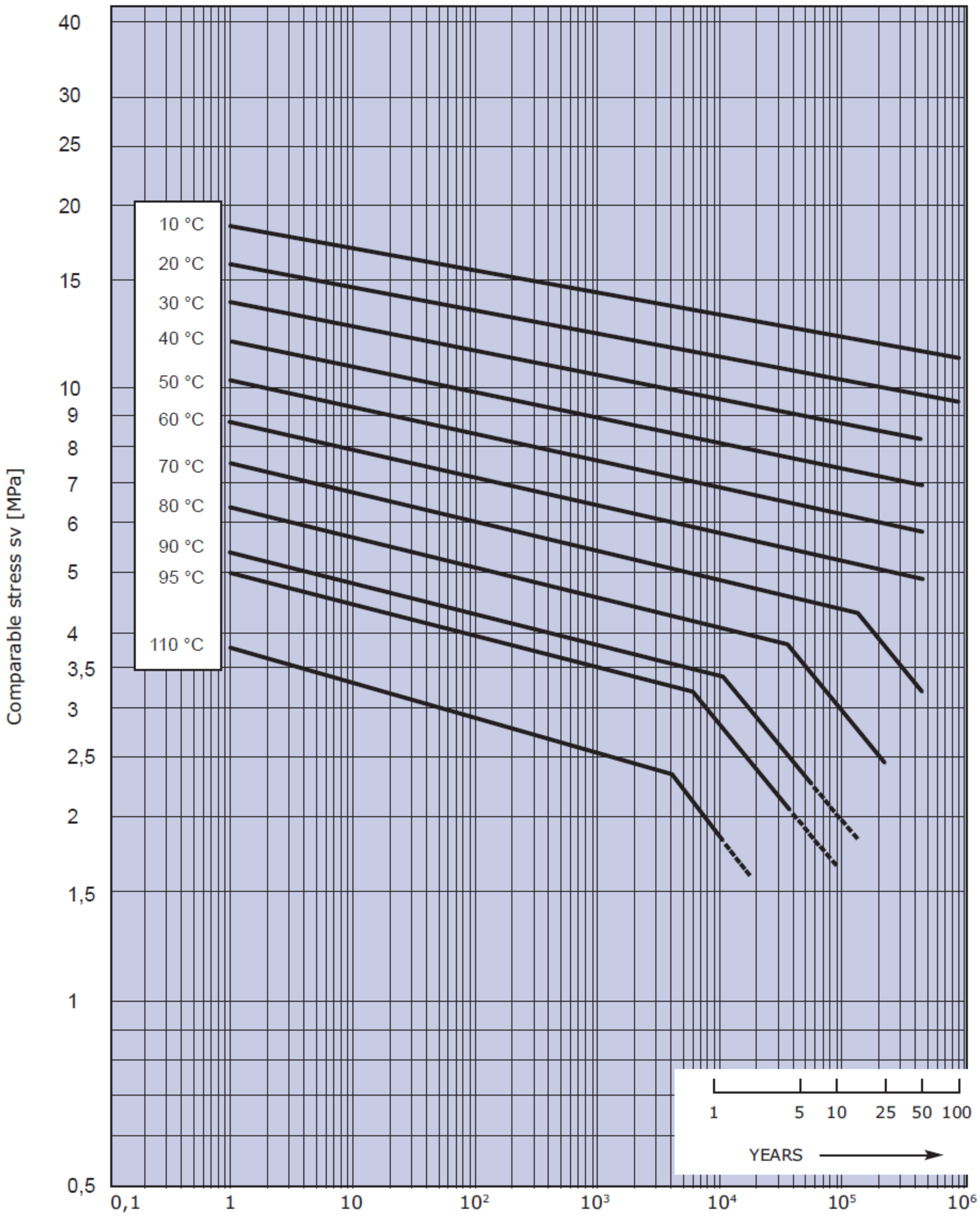
	Operational Excess pressure bar	Temp °C	Hours p.a h
Cold water	0 to 10 Fluctuating	To 25	8760
Hot Water	0 to 10 Fluctuating	Up 60 Up to 85	8030 730

Table 3: Operation requirements for pipes

Temp. (°C)	Max. OP. (years)	Adm. Pressure
10	50	36.7
20	50	32.3
30	50	27.7
40	50	23.0
50	50	18.3
60	50	13.7
70	50	10.0
80	50	8.1
95	50	6.5

Table4: Adminisible operational pressure

Behavior Under Long Term Stress



Service Life in Hours
Termination of an isotherm indicates maximum service life also at lower tension.

Linear expansion

The following items need to be taken into consideration when calculating modifications in length

- Ambient and materials temperature upon installation
- Temperature difference between lowest and highest pipe wall temperatures
- Expansion coefficient

Below the formula for the calculation of length alteration:

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

Expansion

ΔL = length alternation in mm
α = Expansion coefficient in K^{-1}
polypropylene pipes α= 0.15
prostab AL/PPR composite pipes α = 0.05
L = pipe length in mm
ΔT= Difference in temperature in K

Example

Pipe length	Temperature range	
	Pipe wall temperature	60°C
	Temp. at installation	15°C
	Difference in temp.	45K

ΔL_2 = 0.15.6.45= 40.5mm

The alteration of length may be compensated by means of extensions loops, bending legs, extension bows or appropriate adapters.

FP = Fixing Point
LS = length of bending Pipe
SP= Sliding Point
$\Delta L = \Delta L_1 + \Delta L_2$

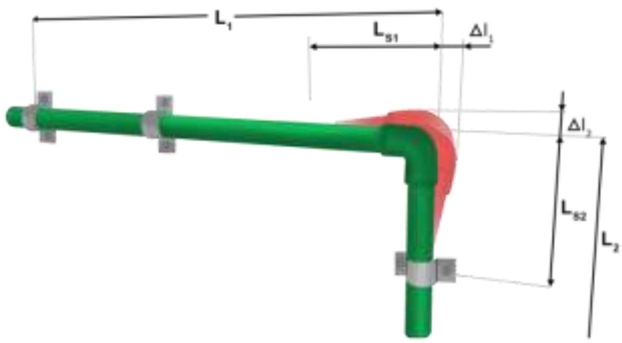
The minimum length of the bending leg results from:

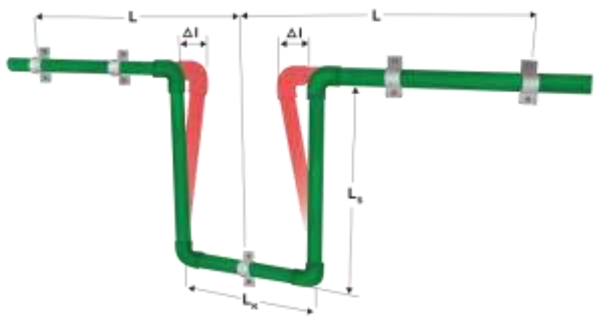
$L_s = K.\sqrt{d.\Delta L}$

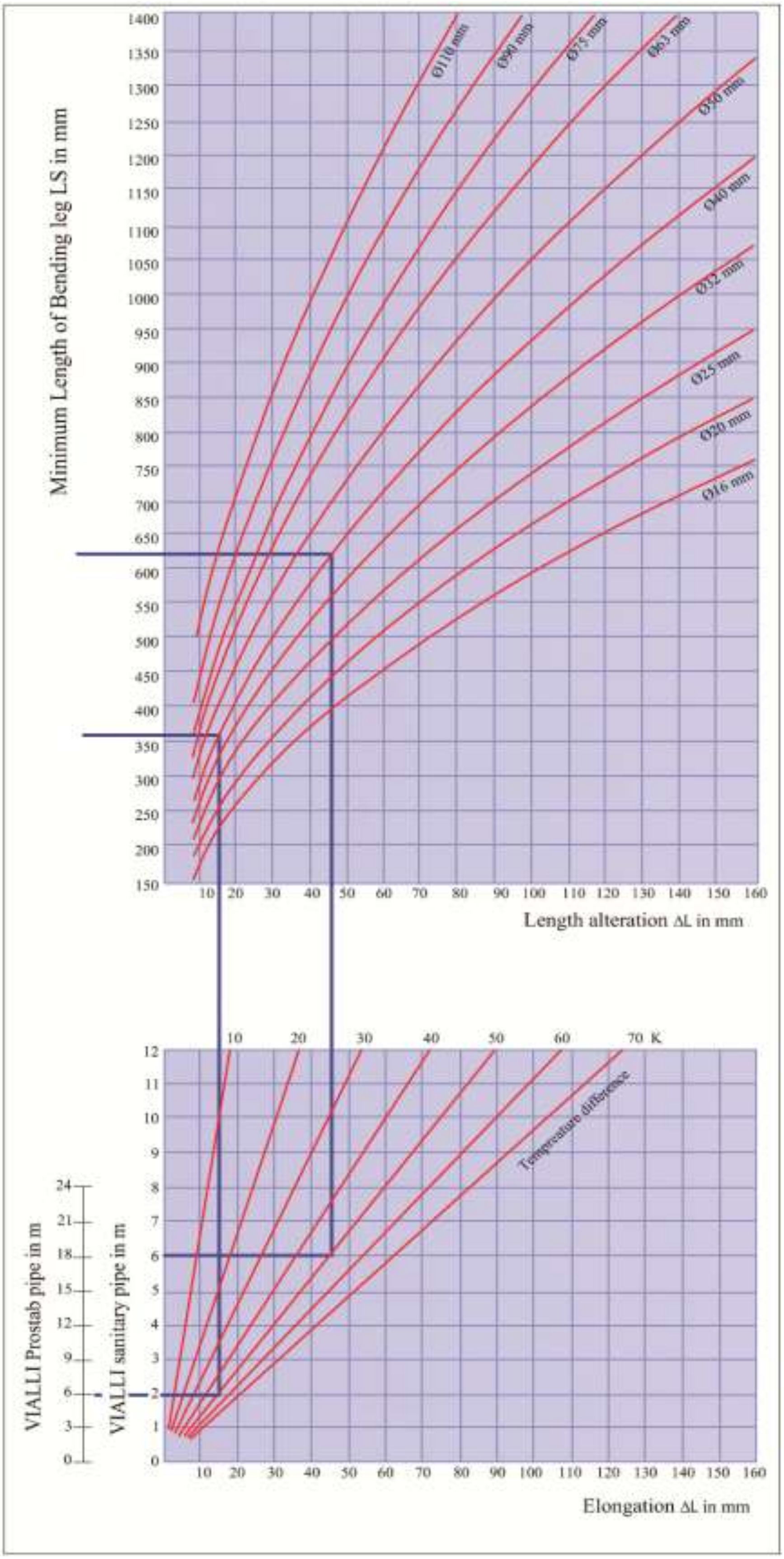
Expansion:

L_s = length of bending leg in mm
K= Constant depending on material
(K value for PP= 15)
d = pipe diameter in mm
Δ = Elongation in mm, calculated by equation $\Delta L = \alpha . L . \Delta T$

Example of graphic and mathematical determination of bending







Example 1

To be Established:

Minimum bending leg for a **VIALLI** pipe
Ø=40, pipe Length 6m,
ΔT= 50 K

1. Expansion
ΔL= 0.15x6x50=45mm

2. Minimum bending Leg Length:
$L_S = 15 \sqrt{40x45} = 636mm$

Example 2

To be Established:

Minimum bending leg for a **VIALLI** pipe

1. Expansion
ΔL= 0.05x5x50=15mm

2. Minimum bending Leg Length:
$L_S = 15 \sqrt{40x15} = 367mm$

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4. Bearing Distance / Fixed reference point Version

Bearing Distance

Arrangement of Fix points for Horizontal piping
Bearing Distance for **VIALLI** pipe to **PN20** – **PN25**

Temp. °C	External Diameter pipe mm									
	16	20	25	32	40	50	63	75	90	110
	Fixing intervals cm									
0	70	85	105	125	140	165	190	205	220	225
20	50	60	75	90	100	120	140	160	160	220
30	50	60	75	90	100	120	140	150	160	215
40	50	60	70	80	90	110	130	140	150	210
50	50	60	70	80	90	110	130	140	150	200
60	50	55	65	75	85	100	115	125	140	180
70	50	50	60	70	85	95	105	115	125	175

Bearing Distance VIALLI prostab pipe

Temp. °C	External Diameter pipe mm								
	16	20	25	32	40	50	63	75	90
	Fixing intervals cm								
0	130	155	170	195	220	245	270	285	300
20	100	120	130	150	170	190	210	220	230
30	100	120	130	150	170	190	210	220	230
40	100	110	120	130	160	180	200	210	230
50	100	110	120	140	160	180	200	210	220
60	80	100	110	130	150	170	190	200	210
70	70	90	100	120	140	160	180	190	200

Fixed Piont Version

A fix point is established by welding sleeves or other molded parts on either side of the pipe clip. Fixed points to be arrange in a line need to be so selected that alterations in direction in the pipe route are exploited.

Drop in pressure Owing to pipe Friction

Pressure drops owing to pipe friction and calculated flow speed depending on peak flow for all pipes of the VIALLI installation system

Following charts of pressure drops resulting from pipe friction were established in analogy to DIN 1988, Section 3

Starting Values:

- Reference Temperature 10°C
- Reference pressure 10 bar
- Absolute roughness of interior pipe wall K = 0.007 mm
  Calculation of pipe friction coefficient according to Colebrook White)

Note:

Pressure losses resulting from pipe friction change only insignificantly in the operating temperature range (up to 60°C) of Domestic Cold & Hot water supply system, therefore it is customary for the house installation to calculate with an overall supply pipes reference temperature of 10 °C (DIN 1988)

The Legal unit used (SI unit) for pressure is the Pa (Pascal) Value, However, DIN standards refers to bar unit or mbar, respectively. Should the loss in pressure required in practice be the Pascal Value, the Following ratio will apply: 1 mbar = 100 Pa.

Intermediate values not indicated in the tables may be interring polated. It should be noted, however, that no liner functions serve as basis

Losses in pressure of the Prostab pipes may be seen from the tables of nominal pressure degree PN20 &PN25 as the inner pipes have the same Dimensions.

Pressure drops owing to pipe friction (R) and calculated flow Speed (V) depending on peak flow (V_s)

Polypropylene pipes

Type3 in acc. With **DIN 8077**, nominal pressure Degree **PN16**

Peak Flow	DN 10 d_a = 16mm d_i = 11.6mm		DN 12 d_a = 20mm d_i = 14.4mm		DN 16 d_a = 25mm d_i = 18.0mm	
Vs L/s	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**
0.01	0.18	0.09	0.04	0.06	0.02	0.04
0.02	0.59	0.19	0.21	0.12	0.07	0.08
0.03	1.19	0.28	0.42	0.18	0.15	0.12
0.04	1.96	0.38	0.70	0.25	0.24	0.16
0.05	2.90	0.47	1.03	0.31	0.36	0.20
0.06	4.01	0.57	1.42	0.37	0.49	0.24
0.07	5.27	0.66	1.86	0.43	0.64	0.28
0.08	6.68	0.76	2.36	0.49	0.81	0.31
0.09	8.25	0.85	2.91	0.55	1.00	0.35
0.10	9.97	0.95	3.51	0.61	1.20	0.39
0.12	13.85	1.14	4.86	0.74	1.66	0.47
0.14	18.31	1.32	6.40	0.86	2.18	0.55
0.16	23.34	1.51	8.14	0.98	2.77	0.63
0.18	28.93	1.70	10.07	1.11	3.42	0.71
0.20	35.09	1.89	12.19	1.23	4.13	0.79
0.30	74.18	2.84	25.55	1.84	8.58	1.18
0.40	126.91	3.78	43.42	2.46	14.50	1.57
0.50	193.69	4.73	65.73	3.07	21.84	1.96
0.60	273.37	5.68	92.42	3.68	30.59	2.36
0.70	366.39	6.62	123.47	4.30	40.72	2.75
0.80	472.71	7.57	159.33	4.91	52.23	3.14
0.90	592.31	8.52	199.09	5.53	65.10	3.54
1.00	725.17	9.46	243.16	6.14	79.34	3.93
1.20	1030.66	11.35	344.20	7.37	112.23	4.72
1.40	1389.12	13.25	462.41	8.60	150.22	5.50
1.60	1800.52	15.14	597.75	9.82	193.59	6.29
1.80	2264.83	17.03	750.22	11.05	242.32	7.07
2.00	2782.05	18.92	919.80	12.28	296.41	7.86
2.20	3352.17	20.82	1106.49	13.51	355.85	8.65
2.40	3875.17	22.71	1310.27	14.74	420.64	9.43
2.60	4651.06	24.60	1531.15	15.96	490.77	10.22
2.80	5379.84	26.49	1769.13	17.9	566.24	11.00
3.00	6161.49	29.39	2024.19	18.42	647.05	11.79
3.20	6996.02	30.28	2296.33	19.65	733.20	12.58
3.40	7883.42	32.17	2585.57	20.88	824.68	13.36
3.60	8823.70	34.06	2891.88	22.10	921.50	14.15
3.80	9816.85	35.96	3215.28	23.33	1023.65	14.93
4.00			3555.76	24.56	1131.13	15.72
4.20			3913.33	25.79	1243.94	16.50
4.40			4287.97	27.02	1362.08	17.29
4.60			4679.70	28.25	1485.56	18.08
4.80			5088.50	29.47	1614.36	18.86
5.00			5514.38	30.70	1748.49	19.65
5.20			5957.35	31.93	1887.95	20.43
5.40			6417.39	33.16	2023.75	21.22
5.60			6894.51	34.39	2182.87	22.01
5.80			7388.70	35.61	2338.31	22.79
6.00			7899.98	36.84	2499.09	23.58
6.20			8428.34	38.07	2664.19	24.36
6.40			8973.77	39.30	2836.63	25.15
6.60			9536.28	40.53	3013.39	25.94
6.80					3195.48	26.72
7.00					3382.89	27.51
7.50					3874.74	29.47
8.00					4399.89	31.44
9.00					5550.06	35.37
10.00					6833.41	39.30

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Pressure drops owing to pipe friction (R) and calculated flow Speed (V) depending on peak flow (V_s)

Polypropylene pipes

Type3 in acc. With **DIN 8077**, nominal pressure Degree **PN16**

Peak Flow	DN 20 d_a = 32mm d_i = 23.0mm		DN 25 d_a = 40mm d_i = 28.8mm		DN 32 d_a = 50mm d_i = 36.2mm	
Vs L/s	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**
0.01	0.01	0.02	0.00	0.02	0.00	0.01
0.02	0.02	0.05	0.01	0.03	0.00	0.02
0.03	0.05	0.07	0.02	0.05	0.00	0.03
0.04	0.08	0.10	0.03	0.06	0.01	0.04
0.05	0.11	0.12	0.04	0.08	0.01	0.05
0.06	0.15	0.14	0.05	0.09	0.02	0.06
0.07	0.20	0.17	0.07	0.11	0.02	0.07
0.08	0.25	0.19	0.09	0.12	0.03	0.08
0.09	0.31	0.22	0.11	0.14	0.04	0.09
0.10	0.37	0.24	0.13	0.15	0.04	0.10
0.12	0.51	0.29	0.18	0.18	0.06	0.12
0.14	0.67	0.34	0.23	0.21	0.08	0.14
0.16	0.85	0.39	0.29	0.25	0.10	0.16
0.18	1.05	0.43	0.36	0.28	0.12	0.17
0.20	1.27	0.48	0.43	0.31	0.14	0.19
0.30	2.61	0.72	0.88	0.46	0.30	0.29
0.40	4.39	0.96	1.48	0.61	0.49	0.39
0.50	6.58	1.20	2.21	0.77	0.73	0.49
0.60	9.18	1.44	3.07	0.92	1.02	0.58
0.70	12.18	1.68	4.06	1.07	1.34	0.68
0.80	15.58	1.93	5.18	1.23	1.71	0.78
0.90	19.36	2.17	6.43	1.38	2.11	0.87
1.00	23.53	2.41	7.80	1.54	2.56	0.97
1.20	33.04	2.89	10.91	1.84	3.57	1.17
1.40	44.07	3.37	14.50	2.15	4.73	1.36
1.60	56.62	3.85	18.57	2.46	6.04	1.55
1.80	70.93	4.33	23.13	2.76	7.50	1.75
2.00	86.53	4.81	28.16	3.07	9.11	1.94
2.20	103.63	5.30	33.66	3.38	10.87	2.14
2.40	122.22	5.78	39.63	3.68	12.78	2.33
2.60	142.32	6.26	46.07	3.99	14.83	2.53
2.80	163.91	6.74	53.17	4.30	17.02	2.72
3.00	186.99	7.22	60.56	4.61	19.36	2.91
3.20	211.56	7.70	68.42	4.91	21.85	3.11
3.40	237.63	8.18	76.74	5.22	24.48	3.30
3.60	265.18	8.66	85.53	5.53	27.25	3.50
3.80	294.23	9.15	94.78	5.83	30.17	3.69
4.00	324.76	9.36	104.50	6.14	33.23	3.89
4.20	356.78	10.11	114.67	6.45	36.57	4.08
4.40	390.29	10.59	125.32	6.75	39.91	4.28
4.60	425.28	11.07	136.42	7.06	43.41	4.47
4.80	461.77	11.55	147.99	7.37	47.04	4.66
5.00	499.73	12.03	160.01	7.68	50.82	4.86
5.20	539.19	12.52	172.50	7.98	54.73	5.05
5.40	580.13	13.00	185.46	8.29	58.79	5.25
5.60	622.55	13.48	198.87	8.60	62.99	5.44
5.80	666.46	13.96	212.75	8.90	67.33	5.64
6.00	711.86	14.44	227.08	9.21	71.81	5.83
6.20	758.74	14.92	241.88	9.52	76.44	6.02
6.40	807.11	15.40	257.14	9.82	81.20	6.22
6.60	856.96	15.89	272.86	10.13	86.11	6.41
6.80	908.29	16.37	289.04	10.44	91.15	6.61
7.00	961.11	16.85	305.68	10.75	96.34	6.80
7.50	1099.66	18.05	349.30	11.51	109.92	7.29
8.00	1247.48	19.26	395.80	12.28	124.38	7.77
9.00	1570.95	21.66	497.44	13.82	155.94	8.74
10.00	1931.52	24.07	610.57	15.35	191.01	9.72

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Pressure drops owing to pipe friction (R) and calculated flow Speed (V) depending on peak flow (V_s)

Polypropylene pipes

Type3 in acc. With **DIN 8077**, nominal pressure Degree **PN16**

Peak Flow	DN 40 d_a = 63mm d_i = 45.6mm		DN 50 d_a = 75mm d_i = 54.2mm		DN 60 d_a = 90mm d_i = 65.0mm		DN 90 d_a = 110mm d_i = 79.6mm	
Vs L/s	R mbar/m	V m/s	R mbar/m	V m/s	R mbar/m	V m/s	R mbar/m	V m/s
0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
0.02	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00
0.03	0.00	0.02	0.00	0.01	0.00	0.01	0.00	0.00
0.04	0.00	0.02	0.00	0.02	0.00	0.01	0.00	0.00
0.05	0.00	0.03	0.00	0.05	0.00	0.02	0.00	0.00
0.06	0.01	0.04	0.00	0.03	0.00	0.02	0.00	0.00
0.07	0.01	0.04	0.00	0.03	0.00	0.02	0.00	0.00
0.08	0.01	0.05	0.00	0.03	0.00	0.02	0.00	0.00
0.09	0.01	0.06	0.01	0.04	0.00	0.03	0.00	0.00
0.10	0.01	0.06	0.01	0.04	0.00	0.03	0.00	0.00
0.12	0.02	0.07	0.01	0.05	0.00	0.04	0.00	0.00
0.14	0.03	0.09	0.01	0.06	0.00	0.04	0.00	0.00
0.16	0.03	0.10	0.01	0.07	0.01	0.05	0.00	0.00
0.18	0.04	0.11	0.02	0.08	0.01	0.05	0.00	0.00
0.20	0.05	0.12	0.02	0.09	0.01	0.06	0.00	0.00
0.30	0.10	0.18	0.04	0.13	0.02	0.09	0.01	0.06
0.40	0.16	0.24	0.07	0.17	0.03	0.12	0.01	0.08
0.50	0.24	0.31	0.11	0.22	0.04	0.15	0.02	0.10
0.60	0.33	0.37	0.15	0.26	0.06	0.18	0.02	0.12
0.70	0.44	0.43	0.19	0.30	0.08	0.21	0.03	0.14
0.80	0.56	0.49	0.24	0.35	0.10	0.24	0.04	0.16
0.90	0.69	0.55	0.30	0.39	0.13	0.27	0.05	0.18
1.00	0.84	0.61	0.36	0.43	0.15	0.30	0.06	0.20
1.20	1.16	0.73	0.50	0.52	0.21	0.36	0.08	0.24
1.40	1.54	0.86	0.67	0.61	0.28	0.42	0.10	0.28
1.60	1.96	0.98	0.85	0.69	0.35	0.48	0.13	0.32
1.80	2.43	1.10	1.05	0.78	0.44	0.54	0.16	0.36
2.00	2.94	1.22	1.27	0.87	0.53	0.60	0.20	0.40
2.20	3.51	1.35	1.51	0.95	0.63	0.66	0.24	0.44
2.40	4.11	1.47	1.77	1.04	0.73	0.72	0.28	0.48
2.60	4.77	1.59	2.05	1.13	0.85	0.78	0.32	0.52
2.80	5.47	1.71	2.35	1.21	0.97	0.84	0.36	0.56
3.00	6.21	1.84	2.67	1.30	1.10	0.90	0.41	0.60
3.20	7.00	1.96	3.00	1.39	1.24	0.96	0.46	0.64
3.40	7.83	2.08	3.35	1.47	1.38	1.02	0.52	0.68
3.60	8.70	2.20	3.73	1.56	1.54	1.08	0.57	0.72
3.80	9.62	2.33	4.12	1.65	1.69	1.15	0.63	0.76
4.00	10.59	2.45	4.53	1.73	1.86	1.21	0.69	0.80
4.20	11.60	2.57	4.96	1.82	2.04	1.27	0.76	0.84
4.40	12.56	2.69	5.40	1.91	2.22	1.33	0.83	0.88
4.60	13.74	2.82	5.86	1.99	2.41	1.39	0.90	0.92
4.80	14.88	2.94	6.35	2.08	2.60	1.45	0.97	0.96
5.00	16.06	3.06	6.85	2.17	2.81	1.51	1.4	1.00
5.20	17.29	3.18	7.36	2.25	3.02	1.57	1.12	1.04
5.40	18.56	3.31	7.90	2.34	3.24	1.63	1.20	1.90
5.60	19.87	3.43	8.45	2.43	3.46	1.69	1.29	1.13
5.80	21.23	3.55	9.03	2.51	3.69	1.75	1.37	1.17
6.00	22.62	3.67	9.61	2.60	3.93	1.81	1.46	1.21
6.20	24.16	3.80	10.22	2.69	4.18	1.87	1.55	1.25
6.40	25.65	3.92	10.85	2.77	4.43	1.93	1.64	1.29
6.60	27.18	4.04	11.49	2.86	4.69	1.99	1.74	1.33
6.80	28.75	4.16	12.15	2.95	4.96	2.05	1.84	1.37
7.00	30.37	4.29	12.83	3.03	5.23	2.11	1.94	1.41
7.50	34.60	4.59	14.60	3.25	5.95	2.26	2.20	1.51
8.00	39.09	4.90	16.48	3.47	6.71	2.41	2.48	1.61
9.00	48.88	5.51	20.66	3.90	8.36	2.71	3.08	1.81
10.00	59.73	6.12	25.30	4.33	10.91	3.01	3.75	2.01

Pressure drops owing to pipe friction (R) and calculated flow Speed (V) depending on peak flow (V_s)

Polypropylene pipes

Type3 in acc. With **DIN 8077**, nominal pressure Degree **PN20**

Peak Flow	DN 10 d_a = 16mm d_i = 10.6mm v = 0.088 l/m		DN 12 d_a = 20mm d_i = 13.2mm v = 0.137 l/m		DN 16 d_a = 25mm d_i = 16.6mm v = 0.216 l/m	
Vs L/s	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**
0.01	0.39	0.11	0.14	0.07	0.05	0.05
0.02	1.23	0.23	0.44	0.15	0.15	0.09
0.03	2.44	0.34	0.87	0.22	0.30	0.14
0.04	3.98	0.45	1.41	0.29	0.48	0.18
0.05	5.84	0.57	2.07	0.37	0.70	0.23
0.06	8.00	0.68	2.83	0.44	0.96	0.28
0.07	10.47	0.79	3.69	0.51	1.25	0.32
0.08	13.22	0.91	4.65	0.58	1.57	0.37
0.09	16.24	1.02	5.70	0.66	1.92	0.42
0.10	19.50	1.13	6.86	0.73	2.30	0.46
0.15	39.92	1.70	13.92	1.10	4.66	0.69
0.20	66.61	2.27	23.13	1.46	7.72	0.92
0.25	99.54	2.83	34.38	1.83	11.45	1.16
0.30	138.44	3.40	47.68	2.19	15.80	1.39
0.35	183.23	3.97	62.92	2.56	20.79	1.62
0.40	223.51	4.53	79.92	2.92	26.33	1.85
0.45	289.41	5.10	33.10	3.29	32.55	2.08
0.50	351.24	5.67	119.82	3.65	39.38	2.31
0.55			142.53	4.02	46.68	2.54
0.60			167.44	4.38	54.62	2.77
0.65			193.092	4.75	72.14	3.00
0.70			21.96	5.12	82.09	3.23
0.75			251.39	5.48	92.17	3.47
0.80					103.12	3.70
0.85					114.05	3.93
0.90					125.91	4.16
0.95					138.87	4.39
1.00					151.69	4.62
1.05					164.92	4.85
1.10					179.41	5.08
1.15					193.50	5.31
1.20						5.54

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Pressure drops owing to pipe friction (R) and calculated flow Speed (V) depending on peak flow (V_s)

Polypropylene pipes

Type3 in acc. With **DIN 8077**, nominal pressure Degree **PN20**

Peak Flow	DN 20 d_a = 32mm d_i = 21.2mm v = 0.352 l/m		DN 25 d_a = 40mm d_i = 26.6 mm v = 0.556 l/m		DN 32 d_a = 50mm d_i = 33.2mm v = 0.866 l/m	
Vs L/s	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**
0.05	0.22	0.14	0.08	0.09	0.03	0.06
0.10	0.72	0.28	0.25	0.18	0.09	0.12
0.15	1.46	0.42	0.50	0.27	0.17	0.17
0.20	2.40	0.57	0.82	0.36	0.29	0.23
0.25	3.55	0.71	1.21	0.45	0.42	0.29
0.30	4.89	0.85	1.65	0.54	0.58	0.35
0.35	6.42	0.99	2.17	0.63	0.76	0.40
0.40	8.15	1.13	2.75	0.72	0.95	0.46
0.45	10.04	1.27	3.38	0.81	1.17	0.52
0.50	12.11	1.42	4.06	0.90	1.41	0.58
0.60	16.76	1.70	5.63	1.08	1.95	0.69
0.70	22.07	1.98	7.40	1.26	2.55	0.81
0.80	28.10	2.27	9.39	1.44	3.24	0.92
0.90	34.64	2.55	11.58	1.62	3.99	1.04
1.00	42.01	2.83	14.00	1.80	4.82	1.16
1.10	49.92	3.12	16.64	1.98	5.71	1.27
1.20	58.59	3.40	19.45	2.16	6.65	1.39
1.30	67.80	3.68	22.42	2.34	7.71	1.50
1.40	77.52	3.97	25.64	2.52	8.78	1.63
1.50	88.14	4.25	29.16	2.70	9.95	1.73
1.60	98.83	4.53	32.72	2.88	11.16	1.85
1.70	110.48	4.82	36.58	3.06	12.48	1.96
1.80	122.63	5.10	40.62	3.24	13.80	2.08
1.90	135.95	5.38	44.82	3.42	15.23	2.19
2.00			49.17	3.64	16.72	2.31
2.10			53.67	3.78	18.25	2.43
2.20			58.61	3.96	19.84	2.54
2.30			63.42	4.14	21.58	2.66
2.40			68.70	4.32	23.26	2.77
2.50			73.70	4.50	25.11	2.89
2.60			79.40	4.68	26.89	3.00
2.70			85.18	4.86	28.85	3.12
2.80			91.13	5.04	30.87	3.23
2.90			97.24	5.22	32.78	3.35
3.00			103.51	5.40	34.90	3.47
3.10					37.07	3.58
3.20					39.30	3.70
3.30					41.57	3.81
3.40					43.90	3.93
3.50					46.27	4.04
3.60					48.95	4.16
3.70					51.43	4.27
3.80					53.96	4.39
3.90					56.53	4.51
4.00					59.15	4.62
4.10					62.14	4.74
4.20					64.86	4.85
4.30					67.61	4.97
4.40					70.79	5.08
4.50					73.64	5.20

Pressure drops owing to pipe friction (R) and calculated flow Speed (V) depending on peak flow (V_s)

Polypropylene pipes

Type3 in acc. With **DIN 8077**, nominal pressure Degree **PN20**

Peak Flow	DN 40 d_a = 63mm d_i = 42.0mm v = 1.385 l/m		DN 50 d_a = 75mm d_i = 50.0mm v = 1.963 l/m		DN 60 d_a = 90mm d_i = 60.0mm v = 2.827 l/m		DN 90 d_a = 110mm d_i = 73.2mm v = 4.200 l/m	
Vs L/s	R mbar/m	V m/s	R mbar/m	V m/s	R mbar/m	V m/s	R mbar/m	V m/s
0.25	0.03	0.07	0.01	0.05	0.01	0.04	0.01	0.06
0.50	0.09	0.14	0.04	0.10	0.02	0.07	0.03	0.12
0.75	0.19	0.22	0.08	0.15	0.04	0.11	0.07	0.18
1.00	0.31	0.29	0.14	0.20	0.06	0.14	0.11	0.24
1.25	0.46	0.36	0.20	0.25	0.08	0.18	0.16	0.30
1.50	0.94	0.54	0.41	0.38	0.17	0.27	0.22	0.36
1.75	1.56	0.72	0.68	0.51	0.28	0.35	0.29	0.42
2.00	2.32	0.90	1.00	0.64	0.42	0.44	0.37	0.48
2.25	3.21	1.08	1.39	0.76	0.58	0.53	0.46	0.53
2.50	4.22	1.26	1.83	0.89	0.76	0.62	0.55	0.59
2.75	5.36	1.44	2.31	1.02	0.97	0.71	0.66	0.65
3.00	6.62	1.62	2.86	1.15	1.19	0.80	0.77	0.71
3.25	8.02	1.80	3.45	1.27	1.44	0.88	0.88	0.77
3.50	9.52	1.98	4.10	1.40	1.70	0.97	1.01	0.83
3.75	11.16	2.17	4.81	1.53	1.99	1.06	1.14	0.89
4.00	12.90	2.35	5.53	1.66	2.30	1.15	1.28	0.95
4.25	14.74	2.53	6.32	1.78	2.63	1.24	1.43	1.01
4.50	16.74	2.71	7.18	1.91	2.98	1.33	1.59	1.07
4.75	18.85	2.89	8.05	2.04	3.34	1.41	1.75	1.13
5.00	21.06	3.07	8.99	2.16	3.73	1.50	1.92	1.19
5.25	23.36	3.25	9.98	2.29	4.14	1.59	2.09	1.25
5.50	25.74	3.43	11.00	2.42	4.56	1.68	2.27	1.31
5.75	28.21	3.61	12.12	2.55	5.00	1.77	2.46	1.37
6.00	30.94	3.79	13.22	2.67	5.46	1.86	2.67	1.43
6.25	33.76	3.97	14.43	2.80	5.96	1.95	2.86	1.49
6.50	36.49	4.15	15.60	2.93	6.44	2.03	3.08	1.54
6.75	39.51	4.33	16.90	3.06	6.98	2.12	3.29	1.60
7.00	42.63	4.51	18.23	3.18	7.49	2.21	3.51	1.66
7.25	45.85	4.69	19.50	3.31	8.06	2.30	3.75	1.72
7.50	49.16	4.87	20.91	3.44	8.64	2.39	3.99	1.78
7.75	52.57	5.05	22.36	3.57	9.19	2.48	4.24	1.84
8.00	56.06	5.25	23.85	3.69	9.81	2.56	4.47	1.90
8.25			25.83	3.82	10.43	2.65	4.72	1.96
8.50			26.95	3.95	11.08	2.74	4.99	2.02
8.75			28.55	4.07	11.74	2.83	5.26	2.08
9.00			32.04	4.33	13.10	3.01	5.56	2.14
9.25			35.50	4.58	14.60	3.18	5.84	2.20
9.50			39.32	4.84	16.08	3.36	6.13	2.26
9.75			43.31	5.09	17.72	3.54	6.41	2.32
10.00			47.18	5.35	19.30	3.71	6.71	2.38
10.25					21.06	3.89	7.05	2.44
10.50					22.88	4.07	7.35	2.50
10.75					24.76	4.24	7.66	2.55
11.00					26.71	4.42	7.98	2.61
11.25					28.71	4.60	8.35	2.67
11.50					30.77	4.77	8.67	2.73
11.75					32.89	4.95	9.00	2.79
12.00					35.06	5.13	9.38	2.85
12.25					37.28	5.31	9.72	2.91

Pressure drops owing to pipe friction (R) and calculated flow Speed (V) depending on peak flow (V_s)

Polypropylene pipes

Type3 in acc. With **DIN 8077**, nominal pressure Degree **PN25**

Peak Flow	**DN 12** d_a = 20mm d_i = 12.0mm v = 0.1132 l/m		**DN 15** d_a = 25mm d_i = 15.0mm v = 0.177 l/m		**DN 20** d_a = 31mm d_i = 19.2mm v = 0.290 l/m	
Vs L/s	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**
0.01	0.22	0.09	0.08	0.06	0.02	0.03
0.02	0.69	0.18	0.24	0.11	0.08	0.07
0.03	1.36	0.27	0.48	0.17	0.15	0.10
0.04	2.21	0.35	0.78	0.23	0.24	0.14
0.05	3.25	0.44	1.13	0.28	0.35	0.17
0.06	4.44	0.53	1.54	0.34	0.48	0.21
0.07	5.79	0.62	2.01	0.40	0.63	0.24
0.08	7.32	0.71	2.53	0.45	0.79	0.28
0.09	8.97	0.80	3.10	0.51	0.96	0.31
0.10	10.78	0.88	3.72	0.57	1.16	0.35
0.15	21.98	1.33	7.56	0.85	2.33	0.52
0.20	36.61	1.77	12.55	1.13	3.85	0.69
0.25	54.55	2.21	18.61	1.41	5.71	0.86
0.30	75.62	2.65	25.74	1.70	7.85	1.04
0.35	99.74	3.09	33.86	1.98	10.31	1.21
0.40	127.15	3.54	43.03	2.26	13.07	1.38
0.45	157.62	3.98	53.16	2.55	16.16	1.55
0.50	191.34	4.42	64.30	2.83	19.49	1.73
0.55	227.58	4.86	76.51	3.11	23.11	1.90
0.60	266.15	5.31	89.52	3.40	27.06	2.07
0.65			103.71	3.68	31.23	2.25
0.70			118.71	3.96	35.61	2.42
0.75			134.47	4.24	40.36	2.59
0.80			150.95	4.53	45.32	2.76
0.85			168.86	4.81	50.72	2.94
0.90			187.58	5.09	56.10	3.11
0.95			207.08	5.38	61.95	3.28
1.00					68.02	3.45
1.05					74.31	3.63
1.10					80.80	3.80
1.15					87.90	3.97
1.20					94.82	4.14
1.25					12.40	4.32
1.30					109.71	4.49
1.35					117.74	4.66
1.40					126.02	4.84
1.45					134.52	5.01
1.50					143.26	5.18
1.55					151.48	5.35

VIALLI GmbH

Pressure drops owing to pipe friction (R) and calculated flow Speed (V) depending on peak flow (V_s)

Polypropylene pipes

Type3 in acc. With **DIN 8077**, nominal pressure Degree PN25

Peak Flow	DN 25 d_a = 40mm d_i = 24.0mm v = 0.452 l/m		DN 30 d_a = 50mm d_i = 30.0mm v = 0.707 l/m	
Vs L/s	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**
0.05	0.12	0.11	0.04	0.07
0.10	0.40	0.22	0.14	0.14
0.15	0.81	0.33	0.28	0.21
0.20	1.33	0.44	0.46	0.28
0.25	1.97	0.55	0.68	0.35
0.30	2.70	0.66	0.93	0.42
0.35	3.54	0.77	1.22	0.50
0.40	4.49	0.88	1.55	0.57
0.45	5.52	0.99	1.90	0.64
0.50	6.67	1.11	2.28	0.71
0.60	9.20	1.33	3.16	0.85
0.70	12.12	1.55	4.15	0.99
0.80	15.44	1.77	5.27	1.13
0.90	19.04	1.99	6.48	1.27
1.00	23.00	2.21	7.48	1.14
1.10	27.34	2.43	9.28	1.56
1.20	31.95	2.65	10.85	1.70
1.30	36.98	2.87	12.57	1.84
1.40	42.29	3.09	14.32	1.98
1.50	48.09	3.32	16.21	2.12
1.60	53.93	3.54	18.27	2.26
1.70	60.30	3.76	20.34	2.41
1.80	66.94	3.98	22.58	2.55
1.90	73.85	4.20	24.92	2.69
2.00	81.01	4.42	27.35	2.83
2.10	88.87	4.64	29.86	2.97
2.20	96.55	4.86	32.61	3.11
2.30	104.99	5.08	35.28	3.25
2.40	113.73	5.31	38.04	3.40
2.50			41.06	3.54
2.60			44.19	3.68
2.70			47.17	3.82
2.80			50.46	3.96
2.90			53.85	4.10
3.00			57.33	4.24
3.10			60.89	4.39
3.20			64.54	4.53
3.30			68.28	4.67
3.40			72.09	4.81
3.50			75.99	4.95
3.60			80.39	5.09
3.70			84.46	5.23
3.80			88.61	5.38

Pressure drops owing to pipe friction (R) and calculated flow Speed (V) depending on peak flow (V_s)

Polypropylene pipes

Type3 in acc. With **DIN 8077**, nominal pressure Degree **PN25**

Peak Flow	DN 40 d_a = 63mm d_i = 37.8mm v = 1.122 l/m		DN 45 d_a = 75mm d_i = 45.0mm v = 1.590 l/m	
Vs L/s	**R mbar/m**	**V m/s**	**R mbar/m**	**V m/s**
0.10	0.05	0.09	0.02	0.06
0.20	0.15	0.18	0.07	0.13
0.30	0.31	0.27	0.14	0.19
0.40	0.51	0.36	0.22	0.25
0.50	0.76	0.45	0.33	0.31
0.75	1.55	0.67	0.67	0.47
1.00	2.58	0.89	1.12	0.63
1.25	3.84	1.11	1.66	0.79
1.50	5.32	1.34	2.30	0.94
1.75	7.01	1.56	3.03	1.10
2.00	8.91	1.78	3.85	1.26
2.25	11.06	2.00	4.76	1.41
2.50	13.32	2.23	5.74	1.57
2.75	15.88	2.45	6.81	1.73
3.00	18.62	2.67	7.98	1.89
3.25	21.52	2.90	9.23	2.04
3.50	24.57	3.12	10.54	2.20
3.75	27.91	3.34	11.98	2.36
4.00	31.42	3.56	13.42	2.52
4.25	35.09	3.79	14.99	2.67
4.50	38.92	4.01	16.63	2.83
4.75	43.12	4.23	18.43	2.99
5.00	47.26	4.46	20.20	3.14
5.25	51.81	4.68	22.03	3.30
5.50	56.54	4.90	24.05	3.46
5.75	61.11	5.12	26.14	3.62
6.00	66.16	5.35	28.14	3.77
6.25			30.37	3.93
6.50			32.66	4.09
6.75			35.02	4.24
7.00			37.44	4.40
7.25			39.94	4.56
7.50			42.49	4.72
7.75			45.11	4.87
8.00			48.06	5.03
8.25			50.82	5.19
8.50			53.62	5.34

6. Determination of Total Pressure loss of the installation

- The calculations of flow rates of the individual take-off points are summed in a direction and are assigned to the corresponding pipe sections as cumulative flow rates.
- The dimensions are calculated from the sum of continuous flow rates and peak rates.
- The continuous flow rates is regarded as the quality which emerges when water is removed for more than 15 minutes, converted to liter per second.
- Values for the conversion of cumulative flow rates in to peak flow rates are shown in diagram.
- In association with international pipe diameter. The peak flow rates determine the pressure gradient due to pipe friction.
- The total pressure loss of the pipe (without equipment resistance)is the sum of the pressure losses due to pipe friction and individual resistance.
- The coefficients of resistance of pipeline sections and individual resistance are shown in table
- The total pressure loss of the pipe can be determined with the aid of the relevant equation:

$$\Delta P = \Sigma(R \times L + Z)$$

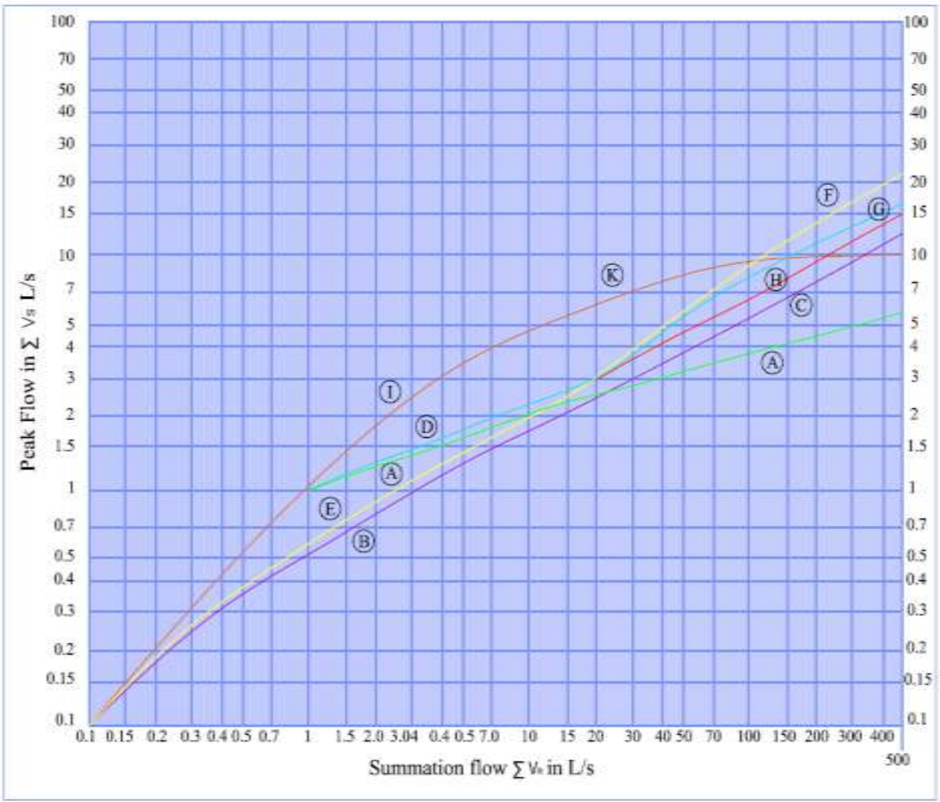
$$Z = \varsigma . \frac{V^2 .e}{2}$$

Peak Flow

Peak flow $V_s$depending on summation flow $\Sigma\ V_R$

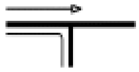
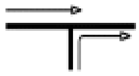
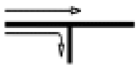
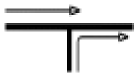
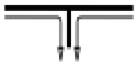
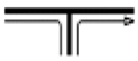
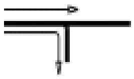
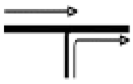
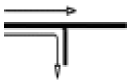
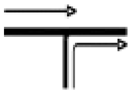
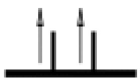
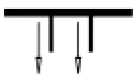
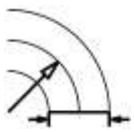
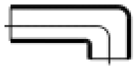
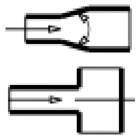
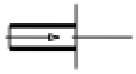
Area of Applications [VR > s 20 L/s]	
Residential buildings	A
Office and Administrative Buildings	C
Hotel Buildings	F
Department Stores	G
Hospitals (only ward sections)	H
Schools	K

Area of Applications [VR ≤ s 20 L/s]		
	[VR ≥ s 1.5 L/s]	[VR < s 1.5 L/s]
Residential buildings	A	B
Office and Administrative Buildings	A	B
Hotel Buildings	D	E
Department Stores	D	E
Hospitals (only ward sections)	D	E
Schools ∑ Vs = Vs von 0.1 bis 1.5 L/s ∑ VR > s 1.5 L/s	I	



Resistance Coefficient Values

Resistance Coefficient Values ς_u for piping junctions

No.	Designation	Graphic Symbols	Loss coefficients
1	Branching. One sided dividing flow		1.3
2	Branching. One sided merging flow		0.9
3	Branching one-sided passage for dividing flow		0.3
4	Branching one-sided passage for merging flow		0.6
5	Branching one sided counter-current for merging flow		3.0
6	Branching one sided counter-current for dividing flow		1.3
7	Branching, one sided bow shaped dividing flow		0.9
8	Branching one sided bow shaped, merging flow		0.4
9	Branching one sided bow shaped passage for dividing flow		0.3
10	Branching one sided bow shaped passage for merging flow		0.2
11	Branching with 2 exit pipes (casing reservoir)		0.5
12	Branching with 2 entry pipes (casing reservoir)		1.0
13	Bow 90°smooth R=d =2d =4d =6d =10d Bow 90° rough R=d =2d =4d =6d =10d		0.21 0.14 0.09 0.11 0.51 0.30 0.23 0.18 0.20
14	Elbow joints 90° smooth Elbow joints 90° rough		1.13 1.27
15	Widening steady ß= 10° =20° =30° =40° Widening sudden Widening free discharge	 	0.20 0.45 0.60 0.75 $(F1/F2=1)^2$ 1.0
16	Narrowing steady Reductions 1 dimensions 2 dimensions 3 dimensions 4 dimensions 5 dimensions 6 dimensions		0.40 0.50 0.60 0.70 0.80 0.90
17	Smooth comp tube bend quill comp tube bend corrugated comp tube		0.7 1.4 2
18	Screw-down stop Globe valve DN20 DN25 Slanted set valves DN 20 DN25		8.5 7.0 2.5 2.0
19	Full current valve DN20 DN25		1.5
20	Corner valves DN20 Dn25		2.0
21	Main slide valve DN20 Dn25		0.5

8. QUALITY CONSIDERATIONS

The deciding factor in the **VIALLI PP-Rc** pipes and fittings manufacturing process is the use of correct/ pure raw materials.

- Pipes and pipe fittings consist of long-lasting PP-Rc material properties and characteristics.
- Has a direct impact on the welding quality (example: the melting point of PP-Rc material is 140 °C that of PP-B material is about 160 °C) welding conditions become different so that the welding quality is easy to grasp. This is because two kinds of crystalline materials used in the PP blend mix have varying melting degrees.
- The cooling rate is different in the welding process due to the different shrinkage rates which leads to stress concentration.
- When the raw material is mixed with a number of recycling industrial waste plastic granulates, the pipes and fittings produced could be toxic and thus not suitable for long-term use to transport drinking water this will seriously damage people's health.
- During the welding process, there is an odor and an emission of black smoke.
- The lifespan of such pipes and fittings is rather short. Leakage problems will probably start within the first few months of regular use. The repair and replacement costs, especially in occupied residential units, will be much higher.

The production machines also play an important role in ensuring a quality product. Low-quality suppliers tend to use inexpensive equipment for their manufacturing process. For example, pipes may be produced with uneven wall thickness throughout the pipe. This can significantly impact the quality of the pipe and its chemical/thermal characteristics.

9. FREQUENTLY ASKED QUESTIONS

Q: Which is the raw material used to produce VIALLI PP-Rc Pipe system?

ANSWER

PP-Rc pipe systems are produced from a type of polypropylene known as polypropylene random copolymer, often referred to as Type III PP-Rc (commonly known as PPR). This raw material is obtained through the cracking of petroleum, where propane-monomer polymerizes with polypropylene co-monomer to form polypropylene random copolymer. We exclusively utilize one of the best PP-Rc raw materials globally, approved for the production of pipes and fittings in accordance with DIN 8078 and DIN 16962 standards.

Q: How are the pipes and Fittings manufactured using this raw material?

ANSWER

The PP-Rc raw material is a thermoplastic resin supplied in pre-colored granules. This raw material is transformed into finished products by raising the temperature, which plasticizes the material. This process allows the production of pipes through extrusion and fittings through molding.

Q: What do PP-Rc type 1 Type, Type 2 and Type 3 refer to? What are the difference between them?

ANSWER

Plastic pipes have become more resistant as they have evolved. The first produced polypropylene had a structure consisting of propylene molecules, which was referred to as Type 1 Polypropylene homo-polymer. Later, propylene molecules with mixed sequences were introduced alongside the propylene molecules, leading to what is known as Type 2 Polypropylene block copolymer. Subsequently, the Type 3 product was developed, which includes ethylene molecules regularly sequenced among the propylene molecules.

Today, due to their specific characteristics, Type 2 and Type 3 are widely used. Type 2 is employed primarily in cold water networks and is not suitable for use with hot fluids. On the other hand, Type 3 can be used for hot water systems because it offers resistance to hot fluids.

Q: Are VIALLI pipes UV resistant?

ANSWER

VIALLI PP-Rc pipes and fittings possess adequate UV stability to protect them from UV rays. Nevertheless, it is not advisable to continuously expose these pipes and fittings to direct sunlight for outdoor pipeline installations. It is recommended to apply an acrylic paint coating to the pipes or to shield them from direct sunlight by providing a protective covering or installing them in a duct. This precaution helps extend the lifespan and maintain the performance of the pipes and fittings when used outdoors.

Q: Is insulation necessary for hot water applications?

ANSWER

Normally, it is not mandatory for plumbers to install insulation because the thermal conductivity of PP-Rc piping systems is lower compared to metal piping systems (0.24 W/mK). However, for centralized heating systems, where preventing heat loss and isolating pipelines from other utilities is important, it is advisable to insulate these lines. The required thickness of insulation is significantly lower compared to conventional lines due to the inherent properties of PP-Rc piping systems.

Q: How can we connect VIALLI products to other metal systems?

ANSWER

VIALLI PP-Rc system can be connected to other metal systems easily by a flange or a metal adaptor. (BS 6920)

Q: What is DIN Standards?

ANSWER

The Deutsches Institutfür Normung (DIN) is Germany's institute for standardization. It is a technical and scientific association recognized by the German government as the national standards body representing Germany's interests at international and European levels. DIN provides a forum in which representatives from manufacturing industries, consumer organizations, commerce, the trades, service industries, science and technical inspectorates, and government can discuss and define their specific standardization requirements, recording the results as German Standards.

Q: What are production standards of VIALLI PP-Rc ?

ANSWER

Following standards are used for the production of VIALLI pipes and fittings:

Standard	Concern Production
DIN 8076	Standard for Testing metal threaded joints
DIN 8077	Polypropylene Pipes. Dimensions
DIN 8078	Polypropylene Pipes, General Quality Requirements & Testing
DIN 16962	Pipe joints and elements for Polypropylene Pressure Pipes
DIN 1988	Drinking Water Supply Systems, Materials, Components, Appliances Design and installation
DIN 16928	Pipe joints & Elements for Pipes, Laying-General Directions
DIN 2999	Standard for fittings with threaded metallic insert
EN ISO - 15874	Plastic piping system for hot & cold water Installation – (PP)
BS 6700	Design, Installation, Testing and Maintenance of Services Supplying Water for Domestic use with in buildings and their Cartilages
DVS 2207	Welding of Thermoplastics
DVS 2208	Welding Machines and Devices for Thermoplastics

Q: What is the service life (life span) of VIALLI PP-Rc piping systems for different pressure groups?

ANSWER

PP-RC pipes have a service life of 50 years according to DIN Standards for in house applications. To have detailed information for Different temperatures and pressure rates, please refer product catalogue

Q: Are VIALLI PP-Rc pipes used for drinking water? Are they Hygienic/ Healthy?

ANSWER

PP-Rc products can safely be used for Drinking water. VAILLI PP-Rc products have got all international Approvals as well as the approvals of the sales territories

Q: What does PN Stands for and what does it mean to be PN-16 or PN20?

ANSWER

PN stands for Nominal Pressure, it is numerical designation used for reference purpose related to mechanical characteristics of the component of a piping system. A PN-20 pipe mean the pipe can withstand pressure Up to 20 Bars.

Q: Why is VIALLI fittings categorized under PN-25 Types?

ANSWER

VIALLI fittings can withstand temperature above 95°C and pressure up to 25 kg/ cm2, (25 Bars) hence categorized under PN-25.

Q: What does PN Stands for and what does it mean to be PN-16 or PN20?

ANSWER

PN stands for Nominal Pressure, it is numerical designation used for reference purpose related to mechanical characteristics of the component of a piping system. A PN-20 pipe mean the pipe can withstand pressure Up to 20 Bars.

Q: What is the deference between PN16 and PN20 pipes due to the application areas?

ANSWER

Life Span of PN20 is Longer than PN-16 pipes under the same temperature and pressure conditions. Especially for the exposed installations as the expansion of PN-20 pipes are 1/5 of PN 16 pipes sagging and snaking problems are avoided.

Q: How is pipe categorized as PN-10, PN-16, PN-20 & PN25 matched with SDR (Standard Dimension Rate) of conventional pipes?

ANSWER

PP-Rc Pipes with all thickness of OD/ SDR is matched as the Equivalent PP-Rc Pipe for a SDR Pipe.

PN-10 is regarded as equivalent to SDR 11 Because, PN 10 Pipe of 20 mm OD has thickness approx. to 20/11=1.8

PN-10 160 mm has thickness approx. to 160/11=14.55
Likewise SDR 7.4 is matched as PN-16 and SDR 6 as PN-20.

Q: What is the intended use of different classes of Pipes?

ANSWER

PN 10 – Cold water distribution and floor heating systems
PN 16 – Higher pressure cold water distribution and domestic hot water system at lower Pressures.
PN 20 – hot water distribution Central
PN 25 - Higher pressure Hot water distribution Central and Domestic

Q: What should be done is somebody accidentally drills a hole on the pipe?

ANSWER

If it is a nail or a drill hole (10.5mm deep max) you may use “VIALLLI PP-Rc Hole Repair Kit to repair the hole on the pipe. If the damage part of the pipe is not concealed yet (before the pressure test is conducted), the recommended procedure is to cut that part and replace it by a new part through normal welding of a socket.

Q: Should any precaution be taken for the installation at low temperatures?

ANSWER

At lower temperature of 0°C and below, the flexibility of PP-Rc pipes reduces and impact strength also reduces. This makes pipes more prone to mechanical damages against impact loads. To avoid the damages at low temperature, it is advisable to insulate the pipe lines

Q: Do VIALLI PP-Rc Piping systems burn?

ANSWER

VIALLI pipes and fittings have a combustion point of 330°C and a burning point of 360°C. These properties conform to the B2 (Normally inflammable) class fire requirements for normal combustibility according to DIN 4102. In the event of a fire, PP-Rc pipes and fittings emit carbon dioxide and water. Additionally, depending on the availability of oxygen, small amounts of carbon monoxide gas, molecular hydrocarbons, and oxidation products may also be emitted. Even in cases of incomplete combustion, the materials emitted are less toxic than those from wood or conventional pipe systems under similar conditions.

Q: How can the PP-Rc pipes & fittings joined together?

ANSWER

The process of joining PP-Rc pipes and fittings is very simple and results in inseparable water joints. This is achieved using a straightforward welding machine that melts the internal surface of the fittings and the external surface of the pipe at 270°C, allowing the material of the pipe and the fitting to meld together. Because both the pipes and fittings are produced from the same material, the connection is typically homogeneous.

Q: Can the pipes alignment be adjusted after the welding process?

ANSWER

Alignment up to 5 degree relative to the axis of the pipe can be done immediately after jointing.

Q: How is the pipe cutting recommended?

ANSWER

It is advised to used sharp cutting tools to cut the pipe with no burrs, VIALLI Provide cutting tools of size 20-40, 20-63, 50-110, 160, 200 & 250.

Q: How is the size of pipes and fittings measured?

ANSWER

Pies size is measured by mm (millimeter) of its outer Dia. PRR fittings are measured by mm (millimeter) of inner dia. and metal threaded fittings treaded side size is measured in inches

Q: Which is the metal used in manufacturing of VIALLI Threaded fittings?

ANSWER

VAILLI Threaded fittings are manufactured using stainless steel inserts, tin bronze inserts, brass with nickel platted inserts & natural brass inserts and its threading is made as per British Standard Threading.

Q: How can the stressing of pipe be avoided?

ANSWER

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

Q: Why is joining of pipes without using sockets un-recommended?

ANSWER

This joining results blockage or reduction in inner Dia. At joining point hence it's recommended to avoid as it can affect the function of the system.

Q: Is joining of pipes & fittings using glue recommended?

ANSWER

Using glue connections is not recommended as they cannot provide a 50-year guarantee against leakages. Additionally, glue connections are susceptible to issues like termite attacks and frequent maintenance requirements, which can impact the hygienic and long-term performance of the VIALLI PP-Rc Pipe system.

Q: How is pressure testing recommended?

ANSWER

Before any pipes are filled or cemented in concealed applications, they must undergo hydrostatic testing to check for pressure loss or leaks. The testing involves pressurizing the closed system, with all ends sealed using caps and pipe plugs, with water up to 25 bar for PN-20 and PN-25 pipes, and up to 15 bar for PN-16 pipes, all at room temperature. The pressure should be maintained for at least 8 hours to detect any pressure drop. This process is repeated to confirm the absence of even minor leaks. If a significant pressure drop is observed, the specific area of leakage must be identified and rectified.

10. VIALLI GLASS FIBER REINFORCED PIPE

PRODUCT DESCRIPTION

FR-PPR Glass Fiber-reinforced hot and cold water composite pipes are three-layer co-extruded pipes. They are produced at low temperatures with high-speed production techniques and offer the special advantages of PP-Rc pipes. Additionally, they possess the following characteristics:

1. The linear expansion coefficient is only about 20-30% of that of ordinary PP-Rc pipes.

2. Enhances pipe rigidity, prevents sagging, provides additional support points, and thereby reduces the total installation cost.

3. Higher pressure resistance level and longer working life under several working conditions. (95 °C at 10bar for short time test 200 hours) 95 °C at6.5 Bar for a service time 50 years.

4. Permanently solves the issue of oxygen ingress into the pipeline, ensuring that it does not appear on the inner surface. The middle layer of the FR-PPR pipe effectively prevents oxygen intrusion, inhibiting algae growth and maintaining fresh, pure water.

5. Exhibits good resistance to ultraviolet radiation, ensuring that the installation remains free from deformation.

6. Low thermal conductivity
   - PP-Rc Aluminum composite pipe coefficient of thermal conductivity is 190w/mk
   - PP-Rc Glass fiber composite pipe coefficient of thermal conductivity is 110w/mk ideal choice for outdoor construction of solar and heat energy system.

Raw Material and Technical Specifications

- Pipe Type: PP-Rc Glass-Fiber Rain Forced
- Elongation coefficient: 0.035 mm/mk
- Fields of use: Heating, Cooling, internal and external cold and hot domestic water supply pipes system.

Liner Expansion Table for the VIALLI Composite Pipes

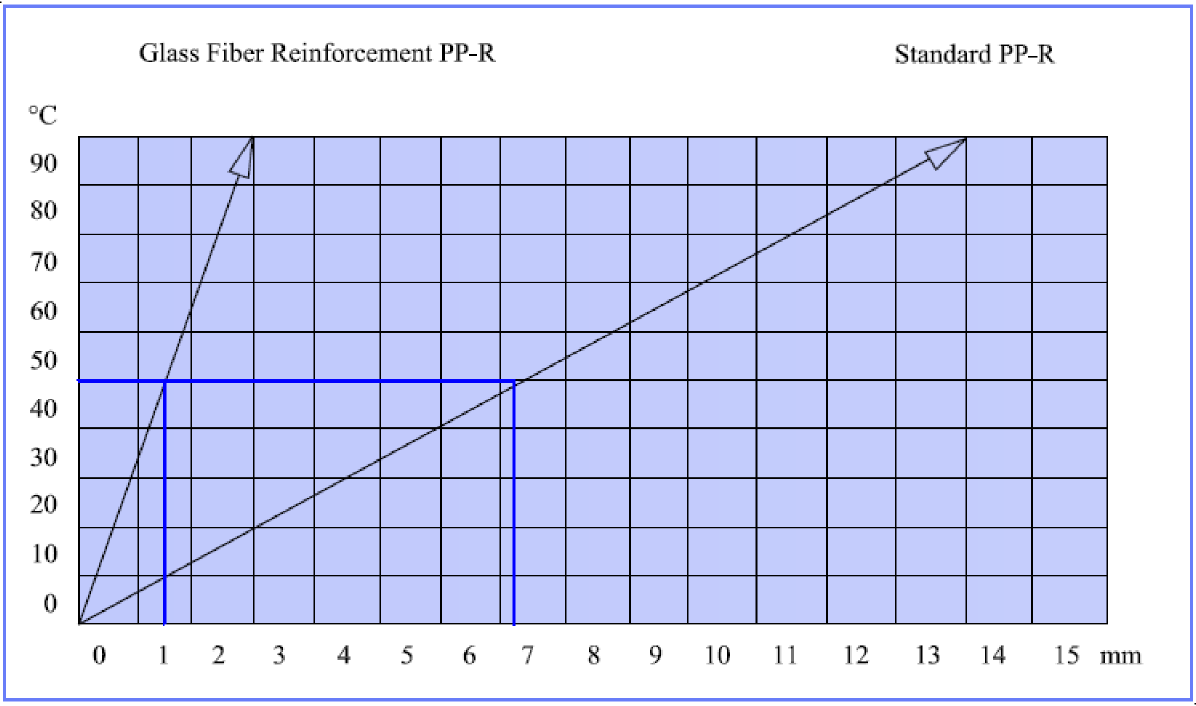
Amount of elongation (ΔL) (mm) :

length	ΔT						
M	**10°C**	**20°C**	**30°C**	**40°C**	**50°C**	**60°C**	**70°C**
5	2	4	6	8	10	12	14
10	4	8	12	16	20	24	28
15	6	12	18	24	30	36	42
20	8	6	24	36	40	48	56

10. Vialli Glass Fiber Reinforced Pipe

Product Description

Compares the amount of elongation from the glass fiber reinforcement PP-Rc pipe with the standard PP-Rc pipe



While fiberglass reinforced PP-Rc pipes elongate by 1.75mm per 1 meter at a temperature difference of 50°C, standard PP-Rc pipes elongate by 7.5mm per 1 meter under the same temperature difference.

Code	Measure	Packet
107020	20x3.4mm	100
107025	25x4.2mm	100
107032	32x5.4mm	60
107040	40x6.7mm	40
107050	50x8.4mm	20
107063	63x10.5mm	16
107075	75x12.5mm	12
107090	90x15mm	8
107110	110x18.3mm	4
107125	125x20.8mm	4
107160	160x26.6mm	4
107200	200x28.3mm	4
107250	250x33.3mm	4

11. Vialli Aluminum Reinforced Pipe

Product Description

VIALLI PN25 pipes (with an aluminum layer) consist of inside and outside layers made of PP-Rc. These layers are securely bonded to the middle layer, which is an aluminum core, using a PP-based adhesive and are well-welded in an overlapping manner. This type of pipe represents a perfect combination of a metal pipe and a plastic pipe.

Advantages

- Greatly reduces linear expansion coefficient, only ¼ of that of PP-Rc, which means the composite pipes have stable dimensions.
- 100% Oxygen tightness, suitable for heating system.
- Improved resistance to impulse under low temperature, resistant to UV-rays.
- Works under High temperatures and pressures for cool and hot water systems.
- Easily detectable when embedded, due to the presence of the metal layer.
- Excellent heat preservation performance with a low thermal conductivity coefficient of 0.45 W/m·K.
- Smooth and hygienic, making it an excellent choice for drinkable water systems.

Advantages

- Suitable for the distribution of both cold and hot water.
- Pipes for a variety of high-temperature and low-temperature heating systems.
- Pipes for heating and cooling settings in solar energy systems.
- Ductfor drinkable water system.
- Industrial transportation for chemical liquids.
- Pipes for connecting air conditioners.
- High-pressure pipes for irrigation systems.

12. Fittings inserts

The durability of fittings is significantly influenced by their resistance to corrosion. Hence, we utilize various types of metal inserts in the manufacturing of male and female VIALLI fittings, as elaborated below.

12.1 Stainless Steel Inserts

- Vialli Stainless Steel Fittings have low Interior surface friction, remain stable under extreme temperatures.
- Vialli Stainless Steel Fittings like the ones link plus installs to be among the most Durable option available
- The standard for producing Vialli Stainless Steel PP-Rc Fittings DIN 17440 and DIN 17441
- **Life Span** for Vialli Stainless Steel PP-Rc fittings under Marin environment **35-50 Years**

12.2 Tin Bronze Inserts

- Excellent properties of Copper-Tin alloys-Gun Metal- of Vialli Bronze PP-Rc Fittings.
- All Bronze Inserts with the following Technical Specifications ($CuSn_5$ Zn_5Pb_5-C), ($CuSn_5$ Zu_5 Pb_2-C)
- **The lifeSpan**of the Vialli Tin Bronze Fittings under Marine Environmentsis approximately **30-45 years.**

12.3 DZR Brass Chrome Platted

- VIALLI DZR Brass Chrome Plated PP-Rc fittings are widely used globally, known for their high quality and competitive pricing.
- The VIALLI DZR Brass Chrome-plated PP-Rc Fittings come with the following technical specifications: (CuZn39 Pb2), (CuZn39 Pb3), (CuZn40 Pb2).
- The Surface Treatment Chrome Plated as Per DIN 259 and BS 2779
- **The life Span** for Vialli DZR Brass Chrome plated Fittings is approximately **25-35 years.**

12.4 Natural Brass Insert

- VIALLI Natural Brass fittings are produced with technical specifications similar to Brass with Nickel Plating but without undergoing any surface treatment.
- It represents a less durable alternative.
- **Life Span** for Vialli Natural Brass PP-Rc Fittings under Marine Environmentsis approximately **15-20 years.**

13. INSTALLATION RECOMMENDATIONS

- Handling the VIALLI installation system does not fundamentally differ from the installation scheme for metallic pipes.
- Fittings and fixtures commonly used in the trade, as well as insulation materials in accordance with heating installation regulations, may be applied in the traditional manner.
- The planning and execution of drinking water systems are conducted in compliance with DIN 1988, which encompasses the "Technical Regulations on Drinking Water Systems."
- It can be used in mixed systems, for example, during repair work without any issues.
- The minimal number of tools needed simplifies the handling of the entire system.
- Owing to the extensive fitting programmed, appropriate molded parts are required for each mode of installation,e.g. wall installations are available.
- Connecting with existing VIALLI systems can be seamlessly accomplished using welding saddles.
- Installations elements subject to frequent use can be pre-assembled (welded)in the workshop.

To make sure that our system is installed in a professional manner, the following recommendation should be observed:

- Avoid the presence of bubbles inside the piping.
- Install piping in an upward direction towards the tapping point.
- Place aerators and ventilation devices at the upper end of the ascending part of the line and evacuation points at the lower end.
- Mount separate cut-offs for ascending phases, apartment piping, pressure risers, hot water boilers, and garden piping.
- Always secure pipe fittings with inserts to prevent sound transmission.
- Avoid contact with structural elements when passing pipes through walls and ceilings to eliminate sound transmission.
- Account for pipe elongation when welding, as welding at outdoor temperatures below 0°C is possible only under specific conditions.

Welding Operations

1.) Cut the pipe perpendicular to its axis

2.) Heating the pipe and the filling simultaneously.

3.) Within the allowed time interval, connect the pipe and Fitting (do not twist)

4.) Ensure that the pipe and fittings are joined with a welding process that is 100% secure.

Recommended values for welding of PP-Rc pipe at an outdoor temperature of 20 °C &medium air movement (time Requirement)

1	2	3	4	5	DVS 2207
External pipe Dia. mm	Insert depth mm	Heating period Sec.	Processing period sec.	Cooling period Mins.	
20 25 32 40 50	14 15 16.5 18 20	5 7 8 12 18	3 3 4 6 7 9	2 4	With hand welding device
63 75 90 110 125 160 200 250	24 26 32 38.5 40 43 46 50	24 30 40 50 55 65 72 78	8 10 10 15 17 20 25 27	6 8 8 10 12 14 17 20	With welding machine

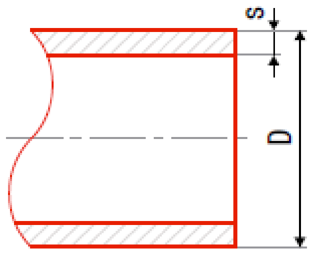
PP-Rc PRODUCTS

Our products include PP-Rc pipes designed for indoor cold and hot water distribution systems, floor and central heating systems, air distribution systems, and various applications in industry and agriculture. The lightweight nature of our pipes, coupled with their ease of processing, ensures quick, straightforward, and safe installations. Our welding concept, combined with the low roughness of the internal surface, contributes significantly to minimizing pressure losses in piping distribution systems.

1.) SDR 7.4 PP-Rc Pipes (Single Layer)

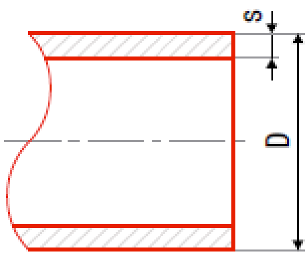
Our 4m pipes, designed for the highest pressure range, are ideal for hot water distribution systems, including applications in high-rise buildings, apartments, and panel buildings. Their exceptional chemical resistance makes them well-suited for use in industrial and agricultural facilities. These pipes are equivalent to PN 16with a safety factor of 1.5, ensuring their durability and reliability in demanding environments.

Size (D)	Inner Dia.	SDR	(S) Wall Thickness
20mm	14.4mm	7.4	2.8mm
25mm	18.0mm	7.4	3.5mm
32mm	23.2mm	7.4	4.4mm
40mm	29.0mm	7.4	5.5mm
50mm	36.2mm	7.4	6.9mm
63mm	45.8mm	7.4	8.6mm
75mm	54.4mm	7.4	10.3mm
90mm	65.4mm	7.4	12.3mm
110mm	79.8mm	7.4	15.1mm
125mm	90.8mm	7.4	17.1mm
160mm	116.2mm	7.4	21.9mm
200mm	153.6mm	9	23.2mm
250mm	195.4mm	9	27.3mm



2.) SDR 6 PP-Rc Pipes (Single Layer)

Our 4m pipes, designed for the highest pressure range, are perfectly suited for hot water distribution systems, including applications in high-rise buildings, apartments, and panel buildings. Their exceptional chemical resistance makes them an ideal choice for use in industrial and agricultural plants. These pipes are equivalent to PN 20 with a safety factor of 1.5, ensuring their reliability and safety in demanding environments.

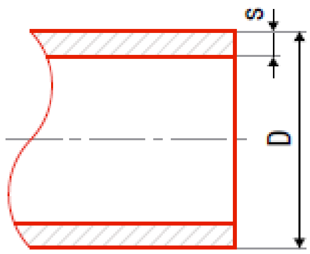


Size (D)	Inner Dia.	SDR	(S) Wall Thickness
20mm	13.2mm	6	3.4mm
25mm	16.6mm	6	4.2mm
32mm	21.2mm	6	5.4mm
40mm	26.6mm	6	6.7mm
50mm	33.2mm	6	8.4mm
63mm	42.0mm	6	10.5mm
75mm	50.0mm	6	12.5mm
90mm	60.0mm	6	15mm
110mm	73.2mm	6	18.4mm
125mm	83.4mm	6	20.8mm
160mm	106.4mm	6	26.6mm
200mm	143.4mm	7.4	28.3mm
250mm	183.0mm	7.4	33.3mm

3.) SDR 7.4 Multilayer PP-Rc Pipes (Fiber Glass Layer)

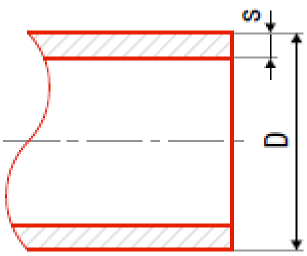
Our 4m pipes are well-suited for hot water distribution systems in locations with lower ceilings, as well as for heating and cooling water distribution systems in hot water heating systems or air conditioning systems. These pipes are designed to have low thermal expansion and high stiffness, making them ideal for such applications. The installation of these pipes does not require the use of any supporting gutters. They are equivalent to PN 20with a safety factor of 1.5, ensuring their durability and reliability.

Size (O.D)	d.i	SDR	Wall Thickness
20mm	14.4mm	7.4	2.8mm
25mm	18.0mm	7.4	3.5mm
32mm	23.2mm	7.4	4.4mm
40mm	29.0mm	7.4	5.5mm
50mm	36.2mm	7.4	6.9mm
63mm	45.8mm	7.4	8.6mm
75mm	54.4mm	7.4	10.3mm
90mm	65.4mm	7.4	12.3mm
110mm	79.8mm	7.4	15.1mm



4.) SDR 6 Multilayer PP-Rc Pipes (Fiber Glass Layer)

Our universal 4m pipe is designed to meet the demands of the most challenging drinking, cooling, and heating water distribution systems. It offers the advantage of having thermal expansion four times lower than that of a standard PP-RC pipe while maintaining high stiffness It can be welded just like a common PP-RC pipe. This pipe is ideal for basic distribution systems, including hot water heating systems, and floor heating systems. These pipes are equivalent to PN 25 with a safety factor of 1.5.

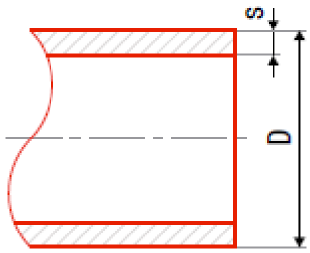


Size (O.D)	d.i	SDR	Wall Thickness
20mm	13.2mm	6	3.4mm
25mm	16.6mm	6	4.2mm
32mm	21.2mm	6	5.4mm
40mm	26.6mm	6	6.7mm
50mm	33.2mm	6	8.4mm
63mm	42.0mm	6	10.5mm
75mm	50.0mm	6	12.5mm
90mm	60.0mm	6	15mm
110mm	73.2mm	6	18.4mm
125mm	83.4mm	6	20.8mm
160mm	106.4mm	6	26.6mm
200mm	143.4mm	7.4	28.3mm
250mm	183.0mm	7.4	33.3mm

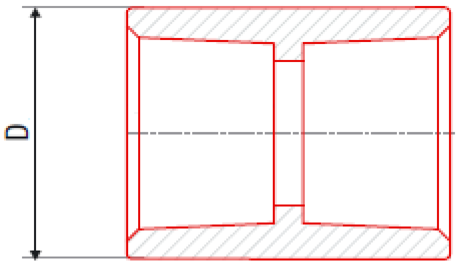
5.) SDR 6 Multilayer PP-Rc Pipes (Aluminum Layer)

Our 4m pipe is ideal for hot water distribution systems in locations with lower ceilings, as well as for heating and cooling water distribution systems in hot water heating systems or air conditioning systems. These pipes offer the advantages of low thermal expansion and high stiffness, making them suitable for various applications. Additionally, there is no need to use any supporting gutters during installation. These pipes are equivalent to PN 25 with a safety factor of 1.5, ensuring their reliability and performance in demanding scenarios.

Size (O.D)	d.i	SDR	Wall Thickness
20mm	13.2mm	6	3.4mm
25mm	16.6mm	6	4.2mm
32mm	21.2mm	6	5.4mm
40mm	26.6mm	6	6.7mm
50mm	33.2mm	6	8.4mm
63mm	42.0mm	6	10.5mm
75mm	50.0mm	6	12.5mm
90mm	60.0mm	6	15mm
110mm	73.2mm	6	18.4mm



6.) Coupling (Equal Socket)



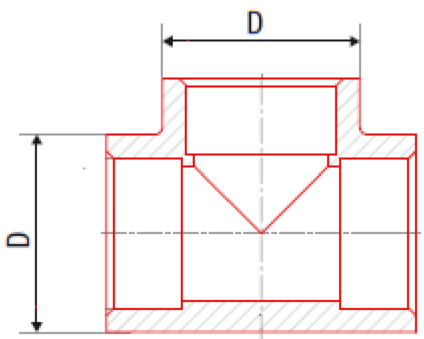
Our piping systems allow for easy interconnection of individual pipes within a water or heating distribution system, minimizing pressure loss.

Size (D)	Description	Art. No.
20mm	Equal Socket	201020
25mm	Equal Socket	201025
32mm	Equal Socket	201032
40mm	Equal Socket	201040
50mm	Equal Socket	201050
63mm	Equal Socket	201063
75mm	Equal Socket	201075
90mm	Equal Socket	201090
110mm	Equal Socket	201110
125mm	Equal Socket	201125
160mm	Equal Socket	201160
200mm	Equal Socket	201200
250mm	Equal Socket	201250

7.) Equal Tee

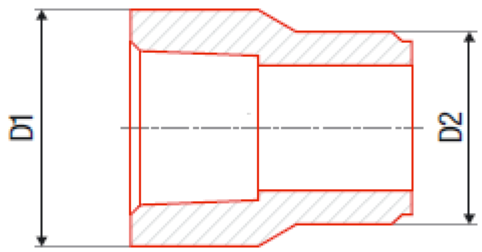
Our fittings facilitate the branching of a distribution system while ensuring that the inside diameter of the fittings remains unchanged compared to the inside diameter of the piping. As a result, these fittings do not significantly increase the pressure loss in the distribution system.

Size (D)	Description	Art. No.
20x20x20mm	Equal Tee	208020
25x25x25mm	Equal Tee	208025
32x32x32mm	Equal Tee	208032
40x40x40mm	Equal Tee	208040
50x50x50mm	Equal Tee	208050
63x63x63mm	Equal Tee	208063
75x75x75mm	Equal Tee	208075
90x90x90mm	Equal Tee	208090
110x110x110mm	Equal Tee	208110
125x125x125mm	Equal Tee	208125
160x160x160mm	Equal Tee	208160
200x200x200mm	Equal Tee	208200
250x250x250mm	Equal Tee	208250

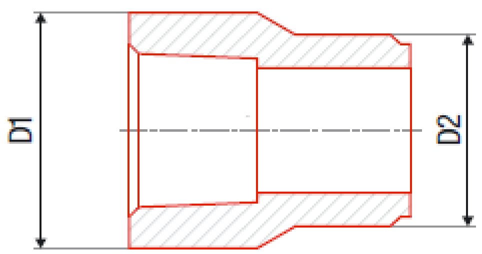


8.) Reducer Socket

Reduces interconnection of individual pipes within a water or heating distribution system, resulting in reduced pressure loss.



Size (D1, D2)	Description	Art. No.
25/20mm	Reducer Socket	209025020
32/20mm	Reducer Socket	209032020
32/25mm	Reducer Socket	209032025
40/20mm	Reducer Socket	209040020
40/25mm	Reducer Socket	209040025
40/32mm	Reducer Socket	209040032
50/25mm	Reducer Socket	209050025
50/32mm	Reducer Socket	209050032
50/40mm	Reducer Socket	209050040
63/25mm	Reducer Socket	209063025
63/32mm	Reducer Socket	209063032
63/40mm	Reducer Socket	209063040
63/50mm	Reducer Socket	209063050
75/50mm	Reducer Socket	209075050
75/63mm	Reducer Socket	209075063



Reducer Socket

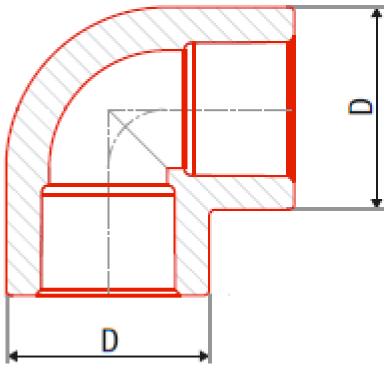
Reduces interconnection of individual pipes within a water or heating distribution system, resulting in reduced pressure loss.

Size (D1, D2)	Description	Art. No.
75/63mm	Reducer Socket	209075063
90/63mm	Reducer Socket	209090063
90/75mm	Reducer Socket	209090075
110/90mm	Reducer Socket	2090110090
125/110mm	Reducer Socket	20901250110
160/110mm	Reducer Socket	20901600110
160/125mm	Reducer Socket	20901600125
160/50mm	Reducer Socket	2090160050
160/75mm	Reducer Socket	2090160075
160/90mm	Reducer Socket	2090160090
200/90mm	Reducer Socket	2090200090
200/110mm	Reducer Socket	20902000110
200/160mm	Reducer Socket	20902000160
250/160mm	Reducer Socket	20902500160
250/200mm	Reducer Socket	2090250200

9.) Elbow 90°

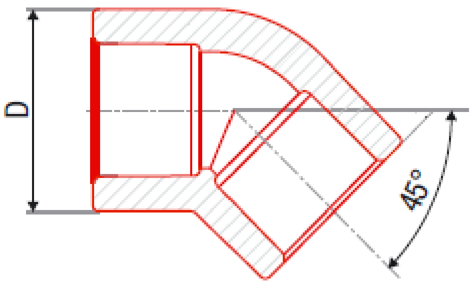
A simple, reliable fitting used to change the direction of a Distribution system. When installed properly it increases the Pressure loss in the distribution system noticeably less than Elbows in other distribution systems. Thanks to the full-size InsideDiameter corresponding to that of the piping.

Size (D)	Description	Art. No.
20mm	Elbow 90°	202020
25mm	Elbow 90°	202025
32mm	Elbow 90°	202032
40mm	Elbow 90°	202040
50mm	Elbow 90°	202050
63mm	Elbow 90°	202063
75mm	Elbow 90°	202075
90mm	Elbow 90°	202090
110mm	Elbow 90°	202110
125mm	Elbow 90°	202125
160mm	Elbow 90°	202160
200mm	Elbow 90°	202200
250mm	Elbow 90°	202250



10.) Elbow 45°

A simple, reliable fitting used to change the direction of a DistributionSystem. When installed properly, it increases the pressure loss in the distribution system noticeably less than elbows in other distribution systems, thanks to the full-size inside diametercorresponding to that of the piping.

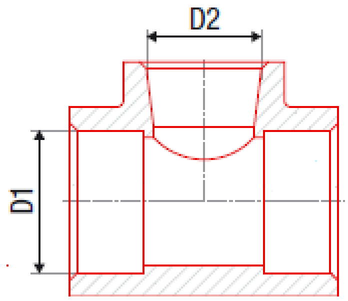


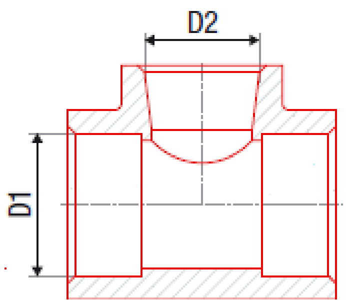
Size (D)	Description	Art. No.
20mm	Elbow 45°	203020
25mm	Elbow 45°	203025
32mm	Elbow 45°	203032
40mm	Elbow 45°	203040
50mm	Elbow 45°	203050
63mm	Elbow 45°	203063
75mm	Elbow 45°	203075
90mm	Elbow 45°	203090
110mm	Elbow 45°	203110
125mm	Elbow 45°	203125
160mm	Elbow 45°	203160
200mm	Elbow 45°	203200
250mm	Elbow 45°	203250

11.) Reducer Tee

A fitting allowing for the branching of a distribution system. The Inside diameter of the fitting is not reduced compared to the Inside diameter of the piping, and therefore, the fitting dose not Significantly increase the pressure loss in the distribution system.

Size (D1, D2)	Description	Art. No.
25x20x25mm	Reducer Tee	212025020
32x25x32mm	Reducer Tee	212032025
32x20x32mm	Reducer Tee	212032020
40x20x40mm	Reducer Tee	212040020
40x25x40mm	Reducer Tee	212040025
40x32x40mm	Reducer Tee	212040032
50x25x50mm	Reducer Tee	212050025
50x32x50mm	Reducer Tee	212050032
63x25x63mm	Reducer Tee	212063025
63x32x63mm	Reducer Tee	212063032
63x40x63mm	Reducer Tee	212063040
63x50x63mm	Reducer Tee	212063050
75x25x75mm	Reducer Tee	212075025
75x32x75mm	Reducer Tee	212075032
75x40x75mm	Reducer Tee	212075040
75x50x75mm	Reducer Tee	212075050
75x63x75mm	Reducer Tee	212075063





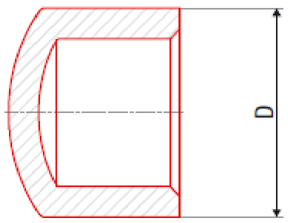
Reducer Tee

Size (D1, D2)	Description	Art. No.
90x40x90mm	Reducer Tee	212090040
90x50x90mm	Reducer Tee	212090050
90x63x90mm	Reducer Tee	212090063
90x75x90mm	Reducer Tee	212090075
110x40x110mm	Reducer Tee	212110040
110x50x110mm	Reducer Tee	212110050
110x63x110mm	Reducer Tee	212110063
110x75x110mm	Reducer Tee	212110075
110x90x110mm	Reducer Tee	212110090
125x110x125mm	Reducer Tee	2121250110
160x110x160mm	Reducer Tee	2121600110
160x25x160mm	Reducer Tee	212160025
160x40x160mm	Reducer Tee	212160040
160x50x160mm	Reducer Tee	212160050
160x63x160mm	Reducer Tee	212160063
160x75x160mm	Reducer Tee	212160075
160x90x160mm	Reducer Tee	212160090

12.) End cap

A permanent or temporary end of a branch of a water or heating Distribution system. Fully corresponding to the pressure range.

Size (D)	Description	Art. No.
20mm	End Cap	229020
25mm	End Cap	229025
32mm	End Cap	229032
40mm	End Cap	229040
50mm	End Cap	229050
63mm	End Cap	229063
75mm	End Cap	229075
90mm	End Cap	229090
110mm	End Cap	229110
125mm	End Cap	229125
160mm	End Cap	229160



13.) Pipe Bridge

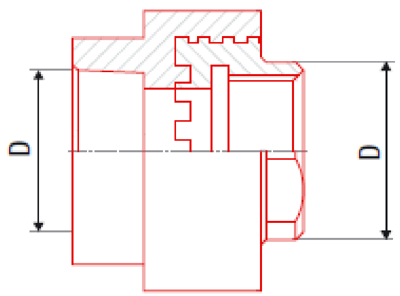
Allows for crossing of individual tracks of a water and HeatingDistribution system. It is most often used for distribution systems inFloor or when avoiding vertical pipes.

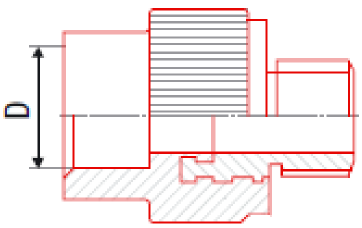
Size (D)	Description	Art. No.
20mm	Pipe Bridge	233020
25mm	Pipe Bridge	233025
32mm	Pipe Bridge	233032

14.) Female Adaptor

A fitting used for the transition from a welded part a water or Heating distribution system to brass screw joints and threaded Fittings.

Size (D)	Description	Art. No.
20x ½”	Female Adaptor	217020
25x ½”	Female Adaptor	217025
25x ¾”	Female Adaptor	217025
32x 1”	Female Adaptor	217032
40x 1¼”	Female Adaptor	217040
50x 1½”	Female Adaptor	217050
63x 2”	Female Adaptor	217063
75x 2½”	Female Adaptor	217075
90x 3”	Female Adaptor	217090
110x 4”	Female Adaptor	217110





15.) Male Adaptor

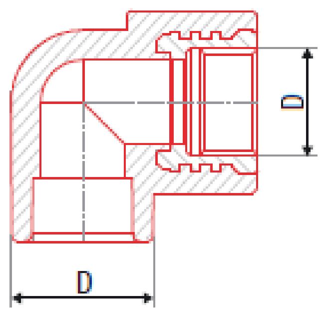
A fitting used for the transition from a welded part of a water or heating distribution system to brass screw joints and ThreadedFittings.

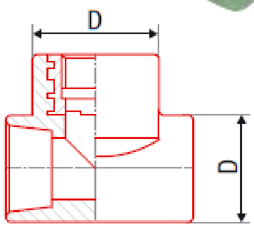
Size (D)	Description	Art. No.
20x ½”	Male Adaptor	215020
25x ½”	Male Adaptor	215025
25x ¾”	Male Adaptor	215025
32x 1”	Male Adaptor	215032
40x 1¼”	Male Adaptor	215040
50x 1½”	Male Adaptor	215050
63x 2”	Male Adaptor	215063
75x 2½”	Male Adaptor	215075
90x 3”	Male Adaptor	215090
110x 4”	Male Adaptor	215110

16.) Female Elbow 90°

A fitting used for the transition from a welded part of a water or heating distribution system to brass screw joints and threaded fittings.

Size (D)	Description	Art. No.
20x ½”	Female Elbow	218020
25x ½”	Female Elbow	218026
25x ¾”	Female Elbow	218025
32x ½”	Female Elbow	208036
32x ¾”	Female Elbow	208035
32x 1”	Female Elbow	218032





17.) Female Tee

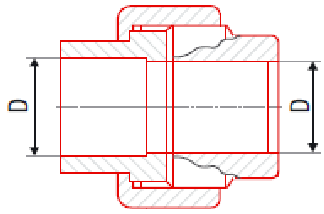
A fitting used for the transition from a welded part of a water or Heating distribution system to brass screw joints and threaded Fittings.

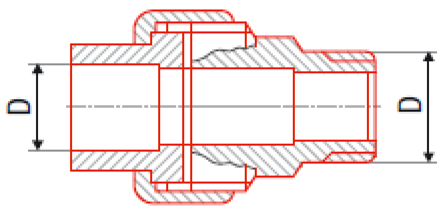
Size (D)	Description	Art. No.
20x ½”x20	Female Tee	222020
25x ½”x25	Female Tee	222026
25x ¾”x25	Female Tee	222025
32x ½”x32	Female Tee	222036
32x ¾”x32	Female Tee	222035
32x1”x32	Female Tee	222032
40x ½”x40	Female Tee	222040

18.) Female Union

A fitting used for the transition from a welded part of a water or Heating distribution system to brass screw joints and threaded fittings.

Size (D)	Description	Art. No.
20x ½”	Female Union	236020
25x ¾”	Female Union	236025
32x1”	Female Union	236032
40x1¼”	Female Union	236040
50x 1½”	Female Union	236050
63x2”	Female Union	236063





19.) Male Union

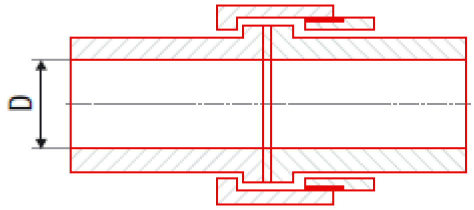
A fitting used for transition from a welded part of a water orHeating distribution system to brass screw joints and threaded fittings.

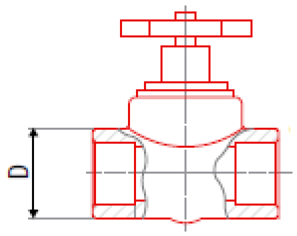
Size (D)	Description	Art. No.
20x ½”	Male Union	237020
25x ¾”	Male Union	237025
32x1”	Male Union	237032
40x1¼”	Male Union	237040
50x 1½”	Male Union	237050
63x2”	Male Union	237063

20.) Union Socket – Metal

A fitting used for the transition from a welded part of a water or Heating distribution system to brass screw joints and threaded fittings.

Size (D)	Description	Art. No.
20mm	Union Socket	238020
25mm	Union Socket	238025
32mm	Union Socket	238032
40mm	Union Socket	238040
50mm	Union Socket	238050
63mm	Union Socket	238063





21.) Stainless Steel Non-Rising Stem Valve

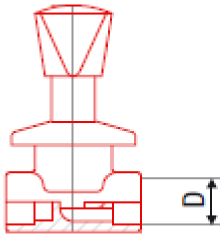
Our straight-way plastic valve not only allows for the closure of a distribution system but also enables partial flow regulation in specific sections. With proper operation and maintenance, the replacement parts ensure an almost endless service life.

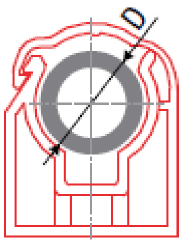
Size (D)	Description	Art. No.
20mm	S.S Non-Rising Stem Valve	304020
25mm	S.S Non-Rising Stem Valve	304025
32mm	S.S Non-Rising Stem Valve	304032
40mm	S.S Non-Rising Stem Valve	304040
50mm	S.S Non-Rising Stem Valve	304050
63mm	S.S Non-Rising Stem Valve	304063

22.) Chrome Plated Valve

An elegant concealed valve for closing branches of a DistributionSystem, intended for premises with higher aesthetic requirementsSuch as bathrooms, toilet rooms and wash rooms.

Size (D)	Description	Art. No.
20mm	Chrome Plated Valve	322020
25mm	Chrome Plated Valve	322025
32mm	Chrome Plated Valve	322032





23.) Pipe Clamp

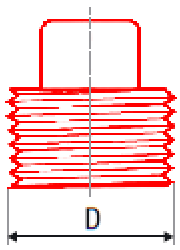
PP-Rc system accessory for fastening pipes.

Size (D)	Description	Art. No.
20mm	Pipe Clamp	901020
25mm	Pipe Clamp	901025
32mm	Pipe Clamp	901032
40mm	Pipe Clamp	901040

24.) Test Plug

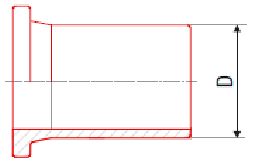
Temporary closure of threaded fittings in water or heating Distribution systems. It is used especially for blank wall-Mounted Tee fittings.

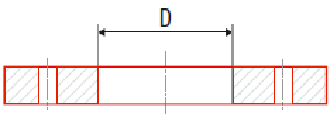
Size (D)	Description	Art. No.
½”	Test Plug	91403



25.) Flange set

A fitting and steel flange used for the transition from a welded part of a water or Heating distribution system to flange dismountable joints.





Size (D)	Description	Art. No.
32mm	Flange Set	231032
40mm	Flange Set	231040
50mm	Flange Set	231050
63mm	Flange Set	231063
75mm	Flange Set	231075
90mm	Flange Set	231090
110mm	Flange Set	231110
125mm	Flange Set	231125
160mm	Flange Set	231160
200mm	Flange Set	231200
250mm	Flange Set	231250

26.) Welding Socket

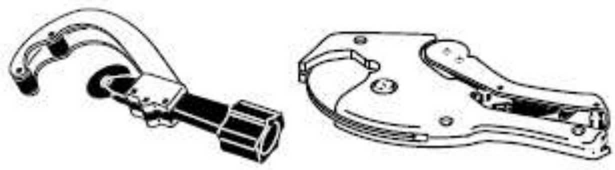
To connect pipes to valves, fittings, or other pipe sections, it is recommended to use fillet-type seal welds. Socket welded joints construction is an excellent choice, especially when high leakage integrity and exceptional structural strength are critical design considerations.

Size	Description	Art. No.
20mm	Welding Socket	20
25mm	Welding Socket	25
32mm	Welding Socket	32
40mm	Welding Socket	40
50mm	Welding Socket	50
63mm	Welding Socket	63
75mm	Welding Socket	75
90mm	Welding Socket	90
110mm	Welding Socket	110
125mm	Welding Socket	125
160mm	Welding Socket	160
200mm	Welding Socket	200
250mm	Welding Socket	250

27.) Pipe Cuter

A pipe cutter is a type of tool used by plumber to cut pipes. besides producing a clean cut, the tool is often a faster, cleaner, and moreconvenient way of cutting pipe

Size	Description	Art. No.
16-40 mm	Pipe Cutter	91411
50-250mm	Special Pipe Cuter	91412



28.) Welding Machine Set

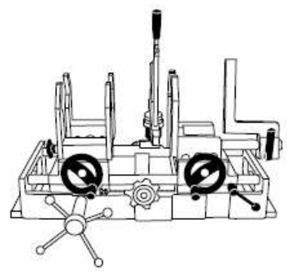
Our PP-Rc Pipe Welding Machine is designed for welding PP-Rc pipes and fittings. It features a high-quality PTFE non-stick coating, ensuring smooth and efficient welding operations.

Size	Description	Art. No.
20-32 mm	Welding Machine	91421
40-110mm	Welding Machine	91422

29.) Adjustable Welding Machine Set

Our PP-Rc Pipe Welding Machine is specifically designed for welding PP-Rc pipes and fittings. It is equipped with a high-quality PTFE non-stick coating, ensuring smooth and efficient welding operations.

Size	Description	Art. No.
125-250mm	Welding Machine	91423



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