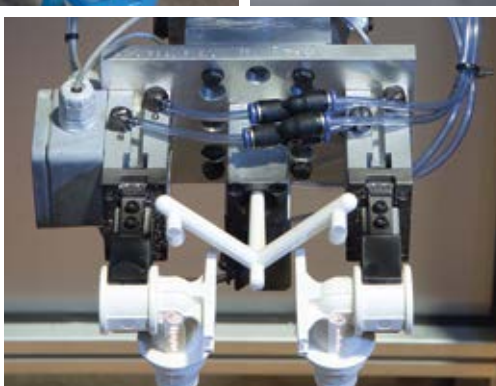


# Fusion-Tech Piping Design and Installation Manual



**aquatechnik®**

Professional **PP-R Fusion Pipe** Solutions for Fluid Handling Systems since 1985



The **aquatechnik**® Fusion-Tech Design and Installation Manual (the “manual”) is intended for use by a qualified installation/service technician or engineering personnel and is proprietary to **aquatechnik**® **S.p.A.** No part of this manual shall be reproduced, converted, or adapted for any commercial purpose, including without limitation, sale, resale, licence, rental or lease, without the prior express written consent of **aquatechnik**® **S.p.A.** and/or **aquatechnik North America (aquatechnik NA)**.

**aquatechnik**® **S.p.A.** and **aquatechnik NA** do not make any representations, warranties or guarantees, express or implied, as to the accuracy or completeness of the manual. Users must be aware that updates and amendments will be made to the manual every so often. It is the user’s responsibility to determine whether there have been any such updates or amendments. Neither **aquatechnik**® **S.p.A.** or **aquatechnik NA** nor any of their employees or agents shall be liable in contract, tort or in any other manner whatsoever to any person for any loss, damage, injury, liability, cost or expense of any nature, including without limitation incidental, special, direct or consequential damages arising out of or in connection with the use of the manual.

Should further information be required, please contact **aquatechnik NA** at 1 (844) FUSION3, or [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com).

## **PAY ATTENTION TO THESE TERMS**

**DANGER** = Indicates the presence of immediate hazards which will cause substantial property damage, severe injury or death if ignored.

**WARNING** = Indicates the presence of hazards or unsafe practices which could cause substantial property damage, severe injury or death if ignored.

**CAUTION** = Indicates the presence of hazards or unsafe practices which could cause minor personal injury or product or property damage if ignored.

**NOTICE** = Indicates special instructions on installation, operation or maintenance which are important but not related to personal injury.

Please visit the Professional Resources section at [aquatechnikNA.com](http://aquatechnikNA.com) for any technical updates.

## Table of Contents

<b>History of aquatechnik®</b>	<b>1</b>
<b>Introducing The New Generation of aquatechnik® Fusion Pipe Solutions</b>	<b>2</b>
<b>Basic Materials</b>	<b>3</b>
The Evolution	3
The New Generation	5
<b>SDR, Standard Dimension Ratio</b>	<b>7</b>
<b>aquatechnik® Piping Solutions</b>	<b>9</b>
Fusion-Tech Single Layer Pipes	9
Fusion-Tech PP-RCT 125 Fiber Reinforced Piping	11
<b>Piping Applications</b>	<b>14</b>
<b>Fittings</b>	<b>15</b>
<b>Designing Systems with Fusion-Tech Piping</b>	<b>16</b>
How to Choose the Most Suitable System	16
Working Pressure	17
Compressed Air	18
Marine Applications	18
Other Applications for aquatechnik® Pipe	18
Potable Water Applications	18
Systems with Different Fluids	18
Pipe Laying Techniques	19
<b>Sizing</b>	<b>20</b>
Continuous Pressure Drops	20
Recommended Velocity for Domestic and Sanitary Building Networks	20
Equivalent Lengths of Fittings (ft.)	21
Designing at Higher Velocities	35
<b>Laying Techniques</b>	<b>36</b>
Compensating for Thermal Linear Expansion	36
Diagram for Calculating Fixed Points in Branches and Right Angle Pipes	44
<b>Pipe Clamping</b>	<b>45</b>
<b>Energy Efficiency</b>	<b>51</b>
<b>Integrating with Other Systems</b>	<b>52</b>
<b>System Protection</b>	<b>54</b>

<b>Flame and Smoke Spread</b>	<b>56</b>
<b>Equipment &amp; Fusion Methods</b>	<b>57</b>
Socket Fusion	57
Electro-Fusion	61
Fusion Outlets	63
Butt Welding	66
Simple Pressure Welding Cycle	71
Repairs and Alterations	73
<b>Fitting Dimensions</b>	<b>74</b>
<b>Flushing the Sanitary System</b>	<b>92</b>
<b>Protection from UV Rays</b>	<b>94</b>
<b>Testing the System</b>	<b>95</b>
<b>Product Registration Form</b>	<b>97</b>
<b>Competences &amp; Responsibilities of aquatechnik®</b>	<b>98</b>
<b>Chemical Applications</b>	<b>99</b>
<b>Quality</b>	<b>100</b>
<b>Applicable Certifications, Standards and Regulations</b>	<b>101</b>
<b>Warranty</b>	<b>102</b>

# History of aquatechnik®

## A Growth-Oriented Family Business

**aquatechnik®** means “water technology,” a focal point that the firm has embraced and enhanced since the early 1980s when President and Owner Lino Petenà set out to be a leading manufacturer and distributor in the hydro-thermal-sanitary marketplace. From its northern Italy base of Magnago, a suburb of Milan, **aquatechnik®** produces sanitary, heating, air conditioning and compressed air PP-RCT 125 and PP-R Super 80 piping systems for residential, commercial and industrial applications for global distribution.

The firm’s 645,000 square-foot plant is a fully automated facility, covering every step of production, from injection molding, extrusion, pipe coating and PUR foam to the production of patented fittings and customized manifolds. The injection molding section alone produces 80 million PP-R and PP-RCT fittings a year. The ISO 9001 operation employs more than 150 **aquatechnik®** employees and it has an annual production capacity of 6,000 tons of PP-R and PP-RCT for pipe production. The production capacity for **aquatechnik®** Multi-Layer pipe exceeds 65 million feet annually.

The **aquatechnik®** research and development center ensures the firm’s commitment to high production quality, continuous improvement, safety assurance and environmental sustainability. The main warehouse, located adjacent to the production department, rapidly sorts and accurately maintains significant buffer stock inventory levels for distribution throughout Italy and 45 countries worldwide, including the United States and Canada.

Over the past four decades, the core family business values of **aquatechnik®** have remained constant, as any of the firm’s employees will attest. As **aquatechnik®** CEO Marco Petenà notes: “Our company is a family business. Every person who works with us is an important resource and a part of this family.”

## aquatechnik® Milestones

The firm’s founder Lino Petenà expanded his family owned hydro-thermal-sanitary products business into the marketing of polypropylene random copolymer (PP-R) pipes and fittings in northern Italy.

**1982**

**1984** After quickly establishing the Fusion-Tech piping system as a viable alternative to galvanized metal piping throughout Italy, the firm built a 17,000 square-foot headquarters and warehouse in the northern Italy town of Busto Arsizio, located 21 miles (34 km) northwest of Milan.

**1985** **aquatechnik®**, meaning “water technology,” is chosen as the firm’s name. The firm grows the popularity of its PP-R piping (Poly-propylene Random 80) and in-floor heating systems.

As more and more professionals moved to **aquatechnik®** PP-R piping solutions, the firm built learning centers to train engineers, installers and technicians in Italy.

**1990**

**1993** The firm opens its current 645,000 square-foot plant in Magnago, a community located near Busto Arsizio.

**1998** **aquatechnik®** Multi-Layer pipe and connections systems were introduced. The firm replaced the PP-R 80 Fusion-Tech piping range, and began producing PP-R Super 80 Fusion-Tech. The company launched its expansion into global sales and distribution.

**2003** **aquatechnik®** introduces the innovative, patented **Safety®-Pol** brass/plastic fittings.

**2007** The company grows its range of manifolds, and introduces **aquatechnik® faser FIBER-T** and **faser FIBER-COND**.

**2012** **aquatechnik®** releases a new range of **Safety®-Pol** PPSU fittings.

**2013** **aquatechnik®** launches a new standard for polypropylene pipe, **PP-RCT 125**, developed and perfected by the firm’s research and development division.

**2015** Celebrating the firm’s 30th anniversary, **aquatechnik NA** is formed to build and sustain selected distribution partners and sales in the United States, Canada and Mexico. The pipe earns NSF/ANSI 14, 61 and 372 standards certification.

**2017** **aquatechnik®** releases their pre-insulated iso-tech pipe, UV resistant Black Stripe Pipe and Safety-Pol PEX-AL-PEX piping in North America.

# Introducing The New Generation of aquatechnik® Fusion Pipe Solutions

Now available in North America, **aquatechnik**® PP-RCT 125 MOR (Maximum Oxidation Resistance) and PP-R Super 80 HTS (High Thermal Stabilization) fiber-reinforced piping deliver:

- Maximum resistance to oxidation
- Reduced wall thickness
- Increased flow rate
- High resistance to pressure
- Increased working temperatures
- Reduced weight
- Reduced thermal expansion
- Decreased number of supports
- Total compliance with standards regulating potable water transport
- Resistance to corrosion
- 100% recyclable material
- Low environmental impact

## Advantages of aquatechnik® Fusion-Tech Pipe

- Leak free connections with minimum turbulence
- Resistant to hard water and aggressive chemicals
- 100% virgin material, fully recyclable material
- Natural heat and sound insulation
- Industry leading flow rates
- NSF/ANSI 61 certified (potable water)
- NSF/ANSI 51 certified (food grade)
- NSF/ANSI 14 certified (mechanical)
- NSF/ANSI 372 (lead-free fittings)
- Safe, simple and fast assembly
- Suitable for direct buried and trenchless applications
- Installations are flame, smoke and odor free
- Reduces water hammer and vibration
- High resistance to oxidation
- Light weight
- Reduced thermal expansion
- Low environmental impact LCA product cycle
- 30 year industry leading warranty
- Chemically inert material
- Scale resistant
- Corrosion resistant
- Shatter resistant material

# Basic Materials

## High Performance Polymers for Different System Requirements

With thirty years experience in producing components for hydro-thermal-sanitary, mechanical and technological systems, **aquatechnik**® is constantly developing and customizing innovative solutions for specific applications. The firm now uses the highest quality of PP-R Super 80 and PP-RCT 125 materials. **aquatechnik**® piping now contain special additives that deliver a high resistance to oxidation and metal ions, and high stability at elevated temperatures. PP-R Super 80 HTS provides increased resistance to pressure/temperature, while PP-RCT 125 MOR ensures maximum oxidation resistance.

### The Evolution

**aquatechnik**® Fusion-Tech piping has used PP-R 80 material since the early 1980s. The number 80 correlates with ISO 9080 regression analysis, taking the value MRS=1160 psi (80 bar) from the 68°F curve for a duration of 50 years (see figure 1).

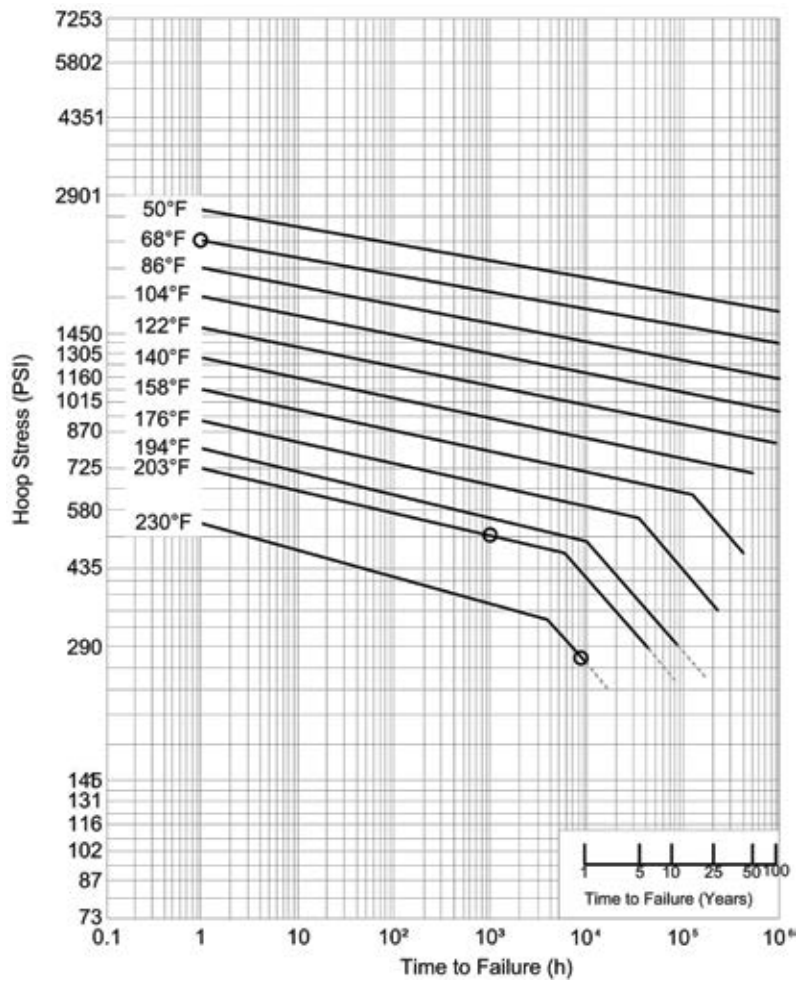


fig.1 ISO 9080 REGRESSION ANALYSIS for PP-R 80



At the end of the 1990s, **aquatechnik**® replaced the Fusion-Tech PP-R 80 range with the fusion-tech PP-R Super 80 product line. The new line enhanced product performance significantly, as verified by numerous tests done in the firm’s laboratories and at the most accredited polymer research institute in Europe.

The figure below shows how pipes extruded with PP-R Super 80 have higher performance. The reference point is the curve extrapolated at 68°F, where the MRS pressure value at 50 years is about 1450 psi, compared to 1160 psi. These discoveries can be shown for curves at high temperatures (158°, 203°, and 230°F).

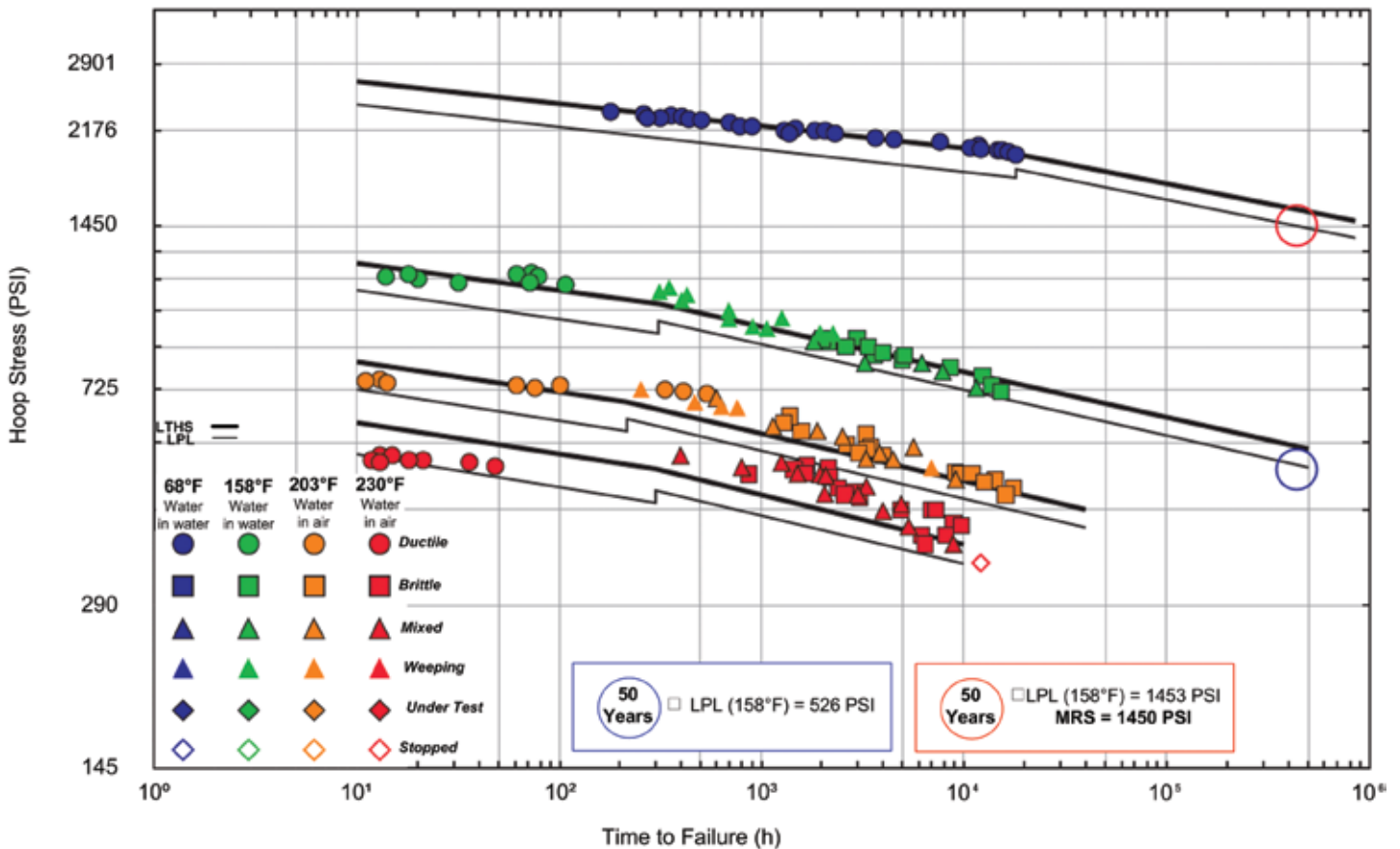


fig.2 ISO 9080 REGRESSION ANALYSIS for PP-R 80

From a performance standpoint, using this new material makes it possible to reduce the thickness while maintaining the same performance; tests done in compliance with the DIN 8077-8078 - EN/ISO 15874 - UNE 53380 standards have confirmed that SDR 7.4 (PN16) thickness pipes have the same performances as SDR 6 (PN20) thickness pipes at the conditions required by the above standards.

## The New Generation

### PP-RCT 125 MOR and PP-R Super 80 HTS Fiber-reinforced Piping

The **aquatechnik**® faser piping range consists of two types of 3-layer pipes made in PP-RCT 125 and PP-R Super 80 with a reinforced center layer made of special fibers. These pipes are called FIBER-T RED striped pipe SDR 7.4 (for sanitary and mechanical system applications) and FIBER-COND GREY striped pipe SDR 11& 17.6 (for mechanical system applications).

PP-RCT is the new generation of polypropylene, already in the EN ISO 15874 standard, with higher performing features than its predecessor PP-R 80.

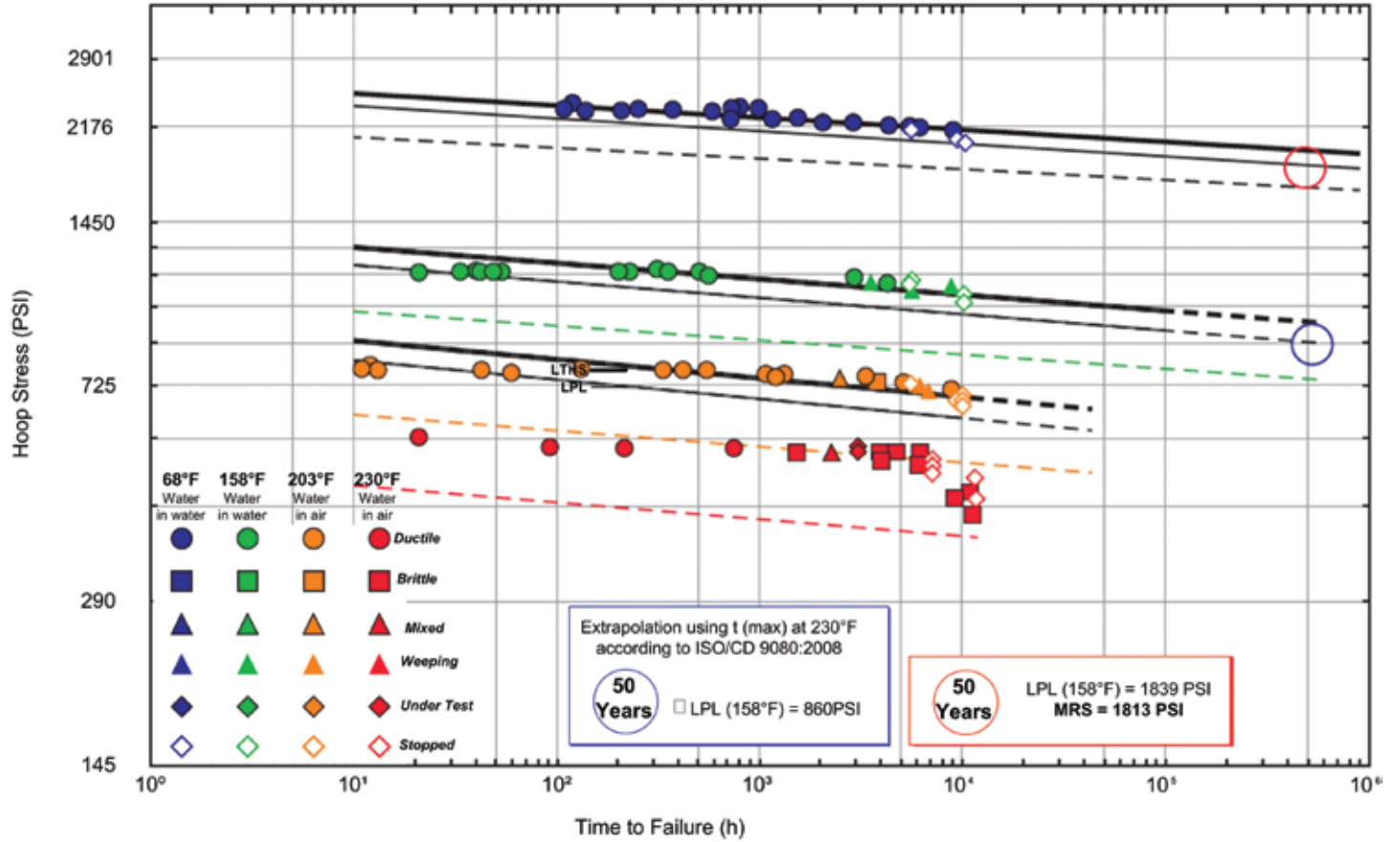


fig.3 ISO 9080 REGRESSION ANALYSIS for PP-RCT 125

With a reduced wall thickness, PP-RCT meets the most stringent certification testing, including NSF standards and EN ISO 15874 class 5 (working at high temperatures).

## PP-R Super 80 and PP-RCT 125 Comparison

	Units of Measurement	PP-R Super 80	PP-R CT 125
σLPL(68°F)	PSI	1450	1842
σLPL(158°F)	PSI	522	870
Melt INDEX Rate 190/5	g/10min.	0.5	0.4
Melt INDEX Rate 230/5	g/10min.	1.3	1
Melt INDEX Rate 230/2.16	g/10min.	0.3	0.2
Breakage Resistance	%	10	12
Melting Point	°F	207.5	213
Yield Strength	PSI	122992	123282

σLPL = Lower confidence limit of the predicted hydrostatic strength

Table 1

**aquatechnik**® is now adding MOR (MAXIMUM OXIDATION RESISTANCE) additives to its raw material, improving performance at high temperatures over time and significantly slowing the oxidation process of plastic materials when subjected to highly oxidizing substances that may be diluted in water.

With this new modification to the raw material, **aquatechnik**® introduced the faser FIBER-T RED Striped pipe range to the market, a system that gives greater safety and reliability when transporting potable water in sanitary and heating systems.

The actual increase in resistance to oxidation using the PP-RCT MOR system is proven by tests performed in the **aquatechnik**® laboratories, in collaboration with industry leaders in the continuous chlorination system sector.

For applications in mechanical systems, **aquatechnik**® has developed HTS (High Thermal Stabilization) additives to improve raw material resistance to temperatures and enhance the longevity of the pipe.

The main advantages of PP-RCT MOR piping are:

- High resistance to oxidation;
- Reduced wall thickness;
- Increased flow rate;
- High resistance to pressure;
- Increased working temperatures;
- Reduced weight;
- Reduced thermal expansion;
- Decreased number of supports;
- Total compliance with standards regulating potable water transport;
- Resistance to corrosion;
- 100% recyclable material;
- Low environmental impact.

# SDR, Standard Dimension Ratio

SDR (Standard Dimension Ratio) is the ratio between the external pipe diameter and its nominal thickness. It is used as a method to classify plastic pipes dimension by rating the pipes durability against pressure.

Each SDR rating has its own advantages. SDR rating is the primary factor used to engineer an **aquatechnik**® piping system for a specific application.

## SDR 7.4

Pipe with the SDR 7.4 rating have the thickest wall which allows it to withstand high pressure and temperature applications.

The following Fusion-Tech pipes utilize SDR 7.4:

Pipe Type	Nominal Diameter
Fusion-Tech faser FIBER-T RED Striped Pipe	1/2" - 4"

## SDR 11

Pipe with the SDR 11 rating have a thinner wall which allows for higher flow rates at high pressures.

The following Fusion-Tech pipes utilize SDR 11 wall thickness:

Pipe Type	Nominal Diameter
Fusion-Tech faser FIBER-T RED Striped Pipe	6" - 16"
Fusion-Tech faser FIBER-COND GREY Striped Pipe	1" - 12"
Fusion-Tech BLUE Striped Pipe	1/2" - 8"
Fusion-Tech VIOLET Pipe	1/2" - 8"

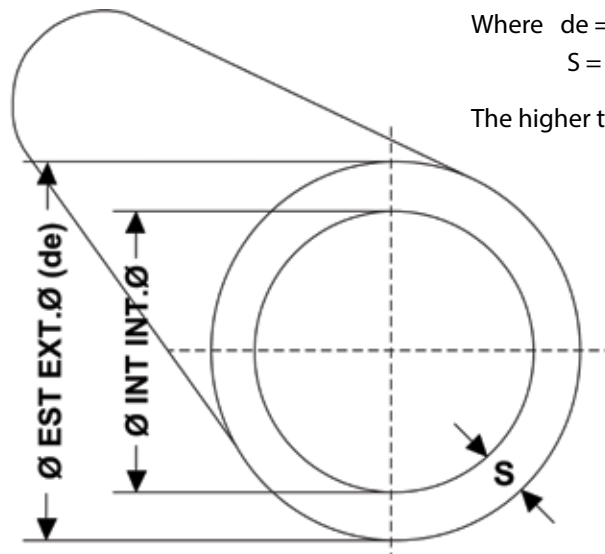
## SDR 17.6

Pipe with the SDR 17.6 rating have a thinner wall which allows for higher flow rates at lower pressures.

The following Fusion-Tech pipes utilize SDR 17.6 wall thickness:

Pipe Type	Nominal Diameter
Fusion-Tech faser FIBER-COND GREY Striped Pipe	6" - 16"

$$SDR = \frac{de}{s}$$



Where de = external diameter  
S = thickness

The higher the SDR value, the thinner the pipe wall

fig. 4

## Nominal Imperial Sizing

**aquatechnik**® pipe is manufactured in metric sizes. The table below converts these sizes to Imperial nominal diameters for the North American Market based on their equivalent diameter.

The metric outside diameter or O.D., as well as the corresponding nominal diameter, is printed on each pipe length and fittings bag.

### Comparison of Water Capacity (gal/ft)

Metric O.D.	Nominal Diameter
20mm	1/2"
25mm	3/4"
32mm	1"
40mm	1 1/4"
50mm	1 1/2"
63mm	2"
75mm	2 1/2"
90mm	3"
110mm	3 1/2"
125mm	4"
160mm	6"
200mm	8"
250mm	10"
315mm	12"
355mm	14"
400mm	16"

Nominal Pipe Diameter	SDR 7.4	SDR 11	SDR 17.6
1/2"	0.013	0.017	-
3/4"	0.024	0.026	-
1"	0.034	0.043	-
1 1/4"	0.053	0.067	-
1 1/2"	0.083	0.105	-
2"	0.133	0.167	-
2 1/2"	0.187	0.237	-
3"	0.270	0.343	-
3 1/2"	0.402	0.512	-
4"	0.521	0.661	0.776
6"	-	1.082	1.271
8"	-	1.692	1.985
10"	-	2.646	3.104
12"	-	4.201	4.927
14"	-	5.338	6.264
16"	-	6.755	7.948

# aquatechnik® Piping Solutions

## Fusion-Tech Single Layer Pipes

### Fusion-Tech BLUE Striped system - SDR 11

#### Description

PP-RCT 125 MOR pipe and fittings connect to each other through thermal polyfusion welding. Fusion-Tech BLUE striped pipe is able to transport potable cold water and aggressive fluids, as it is highly resistant to corrosive, alkali and acidic agents. If transporting chemical products, contact the **aquatechnik NA** Technical Department at 1 (844) FUSION3, or [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com)

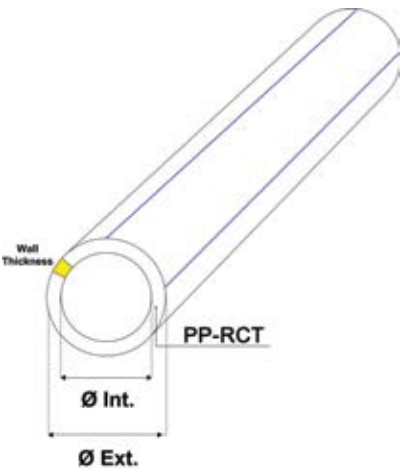


fig. 5

#### Datasheet

Raw material: PP-RCT 125 MOR  
 Series: S 5  
 Thermal conductivity at 68°F: 0.0423 BTU (h)/hr/ft<sup>2</sup>/F  
 Expansion coefficient: 0.001008 in./ft.°F  
 Internal roughness: 0.00028 inches  
 Color: White with blue stripes  
 Sizes: from Ø 1/2" to Ø 8"  
 Marking: done by electronic equipment that stamps an inscription with dashed spaces on every linear 3 ft., as shown in the example below:

**aquatechnik®** article PP-RCT 125 MOR Fusion-Tech DDxS,S SDR11—NSF 14—DIN 8077/8078—IIP282 UNIENISO15874—AENOR001/682—HH:MM GG.MM.AA LX Lotto XXXXXXXXX----- made in Italy

**Working conditions:** see the tables 4 & 5 on pages 17-18.

### Product Specification - Fusion-Tech BLUE Striped PP-RCT 125 MOR

Part No.	Nominal Diameter	Ø ext.	Ø int.	Wall Thickness	SDR	Length	H2O Content	Weight	Amount per Bundle
	in								
61208U	1/2	20	0.638	0.075	11	19	0.017	0.072	328
61210U	3/4	25	0.803	0.091	11	19	0.026	0.110	328
61212U	1	32	1.031	0.114	11	19	0.043	0.179	131
61214U	1 1/4	40	1.283	0.146	11	19	0.067	0.277	131
61216U	1 1/2	50	1.606	0.181	11	19	0.105	0.429	66
61218U	2	63	2.024	0.228	11	19	0.167	0.679	66
61220U	2 1/2	75	2.417	0.268	11	19	0.238	0.954	66
61222U	3	90	2.898	0.323	11	19	0.343	1.390	39
61224U	3 1/2	110	3.543	0.394	11	19	0.512	2.023	26
61226U	4	125	4.024	0.449	11	19	0.661	2.520	13
61228U	6	160	5.150	0.575	11	19	1.082	4.539	19
61230U	8	200	6.441	0.717	11	19	1.693	7.150	19

**Fields of use:** Potable cold water and irrigation

## Fusion-Tech VIOLET Pipe - SDR 11

### Description

PP-R Super 80 pipe and fitting systems are assembled by polyfusion welding. They can be used in external and/or buried applications. The solution for rainwater and grey water systems, Fusion-Tech VIOLET pipe's purpose is to carry recycled, reclaimed and rainwater.

More responsible water usage standards are being written into codes and specified on more and more projects. Since these systems must be kept entirely separate from potable systems to meet most codes, they must be color coded or labeled as non-potable, like the **aquatechnik®** Fusion-Tech VIOLET Pipe.

Fusion-Tech VIOLET Pipe is the solution for non-potable systems due to its resistance to scale and corrosion and non-microbiological growth combined with its easily recognized vibrant color.

The raw material making up the pipes is polypropylene copolymer random (PP-R Super 80) with additives to increase resistance to low PH levels and high alkalinity.

The color identifying these pipes is violet, as required by the standards: pipes with a recovery function must be easily differentiated from those carrying potable water.

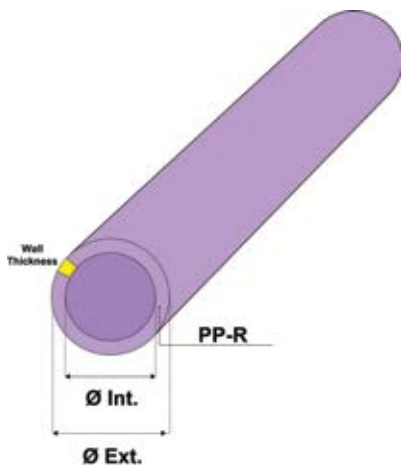


fig. 6

### Datasheet and Marking

Raw material: PP-R Super 80

Series: S 5

Thermal conductivity at 68F: 0.0423 BTU (h)/hr/ft<sup>2</sup>/F

Expansion coefficient: 0.001008 in/ft degrees f

Internal roughness: 0.00028 inches

Color: violet

Sizes: from Ø 1/2" to Ø 10"

Marking: done by electronic equipment that stamps an inscription along the trajectory with dashed spaces on every 3 feet, as shown in the example below

**aquatechnik®** art.xxx PP-R Rain-Water inc 1"x0.11"/ mm 32x2, 9 SDR11---NSFrw

**Working conditions:** see the table 4 on pg 17.

### Product Specification - Fusion-Tech Rain Water VIOLET Pipe PP-R Super 80

Part No.	Nominal Diameter	Ø ext.	Ø int.	Wall Thickness	SDR	Length	H2O Content	Weight	Amount per Bundle
	in	mm	in	in		ft.	US gal/ft.	lbs/ft.	ft.
61608	1/2	20	0.638	0.075	11	13	0.017	0.072	328
61610	3/4	25	0.803	0.091	11	13	0.026	0.110	328
61612	1	32	1.031	0.114	11	13	0.043	0.179	131
61214	1 1/4	40	1.283	0.146	11	13	0.067	0.277	131
61216	1 1/2	50	1.606	0.181	11	13	0.105	0.429	66
61618	2	63	2.024	0.228	11	13	0.167	0.679	66
61620	2 1/2	75	2.417	0.268	11	13	0.238	0.954	66
61622	3	90	2.898	0.323	11	13	0.343	1.390	39
61624	3 1/2	110	3.543	0.394	11	13	0.512	2.023	26
61626	4	125	4.024	0.449	11	13	0.661	2.520	13
61628	6	160	5.150	0.575	11	13	1.082	4.539	13

\*For larger diameter pipes please consult your local representative

**Fields of use:** The rainwater line is dedicated to transporting recycling and recovery water, as well as rainwater. Water deriving from these sources can be used for the following purposes:

- Domestic use not in contact with people: i.e. Restrooms to supply toilet tanks, supplying electrical appliances
- Decorative: i.e. Fountains
- Commercial: i.e. Car washes, industrial process fluid use, courtyard area washing, etc.
- Irrigation: i.e. Green spaces, gardens, etc.
- Emergency water supply: i.e. Supplying fire prevention tanks (**hydrants**)

### Advantages

- Fully recyclable
- Durable and long lasting
- Fast and reliable fittings
- Light and able to resist lower temperature ranges
- Vibrant color prevents cross-contamination with potable lines
- Corrosion resistant pipe and fittings

## Fusion-Tech PP-RCT 125 Fiber Reinforced Piping

The **aquatechnik**® R & D laboratory, created a 3-layer pipe with a center layer made of special fibers that reduce linear thermal expansion by up to 70%, when compared to single layer PP-R. This is done by using high thermal resistant polypropylene as a raw material combined with oxidation-resistant additives. These features also allow the wall thickness to be reduced, thus increasing flow rates by more than 20% for the faser FIBER-T **RED** striped pipe and more than 40% for the faser FIBER-COND **GREY** striped pipe.

**aquatechnik**® is the first company to obtain IIP (Institute of Italian Piping) approval for this type of piping.

## Heat Fusion Connections

The **aquatechnik**® piping systems are made using heat fusion, a simple process that makes a homogeneous union of a PP-R pipe and fitting.

## Longevity

**aquatechnik**® PP-R piping systems outperform conventional systems by eliminating the potential for scaling, corrosion and biological build up.

Lower friction on the walls of the pipe and smoother surfaces on the fittings ensure a longer lifecycle than that of conventional systems.

An **aquatechnik**® piping system will tolerate physical stress better with a heat fusion joint being stronger than the pipe itself.

**aquatechnik**® piping systems outlast conventional systems and provide years of safe and reliable performance, requiring low maintenance service.



## Fusion-Tech faser **FIBER-T RED** Striped piping - SDR 7.4 & 11

### Description

PP-RCT 125 fiber-reinforced piping is assembled by polyfusion welding. Fusion-Tech faser **FIBER-T RED** striped piping features SDR 7.4 from 1/2" to 4", and SDR 11 from 6" to 12". The highly chlorine and metal ion resistant PP-RCT 125 MOR is recommended for sanitary, mechanical, compressed air, or some chemical fluid systems. When transporting chemical products, check suitability with the **aquatechnik NA** Technical Department at 1 (844) FUSION3, or [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com)

### Datasheet and Pipe Marking

Raw material: PP-RCT 125 MOR /PP-RF/PP-R SUPER 80  
 Series: SDR 7.4 from 1/2" to 4"; SDR 11 from 6" to 16"  
 Thermal conductivity at 68 ° F: 0.0423 BTU(h)/hr/ft2/F  
 Expansion coefficient: at 0.0002367 in/ft ° F  
 Internal roughness: 0.00028 inches  
 Color: white with red stripes  
 Sizes: Ø 1/2" to Ø 16"

Marking: done by electronic equipment that stamps an inscription along the pipe with dashed spaces and information below every 3 feet, as shown in the example below:

**aquatechnik**® article PP-RCT/PP-RF/PP-R FUSION-TECH - faser FIBER-T DDxS,S SDR7,4---EN ISO 15874---NSF 61---NSF 14---DIN 16837---IIP282--- HH:MM GG.MM.AA LX Lotto XXXXX--- ---made in Italy-----

**Working conditions:** see the tables 4 & 5 on pg 17-18.

### Product Specification - Fusion-Tech faser **FIBER-T RED** Striped PP-RCT 125

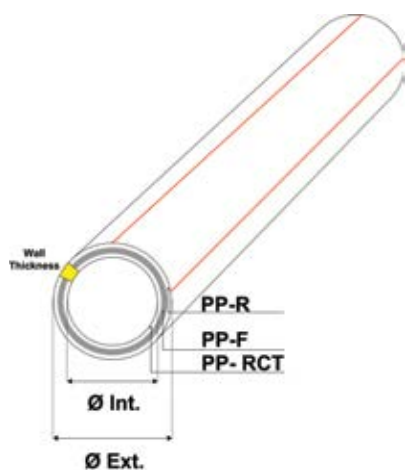


fig. 7

Part No.	Nominal Diameter	Ø ext.	Ø int.	Wall Thickness	SDR	Length	H2O Content	Weight	Amount per Bundle
	in	mm	in	in		ft.	US gal/ft.	lbs/ft.	ft.
61358U	1/2	20	0.567	0.110	7.4	19	0.013	0.101	328
61360U	3/4	25	0.709	0.138	7.4	19	0.022	0.156	328
61362U	1	32	0.913	0.173	7.4	19	0.034	0.255	131
61364U	1 1/4	40	1.142	0.217	7.4	19	0.053	0.388	131
61366U	1 1/2	50	1.425	0.272	7.4	19	0.083	0.581	66
61368U	2	63	1.803	0.339	7.4	19	0.133	0.927	66
61370U	2 1/2	75	2.142	0.406	7.4	19	0.187	1.320	66
61372U	3	90	2.575	0.484	7.4	19	0.270	1.899	39
61374U	3 1/2	110	3.142	0.594	7.4	19	0.403	2.904	26
61376U	4	125	3.575	0.673	7.4	19	0.521	3.523	13
61378U	6	160	5.150	0.575	11	19	1.081	4.539	19
61380U	8	200	6.441	0.717	11	19	1.693	7.150	19
61382U	10	250	8.055	0.894	11	19	2.647	10.604	19
61384U	12	315	10.150	1.126	11	19	4.201	17.202	19
61386U	14	355	11.44	1.268	11	19	5.338	22.457	19
61388U	16	400	12.88	1.429	11	19	6.755	28.498	19

**Fields of use:** The large diameter range and the wide choice of pipes allow the system to be used in most fields including civil, industrial and service sectors for hydro-sanitary, heating, irrigation and compressed air systems.

## Fusion-Tech faser FIBER-COND GREY Striped Pipe - SDR 11

### Description

High thermal stabilization PP-RCT 125 MOR SDR 11 faser FIBER-COND GREY striped pipe

faser FIBER-COND GREY striped pipe has the highest volumetric flow rates in the industry, combined with resistance to seismic stresses, impact and corrosion. faser FIBER-COND GREY Striped Pipe is recommended for the following mechanical applications: heating and air conditioning, compressed air, some chemical applications. It is NOT suitable for potable water.

The high performance of the raw materials used allows for systems to be created with thinner pipe walls compared to conventional piping, thereby increasing the overall water flow rate.

### Advantages

- Fast welding
- Corrosion free pipe and fittings
- Industry leading flow rate
- Resistant to most chemicals
- Naturally dampens sound
- Natural thermal insulator
- Light and impact resistant
- Durable and long lasting

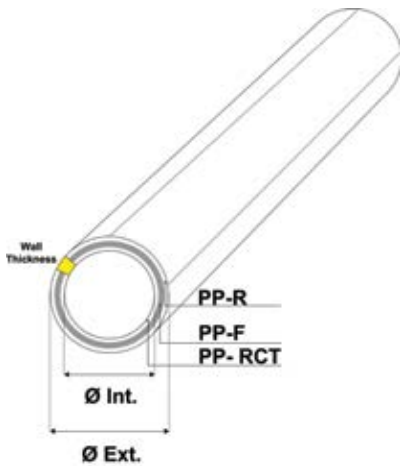


fig. 8

### Datasheet and Marking

Raw material: PP-RCT 125 MOR/PP-RF/PP-R SUPER 80

Series: S 5 from 1" to 12" SDR 11

S 5 from 6" to 16" SDR 17.6

Thermal conductivity at 68F: 0.0423 BTU(h)/hr/ft<sup>2</sup>/F

Expansion coefficient: at 0.0002367 in/ft degrees f

Internal roughness: 0.00028 inches

Sizes: from Ø 1" to Ø 12" SDR 11

from Ø 6" to Ø 16" SDR 17.6

Color: white with grey stripes

Marking: done by electronic equipment that stamps an inscription along the pipe with the pipe information every 3 feet, as shown in the example below

**aquatechnik**® article PP-RCT/PP-RF/PP-R FUSION-TECH – faser FIBER-COND GREY Striped Pipe DDxS,S SDR11---EN ISO 15874--NSF 14---DIN16837---IIP282---HH:MM GG.MM.AA LX Lotto XXXXX--- ---made in Italy

**Working conditions:** see the tables 4 & 5 on pg 17-18.

### Product Specification - Fusion-Tech faser FIBER-COND GREY Striped Piped PP-RCT 125

Part No.	Nominal Diameter	Ø ext.	Ø int.	Wall Thickness	SDR	Length	H2O Content	Weight	Amount per Bundle
	in	mm	in	in		ft.	US gal/ft.	lbs/ft.	ft.
61462U	1	32	1.031	0.114	11	19	0.043	0.179	131
61464U	1 1/4	40	1.283	0.146	11	19	0.067	0.277	131
61466U	1 1/2	50	1.606	0.181	11	19	0.105	0.429	66
61468U	2	63	2.042	0.228	11	19	0.167	0.679	66
61470U	2 1/2	75	2.417	0.268	11	19	0.238	0.954	66
61472U	3	90	2.898	0.323	11	19	0.343	1.390	39
61474U	3 1/2	110	3.543	0.394	11	19	0.512	2.023	26
61476U	4	125	4.017	0.449	11	19	0.661	2.520	13
61478U	6	160	5.150	0.575	11	19	1.082	4.539	19
61480U	8	200	6.441	0.717	11	19	1.693	7.150	19
61482U	10	250	8.055	0.894	11	19	2.647	10.604	19
61484U	12	315	10.150	1.126	11	19	4.201	17.202	19
61476UZ	4	125	4.362	0.280	17.6	19	0.081	1.868	19
61478UZ	6	160	5.583	0.358	17.6	19	1.271	3.037	19
61480UZ	8	200	6.976	0.449	17.6	19	1.985	4.717	19
61482UZ	10	250	8.724	0.559	17.6	19	3.104	7.331	19
61484UZ	12	315	10.992	0.705	17.6	19	4.927	11.565	19
61486UZ	14	355	12.394	0.791	17.6	19	6.264	14.669	19
61488UZ	16	400	13.961	0.894	17.6	19	7.948	18.593	19

**Fields of use:** The system is ideally suited for mechanical, heating, chilled water and compressed air systems.

# Piping Applications

- Recommended for Technical Advantage
- Possible Use (Contact aquatechnikNA)
- Not Recommended

	<i>Fusion-Tech faser FIBER-T RED Striped Pipe</i>	<i>Fusion-Tech faser FIBER-COND GREY Striped Pipe</i>	<i>Fusion-Tech BLUE Striped Pipe</i>	<i>Fusion-Tech VIOLET Pipe</i>
Potable hot water	●	●	●	●
Potable cold water	●	●	●	●
High temperature heating	●	●	●	●
Conditioning/cooling	●	●	●	●
Chilled water	●	●	●	●
Swimming pools	●	●	●	●
Conveying chemicals*	●	●	●	●
Rainwater	●	●	●	●
Irrigation	●	●	●	●
Compressed air	●	●	●	●
Radiant panel heating	●	●	●	●
Naval	●	●	●	●
District heating**	●	●	●	●
Geothermal	●	●	●	●
Agriculture	●	●	●	●

\* After a corporate technical evaluation  
 \*\* At low temperature (max 194°F)

Table 2

# Fittings

## Description

**aquatechnik®** offers a comprehensive series of PP-R fittings for Fusion-Tech pipe systems. The range includes transition fittings, male/female threaded connections, flanged joints, valves as well as supplementary fittings that allow you to connect all the pipe and fittings offered by **aquatechnik®**. The parts are connected through polyfusion welding (socket welding up to 4", butt welding from 6"-16"), a process that ensures maximum seal efficiency. Fittings are available in SDR 5 for socket welding and SDR 11 for butt-welding."

**aquatechnik®** has created a dedicated production department for manifolds and custom design requests. This department is supported by a technical office with a team of specialists. In addition to designing custom parts for projects, they also assist in system design.



## Technical Features and Marking

The Fusion-Tech series fittings are moulded in PP-R SUPER 80. The threaded parts are produced by putting in a brass insert embedded in the plastic material. In order to reach the highest quality standards, **aquatechnik®** uses special brass alloys with the highest mechanical performance, in compliance with the increasingly stringent standards in regard to contact with potable water.

- **Color**  
White (with lead-free brass insert)
- **Thickness**  
Fittings up to 4": SDR 5 (some exceptions)  
Fittings from 6" and up: SDR 11\*
- **Reference standards**  
Product in compliance with NSF/ANSI 14, NSF/ANSI 61 and NSF/ANSI 372
- **Field of use**  
Can be used with all the Fusion-Tech pipe ranges
- **Marking**  
All the Fusion-Tech range fittings (except when the reduced dimensions of the parts do not allow it) bear the company information, the year of manufacture and part measurements

\* Fittings used with SDR 17.6 pipe (6"-16") use SDR 17.6 fittings.

# Designing Systems with Fusion-Tech Piping

Fusion-Tech systems allow for the development of cold or hot potable water distribution networks, reuse water distribution networks, heating/cooling networks and technological systems. Designing with Fusion-Tech systems offers the following advantages:

- Simplified design calculations and implementation of the products;
- Consistency in line processing and piping support;
- Reduced heat dispersion from the distribution networks (thermal conductivity  $\lambda$  0.127 btu/hr-ft-°F for Fusion-Tech **BLUE** striped & **VIOLET** thermal conductivity  $\lambda$  0.120 btu/hr-ft-°F for Fusion-Tech **RED** & **GREY** striped pipes );
- Reduced electrical consumption by the circulation pumps, due to low friction coefficient;
- Extended life cycle, exceeding 50 years, so long as manufacturer’s specifications and instructions are met;
- Eco-sustainability: 100% recyclable.

During the design stage, **aquatechnikNA** is available for consultation at 1 (844) FUSION3 or via email, [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com)

## How to Choose the Most Suitable System

Choosing the most suitable system for your application is based on whether you intend to use lines for potable water or mechanical systems. Chemical compatibility between the fluid carried and the polypropylene needs to be verified. Another important factor is the method in which the pipe is being laid. In the event the pipe is being concealed or buried, all types of pipe may be used. For exposed applications, **aquatechnik**® recommends fiber-reinforced pipes as they reduce linear thermal expansion; however, all pipes may be used in this manner so long as the system is designed properly for thermal expansion.

Recommended installation	Fusion-Tech <b>BLUE</b> Striped Pipe and <b>VIOLET</b> Pipe		Fiber-reinforced pipes	
	SDR 11		<i>faser</i> FIBER-T <b>RED</b> Striped Pipe	<i>faser</i> FIBER-COND GREY Striped Pipe
Concealed or underground	●		●	●
Exposed	●		●	●

Table 3

● Recommended for Technical Advantages

● Possible Use

It is necessary to consider the working temperatures and pressures, as well as the type of circuit (open circuit for sanitary systems and closed circuit for heating/cooling systems).

Working Pressure

		Fusion-Tech faser FIBER-T RED Striped Pipe			Fusion-Tech faser FIBER-T RED & FIBER-COND GREY Striped Pipe	Fusion-Tech BLUE Striped Pipe	Fusion-Tech VIOLET Pipe	Fusion-Tech faser FIBER-COND GREY Striped Pipe
		SDR 7.4 SF 1.25	SDR 7.4 SF 1.5	SDR 11 SF 1.5	SDR 11 SF 1.25	SDR 11 SF 1.5	SDR 11 SF 1.5	SDR 17.6 SF 1.25
°F	years	psi	psi	psi	psi	psi	psi	psi
50	10	550	455	288	348	288	263	208
	25	529	441	280	335	280	241	201
	50	515	429	272	326	272	219	195
	100	486	406	257	308	257	213	184
70	10	496	413	262	314	262	233	188
	25	478	398	253	302	252	213	181
	50	466	388	246	295	246	194	177
	100	441	367	233	279	233	188	167
90	10	442	369	234	280	234	202	168
	25	423	355	225	268	225	186	160
	50	416	347	220	264	220	170	158
	100	395	329	209	250	209	163	150
100	10	389	324	205	246	205	171	147
	25	375	312	198	237	198	158	142
	50	366	305	194	232	193	145	139
	100	350	292	185	222	185	138	133
120	10	335	279	177	212	177	141	127
	25	326	271	172	207	172	131	124
	50	317	264	168	201	167	120	120
	100	304	254	161	193	161	114	115
140	10	282	235	149	178	149	110	107
	25	272	225	143	172	143	103	103
	50	267	223	141	169	141	95	101
160	10		190	120	144	120	79	87
	25	220	184	117	140	116	76	84
	50	218	181	115	138	115	71	83
180	10	193	160	102	122	102		73
	25	184	151	96	116	96		70
200	5	147	123	78	93	78		55
	10	139	115	73	89	73		52

SF = Safety Factor

Table 4

Note: For applications with chilled water mixed with ethylene glycol or glycerin, (-4°F temperature limit.) separate the lines from the circulators with rubber anti-vibration joints.

## Compressed Air

**aquatechnik**® Fusion-Tech piping is suitable for use with compressed air systems because the pipe will not corrode, ensuring rust or debris build-up will not occur in your machinery or valves. The faser FIBER-T **RED** striped pipe is recommended because of its wall thickness wall (SDR 7.4), which ensures a higher maximum allowable pressure and a higher tolerance to shattering.

Both single layer and fiber-reinforced pipes can be used in exposed applications. Fiber-reinforced pipes allow for considerable savings by reducing the number of supports needed. Single layer pipes are generally used in concealed installations as they do not require as many supports as exposed applications.

### Maximum Recommended System Pressures for Compressed Air

Type of Pipe	Fusion-Tech <b>BLUE</b> Striped Pipe (SDR 11)	Fusion-Tech faser FIBER-T <b>RED</b> Striped Pipe (SDR 7.4)	Fusion-Tech faser FIBER-T <b>RED</b> Striped & FIBER-COND <b>GREY</b> Striped Pipe (SDR 11)
System Pressure(psi)	125	220.5	125
Operating Pressure with ambient temperatures between 41°F - 104°F			

Table 5

To check the working pressures, consult the **aquatechnik NA** Technical Department at 1 (844) FUSION3, or [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com)

## Marine Applications

The **aquatechnik**® Fusion-Tech faser FIBER-T **RED** striped pipe, faser FIBER-COND **GREY** striped pipe and **BLUE** striped pipe material acts as a water repellent, making the piping ideal for use in the marine industry. It is unaffected by saltwater, freshwater or brackish water and is a low friction material; increasing flow rates.

## Other Applications for aquatechnik® Pipe

**aquatechnik**®'s Fusion-Tech faser FIBER-T **RED** striped pipe and faser FIBER-COND **GREY** striped pipe can be used in many other applications, including heating systems, chilled water systems, in-floor heating, direct bury and some chemical applications (consult factory).

Fusion-Tech **VIOLET** pipe is used for grey water, irrigation and rain water collection.

Fusion-Tech **BLUE** striped pipe is recommended for potable cold water but, may be used for other applications. Please consult your **aquatechnik**® distributor or the application chart in table 2, pg 14 for other application inquiries you may have.

## Potable Water Applications

**aquatechnik**® Fusion-Tech faser FIBER-T **RED** striped pipe is NSF 61 certified for potable water installations, as well as many other building applications. Fusion-Tech **BLUE** striped pipe is also NSF 61 certified for potable cold water **only**. Using these two piping systems is ideal for residential, commercial, institutional, industrial as well as various other projects.

## Systems with Different Fluids

Fusion-Tech systems can also be used to transport chemicals. Please contact the Technical Department at 1 (844) FUSION3, or [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com). (Please have the following information available: the type of fluid you intend to carry, the temperature, the pressure and the annual hours of operation.)

Note: A series of special fittings are available that do not allow the fluid to come in contact with metal components.

## Pipe Laying Techniques

Both plastic and metal piping undergoes linear thermal expansion when the temperature of the transported fluid increases. Linear expansion creates mechanical stress that, if not properly contained, may damage the system.

### Pipe Laying Outside Buildings

When installing pipe for sanitization or potable water outside of buildings (i.e., crossing over fields or gardens), the pipe must be installed in compliance with the local authority having jurisdiction. In the event of a buried application, the piping is defined as self-compensating. The excavation must be deep enough to prevent ice from forming, and the pipe must be evenly surrounded by sand. During backfilling, care must be taken not to damage the pipes. Pipes must also be protected from crushing, notably when crossing under traffic areas.

The installation must provide access points. Precautions must be taken where there is a risk of pipe contamination; in these cases, suitable protective sheaths are recommended.

In the event of exposed applications outside of buildings, appropriate thermal isolation must be provided to prevent the formation of ice and to provide proper protection from UV rays.

### Pipe Laying Inside Buildings

When laying pipe inside a building, it may be concealed or visible.

When concealing pipe, the effects of linear thermal expansion are not considered, as the pipe is considered to be self-compensating.

When pipe is left visible, linear thermal expansion must be considered. When securing pipe made of synthetic materials, specific sliding collars may be required to allow the pipe to slide, and fixed point collars may be required to lock the pipe. When creating the fixed point, you must ensure rigid anchoring, using threaded bars with an appropriate diameter to support and prevent sagging.

The effect of linear thermal expansion is not considered when installing vertical risers from an aesthetic standpoint; however, proper supports are necessary from a functional aspect. Pipe must be secured only at fixed points; this is essential especially near tee branches. The fixed points must be positioned both immediately after the fitting (following the direction of flow) and at the start of the branch line. For vertical risers, the support distances must be increased by 20% from what is shown in the tables.

When installing long straight runs of exposed pipe with external supports (for example, basements, boiler rooms and power stations), omega expansion compensators or direction changes with flex curves must be created.

For installations with many direction or level changes and with short straight sections (<100ft.), the effects of expansion may be ignored, securing the pipe with only fixed points.



# Sizing

**aquatechnik**® products should be designed in compliance with the local authority having jurisdiction regarding pipe sizing for potable water systems.

When sizing complex piping systems, determine the water supply required, considering maximum admissible velocity, noise, water hammer and overall pressure drops.

**Caution:** Ensure velocities do not exceed **aquatechnik**®'s recommended maximum velocities. Failure to do so may cause degradation to the pipe resulting in premature failure.

**Warning:** When mixing pipe materials in a system the maximum velocity for the materials must be respected.

e.g. When mixing PP-R and copper are being used the system must be designed at the velocity of the copper as it is lower than PP-R.

## Continuous Pressure Drops

A pressure drop is a reduction in pressure caused by resistance that opposes the movement of a fluid.

## Recommended Velocity for Domestic and Sanitary Building Networks

Section of Pipe	Maximum Velocity	
	≤ 15 min.	> 15 min.
Connecting Lines	6.6 ft/s	6.6 ft/s
Pipe sections with full flow valves and a minimum pressure drop (<2.5 *)	16.4 ft/s	6.6 ft/s
Pipe sections with valves that have a high pressure drop coefficient	8.2 ft/s	6.6 ft/s
Domestic hot water recirculation	3.3 ft/s	3.3 ft/s



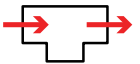
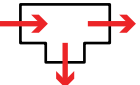
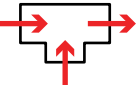
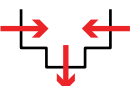



\* E.g. flat seated valves with ball valves and inclined valves

Table 6

It can be continuous or sporadic. A continuous pressure drop appears along the linear sections of the conduits, near components that vary the direction or fluid passage (i.e., reductions, diverters, fittings, influxes, valves, filters, etc.).


The following tables are helpful in properly sizing the hot and cold water lines for every type of system.

## Equivalent Lengths of Fittings (ft.)

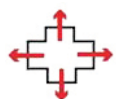
<b>Couplings &amp; Ball Valves</b>	<b>in.</b>	<b>1/2</b>	<b>3/4</b>	<b>1</b>	<b>1 1/4</b>	<b>1 1/2</b>	<b>2</b>	<b>2 1/2</b>	<b>3</b>	<b>3 1/2</b>	<b>4</b>						
	<b>mm</b>	<b>20</b>	<b>25</b>	<b>32</b>	<b>40</b>	<b>50</b>	<b>63</b>	<b>75</b>	<b>90</b>	<b>110</b>	<b>125</b>						
		0.05	0.07	0.09	1.10	1.40	1.70	2.10	2.50	3.00	4.20						
<b>Globe Valve</b>	<b>in.</b>	<b>1/2</b>	<b>3/4</b>	<b>1</b>													
	<b>mm</b>	<b>20</b>	<b>25</b>	<b>32</b>													
		0.10	0.14	0.18													
<b>Tee (through main)</b>	<b>in.</b>	<b>1/2</b>	<b>3/4</b>	<b>1</b>	<b>1 1/4</b>	<b>1 1/2</b>	<b>2</b>	<b>2 1/2</b>	<b>3</b>	<b>3 1/2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>
	<b>mm</b>	<b>20</b>	<b>25</b>	<b>32</b>	<b>40</b>	<b>50</b>	<b>63</b>	<b>75</b>	<b>90</b>	<b>110</b>	<b>125</b>	<b>160</b>	<b>200</b>	<b>250</b>	<b>315</b>	<b>355</b>	<b>400</b>
	SDR 11	0.05	0.07	0.09	1.10	1.40	1.70	2.10	2.50	3.00	4.20	5.40	6.70	8.40	10.60	10.6	11.9
	SDR 17.6	-	-	-	-	-	-	-	-	-	-	5.80	7.30	9.10	11.5	12.9	14.5
<b>Tee (through branch)</b>	<b>in.</b>	<b>1/2</b>	<b>3/4</b>	<b>1</b>	<b>1 1/4</b>	<b>1 1/2</b>	<b>2</b>	<b>2 1/2</b>	<b>3</b>	<b>3 1/2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>
	<b>mm</b>	<b>20</b>	<b>25</b>	<b>32</b>	<b>40</b>	<b>50</b>	<b>63</b>	<b>75</b>	<b>90</b>	<b>110</b>	<b>125</b>	<b>160</b>	<b>200</b>	<b>250</b>	<b>315</b>	<b>355</b>	<b>400</b>
	SDR 11	2.60	3.30	4.20	5.20	6.60	8.30	9.80	11.80	14.40	20.10	25.80	32.20	40.30	50.70	57.2	64.5
	SDR 17.6	-	-	-	-	-	-	-	-	-	-	27.90	34.90	43.60	55.00	62.00	69.80
<b>Tee (conjunction of flow)</b>	<b>in.</b>	<b>1/2</b>	<b>3/4</b>	<b>1</b>	<b>1 1/4</b>	<b>1 1/2</b>	<b>2</b>	<b>2 1/2</b>	<b>3</b>	<b>3 1/2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>
	<b>mm</b>	<b>20</b>	<b>25</b>	<b>32</b>	<b>40</b>	<b>50</b>	<b>63</b>	<b>75</b>	<b>90</b>	<b>110</b>	<b>125</b>	<b>160</b>	<b>200</b>	<b>250</b>	<b>315</b>	<b>355</b>	<b>400</b>
	SDR 11	1.70	2.20	2.80	3.50	4.40	5.50	6.60	7.90	9.60	13.40	17.20	21.50	26.80	33.80	38.10	43.00
	SDR 17.6	-	-	-	-	-	-	-	-	-	-	18.60	23.30	29.10	36.60	41.30	46.50
<b>Tee (counter current flow conjunction)</b>	<b>in.</b>	<b>1/2</b>	<b>3/4</b>	<b>1</b>	<b>1 1/4</b>	<b>1 1/2</b>	<b>2</b>	<b>2 1/2</b>	<b>3</b>	<b>3 1/2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>
	<b>mm</b>	<b>20</b>	<b>25</b>	<b>32</b>	<b>40</b>	<b>50</b>	<b>63</b>	<b>75</b>	<b>90</b>	<b>110</b>	<b>125</b>	<b>160</b>	<b>200</b>	<b>250</b>	<b>315</b>	<b>355</b>	<b>400</b>
	SDR 11	3.90	4.90	6.30	7.90	9.90	12.40	14.80	17.70	21.70	30.20	38.70	48.30	60.40	76.10	143.00	161.2
	SDR 17.6	-	-	-	-	-	-	-	-	-	-	69.80	87.20	109.10	137.40	154.90	174.50
<b>Reducer (by 1 dimension)</b>	<b>in.</b>	<b>1/2</b>	<b>3/4</b>	<b>1</b>	<b>1 1/4</b>	<b>1 1/2</b>	<b>2</b>	<b>2 1/2</b>	<b>3</b>	<b>3 1/2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>
	<b>mm</b>	<b>20</b>	<b>25</b>	<b>32</b>	<b>40</b>	<b>50</b>	<b>63</b>	<b>75</b>	<b>90</b>	<b>110</b>	<b>125</b>	<b>160</b>	<b>200</b>	<b>250</b>	<b>315</b>	<b>355</b>	<b>400</b>
	SDR 11	0.90	1.10	1.40	1.70	2.20	2.80	3.30	3.90	4.80	6.70	8.60	10.70	13.40	16.90	19.10	21.50
	SDR 17.6	-	-	-	-	-	-	-	-	-	-	9.30	11.60	14.50	18.30	20.70	23.30
<b>Reducer (by 2 dimensions)</b>	<b>in.</b>	<b>1/2</b>	<b>3/4</b>	<b>1</b>	<b>1 1/4</b>	<b>1 1/2</b>	<b>2</b>	<b>2 1/2</b>	<b>3</b>	<b>3 1/2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>
	<b>mm</b>	<b>20</b>	<b>25</b>	<b>32</b>	<b>40</b>	<b>50</b>	<b>63</b>	<b>75</b>	<b>90</b>	<b>110</b>	<b>125</b>	<b>160</b>	<b>200</b>	<b>250</b>	<b>315</b>	<b>355</b>	<b>400</b>
	SDR 11	-	1.40	1.70	2.20	2.70	3.40	4.10	4.90	6.00	8.40	10.70	13.40	16.80	21.10	23.80	26.90
	SDR 17.6	-	-	-	-	-	-	-	-	-	-	11.60	14.50	18.20	22.90	25.80	29.10
<b>Reducer (by 3 dimensions)</b>	<b>in.</b>	<b>1/2</b>	<b>3/4</b>	<b>1</b>	<b>1 1/4</b>	<b>1 1/2</b>	<b>2</b>	<b>2 1/2</b>	<b>3</b>	<b>3 1/2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>16</b>
	<b>mm</b>	<b>20</b>	<b>25</b>	<b>32</b>	<b>40</b>	<b>50</b>	<b>63</b>	<b>75</b>	<b>90</b>	<b>110</b>	<b>125</b>	<b>160</b>	<b>200</b>	<b>250</b>	<b>315</b>	<b>355</b>	<b>400</b>
	SDR 11	-	-	2.10	2.60	3.30	4.10	4.90	5.90	7.20	10.10	12.90	16.10	20.10	25.40	28.60	32.20
	SDR 17.6	-	-	-	-	-	-	-	-	-	-	14.00	17.40	21.80	27.50	31.00	34.90

Note: When using reducing tees the "through main" value should be added to the configuration value. E.g. tee through branch value + tee counter current flow conjunction value

## Equivalent Lengths of Fittings (ft.)

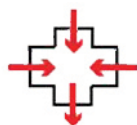
<b>Reducer</b> (by 4 dimensions)	in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	6	8	10	12	14	16
	mm	20	25	32	40	50	63	75	90	110	125	160	200	250	315	355	400
	SDR 11	-	-	-	3.10	3.80	4.80	5.70	6.90	8.40	11.70	15.00	18.80	23.50	29.60	33.40	37.60
	SDR 17.6	-	-	-	-	-	-	-	-	-	-	16.30	20.30	25.40	32.10	36.10	40.70

<b>Cross</b> (separation of flow)	1/2	3/4	1	1 1/4
	20	25	32	40




4.50	5.70	7.30	9.20
------	------	------	------

<b>Cross</b> (conjunction of flow)	1/2	3/4	1	1 1/4
	20	25	32	40



8.00	10.10	12.90	16.10
------	-------	-------	-------




<b>Elbow 90°</b>	in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	6	8	10	12	14	16
	mm	20	25	32	40	50	63	75	90	110	125	160	200	250	315	355	400
	SDR 11	1.60	2.00	2.60	3.30	4.10	5.20	6.20	7.40	9.00	12.60	17.20	21.50	26.90	33.80	26.90	31.00
	SDR 17.6	-	-	-	-	-	-	-	-	-	-	12.70	17.70	20.20	25.20	28.90	32.90

<b>Elbow 90°</b> (street)	1/2	3/4	1	1 1/4
	20	25	32	40




1.60	2.00	2.60	3.30
------	------	------	------


<b>Elbow 45°</b>	in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	6	8	10	12	14	16
	mm	20	25	32	40	50	63	75	90	110	125	160	200	250	315	355	400
	SDR 11	0.90	1.10	1.40	1.70	2.20	2.80	3.30	3.90	4.80	6.70	8.60	10.70	13.40	16.90	17.30	20.40
	SDR 17.6	-	-	-	-	-	-	-	-	-	-	8.80	11.60	15.60	15.60	17.90	20.40

<b>Elbow 45°</b> (street)	1/2	3/4	1
	20	25	32

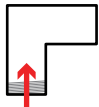


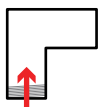
0.90	1.10	1.40
------	------	------

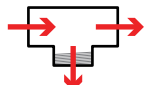
<b>Transition</b> (female thread)	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4
	20	25	32	40	50	63	75	90	110	125
	1.10	1.40	1.70	2.20	2.70	3.40	4.10	6.90	8.40	5.36

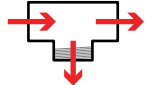
<b>Transition</b> (male thread)	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4
	20	25	32	40	50	63	75	90	110	125
	1.50	1.90	2.40	3.10	3.80	4.80	5.70	6.90	8.40	5.36

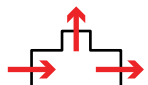
## Equivalent Lengths of Fittings (ft.)

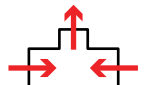
<b>Elbow 90°</b> (female thread)	<b>1/2"</b>	<b>3/4"</b>	<b>1"</b>
	<b>20 mm</b>	<b>25 mm</b>	<b>32 mm</b>
	1.90	2.40	3.00

<b>Elbow 90°</b> (male thread)	<b>1/2"</b>	<b>3/4"</b>	<b>1"</b>
	<b>20 mm</b>	<b>25 mm</b>	<b>32 mm</b>
	2.20	2.70	3.50

<b>Tee</b> (female thread)	<b>1/2"</b>	<b>3/4"</b>	<b>1"</b>
	<b>20 mm</b>	<b>25 mm</b>	<b>32 mm</b>
	3.50	4.40	5.60

<b>Tee</b> (male thread)	<b>1/2"</b>
	<b>20 mm</b>
	3.90

<b>Saddle Reducer</b> (through branch)	<b>1/2"</b>	<b>3/4"</b>	<b>1"</b>	<b>1 1/4"</b>	<b>1 1/2"</b>	<b>2"</b>	<b>2 1/2"</b>	<b>3"</b>	<b>3 1/2"</b>	<b>4"</b>	<b>6"</b>	<b>8"</b>	<b>10"</b>	<b>12"</b>
	<b>20 mm</b>	<b>25 mm</b>	<b>32 mm</b>	<b>40 mm</b>	<b>50 mm</b>	<b>63 mm</b>	<b>75 mm</b>	<b>90 mm</b>	<b>110 mm</b>	<b>125 mm</b>	<b>160 mm</b>	<b>200 mm</b>	<b>250 mm</b>	<b>315 mm</b>
	1.10	1.40	1.70	2.20	2.70	3.40	4.10	4.90	6.00	8.40	10.70	13.40	16.80	21.10

<b>Saddle Reducer</b> (combination of flow)	<b>1/2"</b>	<b>3/4"</b>	<b>1"</b>	<b>1 1/4"</b>	<b>1 1/2"</b>	<b>2"</b>	<b>2 1/2"</b>	<b>3"</b>	<b>3 1/2"</b>	<b>4"</b>	<b>6"</b>	<b>8"</b>	<b>10"</b>	<b>12"</b>
	<b>20 mm</b>	<b>25 mm</b>	<b>32 mm</b>	<b>40 mm</b>	<b>50 mm</b>	<b>63 mm</b>	<b>75 mm</b>	<b>90 mm</b>	<b>110 mm</b>	<b>125 mm</b>	<b>160 mm</b>	<b>200 mm</b>	<b>250 mm</b>	<b>315 mm</b>
	2.20	2.70	3.50	4.40	5.50	6.90	8.20	9.80	12.00	16.80	21.50	26.80	33.60	42.30



Continuous pressure drop tables  
SDR 7.4 (tested PN 20) at 68°F and 153°F

Q = Flowrate US gpm R = ft.hd/ 100ft  
V = Velocity ft./s De = External Diameter  
Di = Internal Diameter ND = Nominal Diameter

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft<sup>3</sup></b>	<b>61.38 lbs/ft<sup>3</sup></b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft<sup>2</sup>/s</b>	<b>5.059E-06 ft<sup>2</sup>/s</b>

Q = US gpm	ND De Di	1/2" 0.79 in 0.57 in	3/4" 0.98 in 0.71 in	1" 1.26 in 0.91 in	1 1/4" 1.57 in 1.14 in	1 1/2" 1.97 in 1.43 in	2" 2.48 in 1.80 in	2 1/2" 2.95 in 2.14 in	3" 3.54 in 2.57 in	3 1/2" 4.33 in 3.14 in	4" 4.92 in 3.57 in
0.1	R	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.13	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.01
0.2	R	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.25	0.16	0.10	0.06	0.04	0.03	0.02	0.01	0.01	0.01
0.3	R	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.38	0.24	0.15	0.09	0.06	0.04	0.03	0.02	0.01	0.01
0.4	R	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.51	0.33	0.20	0.13	0.08	0.05	0.04	0.02	0.02	0.01
0.5	R	0.6	0.4	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
	V	0.64	0.41	0.24	0.16	0.10	0.06	0.04	0.03	0.02	0.02
0.6	R	0.8	0.6	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V	0.76	0.49	0.29	0.19	0.12	0.08	0.05	0.04	0.02	0.02
0.7	R	1.0	0.8	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0
	V	0.89	0.57	0.34	0.22	0.14	0.09	0.06	0.04	0.03	0.02
0.8	R	1.3	1.0	0.5	0.3	0.1	0.1	0.0	0.0	0.0	0.0
	V	1.02	0.65	0.39	0.25	0.16	0.10	0.07	0.05	0.03	0.03
0.9	R	1.6	1.2	0.6	0.4	0.2	0.1	0.0	0.0	0.0	0.0
	V	1.14	0.73	0.44	0.28	0.18	0.11	0.08	0.06	0.04	0.03
1.0	R	1.9	1.5	0.7	0.5	0.2	0.1	0.0	0.0	0.0	0.0
	V	1.27	0.81	0.49	0.31	0.20	0.13	0.09	0.06	0.04	0.03
2.0	R	6.5	4.9	2.3	1.7	0.7	0.5	0.2	0.1	0.0	0.0
	V	2.54	1.63	0.98	0.63	0.40	0.25	0.18	0.12	0.08	0.06
3.0	R	13.3	10.1	4.6	3.5	1.4	1.0	0.5	0.4	0.2	0.1
	V	3.81	2.44	1.47	0.94	0.60	0.38	0.27	0.18	0.12	0.10
4.0	R	22.0	16.6	7.6	5.8	2.3	1.7	0.8	0.6	0.3	0.2
	V	5.09	3.26	1.96	1.25	0.80	0.50	0.36	0.25	0.17	0.13
5.0	R	32.5	24.6	11.3	8.5	3.4	2.6	1.2	0.9	0.4	0.3
	V	6.36	4.07	2.45	1.57	1.01	0.63	0.45	0.31	0.21	0.16
6.0	R	44.8	33.8	15.5	11.7	4.6	3.5	1.6	1.2	0.6	0.4
	V	7.63	4.88	2.94	1.88	1.21	0.75	0.53	0.37	0.25	0.19
7.0	R	58.6	44.3	20.3	15.4	6.1	4.6	2.1	1.6	0.7	0.6
	V	8.90	5.70	3.43	2.19	1.41	0.88	0.62	0.43	0.29	0.22
8.0	R	74.1	56.0	25.7	19.4	7.7	5.8	2.7	2.0	0.9	0.7
	V	10.17	6.51	3.92	2.51	1.61	1.01	0.71	0.49	0.33	0.26
9.0	R	91.0	68.8	31.5	23.8	9.4	7.1	3.3	2.5	1.1	0.9
	V	11.44	7.32	4.41	2.82	1.81	1.13	0.80	0.55	0.37	0.29
10.0	R	109.5	82.7	37.9	28.7	11.4	8.6	3.9	3.0	1.4	1.0
	V	12.72	8.14	4.90	3.14	2.01	1.26	0.89	0.62	0.41	0.32
11.0	R	129.3	97.7	44.8	33.9	13.4	10.1	4.7	3.5	1.6	1.2
	V	13.99	8.95	5.39	3.45	2.21	1.38	0.98	0.68	0.46	0.35
12.0	R			52.2	39.4	15.6	11.8	5.4	4.1	1.9	1.4
	V			9.77	5.88	3.76	2.41	1.51	1.07	0.74	0.50
13.0	R			60.0	45.4	18.0	13.6	6.2	4.7	2.2	1.6
	V			10.58	6.37	4.08	2.62	1.63	1.16	0.80	0.54
14.0	R			68.3	51.6	20.5	15.5	7.1	5.4	2.5	1.9
	V			11.39	6.86	4.39	2.82	1.76	1.25	0.86	0.58
15.0	R			77.1	58.3	23.1	17.5	8.0	6.0	2.8	2.1
	V			12.21	7.35	4.70	3.02	1.89	1.34	0.92	0.62
16.0	R			86.3	65.2	25.9	19.5	9.0	6.8	3.1	2.4
	V			13.02	7.84	5.02	3.22	2.01	1.43	0.99	0.66
17.0	R			96.0	72.5	28.8	21.7	10.0	7.5	3.5	2.6
	V			13.84	8.33	5.33	3.42	2.14	1.51	1.05	0.70
18.0	R			106.1	80.2	31.8	24.0	11.0	8.3	3.8	2.9
	V			14.65	8.82	5.64	3.62	2.26	1.60	1.11	0.75
19.0	R					34.9	26.4	12.1	9.1	4.2	3.2
	V					9.31	5.96	3.82	2.39	1.69	1.17
20.0	R					38.2	28.9	13.2	10.0	4.6	3.5
	V					9.80	6.27	4.02	2.51	1.78	1.23

Table 7

**Continuous pressure drop tables**  
**SDR 7.4 (tested PN 20) at 68°F and 153°F**

Q = Flowrate US gpm    R = ft.hd/ 100ft  
 V = Velocity ft./s    De = External Diameter  
 Di = Internal Diameter    ND = Nominal Diameter

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft<sup>3</sup></b>	<b>61.38 lbs/ft<sup>3</sup></b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft<sup>2</sup>/s</b>	<b>5.059E-06 ft<sup>2</sup>/s</b>

Q = US gpm	ND De Di	1/2" 0.79 in 0.57 in	3/4" 0.98 in 0.71 in	1" 1.26 in 0.91 in	1 1/4" 1.57 in 1.14 in	1 1/2" 1.97 in 1.43 in	2" 2.48 in 1.80 in	2 1/2" 2.95 in 2.14 in	3" 3.54 in 2.57 in	3 1/2" 4.33 in 3.14 in	4" 4.92 in 3.57 in								
22	R			45.1	34.1	15.6	11.8	5.5	4.1	1.8	1.3	0.8	0.6	0.3	0.2	0.1	0.1	0.1	0.1
	V			10.78	6.90	4.43	2.77	1.96	1.36	0.91	0.70								
24	R			52.6	39.7	18.2	13.8	6.4	4.8	2.1	1.6	0.9	0.7	0.4	0.3	0.1	0.1	0.1	0.1
	V			11.76	7.52	4.83	3.02	2.14	1.48	0.99	0.77								
26	R			60.5	45.7	21.0	15.8	7.3	5.5	2.4	1.8	1.1	0.8	0.4	0.3	0.2	0.1	0.1	0.1
	V			12.74	8.15	5.23	3.27	2.32	1.60	1.08	0.83								
28	R			68.9	52.0	23.9	18.0	8.3	6.3	2.7	2.1	1.2	0.9	0.5	0.4	0.2	0.1	0.1	0.1
	V			13.72	8.78	5.63	3.52	2.49	1.73	1.16	0.90								
30	R			77.7	58.7	26.9	20.3	9.4	7.1	3.1	2.3	1.4	1.0	0.6	0.4	0.2	0.2	0.1	0.1
	V			14.70	9.41	6.04	3.77	2.67	1.85	1.24	0.96								
32	R					30.1	22.8	10.5	7.9	3.4	2.6	1.5	1.1	0.6	0.5	0.2	0.2	0.1	0.1
	V					10.03	6.44	4.02	2.85	1.97	1.33	1.02							
34	R					33.5	25.3	11.7	8.8	3.8	2.9	1.7	1.3	0.7	0.5	0.3	0.2	0.1	0.1
	V					10.66	6.84	4.27	3.03	2.10	1.41	1.09							
36	R					37.0	28.0	12.9	9.8	4.2	3.2	1.9	1.4	0.8	0.6	0.3	0.2	0.2	0.1
	V					11.29	7.24	4.53	3.21	2.22	1.49	1.15							
38	R					40.7	30.8	14.2	10.7	4.6	3.5	2.1	1.6	0.9	0.6	0.3	0.3	0.2	0.1
	V					11.91	7.65	4.78	3.39	2.34	1.57	1.22							
40	R					44.5	33.7	15.5	11.7	5.1	3.8	2.2	1.7	0.9	0.7	0.4	0.3	0.2	0.1
	V					12.54	8.05	5.03	3.56	2.47	1.66	1.28							
45	R					54.7	41.4	19.1	14.4	6.2	4.7	2.8	2.1	1.1	0.9	0.4	0.3	0.2	0.2
	V					14.11	9.05	5.66	4.01	2.77	1.86	1.44							
50	R							23.0	17.3	7.5	5.7	3.3	2.5	1.4	1.0	0.5	0.4	0.3	0.2
	V							10.06	6.29	4.46	3.08	2.07	1.60						
55	R							27.1	20.5	8.9	6.7	3.9	3.0	1.6	1.2	0.6	0.5	0.3	0.3
	V							11.07	6.91	4.90	3.39	2.28	1.76						
60	R							31.6	23.9	10.3	7.8	4.6	3.4	1.9	1.4	0.7	0.6	0.4	0.3
	V							12.07	7.54	5.35	3.70	2.48	1.92						
65	R							36.3	27.5	11.9	9.0	5.2	4.0	2.2	1.7	0.9	0.6	0.5	0.3
	V							13.08	8.17	5.79	4.01	2.69	2.08						
70	R							41.4	31.3	13.5	10.2	6.0	4.5	2.5	1.9	1.0	0.7	0.5	0.4
	V							14.09	8.80	6.24	4.32	2.90	2.24						
75	R									15.3	11.5	6.7	5.1	2.8	2.1	1.1	0.8	0.6	0.4
	V									9.43	6.68	4.62	3.11	2.40					
80	R									17.1	12.9	7.5	5.7	3.1	2.4	1.2	0.9	0.7	0.5
	V									10.06	7.13	4.93	3.31	2.56					
85	R									19.0	14.4	8.4	6.3	3.5	2.6	1.4	1.0	0.7	0.6
	V									10.68	7.57	5.24	3.52	2.72					
90	R									21.0	15.9	9.3	7.0	3.9	2.9	1.5	1.1	0.8	0.6
	V									11.31	8.02	5.55	3.73	2.88					
95	R									23.1	17.4	10.2	7.7	4.3	3.2	1.7	1.2	0.9	0.7
	V									11.94	8.46	5.86	3.93	3.04					
100	R									25.3	19.1	11.2	8.4	4.7	3.5	1.8	1.4	1.0	0.7
	V									12.57	8.91	6.16	4.14	3.20					
110	R									29.8	22.6	13.2	10.0	5.5	4.2	2.1	1.6	1.2	0.9
	V									13.83	9.80	6.78	4.55	3.52					
120	R									15.3	11.6	6.4	4.8	2.5	1.9	1.3	1.0	0.7	0.6
	V									10.69	7.40	4.97	3.84	3.04					
130	R									17.7	13.3	7.4	5.6	2.9	2.2	1.5	1.1	0.8	0.6
	V									11.58	8.01	5.38	4.16	3.48					
140	R									20.1	15.2	8.4	6.3	3.3	2.5	1.8	1.3	1.0	0.7
	V									12.47	8.63	5.80	4.48	3.68					
150	R									22.7	17.1	9.5	7.1	3.7	2.8	2.0	1.4	1.0	0.7
	V									13.37	9.25	6.21	4.80	3.80					
160	R									25.4	19.2	10.6	8.0	4.1	3.1	2.2	1.5	1.0	0.7
	V									14.26	9.86	6.63	5.12	4.00					
170	R											11.8	8.9	4.6	3.5	2.5	1.7	1.2	0.8
	V											10.48	7.04	5.44					

Table 8

Continuous pressure drop tables  
SDR 7.4 (tested PN 20) at 68°F and 153°F

Q = Flowrate US gpm    R = ft.hd/ 100ft  
V = Velocity ft./s      De = External Diameter  
Di = Internal Diameter   ND = Nominal Diameter

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft<sup>3</sup></b>	<b>61.38 lbs/ft<sup>3</sup></b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft<sup>2</sup>/s</b>	<b>5.059E-06 ft<sup>2</sup>/s</b>

Q =	ND	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"			
US gpm	De	0.79 in	0.98 in	1.26 in	1.57 in	1.97 in	2.48 in	2.95 in	3.54 in	4.33 in	4.92 in			
	Di	0.57 in	0.71 in	0.91 in	1.14 in	1.43 in	1.80 in	2.14 in	2.57 in	3.14 in	3.57 in			
180	R								13.0	9.8	5.1	3.8	2.7	2.1
	V								11.10		7.45			5.76
190	R								14.3	10.8	5.6	4.2	3.0	2.3
	V								11.71		7.87			6.08
200	R								15.6	11.8	6.1	4.6	3.3	2.5
	V								12.33		8.28			6.40
220	R								18.5	14.0	7.2	5.4	3.9	2.9
	V								13.56		9.11			7.04
240	R								21.5	16.3	8.4	6.3	4.5	3.4
	V								14.80		9.94			7.68
260	R									9.6	7.3	5.2	3.9	2.9
	V									10.77				8.32
280	R									11.0	8.3	5.9	4.5	3.4
	V									11.59				8.95
300	R									12.4	9.3	6.7	5.1	3.9
	V									12.42				9.59
320	R									13.8	10.5	7.5	5.7	4.3
	V									13.25				10.23
340	R									15.4	11.6	8.3	6.3	4.7
	V									14.08				10.87
360	R									17.0	12.8	9.2	7.0	5.2
	V									14.91				11.51
380	R												10.1	7.6
	V												12.15	
400	R												11.1	8.4
	V												12.79	
450	R												13.6	10.3
	V												14.39	

Table 9

### Continuous pressure drop tables

#### SDR 11 (tested PN 10) at 68°F and 153°F

Q = Flowrate US gpm    R = ft.hd/ 100ft  
 V = Velocity ft./s      De = External Diameter  
 Di = Internal Diameter   ND = Nominal Diameter

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft³</b>	<b>61.38 lbs/ft³</b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft²/s</b>	<b>5.059E-06 ft²/s</b>

Q =	ND	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	6"	8"	10"	12"
US gpm	De	0.79 in	0.98 in	1.26 in	1.57 in	1.97 in	2.48 in	2.95 in	3.54 in	4.33 in	4.92 in	6.30 in	7.87 in	9.84 in	12.40 in
	Di	0.64 in	0.80 in	1.03 in	1.28 in	1.61 in	2.02 in	2.42 in	2.90 in	3.54 in	4.02 in	5.15 in	6.44 in	8.06 in	10.15 in
0.1	R	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.10	0.06	0.04	0.02	0.02	0.01	0.01							
0.2	R	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	V	0.20	0.13	0.08	0.05	0.03	0.02	0.01	0.01	0.01					
0.3	R	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
	V	0.30	0.19	0.12	0.07	0.05	0.03	0.02	0.01	0.01					
0.4	R	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	V	0.40	0.25	0.15	0.10	0.06	0.04	0.03	0.02	0.01	0.01	0.01			
0.5	R	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	V	0.50	0.32	0.19	0.12	0.08	0.05	0.03	0.02	0.02	0.01	0.01			
0.6	R	0.5	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.60	0.38	0.23	0.15	0.10	0.06	0.04	0.03	0.02	0.02	0.01	0.01		
0.7	R	0.6	0.5	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.70	0.44	0.27	0.17	0.11	0.07	0.05	0.03	0.02	0.02	0.01	0.01		
0.8	R	0.8	0.6	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.80	0.51	0.31	0.20	0.13	0.08	0.06	0.04	0.03	0.02	0.01	0.01	0.01	
0.9	R	0.9	0.7	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.90	0.57	0.35	0.22	0.14	0.09	0.06	0.04	0.03	0.02	0.01	0.01	0.01	
1	R	1.1	0.8	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	1.00	0.63	0.38	0.25	0.16	0.10	0.07	0.05	0.03	0.03	0.02	0.01	0.01	
2	R	3.7	2.8	1.3	0.9	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	V	2.01	1.27	0.77	0.50	0.32	0.20	0.14	0.10	0.07	0.05	0.03	0.02	0.01	0.01
3	R	7.6	5.7	2.5	1.9	0.8	0.6	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V	3.01	1.90	1.15	0.74	0.48	0.30	0.21	0.15	0.10	0.08	0.05	0.03	0.02	0.01
4	R	12.6	9.5	4.2	3.2	1.3	1.0	0.5	0.3	0.2	0.1	0.0	0.0	0.0	0.0
	V	4.02	2.53	1.54	0.99	0.63	0.40	0.28	0.19	0.13	0.10	0.06	0.04	0.03	0.02
5	R	18.6	14.1	6.2	4.7	1.9	1.4	0.7	0.5	0.2	0.2	0.0	0.0	0.0	0.0
	V	5.02	3.17	1.92	1.24	0.79	0.50	0.35	0.24	0.16	0.13	0.08	0.05	0.03	0.02
6	R	25.6	19.3	8.6	6.5	2.6	2.0	0.9	0.7	0.3	0.2	0.1	0.0	0.0	0.0
	V	6.03	3.80	2.30	1.49	0.95	0.60	0.42	0.29	0.20	0.15	0.09	0.06	0.04	0.02
7	R	33.5	25.3	11.2	8.5	3.4	2.6	1.2	0.9	0.4	0.3	0.1	0.0	0.0	0.0
	V	7.03	4.44	2.69	1.74	1.11	0.70	0.49	0.34	0.23	0.18	0.11	0.07	0.04	0.03
8	R	42.3	32.0	14.2	10.7	4.3	3.3	1.5	1.2	0.5	0.4	0.2	0.1	0.0	0.0
	V	8.04	5.07	3.07	1.98	1.27	0.80	0.56	0.39	0.26	0.20	0.12	0.08	0.05	0.03
9	R	52.0	39.3	17.4	13.2	5.3	4.0	1.9	1.4	0.6	0.5	0.2	0.2	0.1	0.0
	V	9.04	5.70	3.46	2.23	1.43	0.90	0.63	0.44	0.29	0.23	0.14	0.09	0.06	0.04
10	R	62.6	47.3	20.9	15.8	6.4	4.8	2.3	1.7	0.8	0.6	0.3	0.2	0.1	0.0
	V	10.05	6.34	3.84	2.48	1.58	1.00	0.70	0.49	0.33	0.25	0.15	0.10	0.06	0.04
11	R	73.9	55.9	24.7	18.7	7.5	5.7	2.7	2.0	0.9	0.7	0.3	0.2	0.1	0.0
	V	11.05	6.97	4.23	2.73	1.74	1.10	0.77	0.54	0.36	0.28	0.17	0.11	0.07	0.04
12	R	86.1	65.0	28.8	21.8	8.8	6.6	3.1	2.3	1.1	0.8	0.4	0.3	0.2	0.1
	V	12.06	7.60	4.61	2.98	1.90	1.20	0.84	0.58	0.39	0.30	0.18	0.12	0.08	0.05
13	R	99.0	74.8	33.1	25.0	10.1	7.6	3.6	2.7	1.2	0.9	0.4	0.3	0.2	0.1
	V	13.06	8.24	4.99	3.23	2.06	1.30	0.91	0.63	0.42	0.33	0.20	0.13	0.08	0.05
14	R	112.7	85.2	37.7	28.5	11.5	8.7	4.1	3.1	1.4	1.1	0.5	0.4	0.2	0.2
	V	14.07	8.87	5.38	3.47	2.22	1.40	0.98	0.68	0.46	0.35	0.22	0.14	0.09	0.06
15	R			42.5	32.2	13.0	9.8	4.6	3.5	1.6	1.2	0.5	0.4	0.2	0.2
	V			9.50	5.76	3.72	2.38	1.50	1.05	0.73	0.49	0.38	0.23	0.15	0.09
16	R			47.6	36.0	14.5	11.0	5.1	3.9	1.8	1.3	0.6	0.4	0.3	0.2
	V			10.14	6.15	3.97	2.53	1.60	1.12	0.78	0.52	0.40	0.25	0.16	0.10
17	R			53.0	40.0	16.1	12.2	5.7	4.3	2.0	1.5	0.7	0.5	0.3	0.2
	V			10.77	6.53	4.22	2.69	1.70	1.19	0.83	0.55	0.43	0.26	0.17	0.11
18	R			58.5	44.2	17.8	13.5	6.3	4.8	2.2	1.6	0.7	0.5	0.3	0.2
	V			11.40	6.91	4.47	2.85	1.80	1.26	0.88	0.59	0.45	0.28	0.18	0.11
19	R			64.3	48.6	19.6	14.8	6.9	5.2	2.4	1.8	0.8	0.6	0.3	0.3
	V			12.04	7.30	4.71	3.01	1.90	1.33	0.92	0.62	0.48	0.29	0.19	0.12
20	R			70.4	53.2	21.4	16.2	7.6	5.7	2.6	2.0	0.9	0.7	0.4	0.3
	V			12.67	7.68	4.96	3.17	2.00	1.40	0.97	0.65	0.50	0.31	0.20	0.13



## Continuous pressure drop tables SDR 11 (tested PN 10) at 68°F and 153°F

Q = Flowrate US gpm R = ft.hd/ 100ft  
V = Velocity ft./s De = External Diameter  
Di = Internal Diameter ND = Nominal Diameter

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft<sup>3</sup></b>	<b>61.38 lbs/ft<sup>3</sup></b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft<sup>2</sup>/s</b>	<b>5.059E-06 ft<sup>2</sup>/s</b>

Q =	ND	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	6"	8"	10"	12"	14"	16"	
US gpm	De	0.98 in	1.26 in	1.57 in	1.97 in	2.48 in	2.95 in	3.54 in	4.33 in	4.92 in	6.30 in	7.87 in	9.84 in	12.40 in	13.98 in	15.75 in	
	Di	0.80 in	1.03 in	1.28 in	1.61 in	2.02 in	2.42 in	2.90 in	3.54 in	4.02 in	5.15 in	6.44 in	8.06 in	10.15 in	11.44 in	12.88 in	
22	R	83.2	62.9	25.3	19.2	9.0	6.8	3.1	2.3	1.0	0.8	0.4	0.3	0.2	0.1	0.0	0.0
	V	13.94	8.45	5.46	3.48	2.20	1.54	1.07	0.72	0.56	0.34	0.22	0.14	0.09			
24	R		29.5	22.3	10.4	7.9	3.6	2.7	1.2	0.9	0.5	0.4	0.2	0.2	0.1	0.1	0.0
	V		9.22	5.95	3.80	2.40	1.68	1.17	0.78	0.61	0.37	0.24	0.15	0.10	0.11		
26	R		33.9	25.7	12.0	9.1	4.1	3.1	1.4	1.0	0.6	0.4	0.3	0.2	0.1	0.1	0.0
	V		9.99	6.45	4.12	2.59	1.82	1.27	0.85	0.66	0.40	0.26	0.16	0.10	0.11		
28	R		38.6	29.2	13.7	10.3	4.7	3.6	1.6	1.2	0.7	0.5	0.3	0.2	0.1	0.1	0.0
	V		10.76	6.95	4.44	2.79	1.96	1.36	0.91	0.71	0.43	0.28	0.18	0.11	0.12		
30	R		43.6	33.0	15.4	11.7	5.3	4.0	1.8	1.3	0.8	0.6	0.3	0.2	0.1	0.1	0.0
	V		11.52	7.44	4.75	2.99	2.10	1.46	0.98	0.76	0.46	0.30	0.19	0.12	0.12		
32	R		48.8	36.9	17.3	13.1	6.0	4.5	2.0	1.5	0.9	0.6	0.4	0.3	0.1	0.1	0.0
	V		12.29	7.94	5.07	3.19	2.24	1.56	1.04	0.81	0.49	0.32	0.20	0.13	0.14		
34	R		54.3	41.0	19.2	14.5	6.6	5.0	2.2	1.7	1.0	0.7	0.4	0.3	0.1	0.1	0.0
	V		13.06	8.44	5.39	3.39	2.38	1.66	1.11	0.86	0.52	0.33	0.21	0.13	0.16		
36	R		60.0	45.3	21.2	16.1	7.3	5.5	2.4	1.8	1.1	0.8	0.4	0.3	0.1	0.1	0.0
	V		13.83	8.93	5.70	3.59	2.52	1.75	1.17	0.91	0.55	0.35	0.23	0.14	0.17		
38	R		65.9	49.8	23.4	17.6	8.0	6.1	2.7	2.0	1.2	0.9	0.5	0.4	0.2	0.1	0.0
	V		14.60	9.43	6.02	3.79	2.66	1.85	1.24	0.96	0.59	0.37	0.24	0.15	0.19		
40	R			25.5	19.3	8.8	6.7	2.9	2.2	1.3	1.0	0.5	0.4	0.2	0.2	0.1	0.1
	V			9.92	6.34	3.99	2.80	1.95	1.30	1.01	0.62	0.39	0.25	0.16	0.20		
45	R			31.4	23.7	10.8	8.2	3.6	2.7	1.6	1.2	0.7	0.5	0.3	0.2	0.1	0.1
	V			11.16	7.13	4.49	3.15	2.19	1.46	1.14	0.69	0.44	0.28	0.18	0.22	0.11	
50	R			37.7	28.5	13.0	9.8	4.3	3.3	1.9	1.4	0.8	0.6	0.3	0.2	0.1	0.1
	V			12.41	7.92	4.99	3.50	2.43	1.63	1.26	0.77	0.49	0.31	0.20	0.23	0.12	
55	R			44.6	33.7	15.4	11.6	5.1	3.9	2.2	1.7	0.9	0.7	0.4	0.3	0.2	0.1
	V			13.65	8.71	5.49	3.85	2.68	1.79	1.39	0.85	0.54	0.35	0.22	0.25	0.14	
60	R			51.9	39.3	17.9	13.5	6.0	4.5	2.6	1.9	1.1	0.8	0.4	0.3	0.2	0.1
	V			14.89	9.50	5.99	4.20	2.92	1.95	1.51	0.92	0.59	0.38	0.24	0.27	0.15	
65	R				20.6	15.6	6.9	5.2	3.0	2.2	1.2	0.9	0.5	0.4	0.3	0.2	0.1
	V				10.30	6.49	4.55	3.16	2.12	1.64	1.00	0.64	0.41	0.26	0.28	0.16	
70	R				23.4	17.7	7.8	5.9	3.4	2.5	1.4	1.1	0.5	0.4	0.3	0.2	0.1
	V				11.09	6.99	4.90	3.41	2.28	1.77	1.08	0.69	0.44	0.28	0.30	0.17	
75	R				26.4	20.0	8.8	6.7	3.8	2.9	1.6	1.2	0.6	0.5	0.3	0.3	0.1
	V				11.88	7.49	5.25	3.65	2.44	1.89	1.16	0.74	0.47	0.30	0.31	0.18	
80	R				29.6	22.4	9.9	7.5	4.2	3.2	1.8	1.4	0.7	0.5	0.4	0.3	0.1
	V				12.67	7.98	5.60	3.89	2.60	2.02	1.23	0.79	0.50	0.32	0.34	0.20	
85	R				32.9	24.9	11.0	8.3	4.7	3.6	2.0	1.5	0.8	0.6	0.4	0.3	0.1
	V				13.46	8.48	5.95	4.14	2.77	2.15	1.31	0.84	0.54	0.34	0.37	0.21	
90	R				36.4	27.5	12.1	9.2	5.2	3.9	2.2	1.7	0.8	0.6	0.5	0.4	0.1
	V				14.26	8.98	6.29	4.38	2.93	2.27	1.39	0.89	0.57	0.36	0.41	0.22	
95	R					13.3	10.1	5.7	4.3	2.4	1.8	0.9	0.7	0.5	0.4	0.2	0.1
	V					9.48	6.64	4.62	3.09	2.40	1.46	0.94	0.60	0.38	0.44	0.23	
100	R					14.6	11.0	6.3	4.7	2.7	2.0	1.0	0.8	0.6	0.4	0.2	0.1
	V					9.98	6.99	4.87	3.26	2.52	1.54	0.99	0.63	0.40	0.47	0.25	
110	R					17.3	13.0	7.4	5.6	3.1	2.4	1.2	0.9	0.7	0.5	0.2	0.1
	V					10.98	7.69	5.35	3.58	2.78	1.70	1.08	0.69	0.44	0.50	0.27	
120	R					20.1	15.2	8.6	6.5	3.7	2.8	1.4	1.1	0.8	0.6	0.2	0.1
	V					11.98	8.39	5.84	3.91	3.03	1.85	1.18	0.76	0.48	0.53	0.30	
130	R					23.1	17.5	9.9	7.5	4.2	3.2	1.6	1.2	0.9	0.7	0.3	0.2
	V					12.97	9.09	6.33	4.23	3.28	2.00	1.28	0.82	0.52	0.56	0.32	
140	R					26.3	19.9	11.3	8.5	4.8	3.6	1.8	1.4	1.0	0.8	0.3	0.2
	V					13.97	9.79	6.81	4.56	3.53	2.16	1.38	0.88	0.56	0.59	0.34	
150	R					29.7	22.4	12.8	9.6	5.4	4.1	2.1	1.6	1.1	0.9	0.4	0.3
	V					14.97	10.49	7.30	4.88	3.79	2.31	1.48	0.94	0.60	0.62	0.37	
160	R						14.3	10.8	6.0	4.6	2.3	1.8	1.3	1.0	0.4	0.3	0.1
	V						11.19	7.79	5.21	3.30	2.07	1.28	0.81	0.50	0.53	0.30	
170	R						15.9	12.0	6.7	5.1	2.6	2.0	1.4	1.1	0.4	0.3	0.2
	V						11.89	8.28	5.53	4.29	2.62	1.67	1.07	0.67	0.75	0.42	

Table 11

Continuous pressure drop tables  
SDR 11 (tested PN 10) at 68°F and 153°F

Q = Flowrate US gpm R = ft.hd/ 100ft  
V = Velocity ft./s De = External Diameter  
Di = Internal Diameter ND = Nominal Diameter

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft<sup>3</sup></b>	<b>61.38 lbs/ft<sup>3</sup></b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft<sup>2</sup>/s</b>	<b>5.059E-06 ft<sup>2</sup>/s</b>

Q =	ND	2 1/2"	3"	3 1/2"	4"	6"	8"	10"	12"	14"	16"							
US gpm	De	2.95 in	3.54 in	4.33 in	4.92 in	6.30 in	7.87 in	9.84 in	12.40 in	13.98 in	15.75 in							
	Di	2.42 in	2.90 in	3.54 in	4.02 in	5.15 in	6.44 in	8.06 in	10.15 in	11.44 in	12.88 in							
180	R	17.6	13.3	7.4	5.6	2.9	2.2	1.6	1.2	0.5	0.4	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V	12.59	8.76	5.86	4.54	2.77	1.77	1.13	0.71	0.56	0.44							
190	R	19.3	14.6	8.2	6.2	3.1	2.4	1.7	1.3	0.5	0.4	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V	13.29	9.25	6.19	4.80	2.93	1.87	1.20	0.75	0.59	0.47							
200	R	21.1	16.0	8.9	6.7	3.4	2.6	1.9	1.4	0.6	0.4	0.2	0.2	0.1	0.1	0.0	0.0	0.0
	V	13.99	9.74	6.51	5.05	3.08	1.97	1.26	0.79	0.62	0.49							
220	R		10.5	8.0	4.1	3.1	2.2	1.7	0.7	0.5	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V		10.71	7.16	5.55	3.39	2.17	1.39	0.87	0.69	0.54							
240	R		12.3	9.3	4.7	3.6	2.6	2.0	0.8	0.6	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V		11.68	7.81	6.06	3.70	2.36	1.51	0.95	0.75	0.59							
260	R		14.1	10.7	5.4	4.1	3.0	2.2	0.9	0.7	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V		12.66	8.46	6.56	4.01	2.56	1.64	1.03	0.81	0.64							
280	R		16.1	12.2	6.2	4.7	3.4	2.6	1.0	0.8	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0
	V		13.63	9.11	7.07	4.32	2.76	1.76	1.11	0.87	0.69							
300	R		18.1	13.7	7.0	5.3	3.8	2.9	1.2	0.9	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0
	V		14.60	9.77	7.57	4.62	2.96	1.89	1.19	0.94	0.74							
320	R			7.8	5.9	4.3	3.2	1.3	1.0	0.5	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V			10.42	8.08	4.93	3.15	2.02	1.27	1.00	0.79							
340	R			8.7	6.6	4.7	3.6	1.5	1.1	0.5	0.4	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V			11.07	8.58	5.24	3.35	2.14	1.35	1.06	0.84							
360	R			9.6	7.3	5.2	4.0	1.6	1.2	0.6	0.4	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V			11.72	9.09	5.55	3.55	2.27	1.43	1.12	0.89							
380	R			10.6	8.0	5.8	4.4	1.8	1.4	0.6	0.5	0.2	0.2	0.1	0.1	0.0	0.0	0.0
	V			12.37	9.59	5.86	3.74	2.39	1.51	1.19	0.93							
400	R			11.5	8.7	6.3	4.8	2.0	1.5	0.7	0.5	0.2	0.2	0.1	0.1	0.0	0.0	0.0
	V			13.02	10.10	6.16	3.94	2.52	1.59	1.25	0.98							
450	R			14.2	10.7	7.8	5.9	2.4	1.8	0.8	0.6	0.3	0.2	0.1	0.1	0.0	0.0	0.0
	V			14.65	11.36	6.94	4.43	2.83	1.79	1.41	1.11							
500	R				9.3	7.0	2.9	2.2	1.0	0.8	0.3	0.3	0.1	0.1	0.1	0.0	0.0	0.0
	V				12.62	7.71	4.93	3.15	1.98	1.56	1.23							
550	R				11.0	8.3	3.4	2.6	1.2	0.9	0.4	0.3	0.1	0.1	0.1	0.1	0.0	0.0
	V				13.88	8.48	5.42	3.46	2.18	1.72	1.35							
600	R					4.0	3.0	1.4	1.0	0.5	0.4	0.2	0.1	0.1	0.1	0.1	0.0	0.0
	V					9.25	5.91	3.78	2.38	1.87	1.48							
650	R					4.6	3.5	1.6	1.2	0.5	0.4	0.2	0.1	0.1	0.1	0.1	0.0	0.0
	V					10.02	6.40	4.09	2.58	2.03	1.60							
700	R					5.2	3.9	1.8	1.4	0.6	0.5	0.2	0.2	0.1	0.1	0.1	0.1	0.0
	V					10.79	6.90	4.41	2.78	2.19	1.72							
750	R					5.9	4.4	2.0	1.5	0.7	0.5	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	V					11.56	7.39	4.72	2.98	2.34	1.84							
800	R					6.6	5.0	2.3	1.7	0.8	0.6	0.3	0.2	0.1	0.1	0.1	0.1	0.1
	V					12.33	7.88	5.04	3.17	2.50	1.97							
850	R					7.3	5.5	2.5	1.9	0.9	0.7	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	V					13.10	8.37	5.35	3.37	2.65	2.09							
900	R					8.1	6.1	2.8	2.1	1.0	0.7	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	V					13.87	8.87	5.67	3.57	2.81	2.21							
950	R					8.9	6.7	3.1	2.3	1.1	0.8	0.4	0.3	0.2	0.2	0.1	0.1	0.1
	V					14.64	9.36	5.98	3.77	2.97	2.34							
1000	R						3.4	2.5	1.2	0.9	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1
	V						9.85	6.30	3.97	3.12	2.46							
1100	R						4.0	3.0	1.4	1.0	0.5	0.3	0.3	0.2	0.1	0.1	0.1	0.2
	V						10.84	6.93	4.36	3.43	2.71							
1200	R						4.6	3.5	1.6	1.2	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.2
	V						11.82	7.56	4.76	3.75	2.95							
1300	R						5.3	4.0	1.8	1.4	0.6	0.5	0.3	0.3	0.2	0.1	0.1	0.2
	V						12.81	8.19	5.16	4.06	3.20							
1400	R						6.0	4.6	2.1	1.6	0.7	0.5	0.4	0.3	0.2	0.1	0.1	0.2
	V						13.79	8.82	5.55	4.37	3.44							

Table 12

**Continuous pressure drop tables**  
**SDR 11 (tested PN 10) at 68°F and 153°F**

Q = Flowrate US gpm    R = ft.hd/ 100ft  
 V = Velocity ft./s    De = External Diameter  
 Di = Internal Diameter    ND = Nominal Diameter

Q =	ND	8"		10"		12"		14"		16"	
US gpm	De	7.87 in		9.84 in		12.40 in		13.98 in		15.75 in	
	Di	6.44 in		8.06 in		10.15 in		11.44 in		12.88 in	
1500	R	6.8	5.2	2.4	1.8	0.8	0.6	0.4	0.3	0.3	0.2
	V	14.78		9.45		5.95		4.68		3.69	
1600	R			2.6	2.0	0.9	0.7	0.5	0.4	0.3	0.2
	V			10.08		6.35		5.00		3.94	
1700	R			2.9	2.2	1.0	0.7	0.6	0.4	0.3	0.2
	V			10.71		6.74		5.31		4.18	
1800	R			3.2	2.5	1.1	0.8	0.6	0.5	0.3	0.3
	V			11.34		7.14		5.62		4.43	
1900	R			3.6	2.7	1.2	0.9	0.7	0.5	0.4	0.3
	V			11.97		7.54		5.93		4.67	
2000	R			3.9	3.0	1.3	1.0	0.7	0.6	0.4	0.3
	V			12.60		7.93		6.24		4.92	
2200	R			4.6	3.5	1.5	1.2	0.9	0.7	0.5	0.4
	V			13.86		8.73		6.87		5.41	
2400	R					1.8	1.4	1.0	0.8	0.6	0.4
	V					9.52		7.49		5.90	
2600	R					2.1	1.6	1.2	0.9	0.7	0.5
	V					10.32		8.12		6.40	
2800	R					2.3	1.8	1.3	1.0	0.8	0.6
	V					11.11		8.74		6.89	
3000	R					2.6	2.0	1.5	1.2	0.9	0.6
	V					11.90		9.37		7.38	
3200	R					3.0	2.2	1.7	1.4	1.0	0.7
	V					12.70		9.99		7.87	
3400	R					3.3	2.5	1.9	1.6	1.1	0.8
	V					13.49		10.62		8.36	
3600	R					3.6	2.8	2.1	1.8	1.2	0.9
	V					14.28		11.24		8.86	
3800	R							2.3	2.0	1.3	1.0
	V							11.87		9.35	
4000	R							2.5	2.2	1.4	1.1
	V							12.49		9.84	
4500	R									1.7	1.3
	V									11.07	
5000	R									2.1	1.6
	V									12.30	
5500	R										
	V										
6000	R										
	V										

Table 13

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft<sup>3</sup></b>	<b>61.38 lbs/ft<sup>3</sup></b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft<sup>2</sup>/s</b>	<b>5.059E-06 ft<sup>2</sup>/s</b>

Continuous pressure drop tables  
SDR 17.6 (tested PN 10) at 68°F and 153°F

Q = Flowrate US gpm R = ft.hd/ 100ft  
V = Velocity ft./s De = External Diameter  
Di = Internal Diameter ND = Nominal Diameter

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft<sup>3</sup></b>	<b>61.38 lbs/ft<sup>3</sup></b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft<sup>2</sup>/s</b>	<b>5.059E-06 ft<sup>2</sup>/s</b>

Q =	ND	4"	6"	8"	10"	12"	14"	16"
US gpm	De	4.92 in	6.30 in	7.87 in	9.84 in	12.40 in	13.98 in	15.75 in
	Di	4.36 in	5.58 in	6.98 in	8.72 in	10.99 in	12.39 in	13.96 in
6	R	0.0	0.0					
	V	0.13						
8	R	0.0	0.0	0.0	0.0			
	V	0.17	0.10					
9	R	0.0	0.0	0.0	0.0			
	V	0.19	0.12					
10	R	0.0	0.0	0.0	0.0			
	V	0.21	0.13					
11	R	0.0	0.0	0.0	0.0			
	V	0.24	0.14					
12	R	0.0	0.0	0.0	0.0	0.0	0.0	
	V	0.26	0.16	0.10				
13	R	0.0	0.0	0.0	0.0	0.0	0.0	
	V	0.28	0.17	0.11				
14	R	0.0	0.0	0.0	0.0	0.0	0.0	
	V	0.30	0.18	0.12				
15	R	0.0	0.0	0.0	0.0	0.0	0.0	
	V	0.32	0.20	0.13				
16	R	0.0	0.0	0.0	0.0	0.0	0.0	
	V	0.34	0.21	0.13				
17	R	0.0	0.0	0.0	0.0	0.0	0.0	
	V	0.37	0.22	0.14				
18	R	0.0	0.0	0.0	0.0	0.0	0.0	
	V	0.39	0.24	0.15				
19	R	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.41	0.25	0.16	0.10			
20	R	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.43	0.26	0.17	0.11			
22	R	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.47	0.29	0.18	0.13			
24	R	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.52	0.31	0.20	0.14			
26	R	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.56	0.34	0.22	0.15			
28	R	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.60	0.37	0.24	0.16			
30	R	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.64	0.39	0.25	0.17	0.10		
32	R	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.69	0.42	0.27	0.18	0.11		
34	R	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.73	0.45	0.29	0.19	0.12		
36	R	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.77	0.47	0.30	0.20	0.12		
38	R	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	V	0.82	0.50	0.32	0.21	0.13	0.10	
40	R	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	V	0.86	0.52	0.34	0.24	0.14	0.11	
45	R	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	V	0.97	0.59	0.38	0.27	0.15	0.12	
50	R	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	V	1.07	0.66	0.42	0.30	0.17	0.13	0.10
55	R	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	V	1.18	0.72	0.46	0.32	0.19	0.15	0.12
60	R	0.2	0.1	0.0	0.0	0.0	0.0	0.0
	V	1.29	0.79	0.50	0.35	0.20	0.16	0.13
65	R	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	V	1.40	0.85	0.55	0.38	0.22	0.17	0.14

Table 13

**Continuous pressure drop tables**  
**SDR 17.6 (tested PN 10) at 68°F and 153°F**

Q = Flowrate US gpm    R = ft.hd/ 100ft  
 V = Velocity ft./s    De = External Diameter  
 Di = Internal Diameter    ND = Nominal Diameter

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft<sup>3</sup></b>	<b>61.38 lbs/ft<sup>3</sup></b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft<sup>2</sup>/s</b>	<b>5.059E-06 ft<sup>2</sup>/s</b>

Q =	ND	4"	6"	8"	10"	12"	14"	16"
US gpm	De	4.92 in	6.30 in	7.87 in	9.84 in	12.40 in	13.98 in	15.75 in
	Di	4.36 in	5.58 in	6.98 in	8.72 in	10.99 in	12.39 in	13.96 in
70	R	0.2 0.2	0.1 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	1.50	0.92	0.59	0.40	0.24	0.19	0.15
75	R	0.2 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	1.61	0.98	0.63	0.40	0.25	0.20	0.46
80	R	0.3 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	1.72	1.05	0.67	0.43	0.27	0.21	0.50
85	R	0.3 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	1.83	1.11	0.71	0.46	0.29	0.23	0.55
90	R	0.3 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	1.93	1.18	0.76	0.48	0.30	0.24	0.59
95	R	0.3 0.3	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	2.04	1.25	0.80	0.51	0.32	0.25	0.63
100	R	0.4 0.3	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	2.15	1.31	0.84	0.54	0.34	0.27	0.67
110	R	0.5 0.4	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	2.36	1.44	0.92	0.59	0.37	0.29	0.71
120	R	0.6 0.4	0.2 0.1	0.1 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	2.58	1.57	1.01	0.64	0.41	0.32	0.75
130	R	0.7 0.5	0.2 0.1	0.1 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	2.79	1.70	1.09	0.70	0.44	0.35	0.80
140	R	0.8 0.5	0.2 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	3.01	1.84	1.18	0.75	0.47	0.37	0.84
150	R	0.9 0.6	0.2 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	3.22	1.97	1.26	0.81	0.51	0.40	0.94
160	R	1.0 0.7	0.3 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	3.44	2.10	1.34	0.86	0.54	0.43	1.05
170	R	1.1 0.8	0.3 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	3.65	2.23	1.43	0.91	0.58	0.45	1.15
180	R	1.2 0.8	0.3 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	3.87	2.36	1.51	0.97	0.61	0.48	1.26
190	R	1.3 0.9	0.4 0.3	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	4.08	2.49	1.60	1.02	0.64	0.51	1.36
200	R	1.5 1.0	0.4 0.3	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	4.30	2.62	1.68	1.07	0.68	0.53	1.47
220	R	1.8 1.2	0.5 0.4	0.2 0.1	0.1 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	4.73	2.89	1.85	1.18	0.74	0.59	1.57
240	R	2.0 1.4	0.5 0.4	0.2 0.1	0.1 0.0	0.0 0.0	0.0 0.0	0.0 0.0
	V	5.15	3.15	2.02	1.29	0.81	0.64	1.68
260	R	2.3 1.6	0.6 0.5	0.2 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0
	V	5.58	3.41	2.18	1.40	0.88	0.69	1.78
280	R	2.6 1.8	0.7 0.5	0.2 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0
	V	6.01	3.67	2.35	1.50	0.95	0.75	1.89
300	R	2.9 2.0	0.8 0.6	0.3 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0
	V	6.44	3.93	2.52	1.61	1.01	0.80	1.99
320	R	3.2 2.3	0.9 0.7	0.3 0.2	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0
	V	6.87	4.2	2.69	1.72	1.08	0.85	2.10
340	R	3.6 2.5	1.0 0.8	0.3 0.3	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0
	V	7.30	4.46	2.86	1.83	1.15	0.90	2.31
360	R	3.9 2.8	1.1 0.8	0.4 0.3	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0
	V	7.73	4.72	3.02	1.93	1.22	0.96	2.52
380	R	4.3 3.1	1.2 0.9	0.4 0.3	0.1 0.1	0.0 0.0	0.0 0.0	0.0 0.0
	V	8.16	4.98	3.19	2.04	1.29	1.01	2.73
400	R	5.3 3.4	1.3 1.0	0.5 0.3	0.2 0.1	0.1 0.0	0.0 0.0	0.0 0.0
	V	8.59	5.25	3.36	2.15	1.35	1.06	2.94
450	R	6.3 4.1	1.6 1.2	0.6 0.4	0.2 0.1	0.1 0.0	0.0 0.0	0.0 0.0
	V	9.67	5.9	3.78	2.42	1.52	1.20	3.15
500	R	7.5 5.0	2.0 1.5	0.7 0.5	0.2 0.2	0.1 0.1	0.0 0.0	0.0 0.0
	V	10.74	6.56	4.20	2.68	1.69	1.33	3.36

Table 14

Continuous pressure drop tables  
SDR 17.6 (tested PN 10) at 68°F and 153°F

Q = Flowrate US gpm R = ft.hd/ 100ft  
V = Velocity ft./s De = External Diameter  
Di = Internal Diameter ND = Nominal Diameter

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft<sup>3</sup></b>	<b>61.38 lbs/ft<sup>3</sup></b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft<sup>2</sup>/s</b>	<b>5.059E-06 ft<sup>2</sup>/s</b>

Q =	ND	4"	6"	8"	10"	12"	14"	16"
US gpm	De	4.92 in	6.30 in	7.87 in	9.84 in	12.40 in	13.98 in	15.75 in
	Di	4.36 in	5.58 in	6.98 in	8.72 in	10.99 in	12.39 in	13.96 in
550	R	7.5 5.9	2.3 1.8	0.8 0.6	0.3 0.2	0.1 0.1	0.1 0.0	0.0 0.0
	V	11.81	7.21	4.62	2.95	1.86	1.46	3.56
600	R	8.7 6.8	2.7 2.1	0.9 0.7	0.3 0.2	0.1 0.1	0.1 0.0	0.0 0.0
	V	12.89	7.87	5.04	3.22	2.03	1.60	1.26
650	R	10.0 7.9	3.1 2.4	1.1 0.8	0.4 0.3	0.1 0.1	0.1 0.1	0.0 0.0
	V	13.96	8.52	5.46	3.49	2.20	1.73	1.36
700	R		3.5 2.8	1.2 0.9	0.4 0.3	0.1 0.1	0.1 0.1	0.0 0.0
	V		9.18	5.88	3.76	2.37	1.86	1.47
750	R		4.0 3.1	1.4 1.1	0.5 0.4	0.2 0.1	0.1 0.1	0.1 0.0
	V		9.84	6.30	4.03	2.54	2.00	1.57
800	R		4.5 3.5	1.5 1.2	0.5 0.4	0.2 0.1	0.1 0.1	0.1 0.0
	V		10.49	6.72	4.30	2.71	2.13	1.68
850	R		5.0 3.9	1.7 1.4	0.6 0.5	0.2 0.2	0.1 0.1	0.1 0.0
	V		11.15	7.14	4.56	2.88	2.26	1.78
900	R		5.5 4.3	1.9 1.5	0.7 0.5	0.2 0.2	0.1 0.1	0.1 0.1
	V		11.80	7.56	4.83	3.04	2.39	1.89
950	R		6.0 4.7	2.1 1.6	0.7 0.5	0.2 0.2	0.1 0.1	0.1 0.1
	V		12.46	7.98	5.10	3.21	2.53	1.99
1000	R		6.6 5.2	2.3 1.8	0.8 0.6	0.3 0.2	0.1 0.1	0.1 0.1
	V		13.11	8.40	5.37	3.38	2.66	2.10
1100	R		7.8 6.1	2.7 2.1	0.9 0.7	0.3 0.2	0.2 0.1	0.1 0.1
	V		14.43	9.24	5.91	3.72	2.93	2.31
1200	R			3.1 2.5	1.1 0.9	0.4 0.3	0.2 0.1	0.1 0.1
	V			10.08	6.44	4.06	3.19	2.52
1300	R			3.6 2.8	1.3 1.0	0.4 0.3	0.2 0.2	0.1 0.1
	V			10.92	6.98	4.40	3.46	2.73
1400	R			4.1 3.2	1.4 1.1	0.5 0.4	0.3 0.2	0.2 0.1
	V			11.76	7.52	4.74	3.73	2.94
1500	R			4.7 3.7	1.6 1.3	0.5 0.4	0.3 0.2	0.2 0.1
	V			12.60	8.05	5.07	3.99	3.15
1600	R			5.2 4.1	1.8 1.4	0.6 0.5	0.3 0.3	0.2 0.1
	V			13.44	8.59	5.41	4.26	3.36
1700	R			5.8 4.5	2.0 1.6	0.7 0.5	0.4 0.3	0.2 0.2
	V			14.28	9.13	5.75	4.52	3.56
1800	R			6.4 5.0	2.2 1.7	0.7 0.6	0.4 0.3	0.2 0.2
	V			9.67	6.09	4.79	4.79	3.77
1900	R			2.4 1.9	0.8 0.6	0.5 0.3	0.3 0.2	0.3 0.2
	V			10.20	6.43	5.06	3.98	
2000	R			2.7 2.1	0.9 0.7	0.5 0.4	0.3 0.2	0.3 0.2
	V			10.74	6.77	5.32	4.19	
2200	R			3.1 2.5	1.0 0.8	0.6 0.5	0.3 0.3	0.3 0.3
	V			11.81	7.44	5.85	4.61	
2400	R			3.7 2.9	1.2 1.0	0.7 0.5	0.4 0.3	0.4 0.3
	V			12.89	8.12	6.39	5.03	
2600	R			4.2 3.3	1.4 1.1	0.8 0.6	0.5 0.3	0.5 0.3
	V			13.96	8.79	6.92	5.45	
2800	R				1.6 1.3	0.9 0.7	0.5 0.4	0.5 0.4
	V				9.47	7.45	5.87	
3000	R				1.8 1.4	1.0 0.8	0.6 0.5	0.6 0.5
	V				10.15	7.98	6.71	
3200	R				2.0 1.6	1.1 0.9	0.7 0.6	0.7 0.6
	V				10.82	8.51	7.13	
3400	R				2.2 1.8	1.3 1.0	0.7 0.6	0.7 0.6
	V				11.50	9.05	7.13	

Table 15

**Continuous pressure drop tables**  
**SDR 17.6 (tested PN 10) at 68°F and 153°F**

Q = Flowrate US gpm    R = ft.hd/ 100ft  
 V = Velocity ft./s    De = External Diameter  
 Di = Internal Diameter    ND = Nominal Diameter

<b>Roughness</b>	<b>0.00028"</b>	
<b>Specific Weight</b>	<b>62.30 lbs/ft<sup>3</sup></b>	<b>61.38 lbs/ft<sup>3</sup></b>
<b>Temperature</b>	<b>68°F</b>	<b>153°F</b>
<b>Viscosity</b>	<b>1.0979E-05 ft<sup>2</sup>/s</b>	<b>5.059E-06 ft<sup>2</sup>/s</b>

Q =	ND	12"		14"		16"	
	De	12.40 in		13.98 in		15.75 in	
US gpm	Di	10.99 in		12.39 in		13.96 in	
3600	R	2.5	1.9	1.4	1.1	0.8	0.6
	V	12.18		9.58		7.55	
3800	R	2.7	2.1	1.5	1.2	0.9	0.7
	V	12.85		10.11		7.97	
4000	R	3.0	2.3	1.7	1.3	1.0	0.8
	V	13.53		10.64		8.39	
4250	R	3.3	2.6	1.9	1.5	1.1	0.8
	V	14.38		11.31		8.91	
4500	R			2.1	1.6	1.2	0.9
	V			11.97		9.44	
4750	R			2.3	1.8	1.3	1.0
	V			12.64		9.96	
5000	R			2.5	2.0	1.4	1.1
	V			13.30		10.49	
5250	R			2.7	2.1	1.5	1.2
	V			13.97		11.01	
5500	R					1.7	1.3
	V					11.53	
5750	R					1.8	1.4
	V					12.06	
6000	R					2.0	1.5
	V					12.58	
6250	R					2.1	1.6
	V					13.11	
6500	R					2.2	1.8
	V					13.63	
6750	R					2.4	1.9
	V					14.15	
7000	R						
	V						

Table 16

## Designing at Higher Velocities

Using Fusion-Tech piping systems means higher velocity in comparison to standard systems (i.e. metal pipes); thanks to the innate features of PP-RCT 125, including reduced pressure drops, lower risk of obstructions due to sedimentation and lower noise caused by flow. Increasing velocity thus, compensates for the lower water content of Fusion-Tech pipes compared to steel or copper pipes.

### Recommended Maximum Design Velocity

Type of System	Velocity
Buried application	up to 13 ft./s
Main lines without fast closing valves	up to 13 ft./s
Secondary lines	up to 10 ft./s
Branch lines (Tertiary lines)	up to 8 ft./s
Domestic hot water recirculation lines	Max 3.3 ft./s

Table 17

### Pressure Drop Comparison of Different Piping Materials

The following is a comparison between pipes in different materials with comparable internal diameters. Note how the low level of roughness in the Fusion-Tech pipes internal walls significantly reduces pressure drop values.

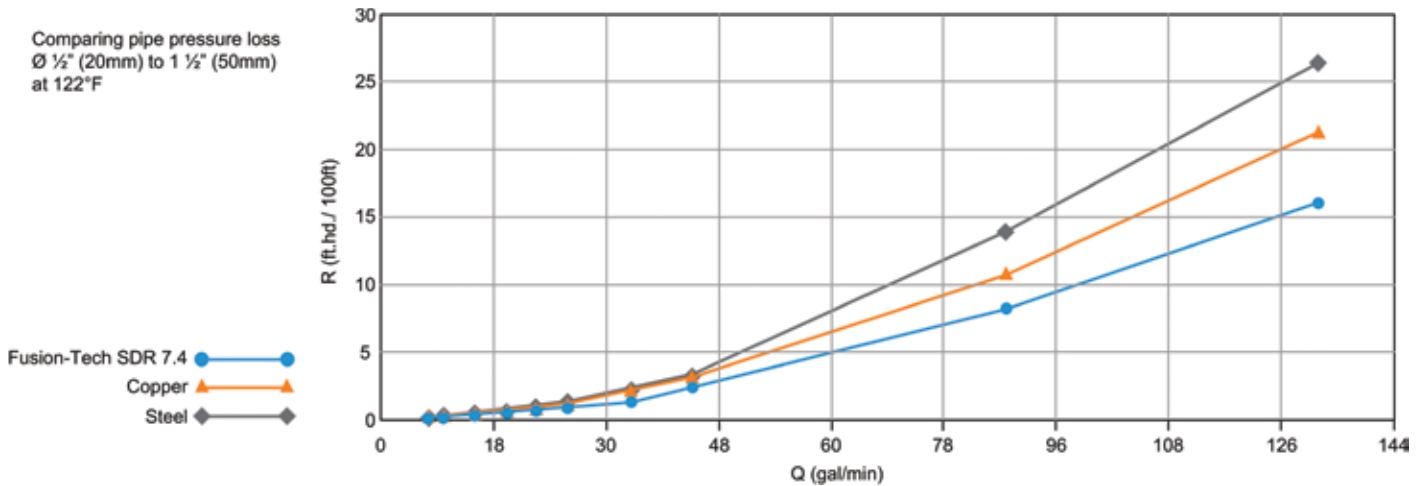


fig. 9

T=122° F	Steel Pipe Ø int. 2 1/8"	Copper Pipe Ø int. 2"	Fusion-Tech SDR 7.4 Pipe Ø int. 2 1/8"
Q(US gpm)	R(ft. hd./ 100 ft.)	R(ft. hd./ 100 ft.)	R(ft. hd./ 100 ft.)
6.7	0.10	0.11	0.06
8.9	0.17	0.17	0.13
13.2	0.34	0.34	0.25
17.6	0.60	0.58	0.42
22.0	0.88	0.86	0.66
26.5	1.28	1.23	0.92
35.2	2.21	2.12	1.49
44.1	3.36	3.08	2.28
88.1	13.46	10.57	8.24
132.0	25.95	21.15	15.69

Table 18



# Laying Techniques

## Compensating for Thermal Linear Expansion

With a 70% lower linear expansion compared to other synthetic pipes, fiber-reinforced piping (faser FIBER-T RED striped pipe and faser FIBER-COND GREY striped pipe) prevents the formation of unsightly bends in the piping, particularly when carrying hot fluids or in cases involving a significant difference between the ambient temperature at the time of installation and the ambient working temperature.

### Comparison of Expansion Between Different Materials

Type of pipe	Fusion-Tech BLUE Striped & VIOLET Pipes	Fusion-Tech BLUE Striped & VIOLET Pipes with shell	faser FIBER-COND GREY Striped and faser FIBER-T RED Striped Pipes	Steel	Copper	PE-HD	polipert (PE-RT)	polipex (PE-X)	multi-calor multi-eco
Linear expansion coefficient $\alpha = \text{in}/(\text{ft} \cdot ^\circ\text{F})$	0.150	0.030	0.035	0.011	0.0170	0.130	0.140	0.190	0.026

Table 19

The risks deriving from linear expansion must be compared to the type of installation done. If, for example, the section of pipe and its fittings are enclosed, the force of the plastic expansion is much lower and the pipe expansion length is contained and hidden in the wall itself. In an exposed system, it is essential to arrange fixed and sliding supports appropriately from an aesthetics point of view.

In either case, additional expansion compensation techniques must be provided.

Appropriate expansion compensators must be added, such as a U-shaped (omega) loop, or directional changes that give the piping a way to discharge the expansion.

**Warning:** Failure to provide appropriate expansion compensation where necessary may result in substantial property damage, severe injury or death.

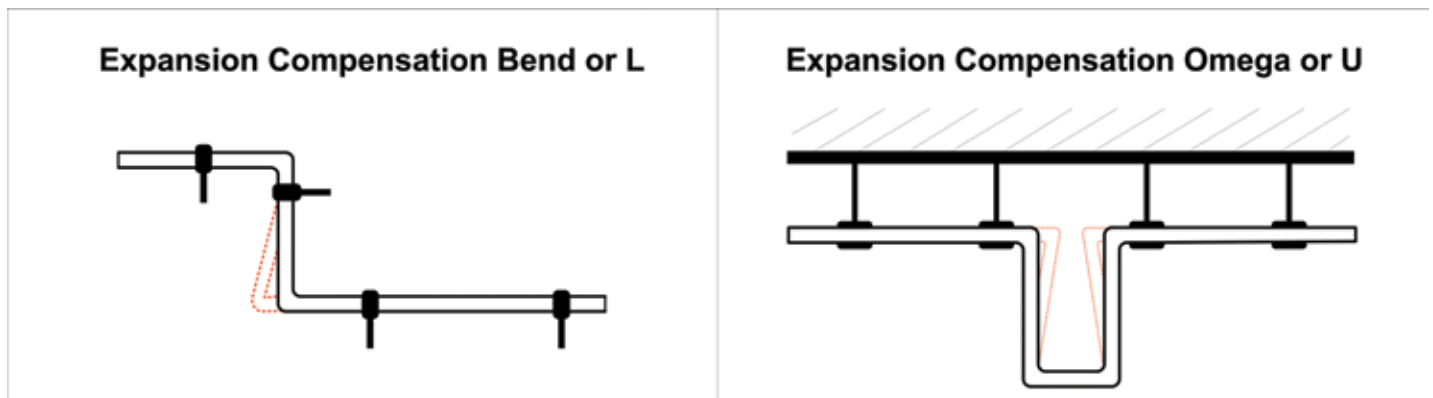


fig. 10

## Calculating Linear Thermal Expansion

Linear thermal expansion is calculated using the following formula:

$$DL = \alpha \cdot L \cdot \Delta t$$

Where:

DL = Expansion expressed in inches

$\alpha$  = Linear thermal expansion coefficient (see table below)

L = Pipe length expressed in ft.

$\Delta t$  = Temperature difference between ambient air and fluid carried (°F)

Type of pipe	Fusion-Tech <b>BLUE</b> Striped or <b>VIOLET</b> Pipes	Fusion-Tech <b>BLUE</b> Striped or <b>VIOLET</b> Pipes with shell	Multilayer pipes faser FIBER-T <b>RED</b> Striped Pipe and faser FIBER-COND <b>GREY</b> Striped Pipe
Linear expansion coefficient $\alpha = \text{in.}/(\text{ft.}\cdot^\circ\text{F})$	0.001008	0.0002029	0.0002367

Table 20

## Example of Linear Expansion Calculation

Example of $\Delta t$ calculation:
Temperature of carried fluid = <b>160°F</b> Ambient installation temperature = <b>70°F</b> <b><math>\Delta t = 160^\circ - 70^\circ = 90^\circ\text{F}</math></b>
Data:
$\alpha = 0.001008 \text{ in./ft.}\cdot^\circ\text{F}$ (value related to Fusion-Tech <b>BLUE</b> Striped piping) L = 18 ft. $\Delta t = 90^\circ\text{F}$
Calculation:
$DL = (\alpha \cdot L \cdot \Delta t)$ $= 0.001008 \cdot 18.0 \cdot 90$ $= 1.63''$

The tables below show the entire Fusion-Tech piping range linear expansion values for pipes with lengths between 1 ft. and 330 ft, with a  $\Delta t$  between 10 and 100°F for quick reference

## Linear Expansion Values

To calculate linear expansion, you can refer to the following tables, while the supports must be made according to the tables in the "Piping Support Distances" section, shown on page 42-43.

Linear Expansion of Fusion-Tech BLUE Striped Pipe and VIOLET Pipe (Inches)

Pipe Length ft.	$\Delta T$ 18°F	$\Delta T$ 36°F	$\Delta T$ 54°F	$\Delta T$ 72°F	$\Delta T$ 90°F	$\Delta T$ 108°F	$\Delta T$ 126°F	$\Delta T$ 144°F
2	1/32	1/16	1/16	1/8	1/8	3/16	3/16	1/4
3	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2
7	1/8	1/4	3/8	1/2	9/16	11/16	13/16	15/16
10	3/16	3/8	9/16	11/16	7/8	1 1/16	1 1/4	1 7/16
13	1/4	1/2	11/16	15/16	1 3/16	1 7/16	1 5/8	1 7/8
16	5/16	9/16	7/8	1 3/16	1 1/2	1 3/4	2 1/16	2 3/8
20	3/8	11/16	1 1/16	1 7/16	1 3/4	2 1/8	2 1/2	2 13/16
23	7/16	13/16	1 1/4	1 5/8	2 1/16	2 1/2	2 7/8	3 5/16
26	1/2	15/16	1 7/16	1 7/8	2 3/8	2 13/16	3 5/16	3 12/16
30	1/2	1 1/16	1 5/8	2 1/4	2 11/16	3 3/16	3 3/4	4 1/4
33	9/16	1 3/16	1 3/4	2 3/8	2 15/16	3 9/16	4 1/8	4 3/4
164	2 15/16	5 7/8	8 7/8	11 13/16	14 3/4	17 11/16	20 11/16	23 5/8
328	5 7/8	11 13/16	15 15/16	23 5/8	29 1/2	35 7/16	41 5/16	47 1/4

$\Delta T$  in inch

$\alpha = 0.001008$  in/ft°F

Table 21

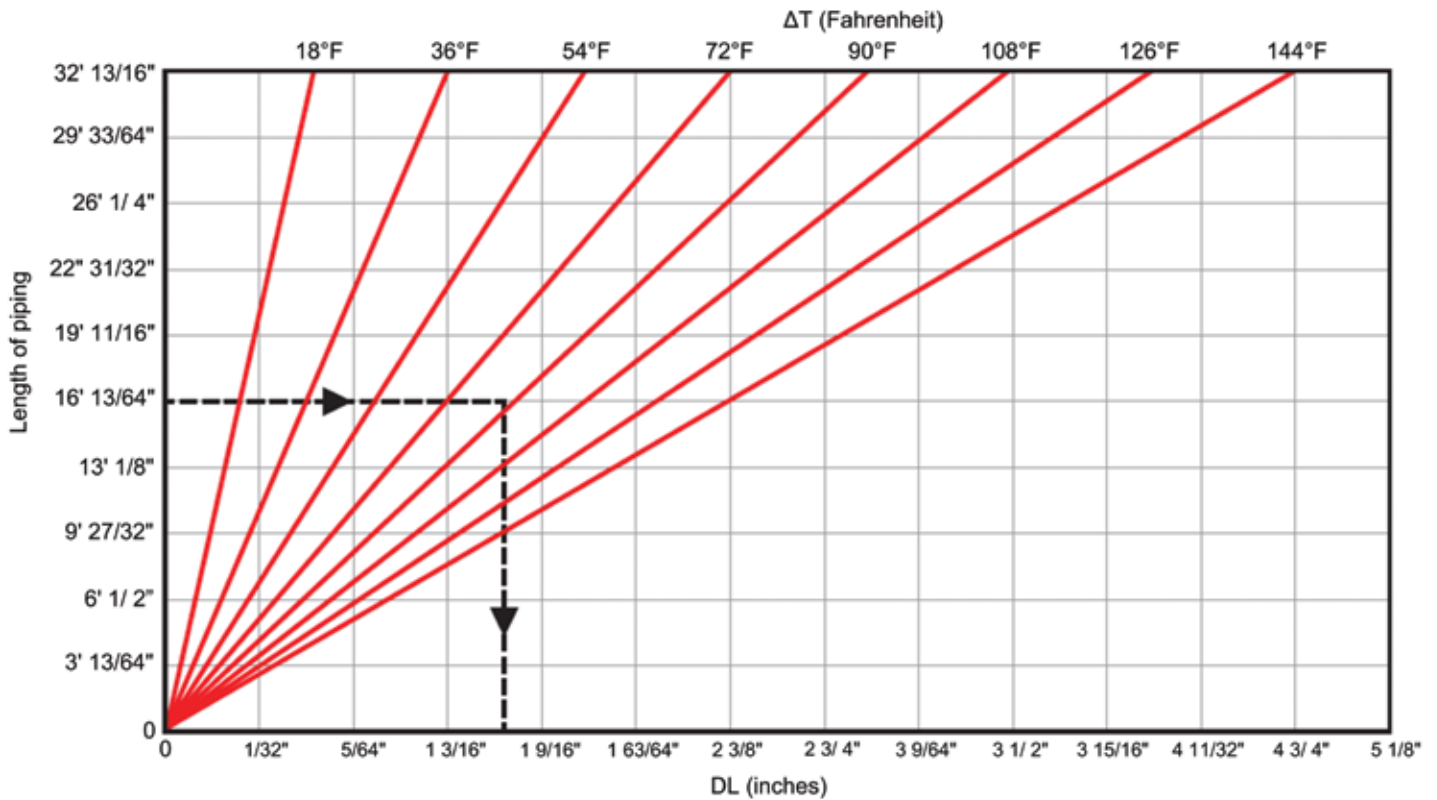


fig. 11

Metal conduits reduce the effect of thermal expansion. They can be used on pre-existing piping or on particular sections where you wish to obtain a better aesthetic appearance.

Linear Expansion Fusion-Tech **BLUE** Striped or Violet Pipe with Metal Conduit ( Inches)

Pipe Length ft.	$\Delta T$ 18°F	$\Delta T$ 36°F	$\Delta T$ 54°F	$\Delta T$ 72°F	$\Delta T$ 90°F	$\Delta T$ 108°F	$\Delta T$ 126°F	$\Delta T$ 144°F
2	N/A	N/A	N/A	N/A	N/A	1/16	1/16	1/16
3	N/A	N/A	1/16	1/16	1/16	1/16	1/16	1/8
7	N/A	N/A	1/16	1/8	1/8	1/8	3/16	3/16
10	1/16	1/16	1/8	1/8	3/16	3/16	1/4	5/16
13	1/16	1/8	1/8	3/16	1/4	5/16	5/16	3/8
16	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2
20	1/16	1/8	3/16	5/16	3/8	7/16	1/2	9/16
23	1/16	3/16	1/4	5/16	7/16	1/2	9/16	11/16
26	1/8	3/16	5/16	3/8	1/2	9/16	11/16	3/4
30	1/8	3/16	5/16	7/16	9/16	5/8	3/4	7/8
33	1/8	1/4	3/8	1/2	9/16	11/16	13/16	15/16
164	9/16	1 3/16	1 3/4	2 3/8	2 15/16	3 9/16	4 1/4	4 3/4
328	1 3/16	2 3/8	3 9/16	4 3/4	5 7/8	7 1/16	8 1/4	9 7/16

$\Delta T$  in inch

$\alpha = 0.0002029$  in./ft°F

Table 22

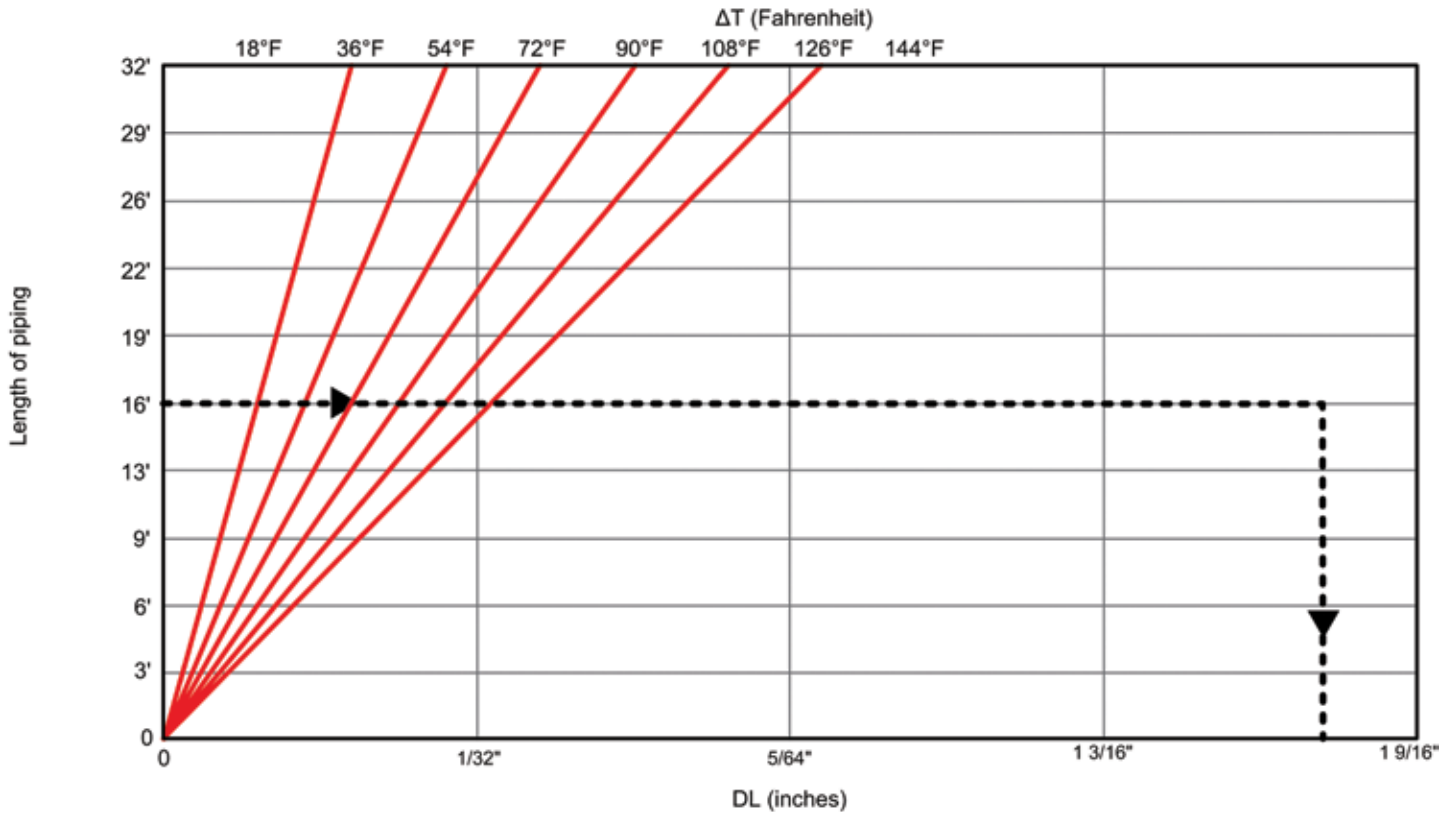


fig. 12

Linear Expansion of faser FIBER-T RED Striped and faser FIBER-COND GREY Striped Pipe (Inches)

Pipe Length ft.	$\Delta T$ 18°F	$\Delta T$ 36°F	$\Delta T$ 54°F	$\Delta T$ 72°F	$\Delta T$ 90°F	$\Delta T$ 108°F	$\Delta T$ 126°F	$\Delta T$ 144°F
2	N/A	N/A	N/A	N/A	1/16	1/16	1/16	1/16
3	N/A	N/A	1/16	1/16	1/16	1/16	1/8	1/8
7	N/A	1/16	1/16	1/8	1/8	3/16	3/16	1/4
10	1/16	1/16	1/8	3/16	3/16	1/4	5/16	5/16
13	1/16	1/8	3/16	1/4	1/4	5/16	3/8	7/16
16	1/16	1/8	3/16	1/4	1/4	7/16	1/2	9/16
20	1/16	3/16	1/4	5/16	1/2	1/2	9/16	11/16
23	1/8	3/16	5/16	3/8	1/2	9/16	11/16	3/4
26	1/8	1/4	5/16	7/16	9/16	11/16	3/4	7/8
30	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1
33	1/8	1/4	7/16	9/16	11/16	13/16	15/16	1 1/8
164	11/16	1 3/8	2 1/16	2 3/4	3 7/16	4 1/8	4 13/16	5 1/2
328	1 3/8	2 3/4	4 1/8	5 1/2	6 7/8	8 1/4	9 5/8	11

$\Delta T$  in inch

$\alpha=0.0002367$  in/ft°F

Table 23

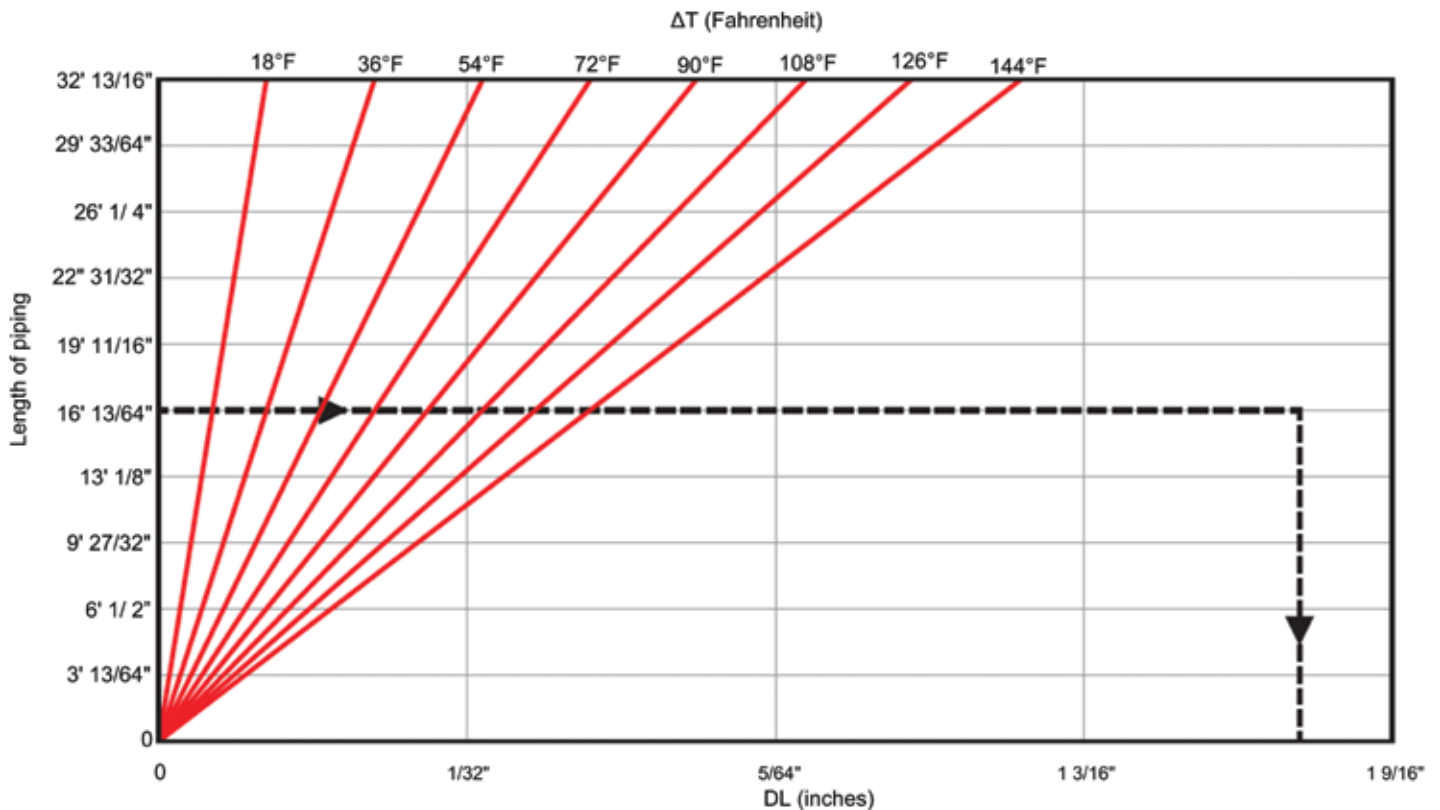


fig. 13

### Calculating Expansion Compensators

To calculate the size of the expansion compensator (L- or U-shaped), the constant value (C) shown in the table below must be known.

Type of pipe	Fusion-Tech <b>BLUE</b> Striped Pipe or <b>VIOLET</b> Pipe	Fusion-Tech <b>BLUE</b> Striped Pipe or <b>VIOLET</b> Pipe with shell	faser FIBER-COND <b>GREY</b> Striped Pipe and faser FIBER-T <b>RED</b> Striped Pipe
constant value C	14	16	16

Note: aquatechnik® applies a ≥15% safety factor when calculating the constant (C) value

Table 23

### Curved or L-shaped Expansion Compensators

This is the most commonly used type of compensator, since it is easy to manipulate the pipe layout to create it. The length of the curved side expansion compensator is calculated using the following formula:

$$LB = C \cdot \sqrt{(D \cdot DL)}$$

Where:

LB = bending arm length in inches

C = material constant (see data in the table)

D = external pipe diameter expressed in inches

DL = thermal linear expansion in inches. (For the calculation, see the “Calculating linear thermal expansion” section on page 33.)

### Omega- or U-shaped Expansion Compensators

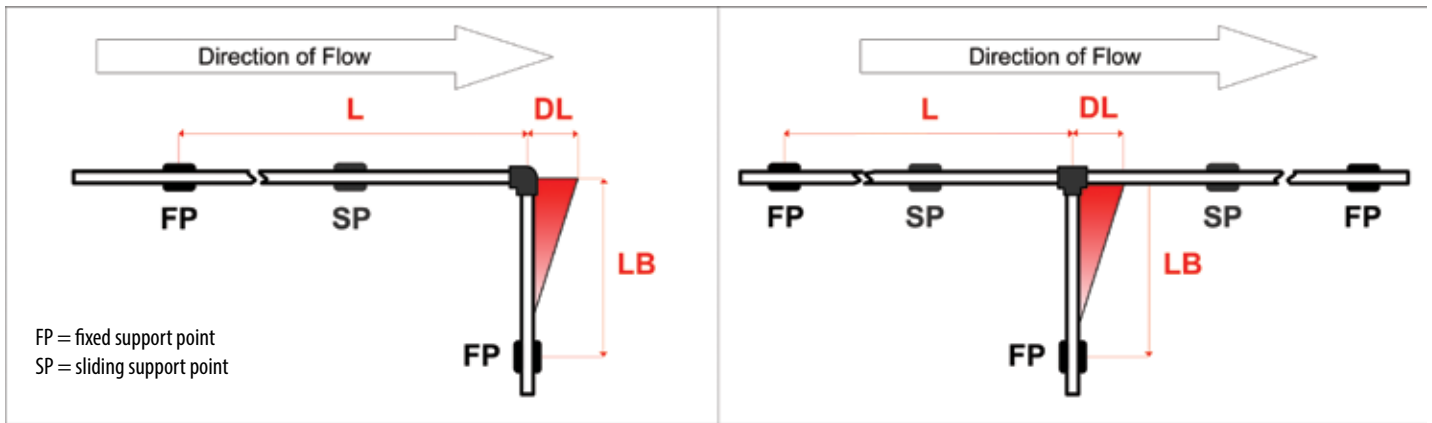


fig. 14

If it is not possible to compensate the expansion through curved or L-shaped expansion compensators, for example, if there are long straight sections, then omega or U-shaped expansion compensators can be created.

In addition to calculating the length of the curved side (LB), the distance (LM) between the two arms that will form the “U” of the compensator needs to be calculated as well, using the following formula:

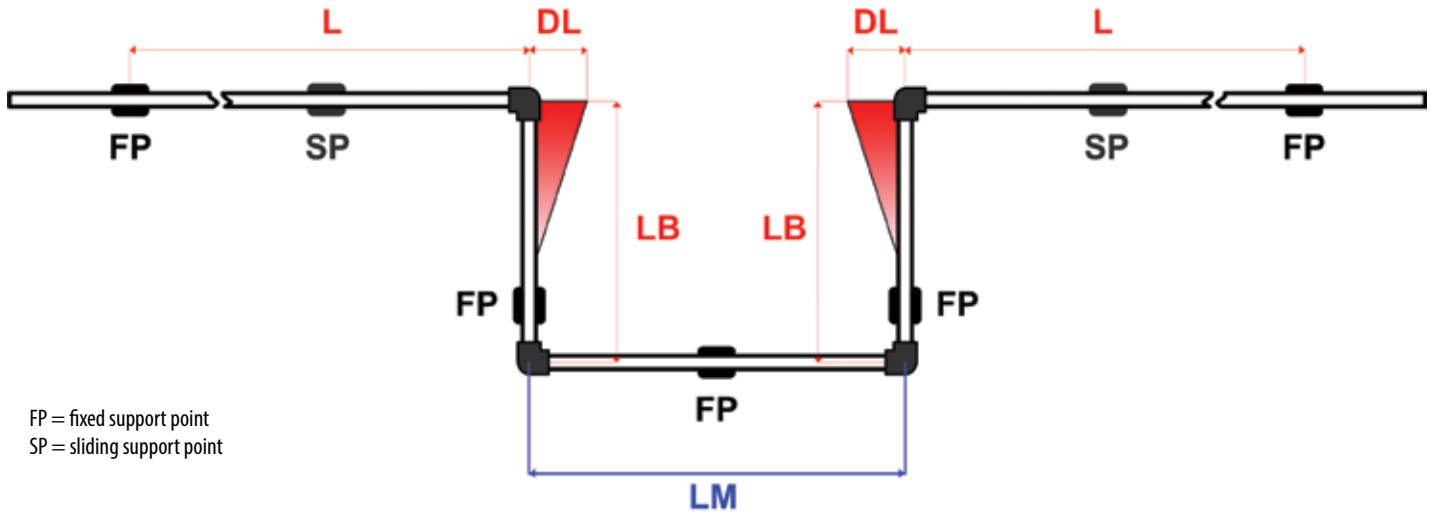
$$LM = 2 \cdot DL$$

Where:

LM = Expansion angle length (inches)

DL = Linear expansion (inches)

2 = Fixed value



FP = fixed support point  
 SP = sliding support point

fig. 15

### Pre-stressed Omega or U-shaped Expansion Compensators

If space does not allow for an Omega or U-shaped compensator to be created, it is possible to reduce the extent of the bending arm using the pre-tensioned compensator technique. During expansion, the installer must pre-stress the Omega, acting on the arm, thus absorbing half of the linear expansion. The formula for the calculation is as follows:

$$LCR = C \cdot \sqrt{(D \cdot (DL/2))}$$

Where:

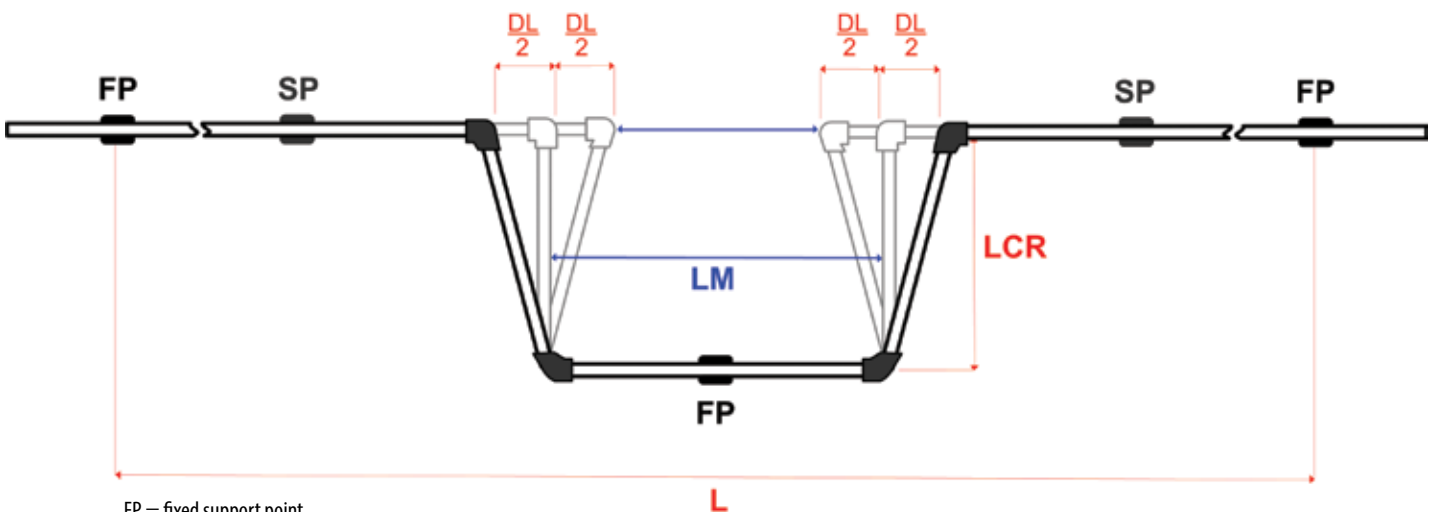
LCR = reduced curved side length (inches)

C = material constant (see data in the table at the beginning of the section)

D = external pipe diameter (inches)

DL = thermal linear expansion (for the calculation, see the "Calculating linear thermal expansion" section on pg. 33)

2 = fixed value

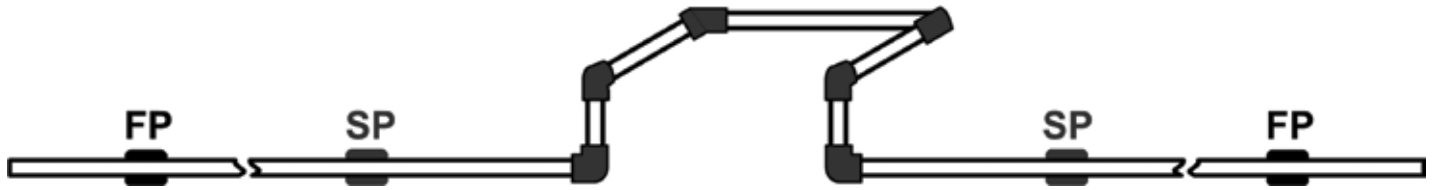


FP = fixed support point  
 SP = sliding support point  
 LM = expansion angle length (=> of 2\*DL)

fig. 16

### Six-elbow Omega

For restricted spaces, it is possible to create six-elbow Omegas as per the drawing shown. Calculating the bending arm is the same as for Omega compensators.



FP = fixed support point  
SP = sliding support point

fig. 17

To save time please refer to tables 29-32 (found on pg 42 - 43) for the bending arm length (LB) value for the entire Fusion-Tech product range.



# Diagram for Calculating Fixed Points in Branches and Right Angle Pipes

Fusion-Tech Pipe graph for calculating fixed points (FP) and the bending arm length (LB) in piping systems

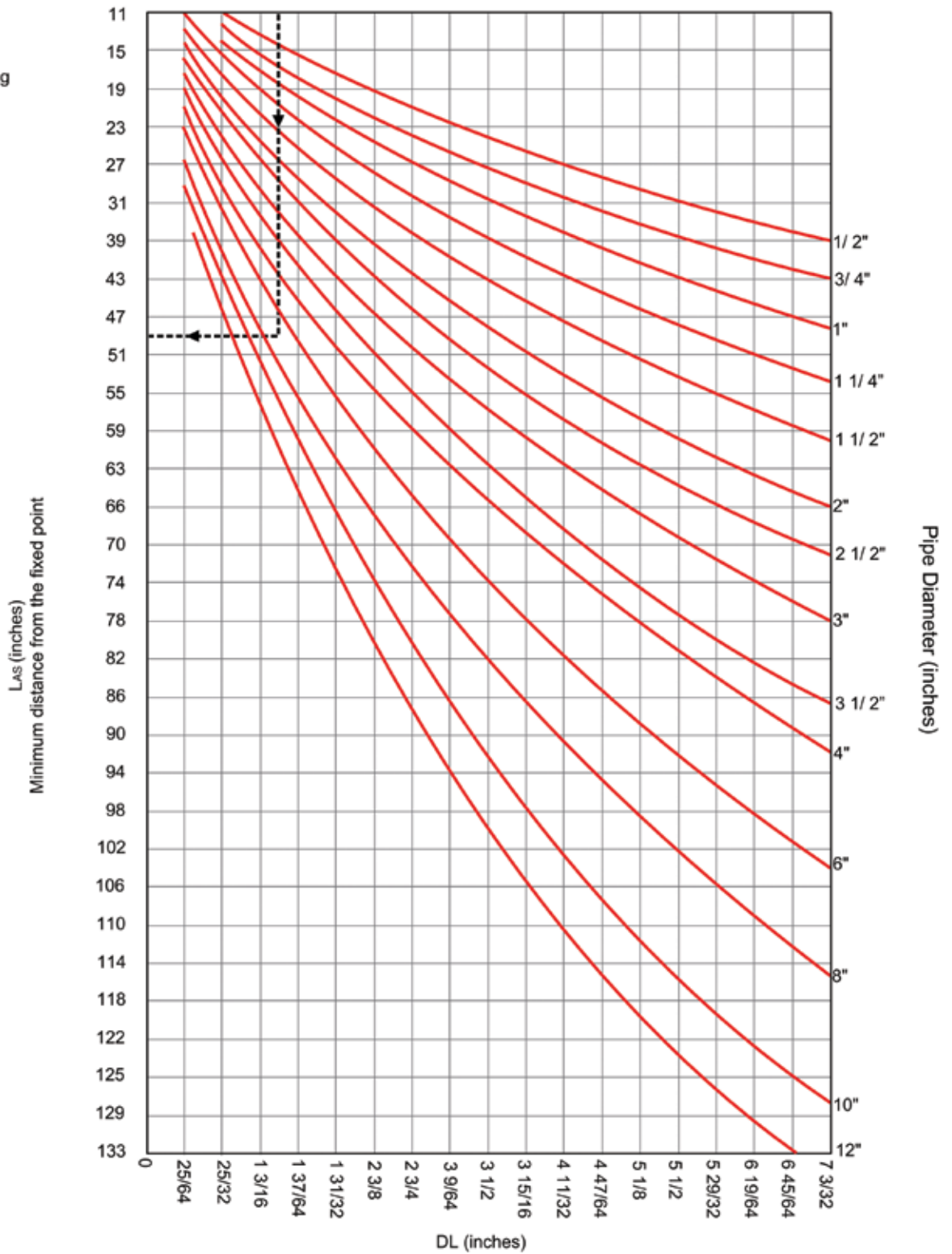


Table 24

# Pipe Clamping

Pipe clamping is essential in order to contain thermal linear expansion in systems. Proper clamping also contributes to creating expansion compensators.

Correct fixed clamp positioning must be done based on the type of pipe used and the temperature of the fluid to be carried.

To cancel or compensate for all the effects deriving from linear expansion, it is necessary to provide clamping that completely locks and eliminates any possibility of the pipes moving (for example, fixed points near the fittings). Sliding supports can then be used to allow expansion at an acceptable location in the run. Ensure that clamping is done in such a way that the valves and/or fittings do not impede sliding.

Fixed points impede pipe movement and divide them into individual sections of linear expansion. In creating fixed points, you must consider all the forces that act simultaneously on the section of pipe (linear expansion, weight of the material, fluid and other additional loads).

The fixed points must be sturdier than the sliding points need to be. We recommend creating fixed points where there are branches or closing parts. Fixed points can also be made in points of the system of your choice, in this case, they must be located to exploit the pipe direction changes in favor of absorbing linear expansion.

**aquatechnik**® pipe clamping must be done with specific brackets recommended by the company, equipped with appropriate protection to safeguard the pipe itself. Please contact **aquatechnik NA** at 1 (844) FUSION3 for a complete list of approved clamp manufacturers.

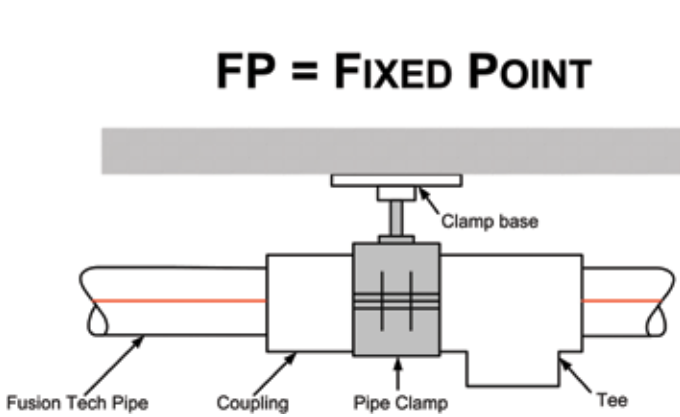


fig. 18

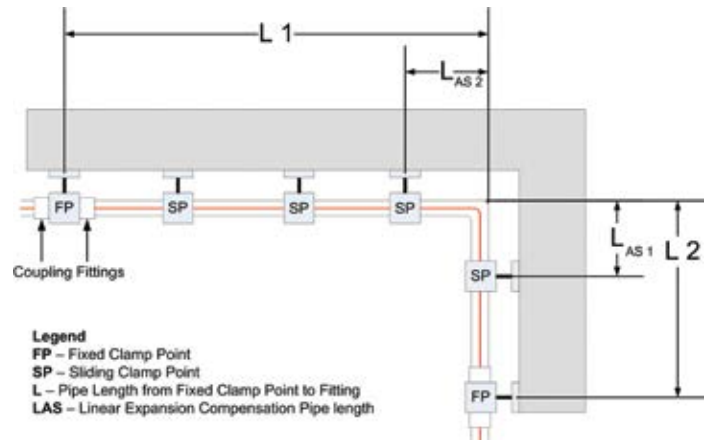


fig. 19

Please see tables below indicating the clamp positioning distances based on the temperature of the carried fluid.

**Caution:** a fixed point clamp must always be installed near curves or branches. This is important, especially near Tee branches where the fixed points must be positioned both immediately after the fitting (following the flow direction) and at the start of the branch line.

**Warning:** Improperly supporting piping or not using enough support clamps may cause damage to the pipe resulting in substantial property damage, severe injury or death.

**Warning:** Ensure only aquatechnik approved clamps are used. Failure to do so may result in premature failure of the piping system causing substantial property damage, severe injury or death.

For more information, please contact aquatechnikNA at 1(844)FUSION3.

## Pipe Support Distances

Clamp Support Distance - Fusion-Tech **BLUE** Striped and **VIOLET** Pipe SDR 11 (in ft.)

ND Ø	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	6"	8"
ext. Ø	0.79"	0.98"	1.26"	1.57"	1.97"	2.48"	2.95"	3.54"	4.33"	4.92"	6.3"	7.87"
ext. Ø mm	20	25	32	40	50	63	70	90	110	125	160	200
ΔT												
0°F	3	4	4	5	6	7	7	8	8	9	9	9
36°F	2	3	3	3	4	5	5	5	6	7	7	6
54°F	2	3	3	3	4	5	5	5	6	6	6	6
72°F	2	2	3	3	4	4	5	5	5	6	6	6

Table 25

Clamp Support Distance - Fusion-Tech **BLUE** Striped and **VIOLET** Pipe with Metal Conduit (in ft.)

ND Ø	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"
ext. Ø	0.79"	0.98"	1.26"	1.57"	1.97"	2.48"	2.95"	3.54"	4.33"
ext. Ø mm	20	25	32	40	50	63	70	90	110
ΔT									
0°F	5	6	6	7	8	9	9	10	11
36°F	4	4	5	6	6	7	7	8	8
54°F	4	4	5	6	6	7	7	8	8
72°F	4	4	5	5	6	7	7	7	8
90°F	4	4	5	5	6	7	7	7	7
108°F	3	4	4	5	6	6	7	7	7
126°F	3	3	4	5	5	6	6	7	7

Table 26

The center layer faser FIBER-T **RED** striped pipe and faser FIBER-COND **GREY** striped pipe is made of PP-R with fiberglass. The layer considerably reduces linear expansion caused by heat when compared with normal PP-R pipes. The piping may be clamped at greater distances compared to single layer PP-R pipes. The following table shows the clamping distances based on ΔL linear expansion.

Clamp Support Distance - Fusion-Tech FASER T **RED** Striped Pipe (in ft.)

ND Ø	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	6"	8"	10"	12"	14"	16"
ext. Ø	0.79"	0.98"	1.26"	1.57"	1.97"	2.48"	2.95"	3.54"	4.33"	4.92"	6.3"	7.87"	9.84"	12.40"	13.98"	15.75"
ext. Ø mm	20	25	32	40	50	63	70	90	110	125	160	200	250	315	355	400
ΔT																
0°F	4	5	5	6	7	8	8	9	10	10	10	10	10	10	10	10
36°F	3	3	4	4	5	6	6	6	7	8	7	7	8	8	7.5	8
54°F	3	3	4	4	5	6	6	6	7	7	7	7	7	7.5	7	7.5
72°F	3	3	4	4	5	5	6	6	7	7	6	7	7	7.5	7	7
90°F	3	3	4	4	5	5	6	6	6	6	6	6	7	7	6.5	7
108°F	3	3	3	4	4	5	5	6	6	6	6	6	6	6.5	6	6
126°F	2	3	3	4	4	5	5	5	6	6	5	6	6	6	6	6

Table 27

Clamp Support Distance - Fusion-Tech FIBER-COND GREY Striped Pipe (in ft.)

ND Ø	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	6"	8"	10"	12"	14"	16"
ext. Ø	0.79"	0.98"	1.26"	1.57"	1.97"	2.48"	2.95"	3.54"	4.33"	4.92"	6.3"	7.87"	9.84"	12.40"	13.98"	15.75"
ext. Ø mm	20	25	32	40	50	63	70	90	110	125	160	200	250	315	355	400
ΔT																
0°F	4	5	5	6	7	7	8	8	9	9	10	10	10	10	10	10
36°F	3	3	4	4	5	6	6	6	7	7	7	7	8	8	7.5	8
54°F	3	3	4	4	5	5	6	6	6	7	7	7	7	7.5	7	7.5
72°F	3	3	3	4	5	5	6	6	6	6	6	7	7	7.5	7	7
90°F	3	3	3	4	5	5	5	6	6	6	6	6	7	7	6.5	7
108°F	3	3	3	4	4	5	5	5	5	5	6	6	6	6.5	6	6
126°F	2	3	3	3	4	4	5	5	5	5	5	6	6	6	6	6

Table 28

Examples of Clamping

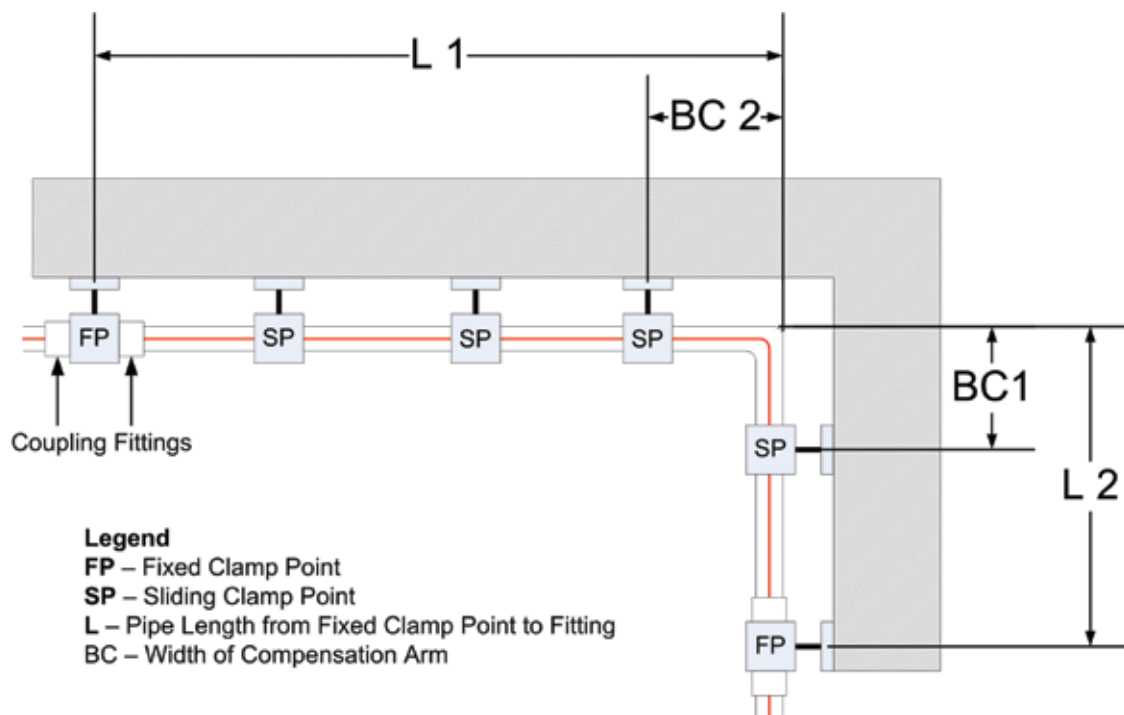


fig. 20

Example 1

Horizontal piping distribution with fixed points of your choice and expansion compensation by means of direction change. Calculate the distance between the supports using the tables in the "Pipe Support Distances" section on pages 42-43 and the width of the compensation arm (BC) from "Calculating Expansion Compensators" section on pages 37-39.

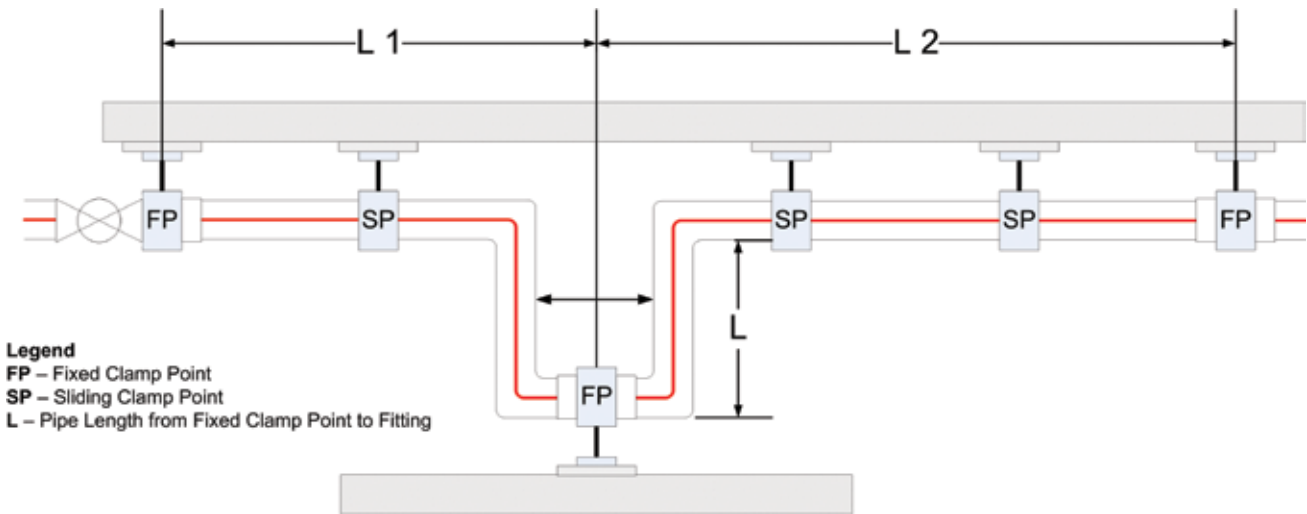


fig. 21

*Example 2*

Horizontal piping with compensator of the same material. Calculate the supports (GB) according to the tables in the "Pipe Support Distances" section on pages 42-43. Calculate the compensation arm (LB) according to the "Calculating Expansion Compensators" section on pages 37-39.

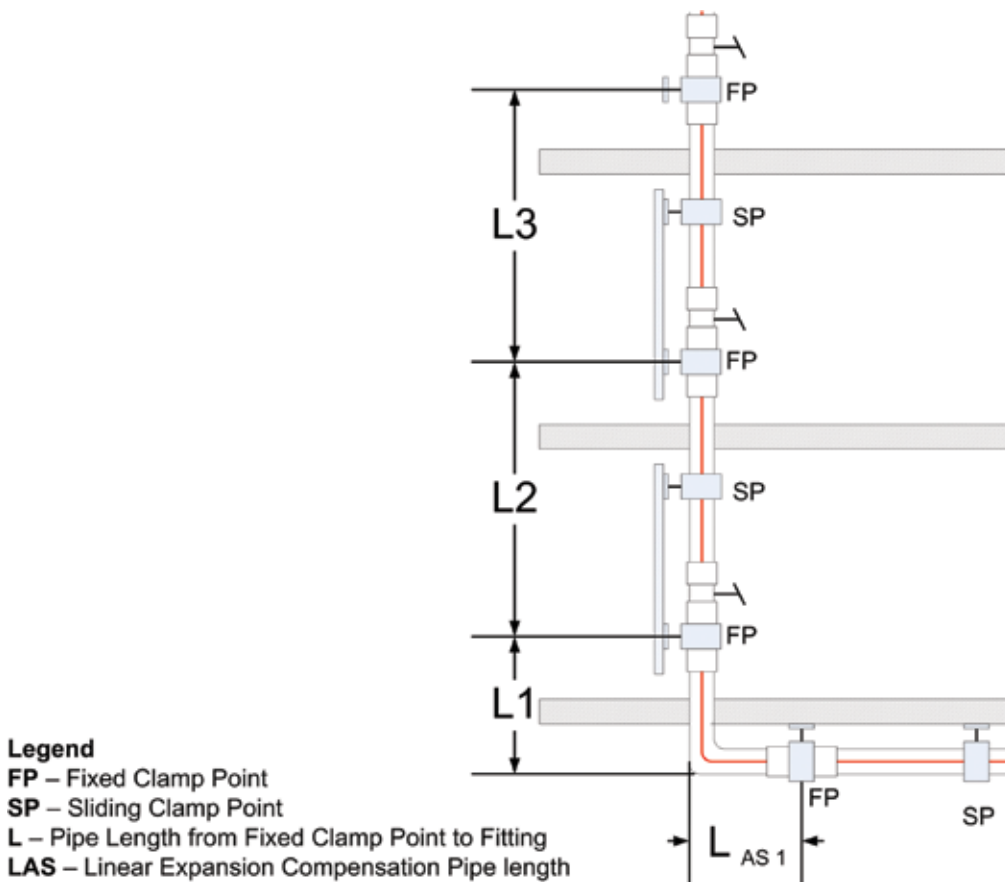


fig. 22

*Example 3*

Vertical distribution in multi-floor buildings.  
Through channels or shafts.  
A fixed point must be applied at every branch.

## Recommended Installing Practices in Enclosures and Through Separating Walls

When branching a vertical riser to various floors, consider the movement of the pipe, due to expansion, and arrange the branches accordingly to absorb the movement as follows:

1. Position the vertical riser in the shaft so that the LB distance is calculated according to the "Calculating for Expansion Compensators" section on pages 37-39.
2. Leaving space for the branched pipe to absorb the expansion;
3. If possible, install a compensation arm with an elbow;
4. In the vertical riser, a fixed point must be set immediately after the branch to prevent uncontrolled pipe movement.

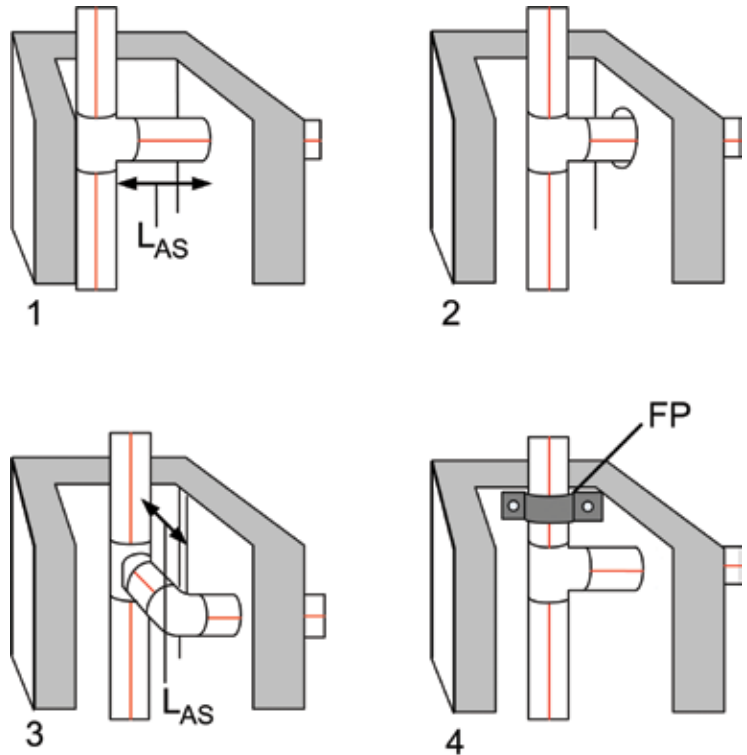


fig. 23

## Determining Compensation Breaks

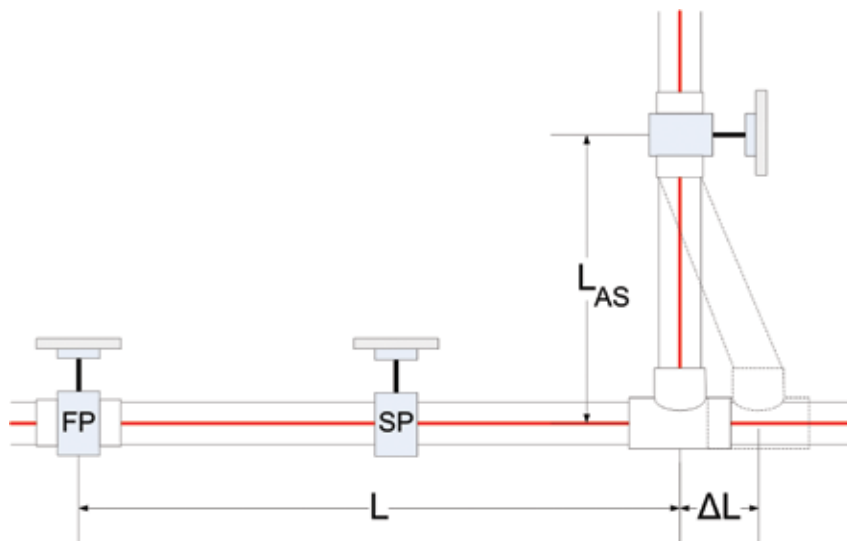


fig. 24

Compensation breaks need to be made to absorb and compensate for linear expansion. It is recommended, when possible, to put compensation breaks in direction changes such as 90° elbows or branching tees, the expansion of a section of pipe determined by a fixed point.

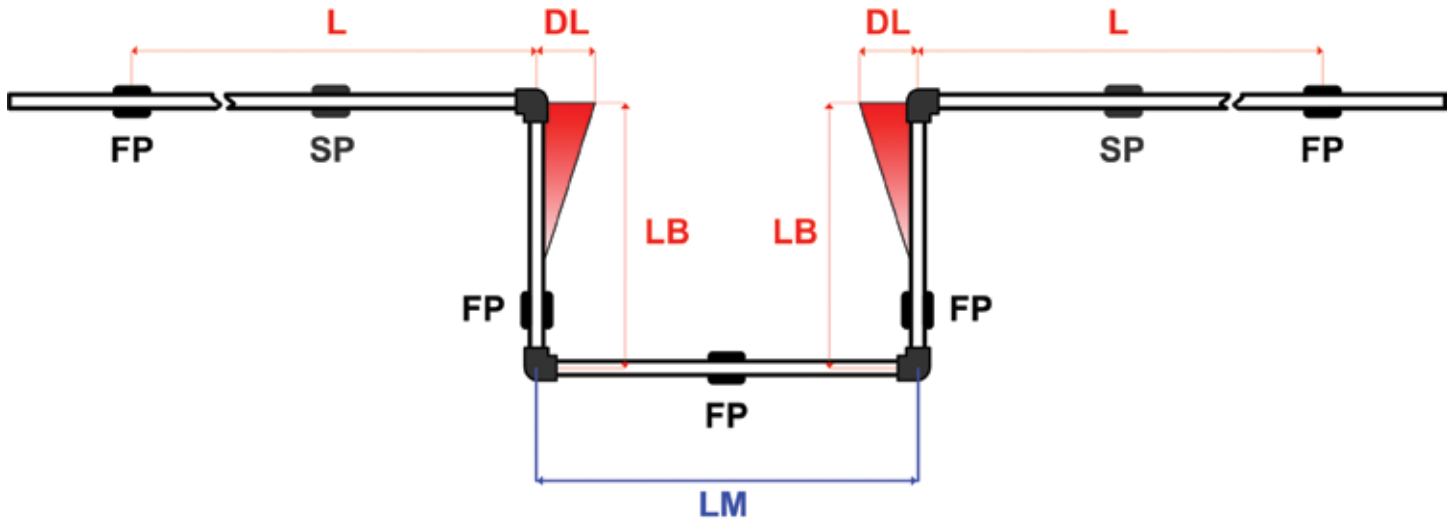


fig. 25

Using the "Calculating for Expansion Compensators" section on pages 37-39, you can calculate the expansion compensation break (BC) based on pipe length and working temperature. Length L is determined by the fixed points (FP).

# Energy Efficiency

In order to reduce heat dispersion from Fusion-Tech piping systems, the standards and national regulations in place regarding energy savings must be applied.

Fusion-Tech systems thermal conductivity is equal to  $\lambda$  0.127 btu/hr-ft-°F for Fusion-Tech **BLUE** striped & **VIOLET** pipes thermal conductivity  $\lambda$  0.120 btu/hr-ft-°F for Fusion-Tech **RED** & **GREY** striped pipes

Fusion-Tech systems, with equal insulation when compared to metal piping, greatly reduce heat dispersion and increase energy efficiency. The low thermal dispersions can allow for reduced circulating fluid temperatures.

## Piping for Sanitary or Heating Hot Water

Refer to local codes for guidance on minimum insulation thickness required to achieve optimum energy savings.

## Piping for Sanitary or Cooling Cold Water

For this type of system, the insulation has the purpose of maintaining a constant water temperature and preventing the formation of surface condensate. Both concealed and externally laid piping may be influenced by the varying temperatures and the relative humidity of their surroundings.

## Determining Dew Point

Fusion-Tech SDR 7.4 —  
 Fusion-Tech SDR 11 —  
 Fusion-Tech SDR 17.6 —

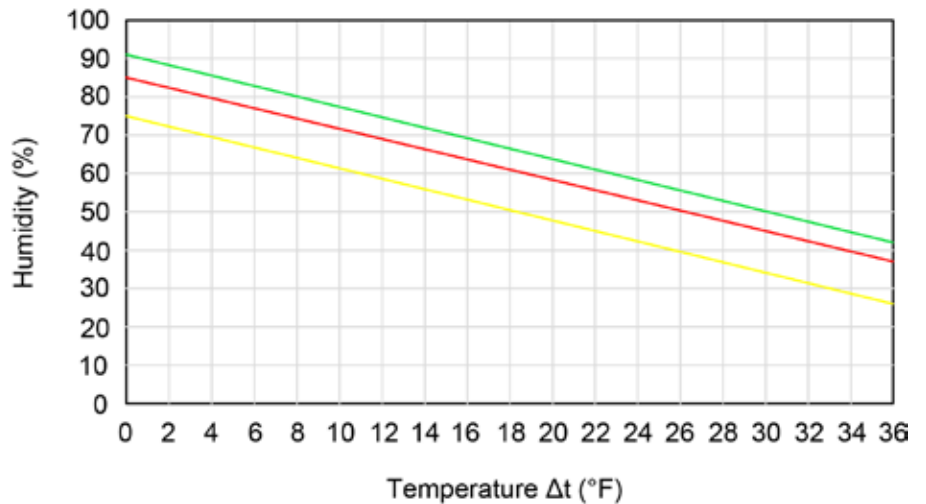


Table 29



# Integrating with Other Systems

**aquatechnik**® has designed a series of special fittings, called transition fittings, which allow you to create connections between Fusion-Tech systems and all the other **aquatechnik**® systems. Special joints allow Fusion-Tech systems to be coupled with the most common accessories (valves, pumps, boilers, chillers, etc.), and with most conventional metal piping systems.



**aquatechnik**® fittings are compatible with what is available in the piping market.

The following is a list of the main connection possibilities and their features.

## PP-R SUPER 80 w/ Metal Threaded Joints

The most common connection is the threaded connection.

The threadings are made of a brass alloy with no-zinc and no-lead content, in accordance with the Reduction of Lead in Drinking Water Act. They feature a special design that allows them to be coupled with PP-R Super 80 during the moulding stage, ensuring reliability over time. Available in sizes from 1/2" to 4" and in male/female, they connect to any standard NPT threading.

## Collar Flange

**aquatechnik**® offers a broad series of plastic coated aluminum flanges as well as PP-R Super 80 collars. Suitable for large diameters, this type of connection is easy to disassemble, and it assures a proper seal. Generally used to connect to accessories that may require servicing (valves, pumps, boilers, chillers, etc.), the range is available in diameters from 1/2" to 16". The PP-R Super 80 collar is designed to be coupled by using socket fusion or butt fusion to all **aquatechnik**® piping. The flange houses a special EPDM flat gasket to secure the connection seal between **aquatechnik**® collars and flanged components. The flanges are perforated according to the ANSI standard; they are protected by an external homopolymer PP coating that protects the metal from oxidation while ensuring reduced weight and high mechanical resistance.

All the collars are equipped with a 30° chamfer for coupling to most butterfly valves. Consult the **aquatechnik NA** Technical Department at 1 (844) FUSION3, or email [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com) to check compatibility with these valves.

## Female Threaded Pipe Union to Fusion Weld

Available in diameters from 1/2" to 2", it features two collars with flat gasket seals and two external metal parts that never come into contact with the fluid that ensure the peroxide EPDM flat gasket is pressed down through a standard threading.

## Male Threaded Pipe Union to Fusion Weld

Available in diameters from 1/2" to 2", these PP-R fittings feature two collars with flat gasket seals and two external metal parts that never come into contact with the fluid that ensure the peroxide EPDM flat gasket is pressed down through a standard threading.

## Direct Branch

These special PP-R fittings allow you to branch off from a larger pipe and connect it to a smaller pipe in confined spaces without the dies required in saddle fusion. These fittings significantly reduce the time required to install a branch or manifold. This operation is possible even on PP-R piping that has already been installed.

Direct branches are available in various sizes and in three different types:

- **Direct branch to fusion weld:** allows a branch of the same material to be fusion welded on a main Fusion-Tech pipe.

- **Threaded direct branch:** allows a female 1/2" or 3/4" threading to be fusion welded on a main Fusion-Tech pipe, where any threaded accessory can be coupled, (i.e., for example, thermometers, flow meters, pressure gauges, taps, shut-off valves).

- **Safety direct branch:** allows you to branch off in PE-X/AL/PE-X multilayer pipe from a Fusion-Tech pipe using an aquatechnik® patented sealing technology, called Safety®-Pol. This joint provides a quick, affordable passage to the multilayer system without double threading, involving a single fitting and a single installation operation.

All the direct branches are installed simply by drilling a hole into the main pipe, which must be at least 4 diameters larger than the branched one, and then welding the branch with the normal dies used for standard fittings.

## Saddle Branch

Similar to a direct branch, this fitting process allows for fusion welding with piping at greater diameters. The technique requires the use of standard socket fusion welding machine. Special dies allow you to weld to the pipe diameter of the branch line and the external wall of the main pipe at the same time. A reducing tee is not required when making saddle branches on existing pipe.

## Fusion-Tech Valve Options

Among the wide range of accessories, there are several series of shut-off valves available that stop the flow of the transported liquid. There are various types of valves with different closing techniques and materials.

### Ball Valves with Brass Alloy Body

Available in versions to fusion weld on both sides or with standard threading on one side, these valves feature a brass alloy body with a closing ball connected using two spigot pipe unions (to access the inner components of the valve). Easy to assemble and able to be serviced, the valves are recommended for use on hot and cold water systems and are available in diameters from 1/2" to 2".

### Flanged Ball Valves

Flanged ball valves are available for diameters from 2 1/2" to 8", and incorporate a flange connection with a flat seated valve. These components are compatible with all the flanges and collars in the catalog.

### Ball Valve with PP-R Super 80 Body and Co-Molded Brass Ball

These are valves with brass internal mechanics in which the PP-R Super 80 body is molded onto. Thanks to the polyfusion welding technique, they connect to the entire Fusion-Tech range. Available in diameters from 1/2" up to 12", they guarantee reduced size and easy installation. The PP-R body and plastic material handle make up a continuous element with all the fusion-tech range.

### PP-R Super 80 Ball Valves

Available in diameters from 1/2" to 2", these valves were created to carry high and low temperature water as well as aggressive fluids that are incompatible with metals.

The entire ball is composed of PP-R Super 80, with no metal elements. An adjustable seal ensures optimal performance. The two PA-M (polyAmide - modified) pipe unions with PP-R collars allow the valve to be replaced at any time. The pipe union seal uses the peroxide EPDM O-ring housed in the valve body.

### Shut-Off Valves

A wide range of globe valves with PP-R Super 80 bodies allow shut-offs to be concealed for diameters from 1/2" to 1". It is available with chrome-plated or a closed cap handle for bathroom installations; the chrome-plated exposed details ensure a pleasant aesthetic appearance.

The green-handle valve is also available for outdoor use.

Shut-off valves are also available with PP-R Super 80 ball and valve body.

# System Protection

In piping systems with pumps, if the pump is operating for extended periods of time with zero flow it can cause overheating and high pressures throughout the system. The temperature and pressure can exceed what is recommended by **aquatechnik**® (see the temperature and pressure ratings in table 4, pg. 17).

The **aquatechnik**® heat temperature stabilization additive is designed to protect the pipe in the event of brief exposure to extreme temperature and pressure conditions. If prolonged, it can weaken the pipe and fittings, leading to premature failure of components.

It is the responsibility of the system designer to provide a heat sensor that will give a warning should the fluid temperature exceed 180°F.

If a pump is 3 hp (horsepower) or larger, **aquatechnik**® recommends that an automatic temperature and pressure relief valve be installed at the discharge side of the pump.

## Isolating Pump to Pipe Connectors

PP-RCT 125 is capable of absorbing some small vibrations. Isolation connectors are not required in most circumstance provided that the pipe has some lateral movement on each side of the pump.

## Thrust Blocking

**aquatechnik**® uses the polyfusion process in order to fuse pipes and fittings together. This process increases the strength and integrity of the joint so that thrust blocking is not required.

If piping is to be buried before entering a building, anchors may be required to minimize pipe movement.

## Noise and Water Hammer

To stop or reduce noise and water hammer in your piping system, **aquatechnik**® recommends the following maximum velocities:

For buried pipe applications velocity should not exceed 13 ft/s

For main lines without fast closing check valves, velocity should not exceed 13 ft/s.

For secondary lines, velocity should not exceed 10 ft/s

For branch lines, velocity should not exceed 8 ft/s

For domestic hot water recirculation lines, MAXIMUM velocity should be 3.3 ft/s

Surge pressure in systems with a velocity of 8 ft/sec or below should be 50% less than the maximum shock pressure that **aquatechnik**® piping systems can withstand (725 psi). For higher velocities, engineers and designers should always take surge pressure into account during the system design stage.

## Mixed System Materials

When creating mixed systems that use both Fusion-Tech and metal piping, attention must be paid to the oxidizing effects of free copper ions on PP-R piping. It is recommended not to exceed a concentration of 0.5 ppm of copper ions. To limit the affects of copper ions on PP-R pipe, **aquatechnik**® designed and created PP-R MOR (Maximum Oxidation Resistance), an additive that reduces the oxidizing effect of free ions.

## Fire Prevention

In case of fire, the Fusion-Tech system causes neither toxic gas emissions nor the development of dioxins.

During combustion, the PP-RCT 125 and PP-R Super 80 material is comparable to common natural products like wood, cork, wool, etc., and its calorific value is equal to wood/coal.

As polypropylene is a combustible material, building codes should be consulted when penetrating a fire-rated wall or fire-rated assemblies. Fire stopping must be used when penetrating a fire-rated assembly, and it must have an equal fire rating to that of the assembly.

It is important to address all fire stopping issues when designing or engineering a project.

Please consult your authorized regional **aquatechnik®** distributor for more information, or contact the **aquatechnik NA** technical department at 1(844) FUSION3, or [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com) for a listing of fire stopping equipment manufacturers.

# Flame and Smoke Spread

PP-R piping will not release any harmful toxins in the event of a fire. If combustion occurs, the PP-R will release H<sub>2</sub>O (water vapor) and small amounts of CO<sub>2</sub>. In some cases, CO is produced in trace amounts but at the same emission levels as burning wood or paper.

Consult local and Federal building codes with respect to flame spread and smoke development. In Canada, the standard is CAN/ULC S-102.2. In the United States, the standard is ASTM E84. Both standards require an installed pipe to have a Flame Spread Index of less than 25 and a Smoke Developed Index of 50 or less.

If a pipe is completely encased in a fire-rated material, such as a plenum wrap or fire-rated insulation, the pipe is considered to be fire-rated compliant.

**aquatechnik**® recommends that pipe should not be installed in an enclosed ceiling return air plenum if possible. Pipe that is not inside a return air plenum does not need to meet the flame spread and smoke development requirements in most cases. Always check local building codes before installing any materials.

**aquatechnik NA** warehouses different fire-rated wraps that meet the IMC and UMC building codes, and recommends that different fire-rated materials or sprays meet local building codes. .

## Piping Within a Plenum

Per the International Mechanical Code (IMC) and Uniform Mechanical Code (UMC), all material exposed within a plenum, must meet ASTM E84 and CAN/ULC S-102-2 Flame Spread and Smoke Development. aquatechnik® pipe and fittings may be safely used so long as the pipe and fittings are wrapped in an insulation that meets ASTM E84 or CAN/ULC S-102-2 Flame Spread and Smoke Development and are not exposed to the plenum.

Please note the following pipe insulations meet the ASTM E84 and CAN/ULC S-102-2 standards and are factory approved for use on aquatechnik® PP-RCT 125 and PP-R SUPER 80 piping solutions:

Manufacturer	Model	Website
Morgan Advanced Materials	PlenumWrap®+	<a href="http://www.morganthermalceramics.com">www.morganthermalceramics.com</a>
Owens Corning Insulating Systems, LLC	FIBERGLAS™ Pipe Insulation	<a href="http://www.owenscorning.com">www.owenscorning.com</a>
Roxul	ProRox®PS960NA	<a href="http://www.ruxol.com">www.ruxol.com</a>

# Equipment & Fusion Methods

## Socket Fusion

The Fusion-Tech piping system connections are made with different types of welding, depending on the application, as shown in the table.

Nominal Dia.	Ø 1/2"	Ø 3/4"	Ø 1"	Ø 1 1/4"	Ø 1 1/2"	Ø 2"	Ø 2 1/2"	Ø 3"	Ø 3 1/2"	Ø 4"	Ø 6"	Ø 8"	Ø 10"	Ø 12"	Ø 14"	Ø 16"
Socket welding	●	●	●	●	●	●	●	●	●	●						
Butt welding											●	●	●	●	●	●
Electric welding	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Table 30

**Note:**

- Only Type AQ and Type A socket adapters should be used with **aquatechnik**® PP-R piping
- Once polyfusion welding is complete, do not use tension or force on hot components.
- Pressure testing should not be performed for at least 1 hour after the last polyfusion weld. (See the “Testing the System” section on pg 86.) The product can sustain the simple passage of fluids with working pressure just a few minutes after welding. (Please refer to the cooling times below in table 31.)
- Ensure the adapters are tight to the polyfusion welding machine plate in order to maintain proper heat transfer. The adapters should be tightened to the welding plate once the plate has been heated. Tightening the adapters before the welding plate has heated can cause the adapters to cut into the welding plate due to thermal expansion.
- The welding adapters must be cleaned (or replaced) periodically, using cloth rags dampened in a mixture of 50:50 mix of water and alcohol.
- Make sure the polyfusion welding machine works at the correct temperature (500°F +/-18°F on the dies).
- With respect to the cooling time, the socket welded joint can be removed from any clamping jig being used after 25% of the cooling time so long as it is not stressed for the remainder of the cooling time.

**WARNING:**

- All welding machines must be grounded.
- Welding machines are equipped with a system indicating when the correct working temperature is reached: refer to the welding machines manufacturer’s instructions and ensure they are read in their entirety before using the welding machine.
- Tampering with equipment voids the warranty.
- Do not use malfunctioning or broken welding machines.
- Do not use polyfusion welders that have nicks in the dies, worn Teflon and deposits of burned residue; these factors compromise welding machine results.
- Do not rotate/twist pipe and fittings from the die, or during assembly.
- Do not perform polyfusion welding when water is present on the pipe, fittings pipe or polyfusion welding machine
- Avoid contamination during the assembly stage.
- Do not work in windy areas.
- Socket fusion irons are hot. Do not touch the irons when they are on or after use as they may take some time to cool down. Avoid contact with the iron and any object other than the piping

## Socket Polyfusion Welding



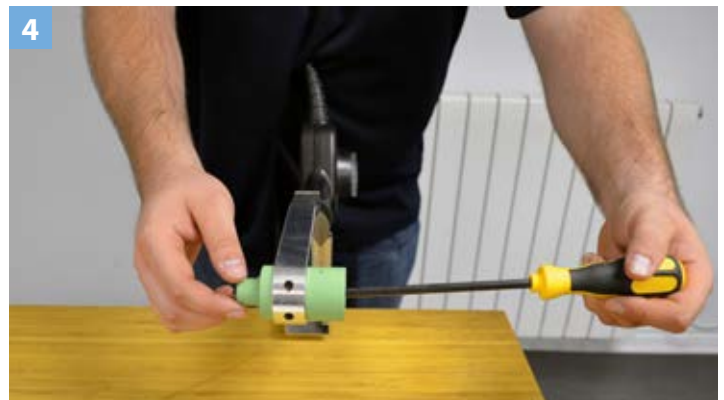
**1** Assemble and secure the dies to the polyfusion welding machine, making sure that the dies are in perfect condition: dies with damaged Teflon, deformed surfaces due to impacts or the presence of irremovable welding material deposits must be replaced.



**2** Switch on the polyfusion welding machine and wait for it to reach working temperature.



**3** Clean the polyfusion welding machine dies with a paper towel or clean, dry, lint-free, non-synthetic cloth.



**4** Lock the dies again and wait for the iron's temperature light to switch off and then on once more, indicating that the dies have now heated to the working temperature.



**5** To cut, use tools intended for plastic materials like shears/scissors and rotary pipe cutters.



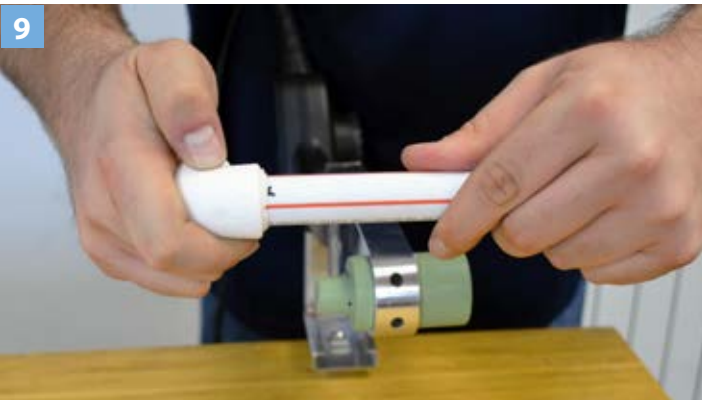
**6** For proper polyfusion welding, use a marker to mark welding depth and the assembly direction.

7



Clean the pipe and fitting using a paper towel or clean, dry, lint-free, non-synthetic cloth. An **aquatechnik**® approved cleaning solution or isopropyl alcohol can be used to assist in cleaning.

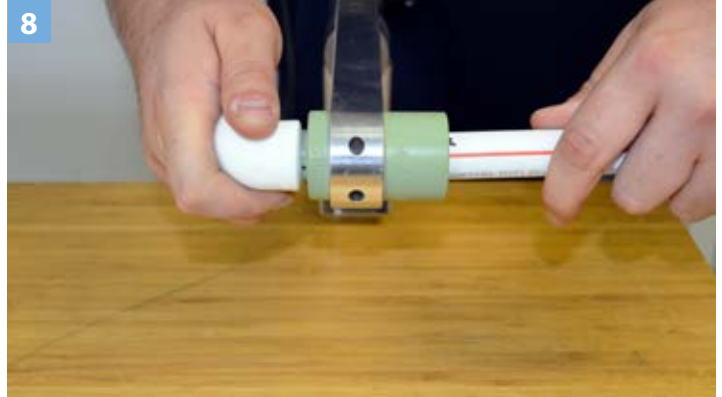
9



Once preheating is complete, remove the parts from the die and assemble them, respecting the maximum assembly times in the Recommended Socket Fusion Time Table.

Note: **aquatechnik**® fittings have special markings on them to assist with squaring the pipe and aligning the stripes on the pipe for aesthetic purposes.

8



Begin the polyfusion welding process by pushing the pipe and fitting simultaneously until the fitting has hit the die stop and the pipe has gone all the way to the distance of the stab depth marking. ensure to work axially, without rotating the elements. Once you have hit the stop, wait for it to preheat, according to the Recommended Socket Fusion Time Table to obtain an even temperature.



## Recommended Socket Fusion Times Chart According to the DVS 2207 Standard

Ø Nominal Diameter	Pipe Diameter		Welding Depth*	Pre-Heating Time in sec.		Maximum Assembly Time	Cooling Time
	Ø External Diameter	Actual OD		above 40°F	below 40°F		
inches	mm	inches	inches	above 40°F	below 40°F	seconds	minutes
1/2"	20	0.79	9/16	5	8	4	2
3/4"	25	0.98	5/8	7	11	4	2
1"	32	1.26	11/16	8	12	6	4
1 1/4"	40	1.57	3/4	12	18	6	4
1 1/2"	50	1.97	13/16	18	27	6	4
2"	63	2.48	15/16	24	36	8	6
2 1/2"	75	2.95	1	30	45	8	8
3"	90	3.54	1 1/8	40	60	8	8
3 1/2"	110	4.33	1 5/16	50	75	10	8
4"	125	4.92	1 9/16	60	90	10	8

\* aquatechnik® welding depths deviate from the DVS 2207 standard on some fittings to allow for better polyfusion welds with their products.

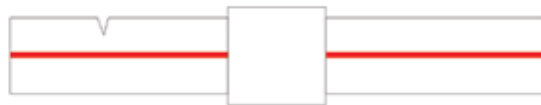
- Note:
- Pre-heating times are intended as pauses for the pipe and fittings when they have reached the limit stop of the respective dies.
  - Once the parts have reached the limit, avoid pushing them further to avoid creating burrs of welded material that would reduce the internal pipe dimension.
  - With external temperatures lower than 40°F, use the times shown in the respective column.

### Socket Welding Errors

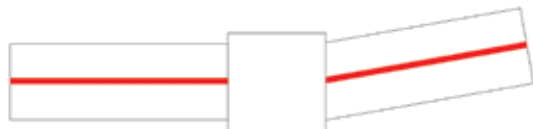
The following are examples of errors that could lead to an improper weld. If a pipe is damaged, the damaged portion should be removed from the pipe and not used.



**Cracks**



**Scratches**



**Inclination in the welding**



**Drastically angled cuts**



**Presence of water**

fig. 26

## Electro-Fusion

Electro-fusion is another type of socket fusion primarily used in tight spaces where it is difficult to perform a traditional socket fusion. Socket fusion may be used for small repairs to damaged piping. This type of polyfusion uses an electro-fusion machine that sends a small current through a copper wire built into the fitting. Specific requirements for voltage, heating time and cooling time can be found on the fitting. The following steps must be taken when performing an electro-fusion weld:



1) Remove electro-fusion fitting from the package and read the instructions in their entirety. **Note:** Fittings should be left in their packages until ready to use as electro-fusion fittings are more sensitive to contaminants and may not fuse properly if they are not clean.



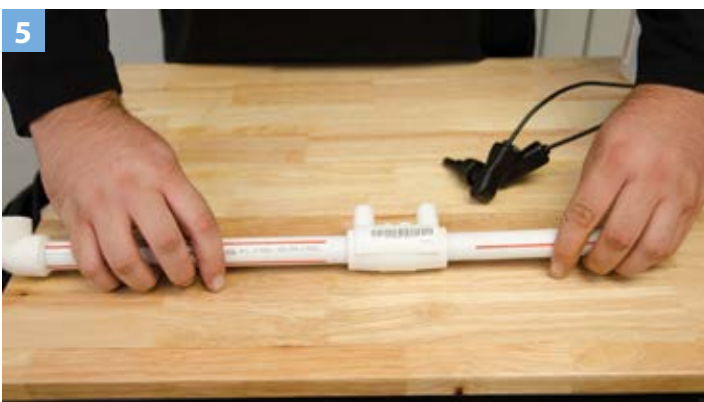
2) Cut pipes square and scrape the pipe ends to ensure they are free from contaminants. Note: Special scraping tools designed to aid in this procedure are available however, as an alternative a paint scraper can be used as well.



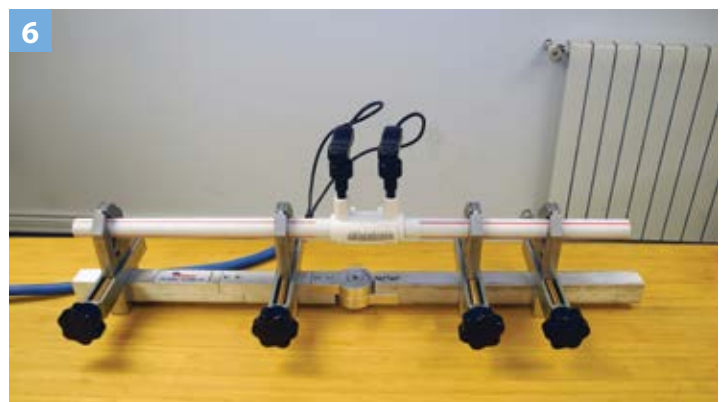
3) Remove any burrs from the pipe end ensuring you do not touch the pipe end with your hands as oils on the skin can lead to a faulty weld.



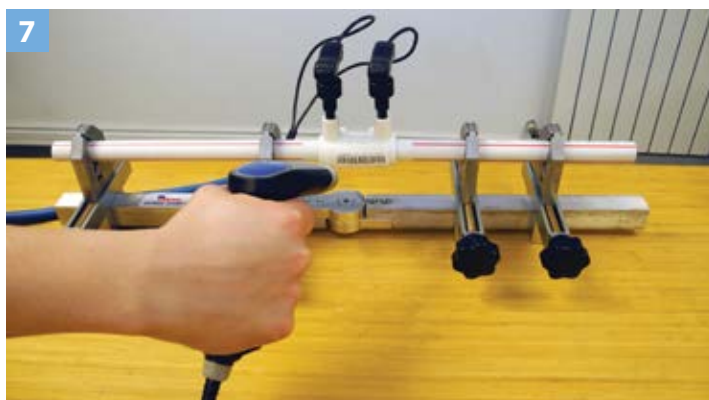
4) Clean pipe ends with an approved **aquatechnik**® cleaning solution or isopropyl alcohol wipes.



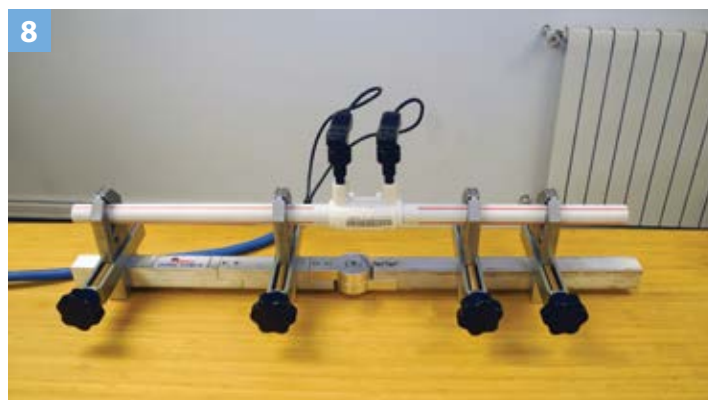
5) Insert pipe ends into the electro-fusion fitting Note: It is important that the pipes are inserted all the way into the fitting and are held in place to prevent the joint from moving during the welding process.



6) Connect the electro-fusion machine to the fitting.



7) Scan the barcode on the fitting and follow the instructions on the machine. Ensure the information on the machine matches the information on the fitting.



8) Wait for the entire cooling time before disconnecting the electro-fusion machine or creating any stress to the weld.

Do not use electric welders other than those specified by **aquatechnik®** unless you have first consulted with the **aquatechnik NA** Technical Department at 1 (844) FUSION3, or [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com).

Note: The welding cycle can be activated by scanning the bar code on the label attached to the fittings, or by manually entering the correct time and voltage values on the display.

**WARNING:** **aquatechnik®** does not recommend performing electro-fusion welds in conditions where the ambient temperature is below 40 °F (5 °C).

### Electro-Fusion Time Chart

Part No.	Nominal Diameter	External Diameter	Voltage	Time	Cooling Time
	inches	mm	V		
69508U	1/2"	20	17	1 min 10 sec	10 min
69510U	3/4"	25	20	1 min 18 sec	10 min
69512U	1"	32	18	1 min 18 sec	10 min
69514U	1 1/4"	40	20	2 min 15 sec	10 min
69516U	1 1/2"	50	40	1 min 27 sec	10 min
69518U	2"	63	40	2 min 45 sec	15 min
69520U	2 1/2"	75	40	2 min 30 sec	15 min
69522U	3"	90	40	2 min 5 sec	20 min
69524U	3 1/2"	110	38	3 min 10 sec	20 min
69526U	4"	125	40	2 min 40 sec	20 min
69528U	6"	160	30	10 min 50 sec	40 min
69530U	8"	200	30	16 minutes	40 min
69532U	10"	250	30	27 minutes	40 min
69534U	12"	315	35	20 minutes	40 min
69536U	14"	355	35	20 minutes	45 min
69538U	16"	400	35	23 minutes	45 min

Table 32

## Fusion Outlets

For piping applications using branch lines, fusion outlets offer many advantages over conventional and reducer tees. Fusion outlets are fused directly into the pipe; this allows the installer to add the branch lines after the main line has been installed. Fusion outlets also have less friction loss in comparison to reducing tees; this reduces the pipe systems total pressure loss.

**aquatechnik**® offers two types of fusion outlets: direct and saddle. Direct outlets are typically easier to install, while saddle outlets are more aesthetically pleasing. Direct outlets can also be installed using standard socket fusion dies; saddle outlets, on the other hand, require specialized dies.

To install a fusion outlet, the installer must first drill a properly sized hole and then fuse the fitting in place using socket fusion. **aquatechnik**® offers drilling bores which will produce a properly sized hole for the fitting. Pipes that are larger than 2" require the use of a drill press. If the installer is using another company's drilling bore, it must be at least 1/32" smaller than the intended branch, and cannot be more than an 1/8" smaller than the intended branch.

The tables below list the available fusion outlet sizes and threaded fusion outlet options that are available.

### Socket Fusion Outlet Sizes

Pipe Size	Outlet Sizes available
1 ¼" (40mm)	½" (20mm) – ¾" (25mm)
1 ½" (50mm)	½" (20mm) – ¾" (25mm)
2" (63mm)	½" (20mm) – 1" (32mm)
2 ½" (75mm)	½" (20mm) - 1 ¼" (40mm)
3" (90mm)	½" (20mm) - 1 ¼" (40mm)
3 ½" (110mm)	½" (20mm) - 1 ½" (50mm)
4" (125mm)	½" (20mm) - 2" (63mm)
6" (160mm)	½" (20mm) - 3" (90mm)
8" (200mm)	½" (20mm) - 4" (125mm)
10" (250mm)	½" (20mm) - 4" (125mm)
12" (315mm)	½" (20mm) - 2 ½" (75mm)
14" (355mm)	½" (20mm) - 2 ½" (75mm)
16" (400mm)	½" (20mm) - 2 ½" (75mm)

### Direct Fusion Outlet Sizes

Pipe Size	Outlet Sizes available
1 ¼" (40mm)	N/A
1 ½" (50mm)	½" (20mm)
2" (63mm)	½" (20mm) – ¾" (25mm)
2 ½" (75mm)	½" (20mm) - 1 ¼" (40mm)
3" (90mm)	½" (20mm) - 1 ¼" (40mm)
3 ½" (110mm)	½" (20mm) - 1 ¼" (40mm)
4" (125mm)	½" (20mm) - 1 ¼" (40mm)
6" (160mm)	½" (20mm) - 1 ¼" (40mm)
8" (200mm)	½" (20mm) - 1 ¼" (40mm)
10" (250mm)	½" (20mm) - 1 ¼" (40mm)
12" (315mm)	½" (20mm) - 1 ¼" (40mm)
14" (355mm)	½" (20mm) - 1 ¼" (40mm)
16" (400mm)	½" (20mm) - 1 ¼" (40mm)

Table 33

### Threaded Fusion Outlet Sizes

Pipe Size	Thread size		
	½"	¾"	1"
1 ¼" (40mm)	M/F	M/F	--
1 ½" (50mm)	M/F	M/F	--
2" (63mm)	M/F	M/F	--
2 ½" (75mm)	M/F	M/F	F
3" (90mm)	M/F	M/F	F
3 ½" (110mm)	M/F	M/F	F
4" (125mm)	M/F	M/F	F
6" (160mm)	M/F	M/F	F
8" (200mm)	F	F	F
10" (250mm)	F	F	F
12" (315mm)	F	F	F
14" (355mm)	F	F	F
16" (400mm)	F	F	F

M = Male NPT Thread, F = Female NPT Thread

Table 34

## Direct Outlets

Direct outlets can be made in pipes from 1 1/2" to 16" diameters.



1) Bore a hole in the pipe using a specialized drill bit, ensuring the drill is perpendicular to the pipe.



2) Remove any burrs and slag from the pipe using a reamer. Clean pipes with a paper towel or dry, clean, lint-free, non-synthetic cloth. An **aquatechnik®** approved cleaning solution or isopropyl alcohol can be used to assist in cleaning.  
Note: Once the piping system is installed it should be flushed to remove any plastic shavings from the system.



3) Insert the components into the polyfusion welding machine following the instructions shown on table 35, pg 55, using the standard dies.



4) Remove the components from the polyfusion welding machine and push the fitting down into the pipe. Use a level to align the fitting both left to right as well as front to back.



5) The fitting should be perpendicular to the pipe with two beads touching each other similar to a normal socket fusion. Wait the entire cooling time before creating a second direct outlet on the same pipe.

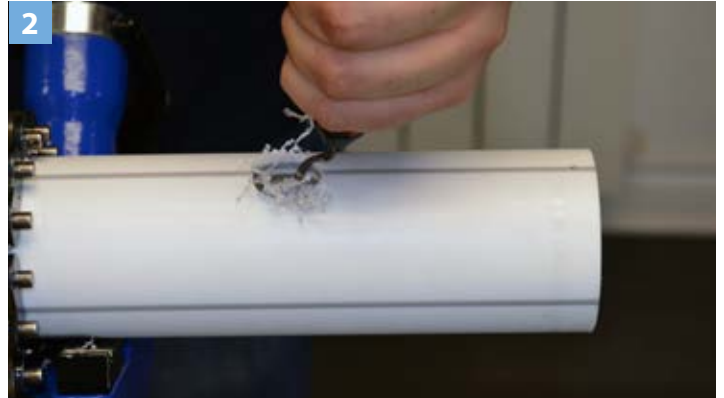
**Note: The stripe on the pipe, when aligned properly can be used as a guide for making multiple branches on the same pipe.**

## Saddle Outlets

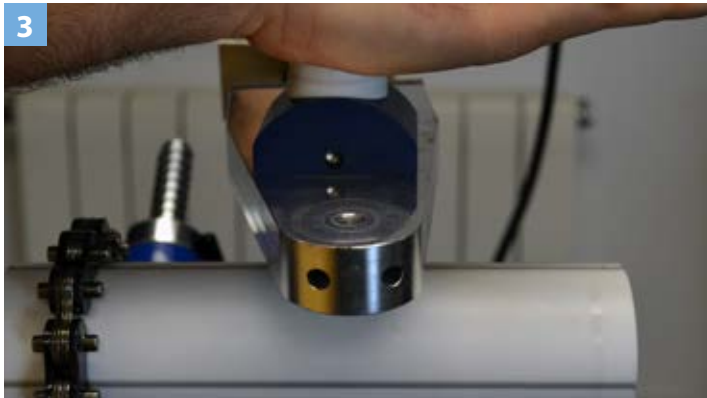
Saddle branches can be made with pipes of diameters from 1 1/2" to 16".



1) Bore a hole in the pipe using a specialized drill bit, ensuring the drill is perpendicular to the pipe.

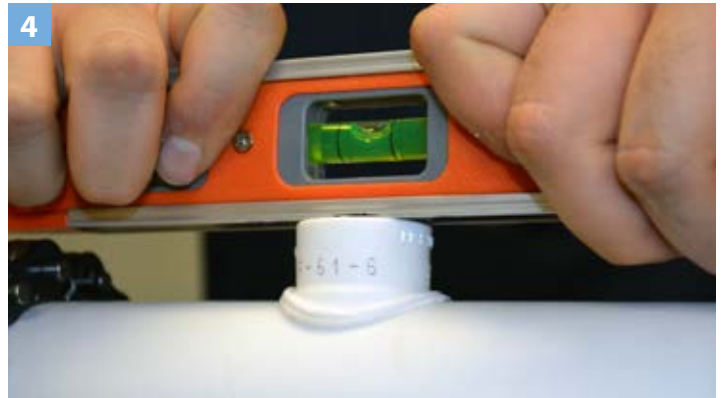


2) Remove any burrs and slag from the pipe using a reamer. Clean pipes with a paper towel or dry, clean, lint-free, non-synthetic cloth. An **aquatechnik**® approved cleaning solution or isopropyl alcohol can be used to assist in cleaning.  
Note: Once the piping system is installed it should be flushed to remove any plastic shavings from the system.



3) Insert the saddles fitting and pipe into the polyfusion welding machine following the instructions shown in the "Socket Polyfusion Welding" section on pg. 53-54, using saddle dies.

Note: it is very important that the polyfusion welding machine is level during this process and that the dies are uniformly touching all sides of the pipe and fitting.



4) Assemble the components applying pressure to them for at least 15 seconds. This should be done using a level so the fitting can be aligned left to right as well as front to back at the same time.



5) The fitting should be perpendicular to the pipe with two beads touching each other similar to a normal socket fusion. Wait the 10 minutes for cooling before creating a second saddle outlet on the same pipe.

**Note: The stripe on the pipe, when aligned properly can be used as a guide for making multiple branches on the same pipe.**

## Butt Welding

Butt welding is the process of joining two parallel pipe ends together without overlap, using temperature and pressure. This method eliminates the need for socket fittings. It is recommended that butt welds only be performed on pipe sizes 6"-12".

### Butt Welding Pressures

During the butt welding process there are specific pressures that must be maintained.

Drag Pressure:	The force required to move the pipe and the machines carriage. This pressure varies at each joint based on the relative weight and length of the pipe, as well as incline of the terrain. Before facing, it is recommended that the drag pressure be measured, keeping the pipe ends to be faced a couple of inches apart from each other for accuracy.
Interfacial Pressure:	The force required to create a weld.
Welding Pressure:	The force required for a machine to create a proper fusion. This can generally be found in the manufacturer's documentation, or in this manual. Pressures do vary by machine being used.
Combined Pressure:	Drag pressure plus welding pressure.

### Butt Welding Bead Heights and Welding Times

Nominal Dia.	External Dia.	SDR	Bead Height		Heating Pressure	Heating Time	Max. transition time	Pressure build-up time	Cooling Time
In.	mm		in.	mm			seconds	seconds	min.
4"	125	17.6	1/32	1.0	*	2 min. 56 sec.	6	7	12
4"	125	11	1/32	1.0	*	3 min. 57 sec.	7	11	19
6"	160	17.6	1/32	1.0	*	3 min. 24 sec.	6	9	15
6"	160	11	1/32	1.0	*	4 min. 37 sec.	8	13	24
8"	200	17.6	1/32	1.0	*	3 min. 57 sec.	7	11	19
8"	200	11	1/32	1.0	*	5 min. 20 sec.	9	16	29
10"	250	17.6	1/16	1.5	*	4 min. 32 sec.	8	13	23
10"	250	11	1/16	1.5	*	6 min. 8 sec.	10	20	35
12"	315	17.6	1/32	1.0	*	5 min. 17 sec.	9	16	28
12"	315	11	1/16	2.0	*	7 min.	12	24	43
14"	355	17.6	1/16	1.5	*	5 min. 41 sec.	9	18	32
14"	355	11	1/16	2.0	*	7 min. 28 sec.	13	28	48
16"	400	17.6	1/16	1.5	*	6 min. 7 sec.	10	20	35
16"	400	11	1/16	2.0	*	8 min.	14	31	54

Table 35

\* Consult your tool manufacturer's documentation for proper heating pressures.

Welding Pressures by Manufacturer



Nominal Dia. in.	External Dia. mm	SDR	Acrobat 160	DynaMc 250 EP	412 & 618 Low Force	824 & 1236 Low Force
Welding Pressure (psi)						
4"	125	17.6	66	-	-	-
4"	125	11	101	-	-	-
6"	160	17.6	108	60	32	-
6"	160	11	167	93	49	-
8"	200	17.6	-	94	50	17
8"	200	11	-	145	77	26
10"	250	17.6	-	142	78	26
10"	250	11	-	218	120	40
12"	315	17.6	-	-	124	41
12"	315	11	-	-	191	63
14"	355	17.6	-	-	157	52
14"	355	11	-	-	242	81
16"	400	17.6	-	-	199	66
16"	400	11	-	-	308	102

Table 36



Nominal Dia. in.	External Dia. mm	SDR	Delta Dragon 160	Delta Dragon 250B	Delta Dragon 315B	Delta Dragon 355B	Delta Dragon 500	Delta Dragon 630
Welding Pressure (psi)								
6"	160	17.6	247	116	102	44	-	-
6"	160	11	392	189	160	73	-	-
8"	200	17.6	-	189	160	73	-	-
8"	200	11	-	290	261	102	-	-
10"	250	17.6	-	305	261	102	-	-
10"	250	11	-	464	406	160	-	-
12"	315	17.6	-	-	406	174	-	-
12"	315	11	-	-	638	261	-	-
14"	355	17.6	-	-	-	218	-	73
14"	355	11	-	-	-	334	-	102
16"	400	17.6	-	-	-	-	174	87
16"	400	11	-	-	-	-	276	131

Table 37





Nominal Dia.	External Dia.	SDR	ROWELD P 160 B	ROWELD P 250 B & P355 B Welding Pressure (bar)	ROWELD P 500 B & P630 B
in.	mm				
4"	125	17.6	7.4	4.2	-
4"	125	11	11.5	6.5	-
6"	160	17.6	12.2	6.9	-
6"	160	11	18.9	10.7	-
8"	200	17.6	-	10.8	4.8
8"	200	11	-	16.6	7.4
10"	250	17.6	-	16.8	7.4
10"	250	11	-	25.9	11.5
12"	315	17.6	-	26.7	11.8
12"	315	11	-	41.1	18.2
14"	355	17.6	-	33.8	15.0
14"	355	11	-	52.2	23.1
16"	400	17.6	-	-	19.0
16"	400	11	-	-	37.2

Table 38



Nominal Dia.	External Dia.	SDR	WI 4400	WI 4600	WI 4900	WI 5100 & 5500	WI 6100
in.	mm				Welding Pressure (bar)		
4"	125	17.6	11	6	-	-	-
4"	125	11	17	8	-	-	-
6"	160	17.6	18	9	8	-	-
6"	160	11	27	13	12	-	-
8"	200	17.6	-	13	12	5	-
8"	200	11	-	20	18	8	-
10"	250	17.6	-	21	18	8	-
10"	250	11	-	32	28	12	-
12"	315	17.6	-	-	29	12	10
12"	315	11	-	-	44	19	15
14"	355	17.6	-	-	-	15	13
14"	355	11	-	-	-	24	19
16"	400	17.6	-	-	-	20	16
16"	400	11	-	-	-	30	24

Table 39

## Warning:

- Always follow the instructions in the user manual of the butt fusion machine.
- Always carry out pipe testing according to the local authorities having jurisdiction.
- Never operate the butt fusion machine while someone's hands are in the carriage.
- Do not touch the facer while it is moving.
- Do not touch the heating paddle while it is on or while it is cooling.

## Caution:

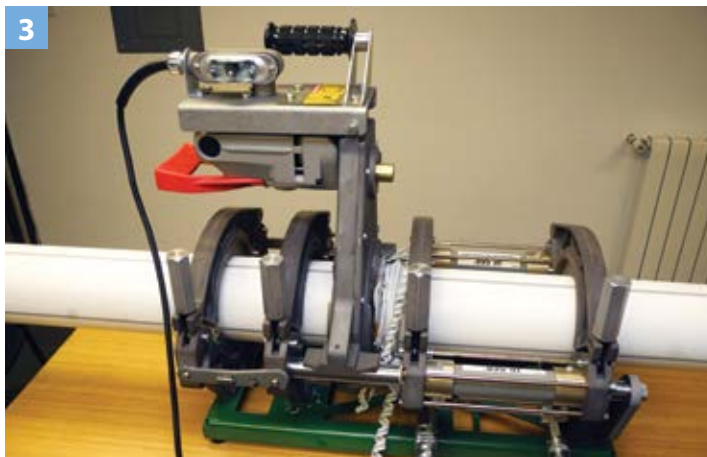
- Do not touch other objects or materials other than the pipe as this may damage the paddle.
- Wear appropriate protective equipment as stated by the manufacturer when operating the machine.



1) Connect the equipment and assemble the appropriate inserts for the pipe into the machine.



2) Bring the pipe heads close together and make sure they are perfectly aligned. Measure your drag pressure and make note of it. Note: On most manufacturers' machines the inner jaws help align the pipe to keep them even. The outer jaws provide stability and do not allow the pipes to move.



3) Assemble the planer on the machine and face both pipe ends so they are even with each other. If the planer is not facing increase the pressure on the machine until it begins facing. You should be seeing long ribbons coming off of both ends of the pipe that indicate the pipe has been faced around the entire diameter of the pipe.



4) Clean pipes with a paper towel or dry, clean, lint-free, non-synthetic cloth. An **aquatechnik®** approved cleaning solution or isopropyl alcohol can be used to assist in cleaning.



5) Attach the heating plate to the butt fusion machine and apply the combined pressure (drag + welding pressure) until a bead is present. The bead should be 1/32" (1 mm) for 6-8" diameter pipe and 1/16" (1.5mm) for 10" diameter pipe.



6) Once the bead has reached the correct height, the pressure should be decreased to the heating + drag pressure. The heating pressure can be found in table 44. Hold the heating pressure for the duration of time shown in table 39 on page 62. Note: Some machines lock into

place; therefore, they do not need the operator to account for the drag pressure. Consult the manufacturer's instructions regarding the operation of the machine.

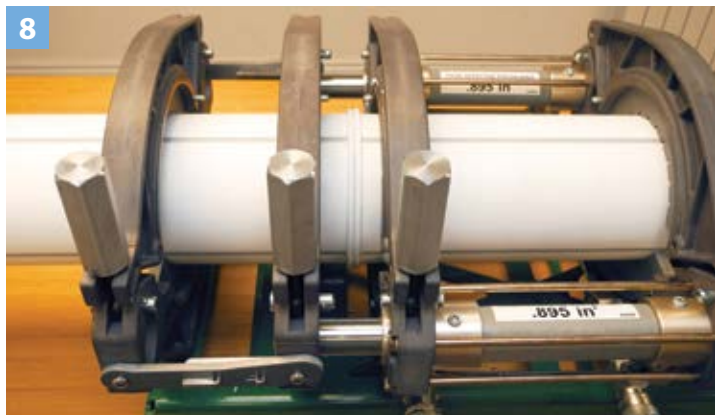
\* Consult your tool manufacturer's documentation for proper heating pressures.

Nominal Dia. In.	External Dia. mm	SDR	Heating Pressure
4"	125	17.6	*
4"	125	11	*
6"	160	17.6	*
6"	160	11	*
8"	200	17.6	*
8"	200	11	*
10"	250	17.6	*
10"	250	11	*
12"	315	17.6	*
12"	315	11	*
14"	355	17.6	*
14"	355	11	*
16"	400	17.6	*
16"	400	11	*

Table 40



7) Remove the heating plate and quickly inspect the pipe ends for any contaminants before closing the carriage to fuse the joint.



8) Close the carriage, pushing the pipes together at maximum pressure. They should cool according to the times and pressures indicated in table 39 on page 62 before removing the pipe from the jaws on the machine.

Inspect the joint to ensure no contaminants got into the joint during the fusion process. The fusion bead should be a single, uniform bead.

## Simple Pressure Welding Cycle

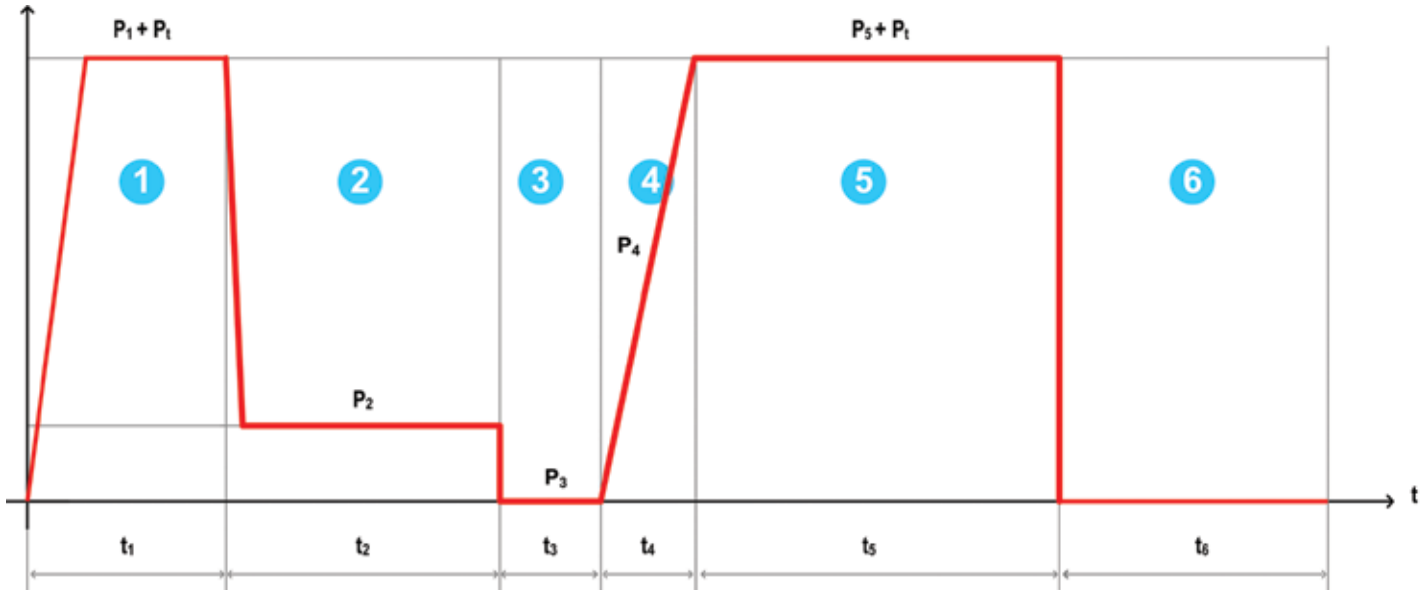


fig. 27

Where:

P1: Approach and pre-heating pressure

P2: Maximum heating pressure

P3: Removing the heating plate

P4: Reaching welding pressure

P5: Welding pressure

Pt (Drag pressure): pressure necessary to overcome machine friction. The operator must measure it on the control unit pressure gauge.

t1, t2, ..., t5: stage duration 1, 2, ..., 6.

### 1 Approach and Pre-Heating.

Bring the pipe ends to be welded to the heating element at maximum pressure,  $P_1 + P_t$ , and wait for the bead to reach the required size shown in table 35.

### 2 Heating.

Reduce the pressure to the  $P_2$  value. The pipe ends should stay in contact with the heating plate. This pressure should be maintained for the time,  $t_2$ , shown in table 35.

Note: The operator, while reducing the pressure, must pay attention not to detach the pipe ends from the heating plate. If this happens, the welding process **must** be repeated.

### 3 Removing the welding machine.

Remove the welding machine in no less than the maximum time,  $t_3$ , shown in table 35, taking care not damage the ends of the pipe to be welded.

### 4 Reaching welding pressure.

Put the two pipe ends in contact, progressively increasing the pressure up to the combined  $P_5 + P_t$  value, in the time,  $t_4$ , shown in table 35. Avoid the pipe coming in contact with any softened material from the nearby surfaces as it could cause defects in the weld.

### 5 Welding.

Keep the ends in contact at the combined pressure of  $P_5 + P_t$  for the time,  $t_5$ , shown in table 35.

### 6 Cooling.

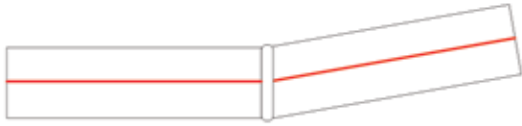
When welding is complete, the welded joint can be removed from the welding machine without being subjected to stress. It must not be stressed until it has completely cooled. Do not use cold water or compressed air to accelerate cooling. If necessary, protect the junction from rain, wind or excessive exposure to the sun.

**Warning:** Always follow the instructions in the user manual of the butt fusion machine and always carry out pipe testing according to the local authorities having jurisdiction. Failure to do so may result in substantial property damage, severe injury or death.

Errors in Butt Welding



**Misalignment**



**Inclination**



**Scratches**



**Uneven Bead**



**Cracks**



**Nick in Bead**



**Presence of Impurities**

fig. 28

**Warning:** Do not use any damaged pieces of pipe as it may result in substantial property damage, severe injury or death. Remove the damaged section from the pipe and use the good section of pipe if possible.

Care and Handling

YES	NO
Handle the product with caution and pay attention to the pipe heads.	Avoid violent impact during storage, transport and processing in construction sites.
Inspect the installation site to ensure the area is safe to work in.	Avoid bumps, falling objects and stress on the pipes, especially during the cold season or when temperatures are low.
Cut pipes with suitable cutting tools. Remove any damaged sections.	Do not install pipes with incisions or nicks.
Respect the processing times indicated in the polyfusion welding and electric welding tables.	Do not push the pipe and fittings excessively during the welding stage.
When performing an electro-fusion ensure the electric sleeve fittings and pipe to be welded are at the same temperature.	Do not use electric sleeve fittings with an ambient temperature lower than 40°F.
Always screw calibrated components onto threaded connections without over-tightening.	Avoid non-compliant tapered threading on all female fittings.
Protect piping exposed to UV rays with approved paint.	Avoid prolonged (i.e., more than 6 months) exposure to direct sunlight.

**WARNING:**

In the event temperatures fall below 40°F, thermal plastic materials are more susceptible to damage. Violent impact and negligence are the most common cause of damage.

## Repairs and Alterations

Should the pipes accidentally be perforated, they can be repaired via normal polyfusion welding. The operation is done using a special die and spigot that allows you to seal the hole.

For holes up to 1/4" in diameter repair kit (code 50028)

For holes from 1/4" to 3/8" in diameter repair kit (code 69350)



1) Drill the hole in the pipe using a drill bit 1/32" smaller than the repair plug.



2) Adjust the depth gauge on the repair die to just past the thickness of the wall. The thickness of the wall can be found in the **aquatechnik**® Piping Solutions section of this manual.



3) Weld the pipe and the plug at the same time, being careful not to create internal burrs.



4) Insert the plug stem into the hole and wait for the weld to cool.

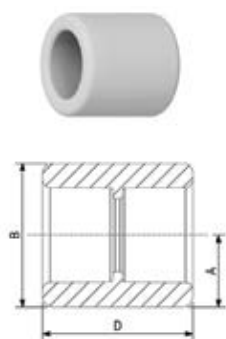


5) Cut the excess material off of the plug.

# Fitting Dimensions

## Coupling

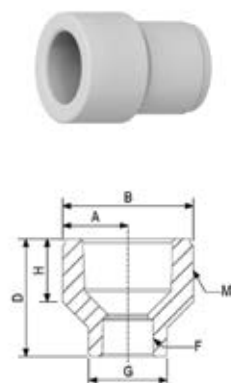
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	D	Weight	pack	box
	in.	mm	in.	in.	in.			
62008U	1/2	20	9/16	1 3/16	1 1/4	0.39	10	400
62010U	3/4	25	11/16	1 3/8	1 1/2	0.60	10	300
62012U	1	32	7/8	1 11/16	1 11/16	1.01	5	150
62014U	1 1/4	40	1 1/16	2 1/8	1 7/8	1.71	5	150
62016U	1 1/2	50	1 5/16	2 11/16	2 1/8	3.00	5	150
62018U	2	63	1 11/16	3 3/8	2 7/16	5.29	1	50
62020U	2 1/2	75	2 3/16	4	2 5/8	8.04	1	60
62022U	3	90	2 3/8	4 3/4	2 7/8	11.87	1	42
62024U	3 1/2	110	2 15/16	5 13/16	3 3/16	21.22	1	24
62026U	4	125	3 1/4	6 7/16	3 9/16	28.70	1	12

## Bushing

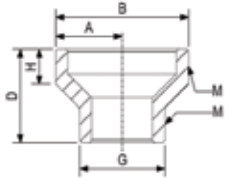
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	D	H	G	Weight	pack	box
	in.	mm	in.	in.	in.	in.	in.			
62112U	M 3/4 - F 1/2	M 25 - F 20	1/2	1	1 5/8	3/4	1 3/16	0.48	10	400
62114U	M 1 - F 1/2	M 32 - F 20	5/8	1 1/4	1 9/16	3/4	1 3/16	0.65	10	300
62116U	M 1 - F 3/4	M 32 - F 25	5/8	1 1/4	1 9/16	3/4	1 3/8	0.69	10	300
62118U	M 1 1/4 - F 1/2	M 40 - F 20	13/16	1 9/16	1 5/8	13/16	1 3/16	1.34	5	500
62120U	M 1 1/4 - F 3/4	M 40 - F 25	13/16	1 9/16	1 5/8	13/16	1 3/8	1.59	5	400
62122U	M 1 1/4 - F 1	M 40 - F 32	13/16	1 9/16	1 5/8	13/16	1 13/16	1.87	5	300
62124U	M 1 1/2 - F 1/2	M 50 - F 20	1	1 15/16	1 3/4	15/16	2 1/8	1.76	5	300
62126U	M 1 1/2 - F 3/4	M 50 - F 25	1	1 15/16	1 3/4	15/16	1 3/8	2.12	5	300
62128U	M 1 1/2 - F 1	M 50 - F 32	1	1 15/16	1 3/4	15/16	2 9/16	2.29	5	300
62130U	M 1 1/2 - F 1 1/4	M 50 - F 40	1	1 15/16	1 3/4	15/16	2 12/16	2.47	5	200
62132U	M 2 - F 3/4	M 63 - F 25	1 1/4	2 1/2	2 1/4	1 3/16	3 1/8	2.82	1	150
62134U	M 2 - F 1	M 63 - F 32	1 1/4	2 1/2	2 1/4	1 3/16	3 3/8	3.00	1	100
62136U	M 2 - F 1 1/4	M 63 - F 40	1 1/4	2 1/2	2 1/4	1 3/16	3 9/16	3.17	1	100
62138U	M 2 - F 1 1/2	M 63 - F 50	1 1/4	2 1/2	2 1/4	1 3/16	4 1/2	4.06	1	100
62139U	M 2 1/2 - F 1 1/4	M 75 - F 40	1 1/2	2 15/16	2 9/16	1 1/4	5 5/16	4.76	1	100
62140U	M 2 1/2 - F 1 1/2	M 75 - F 50	1 1/2	2 15/16	2 9/16	1 1/4	5 1/2	4.94	1	80
62142U	M 2 1/2 - F 2	M 75 - F 63	1 1/2	2 15/16	2 9/16	1 1/4	7 7/8	7.05	1	80
62144U	M 3 - F 1 1/2	M 90 - F 50	1 3/4	3 9/16	3	1 3/8	11	9.88	1	50
62152U	M 3 - F 2	M 90 - F 63	1 3/4	3 9/16	3	1 3/8	11 7/16	10.23	1	50
62153U	M 3 - F 2 1/2	M 90 - F 75	1 3/4	3 9/16	3	1 1/4	12 5/8	11.29	1	50
62155U	M 3 1/2 - F 2	M 110 - F 63	2 3/16	4 5/16	3 9/16	1 9/16	13 3/4	12.35	1	30
62157U	M 3 1/2 - F 2 1/2	M 110 - F 75	2 3/16	4 5/16	3 9/16	1 9/16	17 11/16	15.87	1	30
62159U	M 3 1/2 - F 3	M 110 - F 90	2 3/16	4 5/16	3 9/16	1 9/16	17 11/16	15.87	1	30
62168U	M 4 - F 2 1/2	M 125 - F 75	2 7/16	4 15/16	3 15/16	1 13/16	19 15/16	17.85	1	30
62170U	M 4 - F 3	M 125 - F 90	2 7/16	4 15/16	3 15/16	1 13/16	21 5/8	19.40	1	30
62172U	M 4 - F 3 1/2	M 125 - F 110	2 7/16	4 15/16	3 15/16	1 13/16	23 5/8	21.16	1	24

## Reducer

### Butt fusion



Part #	Nominal Diameter	Actual Diameter	A	B	D	H	G	Weight	pack	box
	in.	mm	in.	in.	in.	in.	in.	oz.		
62173U	M 6 - F3	M 160 - F 90	3 1/4	6 5/16	9 1/16	4 1/4	3 9/16	49.38	1	8
62174U	M 6 - F3 1/2	M 160 - F 110	3 1/4	6 5/16	8 7/16	4 1/16	4 5/16	49.38	1	8
62176U	M 6 - F 4	M 160 - F 125	3 1/4	6 5/16	9 1/16	4	4 15/16	43.56	1	4
62182U	M 8 - F 6	M 200 - F 160	3 1/4	7 7/8	9 7/16	4 5/8	6 5/16	72.31	1	1
62184U	M 10-F 6	M 250-F 160	3 1/8	9 13/16	11 9/16	6 5/16	6 5/16	141.1	1	1
61286U	M 10 - F 8	M 250 - F 200	3 15/16	9 13/16	11 7/8	5 1/2	7 7/8	138.63	1	1
62200U	M12- F10	M315- F250							1	1
62213U	M14- F10	M355- F250							1	1
62214U	M14-F12	M355-F315							1	1
62240U	M16-F10	M400-F250							1	1
62242U	M16-F12	M400-F355							1	1
62244U	M16-F14	M400-F355							1	1
62173UZ	M6-F3	M160-F90							1	1
62174UZ	M6-F 3 1/2	M160-F110							1	1
62176UZ	M6-F4	M160-F125							1	1
62182UZ	M8-F6	M200-F160							1	1
62184UZ	M10-F6	M250-F160							1	1
62186UZ	M10-F8	M250-F200							1	1
62200UZ	M12-F10	M315-F250							1	1
62213UZ	M14-F10	M355-F250							1	1
62214UZ	M14-F12	M355-F315							1	1
62240UZ	M16-F10	M400-F250							1	1
62242UZ	M16-F12	M400-F315							1	1
62244UZ	M16-F14	M400-F355							1	1

## 90° Elbow

### Socket fusion

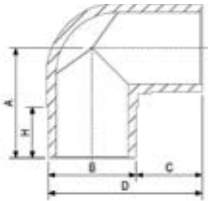


Part #	Nominal Diameter	Actual Diameter	A	B	C	D	Weight	pack	box
	in.	mm	in.	in.	in.	in.	oz.		
63108U	1/2	20	1	1 3/16	3/8	1 9/16	0.63	10	350
63110U	3/4	25	1 1/8	1 3/8	1/2	1 13/16	0.81	10	250
63112U	1	32	1 3/8	1 11/16	1/2	2 1/4	1.59	5	100
63114U	1 1/4	40	1 11/16	2 1/16	5/8	2 11/16	2.72	5	150
63116U	1 1/2	50	2	2 11/16	5/8	3 3/8	6.07	5	80
63118U	2	63	2 7/16	3 3/8	3/4	4 1/8	11.01	1	40
63120U	2 1/2	75	2 7/8	4	7/8	4 7/8	17.99	1	30
63122U	3	90	3 3/16	4 3/4	13/16	5 9/16	28.22	1	18
63124U	3 1/2	110	3 13/16	5 13/16	9 1/4	6 11/16	52.63	1	10
63126U	4	125	4 3/4	6 9/16	1 1/2	8 1/16	72.66	1	5



## 90° Elbow (Cont'd)

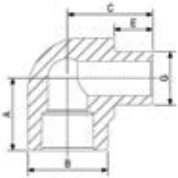
### Butt fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	Weight		
	in.	mm	in.	in.	in.	in.	oz.	pack	box
63128U	6	160	8 3/8	6 5/16	4 15/16	11 9/16	106.46	1	3
63130U	8	200	10 1/16	7 7/8	5 7/8	14	194.01	1	1
63132U	10	250	11 13/16	9 13/16	6 7/8	16 3/4	365.09	1	1
63134U	12	315	15 3/8	12 3/8	9 3/16	21 5/8	659.62	1	1
63136UTY	14	355						1	1
63138UTY	16	400						1	1
63128UZ	6	160						1	3
63130UZ	8	200						1	1
63132UZ	10	250						1	1
63134UZ	12	315						1	1
63136UCZ	14	355						1	1
63138UCZ	16	400						1	1

## 90° Socket X Male Elbow

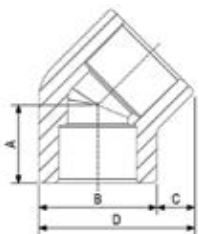
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	E	G	Weight		
	in.	mm	in.	in.	in.	in.	in.	oz.	pack	box
63308U	1/2	20	1 1/16	1 3/16	1 1/4	14.5	20	0.63	10	350
63310U	3/4	25	1 3/16	1 3/8	1 3/16	13.5	25	0.95	10	250
63312U	1	32	1 3/8	1 11/16	1 5/8	16.5	32	1.76	5	100
633314U	1 1/4	40	1 5/8	2 1/16	1 13/16	19.5	40	3.10	5	150

## 45° Elbow

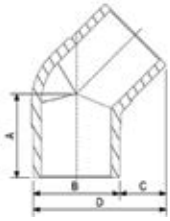
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	Weight		
	in.	mm	in.	in.	in.	in.	oz.	pack	box
63508U	1/2	20	1	1 3/16	3/8	1 9/16	0.55	10	350
63510U	3/4	25	1 1/16	1 3/8	3/8	1 11/16	0.78	10	250
63512U	1	32	1 1/4	1 11/16	7/16	2 1/8	1.29	5	100
63514U	1 1/4	40	1 1/2	2 1/16	1/2	2 9/16	2.36	5	150
63516U	1 1/2	50	1 7/8	2 11/16	9/16	3 1/4	4.69	5	80
63518U	2	63	2 3/8	3 3/8	11/16	4 1/16	8.85	1	40
63520U	2 1/2	75	2 7/8	4	3/4	4 3/4	13.23	1	30
63522U	3	90	3 3/16	4 3/4	3/4	5 1/2	21.73	1	18
63524U	3 1/2	110	3 13/16	5 13/16	13/16	6 5/8	34.07	1	10
63526U	4	125	4 3/4	6 9/16	13/16	7 3/8	47.27	1	5

45° Elbow (Cont'd)

**Butt fusion**



Part #	Nominal Diameter		A	B	C	D	Weight	pack	box
	in.	mm							
63528U	6	160	8 3/8	6 5/16	2 13/16	9 1/4	65.96	1	3
63530U	8	200	10 1/16	7 7/8	4 5/16	12 3/8	156.97	1	1
63532U	10	250	11 13/16	9 13/16	4 3/4	14 3/4	268.08	1	1
63534U	12	315	12 1/2	12 1/2	6 15/16	19 5/16	569.67	1	1
63536UTY	14	355						1	1
63538UTY	16	400						1	1
63528UZ	6	160						1	3
63530UZ	8	200						1	1
63532UZ	10	250						1	1
63534UZ	12	315						1	1
63536UCZ	14	355						1	1
63538UCZ	16	400						1	1

45° Male Elbow

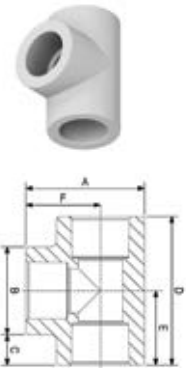
**Socket fusion**



Part #	Nominal Diameter		A	B	E	G	Weight	pack	box
	in.	mm							
63708U	1/2	20	1 1/16	1 3/16	9/16	13/16	0.49	10	350
63710U	3/4	25	1 3/16	1 3/8	9/16	1	0.85	10	250
63712U	1	32	1 3/8	1 11/16	5/8	1 1/4	1.34	5	100

Tee

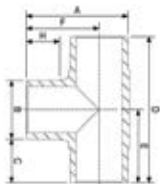
**Socket fusion**



Part #	Nominal Diameter		A	B	C	D	E	F	Weight	pack	box
	in.	mm									
64108U	1/2	20	1 5/8	1 3/16	7/16	2	13/16	1	0.78	10	350
64110U	3/4	25	1 7/8	1 3/8	9/16	2 7/16	7/8	1 3/16	1.16	10	250
64112U	1	32	2 1/4	1 11/16	9/16	2 13/16	1 1/8	1 7/16	1.90	5	100
64114U	1 1/4	40	2 3/4	2 1/8	5/8	3 3/8	1 3/8	1 11/16	3.49	5	150
64116U	1 1/2	50	3 5/16	2 11/16	5/8	4	1 5/8	2	6.17	5	80
64118U	2	63	4 1/16	3 3/8	3/4	4 13/16	2 1/16	2 3/8	13.09	1	40
64120U	2 1/2	75	4 1/16	4	7/8	5 3/4	2 7/16	2 7/8	19.05	1	30
64122U	3	90	5 1/2	4 3/4	13/16	6 5/16	2 3/4	3 1/8	32.59	1	18
64124U	3 1/2	110	6 3/4	5 13/16	7/8	7 5/8	3 3/8	3 13/16	56.83	1	10
64126U	4	125	8 15/16	6 1/2	2 7/16	9 3/4	4 7/8	5 11/16	93.65	1	5

## Tee (Cont'd)

### Butt fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	E	F	H	Weight	pack	box
	in.	mm										
64128U	6	160	11 9/16	6 5/16	4 5/16	16 9/16	8 1/4	8 3/8	4	134.04	1	2
64130U	8	200	13 3/4	7 7/8	4 13/16	19 5/16	9 5/8	9 13/16	4 1/2	264.56	1	1
64132U	10	250	15 7/8	9 13/16	6	24 3/16	12 1/16	11 7/16	5 9/16	489.96	1	1
64134U	12	315	21 5/8	12 3/8	10 1/16	30 9/16	15 1/4	15 1/4	7 1/16	931.23	1	1
64136UTY	14	355									1	1
64138UTY	16	400									1	1
64128UZ	6	160									1	2
64130UZ	8	200									1	1
64132UZ	10	250									1	1
64134UZ	12	315									1	1
64136UCZ	14	355									1	1
64138UCZ	16	400									1	1

## Reducing Tee

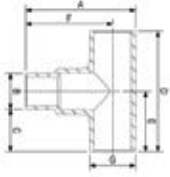
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	E	F	Weight	pack	box
	in.	mm									
64220U	3/4 - 1/2 - 1/2	25-20-20	1 7/8	1 3/16	5/8	2 7/16	1 1/4	1 1/8	1.34	10	150
64222U	3/4 - 3/4 - 1/2	25-25-20	1 7/8	1 3/16	5/8	2 7/16	1 1/4	1 3/16	1.25	10	150
64232U	1 - 3/4 - 3/4	32-25-25	2 3/16	1 3/8	11/16	2 3/4	1 3/8	1 5/16	2.19	5	100
64234U	1 - 1 - 1/2	32-32-20	2 3/16	1 3/8	11/16	2 3/4	1 3/8	1 5/16	2.15	5	100
64240U	1 - 1 - 3/4	32-32-25	2 3/16	1 3/8	11/16	2 3/4	1 3/8	1 5/16	2.05	5	100
64242U	1 1/4 - 1 1/4 - 1/2	40-40-20	2 7/16	1 3/8	1	3 3/8	1 11/16	1 3/8	3.62	5	120
64244U	1 1/4 - 1 1/4 - 3/4	40-40-25	2 7/16	1 3/8	1	3 3/8	1 11/16	1 3/8	3.49	5	120
64245U	1 1/4 - 1 - 1	40-32-32	2 3/4	2 1/8	5/8	3 3/8	1 11/16	1 11/16	4.36	5	100
64246U	1 1/4 - 1 1/4 - 1	40-40-32	2 3/4	2 1/8	5/8	3 3/8	1 11/16	1 11/16	4.32	5	100
64247U	1 1/2 - 1 1/2 - 1/2	50-50-20	3 1/16	1 11/16	1 1/8	4	2	1 3/4	7.94	5	60
64248U	1 1/2 - 1 1/2 - 3/4	50-50-25	3 1/16	1 11/16	1 1/8	4	2	1 3/4	7.94	5	60
64250U	1 1/2 - 1 1/2 - 1	50-50-32	3 1/16	1 11/16	1 1/8	4	2	1 3/4	7.94	5	60
64251U	1 1/2 - 1 1/2 - 1 1/4	50-50-40	3 5/16	2 11/16	1 1/16	4	2	2	8.47	5	60
64252U	2 - 2 - 1/2	63-63-20	3 3/4	1 3/8	1 3/4	4 13/16	2 3/8	2 1/16	14.46	1	35
64254U	2 - 2 - 3/4	63-63-25	3 3/4	1 3/8	1 3/4	4 13/16	2 3/8	2 1/16	14.11	1	35
64256U	2 - 2 - 1	63-63-32	3 3/4	2 1/8	1 3/4	4 13/16	2 3/8	2 1/16	14.46	1	35
64258U	2 - 2 - 1 1/4	63-63-40	3 3/4	2 1/8	1 3/4	4 13/16	2 3/8	2 1/16	14.11	1	35
64260U	2 - 2 - 1 1/2	63-63-50	4 1/16	3 3/8	3/4	4 13/16	2 3/8	2 3/8	16.40	1	30
64261U	2 1/2 - 2 1/2 - 1/2	75-75-20	4 3/8	1 11/16	2	5 3/4	2 7/8	2 3/8	22.22	1	25
64262U	2 1/2 - 2 1/2 - 3/4	75-75-25	4 3/8	1 11/16	2	5 3/4	2 7/8	2 3/8	22.22	1	25
64264U	2 1/2 - 2 1/2 - 1	75-75-32	4 3/8	1 11/16	2	5 3/4	2 7/8	2 3/8	22.22	1	25
64266U	2 1/2 - 2 1/2 - 1 1/4	75-75-40	4 9/16	2 11/16	1 9/16	5 3/4	2 7/8	2 9/16	22.22	1	25
64268U	2 1/2 - 2 1/2 - 1 1/2	75-75-50	4 9/16	2 11/16	1 9/16	5 3/4	2 7/8	2 9/16	22.22	1	25
64270U	2 1/2 - 2 1/2 - 2	75-75-63	4 7/8	4	7/8	5 3/4	2 7/8	2 7/8	23.99	1	16
64280U	3 - 3 - 1 1/2	90-90-50	5 1/4	3 3/8	1 1/2	6 5/16	3 1/8	2 15/16	28.75	1	16
64282U	3 - 3 - 2	90-90-63	5 1/4	3 3/8	1 1/2	6 5/16	3 1/8	2 15/16	27.51	1	16
64284U	3 - 3 - 2 1/2	90-90-75	5 1/2	4 5/8	1 3/16	6 5/16	3 1/8	3 1/8	32.28	1	16
64286U	3 1/2 - 3 1/2 - 2	110-110-63	6 1/4	4	1 13/16	7 5/8	3 13/16	3 3/8	58.20	1	10
64288U	3 1/2 - 3 1/2 - 2 1/2	110-110-75	6 1/4	4	1 13/16	7 5/8	3 13/16	3 3/8	57.14	1	10
64290U	3 1/2 - 3 1/2 - 3	110-110-90	6 3/4	5 13/16	7/8	7 5/8	3 13/16	2 15/16	62.79	1	10
64294U	4 - 4 - 3	125-125-90	8 15/16	4 7/8	2 7/16	9 3/4	4 7/8	5 11/16	88.54	1	5
64296U	4 - 4 - 3 1/2	125-125-110	8 7/16	5 7/8	1 15/16	9 3/4	4 7/8	5 3/16	90.30	1	5

Reducing Tee (Cont'd)

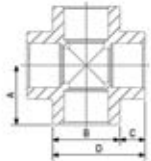
**Butt fusion**



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	E	F	Weight	pack	box
	in.	mm	in.	in.	in.	in.	in.	in.			
64298U	6 - 6 - 3	160-160-90	3 1/8	6 5/16	9 1/16	4 1/4	3 9/16	17 5/16	49.38	1	8
64299U	6 - 6 - 3 1/2	160-160-110	3 1/8	6 5/16	8 7/16	4 1/16	4 5/16	16 11/16	49.38	1	8
64300U	6 - 6 - 4	160-160-125	3 1/8	6 5/16	9 1/16	4	4 15/16	17 5/16	43.56	1	4
64302U	8 - 8 - 6	200-200-160	3 1/8	7 7/8	9 7/16	4 5/8	6 5/16	19 1/16	72.31	1	1
64306U	10 - 10 - 6	250-160-250	27 1/4	6 5/16	8 15/16	24 1/8	12 1/16	22 5/16	627.88	1	1
64307U	10 - 10 - 8	250-200-250	27 1/2	7 7/8	8 1/8	24 1/8	12 1/16	22 5/8	627.88	1	1
643094U	12-12-8	315-315-200	33 7/8	7 7/8	11 5/16	30 9/16	15 1/4	27 9/16	1252.23	1	1
643098U	12-12-10	315-315-250	34 13/16	9 13/16	10 3/8	30 9/16	15 1/4	27 9/16	1241.64	1	1
643124UTY	14-14-12	355-355-315								1	1
643154UTY	16-16-14	400-400-355								1	1
64298UZ	6-6-3	160-160-90								1	1
64299UZ	6-6-3 1/2	160-160-110								1	1
64300UZ	6-6-4	160-160-125								1	1
64302UZ	8-8-6	200-200-160								1	1
64306UZ	10-10-6	250-250-160								1	1
64307UZ	10-10-8	250-250-200								1	1
643094UZ	12-12-8	315-315-200								1	1
643098UZ	12-12-10	315-315-250								1	1
643124UCZ	14-14-12	355-355-315								1	1
643154UCZ	16-16-14	400-400-355								1	1

**Cross**

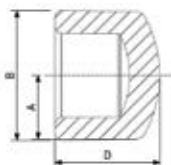
**Socket fusion**



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	Weight	pack	box
	in.	mm	in.	in.	in.	in.			
64308U	1/2	20	1	1 1/8	7/16	1 5/8	1.02	10	400
64310U	3/4	25	1 3/16	1 5/16	1/2	1 7/8	1.31	10	300
64312U	1	32	1 3/8	1 11/16	9/16	2 1/4	2.38	5	150
64314U	1 1/4	40	1 5/8	2 1/8	9/16	2 11/16	4.04	5	80

**Cap**

**Socket fusion**



Part #	Nominal Diameter	Actual Diameter	A	B	D	Weight	pack	box
	in.	mm	in.	in.	in.			
65008U	1/2	20	9/16	1 3/16	15/16	0.39	10	500
65010U	3/4	25	11/16	1 3/8	1 1/16	0.48	10	450
65012U	1	32	7/8	1 11/16	1 3/8	0.81	5	250
65014U	1 1/4	40	1 1/16	2 1/8	1 1/2	1.59	5	350
65016U	1 1/2	50	1 3/8	2 11/16	1 13/16	3.00	5	200
65018U	2	63	1 11/16	3 3/8	2 1/8	5.64	1	80
65020U	2 1/2	75	2	4	2 1/2	6.35	1	80
65022U	3	90	2 3/8	4 3/4	2 7/8	10.76	1	50
65024U	3 1/2	110	2 7/8	5 13/16	3 7/16	19.05	1	24
65026U	4	125	3 5/16	6 5/16	3 11/16	30.34	1	12

## Cap (Cont'd)

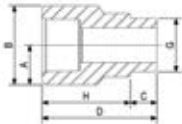
### Butt fusion



Part #	Nominal Diameter	Actual Diameter	A	B	D	Weight		
	in.	mm	in.	in.	in.	oz.	pack	box
65028U	6	160	3 1/8	6 5/16	5 11/16	37.39	1	5
65030U	8	200	3 15/16	7 7/8	6 7/8	71.61	1	2
65032U	10	250	4 15/16	9 13/16	7 1/16	116.40	1	1
65034U	12	315	6 3/16	12 3/8	11 11/16	253.97	1	1
65036U	14	355					1	1
65038U	16	400					1	1
65028UZ	6	160					1	5
65030UZ	8	200					1	2
65032UZ	10	250					1	1
65034UZ	12	315					1	1
65036UZ	14	355					1	1
65038UZ	16	400					1	1

## Direct Fusion Outlet

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	H	G	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
65132U	1/2	20	9/16	1 3/16	3/8	1 11/16	1 5/16	13/16	0.44	10	1000
65134U	3/4	25	11/16	1 3/8	7/16	1 3/4	1 5/16	1	0.65	10	500
65136U	1	32	7/8	1 3/4	1/2	2	1 9/16	1 1/4	1.09	5	400
65138U	1 1/4	40	1 1/16	2 1/8	9/16	2 3/16	1 5/8	1 9/16	2.58	5	200

## Direct Fusion Outlet X Threaded Female

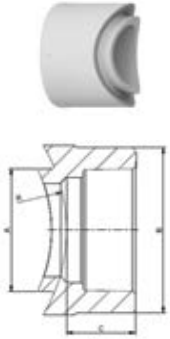
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	F	G	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
65152U	1/2	20	3/4	1 7/16	3/8	1 7/8	1 7/16	13/16	1.06	5	200
65154U	3/4	25	7/8	1 3/4	7/16	1 15/16	1 1/2	1	1.55	5	150

**Saddle Fusion Outlet**

**Socket fusion**



Part #	Nominal Diameter		Actual Diameter		For Pipe Diameter		A	B	C	R	Weight	Boring Bit Size
	in.	mm	in.	mm	in.	mm	in.	in.	in.	in.	oz.	in.
650472U	1/2	20	1 1/4	40	1	1 1/16	3/4	13/16	0.66	7/8 - 31/32		
650474U	3/4	25	1 1/4	40	1	1 5/16	13/16	13/16	0.46	7/8 - 31/32		
650478U	1/2	20	1 1/2	50	1	1 1/16	3/4	1	0.41	7/8 - 31/32		
650480U	3/4	25	1 1/2 - 2	50 - 63	1	1 5/16	13/16	1	0.46	7/8 - 31/32		
650498U	1/2	20	2 - 2 1/2	63 - 75	1	1 1/16	3/4	1 3/8	0.38	7/8 - 31/32		
650500U	3/4	25	2 - 2 1/2	63 - 75	1	1 5/16	13/16	1 3/8	0.44	7/8 - 31/32		
650502U	1	32	2 - 2 1/2	63 - 75	1 1/4	1 11/16	1	1 3/8	1.02	1 1/8 - 1 3/32		
650540U	1 1/4	40	2 1/2	75	1 9/16	2 1/8	1 1/16	1 1/2	1.68	1 7/16 - 1 17/32		
650556U	1/2	20	3 - 4	90 - 125	1	1 1/16	3/4	2 1/8	0.37	7/8 - 31/32		
650558U	3/4	25	3 - 4	90 - 125	1	1 5/16	13/16	2 3/16	0.42	7/8 - 31/32		
650560U	1	32	3 - 4	90 - 125	1 1/4	1 11/16	1	2 3/16	0.95	1 1/8 - 1 3/32		
650580U	1 1/4	40	3	90	1 9/16	2 1/8	1 1/16	1 3/4	1.62	1 7/16 - 1 17/32		
650600U	1 1/4	40	3 1/2	110	1 9/16	2 1/8	1 1/16	2 3/16	1.58	1 1/2 - 1 19/32		
650620U	1 1/2	50	3 1/2	110	1 15/16	2 5/8	1 3/8	2 3/16	3.28	1 13/16 - 1 29/32		
650638U	1 1/4	40	4	125	1 9/16	2 1/8	1 1/16	2 7/16	1.58	1 7/16 - 1 17/32		
650640U	1 1/2	50	4	125	1 15/16	2 5/8	1 3/8	2 7/16	3.22	1 13/16 - 1 29/32		
650660U	2	63	4	125	2 1/2	3 5/16	1 9/16	2 7/16	5.83	2 3/8 - 2 15/32		
650672U	1/2	20	6 - 8	160 - 200	1	1 1/16	3/4	3 9/16	0.36	7/8 - 31/32		
650674U	3/4	25	6 - 8	160 - 200	1	1 5/16	13/16	3 9/16	0.42	7/8 - 31/32		
650676U	1	32	6 - 8	160 - 200	1 1/4	1 11/16	1	3 9/16	0.95	1 1/8 - 1 3/32		
650678U	1 1/4	40	6 - 8	160 - 200	1 9/16	2 1/8	1 1/16	3 9/16	1.51	1 7/16 - 1 17/32		
650680U	1 1/2	50	6	160	1 15/16	2 5/8	1 3/8	3 1/8	3.29	1 13/16 - 1 29/32		
650700U	2	63	6	160	2 1/2	3 5/16	1 9/16	3 1/8	5.46	2 3/8 - 2 15/32		
650720U	2 1/2	75	6	160	2 15/16	4	1 5/8	3 1/8	7.15	2 13/16 - 2 29/32		
650740U	3	90	6	160	3 9/16	4 1/2	1 3/4	3 1/8	10.95	3 7/16 - 3 17/32		
650760U	1 1/2	50	8	200	1 15/16	2 5/8	1 3/8	3 15/16	3.07	1 13/16 - 1 29/32		
650780U	2	63	8	200	2 1/2	3 5/16	1 9/16	3 15/16	5.18	2 3/8 - 2 15/32		
650800U	2 1/2	75	8	200	2 15/16	4	1 5/8	3 15/16	7.10	2 13/16 - 2 29/32		
650820U	3	90	8	200	3 9/16	4 1/2	1 3/4	3 15/16	10.43	3 7/16 - 3 17/32		
650840U	3 1/2	110	8	200	4 5/16	5 3/4	2	3 15/16	25.51	4 3/16 - 4 9/32		
650860U	4	125	8	200	4 15/16	6 7/8	2 3/16	3 15/16	29.67	4 13/16 - 4 29/32		
650872U	1/2	20	10 - 12	250 - 315	1	1 1/16	3/4	5 9/16	0.35	7/8 - 31/32		
650874U	3/4	25	10 - 12	250 - 315	1	1 5/16	13/16	5 9/16	0.41	7/8 - 31/32		
650876U	1	32	10 - 12	250 - 315	1 1/4	1 11/16	1	5 9/16	0.93	1 1/8 - 1 3/32		
650878U	1 1/4	40	10 - 12	250 - 315	1 9/16	2 1/8	1 1/16	5 9/16	1.51	1 7/16 - 1 17/32		
650880U	1 1/2	50	10	250	1 15/16	2 5/8	1 3/8	4 15/16	3.03	1 13/16 - 1 29/32		
650900U	2	63	10	250	2 1/2	3 5/16	1 9/16	4 15/16	5.08	2 3/8 - 2 15/32		
650920U	2 1/2	75	10	250	2 15/16	4	1 5/8	9 13/16	6.76	2 13/16 - 2 29/32		
650940U	3	90	10	250	3 9/16	4 1/2	1 3/4	4 15/16	9.97	3 7/16 - 3 17/32		
650960U	3 1/2	110	10	250	4 5/16	5 3/4	2	9 13/16	20.11	4 3/16 - 4 9/32		
650980U	4	125	10	250	4 15/16	6 7/8	2 3/16	9 13/16	27.87	4 13/16 - 4 29/32		

## Fusion-Tech Direct Fusion Outlet X Safety®-Pol Connection

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	F	G	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
65170U	1/2	16	3/4	1 7/16	3/8	3 1/16	1 7/16	13/16	0.72	5	150
65172U	5/8	20	3/4	1 7/16	3/8	3 1/16	1 7/16	13/16	0.65	5	
65174U	7/8	26	7/8	1 3/4	7/16	3 1/4	1 15/16	1	0.90	5	

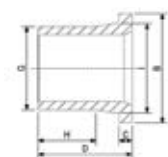
### Flange Adapter

#### Socket fusion



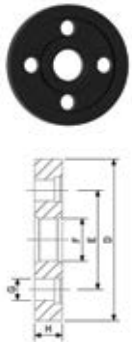
Part #	Nominal Diameter	Actual Diameter	B	C	D	H	G	I	Weight		
	in.	mm	in.	in.	in.	in.	in.	in	oz.	pack	box
65208U	1/2	20	1 5/16	1/4	1 2/4	1 3/16	1	1 1/16	0.48	10	1000
65210U	3/4	25	1 5/8	1/4	1 5/8	1 1/4	1 5/16	1 5/16	0.78	10	400
65212U	1	32	2 1/16	5/16	2 1/16	1 9/16	1 5/8	1 5/8	1.32	5	300
65214U	1 1/4	40	2 1/2	3/8	2 5/16	1 3/4	1 15/16	2	1.99	5	200
65216U	1 1/2	50	3 1/16	3/8	2 9/16	1 15/16	2 5/16	2 7/16	2.59	1	100
65218U	2	63	3 13/16	1/2	3	2 3/16	2 7/8	3 1/16	4.76	1	50
65220U	2 1/2	75	4 1/2	9/16	3 3/8	2 1/2	3 1/2	3 5/8	8.68	1	40
65222U	3	90	5 3/16	11/16	3 7/8	2 13/16	4 1/8	4 1/4	13.37	1	25
65224U	3 1/2	110	6 1/8	7/8	4 3/16	2 15/16	5 1/8	5 1/4	19.61	1	16
65226U	4	125	7 3/16	1	4 9/16	3 1/8	5 3/4	6 1/8	35.27	1	12

#### Butt fusion



Part #	Nominal Diameter	Actual Diameter	B	C	D	H	G	I	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
65228U	6	160	8 3/8	1	7 3/16	5 11/16	6 3/8	6 13/16	53.97	1	4
65230U	8	200	10 9/16	1 1/4	8 1/16	6 1/4	7 15/16	9 1/8	98.77	1	4
65232U	10	250	12 5/8	1 3/8	8 1/8	5 3/16	9 7/8	11 1/4	154.15	1	1
65234U	12	315	14 1/2	1 1/4	10 3/4	7	12 5/16	13 1/8	317.47	1	1
65236U	14	355								1	1
65238U	16	400								1	1
65228UZ	6	160								1	4
65230UZ	8	200								1	4
65232UZ	10	250								1	1
65234UZ	12	315								1	1
65236UZ	14	355								1	1
65238UZ	16	400								1	1

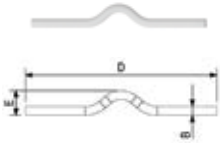
## Aluminum Flange



Part #	Nominal Diameter	Actual Diameter	D	E	F	G	H	Weight	No. Holes		
	in.	mm	in.	in.	in.	in.	in.				
65266U	1/2	20	4 3/16	2 9/16	1 1/8	9/16	11/16	12.70	4	1	30
65268U	3/4	25	4 5/8	2 15/16	1 5/16	9/16	11/16	16.23	4	1	25
65270U	1	32	4 13/16	3 3/8	1 5/8	11/16	11/16	17.64	4	1	25
65272U	1 1/4	40	5 9/16	3 15/16	2	11/16	11/16	19.40	4	1	20
65274U	1 1/2	50	6 1/8	4 5/16	2 7/16	11/16	3/4	26.46	4	1	20
65276U	2	63	6 3/4	4 15/16	3 1/16	11/16	13/16	31.75	4	1	15
65278U	2 1/2	75	7 1/2	5 11/16	3 5/8	11/16	13/16	38.80	4	1	10
65280U	3	90	8 1/8	6 5/16	4 1/2	11/16	13/16	45.86	8	1	8
65282U	3 1/2	110	8 7/8	7 1/16	5 5/16	11/16	7/8	47.97	8	1	5
65284U	4	125	8 7/8	7 1/16	6	7/8	7/8	61.38	8	1	5
65286U	6	160	11 5/8	9 7/16	7	7/8	7/8	63.49	8	1	4
65290U	8	200	13 3/4	11 5/8	9 1/2	7/8	7/8	84.66	8	1	4
65292U	10	250	16 1/4	13 3/4	13 3/4	7/8	1 7/16	121.70	12	1	1
65294U	12	315	18 3/16	15 3/4	13 5/16	7/8	1 5/8	252.21	12	1	1
65296U	14	355	20 11/16	18 1/8	14 13/16	7/8	2 1/16	391.54	16	1	1
65298U	16	400	23 1/16	20 1/4	16 15/16	1	2 3/16	518.53	16	1	1

## faser FIBER-T RED Striped Pipe Crossover

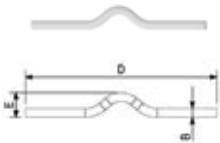
**Socket fusion**



Part #	Nominal Diameter	Actual Diameter	B	D	E	Weight		
	in.	mm	in.	in.	in.			
65414U	1/2	20	13/16	15 3/16	2 3/16	2.40	10	250
65416U	3/4	25	1	15 3/16	2 3/16	3.53	10	70
65418U	1	32	1 1/4	15 3/16	2 11/16	6.00	5	40

## faser FIBER-Cond GREY Striped Pipe Crossover

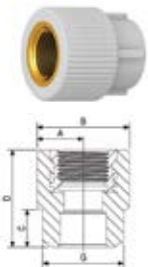
**Socket fusion**



Part #	Nominal Diameter	Actual Diameter	B	D	E	Weight		
	in.	mm	in.	in.	in.			
65424U	1	32	1 1/4	15 3/16	2 3/16	5.75	5	40

## Female Threaded Adapter

**Socket fusion**

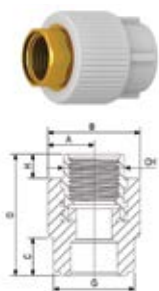


Part #	Nominal Diameter	Actual Diameter	A	B	C	D	G	Weight		
	in.	mm	in.	in.	in.	in.	in.			
66008U	F1/2-1/2	F1/2-20	3/4	1 1/2	5/8	1 5/8	1 5/16	2.13	10	200
66009U	F1/2-3/4	F1/2-25	3/4	1 1/2	11/16	1 5/8	1 5/16	2.20	10	200
66010U	F3/4-3/4	F3/4-25	3/4	1 3/4	5/8	1 5/8	1 9/16	2.82	10	200
66011U	F3/4-1/2	F3/4-20	7/8	1 3/4	5/8	1 9/16	1 3/8	3.17	10	200
66013U	F3/4-1	F3/4-32	7/8	1 3/4	11/16	1 11/16	1 9/16	3.21	5	150



## Female Threaded Hex Adapter

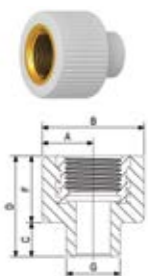
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	G	H	CH	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.		oz.	pack	box
66108U	F1/2-1/2	F1/2-20	3/4	1 1/2	9/16	2	1 5/16	3/8	15/16	2.93	10	200
66109U	F3/4-1/2	F3/4-20	3/4	1 1/2	9/16	2	1 5/16	3/8	1 2/8	3.88	10	150
66110U	F3/4-3/4	F3/4-25	7/8	1 3/4	5/8	2	1 9/16	3/8	1 2/8	3.88	10	150
66112U	F1-1"	F1-32	1 1/8	2 5/16	3/4	2 3/8	1 11/16	9/16	1 9/16	8.29	5	80
66114U	F1 1/4-1 1/4	F1 1/4-40	1 7/16	2 15/16	7/8	2 9/16	2 1/8	9/16	1 7/8	11.89	5	50
66116U	F1 1/2-1 1/2	F1 1/2-50	1 9/16	3 1/8	1	2 11/16	2 13/16	9/16	2 3/16	14.46	1	40
66118U	F2-2	F2-63	1 13/16	3 11/16	1 1/16	2 7/8	3 3/8	5/8	2 5/8	20.04	1	25
66120U	F2 1/2- F2 1/2	F2 1/2- 75	2 5/16	4 1/2	1 1/4	3 3/8	3 15/16	7/8	3 7/16	39.05	1	15
66122U	F3-3	F90-90	25 3/4	50 11/16	15 5/16	38 15/16	48 9/16	9 7/16	37 5/16	45.36	1	12
66124U	F4-4	F125-125	32 1/4	64 7/16	15 5/16	43 5/8	58 9/16	11 3/8	47 3/16	68.18	1	6
66126U	F5-4	F5125	4 5/16	8 9/16	1 9/16	4 7/16	6 9/16	9/16	5 7/8	124.38	1	4

## Female Threaded Bushing

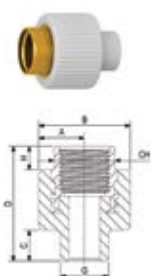
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	F	G	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
66150U	F1/2-1/2	F1/2-20	3/4	1 1/2	1/2	1 1/2	1	13/16	2.36	10	200

## Female Threaded Hex Bushing

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	F	G	CH	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.		oz.	pack	box
66158U	F1/2-1/2	F1/2-20	3/4	1 1/2	9/16	1 15/16	13/16	1	15/16	0.08	10	200

## Male Threaded Adapter

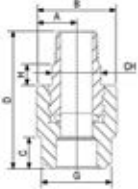
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	G	Weight		
	in.	mm	in.	in.	in.	in.	in.	oz.	pack	box
66208U	M1/2-1/2	M1/2-20	3/4	1 1/2	5/8	2 1/4	1 5/16	2.75	10	200
66209U	M1/2-3/4	M1/2-25	3/4	1 1/2	11/16	2 1/4	1 7/16	3.60	10	200
66210U	M3/4-3/4	M3/4-25	3/4	1 1/2	11/16	2 5/16	1 7/16	3.60	10	200
66211U	M3/4-1/2	M3/4-20	3/4	1 1/2	5/8	2 5/16	1 3/8	3.52	10	200
66213U	M3/4-1	M3/4-32	3/4	1 1/2	3/4	2 3/8	1 5/8	3.77	5	150

## Male Threaded Hex Adapter

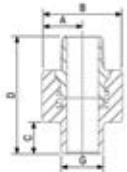
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	G	H	CH	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	in.	oz.	pack	box
66308U	M1/2-1/2	M1/2-20	3/4	1 1/2	9/16	2 5/8	1 5/16	3/8	7/8	3.84	10	200
66310U	M3/4-1/2	M3/4-20	3/4	1 1/2	9/16	2 11/16	1 5/16	3/8	1 1/16	4.90	10	150
66311U	M3/4-3/4	M3/4-25	3/4	1 1/2	9/16	2 11/16	1 5/16	3/8	1 1/16	4.90	10	150
66312U	M1-1"	M1-32	1	2 1/16	3/4	3 1/16	1 11/16	9/16	1 9/16	7.97	5	70
66314U	M1 1/4-1 1/4	M1 1/4-40	1 3/8	2 11/16	7/8	3 3/8	2 1/8	9/16	1 11/16	13.65	5	50
66316U	M1 1/2-1 1/2	M1 1/2-50	1 7/16	2 15/16	7/8	3 1/2	2 11/16	9/16	1 15/16	14.74	5	40
66318U	M2-2	M2-63	1 11/16	3 7/16	1 5/16	3 13/16	3 3/8	9/16	2 3/8	20.11	1	20
66320U	M2 1/2- F2 1/2	M2 1/2- 75	2	4 1/16	1 9/16	4 1/4	4	9/16	3	35.63	1	20
66321U	M2 1/2-3	M2 1/2-90	2	4 1/16	1 7/16	4 5/16	4 3/4	9/16	3	38.10	1	15
66322U	M3-3	M3-90	2 9/16	5 1/8	1 3/4	4 3/4	5 7/8	9/16	3 9/16	62.79	1	6
66324U	M3-3 1/2	M3-110	2 5/8	5 1/8	1 3/4	4 3/4	5 7/8	9/16	3 9/16	58.94	1	6
66325U	M4-3 1/2	M125-3 1/2	3 3/16	6 7/16	1 9/16	5 3/4	5 7/8	1 1/8	4 1/2	100.53	1	4
66326U	M5-4	M5-125	4 1/4	8 1/2	1 9/16	6 5/16	6 1/2	9/16	5 7/8	156.26	1	4

## Male Threaded Bushing

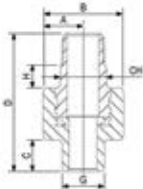
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	G	H	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
66350U	M1/2-1/2	M1/2-20	13/16	1 9/16	9/16	2 3/16	13/16	1	2.54	10	200

## Male Threaded Hex Bushing

### Socket fusion



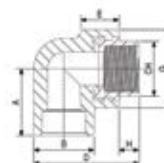
Part #	Nominal Diameter	Actual Diameter	A	B	C	D	G	H	CH	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.		oz.	pack	box
66358U	M1/2-1/2	M1/2-20	13/16	1 9/16	9/16	2 5/8	13/16	1	7/8	3.88	10	200

## Female Threaded X Socket Elbow

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	D	E	G	Weight		
	in.	mm	in.	in.	in.	in.	in.	oz.	pack	box
67008U	F 1/2-1/2	F 1/2-20	1 1/4	1 3/16	2 1/16	1	1 1/2	2.50	10	200
67009U	F 1/2-3/4	F 1/2-25	1 3/8	1 3/8	2 3/16	1	1 1/2	2.75	10	150
67010U	F 3/4-3/4	F 3/4-25	1 3/8	1 3/8	2 1/8	1	1 3/4	3.79	10	150
67011U	F 3/4-1/2	F 3/4-20	1 7/16	1 5/16	2 1/8	1	1 3/4	4.00	10	100
67013U	F 3/4-1	F 3/4-32	1 7/8	1 11/16	2 3/8	1 1/16	2	5.22	5	100



Part #	Nominal Diameter	Actual Diameter	A	B	D	E	G	H	CH	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	in.	oz.	pack	box
67014U	F 1-1	F 1-32	1 7/8	1 11/16	3	1 1/8	2 1/4	9/16	1 9/16	9.488706	5	70

## Drop Ear Elbow

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	D	E	G	L	F	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	in.	oz.	pack	box
67108U	F 1/2-1/2	F 1/2-20	1 1/4	1 3/16	2 1/16	1	1 1/2	2 3/16	1 9/16	2.56	10	150
67109U	F 3/4-3/4	F 3/4-20	1 3/8	1 3/8	2 3/16	1	1 3/4	2 11/16	1 7/8	4.20	10	100
67110U	F 3/4-3/4	F 3/4-25	1 3/8	1 3/8	2 3/16	1	1 3/4	2 11/16	1 7/8	4.13	10	100
67111U	F 1/2-3/4	F 1/2-25	1 3/8	1 3/8	2 5/16	1 1/16	1 1/2	2 3/16	1 9/16	2.95	10	100

## Female Threaded X Male Socket Elbow

### Socket fusion



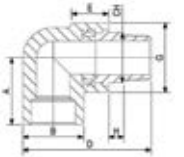
Part #	Nominal Diameter	Actual Diameter	A	B	D	F	G	Weight		
	in.	mm	in.	in.	in.	in.	in.	oz.	pack	box
67208U	F 1/2-1/2	F 1/2-20	1 5/16	1 3/16	2 1/16	1	1 1/2	2.54	10	200

## Male Threaded X Socket Elbow

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	D	E	G	I	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
67500U	M1/2-3/4	M 1/2-25	1 1/4	1 3/8	2 3/4	1	1 1/2	2 1/8	3.32	10	200
67508U	M1/2-1/2	M1/2-20	1 1/4	1 3/16	2 11/16	1	1 1/2	2 1/16	3.17	10	150
67509U	M3/4-1/2	M3/4-20	1 7/16	1 3/8	2 13/16	1	1 3/4	2 1/8	4.66	10	150
67510U	M3/4-3/4	M3/4-25	1 7/16	1 3/8	2 13/16	1	1 9/16	2 1/8	4.27	10	100
67511U	M3/4-1	M3/4-32	1 7/8	1 3/4	3 1/8	1	2	2 7/16	6.07	5	100



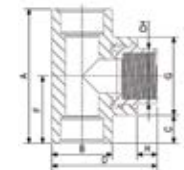
Part #	Nominal Diameter	Actual Diameter	A	B	D	E	G	I	CH	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	in.	oz.	pack	box
67512U	M1-1	M1-32	1 7/8	1 11/16	3	1 1/8	2 1/4	9/16	1 9/16	9.49	5	50

## Female Threaded Tee

### Socket fusion



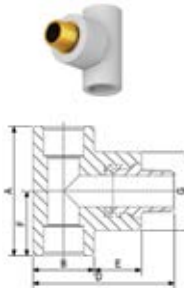
Part #	Nominal Diameter	Actual Diameter	A	B	C	D	E	F	G	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	in.	oz.	pack	box
68008U	1/2-1/2-F1/2	20-20-F1/2	2 7/16	1 3/16	1/2	2 1/16	7/8	1 1/4	1 1/2	2.75	10	150
68009U	1/2-1/2-F3/4	20-20-F3/4	2 7/16	1 3/16	3/8	2 1/16	7/8	1 1/4	1 3/4	3.67	10	100
68010U	3/4-3/4-F3/4	25-25-F3/4	2 15/16	1 5/16	9/16	2 1/8	13/16	1 7/16	1 3/4	4.02	10	100
68011U	3/4-3/4-F1/2	25-25-F1/2	2 11/16	1 5/16	9/16	2 1/8	13/16	1 3/8	1 1/2	3.00	10	100
68014U	1-1-F3/4	32-33-F3/4	3 3/4	1 3/4	13/16	2 3/8	11/16	1 1/4	2 1/4	6.00	5	50



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	E	F	G	H	CH	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	in.	in.	in.	oz.	pack	box
68016U	1-1-F1	32-32-F1	3 3/4	1 11/16	13/16	3	11/16	1 7/8	2 1/4	9/16	1 9/16	9.98	5	50

## Male Threaded Tee

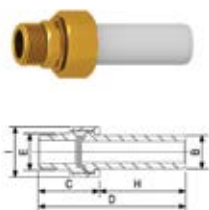
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	E	F	G	I	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	in.	in.	oz.	pack	box
68508U	1/2-1/2-M1/2	20-20-M1/2	2 7/16	1 3/16	1/2	2 1/16	7/8	1 1/4	1 1/2	2 11/16	3.88	10	150

## Male Threaded Pipe Union

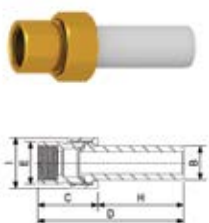
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	B	C	D	E	H	I	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
69230U	M1/2-1/2	M1/2-20	13/16	1 9/16	3 1/2	7/8	1 15/16	1 1/8	3.25	5	200
69232U	M3/4-3/4	M3/4-25	1	1 5/8	3 13/16	1	2 3/16	1 1/2	5.75	5	100
69234U	M1-1	M1-32	1 1/4	1 11/16	4 3/16	1 5/16	2 1/2	1 13/16	8.08	5	50
69236U	M1 1/4-1 1/4	M1 1/4-40	1 9/16	1 15/16	4 7/16	1 5/8	2 1/2	2 3/16	13.55	5	40
69238U	M1 1/2- 1 1/2	M1 1/2-50	1 15/16	2 11/16	5 3/4	2 1/16	3 1/16	2 1/2	25.57	1	20
69240U	M2-2	M2-63	2 1/2	2 11/16	5 3/4	2 1/2	3 1/16	3 1/4	35.06	1	15

## Female Threaded Pipe Union

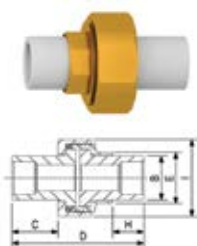
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	B	C	D	E	H	I	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
69260U	F1/2-1/2	F1/2-20	13/16	1 1/2	3 1/2	15/16	1 15/16	1 1/8	3.17	5	200
69262U	F3/4-25	F3/4-25	1	1 5/8	3 13/16	1 1/4	2 3/16	1 1/2	5.75	5	100
69264U	F1-1	F1-32	1 1/4	1 7/8	4 1/4	1 9/16	2 1/2	1 13/16	9.17	5	50
69266U	F1 1/4-1 1/4	F1 1/4-40	1 9/16	2	4 1/2	2	2 1/2	2 3/16	15.66	5	40
69268U	F1 1/2- 1 1/2	F1 1/2-50	1 15/16	2 9/16	5 3/4	2 3/16	3 1/16	2 1/2	23.63	1	20
69270U	F2-2	F2-63	2 1/2	2 11/16	5 13/16	2 3/4	3 1/16	3 1/4	38.45	1	15

## Pipe Union

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	B	C	D	E	H	I	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
69280U	1/2-1/2	20-20	1 1/16	1 1/8	3 1/8	1 1/4	5/8	1 13/16	6.631512	5	100
69282U	3/4-3/4	25-25	1 5/16	1 1/4	3 3/8	1 9/16	3/4	2 1/16	7.901376	5	50
69284U	1-1	32-32	1 5/8	1 5/8	4 3/16	1 15/16	15/16	2 11/16	18.765768	5	30
69286U	1 1/4-1 1/4	40-40	1 15/16	1 3/4	4 13/16	2 3/16	15/16	3 1/8	24.86817	5	20
69288U	1 1/2- 1 1/2	50-50	2 5/16	1 15/16	5 1/8	2 13/16	1	3 13/16	38.483934	1	10
69290U	2-2	63-63	2 7/8	2 3/16	5 15/16	3 3/16	1 3/8	4 5/16	46.91442	1	8

## Ring Nut - Female

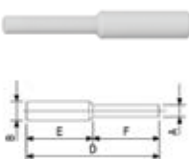
### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	D	Weight		
	in.	mm	in.	in.	in.	oz.	pack	box
69314U	F1/2	F20	7/16	7/8	1 1/4	1.55	5	200

## PP-R Pipe Plug

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	D	E	F	Weight		
	in.	mm	in.	in.	in.	in.	in.	oz.	pack	box
69350U	1/4 - 7/16	7-11	5/16	7/16	3 1/8	1 9/16	1 9/16	0.21	10	1000

## Electro-fusion Coupling

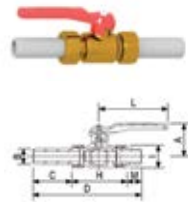
### Electrofusion



Part #	Nominal Diameter	Actual Diameter	B	C	D	H	Weight	pack	box
	in.	mm	in.	in.	in.	in.			
69508U	1/2	20	1 5/16	1 5/16	2 3/4	2 1/16	1.90	10	250
69510U	3/4	25	1 1/2	1 5/16	2 3/4	2 5/16	1.90	10	200
69512U	1	32	1 13/16	1 5/16	2 3/4	2 9/16	2.65	10	150
69514U	1 1/4	40	2 3/16	1 5/8	3 3/8	2 15/16	3.95	5	100
69516U	1 1/2	50	2 11/16	1 11/16	3 7/16	3 7/16	5.29	5	75
69518U	2	63	3 1/4	1 7/8	3 7/8	3 15/16	7.76	5	50
695120U	2 1/2	75	3 7/8	2 3/8	4 15/16	4 1/2	12.03	1	40
695122U	3	90	4 7/16	2 13/16	5 3/4	5 1/8	17.64	1	24
69524U	3 1/2	110	5 3/8	3 1/16	6 1/8	5 11/16	23.39	1	12
69526U	4	125	6 3/16	3 1/4	6 9/16	6 9/16	35.27	1	6
69528U	6	160	7 1/2	3 3/8	6 7/8	7 15/16	52.91	1	4
69530U	8	200	9 1/8	3 5/8	7 5/16	9 9/16	76.58	1	4
69532U	10	250	11 5/8	4 3/16	8 3/8	11 13/16	157.36	1	1
69534U	12	315	14 11/16	4 3/4	9 7/16	14 11/16		1	1
69536U	14	355						1	1
69538U	16	400						1	1

## Ball Valve

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	H	I	L	Weight	pack	box
	in.	mm	in.	in.	in.	in.	in.	in.	in.			
40008U	1/2	20	1 3/4	13/16	2	7 1/16	3 1/16	1 3/16	3 9/16	10.76	5	50
40010U	3/4	25	1 7/8	1	2 3/16	7 1/2	3 1/8	1 1/2	3 9/16	16.05	5	40
40012U	1	32	2 3/8	1 1/4	2 9/16	8 11/16	3 1/2	1 7/8	4 7/16	25.75	1	20
40014U	1 1/4	40	2 3/4	1 9/16	2 9/16	9 5/16	4 5/16	2 3/16	4 7/16	37.74	1	15
40016U	1 1/2	50	2 9/16	1 15/16	3 1/16	10 11/16	4 1/2	2 9/16	4 7/16	47.27	1	10
40018U	2	63	3 1/4	2 1/2	3 1/16	11 3/8	4 15/16	3 1/4	5 3/4	77.60	1	7

## Ball Valve & Body (fully PP-R)

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	H	I	L	Weight	pack	box
	in.	mm	in.	in.	in.	in.	in.	in.	in.			
40258U	1/2	20	1 15/16	3/8	2 1/4	1 1/8	1 7/16	1 5/16	3 1/4	6.35	1	25
40260U	3/4	25	2 3/8	7/16	2 1/2	1 3/8	1 11/16	1 1/8	3 11/16	9.17	1	20
40262U	1	32	2 11/16	1/2	2 7/8	1 3/4	1 15/16	1 3/16	4 3/16	12.70	1	15
40264U	1 1/4	40	3 3/8	1 9/16	3 1/4	1 15/16	7 7/8			21.24	1	10
40266U	1 1/2	50	3 15/16	1 9/16	3 1/2	2 5/16	8 7/16			27.61	1	7
40268U	2	63	4 15/16	2 1/16	4 1/2	3 1/16	9 13/16			51.32	1	4

## Ball Valve w Butterfly Handle

### Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	H	I	L	Weight	pack	box
	in.	mm	in.	in.	in.	in.	in.	in.	in.			
40058U	1/2	20	1 5/8	13/16	2	7 1/16	3 1/16	1 3/16	1 3/16	10.65	5	50
40060U	3/4	25	1 3/4	1	2 3/16	7 1/2	3 1/8	1 1/2	1 3/16	15.94	5	40
40062U	1	32	2 3/16	1 1/4	2 9/16	8 11/16	3 5/8	1 7/8	1 5/16	25.57	1	20

## Globe Stop-Cock

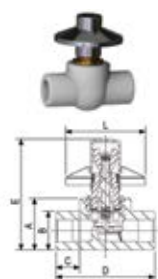
Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	E	L	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
40719U	1/2	20	1 13/16	1 5/16	13/16	3 7/16	3 13/16	2 5/16	8.85	1	40
40721U	3/4	25	1 13/16	1 5/16	13/16	3 7/16	3 13/16	2 5/16	8.61	1	40
40723U	1	32	2 1/4	1 11/16	13/16	3 13/16	4 5/8	2 5/16	15.31	1	30

## Globe Stop-Cock w Concealed Handle & Cover

Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	H	I	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
40730U	1/2	20	1 15/16	1 5/16	15/16	3 9/16	4 13/16	2 13/16	18.87	1	40
40732U	3/4	25	1 15/16	1 5/16	15/16	3 9/16	4 13/16	2 13/16	18.84	1	40

## Globe Stop-Cock w Chrome Handle

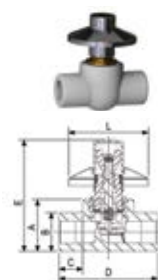
Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	E	I	L	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	in.	oz.	pack	box
40900U	1/2	20	1 13/16	1 5/16	13/16	3 7/16	4 3/4	1 13/16	2 13/16	16.08	1	40
40902U	3/4	25	1 13/16	1 5/16	13/16	3 7/16	4 3/4	1 13/16	2 13/16	16.05	1	40
40920U	1	32	2 1/4	1 11/16	13/16	3 13/16	4 15/16	1 13/16	2 13/16	20.11	1	30

## Concealed Stop-Cock w Chrome Handle

Socket fusion



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	E	I	Weight		
	in.	mm	in.	in.	in.	in.	in.	in.	oz.	pack	box
40921U	1/2	20	1 13/16	1 5/16	13/16	3 7/16	3 5/8	2 3/4	10.58	1	40
40923U	3/4	25	1 13/16	1 5/16	13/16	3 7/16	3 5/8	2 3/4	10.55	1	40
40924U	1	32	2 1/4	1 11/16	13/16	3 13/16	4 3/16	2 3/4	16.37	1	30

## Globe Stop-Cock Body

**Socket fusion**



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	Weight		
	in.	mm	in.	in.	in.	in.	oz.	pack	box
40846U	1/2	20	1 13/16	1 5/16	13/16	3 7/16	3.88	10	100
40847U	3/4	25	1 13/16	1 5/16	13/16	3 7/16	3.53	10	100
40850U	1	32	2 1/4	1 11/16	13/16	3 13/16	6.00	5	50

## Stop-Cock Body w/ Ball Valve

**Socket fusion**



Part #	Nominal Diameter	Actual Diameter	A	B	C	D	E	Weight		
	in.	mm	in.	in.	in.	in.	in.	oz.	pack	box
40852U	1/2	20	1 15/16	1 5/16	15/16	3 9/16	3 9/16	14.11	1	
40854U	3/4	25	1 15/16	1 5/16	15/16	3 9/16	3 9/16	13.76	1	



# Flushing the Sanitary System

Once the system has been built and the pressure test has been performed, following the “Testing the System” section of this manual (pg 86), proceed with flushing. If using water-air mixtures, the compressor or compressed air tanks must be equipped with an oil separating filter.

Flush sections of piping not exceeding 327 ft. in length. Start from the fill point ascending through the vertical risers and proceeding floor by floor. The velocity must be at least 6.5 ft. /s. The volume of water changed must be at least 20 times the volume that will be normally contained in the piping. For each floor, open the drain point furthest from the vertical riser and then continue on to all the other points. When the procedure is complete, close the drain points in reverse. Drain the system if it is unused or if there is a risk of freezing. Complete the product registration form (pg 88) to hand in to the site manager and building owner.

## Preventive Measures Against the Spread of Legionella

Prevention during the design phase is an efficient way to combat the risk of Legionella growth.

Regarding sanitary systems, attend to the following guidelines.

- Avoid pipes with blind ends or without circulation.
- Prevent the lines from ending with stagnations, by putting in a loop at the end distributions.
- When installing the system, maintenance and periodic cleaning should be performed, using drain points and shutoffs.
- Carefully choose the materials, using pipe with extremely low surface roughness (e.g., P-r 0.00028”) and with full bore fittings. This step helps reduce the risk of deposits that may favor bacterial growth and prevent the formation of biofilm, sediment and limescale.

## Disinfecting Fusion-Tech Piping Systems

The Fusion-Tech faser pipes are now using PP-RCT 125 as a raw material along with MOR (Maximum Oxidation Resistance) additives, improving performance at high temperatures over time and significantly slowing the oxidation process of plastic materials under the aggressive effect of highly oxidized substances.

The **PP-RCT 125 MOR** fiber-reinforced Fusion-Tech pipes are suitable for systems that require the transported fluid to be chlorinated for sanitary purposes.

## Disinfecting Techniques

Disinfection processes must be designed and carried out with these four goals:

- Safeguarding humans from the presence of bacteria in water, overexposure to oxidizing agents and the risk of burns.
- Maintaining chemical requirements required by the local authority having jurisdiction regarding the quality of potable water.
- Protecting the environment from pollution by oxidizing loads from waste water.
- Ensuring the integrity and longevity of the components of the system.

## Chemical Disinfection of Potable Water

Continuous chemical disinfection of potable water must be done with a maximum concentration of 0.0000534 oz. /gal of free chlorine. The water temperature must not exceed 158°F.

Should the presence of bacteria become apparent, it is possible to carry out a hyper-chlorination process twice a year. To define times, temperatures and doses, consult with the **aquatechnik NA** Technical Department at 1 (844) FUSION3, or [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com). Once complete, flush the system with cold potable water. If necessary, neutralize the oxidizing loads in the waste water to avoid polluting the environment.

## Thermal Disinfection of the System

If bacteria is present in the system, a thermal disinfection is highly recommended. This can be achieved by increasing the system water temperature to 158°F for at least 3 minutes. Ensure occupants of the dwelling are aware that this procedure is taking place to avoid occupants from being burned and scalded.

**WARNING:** Thermal and hyper-chlorination disinfections must never be carried out at the same time as it may cause substantial property damage, severe injury or death.

Disinfection processes must be carried out by qualified specialists; **aquatechnik**® recommends maintaining a log noting the doses, temperatures and pressures detected during the procedures.

**IMPORTANT:**

In systems made with **aquatechnik**® products that require flushing or permanent sanitation actions, it is advisable to consult with the **aquatechnik NA** Technical Department at 1 (844) FUSION3, or [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com).

# Protection from UV Rays

---

**aquatechnik®** recommends that their UV black PP-R pipe be used for outdoor applications; however, standard PP-R pipe can be used if protected properly. Standard PP-R pipe can be weakened and/or damaged when exposed to Ultra Violet (UV) light or sunlight, over long periods of time. Pipe that is exposed outdoors should be wrapped or painted with an **aquatechnik®** approved covering. **aquatechnik®** recommends a water-based, elastomeric acrylic paint be used such as a heavy duty elastomeric roof coating. Consult **aquatechnik NA** Technical Support at 1 (844) FUSION3, or [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com) for a list of approved paint manufacturers.

## Instructions for Painting Fusion-Tech Pipe

- The paint can be applied with a brush, roller, or spray after thoroughly cleaning the surfaces to be painted with approved paint thinner.
- It is recommended that painted product not be subjected to excessive stress before the paint has completely cured. This process can take up to approximately 2 days.
- Since paint is subject to wear over time, routine maintenance is required.

# Testing the System

---

Every system built (sanitary, heating, etc.) must be tested by the installing company in compliance with the installation manual and the authorities having jurisdiction before enclosing the pipe. **The installing company is legally responsible** for the work done and must guarantee proper operation of all components.

Testing in compliance with the standards requires the following procedures:

## STEP 1 – PRE-TEST

- Test duration 30 minutes.
- The system must be filled with water and air vented at the highest points in the pipeline.
- Connect the pressurizing pump to the lowest point in the piping system. Pressurize the piping system to 220 psi. Since the piping system will expand slightly during the pressurizing phase, extra pressure may be required.
- The maximum allowable pressure drop is 5 psi.
- Inspect all fittings, fusion connections and pipes for leaks.
- After 30 minutes drain the piping system.

## STEP 2 – FINAL TEST

- Test duration minimum 2 hours.
- The system must be filled with water and air vented at the highest points in the pipeline.
- Connect the pressurizing pump at the lowest point in the piping system. Pressurize the pipe system to 220 psi. The maximum allowable pressure drop is 5 psi.
- Inspect all fittings, fusion connections and pipes for leaks.
- If the piping system is to be installed behind walls, it is recommended to enclose the piping system now.
- After a minimum of 2 hours, drain the piping system

## STEP 3 – WARRANTY TEST FORM

- The Installing Company must complete and send in the Product Registration Form (pg 88) to [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com) order to qualify for Warranty. The form can also be found in the Professional Resources section of [aquatechnikNA.com](http://aquatechnikNA.com).

## IMPORTANT NOTES

- a) Should the pressure test partially or totally fail, then the warranty on the **aquatechnik**® products is considered VOID and **aquatechnik**® is released from any responsibilities of accidents and/or damages to structures, property or people.
- b) Thermoplastic materials are sensitive to changes in room temperature. Drastic temperature swings can cause increases or decreases in pressure during testing.  
Example:  
A temperature change of 18°F can cause a pressure increase or decrease of 7–15 psi.
- c) The pump used during the pressure test should be located at the lowest point of the piping system and shall have a pressure gauge that can sense pressure variation as little as 1 psi.
- d) It is recommended that pipe lines longer than 328ft be pressure tested in sections.
- e) If the piping system is installed behind walls, it is recommended to enclose the piping system before the final test. This is done to ensure piping is not damaged while being enclosed.
- f) In cases where freezing is a possibility, it is recommended to drain the piping system completely when not in use.
- g) Ensure that all code and regulations are followed during installation.

# Product Registration Form

\*Please note that all fields of this form are required to be filled in\*

**Reply to:**

2125 South Service Rd. W Unit A  
 Oakville, Ontario  
 Canada L6L 5W2  
 P: 844.FUSION3  
 F: 905.602.5360  
 E: [info@aquatechnikna.com](mailto:info@aquatechnikna.com)  
 W: [www.aquatechnikna.com](http://www.aquatechnikna.com)

**Contact Information:**

Company: \_\_\_\_\_  
 Name: \_\_\_\_\_  
 Position: \_\_\_\_\_

**Address:**

Street \_\_\_\_\_  
 City, State, Zip: \_\_\_\_\_  
 Contact #: \_\_\_\_\_  
 Fax #: \_\_\_\_\_  
 Email Address: \_\_\_\_\_

**Project:**

Brief Description: \_\_\_\_\_  
 Street: \_\_\_\_\_  
 City, State, Zip: \_\_\_\_\_

**Length of pipe used:**

1/2" (20mm)	_____	3 1/2" (110mm)	_____
3/4" (25mm)	_____	4" (125mm)	_____
7/8" (26mm)	_____	6" (160mm)	_____
1" (32mm)	_____	8" (200mm)	_____
1 1/4" (40mm)	_____	10" (250mm)	_____
1 1/2" (50mm)	_____	12" (315mm)	_____
2" (63mm)	_____	14" (355mm)	_____
2 1/2" (75mm)	_____	16" (400mm)	_____
3" (90mm)	_____		

Temperature being operated at (°F or °C):     °F      
 Pressure (psi and/or mbar):     psi      
 Highest Point: \_\_\_\_\_  
 (over pressure gauge)

Test Duration:     °F      
 Start Time:     psi      
 End Time: \_\_\_\_\_

**Installed Pipes:**

\_\_\_\_\_ Fusion-Tech **BLUE** striped pipe  
 \_\_\_\_\_ Fusion-Tech **VIOLET** striped pipe  
 \_\_\_\_\_ Fusion-Tech **faser RED** striped pipe  
 \_\_\_\_\_ Fusion-Tech **faser GREY** striped pipe  
 \_\_\_\_\_ Fusion-Tech **faser UV** Black pipe  
 \_\_\_\_\_ iso-tech **faser RED** striped pipe  
 \_\_\_\_\_ iso-tech **faser GREY** striped pipe  
 \_\_\_\_\_ Safety-Pol Fitting/ Multi-Calor Pipe

**Installing Purposes:**

\_\_\_\_\_ Water/Sanitary  
 \_\_\_\_\_ Heating  
 \_\_\_\_\_ Other (please specify)

**Testing Chart:**

Pre-Testing	Duration 30 minutes	Final test	Duration 120 minutes (2 hours)
Starting Pressure	(220 psi/ 15 bar)	Starting Pressure	(220 psi/ 15 bar)
Reset Pressure	(220 psi/ 15 bar)	Pressure after 60 minutes (1 hour)	
Pressure Drop		Pressure after 120 minutes (2 hours)	
Test Result		Test Result	

\*\*Depressurize the pipe between each cycle\*\*

Pay attention during the testing, always comply with the regulations and norms of the authorities having jurisdiction and always respect the performance of the other components.

Signature: \_\_\_\_\_  
 Date: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

# Competences & Responsibilities of aquatechnik®

The following overview outlines the competences and responsibilities of **aquatechnik®** regarding heating, cooling and hydrothermal sanitary systems in general.

1. The competences and responsibilities of **aquatechnik® S.p.A.** exclusively regard the materials of its own construction and supply, covered by a standard warranty, for any manufacturing flaws or defects.

2. The company is relieved from any possible claims that may regard:

- a) Any type and kind of malfunctioning systems.
- b) Broken pipes and/or fittings caused by transportation at the construction or work sites; failure to carry out pressure testing as indicated in the technical guide; carrying aggressive fluids; materials from other origins inserted into the system that can cause damage or wear on the original piping.
- c) Errors in hydraulic, electrical or electronic connections made by installation technicians.

The competences and responsibilities of making the piping system are illustrated in the diagram below.

Object of the system	Responsible individual
System estimate, calculation and sizing according to the local authority having jurisdiction.	Professional office and/or freelancer qualified in designing for the application.
Installation of the necessary materials, including: thermoplastic pipes and fittings, insulation in compliance with the standard to form distribution and connection networks to heating components, distribution manifolds, regulation equipment, boiler and central heating system, various testing, system start-up and all other work pertaining to the system.	Company specializing in plumbing and hydronic installations and technical services.
Electrical connections to control equipment, to service thermostats, safety devices and all other work pertaining to the electrical or electronic parts.	Company specializing in electrical installations.
Thermoplastic pipes and fittings for hydraulic circuits, accessories and components made by the company itself.	<b>aquatechnik® S.p.A.</b>

# Chemical Applications

Although **aquatechnik**® products are chemical resistant, for the most part, there are certain applications where **aquatechnik**® PP-R piping and fittings may not be suitable.

If you have a concern that our PP-R pipe may not be acceptable for a given application, we encourage you to complete the following form and submit it by email to [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com), or mail to the address provided. The form may also be completed and submitted Online in the Contractor Resources section of [aquatechnikNA.com](http://aquatechnikNA.com).

**Reply to:**

2125 South Service Rd. W Unit A  
Oakville, Ontario  
L6L 5W2, Canada  
P: 1.844.FUSION3  
F: 905.602.5360  
E: [info@aquatechnikna.com](mailto:info@aquatechnikna.com)  
W: [www.aquatechnikna.com](http://www.aquatechnikna.com)

**Contact Information:**

Company: \_\_\_\_\_  
Name: \_\_\_\_\_  
Position: \_\_\_\_\_

**Address:**

Street \_\_\_\_\_  
City, State, Zip: \_\_\_\_\_  
Contact #: \_\_\_\_\_  
Fax #: \_\_\_\_\_  
Email Address: \_\_\_\_\_

**Project:**

Brief Description: \_\_\_\_\_  
  
Street: \_\_\_\_\_  
City, State, Zip: \_\_\_\_\_

Conversion elements with brass inserts are not acceptable for all media. When corrosive applications apply, use valves and connections that are only stainless steel or polypropylene.

**Warning:** Using **aquatechnik**® PP-R piping with incompatible chemicals may result in a failure or leak causing substantial property damage, severe injury or death.

Brief description of the application:

Type of fluid being used in piping:

Temperature being operated at (°F or °C): \_\_\_\_\_  
Pressure (psi and/or mbar): \_\_\_\_\_  
Service life: \_\_\_\_\_  
Concentration (percentage): \_\_\_\_\_

Ambient medium:

Ambient temperature (°F or °C): \_\_\_\_\_  
Ambient pressure (psi and/or mbar): \_\_\_\_\_

	Attached	Not Attached
MSDS	_____	_____

\*\* If pressure and/or temperature conditions change over the period of a \*\* year please disclose predictable monthly situations in writing below.

Signature: \_\_\_\_\_  
Date: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_



# Quality

---

**aquatechnik**® has always embraced quality as the guiding principle for its business.

The production site, was founded in 1993 following the ISO 9001 quality system, and adhering to the ISO operating rules and methods to ensure the highest quality of products. **aquatechnik**® products undergo stringent approvals testing by the most respected international testing agencies which continuously monitor production and control processes. A commitment to achieving high standards of quality enabled **aquatechnik**® to earn important certifications globally.

The **aquatechnik**® testing laboratories provide continuous quality control of product. This specialized research and development center is an essential resource in delivering the **aquatechnik**® value promise.

Following a disciplined business model and respecting leading production standards, **aquatechnik**® is committed to ongoing improvement in technical performance and customer satisfaction. The company's professionalism and customer care commitment are clearly evident from designing the product to developing it, checking technical qualities, reaching distribution and delivering responsive after-sales customer service.

# Applicable Certifications, Standards and Regulations

Fusion-Tech <b>Blue</b> Striped Pipe		Fusion-Tech faser Fiber-T <b>Red</b> Striped pipe	
<b>Listings and Approvals:</b>	<b>Reference Standards:</b>	<b>Listings and Approvals:</b>	<b>Reference Standards:</b>
NSF/ANSI 61	ASTM F2389-17	NSF/ANSI 61	ASTM F2389-17
NSF/ANSI 14	ASTM F2023	NSF/ANSI 14	ASTM F2023
NSF/ANSI -pw	ASTM D2837	NSF/ANSI 51	ASTM D2837
NSF/ANSI 372	DIN 8078	NSF/ANSI -pw	DIN 8078
IPC 2009 sec. 605IMC2009 ch. 12	DIN 8077	NSF/ANSI 372	DIN 8077
IRC 2009 ch. 21 & 26	CSA B137.11	IPC 2009 sec. 605IMC2009 ch. 12	CSA B137.11
UMC 2012 ch. 6	CSA B214	IRC 2009 ch. 21 & 26	CSA B214
	ISO 9080	UMC 2012 ch. 6	ISO 9080
	ISO 15874		ISO 15874
	ISO 9001		ISO 9001

Fusion-Tech faser Fiber-COND <b>Grey</b> Striped Pipe		Fusion-Tech <b>Violet</b> Pipe	
<b>Listings and Approvals:</b>	<b>Reference Standards:</b>	<b>Listings and Approvals:</b>	<b>Reference Standards:</b>
NSF/ANSI 14	ASTM F2389-17	NSF/ANSI-rw	ASTM F2389-06
NSF/ANSI 372	ASTM F2023	NSF/ANSI 372	ASTM F2023
IPC 2009 sec. 605IMC2009 ch. 12	ASTM D2837	IPC 2009 sec. 605IMC2009 ch. 12	ASTM D2837
IRC 2009 ch. 21 & 26	DIN 8078	IRC 2009 ch. 21 & 26	DIN 8078
UMC 2012 ch. 6	DIN 8077	UMC 2012 ch. 6	DIN 8077
	CSA B137.11		CSA B137.11
	CSA B214		CSA B214
	ISO 9080		ISO 9080
	ISO 15874		ISO 15874
	ISO 9001		ISO 9001



# Warranty

Thank you for choosing **aquatechnik**® PP-R and PP-RCT piping solutions. As the manufacturer of this proven and reliable product, we have been producing top-of-line pipe, valves and fittings for fluid handling systems for more than 30 years. The manufacturer warrants that all **aquatechnik**® produced piping systems will be free of any defect in materials or workmanship, and offers a limited liability insurance coverage over a 30-year period.

Warranty begins from the date of production, providing that the installing company has tested the system, following the testing protocol specified in the “Testing the System” section of this manual (please see page 86) and has submitted the product registration form (please see page 97).

The warranty is extended to customers and applies to all **aquatechnik**® manufactured piping systems purchased, installed and used for the purpose for which such piping system product was originally designed. The warranty covers only defects arising under normal use and does not include malfunctions or failures resulting from misuse, abuse, neglect, alteration, usage not in accordance with product instructions, acts of nature, or improper installation or repairs made by anyone other than **aquatechnik**® or an **aquatechnik**® authorized third-party service provider. The manufacturer reserves the right to assess and test all products installed and purchased prior to repair or replacement. All warranty matters shall be at the sole discretion of the manufacturer.

## All Products Covered by **aquatechnik**® Warranty

Fusion-Tech faser FIBER-T **RED** Striped Pipe

Fusion-Tech faser FIBER- COND **GREY** Striped Pipe

Fusion- Tech **BLUE** Striped Pipe

Fusion-Tech **VIOLET** Pipe

iso-tech faser FIBER-T **RED** Striped Pipe

iso-tech faser FIBER- COND **GREY** Striped Pipe

## What the Warranty DOES Cover

### **Protect Your Property**

Property damage caused by **aquatechnik**® products is covered with appropriate costs to restore the property to the same state that existed prior to the damage. Damages occurred are covered only if the product is deemed a manufacturing defect, yet correctly installed by an **aquatechnik**® authorized third-party service provider, following the manufacturer’s specific installations instructions.

### **Protect Your Finances and Personal Injury**

A financial loss may qualify as personal or business. If property damage has put you in a financial loss due to expenses of repair or removal of damages, or personal injury (physical injury/medical costs , etc. ), the **aquatechnik**® warranty (with ALLIANZ) will reimburse you back to the original state prior to the incident.

## What the Warranty DOES NOT Cover

Costs occurred because:

- The product was installed incorrectly.
- Unauthorized tools and materials were used.
- Pipe, valves and fittings were installed without considering the manufacturer's installation instructions. **(Note: It is the responsibility of each authorized installer to keep informed about up to date installation instructions.)**
- Materials were previously damaged by carelessness and/or negligence (e.g.. grazes, knocks, engraves, torsions, use of threads conical or not calibrated, exceeding washers, exposures to sun rays, heating by free flames, etc.).
- Improper functioning of the system caused by exceeding temperatures from heating appliances, internal pressures higher than the ones specified in the design manual, aggressive elements in the fluids, settling of building structures, fluids freezing, sabotage, etc.
- Pressure testing procedures did not follow specifications in the design guide.
- Defects, failures, damages or performance limitations caused in whole or in part by (A) power failures, surges, fires, floods, snow, ice, lightning, excessive heat or cold, highly corrosive environments, accidents, actions of third parties, or other events outside of **aquatechnik®**'s control, or (B) customers abuse, mishandling, misuse, negligence, improper storage, servicing or operation, or unauthorized attempts to repair or alter the equipment in any way. Customer must provide qualified technical personnel to maintain and repair the equipment.
- Alterations and/or modifications to any part of **aquatechnik®** products without **aquatechnik®**'s written authorization unconditionally **voids** the warranty.
- Piping systems constructed to a customer's specifications that are later found not to meet the customer's needs or expectations.
- Equipment was used that was not approved for application with **aquatechnik®** product.

**Please Note: The above content includes the most common reasons cited for declining warranty claims, at the discretion of the manufacturer. There may be other scenarios that may result in a warranty claim being declined.**

## Coverage

ALLIANZ provides the manufacturer with world-wide policy coverage for all of our piping systems. Our 30-year limited liability coverage is stated in EUROS with personal injury, financial loss and property damage up to a maximum of 15 million EURO per claim. Our maximum for multiple claims made in one year is a maximum of 30 million EURO. The insurance company pays according to the local currency where the damage is claimed ex: USD in USA, CAD in Canada and EURO in EU, etc.

## Steps You Must Take to Keep the Warranty in Effect

### **Only trained third-party service providers are approved to install aquatechnik® products.**

In order to avoid a faulty installation we only recommend trained and contractors to install our product. These contractors attend installation courses and take an examination to ensure they have a good understanding of the product and its applications, as well as proper installation and servicing procedures.

### **Proper handling of aquatechnik® products.**

Correctly handling and shipping all products is essential. Typically **aquatechnik®** products would be damaged by carelessness in the handling of products, whether it be while shipping or when stored incorrectly. (Please see our "Handling & Storage" documentation.)

### **Only aquatechnik® pipe, valves and fittings may be used in a piping system covered by this warranty policy.**

Piping components may not be mixed with product(s) of any other manufacturer.

## Warranty Regulations

To place a claim for an alleged defect, the installer must inform **in writing** the authorized **aquatechnik®** distributor from whom the goods were purchased. An authorized **aquatechnik®** technician will be assigned to verify any alleged defect.

**Please Note: Should the technical assessment show that the alleged defects are not due to aquatechnik® production, any costs incurred for the testing will be charged to the claimant.**





# aquatechnik®

**aquatechnik North America**  
2125 South Service Rd. W Unit A  
Oakville, Ontario  
Canada L6L 5W2

T: 1-844-FUSION3  
(1-844-387-4663)  
F: 905-602-7422  
E: [info@aquatechnikNA.com](mailto:info@aquatechnikNA.com)

**[aquatechnikNA.com](http://aquatechnikNA.com)**