



aquatherm green pipe® aquatherm blue pipe® aquatherm lilac pipe® Aquatherm Piping Systems

aquatherm - 2013

NA Edition

aquatherm piping systems

aquatherm green pipe®
aquatherm blue pipe®
aquatherm lilac pipe®

40 Years of Innovation

PP-R PIPING SYSTEMS



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aquatherm

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TECHNICAL INFORMATION AND PRODUCT CATALOG FOR

aquatherm green pipe®

pressure pipe system for potable water,
food processing, and hygienically sensitive applications

aquatherm blue pipe®

pressure pipe system for hydronic, compressed air,
chemical and industrial applications

aquatherm lilac pipe®

pressure pipe system for
recycled and reclaimed water systems

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Note: This version of the Aquatherm catalog has been modified for distribution in Canada and the United States by Aquatherm NA, L.C. The text has been translated and edited for greater clarity and the data has been converted from metric to imperial units. Some content has been added to address issues specific to North America. As such, Aquatherm GmbH assumes no responsibility for these modifications, and assumes no liability for any problems that may arise from them. In addition, Aquatherm NA, L.C. does not warranty the accuracy, reliability or completeness of any information contained herein. In the case of discrepancies between this document and any information published or produced by Aquatherm GmbH, the material published by Aquatherm GmbH shall be considered the authoritative source. This edition supersedes all previous editions of the Aquatherm catalog, and will be replaced by the next edition.

CHAPTER 1

FEATURES

Welcome to Aquatherm

aquatherm green pipe®

aquatherm blue pipe®

aquatherm lilac pipe®

Standard dimension ratio

Fields of application

fusiolen® PP-R

Ecological advantages

System features

Installation advantages

Operation advantages



Welcome to Aquatherm

We make the best polypropylene pressure piping systems in the world. Period.

Over the past forty years, we've used our hard work, technology, and industry-leading expertise to provide the highest quality pipe made anywhere. It's important to us, because pipes provide everyone with the most basic elements they need to live and thrive. As we've grown from one man working out of his garage to the world's largest and most advanced PP-R pressure pipe manufacturer, we've always strived to make our products better and better.

And we stand by the philosophy that a better product is better for everyone, including our planet. So while our pipes are built to highest standards of quality and engineering, they are also made following the strictest ecological criteria. Our pipes are designed to last for over 60 years without corroding, leaking, or failing, which reduces both costs to the owner and waste in the environment.

This catalog focuses on Aquatherm's **green pipe**, **blue pipe**, and **lilac pipe** systems. It provides detailed information regarding acceptable applications, code approvals, engineering parameters, installation instructions, and list of available parts. Following the directions here will deliver optimal results from our superior products. We've changed what's possible when it comes to pipes. Now it's your turn.



Aquatherm's team (from left): Chief Digital Officer **Parr Young**, President and CEO **Steve Clark**, Director of Advertising and Media Relations **Barry Campbell**, National Accounts Manager **Charles Clark**, CFO **Jordan Hardy**, COO **David Chen**, Chief Brand Officer **Adam Clark**, Marketing and Travel Coordinator **Camilla Shoemaker**, Managing Director **Dirk Rosenberg** (Germany), Manager of Financial Operations **Shawna Gobble**, Executive VP of US Sales **Ed Eldredge**, and NA Export Liaison **Philip Menke** (Germany).

Not pictured: Executive VP of Canada Sales **Don Schneider**, Eastern Regional Sales Manager **John Grabarits**, Senior Applications Engineer **Clifford Holmes**, Lead Technical Writer **Andrew Deaver**, Graphic Designer **Rebecca Moorhouse**, Financial Controller **Jaron McCloy**, Administrative and Training Assistant **Kim Schneider**, Chief Instructor **Buddy Finley**, Training Specialist **Dalton Clark**, and Special Applications Engineer **Brigham Arce**.



1973

Aquatherm founded by Gerhard Rosenberg

1978

Transfer to the first factory in Attendorn, Germany

1985

Factory 1 in Attendorn, Germany completed

1996

Founding of the metal processing company, Aquatherm Metal, in Attendorn

1999

Main campus in Attendorn completed as one complex (factories 1+2, storage, assembly, laboratory and training center)

2002

Logistics center in Attendorn completed

2005

Aquatherm launched in Canada

2007

Aquatherm launched in the United States

2012

Aquatherm North American logistics center established in Lindon, Utah



Aquatherm Founder Gerhard Rosenberg (center left), with Managing Directors Maik, Christof, and Dirk Rosenberg (shown left to right).

aquatherm green pipe®

THE ULTIMATE IN POTABLE WATER PIPING TECHNOLOGY

aquatherm green pipe is a pressure pipe system with a wide range of applications. Exceptional chemical purity and outstanding physical strength have made **aquatherm green pipe** successful in over 70 countries worldwide.

aquatherm green pipe can be used in almost every aspect of the piping industry, but is best suited for potable and food-grade applications where the combination of chemical safety and physical durability can truly perform. **aquatherm green pipe** can also be used for multipurpose residential sprinkler applications per NFPA 13D.

With over 400 fittings, transitions, and valves, **aquatherm green pipe** is an easy fit into any design or space. The dimensions range from ½" to 18" nominal diameter (ND). **aquatherm green pipe** is also available with UV protection for outdoor installations and faser-composite technology, which reduces linear expansion.



THE aquatherm green pipe ADVANTAGE

- Leak-free connections
- Resistant to hard water & aggressive chemicals
- Environmentally friendly material
- Reduced insulation requirements
- Increased flow rate
- Potable and food rated
- Fast and easy assembly
- Flame, smoke, and fume-free installation
- Reduced noise from water hammer and vibration

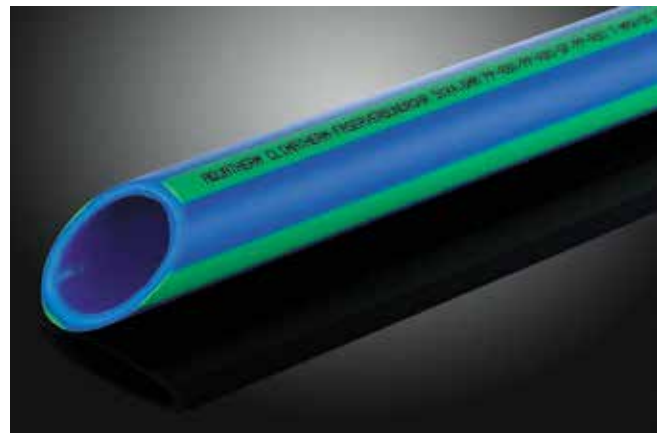
aquatherm blue pipe® (FORMERLY CLIMATHERM)

A BETTER CHOICE FOR HYDRONICS, COMPRESSED AIR, AND INDUSTRIAL APPLICATIONS

aquatherm blue pipe is specifically engineered for applications beyond potable water installations. It offers a tougher, longer lasting, more environmentally responsible solution to comparable non-potable pressure systems.

In addition to the general advantages of the PP-R pipe system, **aquatherm blue pipe** offers higher volumetric flow values due to smaller wall thickness and is high-heat stabilized for short exposures to temperatures beyond the intended design. PP-R piping is extremely resistant to impact, corrosion, and seismic stresses.

aquatherm blue pipe uses the same socket fittings and tools as **aquatherm green pipe**, making installation simple and easy. The dimensions range from ½" to 24" ND. **aquatherm blue pipe** is also available with UV protection for outdoor installations and faser-composite technology, which reduces linear expansion.



THE aquatherm blue pipe ADVANTAGE

- Resistant to most chemicals
- Increased flow rate
- Fast, welded connections
- Light, impact-resistant material
- Corrosion-free pipe and fittings
- Natural sound and heat insulation
- Long lasting
- Fully recyclable
- High-heat stabilized

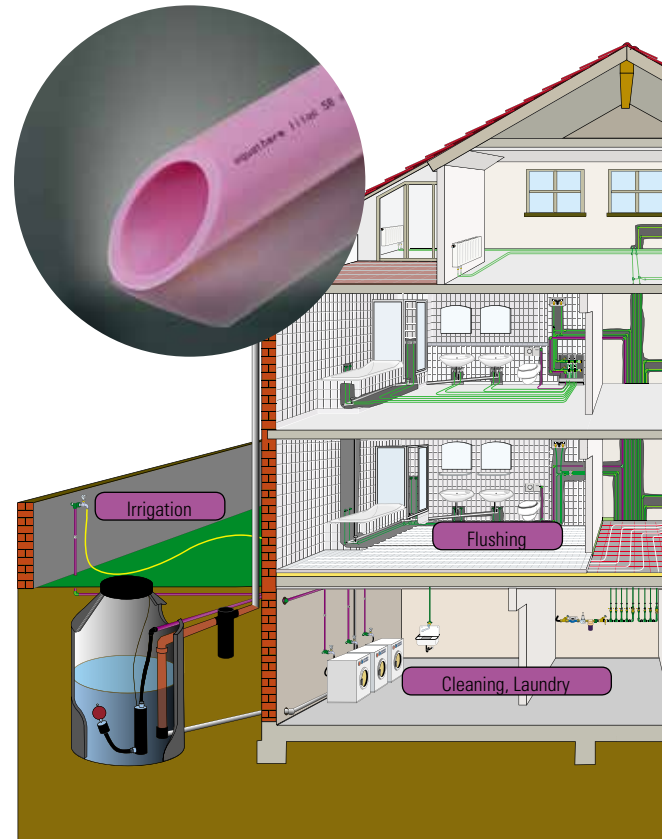
aquatherm lilac pipe®

THE PERFECT SOLUTION FOR RECYCLED, RECLAIMED, & RAINWATER APPLICATIONS

Water conservation systems are being specified and installed much more frequently as building and plumbing codes are updated to encourage more responsible water use. Most codes require that these systems be kept entirely separate from the potable water supply and that the piping be color coded and labeled to identify it as non-potable.

The water from reclaimed, recycled and rainwater sources can be used for flushing, irrigation, cleaning and other applications. **aquatherm lilac pipe** is available from 1/2" to 10" sizes and uses the same fittings as other Aquatherm systems.

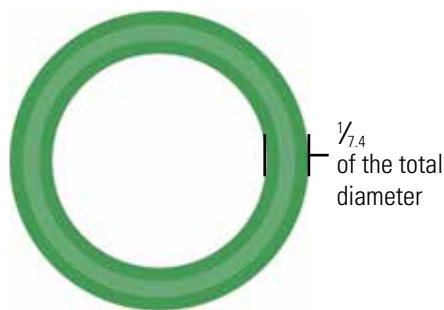
aquatherm lilac pipe is designed exclusively for these applications. The piping uses the same durable, corrosion-resistant PP-R material that has been successfully used for hot and cold water distribution for over 35 years. This, combined with design modifications, coloring, marking, and independent third-party certification by NSF International, make **aquatherm lilac pipe** the ideal choice for water conservation.



STANDARD DIMENSION RATIO

Aquatherm's pipes are manufactured using a standard dimension ratio (SDR), meaning that the wall thickness is a ratio of the total diameter. This is different from schedules, which are commonly used in North America, but is typical of fusible plastics.

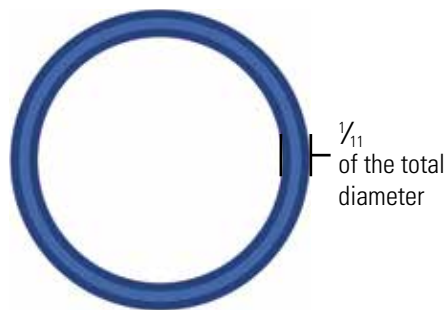
Each SDR provides its own advantages. The SDR is one of the major factors used in engineering an Aquatherm piping system for a specific application.



SDR 7.4

A heavy wall provides increased pressure and temperature ratings for high-stress applications such as hot water recirculation.

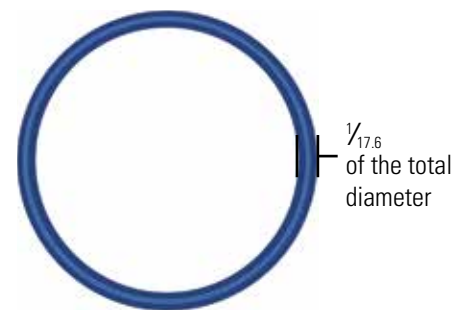
aquatherm green pipe faser-composite (all 1/2" and 3/4" pipes are SDR 7.4 unless otherwise indicated)



SDR 11

A balanced wall thickness to provide higher flow rates while maintaining high pressures. Suitable for most applications.

aquatherm green pipe
aquatherm blue pipe faser-composite
aquatherm lilac pipe



SDR 17.6

A thinner wall provides maximum flow rate while minimizing material weight, cost, and fusion times. For chilled, cooling, and condenser applications.

aquatherm blue pipe faser-composite

FIELDS OF APPLICATION FOR AQUATHERM PIPING SYSTEMS:

System is ideal for this application: ●

System is suitable for this application, but not ideal: ○

aquatherm
green pipe®

aquatherm
blue pipe®

aquatherm
lilac pipe®

	aquatherm green pipe®	aquatherm blue pipe®	aquatherm lilac pipe®
Potable water and food-grade applications	●		
Swimming pools	○	●	
Compressed air systems	●	●	
Heating distribution	○	●	
Marine applications	●	●	●
Chilled water distribution	○	●	
Direct-buried applications	●	●	●
Recycled, reclaimed, and rainwater applications			●
Irrigation	○	○	●
Industrial applications and chemical transport	○	●	
In-floor heating systems	○	●	
Multipurpose fire sprinkler applications	●		

FIELDS OF APPLICATION

Aquatherm piping systems are ideal for many pressurized applications due to their durability and versatility.

Potable water and food-grade applications

For use in residential buildings, hospitals, hotels, office and school buildings, shipbuilding, sports facilities, high-rise construction, distribution mains, and many other applications, **aquatherm green pipe** is safe for use in direct contact with food and potable water.

Swimming pools



For applications where aggressive chemicals are constantly present inside the pipe, **aquatherm blue pipe** is highly resistant and non-corroding. (For information regarding chemical compatibility refer to page <?>).

Compressed air systems

Both **aquatherm green pipe** and **aquatherm blue pipe** are ideal for use in light industry, heavy industry, automotive mechanic shops, etc. due to phenomenal pressure ratings and resistance to shattering. Aquatherm piping systems do not corrode, protecting the attached equipment from rust and debris.



Heating distribution

For residential, commercial, and industrial use, **aquatherm blue pipe** with fiber-composite is an ideal choice due to its reduced linear expansion and resistance to corrosion, which increases service life. It can also be used for snow-melt applications in concrete or asphalt.

Marine applications

Aquatherm pipes and fittings are made from a hydrophobic, low-friction material that is safe from the dissolved minerals contained in seawater, freshwater, and brine.

Chilled water distribution

For residential, commercial, and industrial use, **aquatherm blue pipe** has a natural insulation value that helps reduce heat gain and often eliminates problems with condensation. Excellent for cooling towers and condenser water.



Direct-buried applications

In cases where the pipe needs to be buried in soil, sand, or concrete, **aquatherm blue pipe**, **aquatherm green pipe**, and **aquatherm lilac pipe** are all safe and non-leaching. Aquatherm pipe is also suitable for directional boring.



Recycled, reclaimed, and rainwater applications

aquatherm lilac pipe is ideally suited for non-potable service water due to its resistance to corrosion, scaling, and microbiological growth and distinct purple coloring.



Irrigation

For greywater applications where the system is exposed to varying water quality and the potential of freezing, **aquatherm lilac pipe** is corrosion resistant and can withstand isolated instances of freezing.

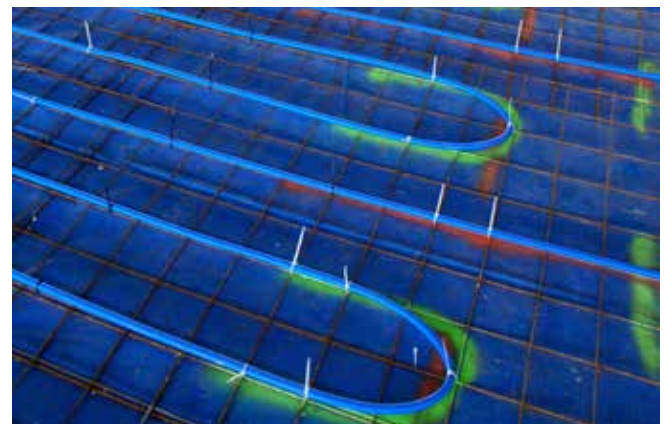
Industrial applications

For the processing and transport of aggressive mediums and materials, **aquatherm green pipe** and **aquatherm blue pipe** resist most types of chemicals.



In-floor heating systems

For use in radiant heating applications. Aquatherm's fused connections, low pressure drops, and 8 to 1 bending radius (non-fuser only) make for a safe and efficient installation. Aquatherm's fusion outlets allow for an extended manifold layout, reducing costs, and improving performance.



Multipurpose fire sprinkler applications

For light hazard occupancies, **aquatherm green pipe** can be integrated with the potable water system to provide fire protection. The high flow rates allow for mains and branches to be run through the building rather than many individual pipes, keeping the system simple and efficient. External fittings do not restrict flow throughout the system.

fusiolen® PP-R

All Aquatherm pipes and fittings are made of **fusiolen** PP-R. The **fusiolen** PP-R material is both physically and chemically resistant to the abuse that can damage other materials. It is also a low friction material, protecting it from abrasion and reducing pressure loss. The superior fusion properties of **fusiolen** PP-R result in a permanent, homogeneous connection that is chemically indistinguishable from the rest of the material. This and countless other benefits have made the Aquatherm pipe systems and the raw material **fusiolen** PP-R successful and respected worldwide.

Non-leaching composition

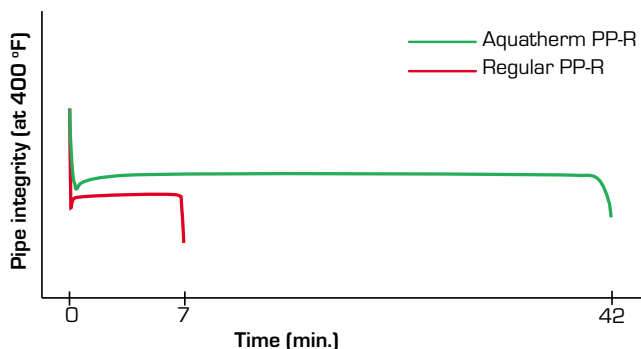
PP-R is a hydrophobic material, meaning it repels polarized molecules like H₂O. By using a material that does not interact with water or most other fluids, Aquatherm ensures that chemicals from the pipe walls and fittings will never leach into drinking water or the underground water table. This makes the pipe healthier for the people using it and safer for the environment they live in.

Superior fusion properties

fusiolen PP-R is engineered to have an ideal melt index for socket fusion and butt welding, resulting in connections that are strong and homogeneous. The material does not burn or change during fusion, so the actual point of fusion is chemically indistinguishable from the rest. This prevents weaknesses and cracking in the joints.

High-temperature stabilization

fusiolen PP-R is heat stabilized, giving it a much higher safety factor than traditional polypropylene. Under extreme temperatures, **fusiolen** PP-R will last six times longer without material degradation. **fusiolen**® PP-R C, the material used in **aquatherm blue pipe**®, is high-heat stabilized to last even longer. This means that occasional exposure to high temperatures due to mechanical failure won't damage the Aquatherm pipe systems.



Raw **fusiolen** PP-R granules.

High-opacity pigmentation

To prevent biofilm formation, **fusiolen** PP-R is intentionally pigmented to be opaque, preventing light from entering the pipe. This helps protect the pipe from microbiological build-up and increases the service life of the system.

Low-impact lifecycle

fusiolen PP-R is fully recyclable and can be ground, melted, and re-used in car parts, home products, food packaging, medical equipment, and other applications. There are no harmful waste products created by the processing or disposal of **fusiolen** PP-R. The pipe and fittings made with **fusiolen** PP-R have an estimated service life of over 60 years. As a result, Aquatherm's pipe systems require no maintenance or costly repairs.

Proven worldwide

The exceptional performance of Aquatherm piping systems has been proven worldwide for nearly 40 years. Aquatherm piping systems have been tested, listed, and certified by numerous national and international organizations, including:

- NSF, ICC, IAPMO, ASTM, FM (USA)
- CSA, BNO, CFIA (Canada)
- DVGW, SKZ (Germany)
- WRAS (UK)
- SVGW (Switzerland)
- SAI-Global (Australia)
- SITAC (Sweden) ... and many more!

The quality of Aquatherm's **fusiolen** PP-R is recognized around the world.



ECOLOGICAL ADVANTAGES

Since its founding in 1973, Aquatherm has worked hard to ensure that its products and manufacturing processes do not pollute the earth's sensitive ecosystems. Long before environmental protection was recognized as a global issue, Aquatherm piping systems fulfilled the high ecological standards demanded today. Being green isn't just a fad with Aquatherm; it's our way of doing business.

Aquatherm believes that ecological and economic interests should go hand-in-hand, both in the production and installation of our products. Aquatherm's PP-R pipes and fittings are even fully recyclable, minimizing their impact from start to finish.

To ensure its environmental compatibility, the base PP-R material and additives (color pigments and stabilizers) are extensively tested by Aquatherm's own laboratory as well as independent researchers to ensure that nothing harmful is ever put into our pipes.

aquatherm and LEED credits

Aquatherm pipe has been used on many LEED certified projects. Although there are no direct LEED credits for using a particular piping material, there are several points which the right piping system can address.

Please refer to the Aquatherm LEED Planning Guide on our website at www.aquatherm.com/technical-documents for further details. Information regarding LEED projects that have used Aquatherm pipes can be found in the Case Studies section.

Reduced pumping energy

One of the most overlooked issues in energy efficient buildings is the energy used by the piping system. While some energy is lost from heat transfer, a great deal more is lost from the pumping energy used to move water around. Aquatherm's pipes have a low friction factor, reducing the energy lost during transit. Even more importantly, Aquatherm pipes do not corrode, meaning that the energy savings increase over time when compared to a system made from ferrous metals.

Extended service life

Aquatherm pipes will last for over 60 years within the design parameters given in this catalog. This eliminates the environmental impact of repairs, mold, leaks, and other problems that can be caused by piping failure. By using components that last longer, buildings can be made safer and more sustainable.

No BPAs, dioxins, or VOCs

Unlike many other plastics, Aquatherm's PP-R material is completely non-toxic. It does not contain any BPA or dioxins that could leach into drinking water and there are no VOCs released during the joining process. This helps improve the on-site air quality during installation and the water quality throughout the life of the system.

Greywater-safe material

To help reduce waste, many buildings are integrating water conservation systems. These systems use non-potable water for irrigation, flushing, and other suitable applications. Greywater can be highly oxygenated and aggressive toward most piping materials, but PP-R is resistant to all qualities of greywater, making it an ideal choice for water conservation systems. **aquatherm lilac pipe®** is colored purple to help distinguish it from potable and hydronic lines.

Fully recyclable pipe and fittings

Aquatherm's pipe and fittings are made from over 97% PP-R, a material that is easily processed and recycled into a variety of other goods. The heat-fused connections don't damage or alter the PP-R, so there are no problems with recycling an entire system.

SYSTEM FEATURES

Polypropylene-random

Aquatherm piping systems are made from the same type of material used in high-purity systems, making them ideal for potable water and food-grade applications. Aquatherm piping systems do not support the formation of mineral deposits and are opaque so as to not promote microbiological growth. PP-R does not contain any chemicals that can leach from the pipe wall into the water. The water delivered to the tap is always the same quality as when it entered the system.

Heat fusion connections

The connections in an Aquatherm piping system are made using heat fusion, a simple process which actually turns the pipe and fitting into a single piece of PP-R. There are never any solders, solvents, or glues added to the connection, eliminating traditional weak points and harmful chemicals from the system.



Application-specific engineering

Aquatherm's pipe systems are engineered for optimal performance based on the application type. **aquatherm green pipe**® is rated for potability, and comes with faser-composite and non-faser variations to optimize efficiency and economics. **aquatherm blue pipe**® is high-heat stabilized to have a higher safety factor while maintaining superior flow rates. **aquatherm lilac pipe**® is designed without faser-composite, providing the highest value for a greywater installation. Each of these systems has distinct colors and stripes for easy identification.

Corrosion and scale resistance

While other piping materials lose performance over time to scaling and corrosion, Aquatherm's PP-R material resists any form of change to the material wall. Even after decades of use, the Aquatherm pipe will retain its original flow characteristics. This prevents the loss of efficiency that occurs when using a pipe that can scale or corrode and will save energy over the life of the system.

Incidental freezing tolerance

Due to their natural insulation value, Aquatherm pipes are resistant to freezing if left exposed. And because of the strong but flexible nature of the PP-R and heat fusion connections, Aquatherm pipes can freeze solid with water in them without breaking.

Note: Aquatherm pipes can withstand isolated instances of freezing. They are not designed to be repeatedly frozen and thawed.

Nominal imperial sizing

All Aquatherm piping systems are manufactured based on metric units of measurement. In order to make the systems more intuitive to the North American market, Aquatherm has converted each of its standard pipe sizes into an imperial nominal diameter based on comparable size and flow rate. The following table gives a standard nominal diameter for each metric size of pipe. Use the flow rate tables given in chapter 3 to verify proper selection for an application based on SDR and flow rate.

Socket fusion

Manufactured metric OD	Nominal diameter
20 mm	½"
25 mm	¾"
32 mm	1"
40 mm	1 ¼"
50 mm	1 ½"
63 mm	2"
75 mm	2 ½"
90 mm	3"
110 mm	3 ½"
125 mm	4"

Butt welding

Manufactured metric OD	Nominal diameter
160 mm	6"
200 mm	8"
250 mm	10"
315 mm	12"
355 mm	14"
400 mm	16"
450 mm	18"
500 mm	20"
560 mm	22"
630 mm	24"

Full system range

Aquatherm piping systems can be used in nearly any pressure application and range in size from ½" to 24". This allows installers to use one type of pipe for an entire system rather than mixing multiple materials and joining methods. An entire project can be done using Note: All Aquatherm products are manufactured using metric sizing. This table shows matching nominal diameters in imperial units. Metric OD is printed on the pipe and fittings. The nominal imperial OD is printed on the pipe and on the fitting bags.

Aquatherm pipes, eliminating the need for multiple toolsets and maintenance programs. Transitions to ANSI flanges, NPT threads, PEX piping, and copper tube make combining Aquatherm pipe with other systems and components simple and easy.

60+ year lifespan

Aquatherm piping systems resist the scaling and corrosion that reduce the performance of other piping systems. The walls of the PP-R piping systems generate less friction than other systems, eliminating the abrasion that can cause pinhole leaks and shorten the life cycle of the pipe. The heat fusion joints maintain the same properties as the pipe itself, so physical stresses will not damage their integrity. Overall, the Aquatherm piping systems last longer with less maintenance than other systems, adding greater value to each installation. With proper design, Aquatherm piping systems can last for over 60 years.

Shatterproof material

Unlike other rigid plastics that often shatter under impact, Aquatherm's piping systems remain flexible and resilient at normal operating temperatures. When hit by a high-speed impact or crushed by a heavy object, systems made from **fusiolen**® PP-R tend to flatten and split rather than throwing dangerous shrapnel. Often, no structural damage will occur at all. This makes the pipe safer to use, even in high-risk applications. (Note: Damaged pipe may break apart during pressure testing. If there is any risk that the pipe was damaged before or during installation, it is best to stand clear during air testing).

Potable water rating

Aquatherm piping systems meet the requirements of NSF Standard 14 and **aquatherm green pipe** meets NSF Standard 61, showing that it is safe for direct contact with drinking water. In addition, **aquatherm green pipe** has been tested to NSF 51 and is acceptable for direct food contact and food processing applications up to 212 °F. Aquatherm piping systems meet the stringent requirements for strength, material quality, dimension, damage resistance, marking, and quality control of ASTM F2389 and CSA B137.11.

Natural sound insulation

Aquatherm's PP-R material absorbs the force from pressure surges and also dampens the noise created by water flow and hydraulic shock. The sound generated and carried by the pipe is much less than that of other piping systems, adding to the comfort of the building's occupants.

Consistent quality

Aquatherm creates its **fusiolen** PP-R from the highest quality PP-R granules and tests it for consistency, purity, and performance at every step. This ensures the quality of every pipe and fitting that Aquatherm makes.



Faser-composite technology

To increase maximum operating temperatures and overall performance, Aquatherm has developed the revolutionary faser-composite layer. The faser-composite material is a mixture of glass fibers and **fusiolen** PP-R or **fusiolen**® PP-R C. This material is extruded as the middle layer of the pipe and allows the pipe to remain rigid at high temperatures without sacrificing any of the other benefits of the pipe. The low concentration of glass fibers does not interfere with the fusion process or the recycling process, so all other aspects of installation and use remain the same.

An unmatched guarantee

As proof of Aquatherm's demanding quality standards, all properly installed Aquatherm pipe systems carry a 10-year warranty for property damage liability coverage of up to €15 million per damage event. This warranty covers the pipes, the fittings, and any incidental damage caused by material failure from manufacturer defect. The policy also provides coverage for personal injury and for financial loss.

Note: The Aquatherm warranty only applies to material failures from manufacturer's defect. Systems must be properly installed by an Aquatherm-trained installer. Improper installation or fusing to non-**fusiolen** parts will void the warranty for those connections. Following all the procedures in the Aquatherm Installer manual will minimize the risk of material failure and help ensure coverage in the event of a problem. Pressure testing is required to verify proper installation.

The Aquatherm warranty does not cover the following issues*:

- Improperly assembled transitions (threads, flanges, copper stub outs, etc) unless the fitting was originally defective.
- Time lost due to poor planning, supplier issues, or failure to order the proper parts/tools.
- Connections that have not been properly fused.
- Failures in systems that were not pressure tested before operation (evaluated on a case-by-case basis).
- Damage to pipe or fittings from mishandling after they have left Aquatherm's possession.
- Use of defective tools and equipment to make welded joints or fittings connections.

*Not a comprehensive list

INSTALLATION ADVANTAGES

Lightweight pipe and fittings

Aquatherm pipes weigh up to 80% less than similarly sized metal piping, making it easier to ship, unpack, position, hang, and put together. It's an added bonus that lets the installer carry more, work faster, and feel less tired at the end of the day.

Suitable for air testing



Aquatherm's unique properties allow the pipes to be tested using air pressure, which can be a huge time saver to the installer. It also helps prevent water spray in the event that there is a leak during the pressure test. The system can also be tested using water or an air/water mix.

Fast connection times

Aquatherm pipes and fittings are assembled with heat fusion, a fast and simple process that involves heating the materials and sliding them together for a perfect connection every time. Heat fusion can save over 50% on labor time compared to traditional welding and soldering and is comparable to the quickest labor-saving connections.



Durable material

Damaged pipe means lost time and money, which are things that no installer can afford. PP-R is chemically and physically tough and can withstand most forms of incidental damage without cracking or breaking. Installers should still follow the care and handling procedures given in chapter 2 to prevent system failure.

Full system compatibility

Almost every job will require the installer to switch to and from other piping systems and integrate various pieces of mechanical equipment. With a wide range of flange connections and the world's most advanced PP-R to metal transitions, connecting to equipment and other pipes is quick, easy, and secure. Transitions include flanges, brass and stainless steel threads, brass PEX connections, and PP-R to copper stubs for fixture transitions.



Fusion outlets

This innovation allows for branch lines to be added after the mains are already in place, reducing labor times and giving the installer unparalleled flexibility. Fusion outlets replace standard reducing tees and offer many advantages such as replacing two connections with one, having a lower pressure drop, and using less material. Fusion outlets are fused through the pipe wall for maximum reliability.



Rigid hanging pipe

Aquatherm's pipes are designed to remain rigid on hangers, giving the pipe a clean, conventional layout with elbows and tees. This allows installers to create a craftsman's appearance in the final product while being able to prefabricate more pipe due to its lighter weight.

Flexible lengths and connections

Heat fusion connections have the exact same properties as the pipes and fittings, so there is a certain level of flexibility in the assembled pipe that makes it easy to prefabricate and move on-site without the risk of the joints cracking and leaking. This flexibility also allows for a wider range of applications and protects the pipe from seismic stresses.



USA-based fabrication

As part of ongoing efforts to provide superior service to match its superior products, Aquatherm offers prefabrication options for manifolds and other complicated or large assemblies. For a quote and lead time, submit a spec to fabrication@aquatherm.com. Aquatherm's Utah-based fabrication team also builds all the segmented fittings for increased accuracy and reduced leads times.



Consistent results

One of the major advantages of using PP-R and heat fusion is that the results are both reliable and consistent. The double bead of plastic allows for accurate visual inspection. Imagine turning on an entire system and not having a single leak anywhere.



Simple expansion control

The fiber-composite layer reduces linear expansion, reducing or eliminating the need for additional expansion control. The pipe can absorb its own stresses when anchored or buried, and expansion loops can be used for longer runs.



OPERATION ADVANTAGES

Reduced maintenance costs

Aquatherm's PP-R pipes and fittings require virtually no maintenance. They don't require chemical treatments to prevent corrosion and they are not prone to leaking, even from impact or accidental chemical exposure. Fused connections are one material throughout, so there's no issue of gaskets leaking or connections weeping as time goes on. This eliminates costly repairs for everything from small leaks to catastrophic failures.

Occupant-safe installation

Heat fusion is a safe and unobtrusive process that can be done while a building is fully occupied. It does not produce any smoke, fumes, or off-gassing, so there's no need to provide additional ventilation. And with no open flames, there are no requirements for burn permits or a fire watch. Heat-fused connections are also ready for full pressure within minutes, allowing minimum downtime during repairs and expansions.

Superior water quality

PP-R is a non-leaching plastic, meaning that it does not transfer chemicals or ions into water. And because Aquatherm's pipes and

fittings are both made from PP-R, water arrives at the tap with the same quality it had when it left the pump. This eliminates metallic and plastic tastes in the water and allows building owners to install a filtered drinking water line throughout the building.

Improved energy efficiency

One of the most cost-effective ways of making a building more environmentally responsible is to reduce its energy costs, as these improvements can pay for themselves over time. Aquatherm's non-corrosive PP-R material can save thousands of dollars in energy costs over the life of the building. And the natural insulation value of the material helps reduce heat loss and heat gain on uninsulated sections of the pipe.

Extended service life

There is increasing pressure on building owners to "go green" and make their buildings more sustainable. Aquatherm piping systems give owners a longer lifecycle, improved performance, and peace of mind while having one of the smallest carbon footprints in the industry. Put simply, Aquatherm pipes improve the quality of the building while reducing its impact on the environment.



CHAPTER 2

QUALITY ASSURANCE

Standards, regulations, and listings

Aquatherm quality control

Labeling, shipping, and handling

Test certificates



Standards, regulations, and listings

The following national and international standards, regulations, and listings are applicable to Aquatherm piping systems.

- NSF Standard 61 (C.HOT 180 °F/82 °C)
Suitable for potable water
- NSF Standard 14
Meets piping performance requirements
- NSF Standard 51
Suitable for food processing up to 212 °F (100 °C)
- CFIA #A508
Canadian Food Inspection Agency approval #A508
- ICC ESR-1613 / PMG Listing 1014
Polypropylene pipe and fittings meet or exceed North American standards
- DIN EN ISO 9001
Quality management systems: requirements
- IPC 2009 Sec. 605
Water distribution & Water service
- IMC 2009 Chapter 12
Hydronic piping
- IRC 2009 Chapter 21 & 26
Hydronic piping & Plumbing
- UMC 2009 Chapter 12
Hydronic piping
- UPC 2012 Chapter 6
Water distribution & Building supply
- IAPMO File M-6022
Mechanical
- IAPMO File 5053
Plumbing
- ASTM F2389
Standard specification for pressure rated polypropylene (PP) piping systems
- CSA B137.11
Polypropylene (PP-R) pipe and fittings for pressure applications
- CSA B214
Polypropylene (PP-R) pipe and fittings for hydronic applications
- BNQ 3660-950
Safety of products and materials in contact with drinking water
- ISO 15874
Plastic pipe system for hot and cold water installation: polypropylene
- ASTM F2023
Standard test method for evaluating the oxidative resistance of plastic piping to hot chlorinated water
- ASTM D 635
Standard test method for rate of burning and/or extent and time of burning of plastics in a horizontal position
- FM 1635
For wet pipe automatic sprinkler systems in light-hazard occupancies
- NFPA 13D
Standard for the installation of sprinkler systems in one/two-family dwellings & manufactured homes
- DIN EN ISO 14001
Standard for environmental management



Aquatherm quality control

The production of a quality-controlled pipe system demands supervision, regulation, and control in every step of the process. All results and processes are carefully documented.

In its manufacturing process, Aquatherm requires:

- testing and acceptance of incoming goods
- in-process inspection and testing
- process control at all stages
- final inspection and testing

Aquatherm complies with all relevant regulations and standards for the quality control of potable water pipe systems established by:

- NSF
- CSA
- CFIA
- ASTM
- ICC
- IAPMO
- ISO
- DIN

These standards and guidelines detail the minimum requirements for internal control. Conformance to these standards is verified by independent institutions in the form of unannounced factory audits, random product sampling, and laboratory testing.

Quality from experience

Decades of experience in the extrusion and injection molding industries have made Aquatherm the market leader and pioneer in manufacturing polypropylene piping systems. This experience is reflected in Aquatherm's demanding quality control standards and carefully established procedures. The value of this experience can be seen in the consistent and superior quality of Aquatherm's products.



External control

External supervision consists of tests with a defined scope in set intervals. The respective supervising institutions appoint authorized test organizations to carry out these tests.

The external supervision includes:

- external tests of the products
- internal audit of Aquatherm's quality assurance system and test procedures
- calibration of the test equipment
- hygiene and toxicity tests

The results of the supervisory visits as well as external tests made on pipe and fitting samples are confirmed to Aquatherm with test certificates.

In addition to the extensive quality assurance testing conducted by Aquatherm at its production facilities, independent third-party auditing is carried out by several North American certification agencies including NSF International, IAPMO, and ICC. NSF conducts four unannounced plant inspections each year, verifying that the materials, processes, quality control, and piping system performance are in accordance with national and international consensus standards.

NSF is an independent, non-profit, third-party organization that certifies piping products in accordance with national and international quality standards related to public health and safety.

Internal control

Trained, qualified employees and a modern, well-equipped laboratory ensure that all tests are carried out and regulations are complied with in accordance to Aquatherm's quality control policy.

All internal quality controls are documented and recorded in accordance with the quality control policy.

To ensure consistent performance, Aquatherm produces all of the **fusiolen**® PP-R material used in the production of its piping systems, accepting only the highest quality of raw polypropylene. By manufacturing its own resin for the extrusion process, Aquatherm minimizes the possibility of material failure.

All metal inserts used in Aquatherm's transition fittings are machined in the Aquatherm Metal facility, where each piece is designed and engineered to meet the exacting quality standards that Aquatherm demands.

Test and acceptance of incoming goods

All incoming materials are subject to testing. This ensures that incoming products conform to specified requirements. Materials that have not been tested are not released for production. Materials which fail the testing in any way are rejected and returned to the supplier.

In-process inspection and testing

The quality control standards require that tests and inspections be carried out before and during production. At the start of production all quality-relevant data is checked by the quality assurance department. Preproduction samples are tested by the laboratory technicians for proper surface finish and dimensional accuracy.

The data from the extrusion and injection molding machines are cross-checked with the actual pipe dimensions and the materials are released for production only if optimal test results are achieved. These tests are carried out at the start of each production series to ensure perfect quality.

Process control

Ultrasonic measurement and process data recording in the field of extrusion are only two examples of Aquatherm’s extensive quality control process. This equipment allows for constant observation and control of production.



Ultrasonic waves automatically measure and report any deviations in tolerance to the cutting device on the extrusion machine so that the sizing controls can automatically isolate a substandard product. This ensures that only perfect quality products are packed and stored. All data received during production is analyzed in detail.

Final inspection and testing

The quality control standards require that inspections be carried out on all finished products and tests performed on samples from every production run. The results are documented in test reports. Finished products are only released to stock when all tests and inspections conform to the prescribed procedures and specifications.

The final inspection and testing includes time-lapse test procedures. This allows Aquatherm to accurately predict the performance of the products in various fields of application.

These tests are used for quality assurance during production and product development. They allow Aquatherm to discover and remove any potential weaknesses.

The results document the system quality and optimize the manufacturing process. The final inspection and tests cover the following procedures:

- dimensional control
- surface finish
- measurement of the melt flow index
- impact bending test
- heat reversion test
- homogeneity of the material
- internal pressure test

In addition to the tests mentioned above, daily hygiene tests in accordance with international guidelines are carried out in the company’s own sensory analysis laboratory.



Labeling, shipping, and handling

Labeling and packaging

All Aquatherm pipes are labeled every three feet to identify the size and type of pipe and the test standards which they meet. Fittings are sorted according to the designated packing units and are packaged in bags with coded labels to make storage and identification easier. Fittings also have their size and production run stamped onto them so they can be identified after being removed from their packaging.

Storage, packing, and shipping

After passing all tests and inspections, the products are released for storage and shipping. The pipe and fittings are processed through the Aquatherm warehouse in Attendorf and shipped around the world for use in over 70 countries.

In North America, pipe is stored at Aquatherm's Logistics Center in Lindon, UT, and distributed through many local and regional wholesalers. Containers of pipe can also be shipped directly on-site for larger projects.

Upon receipt of piping shipments, the customer should inspect the pipe to ensure that it has not been damaged during shipping. Damaged pipe should be cataloged and returned for replacement, following all of the distributor's procedures for returns.



Note: Aquatherm only accepts responsibility for damage caused to the pipe and fittings while they are still in Aquatherm's possession. Once another party takes possession of the product (i.e., receiving a shipment), Aquatherm can no longer accept responsibility for incidental damages that happen to the pipe and fittings. Parts that were not reported damaged upon receipt will be assumed to have been damaged after leaving Aquatherm's possession.

Care and handling of Aquatherm pipes and fittings

1. Always store the pipe on a flat surface. When storing the pipe on racks, always have at least three supports under 13 ft lengths and four supports under 19 ft lengths. It is best to place plywood or something similar on top of the supports to avoid any warping or flattening. PP-R has a memory and will bow if stored improperly.
2. Always handle the ends of the pipe carefully. Dropping the pipe, banging it into things, or stepping on it can cause fractures in the end of the pipe. If the pipe is exposed to impact or stress, inspect it for damage. Damaged ends or sections should be marked and removed before installation. Surface scratches deeper than 10% of the wall thickness are considered damage.
3. When storing the pipe outdoors, leave it in the factory-issued protective bag as much as possible. This bag will protect the pipe from dust, scratches, and UV damage. If the pipe is removed from its bag, do not store it uncovered for more than six months. Pipe that is exposed to direct sunlight longer than six months is no longer covered under the warranty. The black-coated UV pipe may be stored outdoors indefinitely.
4. Never place the forks of a forklift into the ends of the pipe. This will damage the pipe and can cause it to crack. Handlers may use a padded rug ram inside the pipe. Otherwise, it is recommended to use a crane or lift to handle larger pipes.
5. In cold weather, take extra care when handling the pipe. Cold temperatures reduce the pipe's flexibility, making it more susceptible to impact damage.
6. Keep the fittings in their original bags. Many of the fittings do not have detailed labels printed on them and can get mixed up if they are not stored with their bags. When storing loose fittings in boxes or bins, attach a label from the packing bag to identify the fittings.
7. When shipping the pipe, always load it onto a flat surface or one which is evenly supported. Only strap the pipe at a place where it is supported to prevent bowing.
8. When covering the pipe, always use a light colored tarp such as blue or white. Do not use a black tarp, as this may cause heat damage to the pipe. Pipe may also be covered with a structure that provides shade.
9. Additional care and handling instructions can be found in the Aquatherm Installer Manual.

NSF International

RECOGNIZES

AQUATHERM GMBH
GERMANY

AS COMPLYING WITH NSF/ANSI 14.
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE
AUTHORIZED TO BEAR THE NSF MARK.



Certification Program
Accredited by the
American National
Standards Institute



Certification Program
Accredited by the
Standards Council
of Canada

This certificate is the property of NSF International and must be returned upon request. To verify Certification, call 800 NSF-MARK or 734 769-8010.

April 25, 2003
Certificate# 03850 - 01

Mark L. Jost, Senior V.P., Water Systems
Water Distribution Systems

NSF International

RECOGNIZES

**AQUATHERM KUNSTSTOFF EXTRUSIONS- UND
SPRITZGIEßTECHNIK**
GERMANY

AS COMPLYING WITH NSF/ANSI 51.
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE
AUTHORIZED TO BEAR THE NSF MARK.



Certification Program
Accredited by the
American National
Standards Institute



Certification Program
Accredited by the
Standards Council
of Canada

This certificate is the property of NSF International and must be returned upon request. For the most current and complete information, please access NSF's website (www.nsf.org).

NSF International

RECOGNIZES

AQUATHERM GMBH
GERMANY

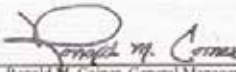
AS COMPLYING WITH ANSI/NSF 61.

PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE
AUTHORIZED TO BEAR THE NSF MARK.



This certificate is the property of NSF International and must be returned upon request. To verify certification, call 800 NSF-MARK or (313) 734-7010.

May 25, 2001
Certificate# 03850 - 01


Ronald M. Coimer, General Manager
Water Distribution Systems



Certificate of Compliance

This certificate is issued for the following:

**GREENPIPE F
FUSIOLEN® PP-R PIPE AND FITTINGS
FOR WET PIPE AUTOMATIC SPRINKLER SYSTEMS
IN LIGHT HAZARD OCCUPANCIES**

SIZES 3/4 THROUGH 4 INCH NPS

Prepared for:

**Aquatherm GmbH
Biggen 5
57439 Attendorn
Germany**

FM Approvals Class: 1635

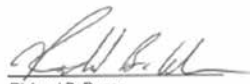
Approval Identification: 3036285 Approval Granted: April 13, 2010

Said Approval is subject to satisfactory field performance, continuing follow-up Facilities and Procedures Audits, and strict conformity to the constructions as shown in the Approval Guide, an online resource of FM Approvals.

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to reduce property losses.*



Member of the FM Global Group


Richard B. Dunne
Group Manager - Hydraulics Group
FM Approvals
1151 Boston-Providence Turnpike
Norwood, MA 02062

April 13, 2010

IAPMO RESEARCH AND TESTING, INC.

5001 East Philadelphia Street, Ontario, California 91761-2816 • (909) 472-4100 Fax (909) 472-4244 • www.iapmo.org



CERTIFICATE OF LISTING

IAPMO Research and Testing, Inc. is a product certification body which tests and inspects samples taken from the supplier's stock or from the market or a combination of both to verify compliance to the requirements of applicable codes and standards. This activity is coupled with periodic surveillance of the supplier's factory and warehouses as well as the assessment of the supplier's Quality Assurance System. This listing is subject to the conditions set forth in the characteristics below and is not to be construed as any recommendation, assurance or guarantee by IAPMO Research and Testing, Inc. of the product acceptance by Authorities Having Jurisdiction.

Effective Date:	April 2012	Void After:	April 2013
Product:	Pressure Rated Polypropylene Piping Systems	File No.	M-6022
Issued To:	Aquatherm GmbH Biggen 5 D-57439 Attendorn, Germany		

IDENTIFICATION: Pipe shall be marked at intervals of not more than 5 ft. with the manufacturer's name or trademark, nominal size, for metric series pipe - the term "metric" and the dimension ratio or both the outside diameter and wall thickness, IPS series pipe shall include "Schedule 80" or "SCH 80", type of material (PP-R) and classification number (80 or 100), pressure rating and temperature for which pressure rating is valid, the designation "F2389", manufacturer's production code, and pipe intended for the transport of potable water shall bear the mark of the lab making such evaluation. Fittings shall be marked with the manufacturer's name or trademark, nominal size, dimension ratio or schedule for corresponding pipe and type of material (PP-R). The fitting or packaging shall be marked with "Metric" or "NPT" for threaded fittings, and the designation "F2389". All products shall bear the UMC certification mark.

Robert R. Simeon
 Chairman, Product Certification Committee

Russ Chaney
 CEO, The IAPMO Group

For the most accurate and updated information please visit <http://pid.iapmo.org/M-6022>

This listing period is based upon the last date of the month indicated on the Effective Date and Void After Date shown above. Any change in material, manufacturing process, marking or design without having first obtained the approval of the Product Certification Committee, or any evidence of non-compliance with applicable codes and standards or of inferior workmanship, may be deemed sufficient cause for revocation of this listing. Production of or reference to this form for advertising purposes may be made only by specific written permission of IAPMO Research and Testing, Inc. Any alteration of this certificate could be grounds for revocation of the listing.



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Effective Date: June 2012 Void After: June 2013

Product: Pressure Rated Polypropylene Piping Systems File No. 5053

Issued To: AQUATHERM GMBH
Biggen 5
D-57439 Attendorn,
Germany

IDENTIFICATION: Pipe shall be marked at intervals of not more than 5 ft. with the manufacturer's name or trademark, nominal size, for metric series pipe - the term "metric" and the dimension ratio or both the outside diameter and wall thickness, IPS series pipe shall include "Schedule 80" or "SCH 80", type of material (PP-R) and classification number (80 or 100), pressure rating and temperature for which pressure rating is valid, the designation "F2389", manufacturer's production code, and pipe intended for the transport of potable water shall bear the mark of the lab making such evaluation. Fittings shall be marked with the manufacturer's name or trademark, nominal size, dimension ratio or schedule for corresponding pipe and type of material (PP-R). The fitting or packaging shall be marked with "Metric" or "NPT" for threaded fittings, and the designation "F2389". All products shall bear the UPC® certification mark.

Robert R. Sieman
Chairman, Product Certification Committee

Russ Chaney
CEO, The IAPMO Group

For the most accurate and updated information please visit <http://pid.iapmo.org/5053>

This listing period is based upon the last date of the month indicated on the Effective Date and Void After Date shown above. Any change in material, manufacturing process, marking or design without having first obtained the approval of the Product Certification Committee, or any evidence of non-compliance with applicable codes and standards or of inferior workmanship, may be deemed sufficient cause for revocation of this listing. Production of or reference to this form for advertising purposes may be made only by specific written permission of IAPMO Research and Testing, Inc. Any alteration of this certificate could be grounds for revocation of the listing.



CHAPTER 3

PLANNING

Planning and engineering with Aquatherm

Working pressure

Integration with other systems

Flame spread and smoke developed
Aquatherm Advanced

Using the I-Codes
Using the IAPMO codes

Special applications

System considerations
Pipe sizing by flow rate

Flow velocity and head loss

Equivalent lengths of fittings

Maximum pull force



Planning and engineering with Aquatherm

With unique advantages over both metal and other plastic systems, Aquatherm piping systems offer new possibilities for design and application. By combining revolutionary strength and longevity with industry-leading purity and neutrality, Aquatherm manufactures piping systems that can truly address all possible concerns for potable, food-grade, hydronic, chemical, and industrial applications.

When designing with Aquatherm piping systems, it is important to be aware of its unique features such as the fiber-composite for expansion control, the fusion connections, the impact and chemical resistance, and the sound insulation.

The natural R-value and reduced friction factors are particularly important because they reduce the amount of energy needed for the system to perform. With careful planning and engineering, it is possible to exceed existing performance standards and maximize a system's efficiency.

Be sure to verify all calculations before installing an Aquatherm piping system. The sizing and insulation recommendations given in this catalog are intended for easy reference and are not a substitute for actual engineering.

Determining compatibility

The first step to designing with Aquatherm is to verify that PP-R is an acceptable material choice for a particular application. Aquatherm pipes are suited to a wide variety of applications and generally perform without the problems that plague other systems. However, PP-R still has some chemical, pressure, and temperature considerations that need to be addressed in order to eliminate the risk of failure.

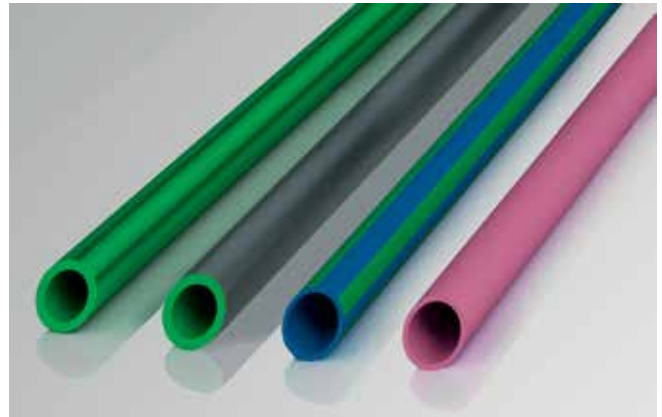
Operating outside of the safety parameters provided by Aquatherm can shorten the life of the pipe. By bringing a system's intended load in line with the safety parameters given in this chapter, a designer can ensure that the pipes will last for their entire 60-year lifespan or longer.

This chapter contains information to help determine the suitability of PP-R for a given application. Steam systems, water systems with both high temperature and pressure, or systems with high levels of certain aggressive chemicals will likely not be suitable for use with PP-R. If you are uncertain about a specific application, contact Aquatherm to determine the suitability of Aquatherm piping systems to the application.

Choosing your system

Aquatherm offers piping systems that are engineered for use in certain applications. Choosing the correct system for the application will maximize performance and minimize material costs.

As a general rule, **aquatherm green pipe**® should be used for potable and food-grade applications while **aquatherm blue pipe**® is used for heating and cooling, compressed air, and a variety of industrial applications. **aquatherm lilac pipe**® is intended for use in greywater systems. A more detailed list of suitable applications can be found in chapter 1.



Addressing additional needs

Aquatherm offers two major variations on its piping systems: the Aquatherm UV and the Aquatherm Advanced. Both are modifications to help the pipe perform in adverse conditions. The Aquatherm UV is a black polyethylene coating added to the exterior of the standard pipe and is used in outdoor installations where the pipe is regularly exposed to sunlight. The Aquatherm Advanced is a layer of fire-rated insulation that provides fire protection and can provide code-accepted insulation for the Aquatherm pipes. The designer or engineer will need to determine if and where these variations are needed.

Determining efficiency

Aquatherm's PP-R pipes offer a number of energy benefits including improved flow rates, reduced pressure loss, and reduced heat loss and heat gain. Designers can help reduce both installation and operation costs by taking advantage of these benefits. Reducing these costs not only helps the building's owner and occupants but also the environment.

Working pressure

The working pressure tables illustrate the permissible working pressures of the Aquatherm piping systems. The balance between working pressure and operating temperature varies based on the wall thickness of the pipe as well as the presence of a faser-composite layer. Aquatherm's heat-stabilized PP-R negates the effects of occasional, short-term increases in temperature, so these do not need to be taken into account. The burst pressure for the pipes is much higher.

The tables with "constant operating parameters" assume a steady, year-round load. Their expected minimums are based on negligible material degradation during that time. The "seasonal peaks" table assumes that the system will only operate at full capacity during winter months and will operate at a lower, more efficient capacity during the rest of the year. The "compressed air" table assumes an air temperature under 100 °F. For applications outside the parameters shown here, please submit a compatibility report (sample on page 3.6). Aquatherm pipe may be used for vacuum applications up to 29.92 inHg.

These tables are based on the piping system using water or water mixed with propylene or ethylene glycol. For applications using different fluids or operating conditions outside those given below please contact your local Aquatherm representative. Aquatherm pipes are not intended for operational temperatures colder than -5 °F, as the pipes begin to lose their resistance to impact.

Systems with constant operating parameters (60 year expected minimum)

Temperature	aquatherm green pipe® SDR 11 (non-faser)	aquatherm green pipe® SDR 7.4 (faser)	aquatherm blue pipe® SDR 11 (faser)	aquatherm blue pipe® SDR 17.6 (faser)
	Permissible working pressure (psi)			
50 °F	220	415	350	160
80 °F	180	340	275	125
100 °F	135	255	212	95
120 °F	112	213	180	80
140 °F	93	180	150	70
160 °F	-	120	100	45
180 °F	-	100	62	30
200 °F	-	45	30	15

Systems with constant operating parameters (25 year expected minimum)

Temperature	aquatherm green pipe® SDR 11 (non-faser)	aquatherm green pipe® SDR 7.4 (faser)	aquatherm blue pipe® SDR 11 (faser)	aquatherm blue pipe® SDR 17.6 (faser)
	Permissible working pressure (psi)			
50 °F	225	420	360	165
80 °F	185	360	280	130
100 °F	140	260	220	100
120 °F	116	220	185	85
140 °F	97	185	155	72
160 °F	-	140	115	55
180 °F	-	110	75	35
200 °F	-	55	45	20

Systems with seasonal peaks (60 year expected minimum)

Temperature		60 days		90 days	
		aquatherm blue pipe® SDR 11 (faser)	aquatherm blue pipe® SDR 17.6 (faser)	aquatherm blue pipe® SDR 11 (faser)	aquatherm blue pipe® SDR 17.6 (faser)
Regular load	Seasonal load	Permissible working pressure (psi)			
160 °F	175 °F	90	55	85	50
160 °F	185 °F	80	50	75	45
160 °F	195 °F	70	40	65	35

Compressed air

aquatherm green pipe® SDR 11 (non-faser)	aquatherm green pipe® SDR 7.4 (faser)	aquatherm blue pipe® SDR 11 (faser)	aquatherm blue pipe® SDR 17.6 (faser)
Permissible working pressure (psi)			
125	200	125	50

Integration with other systems

When integrating Aquatherm piping systems with other systems, make sure that the operating parameters for PP-R won't damage the other materials or vice versa. Be aware that even if the Aquatherm pipe is compatible with the chemical being transported, other materials in the system may not be. Make sure that all parts of the system are compatible with the medium being carried before installing them. And, while Aquatherm pipe does not require treatment to protect it from corrosion, ferrous metals in the system will. Do not mix Aquatherm pipe with other piping systems in conditions that will cause the other system to fail.

When there is extensive use of copper piping in conjunction with PP-R, care should be taken to ensure the operating conditions will not cause dissolution or corrosion of the copper. Aquatherm recommends following the Copper Development Agency's guidelines for sizing, temperature and flow speed in copper pipe. This will also help ensure that the copper levels in the water do not approach the regulatory action levels. Sustained high levels of copper ions in a water system can damage wetted surfaces within the system, even PP-R. Damage caused by unregulated copper ions may void the warranty.

Alternatively, you can avoid using large amounts of new copper upstream of the PP-R in hot water recirculation lines. If the copper fails, it may degrade the PP-R as well, shortening its service life. Small amounts of copper from valves and other equipment will generally not cause an issue. For maximum longevity, recirculation lines for domestic hot water should not exceed a flowspeed of 4 ft/s unless the piping is all PP-R.

If you are adding PP-R to an existing copper system, the level of copper in the water should be tested. These levels should not exceed 0.5 P.P.M., and are considered actionable by the EPA at 1.3 P.P.M. High levels of free copper indicate that the copper pipe is eroding due to system and/or water conditions..

Flame spread / Smoke developed

Aquatherm piping systems do not produce toxic by-products during combustion. In a fully developed fire, **fusiolen**® PP-R will only produce CO₂ and H₂O_{gas}. In an under-developed fire trace amounts of CO can be produced, but this is common in all combustible materials including wood and paper.

Many building codes do not consider the toxicity of the smoke produced but focus only on the volume and opacity of the smoke. Therefore, it is important to install only pipe that meets local code requirements. These codes generally reference ASTM E84 in the United States and CAN/ULC S-102.2 in Canada and require that the installed pipe have a Flame Spread Index of 25 or less and Smoke Developed Index of 50 or less.

According to the IMC and UMC building codes, materials that are completely enclosed in a fire rated material, such as pipe insulation, are considered fire rated as well, as they are not technically exposed in the plenum.

Flame and smoke rated options

For applications where the code requires the pipe to meet an FSI of 25 and SDI of 50, Aquatherm recommends one of the following solutions:

1. Aquatherm Advanced is a listed solution for meeting the E84 and S-102.2 ratings. Aquatherm Advanced is a combination of Aquatherm pipe and a fire-rated insulation (see next column). Aquatherm Advanced may also provide sufficient insulation value for hot and cold applications, but the thermal values are dependant on the manufacturer of the insulation.
2. Encasing the pipe inside of any insulation that meets the 25/50 flame spread and smoke development requirements (see page 3.5). This solution requires that the fittings be insulated as well and is subject to adoption of the relevant IMC and UMC codes, as well as the local authority having jurisdiction. Alternatively, the pipe can be enclosed in a fire-rated chase.
3. Avoid using a ceiling return air plenum. Using ducted or dedicated outdoor air eliminates the health and safety risks introduced by a return air plenum. It also eliminates the need for a large number of fire-retardant chemicals within the building. Pipe that is not inside a return air plenum generally does not need to meet flame spread and smoke development requirements.

With these options, the engineer should be able to comply with all local codes involving flame spread and smoke development. However, it is important to confirm with local officials that the measures being taken are acceptable before beginning the installation.

Aquatherm Advanced

In order to meet flamespread and smoke development ratings, Aquatherm has tested and listed a system in which the pipe is encased in a fire resistant material. Originally, this system required a double-foil bubblewrap insulation.



In Canada, improvements to building codes and additional testing from Aquatherm has allowed the Aquatherm Advanced system to be expanded from the original double-foil bubble wrap to include any insulation that meets the S-102.2 rating. However, while the wrap-based Aquatherm Advanced is tested and listed with the fitting exposed, other insulations require that the Aquatherm pipe be enclosed completely in the insulation. In the United States, only Aquatherm Advanced using the double-foil bubble wrap is considered a listed system to meet the E-84 requirements.

The wrapped pipe meets a Flame Spread Index of 25 and a Smoke Developed Index of 50, making the system safe for use in:

- return air plenums
- exposed installation in high-rise buildings
- non-combustible construction

As of December 1st, 2012, Aquatherm has stopped providing Reflectix-brand double foil bubble wrap directly to customers. Instead, Aquatherm encourages installers to use whatever variety of acceptable insulation they are most comfortable with. This is due to the improvements in the code requirements, the changes in the Aquatherm Advanced listing, and the frequent customer requests over the years for Aquatherm to allow a broader solution for fire rating. Visit www.aquatherm.com/plenum-rating for current plenum-rating information.

Fire-rated insulations should be installed using the manufacturer's specifications. Obtain information regarding thermal performance directly from the manufacturer.

Using the I-Codes

Under the IMC, materials exposed within plenums are required to meet the ASTM E 84 test for flame spread and smoke development. As given in the 2006 edition:

602.2.1 Materials exposed within plenums

Except as required by Sections 602.2.1.1 through 602.2.1.5, materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84.

Exceptions:

5. Combustible materials enclosed in noncombustible raceways or enclosures, approved gypsum board assemblies or enclosed in materials listed and labeled for such application.

Exception 5 excluded materials that were enclosed within noncombustible (or otherwise approved) materials, as the enclosed materials are technically concealed, rather than exposed. This exception was further detailed in the 2012 edition, making the intent of the previous editions clear:

602.2.1 Materials exposed within plenums

Except as required by Sections 602.2.1.1 through 602.2.1.5, materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84 or UL 723

Exceptions:

5. Combustible materials fully enclosed within one of the following:

- 5.1 Continuous noncombustible raceways or enclosures
- 5.2 Approved gypsum board assemblies
- 5.3 Materials listed and labeled for installation within a plenum.

Under the IMC, Aquatherm pipe may be safely installed in a plenum if the pipe and fittings are contained within an insulation that meets the ASTM E 84 test requirements. This is due to the fact that pipes enclosed within the insulation are no longer considered exposed inside the plenum. Where insulation is not needed, a plenum-rated wrap will also suffice.

Using the IAPMO codes

The UMC contains similar requirements to the IMC in regards to plenums. In turn, the exceptions are similar, although the UMC does not offer as detailed of an exception. In the 2009 edition, it reads:

602.2 Combustibles within Ducts or Plenums

Materials exposed within ducts or plenums shall be noncombustible or shall have a flame spread index not greater than twenty five (25) and a smoke developed index not greater than fifty (50), when tested as a composite product in accordance with one of the following test methods: NFPA 255, *Method of Test of Surface Burning Characteristics of Building Materials*, ASTM E 84, *Surface Burning Characteristics of Building Materials*, or UL 723, *Test for Surface Burning Characteristics of Building Materials* except as indicated below.

In this case, materials that are exposed are required to be non-combustible or meet flame spread and smoke developed requirements. Materials that are not exposed within the plenum are therefore excluded. This follows the logic and intent of the IMC.

More recent versions maintain this language, but simplify the associated test methods. In the 2012 edition:

602.2 Combustibles within Ducts or Plenums

Materials exposed within ducts or plenums shall be noncombustible or shall have a flame spread index not greater than twenty five (25) and a smoke developed index not greater than fifty (50), when tested as a composite product in accordance with ASTM E 84 or UL 723, except as indicated below.

In short, under the UMC, Aquatherm pipe may be safely installed in a plenum as long as the pipe is not exposed to the plenum space. This is easily solved by encasing the pipe and fittings in a plenum-rated insulation. Where insulation is not required, a plenum-rated wrap may be used instead.

Other solutions

If none of the plenum-rating options discussed here will suffice for a particular installation, please contact Aquatherm's Engineering Support department in Lindon, Utah via email (engineering@aquatherm.com) or phone (801-805-6657).

Special applications

Due to their special material properties, Aquatherm pipes and fittings are generally chemical resistant. However, there are certain application where PP-R may not be acceptable.

To find out if the pipe is suitable for a specific application, fill out the inquiry form below and submit it to an Aquatherm representative. This form can be used for chemical, high-heat, high-pressure, or other non-standard applications.

Transition elements with brass inserts are not suitable for all media. For corrosive applications, use connections and valves that are strictly polypropylene or stainless steel.

The special applications inquiry form can be found at www.aquatherm.com/compatibility and may be printed and sent in by fax. A digital version of this form is also available and may be submitted electronically.

Special application inquiry for Aquatherm pipe systems

Send to:

Aquatherm Technical Department

500 S 500 W Lindon, UT 84042

Phone: (801) 805-6657

Fax: (801) 847-6554

Inquirer:

Position:

Company

Contact

Street

City/State/Zip

Phone

Fax

E-mail

Building Project:

Street

City

State/Province

Date / Signature

E-mail: technical@aquatherm.com

Web site: www.aquatherm.com

Field of application:

Fluid transported:

Operating temperature [°C and/or °F]*: _____

Working pressure [mbar and/or psi]: _____

Service life [h/d]: _____

Concentration [%]: _____

Ambient medium:

Ambient temperature [°C and/or °F] _____

Ambient pressure [mbar and/or psi] _____

MSDS

attached

not
attached

Fluid transported	<input type="checkbox"/>	<input type="checkbox"/>
Ambient medium	<input type="checkbox"/>	<input type="checkbox"/>

* If operating temperature and/or pressure vary over the year, please indicate typical monthly conditions below.

use online version only

Fire stopping

Polypropylene is a combustible material and must be treated as such. Generally, when penetrating a fire-rated assembly, fire stopping must be used to give the penetration a fire rating that matches the rating of the assembly. However, building code requirements vary greatly between areas.

It is critical that fire stopping issues be addressed early in the design and construction of a project. Please contact your fire stopping manufacturer for current listing and installation requirements. Visit www.aquatherm.com/firestopping for a current list of manufacturers who have tested and listed their products for use with Aquatherm piping systems.

System protection

Allowing a pump to operate for an extended period of time with zero flow passing through it can result in the pump and adjoining piping system reaching temperatures and pressures far above those recommended by Aquatherm (see pages 3.2 - 3.3). While Aquatherm's heat stabilization will protect the pipe from brief exposure to these conditions, prolonged exposure can weaken the pipe and fittings considerably, potentially causing them and other components to fail.

It is recommended that the designer provide a sensor system that will warn of temperatures over 180 °F, an automatic temperature and pressure relief valve at the pump discharge, or a similar preventative measure.

To protect the pipe from exposure to unacceptably high temperatures and pressures that could occur due to prolonged "dead heading" (pump operating at full speed with flow completely restricted), Aquatherm recommends temperature and pressure relief valves at the discharge of 3 horsepower and larger pumps.



Thrust blocking

Due to the inherent strength and integrity of fused connections, thrust blocking is not required.

UV resistance

Pipes made from **fusiolen® PP-R** and **fusiolen® PP-R C** are normally not installed where they will be subject to UV radiation. UV radiation can damage and weaken the polypropylene chains over time. UV-rated solutions can be found on page <?>.

Isolating pump-to-pipe connectors

PP-R can absorb small vibrations, so isolators are not required if the pipe has some limited mobility on either side of the pump.

Pipe sizing by flow rate

PP-R is a low friction material, making Aquatherm piping systems highly resistant to abrasion and pinhole leaks. As a result, most Aquatherm piping systems are designed to run at 8 ft/s. At this speed, the flow rate (gpm) is determined by the pipe diameter and wall thickness. The following tables give the approximate flow rates based 8 ft/s.

Nominal diameter	GPM SDR 7.4	GPM SDR 11	GPM SDR 17.6
½"	6.3	8.0	-
¾"	9.8	12.6	-
1"	16.3	20.8	-
1 ¼"	25.5	32.3	-
1 ½"	39.8	50.5	-
2"	63.7	80.2	-
2 ½"	90	114	-
3"	129	164	-
3 ½"	193	246	-
4"	250	317	-
6"	409	519	611
8"	639	812	954
10"	1001	1270	1491
12"	1604	2020	2367
14"	2038	2600	3006
16"	-	3252	3817
18"	-	4116	4831
20"	-	-	5964
22"	-	-	7481
24"	-	-	9468

Noise and water hammer

To avoid noise generation and water hammer, the calculated flow rate should not exceed 8 ft/s. Noise generation at this speed is slightly less than copper tube at 4 ft/s. Buried pipe may run up to 12 ft/s, as noise generation is not an issue.

The surge pressure created in systems operating at 8 ft/s or lower velocity will be less than 50% of the maximum shock pressure the Aquatherm piping can withstand (725 psi). At higher flow velocity, the design engineer must still account for surge pressures and design accordingly.

Flow velocity and head (friction) losses in piping

The head loss (friction pressure loss) due to the flow of water through the Aquatherm PP-R piping is given in the following tables. The water velocity is also provided. These values are calculated from the equations below. The Hazen-Williams formula is widely used in water piping applications, but it does not account for differences in fluid viscosity (different fluids) and fluid temperature. Consult your Aquatherm representative for data using other fluids such as chemical process piping or compressed gases.

Hazen-Williams formula for pressure loss (psi/100 ft of pipe):

$$P_L = \frac{452}{d_i^{4.87}} \left(\frac{Q}{C} \right)^{1.85}$$

Where:

PL = pressure loss, psi /100 ft of pipe

Q = flow rate, gpm

d_i = inside diameter of pipe, inches

C = flow coefficient = 150 for PP-R piping

Conversion to head loss (ft of head loss per 100 ft of pipe):

$$HL = 2.31(PL)$$

Where: HL = head loss, ft / 100 ft of pipe

Calculation of flow velocity:

$$v = 0.4084 \left(\frac{Q}{d_i^2} \right)$$

Where:

Pipe sizing by head loss


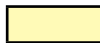

This section includes charts on the head loss of SDR 7.4, SDR 11, and SDR 17.6 systems as well as the estimated flow rate based on a flow speed of 8 ft/s. It is important to note the differences between the standard dimensional ratios as the actual IDs for each vary slightly.

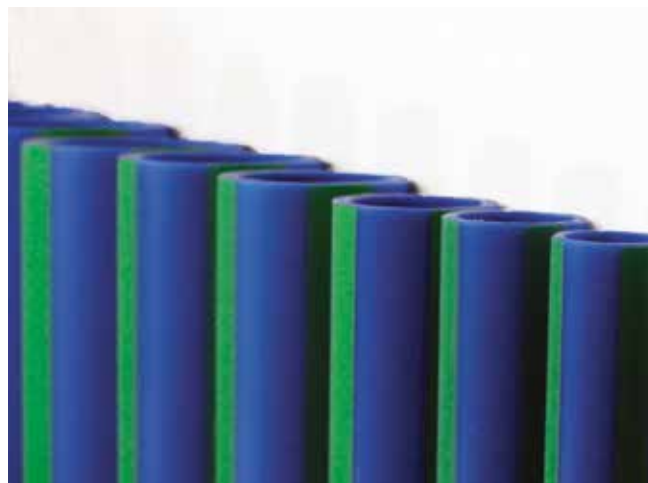
Having a flow speed of 8 ft/s can allow for downsizing of the pipe when compared against other piping systems. For example, in an application where a six-inch copper pipe would have been used, a four-inch Aquatherm PP-R pipe may be sufficient. However, this is more common when using SDR 11 and 17.6 pipe because those pipes have a higher water content per foot.

The coefficients of loss for the fittings are also included on pages 3.27 - 3.31.

Recommended sizing

The following tables give the head loss and flow rates of the pipe based on the pipe size and the desired GPM. Reducing head loss on the critical leg of the system can allow for downsizing on other sections of pipe.

-  Blue indicates the recommended sizing based on flow rate (approx. 8 ft/s).
-  Yellow indicates the recommended size of the critical leg of the system based on head loss (avg. 3 ft /100 ft or less). This sizing is used for more energy-efficient operation.
-  Green indicates that the recommended size of pipe for the critical leg and other sections of the system are the same.



Pipe friction factor (R) in feet of head per 100 ft and calculated velocity (v) in feet per second based on the flow rate (Q)

SDR 11 pipe

Q	Dimension	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"	6"	8"	10"	12"	14"	16"	18"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm	250 mm	315 mm	355 mm	400 mm	450 mm
0.1 US gpm	R	0.0																
	v	0.1																
0.2 US gpm	R	0.0	0.0															
	v	0.2	0.1															
0.3 US gpm	R	0.1	0.0	0.0														
	v	0.3	0.2	0.1														
0.4 US gpm	R	0.2	0.1	0.0	0.0													
	v	0.4	0.3	0.2	0.1													
0.5 US gpm	R	0.2	0.1	0.0	0.0													
	v	0.5	0.3	0.2	0.1													
0.6 US gpm	R	0.3	0.1	0.0	0.0													
	v	0.6	0.4	0.2	0.2													
0.7 US gpm	R	0.5	0.2	0.0	0.0	0.0												
	v	0.7	0.4	0.3	0.2	0.1												
0.8 US gpm	R	0.6	0.2	0.1	0.0	0.0												
	v	0.8	0.5	0.3	0.2	0.1												
0.9 US gpm	R	0.7	0.2	0.1	0.0	0.0												
	v	0.9	0.6	0.4	0.2	0.1												
1 US gpm	R	0.9	0.3	0.1	0.0	0.0												
	v	1.0	0.6	0.4	0.3	0.2												
2 US gpm	R	3.2	1.0	0.3	0.1	0.0	0.0											
	v	2.0	1.3	0.8	0.5	0.3	0.2											
3 US gpm	R	6.7	2.2	0.6	0.2	0.1	0.0	0.0										
	v	3.0	1.9	1.2	0.7	0.5	0.3	0.2										
4 US gpm	R	11.4	3.7	1.1	0.4	0.1	0.0	0.0	0.0									
	v	4.0	2.5	1.5	1.0	0.6	0.4	0.3	0.2									
5 US gpm	R	17.2	5.6	1.7	0.6	0.2	0.1	0.0	0.0									
	v	5.0	3.2	1.9	1.2	0.8	0.5	0.4	0.2									
6 US gpm	R	24.1	7.8	2.3	0.8	0.3	0.1	0.0	0.0	0.0								
	v	6.0	3.8	2.3	1.5	1.0	0.6	0.4	0.3	0.2								
7 US gpm	R	32.0	10.4	3.1	1.1	0.4	0.1	0.1	0.0	0.0								
	v	7.0	4.4	2.7	1.7	1.1	0.7	0.5	0.3	0.2								
8 US gpm	R	41.0	13.4	4.0	1.4	0.5	0.2	0.1	0.0	0.0	0.0							
	v	8.0	5.1	3.1	2.0	1.3	0.8	0.6	0.4	0.3	0.2							
9 US gpm	R	50.9	16.6	4.9	1.7	0.6	0.2	0.1	0.0	0.0	0.0							
	v	9.0	5.7	3.5	2.2	1.4	0.9	0.6	0.4	0.3	0.2							
10 US gpm	R	61.9	20.2	6.0	2.1	0.7	0.2	0.1	0.0	0.0	0.0							
	v	10.0	6.3	3.8	2.5	1.6	1.0	0.7	0.5	0.3	0.3							
11 US gpm	R	73.8	24.1	7.1	2.5	0.8	0.3	0.1	0.1	0.0	0.0							
	v	11.0	7.0	4.2	2.7	1.7	1.1	0.8	0.5	0.4	0.3							
12 US gpm	R	86.7	28.3	8.4	2.9	1.0	0.3	0.1	0.1	0.0	0.0							
	v	12.0	7.6	4.6	3.0	1.9	1.2	0.8	0.6	0.4	0.3							

Q = flow rate (US gpm) R = feet of head per 100 ft v = velocity (ft/sec)

SDR 11 pipe

Q	Direction	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"	6"	8"	10"	12"	14"	16"	18"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm	250 mm	315 mm	355 mm	400 mm	450 mm
13 US gpm	R		32.8	9.7	3.3	1.1	0.4	0.2	0.1	0.0	0.0							
	v		8.2	5.0	3.2	2.1	1.3	0.9	0.6	0.4	0.3							
14 US gpm	R		37.6	11.1	3.8	1.3	0.4	0.2	0.1	0.0	0.0							
	v		8.9	5.4	3.5	2.2	1.4	1.0	0.7	0.5	0.4							
15 US gpm	R		42.7	12.6	4.4	1.5	0.5	0.2	0.1	0.0	0.0	0.0						
	v		9.5	5.8	3.7	2.4	1.5	1.1	0.7	0.5	0.4	0.2						
16 US gpm	R		48.1	14.2	4.9	1.7	0.5	0.2	0.1	0.0	0.0	0.0						
	v		10.1	6.1	4.0	2.5	1.6	1.1	0.8	0.5	0.4	0.3						
17 US gpm	R		53.8	15.9	5.5	1.8	0.6	0.3	0.1	0.0	0.0	0.0						
	v		10.8	6.5	4.2	2.7	1.7	1.2	0.8	0.6	0.4	0.3						
18 US gpm	R		59.8	17.7	6.1	2.1	0.7	0.3	0.1	0.0	0.0	0.0						
	v		11.4	6.9	4.5	2.9	1.8	1.3	0.9	0.6	0.5	0.3						
19 US gpm	R		66.1	19.6	6.7	2.3	0.7	0.3	0.1	0.1	0.0	0.0						
	v		12.0	7.3	4.7	3.0	1.9	1.3	0.9	0.6	0.5	0.3						
20 US gpm	R		72.7	21.5	7.4	2.5	0.8	0.3	0.1	0.1	0.0	0.0						
	v		12.7	7.7	5.0	3.2	2.0	1.4	1.0	0.7	0.5	0.3						
22 US gpm	R		86.7	25.6	8.9	3.0	1.0	0.4	0.2	0.1	0.0	0.0						
	v		13.9	8.4	5.5	3.5	2.2	1.5	1.1	0.7	0.6	0.3						
24 US gpm	R			30.1	10.4	3.5	1.1	0.5	0.2	0.1	0.0	0.0						
	v			9.2	6.0	3.8	2.4	1.7	1.2	0.8	0.6	0.4						
26 US gpm	R			34.9	12.1	4.0	1.3	0.6	0.2	0.1	0.1	0.0						
	v			10.0	6.5	4.1	2.6	1.8	1.3	0.9	0.7	0.4						
28 US gpm	R			40.1	13.8	4.6	1.5	0.6	0.3	0.1	0.1	0.0	0.0					
	v			10.8	6.9	4.4	2.8	2.0	1.4	0.9	0.7	0.4	0.3					
30 US gpm	R			45.5	15.7	5.3	1.7	0.7	0.3	0.1	0.1	0.0	0.0					
	v			11.5	7.4	4.8	3.0	2.1	1.5	1.0	0.8	0.5	0.3					
32 US gpm	R			51.3	17.7	5.9	1.9	0.8	0.3	0.1	0.1	0.0	0.0					
	v			12.3	7.9	5.1	3.2	2.2	1.6	1.0	0.8	0.5	0.3					
34 US gpm	R			57.4	19.8	6.6	2.2	0.9	0.4	0.1	0.1	0.0	0.0					
	v			13.1	8.4	5.4	3.4	2.4	1.7	1.1	0.9	0.5	0.3					
36 US gpm	R			63.8	22.0	7.4	2.4	1.0	0.4	0.2	0.1	0.0	0.0					
	v			13.8	8.9	5.7	3.6	2.5	1.8	1.2	0.9	0.6	0.4					
38 US gpm	R			70.5	24.3	8.2	2.7	1.1	0.5	0.2	0.1	0.0	0.0					
	v			14.6	9.4	6.0	3.8	2.7	1.9	1.2	1.0	0.6	0.4					
40 US gpm	R			77.5	26.7	9.0	2.9	1.2	0.5	0.2	0.1	0.0	0.0					
	v			15.4	9.9	6.3	4.0	2.8	2.0	1.3	1.0	0.6	0.4					
45 US gpm	R				33.2	11.2	3.6	1.5	0.6	0.2	0.1	0.0	0.0					
	v				11.2	7.1	4.5	3.2	2.2	1.5	1.1	0.7	0.4					
50 US gpm	R				40.4	13.6	4.4	1.9	0.8	0.3	0.2	0.1	0.0	0.0				
	v				12.4	7.9	5.0	3.5	2.4	1.6	1.3	0.8	0.5	0.3				
55 US gpm	R				48.2	16.2	5.3	2.2	0.9	0.3	0.2	0.1	0.0	0.0				
	v				13.6	8.7	5.5	3.8	2.7	1.8	1.4	0.9	0.5	0.4				
60 US gpm	R				56.6	19.0	6.2	2.6	1.1	0.4	0.2	0.1	0.0	0.0				
	v				14.9	9.5	6.0	4.2	2.9	2.0	1.5	0.9	0.6	0.4				

Q = flow rate (US gpm) R = feet of head per 100 ft v = velocity (ft/sec)

SDR 11 pipe

Q	Dimension	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"	6"	8"	10"	12"	14"	16"	18"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm	250 mm	315 mm	355 mm	400 mm	450 mm
65 US gpm	R					22.0	7.2	3.0	1.2	0.5	0.3	0.1	0.0	0.0				
	v					10.3	6.5	4.5	3.2	2.1	1.6	1.0	0.6	0.4				
70 US gpm	R					25.2	8.2	3.5	1.4	0.5	0.3	0.1	0.0	0.0				
	v					11.1	7.0	4.9	3.4	2.3	1.8	1.1	0.7	0.4				
75 US gpm	R					28.7	9.3	3.9	1.6	0.6	0.3	0.1	0.0	0.0				
	v					11.9	7.5	5.2	3.7	2.4	1.9	1.2	0.7	0.5				
80 US gpm	R					32.3	10.5	4.4	1.8	0.7	0.4	0.1	0.0	0.0				
	v					12.7	8.0	5.6	3.9	2.6	2.0	1.2	0.8	0.5				
85 US gpm	R					36.2	11.7	4.9	2.0	0.8	0.4	0.1	0.0	0.0				
	v					13.5	8.5	5.9	4.1	2.8	2.1	1.3	0.8	0.5				
90 US gpm	R					40.2	13.1	5.5	2.3	0.9	0.5	0.1	0.1	0.0	0.0			
	v					14.3	9.0	6.3	4.4	2.9	2.3	1.4	0.9	0.6	0.4			
95 US gpm	R					44.4	14.4	6.1	2.5	0.9	0.5	0.2	0.1	0.0	0.0			
	v					15.0	9.5	6.6	4.6	3.1	2.4	1.5	0.9	0.6	0.4			
100 US gpm	R					48.8	15.9	6.7	2.8	1.0	0.6	0.2	0.1	0.0	0.0			
	v					15.8	10.0	7.0	4.9	3.3	2.5	1.5	1.0	0.6	0.4			
110 US gpm	R						18.9	8.0	3.3	1.2	0.7	0.2	0.1	0.0	0.0			
	v						11.0	7.7	5.4	3.6	2.8	1.7	1.1	0.7	0.4			
120 US gpm	R						22.2	9.4	3.9	1.5	0.8	0.2	0.1	0.0	0.0			
	v						12.0	8.4	5.8	3.9	3.0	1.9	1.2	0.8	0.5			
130 US gpm	R						25.8	10.8	4.5	1.7	0.9	0.3	0.1	0.0	0.0			
	v						13.0	9.1	6.3	4.2	3.3	2.0	1.3	0.8	0.5			
140 US gpm	R						29.6	12.4	5.1	1.9	1.0	0.3	0.1	0.0	0.0			
	v						14.0	9.8	6.8	4.6	3.5	2.2	1.4	0.9	0.6			
150 US gpm	R						33.6	14.1	5.8	2.2	1.2	0.4	0.1	0.0	0.0			
	v						15.0	10.5	7.3	4.9	3.8	2.3	1.5	0.9	0.6			
160 US gpm	R						37.8	15.9	6.6	2.5	1.3	0.4	0.1	0.1	0.0			
	v						16.0	11.2	7.8	5.2	4.0	2.5	1.6	1.0	0.6			
170 US gpm	R							17.8	7.4	2.8	1.5	0.5	0.2	0.1	0.0			
	v							11.9	8.3	5.5	4.3	2.6	1.7	1.1	0.7			
180 US gpm	R							19.8	8.2	3.1	1.7	0.5	0.2	0.1	0.0			
	v							12.6	8.8	5.9	4.5	2.8	1.8	1.1	0.7			
190 US gpm	R							21.9	9.1	3.4	1.8	0.6	0.2	0.1	0.0			
	v							13.3	9.2	6.2	4.8	2.9	1.9	1.2	0.8			
200 US gpm	R							24.1	10.0	3.7	2.0	0.6	0.2	0.1	0.0			
	v							14.0	9.7	6.5	5.1	3.1	2.0	1.3	0.8			
220 US gpm	R							28.7	11.9	4.5	2.4	0.7	0.2	0.1	0.0			
	v							15.4	10.7	7.2	5.6	3.4	2.2	1.4	0.9			
240 US gpm	R								13.9	5.2	2.8	0.9	0.3	0.1	0.0			
	v								11.7	7.8	6.1	3.7	2.4	1.5	1.0			
260 US gpm	R								16.2	6.1	3.3	1.0	0.3	0.1	0.0			
	v								12.7	8.5	6.6	4.0	2.6	1.6	1.0			
280 US gpm	R								18.5	7.0	3.8	1.1	0.4	0.1	0.0			
	v								13.6	9.1	7.1	4.3	2.8	1.8	1.1			

Q = flow rate (US gpm) R = feet of head per 100 ft v = velocity (ft/sec)

SDR 11 pipe

Q	Direction	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"	6"	8"	10"	12"	14"	16"	18"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm	250 mm	315 mm	355 mm	400 mm	450 mm
300 US gpm	R								21.1	7.9	4.3	1.3	0.4	0.1	0.1			
	v								14.6	9.8	7.6	4.6	3.0	1.9	1.2			
320 US gpm	R								23.7	8.9	4.8	1.4	0.5	0.2	0.1			
	v								15.6	10.4	8.1	4.9	3.2	2.0	1.3			
340 US gpm	R									10.0	5.4	1.6	0.5	0.2	0.1			
	v									11.1	8.6	5.2	3.4	2.1	1.4			
360 US gpm	R									11.1	6.0	1.8	0.6	0.2	0.1			
	v									11.7	9.1	5.5	3.5	2.3	1.4			
380 US gpm	R									12.3	6.6	2.0	0.7	0.2	0.1			
	v									12.4	9.6	5.9	3.7	2.4	1.5			
400 US gpm	R									13.5	7.3	2.2	0.7	0.3	0.1	0.0		
	v									13.0	10.1	6.2	3.9	2.5	1.6	1.2		
450 US gpm	R									16.8	9.0	2.7	0.9	0.3	0.1	0.1		
	v									14.6	11.4	6.9	4.4	2.8	1.8	1.4		
500 US gpm	R										11.0	3.3	1.1	0.4	0.1	0.1		
	v										12.6	7.7	4.9	3.2	2.0	1.6		
550 US gpm	R										13.1	3.9	1.3	0.4	0.1	0.1		
	v										13.9	8.5	5.4	3.5	2.2	1.7		
600 US gpm	R										15.4	4.6	1.6	0.5	0.2	0.1		
	v										15.1	9.2	5.9	3.8	2.4	1.9		
650 US gpm	R											5.4	1.8	0.6	0.2	0.1		
	v											10.0	6.4	4.1	2.6	2.0		
700 US gpm	R											6.1	2.1	0.7	0.2	0.1		
	v											10.8	6.9	4.4	2.8	2.2		
750 US gpm	R											7.0	2.4	0.8	0.3	0.1		
	v											11.6	7.4	4.7	3.0	2.3		
800 US gpm	R											7.9	2.6	0.9	0.3	0.2		
	v											12.3	7.9	5.0	3.2	2.5		
850 US gpm	R											8.8	3.0	1.0	0.3	0.2		
	v											13.1	8.4	5.4	3.4	2.7		
900 US gpm	R											9.8	3.3	1.1	0.4	0.2		
	v											13.9	8.9	5.7	3.6	2.8		
950 US gpm	R											10.8	3.6	1.2	0.4	0.2		
	v											14.6	9.4	6.0	3.8	3.0		
1000 US gpm	R											11.9	4.0	1.3	0.4	0.2	0.1	0.1
	v											15.4	9.8	6.3	4.0	3.1	2.5	1.9
1100 US gpm	R												4.8	1.6	0.5	0.3	0.2	0.1
	v												10.8	6.9	4.4	3.4	2.7	2.1
1200 US gpm	R												5.6	1.9	0.6	0.3	0.2	0.1
	v												11.8	7.6	4.8	3.7	2.9	2.3
1300 US gpm	R												6.5	2.2	0.7	0.4	0.2	0.1
	v												12.8	8.2	5.2	4.1	3.2	2.5
1400 US gpm	R												7.4	2.5	0.8	0.5	0.3	0.1
	v												13.8	8.8	5.6	4.4	3.4	2.7

Q = flow rate (US gpm) R = feet of head per 100 ft v = velocity (ft/sec)

SDR 11 pipe

Q	Dimension	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"	18"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm	250 mm	315 mm	355 mm	400 mm	450 mm
1500 US gpm	R												8.5	2.9	0.9	0.5	0.3	0.2
	v												14.8	9.4	6.0	4.7	3.7	2.9
1600 US gpm	R												9.5	3.2	1.0	0.6	0.3	0.2
	v												15.8	10.1	6.3	5.0	3.9	3.1
1700 US gpm	R													3.6	1.2	0.7	0.4	0.2
	v													10.7	6.7	5.3	4.2	3.3
1800 US gpm	R													4.0	1.3	0.7	0.4	0.2
	v													11.3	7.1	5.6	4.4	3.5
1900 US gpm	R													4.4	1.4	0.8	0.4	0.3
	v													12.0	7.5	5.9	4.7	3.7
2000 US gpm	R													4.9	1.6	0.9	0.5	0.3
	v													12.6	7.9	6.2	4.9	3.9
2200 US gpm	R													5.8	1.9	1.1	0.6	0.3
	v													13.9	8.7	6.9	5.4	4.3
2400 US gpm	R													6.8	2.2	1.2	0.7	0.4
	v													15.1	9.5	7.5	5.9	4.7
2600 US gpm	R														2.6	1.4	0.8	0.5
	v														10.3	8.1	6.4	5.1
2800 US gpm	R														2.9	1.6	0.9	0.5
	v														11.1	8.7	6.9	5.4
3000 US gpm	R														3.3	1.9	1.0	0.6
	v														11.9	9.4	7.4	5.8
3200 US gpm	R															2.1	1.2	0.7
	v															10.0	7.9	6.2
3400 US gpm	R															2.4	1.3	0.7
	v															10.6	8.3	6.6
3600 US gpm	R															2.6	1.5	0.8
	v															11.2	8.8	7.0
3800 US gpm	R															2.9	1.6	0.9
	v															11.9	9.3	7.4
4000 US gpm	R															3.2	1.8	1.0
	v															12.5	9.8	7.8
4500 US gpm	R																2.2	1.2
	v																11.1	8.8
5000 US gpm	R																2.7	1.5
	v																12.3	9.7
5500 US gpm	R																	1.8
	v																	10.7
6000 US gpm	R																	2.1
	v																	11.7
6500 US gpm	R																	2.5
	v																	12.6

Q = flow rate (US gpm) R = feet of head per 100 ft v = velocity (ft/sec)

Pipe friction factor (R) in feet of head per 100 ft and calculated velocity (v) in feet per second based on the flow rate (Q)

SDR 7.4 pipe

Q	Dimension	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"	6"	8"	10"	12"	14"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm	250 mm	315 mm	355 mm
0.1 US gpm	R	0.0	0.0													
	v	0.1	0.1													
0.2 US gpm	R	0.1	0.0	0.0												
	v	0.3	0.2	0.1												
0.3 US gpm	R	0.2	0.1	0.0	0.0											
	v	0.4	0.2	0.2	0.1											
0.4 US gpm	R	0.3	0.1	0.0	0.0											
	v	0.5	0.3	0.2	0.1											
0.5 US gpm	R	0.4	0.2	0.0	0.0											
	v	0.6	0.4	0.2	0.2											
0.6 US gpm	R	0.6	0.2	0.1	0.0	0.0										
	v	0.8	0.5	0.3	0.2	0.1										
0.7 US gpm	R	0.8	0.3	0.1	0.0	0.0										
	v	0.9	0.6	0.3	0.2	0.1										
0.8 US gpm	R	1.0	0.4	0.1	0.0	0.0										
	v	1.0	0.7	0.4	0.3	0.2										
0.9 US gpm	R	1.3	0.4	0.1	0.0	0.0										
	v	1.1	0.7	0.4	0.3	0.2										
1 US gpm	R	1.6	0.5	0.2	0.1	0.0	0.0									
	v	1.3	0.8	0.5	0.3	0.2	0.1									
2 US gpm	R	5.6	1.9	0.6	0.2	0.1	0.0	0.0								
	v	2.5	1.6	1.0	0.6	0.4	0.3	0.2								
3 US gpm	R	11.9	4.0	1.2	0.4	0.1	0.0	0.0	0.0							
	v	3.8	2.4	1.5	0.9	0.6	0.4	0.3	0.2							
4 US gpm	R	20.2	6.8	2.0	0.7	0.2	0.1	0.0	0.0							
	v	5.1	3.3	2.0	1.3	0.8	0.5	0.4	0.3							
5 US gpm	R	30.5	10.3	3.0	1.0	0.3	0.1	0.1	0.0	0.0						
	v	6.4	4.1	2.5	1.6	1.0	0.6	0.5	0.3	0.2						
6 US gpm	R	42.8	14.4	4.2	1.4	0.5	0.2	0.1	0.0	0.0	0.0					
	v	7.6	4.9	2.9	1.9	1.2	0.8	0.5	0.4	0.3	0.2					
7 US gpm	R	56.9	19.2	5.6	1.9	0.6	0.2	0.1	0.0	0.0	0.0					
	v	8.9	5.7	3.4	2.2	1.4	0.9	0.6	0.4	0.3	0.2					
8 US gpm	R	72.8	24.6	7.1	2.4	0.8	0.3	0.1	0.1	0.0	0.0					
	v	10.2	6.5	3.9	2.5	1.6	1.0	0.7	0.5	0.3	0.3					
9 US gpm	R	90.5	30.5	8.9	3.0	1.0	0.3	0.1	0.1	0.0	0.0					
	v	11.4	7.3	4.4	2.8	1.8	1.1	0.8	0.6	0.4	0.3					
10 US gpm	R		37.1	10.8	3.6	1.2	0.4	0.2	0.1	0.0	0.0					
	v		8.1	4.9	3.1	2.0	1.3	0.9	0.6	0.4	0.3					
11 US gpm	R		44.3	12.9	4.3	1.5	0.5	0.2	0.1	0.0	0.0	0.0				
	v		9.0	5.4	3.5	2.2	1.4	1.0	0.7	0.5	0.4	0.2				

Q = flow rate (US gpm) R = feet of head per 100 ft v = velocity (ft/sec)

SDR 7.4 pipe

Q	Direction	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"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm	250 mm	315 mm	355 mm
12 US gpm	R		52.0	15.1	5.1	1.7	0.6	0.2	0.1	0.0	0.0	0.0				
	v		9.8	5.9	3.8	2.4	1.5	1.1	0.7	0.5	0.4	0.2				
13 US gpm	R		60.3	17.5	5.9	2.0	0.6	0.3	0.1	0.0	0.0	0.0				
	v		10.6	6.4	4.1	2.6	1.6	1.2	0.8	0.5	0.4	0.3				
14 US gpm	R		69.2	20.1	6.8	2.3	0.7	0.3	0.1	0.1	0.0	0.0				
	v		11.4	6.9	4.4	2.8	1.8	1.3	0.9	0.6	0.5	0.3				
15 US gpm	R		78.6	22.8	7.7	2.6	0.8	0.4	0.2	0.1	0.0	0.0				
	v		12.2	7.3	4.7	3.0	1.9	1.3	0.9	0.6	0.5	0.3				
16 US gpm	R		88.5	25.7	8.7	3.0	0.9	0.4	0.2	0.1	0.0	0.0				
	v		13.0	7.8	5.0	3.2	2.0	1.4	1.0	0.7	0.5	0.3				
17 US gpm	R		99.0	28.8	9.7	3.3	1.1	0.5	0.2	0.1	0.0	0.0				
	v		13.8	8.3	5.3	3.4	2.1	1.5	1.1	0.7	0.5	0.3				
18 US gpm	R			32.0	10.8	3.7	1.2	0.5	0.2	0.1	0.0	0.0				
	v			8.8	5.6	3.6	2.3	1.6	1.1	0.7	0.6	0.4				
19 US gpm	R			35.4	11.9	4.1	1.3	0.6	0.2	0.1	0.1	0.0				
	v			9.3	6.0	3.8	2.4	1.7	1.2	0.8	0.6	0.4				
20 US gpm	R			38.9	13.1	4.5	1.4	0.6	0.3	0.1	0.1	0.0	0.0			
	v			9.8	6.3	4.0	2.5	1.8	1.2	0.8	0.6	0.4	0.3			
22 US gpm	R			46.4	15.6	5.3	1.7	0.7	0.3	0.1	0.1	0.0	0.0			
	v			10.8	6.9	4.4	2.8	2.0	1.4	0.9	0.7	0.4	0.3			
24 US gpm	R			54.5	18.4	6.2	2.0	0.9	0.4	0.1	0.1	0.0	0.0			
	v			11.8	7.5	4.8	3.0	2.1	1.5	1.0	0.8	0.5	0.3			
26 US gpm	R			63.2	21.3	7.2	2.3	1.0	0.4	0.2	0.1	0.0	0.0			
	v			12.7	8.2	5.2	3.3	2.3	1.6	1.1	0.8	0.5	0.3			
28 US gpm	R			72.4	24.4	8.3	2.6	1.1	0.5	0.2	0.1	0.0	0.0			
	v			13.7	8.8	5.6	3.5	2.5	1.7	1.2	0.9	0.6	0.4			
30 US gpm	R			82.3	27.8	9.4	3.0	1.3	0.5	0.2	0.1	0.0	0.0			
	v			14.7	9.4	6.0	3.8	2.7	1.9	1.2	1.0	0.6	0.4			
32 US gpm	R			92.7	31.3	10.6	3.4	1.5	0.6	0.2	0.1	0.0	0.0			
	v			15.7	10.0	6.4	4.0	2.9	2.0	1.3	1.0	0.6	0.4			
34 US gpm	R				35.0	11.9	3.8	1.6	0.7	0.3	0.1	0.0	0.0			
	v				10.7	6.8	4.3	3.0	2.1	1.4	1.1	0.7	0.4			
36 US gpm	R				38.9	13.2	4.2	1.8	0.7	0.3	0.2	0.1	0.0	0.0		
	v				11.3	7.2	4.5	3.2	2.2	1.5	1.2	0.7	0.5	0.3		
38 US gpm	R				43.0	14.6	4.6	2.0	0.8	0.3	0.2	0.1	0.0	0.0		
	v				11.9	7.6	4.8	3.4	2.3	1.6	1.2	0.7	0.5	0.3		
40 US gpm	R				47.3	16.1	5.1	2.2	0.9	0.3	0.2	0.1	0.0	0.0		
	v				12.5	8.0	5.0	3.6	2.5	1.7	1.3	0.8	0.5	0.3		
45 US gpm	R				58.8	20.0	6.4	2.8	1.1	0.4	0.2	0.1	0.0	0.0		
	v				14.1	9.1	5.7	4.0	2.8	1.9	1.4	0.9	0.6	0.4		
50 US gpm	R				71.4	24.3	7.7	3.3	1.4	0.5	0.3	0.1	0.0	0.0		
	v				15.7	10.1	6.3	4.5	3.1	2.1	1.6	1.0	0.6	0.4		

Q = flow rate (US gpm) R = feet of head per 100 ft v = velocity (ft/sec)

SDR 7.4 pipe

Q	Direction	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"	6"	8"	10"	12"	14"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm	250 mm	315 mm	355 mm
55 US gpm	R					28.9	9.2	4.0	1.6	0.6	0.3	0.1	0.0	0.0		
	v					11.1	6.9	4.9	3.4	2.3	1.8	1.1	0.7	0.4		
60 US gpm	R					34.0	10.8	4.7	1.9	0.7	0.4	0.1	0.0	0.0		
	v					12.1	7.5	5.3	3.7	2.5	1.9	1.2	0.8	0.5		
65 US gpm	R					39.4	12.5	5.4	2.2	0.8	0.5	0.1	0.1	0.0		
	v					13.1	8.2	5.8	4.0	2.7	2.1	1.3	0.8	0.5		
70 US gpm	R					45.2	14.4	6.2	2.5	1.0	0.5	0.2	0.1	0.0		
	v					14.1	8.8	6.2	4.3	2.9	2.2	1.4	0.9	0.6		
75 US gpm	R					51.4	16.3	7.1	2.9	1.1	0.6	0.2	0.1	0.0		
	v					15.1	9.4	6.7	4.6	3.1	2.4	1.5	0.9	0.6		
80 US gpm	R						18.4	8.0	3.3	1.2	0.7	0.2	0.1	0.0		
	v						10.1	7.1	4.9	3.3	2.6	1.6	1.0	0.6		
85 US gpm	R						20.6	8.9	3.6	1.4	0.7	0.2	0.1	0.0		
	v						10.7	7.6	5.2	3.5	2.7	1.7	1.1	0.7		
90 US gpm	R						22.9	9.9	4.0	1.5	0.8	0.3	0.1	0.0		
	v						11.3	8.0	5.5	3.7	2.9	1.8	1.1	0.7		
95 US gpm	R						25.3	10.9	4.5	1.7	0.9	0.3	0.1	0.0		
	v						11.9	8.5	5.9	3.9	3.0	1.9	1.2	0.8		
100 US gpm	R						27.8	12.0	4.9	1.9	1.0	0.3	0.1	0.0		
	v						12.6	8.9	6.2	4.1	3.2	2.0	1.3	0.8		
110 US gpm	R						33.2	14.4	5.9	2.2	1.2	0.4	0.1	0.0		
	v						13.8	9.8	6.8	4.6	3.5	2.2	1.4	0.9		
120 US gpm	R						39.0	16.9	6.9	2.6	1.4	0.4	0.1	0.1		
	v						15.1	10.7	7.4	5.0	3.8	2.3	1.5	1.0		
130 US gpm	R							19.6	8.0	3.0	1.6	0.5	0.2	0.1		
	v							11.6	8.0	5.4	4.2	2.5	1.6	1.0		
140 US gpm	R							22.4	9.1	3.5	1.9	0.6	0.2	0.1		
	v							12.5	8.6	5.8	4.5	2.7	1.8	1.1		
150 US gpm	R							25.5	10.4	3.9	2.1	0.6	0.2	0.1		
	v							13.4	9.2	6.2	4.8	2.9	1.9	1.2		
160 US gpm	R							28.7	11.7	4.4	2.4	0.7	0.2	0.1		
	v							14.3	9.9	6.6	5.1	3.1	2.0	1.3		
170 US gpm	R							32.1	13.1	5.0	2.7	0.8	0.3	0.1		
	v							15.1	10.5	7.0	5.4	3.3	2.1	1.4		
180 US gpm	R								14.6	5.5	2.9	0.9	0.3	0.1		
	v								11.1	7.5	5.8	3.5	2.3	1.4		
190 US gpm	R								16.1	6.1	3.3	1.0	0.3	0.1		
	v								11.7	7.9	6.1	3.7	2.4	1.5		
200 US gpm	R								17.7	6.7	3.6	1.1	0.4	0.1		
	v								12.3	8.3	6.4	3.9	2.5	1.6		
220 US gpm	R								21.1	8.0	4.3	1.3	0.4	0.2		
	v								13.6	9.1	7.0	4.3	2.8	1.8		

Q = flow rate (US gpm) R = feet of head per 100 ft v = velocity (ft/sec)

SDR 7.4 pipe

Q	Dimension	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"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm	250 mm	315 mm	355 mm
240 US gpm	R								24.8	9.4	5.0	1.5	0.5	0.2		
	v								14.8	9.9	7.7	4.7	3.0	1.9		
260 US gpm	R									10.9	5.8	1.8	0.6	0.2		
	v									10.8	8.3	5.1	3.3	2.1		
280 US gpm	R									12.5	6.7	2.0	0.7	0.2		
	v									11.6	9.0	5.5	3.5	2.2		
300 US gpm	R									14.2	7.6	2.3	0.8	0.3	0.1	
	v									12.4	9.6	5.9	3.8	2.4	1.5	
320 US gpm	R									16.0	8.5	2.6	0.9	0.3	0.1	
	v									13.2	10.2	6.2	4.0	2.6	1.6	
340 US gpm	R									17.9	9.6	2.9	1.0	0.3	0.1	
	v									14.1	10.9	6.6	4.3	2.7	1.7	
360 US gpm	R									19.9	10.6	3.2	1.1	0.4	0.1	
	v									14.9	11.5	7.0	4.5	2.9	1.8	
380 US gpm	R									22.0	11.7	3.5	1.2	0.4	0.1	
	v									15.7	12.1	7.4	4.8	3.0	1.9	
400 US gpm	R										12.9	3.9	1.3	0.4	0.1	
	v										12.8	7.8	5.0	3.2	2.0	
450 US gpm	R										16.0	4.8	1.6	0.6	0.2	
	v										14.4	8.8	5.6	3.6	2.3	
500 US gpm	R										19.5	5.9	2.0	0.7	0.2	0.1
	v										16.0	9.8	6.3	4.0	2.5	2.0
550 US gpm	R											7.0	2.4	0.8	0.3	0.1
	v											10.7	6.9	4.4	2.7	2.7
600 US gpm	R											8.2	2.8	0.9	0.3	0.2
	v											11.7	7.5	4.8	3.0	2.4
650 US gpm	R											9.5	3.2	1.1	0.3	0.2
	v											12.7	8.1	5.2	3.2	2.6
700 US gpm	R											10.9	3.7	1.2	0.4	0.2
	v											13.7	8.8	5.6	3.5	2.8
750 US gpm	R											12.4	4.2	1.4	0.5	0.3
	v											14.6	9.4	6.0	3.7	2.9
800 US gpm	R											14.0	4.7	1.6	0.5	0.3
	v											15.6	10.0	6.4	4.0	3.1
850 US gpm	R												5.3	1.8	0.6	0.3
	v												10.6	6.8	4.2	3.3
900 US gpm	R												5.9	2.0	0.6	0.4
	v												11.3	7.2	4.5	3.5
950 US gpm	R												6.5	2.2	0.7	0.4
	v												11.9	7.6	4.7	3.7
1000 US gpm	R												7.1	2.4	0.8	0.4
	v												12.5	8.0	5.0	3.9

Q = flow rate (US gpm) R = feet of head per 100 ft v = velocity (ft/sec)

SDR 7.4 pipe

Q	Direction	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"	6"	8"	10"	12"	14"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm	250 mm	315 mm	355 mm
1100 US gpm	R												8.5	2.9	0.9	0.5
	v												13.8	8.8	5.5	4.3
1200 US gpm	R												10.0	3.4	1.1	0.6
	v												15.0	9.6	6.0	4.7
1300 US gpm	R													3.9	1.2	0.7
	v													10.4	6.5	5.1
1400 US gpm	R													4.5	1.4	0.8
	v													11.2	7.0	5.5
1500 US gpm	R													5.0	1.6	0.9
	v													11.9	7.5	5.9
1600 US gpm	R													5.6	1.8	1.0
	v													12.7	8.0	6.3
1700 US gpm	R														2.0	1.1
	v														8.5	6.7
1800 US gpm	R														2.3	1.3
	v														9.0	7.0
1900 US gpm	R														2.5	1.4
	v														9.5	7.5
2000 US gpm	R														2.8	1.5
	v														10.0	7.9
2200 US gpm	R														3.3	1.8
	v														11.0	8.6
2400 US gpm	R														3.8	2.1
	v														12.0	9.4
2600 US gpm	R															2.5
	v															10.2
2800 US gpm	R															2.9
	v															11.0
3000 US gpm	R															3.3
	v															11.8

Q = flow rate (US gpm) R = feet of head per 100 ft v = velocity (ft/sec)

Pipe friction factor (R) in feet of head per 100 ft and calculated velocity (v) in feet per second based on the flow rate (Q)

SDR 17.6 pipe

Q	Dimension	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
		160 mm	200 mm	250 mm	315 mm	355 mm	400 mm	450 mm	500 mm	560 mm	630 mm
200 US gpm	R	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	v	2.6	1.7	1.1	0.7	0.5	0.4	0.3	0.3	0.2	0.2
220 US gpm	R	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	v	2.9	1.8	1.2	0.7	0.6	0.5	0.4	0.3	0.2	0.2
240 US gpm	R	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	v	3.1	2.0	1.3	0.8	0.6	0.5	0.4	0.3	0.3	0.2
260 US gpm	R	0.7	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	v	3.4	2.2	1.4	0.9	0.7	0.5	0.4	0.3	0.3	0.2
280 US gpm	R	0.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	v	3.7	2.3	1.5	0.9	0.7	0.6	0.5	0.4	0.3	0.2
300 US gpm	R	0.9	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	v	3.9	2.5	1.6	1.0	0.8	0.6	0.5	0.4	0.3	0.3
350 US gpm	R	1.2	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	v	4.6	2.9	1.9	1.2	0.9	0.7	0.6	0.5	0.4	0.3
400 US gpm	R	1.5	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	v	5.2	3.4	2.1	1.4	1.1	0.8	0.7	0.5	0.4	0.3
450 US gpm	R	1.8	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	v	5.9	3.8	2.4	1.5	1.2	0.9	0.7	0.6	0.5	0.4
500 US gpm	R	2.2	0.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	v	6.6	4.2	2.7	1.7	1.3	1.0	0.8	0.7	0.5	0.4
550 US gpm	R	2.7	0.9	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	v	7.2	4.6	3.0	1.9	1.5	1.2	0.9	0.7	0.6	0.5
600 US gpm	R	3.1	1.1	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	v	7.9	5.0	3.2	2.0	1.6	1.3	1.0	0.8	0.6	0.5
650 US gpm	R	3.6	1.2	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	v	8.5	5.4	3.5	2.2	1.7	1.4	1.1	0.9	0.7	0.5
700 US gpm	R	4.2	1.4	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0
	v	9.2	5.9	3.8	2.4	1.9	1.5	1.2	0.9	0.7	0.6
750 US gpm	R	4.7	1.6	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	v	9.8	6.3	4.0	2.5	2.0	1.6	1.2	1.0	0.8	0.6
800 US gpm	R	5.3	1.8	0.6	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	v	10.5	6.7	4.3	2.7	2.1	1.7	1.3	1.1	0.9	0.7
900 US gpm	R		2.2	0.8	0.2	0.1	0.1	0.0	0.0	0.0	0.0
	v		7.5	4.8	3.0	2.4	1.9	1.5	1.2	1.0	0.8
1000 US gpm	R		2.7	0.9	0.3	0.2	0.1	0.1	0.0	0.0	0.0
	v		8.4	5.4	3.4	2.7	2.1	1.7	1.3	1.1	0.8
1100 US gpm	R		3.2	1.1	0.4	0.2	0.1	0.1	0.0	0.0	0.0
	v		9.2	5.9	3.7	2.9	2.3	1.8	1.5	1.2	0.9
1200 US gpm	R		3.8	1.3	0.4	0.2	0.1	0.1	0.0	0.0	0.0
	v		10.1	6.4	4.1	3.2	2.5	2.0	1.6	1.3	1.0
Q = flow rate (US gpm)			R = feet of head per 100 ft.					v = velocity (ft./ sec)			

SDR 17.6 pipe

Q	Dimension	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
		160 mm	200 mm	250 mm	315 mm	355 mm	400 mm	450 mm	500 mm	560 mm	630 mm
1300 US gpm	R		4.4	1.5	0.5	0.3	0.2	0.1	0.1	0.0	0.0
	v		10.9	7.0	4.4	3.5	2.7	2.2	1.7	1.4	1.1
1400 US gpm	R		5.1	1.7	0.6	0.3	0.2	0.1	0.1	0.0	0.0
	v		11.7	7.5	4.7	3.7	2.9	2.3	1.9	1.5	1.2
1500 US gpm	R		5.7	1.9	0.6	0.4	0.2	0.1	0.1	0.0	0.0
	v		12.6	8.1	5.1	4.0	3.1	2.5	2.0	1.6	1.3
1600 US gpm	R		6.5	2.2	0.7	0.4	0.2	0.1	0.1	0.0	0.0
	v		13.4	8.6	5.4	4.3	3.3	2.6	2.1	1.7	1.4
1700 US gpm	R		7.2	2.4	0.8	0.4	0.2	0.1	0.1	0.0	0.0
	v		14.3	9.1	5.7	4.5	3.6	2.8	2.3	1.8	1.4
1800 US gpm	R		8.0	2.7	0.9	0.5	0.3	0.2	0.1	0.1	0.0
	v		15.1	9.7	6.1	4.8	3.8	3.0	2.4	1.9	1.5
1900 US gpm	R		8.9	3.0	1.0	0.5	0.3	0.2	0.1	0.1	0.0
	v		15.9	10.2	6.4	5.1	4.0	3.1	2.5	2.0	1.6
2000 US gpm	R		9.8	3.3	1.1	0.6	0.3	0.2	0.1	0.1	0.0
	v		16.8	10.7	6.8	5.3	4.2	3.3	2.7	2.1	1.7
2200 US gpm	R			3.9	1.3	0.7	0.4	0.2	0.1	0.1	0.0
	v			11.8	7.4	5.9	4.6	3.6	3.0	2.4	1.9
2400 US gpm	R			4.6	1.5	0.8	0.5	0.3	0.2	0.1	0.1
	v			12.9	8.1	6.4	5.0	4.0	3.2	2.6	2.0
2600 US gpm	R			5.4	1.7	1.0	0.5	0.3	0.2	0.1	0.1
	v			14.0	8.8	6.9	5.4	4.3	3.5	2.8	2.2
2800 US gpm	R			6.2	2.0	1.1	0.6	0.3	0.2	0.1	0.1
	v			15.0	9.5	7.4	5.9	4.6	3.8	3.0	2.4
3000 US gpm	R			7.0	2.3	1.3	0.7	0.4	0.2	0.1	0.1
	v			16.1	10.1	8.0	6.3	5.0	4.0	3.2	2.5
3200 US gpm	R				2.6	1.4	0.8	0.4	0.3	0.2	0.1
	v				10.8	8.5	6.7	5.3	4.3	3.4	2.7
3400 US gpm	R				2.9	1.6	0.9	0.5	0.3	0.2	0.1
	v				11.5	9.0	7.1	5.6	4.6	3.6	2.9
3600 US gpm	R				3.2	1.8	1.0	0.6	0.3	0.2	0.1
	v				12.2	9.6	7.5	6.0	4.8	3.8	3.0
3800 US gpm	R				3.5	2.0	1.1	0.6	0.4	0.2	0.1
	v				12.8	10.1	8.0	6.3	5.1	4.1	3.2
4000 US gpm	R				3.9	2.2	1.2	0.7	0.4	0.2	0.1
	v				13.5	10.6	8.4	6.6	5.4	4.3	3.4
4250 US gpm	R				4.3	2.4	1.3	0.8	0.5	0.3	0.1
	v				14.4	11.3	8.9	7.0	5.7	4.5	3.6
4500 US gpm	R				4.8	2.7	1.5	0.8	0.5	0.3	0.2
	v				15.2	12.0	9.4	7.4	6.0	4.8	3.8
4750 US gpm	R				5.3	3.0	1.7	0.9	0.6	0.3	0.2
	v				16.1	12.6	9.9	7.9	6.4	5.1	4.0
5000 US gpm	R				5.8	3.3	1.8	1.0	0.6	0.4	0.2
	v				16.9	13.3	10.5	8.3	6.7	5.3	4.2
5250 US gpm	R					3.6	2.0	1.1	0.7	0.4	0.2
	v					14.0	11.0	8.7	7.0	5.6	4.4
5500 US gpm	R					3.9	2.2	1.2	0.7	0.4	0.2
	v					14.6	11.5	9.1	7.4	5.9	4.6
5750 US gpm	R					4.2	2.4	1.3	0.8	0.5	0.3
	v					15.3	12.0	9.5	7.7	6.1	4.9

Q = flow rate (US gpm)

R = feet of head per 100 ft.

v = velocity (ft./sec)

SDR 17.6 pipe

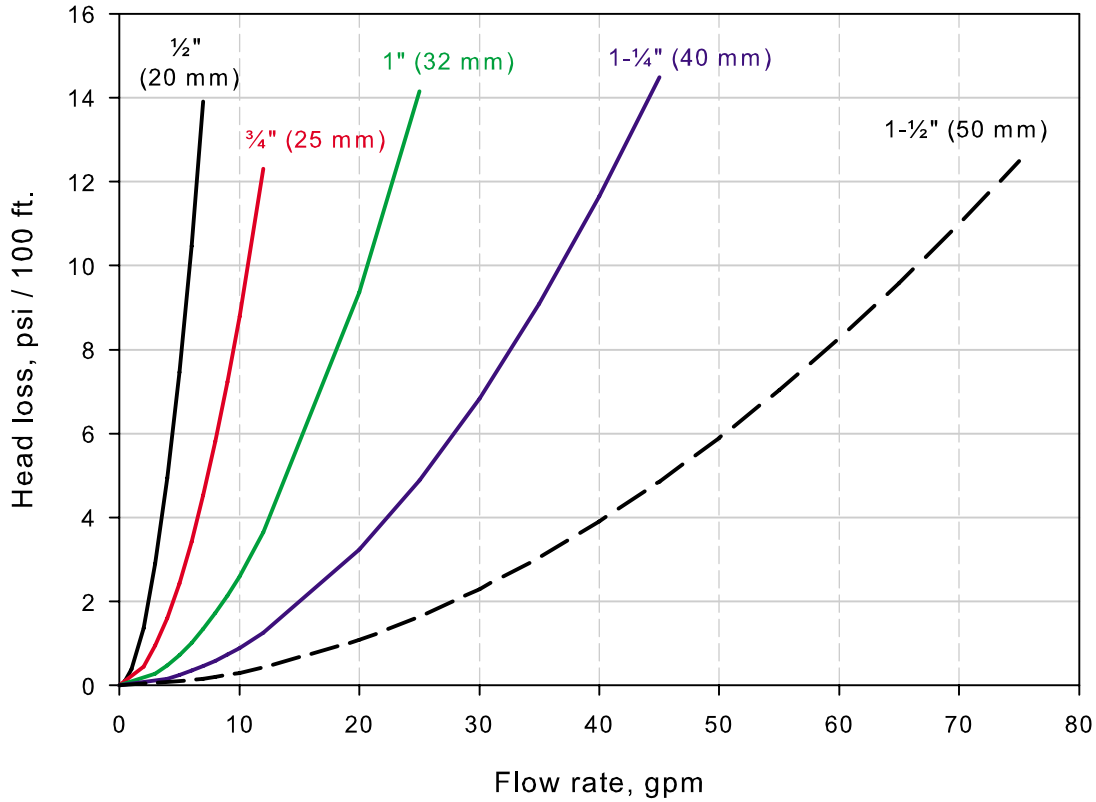
Q	Dimension	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
		160 mm	200 mm	250 mm	315 mm	355 mm	400 mm	450 mm	500 mm	560 mm	630 mm
6000 US gpm	R					4.6	2.5	1.4	0.9	0.5	0.3
	v					16.0	12.6	9.9	8.0	6.4	5.1
6250 US gpm	R					4.9	2.7	1.5	0.9	0.5	0.3
	v					16.6	13.1	10.3	8.4	6.7	5.3
6500 US gpm	R						2.9	1.7	1.0	0.6	0.3
	v						13.6	10.8	8.7	6.9	5.5
6750 US gpm	R						3.2	1.8	1.1	0.6	0.3
	v						14.1	11.2	9.1	7.2	5.7
7000 US gpm	R						3.4	1.9	1.1	0.7	0.4
	v						14.6	11.6	9.4	7.5	5.9
7250 US gpm	R						3.6	2.0	1.2	0.7	0.4
	v						15.2	12.0	9.7	7.7	6.1
7500 US gpm	R						3.8	2.2	1.3	0.7	0.4
	v						15.7	12.4	10.1	8.0	6.3
7750 US gpm	R						4.1	2.3	1.4	0.8	0.4
	v						16.2	12.8	10.4	8.3	6.5
8000 US gpm	R						4.3	2.4	1.5	0.8	0.5
	v						16.7	13.2	10.7	8.5	6.8
8500 US gpm	R							2.7	1.6	0.9	0.5
	v							14.1	11.4	9.1	7.2
9000 US gpm	R							3.0	1.8	1.0	0.6
	v							14.9	12.1	9.6	7.6
9500 US gpm	R							3.3	2.0	1.2	0.7
	v							15.7	12.7	10.2	8.0
10000 US gpm	R							3.7	2.2	1.3	0.7
	v							16.5	13.4	10.7	8.4
10500 US gpm	R								2.4	1.4	0.8
	v								14.1	11.2	8.9
11000 US gpm	R								2.6	1.5	0.9
	v								14.8	11.8	9.3
11500 US gpm	R								2.9	1.6	0.9
	v								15.4	12.3	9.7
12000 US gpm	R								3.1	1.8	1.0
	v								16.1	12.8	10.1
12500 US gpm	R								3.3	1.9	1.1
	v								16.8	13.4	10.6
13000 US gpm	R									2.1	1.2
	v									13.9	11.0
13500 US gpm	R									2.2	1.3
	v									14.4	11.4
14000 US gpm	R									2.4	1.3
	v									15.0	11.8
14500 US gpm	R									2.5	1.4
	v									15.5	12.2
15000 US gpm	R									2.7	1.5
	v									16.0	12.7

Q = flow rate (US gpm)

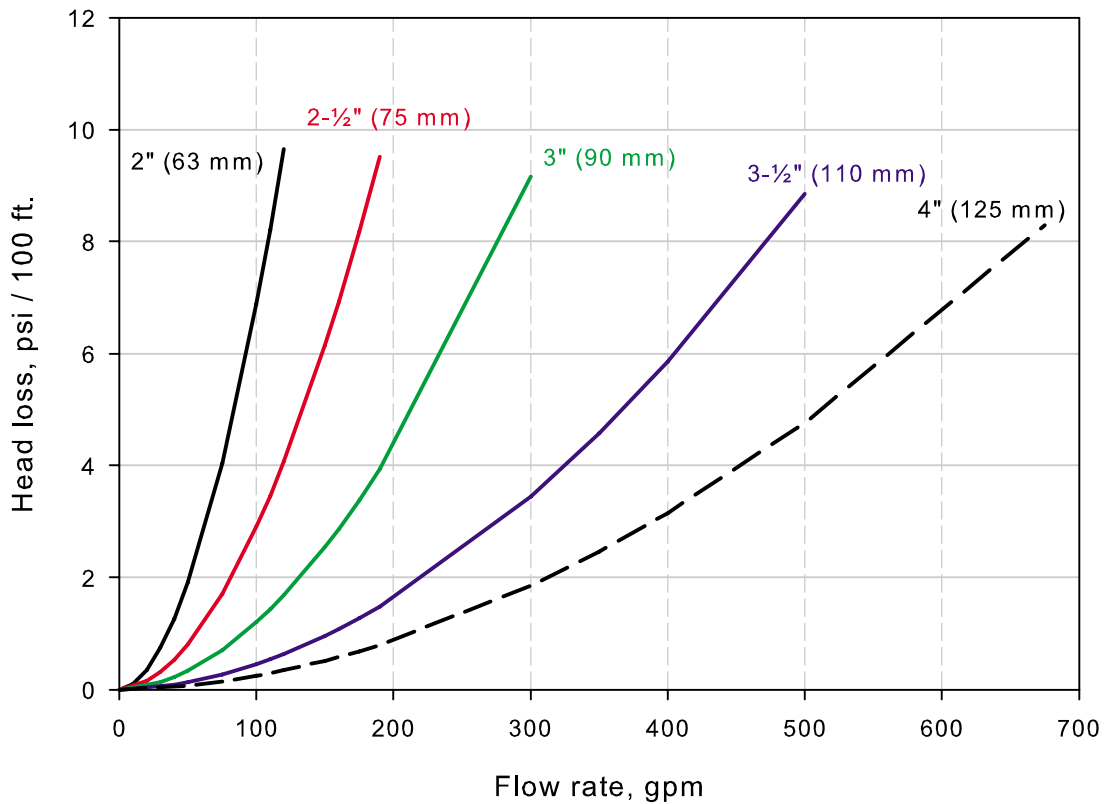
R = feet of head per 100 ft.

v = velocity (ft./ sec)

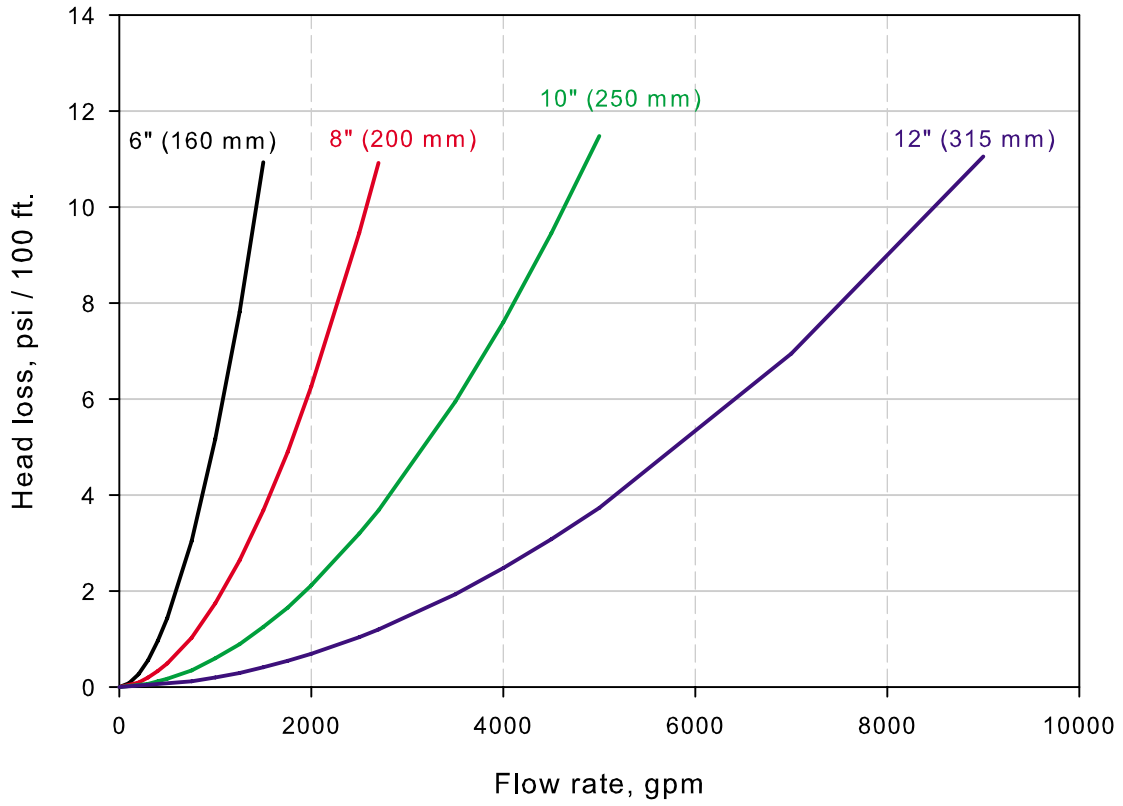
Pressure Loss vs. Flow Rate
1/2" thru 1-1/2", SDR 11



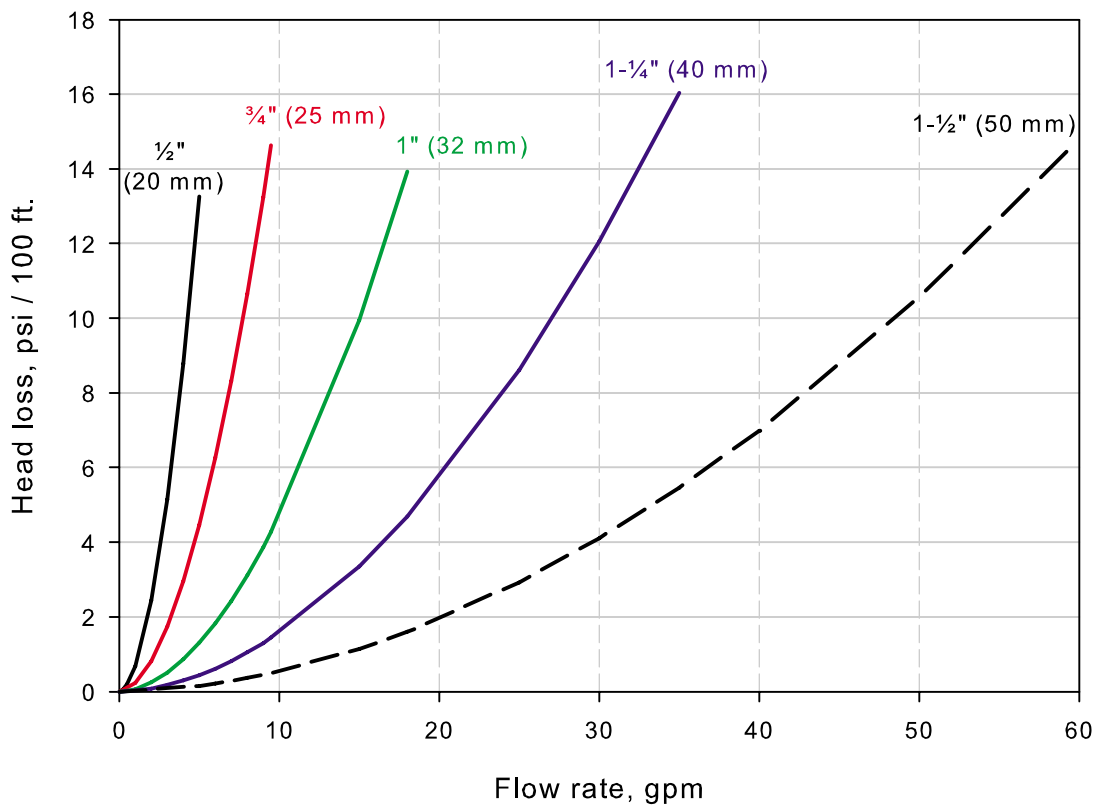
Pressure Loss vs. Flow Rate
2" thru 4", SDR 11



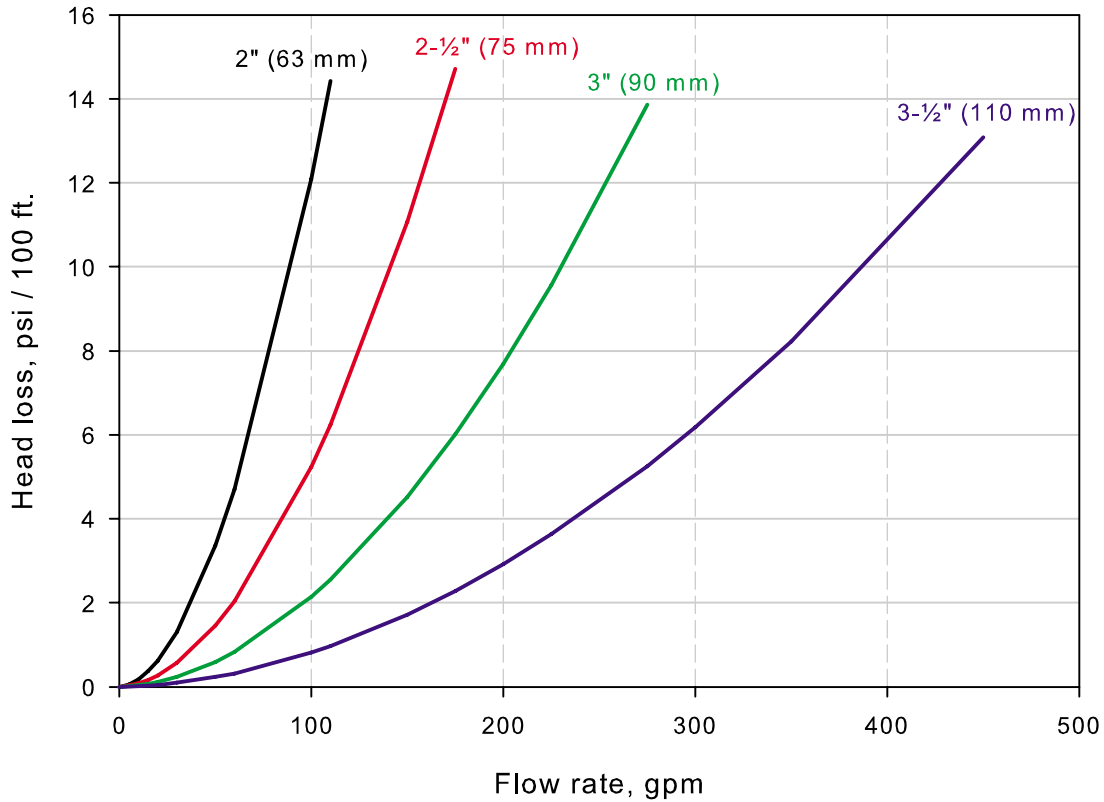
Pressure Loss vs. Flow Rate
6" thru 12", SDR 11



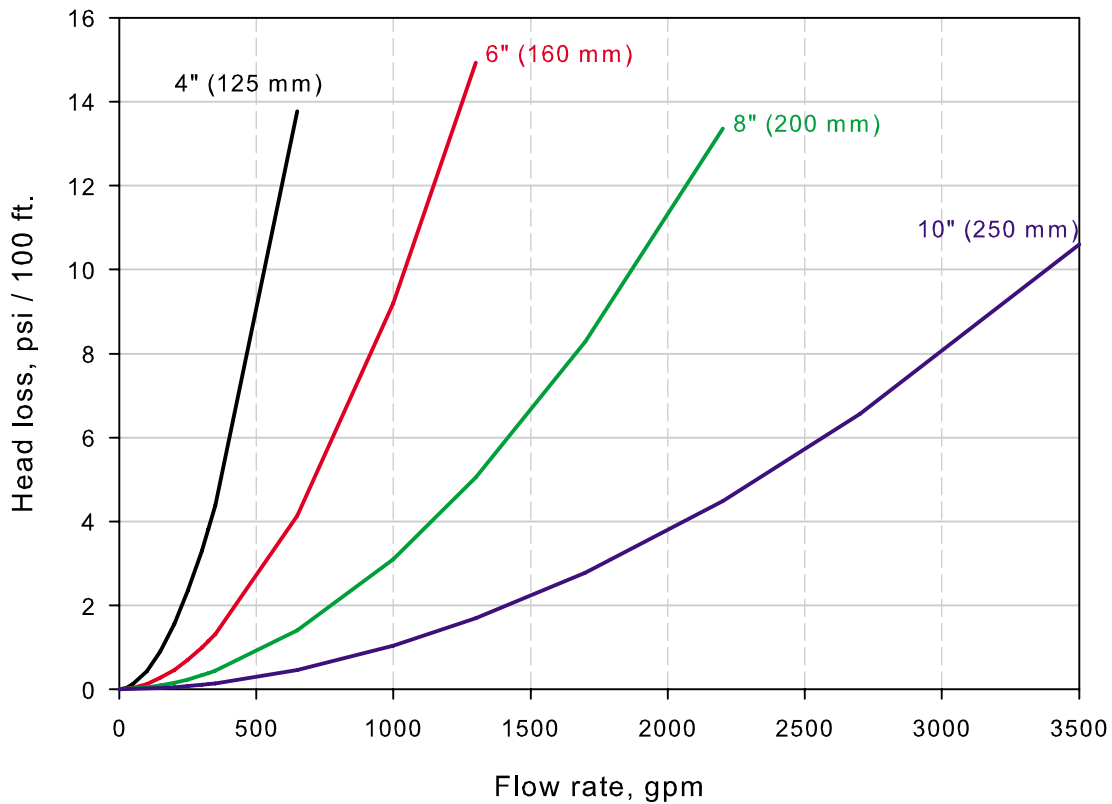
Pressure Loss vs. Flow Rate
½" thru 1-½", SDR 7.4



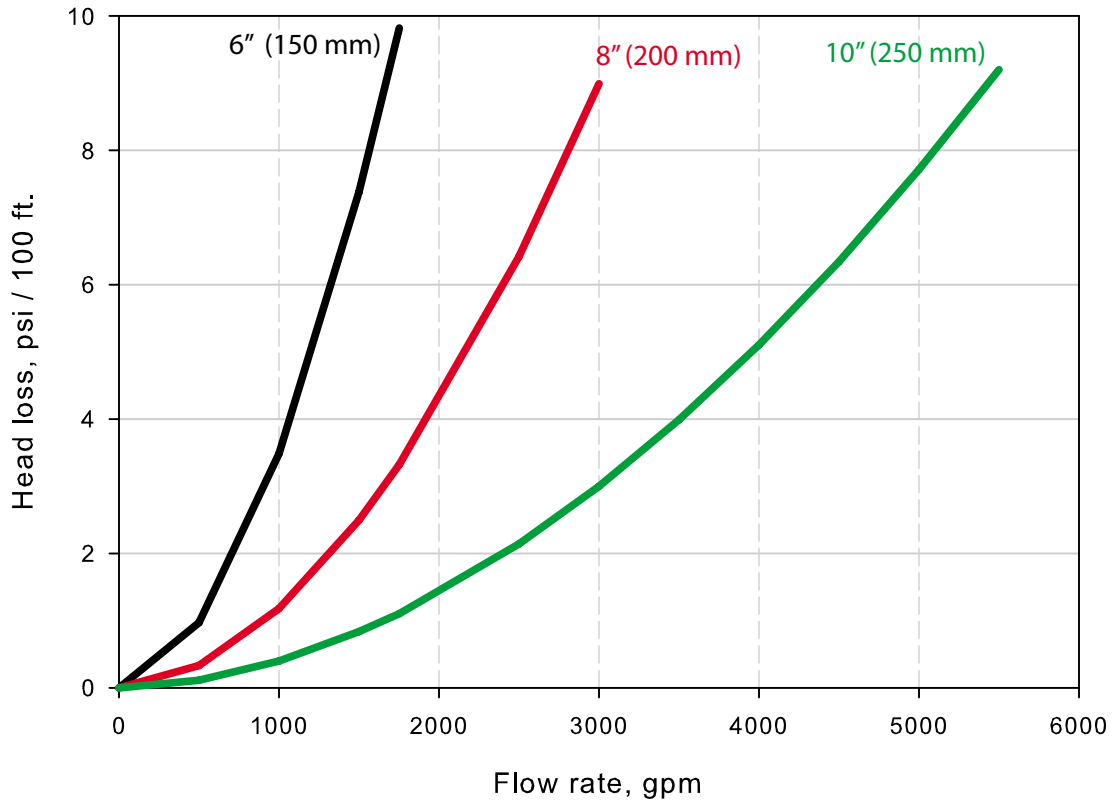
Pressure Loss vs. Flow Rate
2" thru 3-½", SDR 7.4



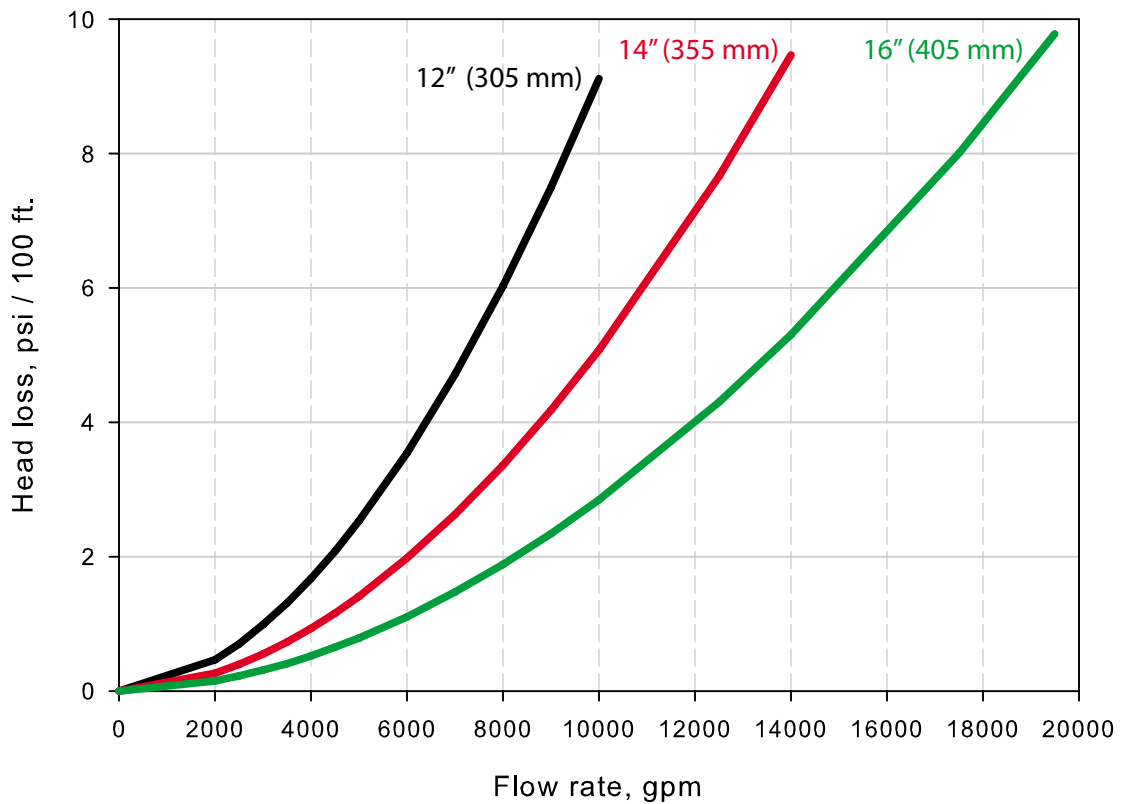
Pressure Loss vs. Flow Rate
4" thru 10", SDR 7.4

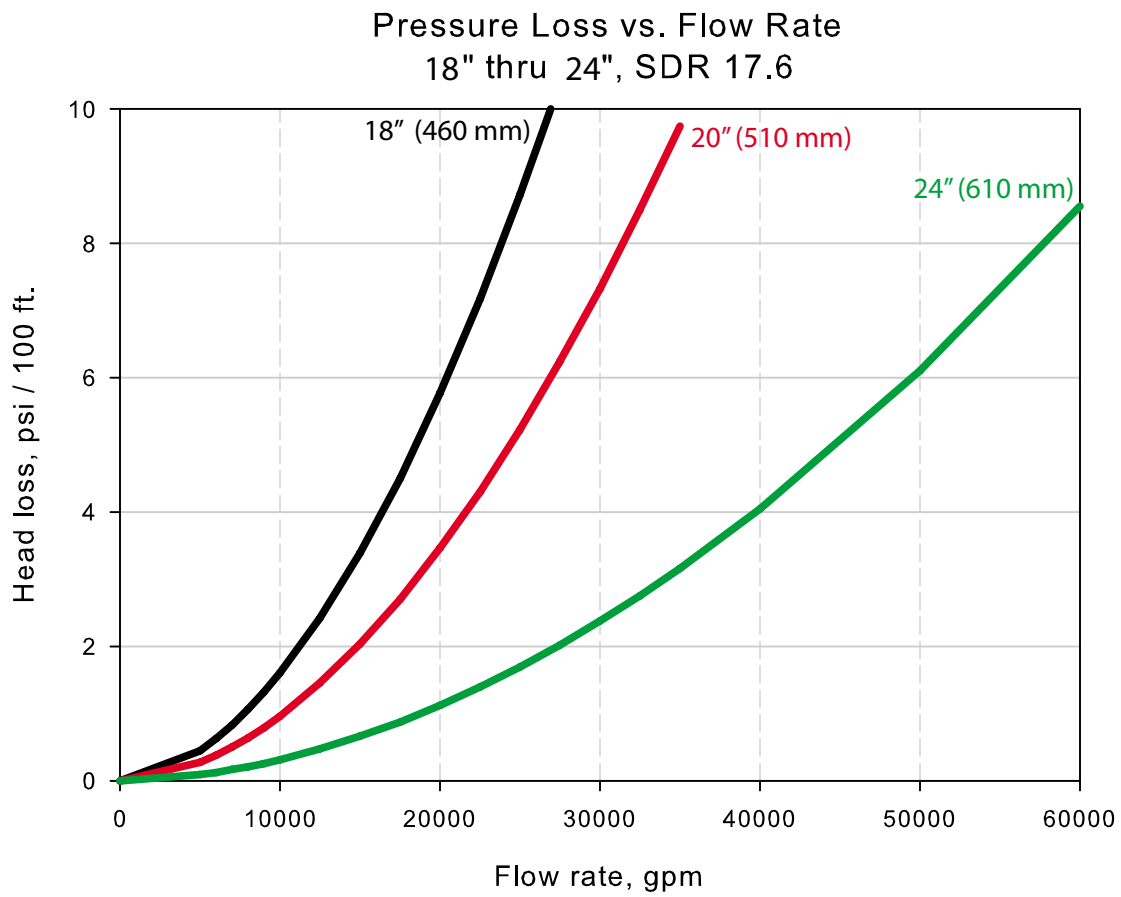


Pressure Loss vs. Flow Rate
6" thru 10", SDR 17.6



Pressure Loss vs. Flow Rate
12" thru 16", SDR 17.6





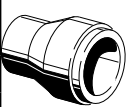
Equivalent lengths of fittings (ft)

	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		0.5	0.7	0.9	1.1	1.4	1.7	2.1	2.5	3.0	4.2

	Butt welded	6" / 160 mm	8" / 200 mm	10" / 250 mm	12" / 315 mm	14" / 355 mm	16" / 400 mm	18" / 450 mm	20" / 500 mm	22" / 560 mm	24" / 630 mm
	SDR 7.4	1.5	1.9	2.4	3.0	3.4	-	-	-	-	-
	SDR 11	1.7	2.1	2.7	3.4	3.8	4.3	4.8	-	-	-
	SDR 17.6	1.9	2.3	2.9	3.7	4.1	4.7	5.2	5.8	6.5	7.3

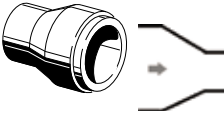
	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	SDR 7.4	6" / 160 mm	8" / 200 mm	10" / 250 mm	12" / 315 mm	14" / 355 mm	16" / 400 mm	18" / 450 mm	20" / 500 mm	22" / 560 mm	24" / 630 mm
		0.5	0.5	0.5	-	-	-	-	-	-	-
0.5		0.5	0.5	-	-	-	-	-	-	-	
SDR 11	0.5	0.5	0.5	-	-	-	-	-	-	-	
	0.5	0.5	0.5	-	-	-	-	-	-	-	
	0.5	0.5	0.5	-	-	-	-	-	-	-	

	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		0.9	1.1	1.4	1.7	2.2	2.8	3.3	3.9	4.8	6.7
	Butt welded	6" / 160 mm	8" / 200 mm	10" / 250 mm	12" / 315 mm	14" / 355 mm	16" / 400 mm	18" / 450 mm	20" / 500 mm	22" / 560 mm	24" / 630 mm
		7.6	9.5	11.9	15.0	16.9	-	-	-	-	-
8.6		10.7	13.4	16.9	19.1	21.5	24.2	-	-	-	
SDR 17.6	9.3	11.6	14.5	18.3	20.7	23.3	26.2	29.1	32.6	36.7	


	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		-	1.4	1.7	2.2	2.7	3.4	4.1	4.9	6.0	8.4
	Butt welded	6" / 160 mm	8" / 200 mm	10" / 250 mm	12" / 315 mm	14" / 355 mm	16" / 400 mm	18" / 450 mm	20" / 500 mm	22" / 560 mm	24" / 630 mm
		9.5	11.9	14.9	18.8	21.1	-	-	-	-	-
10.7		13.4	16.8	21.1	23.8	26.9	30.2	-	-	-	
SDR 17.6	11.6	14.5	18.2	22.9	25.8	29.1	32.7	36.4	40.7	45.8	

	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		-	-	2.1	2.6	3.3	4.1	4.9	5.9	7.2	10.1
	Butt welded	6" / 160 mm	8" / 200 mm	10" / 250 mm	12" / 315 mm	14" / 355 mm	16" / 400 mm	18" / 450 mm	20" / 500 mm	22" / 560 mm	24" / 630 mm
		11.4	14.3	17.9	22.5	25.4	-	-	-	-	-
12.9		16.1	20.1	25.4	28.6	32.2	36.2	-	-	-	
SDR 17.6	14.0	17.4	21.8	27.5	31.0	34.9	39.3	43.6	48.9	55.0	


Equivalent lengths of fittings (ft)

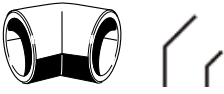
Bushing (by 4 dimensions)	Socket fusion	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm
	Butt welded	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
	SDR 7.4	13.3	16.7	20.8	26.3	29.6	-	-	-	-	-
	SDR 11	15.0	18.8	23.5	29.6	33.4	37.6	42.3	-	-	-
	SDR 17.6	16.3	20.3	25.4	32.1	36.1	40.7	45.8	50.9	57.0	64.1

Bushing (by 5 dimensions)	Socket fusion	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm
	Butt welded	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
	SDR 7.4	15.2	19.1	23.8	30.0	33.8	-	-	-	-	-
	SDR 11	17.2	21.5	26.8	33.8	38.1	43.0	48.3	-	-	-
	SDR 17.6	18.6	23.3	29.1	36.6	41.3	46.5	52.4	58.2	65.2	73.3

Bushing (by 6 dimensions)	Socket fusion	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm
	Butt welded	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
	SDR 7.4	17.2	21.4	26.8	33.8	38.1	-	-	-	-	-
	SDR 11	19.3	24.2	30.2	38.1	42.9	48.4	54.4	-	-	-
	SDR 17.6	20.9	26.2	32.7	41.2	46.5	52.4	58.9	65.4	73.3	82.5


Elbow 90°	Socket fusion	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm
	Butt welded	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
	SDR 7.4	14.3	17.9	22.3	18.0	20.3	-	-	-	-	-
	SDR 11	10.3	12.9	16.1	20.3	22.9	25.8	29.0	-	-	-
	SDR 17.6	11.2	14.0	17.4	22.0	24.8	27.9	31.4	34.9	39.1	44.0


Elbow 90° (male / female)	Socket fusion	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm
	Butt welded	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
	SDR 7.4	14.3	17.9	22.3	18.0	20.3	-	-	-	-	-


Elbow 45°	Socket fusion	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm
	Butt welded	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
	SDR 7.4	7.6	9.5	11.9	11.3	12.7	-	-	-	-	-
	SDR 11	6.4	8.1	10.1	12.7	14.3	16.1	18.1	-	-	-
	SDR 17.6	7.0	8.7	10.9	13.7	15.5	17.5	19.6	21.8	24.4	27.5


[→ = flow direction]


Equivalent lengths of fittings (ft)


Elbow 45° (male / female) 	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		0.9	1.1	1.4	1.7	-	-	-	-	-	-

Tee (thru-flow) 	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		0.5	0.7	0.9	1.1	1.4	1.7	2.1	2.5	3.0	4.2
	Butt welded	6" / 160 mm	8" / 200 mm	10" / 250 mm	12" / 315 mm	14" / 355 mm	16" / 400 mm	18" / 450 mm	20" / 500 mm	22" / 560 mm	24" / 630 mm
		SDR 7.4	4.8	6.0	7.4	9.4	10.6	-	-	-	-
		SDR 11	5.4	6.7	8.4	10.6	11.9	13.4	15.1	-	-
SDR 17.6	5.8	7.3	9.1	11.5	12.9	14.5	16.4	18.2	20.4	22.9	

Tee (separation of flow) 	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		2.6	3.3	4.2	5.2	6.6	8.3	9.8	11.8	14.4	20.1
	Butt welded	6" / 160 mm	8" / 200 mm	10" / 250 mm	12" / 315 mm	14" / 355 mm	16" / 400 mm	18" / 450 mm	20" / 500 mm	22" / 560 mm	24" / 630 mm
		SDR 7.4	22.9	28.6	35.7	45.0	50.7	-	-	-	-
		SDR 11	25.8	32.2	40.3	50.7	57.2	64.5	72.5	-	-
SDR 17.6	27.9	34.9	43.6	55.0	62.0	69.8	78.5	87.2	97.8	110.0	

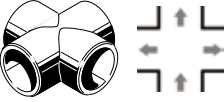
Tee (conjunction of flow) 	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		1.7	2.2	2.8	3.5	4.4	5.5	6.6	7.9	9.6	13.4
	Butt welded	6" / 160 mm	8" / 200 mm	10" / 250 mm	12" / 315 mm	14" / 355 mm	16" / 400 mm	18" / 450 mm	20" / 500 mm	22" / 560 mm	24" / 630 mm
		SDR 7.4	15.2	19.1	23.8	30.0	33.8	-	-	-	-
		SDR 11	17.2	21.5	26.8	33.8	38.1	43.0	48.3	-	-
SDR 17.6	18.6	23.3	29.1	36.6	41.3	46.5	52.4	58.2	65.2	73.3	

Tee (counter current in case of separation of flow) 	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		3.9	4.9	6.3	7.9	9.9	12.4	14.8	17.7	21.7	30.2
	Butt welded	6" / 160 mm	8" / 200 mm	10" / 250 mm	12" / 315 mm	14" / 355 mm	16" / 400 mm	18" / 450 mm	20" / 500 mm	22" / 560 mm	24" / 630 mm
		SDR 7.4	34.3	42.9	53.6	67.5	76.1	-	-	-	-
		SDR 11	38.7	48.3	60.4	76.1	85.8	96.7	108.7	-	-
SDR 17.6	41.9	52.3	65.4	82.4	93.0	104.7	117.8	130.9	146.6	164.9	


Tee (counter current in case of conjunction of flow) 	Socket fusion	½" / 20 mm	¾" / 25 mm	1" / 32 mm	1 ¼" / 40 mm	1 ½" / 50 mm	2" / 63 mm	2 ½" / 75 mm	3" / 90 mm	3 ½" / 110 mm	4" / 125 mm
		5.2	6.5	8.2	10.4	13.1	16.4	24.6	29.5	36.1	50.3
	Butt welded	6" / 160 mm	8" / 200 mm	10" / 250 mm	12" / 315 mm	14" / 355 mm	16" / 400 mm	18" / 450 mm	20" / 500 mm	22" / 560 mm	24" / 630 mm
		SDR 7.4	57.2	71.5	89.3	112.5	126.8	-	-	-	-
		SDR 11	64.4	80.5	100.7	126.9	143.0	161.2	181.2	-	-
SDR 17.6	69.8	87.2	109.1	137.4	154.9	174.5	196.4	218.1	244.4	274.9	

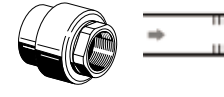
(⇒ = flow direction)

Equivalent lengths of fittings (ft)

Cross (separation of flow)	Socket fusion	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm
	Butt welded	6" 160 mm	8" 200 mm	10" 250 mm	12" 315 mm	14" 355 mm	16" 400 mm	18" 450 mm	20" 500 mm	22" 560 mm	24" 630 mm
	SDR 7.4	40.0	50.0	62.5	78.8	88.8	-	-	-	-	-
	SDR 11	45.1	56.4	70.5	88.8	100.1	112.9	126.8	-	-	-
	SDR 17.6	48.8	61.0	76.3	96.2	108.4	122.2	137.5	152.7	171.1	192.4

Cross (conjunction of flow)	Socket fusion	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm
	Butt welded	6" 160 mm	8" 200 mm	10" 250 mm	12" 315 mm	14" 355 mm	16" 400 mm	18" 450 mm	20" 500 mm	22" 560 mm	24" 630 mm
	SDR 7.4	70.5	88.1	110.2	138.8	156.4	-	-	-	-	-
	SDR 11	79.5	99.3	124.1	156.5	176.4	198.8	223.5	-	-	-
	SDR 17.6	86.1	107.6	134.5	169.5	191.1	215.2	242.2	269.0	301.4	339.0

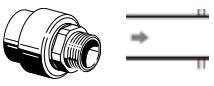
Fusion outlet (separation of flow) ^a	Side-wall fusion (based on branch size)	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"	6"	8"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm	160 mm	200 mm
		0.6	0.8	1.0	1.3	1.7	2.1	2.5	3.0	3.6	5.0	5.8	6.5


Transition (female thread)	Socket fusion	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	3 ½"	4"
		20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	75 mm	90 mm	110 mm	125 mm
		1.1	1.4	1.7	2.2	2.7	3.4	4.1	-	-	-


[→ = flow direction]


^a Note: For reducing tees, add the "thru-flow" value in the main line to the configuration value in the branch size. For example, a 4" x 4" x ¾" reducing tee with flow separation would be 4.2 ft + 3.3 ft = 7.5 ft, while a conjunction of flow would be 4.2 ft + 2.2 ft = 6.4 ft.


Equivalent lengths of fittings (ft)

Transition (male thread) 	Socket fusion	1/2" 20 mm	3/4" 25 mm	1" 32 mm	1 1/4" 40 mm	1 1/2" 50 mm	2" 63 mm	2 1/2" 75 mm	3" 90 mm	3 1/2" 110 mm	4" 125 mm
		1.5	1.9	2.4	3.1	3.8	4.8	5.7	6.9	8.4	-

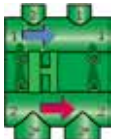
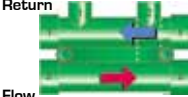

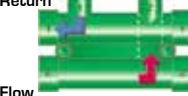
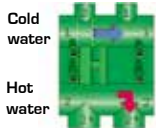
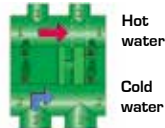
Elbow (female thread) 	Socket fusion	1/2" 20 mm	3/4" 25 mm	1" 32 mm	1 1/4" 40 mm	1 1/2" 50 mm	2" 63 mm	2 1/2" 75 mm	3" 90 mm	3 1/2" 110 mm	4" 125 mm
		1.9	2.4	3.0	-	-	-	-	-	-	-

Elbow (male thread) 	Socket fusion	1/2" 20 mm	3/4" 25 mm	1" 32 mm	1 1/4" 40 mm	1 1/2" 50 mm	2" 63 mm	2 1/2" 75 mm	3" 90 mm	3 1/2" 110 mm	4" 125 mm
		2.2	2.7	3.5	-	-	-	-	-	-	-

Tee (female thread) 	Socket fusion	1/2" 20 mm	3/4" 25 mm	1" 32 mm	1 1/4" 40 mm	1 1/2" 50 mm	2" 63 mm	2 1/2" 75 mm	3" 90 mm	3 1/2" 110 mm	4" 125 mm
		3.5	4.4	5.6	-	-	-	-	-	-	-

Tee (male thread) 	Socket fusion	1/2" 20 mm	3/4" 25 mm	1" 32 mm	1 1/4" 40 mm	1 1/2" 50 mm	2" 63 mm	2 1/2" 75 mm	3" 90 mm	3 1/2" 110 mm	4" 125 mm
		3.9	-	-	-	-	-	-	-	-	-

Equivalent lengths of distribution blocks

Picture	Comment	Picture	Comment	Equivalent length (ft)
Potable water installation Cold water  Hot water	Reduced 3/4" (25 mm) passage for separation of flow	Heating installation Return  Flow	Reduced 1/2" (20 mm) passage for separation of flow	2.0
	3/4" (25 mm) passage for separation of flow		1/2" (20 mm) passage for separation of flow	0.5
Potable water installation Cold water  Hot water	1/2" (20 mm) passage for separation of flow	Heating installation Return  Flow	3/8" (16 mm) branch for separation of flow	1.6
	1/2" (20 mm) branch for conjunction of flow		3/8" (16 mm) branch in case of conjunction of flow	3.2
	Reduced 1/2" (20 mm) passage for separation of flow		3/8" (16 mm) branch for separation of flow	4.4
Potable water installation Cold water  Hot water Hot water return 			3/4" (25 mm) branch for separation of flow	2.4
				3/8" (16 mm) branch for conjunction of flow

Maximum pull force

A major advantage of using PP-R is that the pipes have a very high tensile strength. And because Aquatherm uses heat-fused connections, that tensile strength is consistent through the connections. The result is a system that can be assembled in large sections and moved without the risk of damaging the pipe or the connections.

The following tables give the maximum pull force that can be exerted on the pipe before stretching it (and thus weakening it). Vertically, the pull force is based on the weight of the attached pipe and fittings. Horizontally, the friction of the ground must also be considered. Wetting the ground before dragging the pipe can help reduce the friction.

Their physical strength makes Aquatherm pipes exceptionally well suited for directional boring. However, it is important to use pull heads that are compatible with metric pipe. When selecting a pull head, use the metric size of the pipe, not the nominal imperial size.

Pipe diameter	Max pull force (lb)		
	SDR 7.4	SDR 11	SDR 17.6
6" — 160 mm	16,055	11,353	7,362
8" — 200 mm	25,087	17,739	11,503
10" — 250 mm	39,198	27,718	17,973
12" — 315 mm	62,230	44,005	28,534
14" — 355 mm	79,038	55,890	36,241
16" — 400 mm	100,346	70,958	46,012
18" — 450 mm	127,001	89,806	58,233
20" — 500 mm	156,791	110,871	71,893
22" — 560 mm	196,678	139,077	90,183
24" — 630 mm	248,921	176,019	114,137

CHAPTER 4

INSTALLATION PRINCIPLES

Heat fusion

Fusion techniques

Installation concepts

Supporting the pipe

Linear expansion

Expansion controls

Fusion outlets

Transition fittings

Distribution blocks

Other considerations

Pressure test

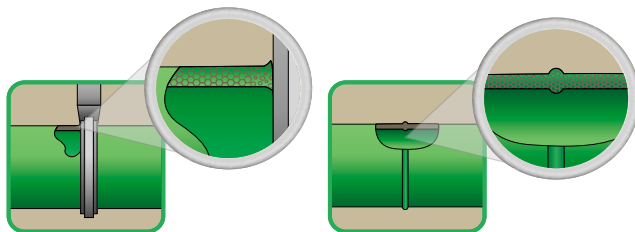


Heat fusion connections

All Aquatherm piping products are made from the same reliable PP-R material and are engineered to be heat fused together. Since pipes and fittings come in sizes ranging from ½" to 24" in diameter, the fusion process, equipment required, and installation time will vary, but the principles of heat fusion remain the same.

For a proper heat fusion connection, the two surfaces being fused are heated to a melting temperature, pressed together, and allowed to cool under pressure. This process allows the PP-R chains to reform as one, joining the pieces together without the need for glues, solders, gaskets, or other foreign materials.

By eliminating the foreign materials in the connection, heat fusion removes the most likely source of leaks and failures. The fused



portion of the pipe also retains its flexibility and resistance to impact, making the connection easier and safer to prefabricate and transport. In short, a properly fused joint behaves as if it were manufactured that way.

There are several methods of fusion used in joining Aquatherm pipes. Each of these methods, if properly executed, will provide a connection that is stronger than the pipe itself. A final pressure test will help verify the integrity of the connections, and drastically reduce the risk of failure due to improper installation. Aquatherm's heat fusion training courses are designed to help installers know when to employ each of these different methods and to become skilled in using them.



Training and installation

Aquatherm offers detailed training courses to prepare installers for using Aquatherm PP-R products and approved tools. These courses are intended to help supplement the skills of licensed plumbers and pipe fitters. They are designed to minimize the learning curve associated with installing a new piping system, and prevent potentially costly on-the-job mistakes.

The available courses are as follows:

- **Aquatherm Installer Course:** a comprehensive course that covers the PP-R material, the heat fusion process, and how to fuse pipe from ½" to 4" OD. The course focuses heavily on socket fusion with hand irons, including fusion outlets, and includes some practice with an assisted fusion machine. This course is required before taking the other courses.
- **Aquatherm Butt Welding Course:** this course focuses on fusing pipe sizes 6" OD and larger. It gives a generic explanation of butt fusion, which can be applied to a variety of machine styles. Specific training from the manufacturer for the machines being used is still recommended.
- **Aquatherm Electrofusion Course:** a course designed for an alternative socket fusion method using electrical resistance heat rather than contact heat. A common alternative for risers, repairs, and other tough-to-reach applications.

These courses are taught by authorized Aquatherm trainers. Installers are required to take the appropriate course for the type of fusions they will be performing. Training is available through local wholesalers and manufacturer's representatives. All coursework should be completed before beginning installation. Failure to follow proper installation procedures will void the warranty.

The information provided in this product catalog regarding proper fusion and installation procedures has been summarized and is for general reference only. It is not intended for use as the installation instructions. Full installation instructions can be found in the Aquatherm Installer Manual. The information in the Installer Manual is supplemented by Technical Bulletins, which can be found at www.aquatherm.com/bulletin and are distributed with the Aquatherm newsletter.

The Aquatherm Installer Manual is distributed with training, and is available upon request. Visit www.aquatherm.com/technical-documents for the most up-to-date version.

Socket fusion

Socket fusion is used for pipe and fittings from ½" to 4" in diameter. To perform a proper fusion, the pipe is cut, marked for insertion depth, and heated along with the socket fitting for a specified time. The pipe and fitting are then pushed together and allowed to cool. The pressure for these connections comes from the OD of the pipe being slightly larger than the ID of the fitting. Marking the pipe to the proper welding depth helps bring the connection to its maximum strength without flow restriction.



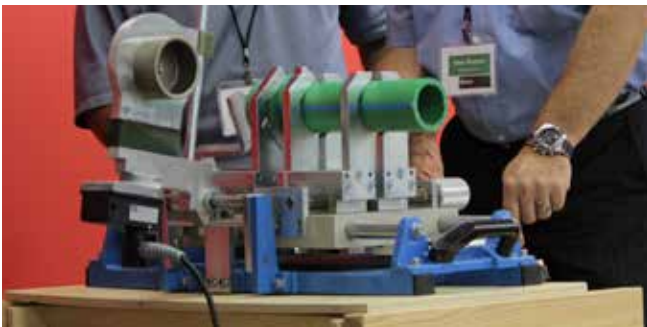
Butt fusion

Butt fusion (or butt welding) is used for pipe and fittings from 6" to 24" in diameter. The process consists of planing the ends of the pipe smooth, pressing them against a heating plate, and then pressing them together to cool. This allows larger sizes of pipe to be assembled without the need for additional couplings. Butt fusion fittings are either made from the pipe itself, or to the same OD as the pipe, so they can be fused directly to the face of the pipe.



Mechanically assisted fusions

For socket fusions in sizes larger than 2", it can be difficult for one installer to make a proper connection by hand. Fusion machines can act as a second pair of hands to hold the pipe, speed up the connection process, and even assist with alignment and insertion depth.



Fusion machines come in a variety of designs. Bench-style machines (shown above) offer greater support and alignment control. Jig-style machines (shown below) are lighter and offer more workspace flexibility. Some installers use a variety of machines, depending on the application.



Outlet fusion

As an easy and reliable alternative to reducing tees, Aquatherm offers fusion outlets that can be installed directly onto the outside of the pipe. This allows for increased design flexibility and simplified installation. Fusion outlets are socket fused using welding heads and heating irons.



Electrofusion

This alternative to socket fusion is commonly used when space is very limited, or the pipe cannot be moved laterally in order to perform a fusion. Heat is generated by a current run through electrical coils inside the fittings.



A new way of thinking

Aquatherm piping systems offer many innovative technologies and advantages that can greatly improve the speed and ease of installation. These advantages include:

- Fusion connections
- Fusion outlets
- Lightweight material
- Resilient, slightly flexible pipe and connections
- Reduced expansion and contraction

To fully utilize these advantages, a different mind-set from metal or even other plastic systems is required.

A craftsman's pipe

As a company, Aquatherm takes pride in the systems they manufacture and expects the same from those installing it. No matter the quality of the material, the performance of a system will always depend on how carefully and professionally it is installed. Aquatherm piping systems are designed to look neat and clean when installed, making it easier to expand the system or trace lines. Square fittings and rigid pipe provide a traditional layout, such as an installer would use with copper or steel.

Planning

As with any piping system, the speed and accuracy of an Aquatherm installation is improved with careful planning. Planning will allow for a greater amount of prefabrication and a lower probability of error.

All fusion connections require a certain amount of space and mobility around each joint. When installing an Aquatherm piping system, it is important to be conscious of the workspace in which each fusion will be performed. The amount of space needed for a fusion machine to operate varies by manufacturer and machine type. It is best to confirm that there will be enough space for the machine to operate while planning the installation.

Prefabrication

Aquatherm piping systems are light, strong, and somewhat flexible, making them ideal for prefabrication. When installing Aquatherm pipe, identify the more complicated assemblies such as drop 90s, flange adapters, branch lines, and headers, and assemble them in-shop or at a prefabrication station on the job site. Many installers will assemble whole mechanical rooms in-shop and move the entire assembly to the job site. If a pipe will pass through an area that is difficult to access, Aquatherm recommends prefabricating all the connections in that area. This can be done offsite or onsite, depending on installer preference.

On-site prefabrication

Polypropylene is lighter than most other piping materials, and fusion

joints adjust easily to reasonable levels of stress from being carried. To take advantage of this, many installers set up a prefab station on the job site, including a workbench, technical drawings, a welding jig or bench machine and the appropriate welding tools. This station is used to measure, cut, and prefabricate pipe and fittings for the installation. Use of this station ensures adequate space for tool operation.

Pre-assembly

Connections done in a shop or at the prefab station on the job site are easier and faster to assemble than connections done on pipe that is already in place. It is possible to greatly speed up installation by attaching the appropriate fittings to one end of the pipe before hanging it. Identify the fittings (couplings, elbows, tees, valves, etc) that will go with each length of pipe and fuse them together before hanging the pipe in its proper place. This will allow you to assemble as many as half your connections without any of the complications associated with in-line or overhead fusions.

Technical bulletins

Due to the wide variety of applications that Aquatherm pipe is used in, and the ongoing development of third-party tools, clamps, insulations, and other solutions, the recommendations for installing Aquatherm products are regularly improved and updated. Aquatherm releases regular technical bulletins to fill in the gaps between editions of the catalog and installer manual.

Aquatherm recommends reading both past and new technical bulletins, in addition to this catalog. Notifications regarding new technical bulletins are sent out monthly with the Aquatherm Newsletter. Technical bulletins are sent to Aquatherm's installers and trainers at least quarterly.



Supporting the pipe

There are two types of Aquatherm pipes: fiber-composite pipes and non-fiber pipes. Fiber-composite pipes are designed for hot water installations and non-fiber pipes are intended only for use in cold water installations. The fiber-composite layer reduces expansion in the pipe and provides linear support. As a result, the support spacing for fiber-composite pipe is wider than other plastics in most cases and is dependent on the temperature of the fluid it is carrying. The hanger spacing for cold water pipes is generally uniform.

The installer should base hanger spacing on the intended temperature of the pipes, taking into account the temperature of the pipes at the time of installation.



Hangers and clamps

When installing Aquatherm pipes, use only rubber-lined or felt-lined clamps. You may use tape to pad the space between the PP-R and the metal on non-clamping hangers, such as clevis hangers.

Metal clamps (even plastic-safe clamps) can damage hot water pipes, and can condensate when used on cold water pipe. When installing chilled water lines in high-humidity areas, use a non-crushable pipe shield. Metal that is in direct contact with the Aquatherm pipe may sweat in certain chilled applications, even if the pipe itself shows no signs of condensation.

When securing the pipe in place, it is important to distinguish between fixed points and sliding points. Fixed points are clamped tightly against the pipe and prevent any expansion or movement through that point. Sliding points are clamped loosely or simply hung and do not restrict expansion or movement. The proper application of each is explained in the next two sections.

Fixed (anchor) points

Fixed points are used to divide the pipe into sections, restricting any uncontrolled movement of the pipe. Fixed points must be measured and installed to accommodate the forces of expansion in the pipe as well as probable additional loads.

When using threaded rods or threaded screws, the drop from the ceiling should be as short as possible. Swinging clamps should not be used as fixed points.

Vertical distributions can be installed using only fixed points. Fiber-composite risers do not require expansion loops, provided that fixed points are located immediately before or after a branch. Pipe clamp distances of vertically installed pipes can be increased by 20% of the tabular values on the following page, (i.e., multiply the tabular value by 1.2).

Sliding (guide) points

Sliding points must allow axial pipe movement without damaging the pipe. When positioning a sliding point, make sure that movement of the pipe is not blocked by walls, fittings, or mechanical equipment installed next to the clamp or hanger.

Clamp and hanger sizing

Use the following table to find the approximate imperial OD for supporting bare pipe. Larger clamps will be needed to go over insulation and/or pipe shields.

Pipe size	Clamp size
½" (20 mm)	¾"
¾" (25 mm)	1"
1" (32 mm)	1 ¼"
1 ¼" (40 mm)	1 ½"
1 ½" (50 mm)	2"
2" (63 mm)	2 ½"
2 ½" (75 mm)	3"
3" (90 mm)	3 ½"
3 ½" (110 mm)	4 ½"
4" (125 mm)	5"

Pipe size	Clamp size
6" (160 mm)	6 ½"
8" (200 mm)	8"
10" (250 mm)	10"
12" (315 mm)	12 ½"
14" (355 mm)	14"
16" (400 mm)	15 ¾"
18" (450 mm)	17 ¾"
20" (500 mm)	19 ¾"
22" (560 mm)	22"
24" (630 mm)	24 ¾"

Increasing hanger spacing

Installers can increase the hanger spacing by running hot water through the pipes before fixing them in place. This reduces the temperature difference between installation and operation. Installers may also use in-line supports to increase the acceptable distance between hangers.

Support intervals

aquatherm green pipe® faser-composite pipe SDR 7.4 & aquatherm blue pipe® SDR 7.4 & 11 faser-composite pipe

These tables provide the support intervals based on pipe size and the difference between the operating fluid temperature and the ambient temperature.

ΔT Difference in temp.	Pipe diameter																
	½" 20 mm	¾" 25 mm	1" 32 mm	1 ¼" 40 mm	1 ½" 50 mm	2" 63 mm	2 ½" 75 mm	3" 90 mm	3 ½" 110 mm	4" 125 mm	6" 160 mm	8" 200 mm	10" 250 mm	12" 315 mm	14" 355 mm	16" 400 mm	18" 450 mm
	Support intervals (ft)																
0 °F (0 °C)	4	4.6	5.2	5.9	6.7	7.5	8	8.5	9.5	10.5	11.2	11.3	11.5	12.5	13.5	15	16
36 °F (20 °C)	4	4	4	4.4	5.1	5.7	6.1	6.4	7.1	7.9	8.9	9	9.2	10.1	11	14	15
54 °F (30 °C)	4	4	4	4.4	5.1	5.7	6.1	6.4	6.9	7.4	8	8.2	8.4	9.2	10	12	13
72 °F (40 °C)	4	4	4	4.1	4.8	5.4	5.7	6.1	6.6	7.1	7.7	7.9	8	8.7	9.5	11	12
90 °F (50 °C)	4	4	4	4.1	4.8	5.4	5.7	6.1	6.2	6.4	6.7	6.9	7.1	7.8	8.5	10	11
108 °F (60 °C)	4	4	4	4	4.4	5.1	5.4	5.7	5.9	6.1	6.4	6.6	6.7	7.1	7.5	9	10
126 °F (70 °C)	4	4	4	4	4.3	4.8	5.1	5.4	5.6	5.7	6.1	6.2	6.4	6.7	7	8	8

Support intervals

aquatherm green pipe SDR 11 & aquatherm lilac pipe® SDR 11

Pipe diameter																
½" 20 mm	¾" 25 mm	1" 32 mm	1 ¼" 40 mm	1 ½" 50 mm	2" 63 mm	2 ½" 75 mm	3" 90 mm	3 ½" 110 mm	4" 125 mm	6" 160 mm	8" 200 mm	10" 250 mm	12" 315 mm	14" 355 mm	16" 400 mm	18" 450 mm
Support intervals (ft)																
4	4	4	4	4	4.6	4.9	5.2	5.9	6.6	7.2	7.5	7.9	8.4	9.5	10.5	11.2

Support intervals

aquatherm blue pipe SDR 17.6 faser-composite pipe

ΔT Difference in temp.	Pipe diameter									
	6" 160 mm	8" 200 mm	10" 250 mm	12" 315 mm	14" 355 mm	16" 400 mm	18" 450 mm	20" 500 mm	22" 560 mm	24" 630 mm
	Support intervals (ft)									
0 °F (0 °C)	8.5	8.7	9.0	9.2	9.4	9.7	10.0	10.3	10.7	10.8
36 °F (20 °C)	6.2	6.6	6.7	6.9	7.1	7.5	7.9	8.4	8.9	9.2
54 °F (30 °C)	5.9	6.2	6.4	6.6	6.7	7.2	7.5	8.0	8.5	9.0
72 °F (40 °C)	5.7	5.9	6.2	6.2	6.4	6.9	7.4	7.7	8.2	8.7
90 °F (50 °C)	5.4	5.7	5.9	6.1	6.1	6.6	7.1	7.5	7.9	8.4
108 °F (60 °C)	5.1	5.4	5.6	5.7	5.7	6.1	6.6	7.1	7.5	7.9
126 °F (70 °C)	4.8	5.1	5.2	5.6	5.7	5.7	6.2	6.7	7.2	7.5

Linear expansion

The linear expansion of pipe depends on the difference between the installation temperature and the operating temperature:

$$\Delta T = T_{\text{operating temperature}} - T_{\text{installation temperature}}$$

Therefore, cold water pipes have practically no linear expansion. They can experience some contraction, but this is not a concern. The heat-fused connections cannot be pulled apart.

Hot water installations can expand visibly and may require expansion loops or sliding elbows to prevent bowing or curving. Aquatherm has significantly reduced the issues related to heat expansion with the introduction of patented faser-composite pipes.

aquatherm faser-composite pipes

The faser-composite layer is a unique feature of Aquatherm piping systems. Made from a blend of the **fusiolen® PP-R** material and e-glass fibers, this layer is perfectly integrated into the center of the Aquatherm pipes. By extruding this special layer into the center of the pipe, the exterior and interior layers remain unaltered.

The e-glass fibers expand less than the PP-R material when heated, which prevents the material they are bonded to from expanding. Because the faser-composite layer does not expand, the outside and inside layers can't either, reducing the overall expansion and contraction of the pipe by 75% when compared to non-faser plastic pipes.



The faser-composite layer uses a low concentration of glass fibers, so the fusion properties of the pipe remain the same. There is also no issue with recycling the pipe, as the fibers can be removed during the process.

Concealed installation

Unlike most piping materials, PP-R is able to absorb the stress caused by expansion within certain limits. The faser-composite layer helps keep the pipe within these limits for most applications.

Concealed installations generally do not require additional consideration for the expansion of faser-composite pipes. Most insulations give enough expansion space for the pipe. In the case where the expansion is greater than the room to move in the insulation, the material absorbs any stress arising from a residual expansion.

The same applies to pipes which do not have to be insulated according to current regulations. The expansion on pipes that don't need to be insulated is minimal because of the lower difference in temperature. The pipe itself can absorb the remaining stress.

Embedding the pipe in concrete or plaster will negate most of the linear expansion. The compressive strain and tensile stress arising from this are no longer critical, as the extra forces are absorbed by the pipe itself. This is also true of pipe that is buried in soil or sand.

Open installation

In the case of exposed installations, it is important to maintain the visual trueness of the pipe as well as compensate for any expansive forces. Aquatherm's faser-composite pipes make this an easy process.

It is important to calculate the expansion of the system and allow the piping to expand. Expansion can be compensated for using sliding elbows and expansion loops. The flexible heat fusion joints will not crack or leak from the tension of expanding and contracting if the bending side is long enough.



Calculation of linear expansion

The coefficient (α) of linear expansion of Aquatherm faser-composite pipes is comparable to the linear expansion of metal pipes and is only:

$$\alpha \text{ faser-composite} = 0.035 \text{ mm/mK} = 2.367 \cdot 10^{-4} \text{ in/ft}^\circ\text{F}$$

The coefficient of linear expansion of Aquatherm piping systems without the fiber-composite layer is comparable to other plastic pipes:

$$\alpha \text{ non-faser} = 0.150 \text{ mm/mK} = 1.008 \cdot 10^{-3} \text{ in/ft}^\circ\text{F}$$

While Aquatherm faser-composite pipes can absorb most of their own expansion stresses, this can cause the pipe to bow or bend. Fixed points should be installed at least every 120 feet, with some form of expansion control between each fixed point. The expansion control must be able to absorb the stress of all the expansion between the two fixed points.

Non-faser pipes used for hot applications should have expansion controls at every 30 feet for straight runs.

Risers of faser-composite pipes may be installed rigidly without expansion compensation. The risers will need to be anchored at each floor. It is recommended to anchor near any branch lines to minimize vertical movement.

The following formula, calculation examples, data tables and diagrams help to determine the linear expansion. The difference between working temperature and maximum or minimum installation temperature is essential for the calculation of linear expansion.

Calculation of linear expansion

Calculation example: Linear expansion

Given and required values

Symbol	Meaning	Value	Measuring unit
ΔL	Linear expansion	?	$\text{in/ft}^\circ\text{F}$
			$\text{mm/m}^\circ\text{K}$
α_1	Coefficient of linear expansion Aquatherm faser-composite pipe	$2.367 \cdot 10^{-4}$	$\text{in/ft}^\circ\text{F}$
		0.035	$\text{mm/m}^\circ\text{K}$
α_2	Coefficient of linear expansion Aquatherm non-faser pipe	$1.008 \cdot 10^{-3}$	$\text{in/ft}^\circ\text{F}$
		0.15	$\text{mm/m}^\circ\text{K}$
L	Pipe length	100	ft
		30.5	m
T_w	Working temperature	160	$^\circ\text{F}$
		71.0	$^\circ\text{C}$
T_M	Installation temperature	60	$^\circ\text{F}$
		15.6	$^\circ\text{C}$
ΔT	Temperature difference between working and installation temperature ($\Delta T = T_w - T_M$)	100	$^\circ\text{F}$
		38.0	$^\circ\text{K}$

$$\Delta T [^\circ\text{F}] \cdot \% = \Delta T [^\circ\text{K}]$$

The linear expansion ΔL is calculated according to the following formula:

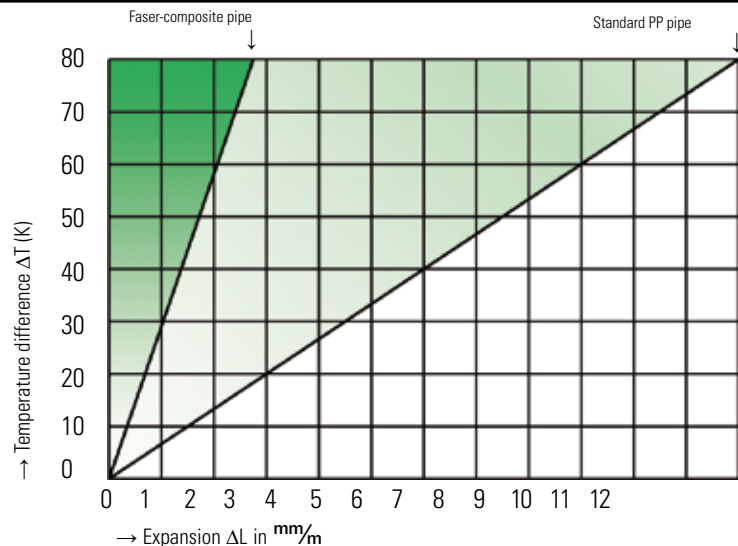
$$\Delta L = \alpha \cdot L \cdot \Delta T$$

Material: Aquatherm faser-composite pipe ($\alpha_1 = 2.367 \cdot 10^{-4} \text{ in/ft}^\circ\text{F}$)

$$\Delta L = 2.367 \cdot 10^{-4} \cdot 100 \text{ ft} \cdot 100^\circ\text{F}$$

$$\Delta L = 2.4 \text{ in}$$

Linear expansion comparison: faser-composite to standard PP pipe



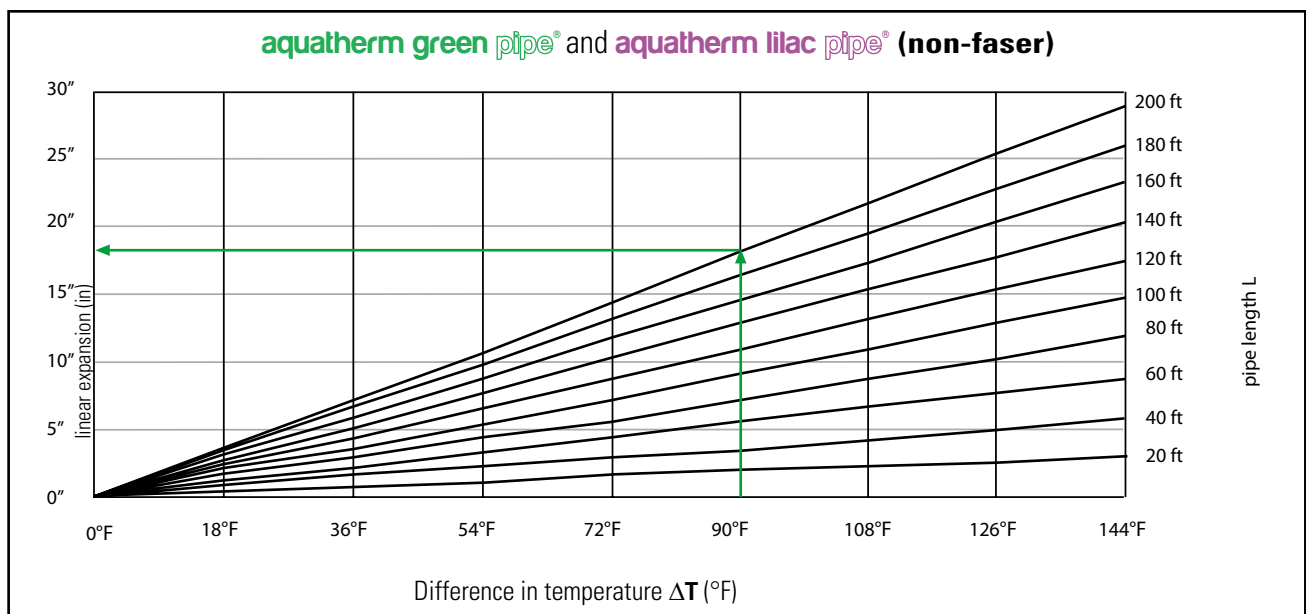
Linear expansion for aquatherm non-faser PP-R pipes

The linear expansion described on the preceding pages can be taken from the following tables and graphs.

Linear expansion ΔL (in):

aquatherm non-faser pipe - $\alpha_2 = 0.150 \text{ mm/mK} = 1.008 \cdot 10^{-3} \text{ in/ft}^\circ\text{F}$

Pipe length	Difference in temperature $\Delta T = T_{\text{operating temperature}} - T_{\text{installation temperature}}$							
	10 °F	20 °F	30 °F	40 °F	50 °F	60 °F	80 °F	100 °F
	Linear expansion ΔL (in)							
10 ft	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0
20 ft	0.2	0.4	0.6	0.8	1.0	1.2	1.6	2.0
30 ft	0.3	0.6	0.9	1.2	1.5	1.8	2.4	3.0
40 ft	0.4	0.8	1.2	1.6	2.0	2.4	3.2	4.0
50 ft	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0
60 ft	0.6	1.2	1.8	2.4	3.0	3.6	4.8	6.0
70 ft	0.7	1.4	2.1	2.8	3.5	4.2	5.6	7.0
80 ft	0.8	1.6	2.4	3.2	4.0	4.8	6.4	8.0
90 ft	0.9	1.8	2.7	3.6	4.5	5.4	7.2	9.0
100 ft	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0
150 ft	1.5	3.0	4.5	6.0	7.5	9.0	12.0	14.9
200 ft	2.0	4.0	6.0	8.0	10.0	12.0	15.9	19.9



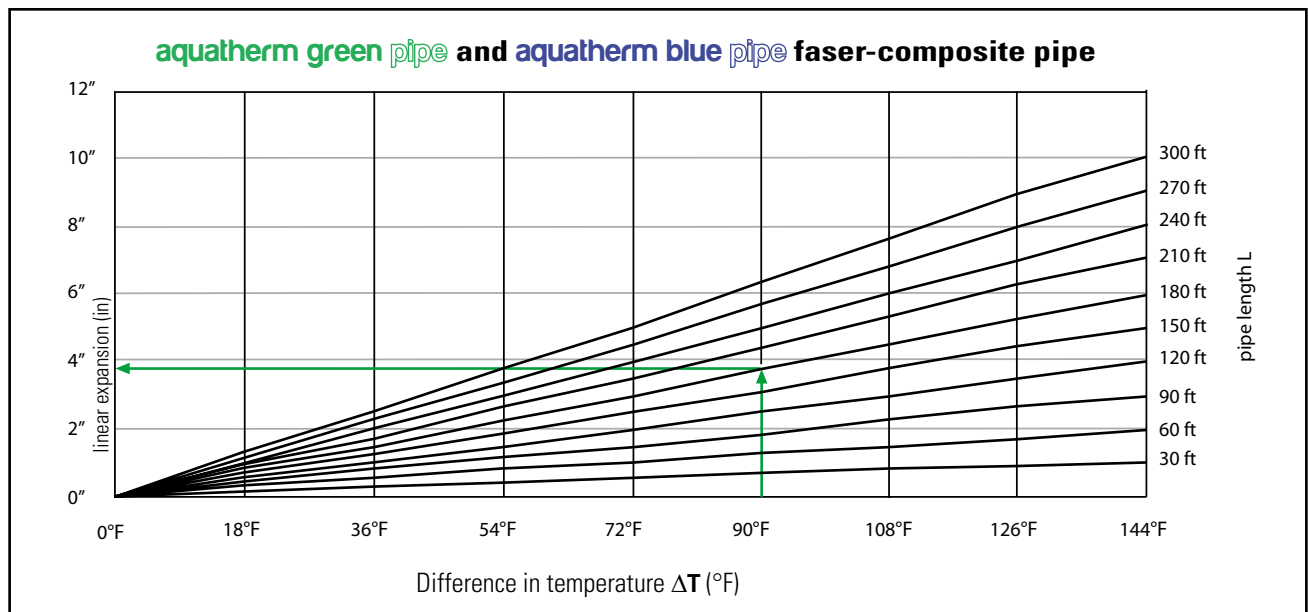
Linear expansion for aquatherm faser-composite PP-R pipes

Due to the integration and positive bond of the different materials, the **aquatherm green pipe**® and **aquatherm blue pipe**® faser-composite pipes offer much higher stability. The linear expansion is reduced to almost 1/5 the value of the standard PP-R pipes.

Linear expansion ΔL (in):

aquatherm faser-composite pipe - $\alpha_1 = 0.035 \text{ mm/mK} = 2.367 \cdot 10^{-4} \text{ "/ft}^\circ\text{F}$

Pipe length	Difference in temperature $\Delta T = T_{\text{operating temperature}} - T_{\text{installation temperature}}$							
	10 °F	20 °F	30 °F	40 °F	50 °F	60 °F	80 °F	100 °F
	Linear expansion ΔL (in)							
10 ft	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2
20 ft	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.5
30 ft	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.7
40 ft	0.1	0.2	0.3	0.4	0.5	0.5	0.7	0.9
50 ft	0.1	0.2	0.3	0.5	0.6	0.7	0.9	1.1
60 ft	0.1	0.3	0.4	0.5	0.7	0.8	1.1	1.4
70 ft	0.2	0.3	0.5	0.6	0.8	1.0	1.3	1.6
80 ft	0.2	0.4	0.5	0.7	0.9	1.1	1.5	1.8
90 ft	0.2	0.4	0.6	0.8	1.0	1.2	1.6	2.1
100 ft	0.2	0.5	0.7	0.9	1.1	1.4	1.8	2.3
150 ft	0.3	0.7	1.0	1.4	1.7	2.1	2.7	3.4
200 ft	0.5	0.9	1.4	1.8	2.3	2.7	3.6	4.6



Expansion controls

Linear expansion from the temperature difference between operating temperature and installation temperature can be addressed with the controls shown here.

Bending side

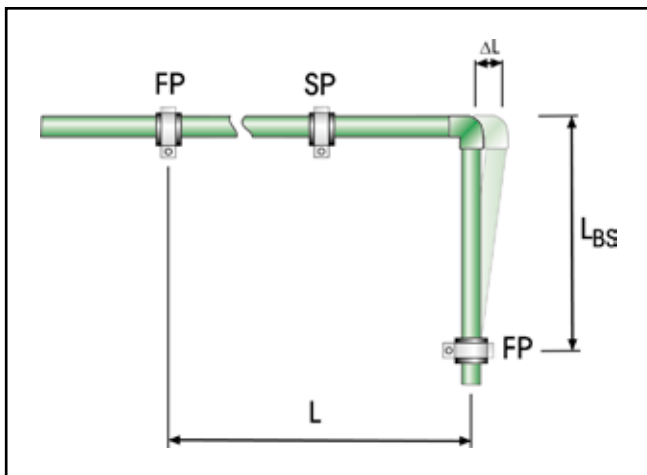
In most cases, directional changes can be used to compensate for linear expansion in pipes. The values of the bending side can be determined using the following tables and diagrams.

Symbol	Meaning		
L_{BS}	Length of the bending side	(in)	(mm)
K	Material-specific constant	2.98*	15
d	Outside diameter	(mm)	(mm)
ΔL	Linear expansion	(in)	(mm)
L	Pipe Length	(ft)	(m)
FP	Fixed point		
SP	Sliding point		

*Includes metric to imperial conversion factor

Calculation of the bending side length:

$$L_{BS} = K \cdot \sqrt{d \cdot \Delta L}$$



Expansion loop

If the linear expansion cannot be compensated for by a change in direction, it may be necessary to install an expansion loop.

In addition to the length of the bending side L_{BS} , the width of the pipe bend A_{min} must be considered.

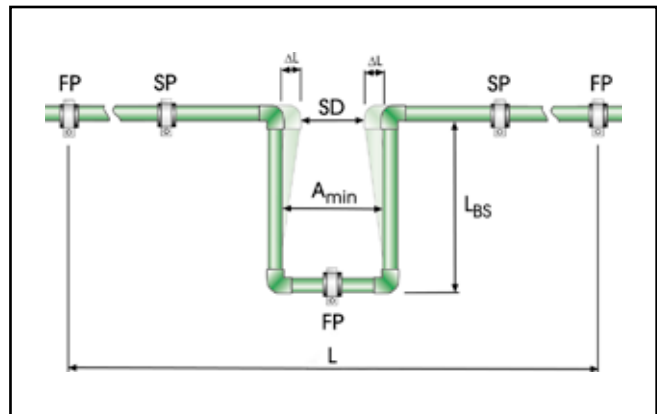
Symbol	Meaning	
A_{min}	Width of the expansion loop	(in)
SD	Safety distance	6 in

The pipe bend A_{min} is calculated according to the following formula:

$$A_{min} = 2 \cdot \Delta L + SD$$

For example, with $\Delta L = 1.4$ in

the width of the expansion loop should be at least $(2 \cdot 1.4) + 6 = 8.8$ in



Pre-expansion

In applications where the system will be continuously running hot, the installer can fill the pipes and begin operation to expand the system before tightening down the clamps. This eliminates concerns about fixed and sliding points. If the system is turned off and the pipes contract, the fittings will not pull apart.

Pre-stress

Where space is limited, it is possible to shorten the total width A_{min} as well as the length of the bending side L_{BSV} by pre-stressing the pipe.

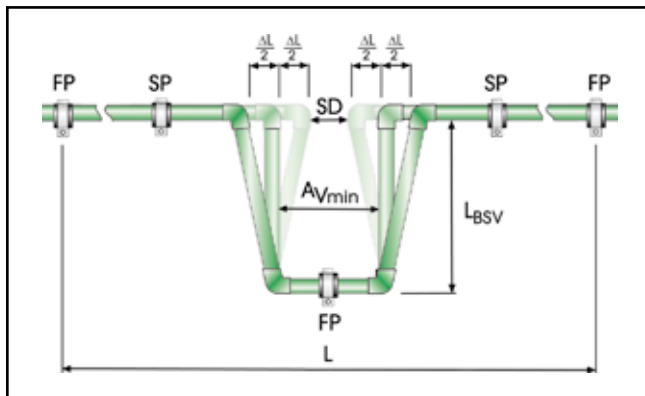
Pre-stressing the pipe during installation can help reduce the length of the bending side. It can also be used to make the operating system look visually square by using ΔL in the equation rather than ΔL_2 .

When shortening the length of the bending side, the new value is defined as:

Symbol	Meaning
L_{BSV}	Length of pre-stress (in)

The bending side length of expansion loops with pre-stress is calculated according to the following equation:

$$L_{BSV} = K \cdot \sqrt{d \cdot \Delta L / 2}$$



As noted previously, the value of K is a material constant (2.98), d is the pipe outside diameter in mm, and ΔL is the previously calculated thermal expansion.

Bellows expansion joint

All corrugated metal bellows expansion joints are unsuitable for use with Aquatherm piping systems. Joints made from elastomeric materials are acceptable. When using axial expansion joints, observe the manufacturer's instructions.

Vertical installation:

Due to the different linear expansion coefficients of the faser and non-faser pipes, the installation of pipe branches in risers has to be made according to the type of pipe.

with faser-composite pipe

The linear expansion of Aquatherm faser-composite pipes in vertical risers can be ignored. The positioning of a fixed point directly before each branch is sufficient to keep the branch line from shifting under expansion.

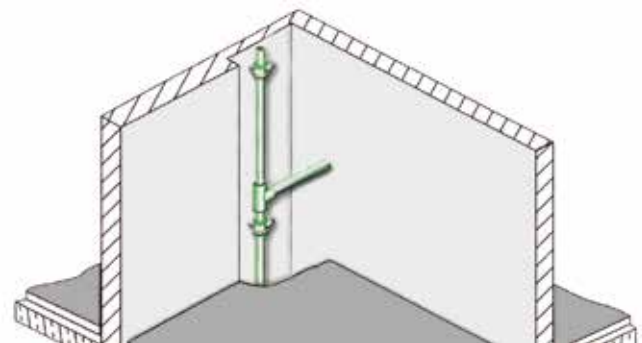
In general, it is possible to install risers rigidly without expansion joints. This directs the expansion on the distance between the fixed points, where it becomes negligible.

It is important to maintain 10 feet of space between two fixed points, and mid-story guides may be necessary for sizes 2" and below.

with non-faser pipe

The installation of risers using Aquatherm pipes without faser-composite requires that branch lines be installed in such a manner as to accommodate linear expansion of the vertical riser. Non-faser pipes in a heated application cannot absorb their own stresses. Adequate expansion controls will need to be added according to the guidelines given earlier in this chapter.

This can be done by installing a fixed point directly before or after each branch line, which prevents the line from moving. Using a large pipe sleeve that can accommodate the movement will also work. A swing joint may also be used to absorb vertical stresses.



Positioning of the fixed point clamp.

Length of bending side for Aquatherm piping systems

The length of the bending side L_{BS} can be taken from the following tables and diagrams with consideration of the applied pipe dimensions and determined linear expansion.

Pipe dimension in inches (mm)	Linear expansion											
	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"	11"	12"
	Length of bending side (in)											
½" (20)	13	19	23	27	30	33	35	38	40	42	44	46
¾" (25)	15	21	26	30	34	37	40	42	45	47	50	52
1" (32)	17	24	29	34	38	42	45	48	51	54	56	59
1¼" (40)	19	27	33	38	42	46	50	54	57	60	63	66
1½" (50)	21	30	37	42	47	52	56	60	64	67	70	73
2" (63)	24	34	41	48	53	58	63	67	71	75	79	82
2½" (75)	26	37	45	52	58	64	69	73	78	82	86	90
3" (90)	28	40	49	57	64	70	75	80	85	90	94	99
3½" (110)	31	44	54	63	70	77	83	89	94	99	104	109
4" (125)	34	47	58	67	70	82	89	95	101	106	111	116
6" (160)	38	54	66	76	85	93	100	107	114	120	126	131
8" (200)	42	60	73	85	95	104	112	120	127	134	141	147
10" (250)	47	67	82	95	106	116	125	134	142	150	157	164
12" (315)	53	75	92	106	119	130	141	151	160	168	177	184
14" (355)	56	79	97	112	126	138	149	159	168	178	186	194
16" (400)	60	84	103	119	133	146	158	169	179	188	198	206
18" (450)	63	89	109	126	141	155	167	178	190	200	210	219
20" (500)	67	94	115	133	149	163	176	188	200	211	221	231
22" (560)	71	100	122	141	158	173	187	199	212	223	234	244
24" (630)	75	106	130	150	167	183	198	212	224	237	248	259

Length of bending side with pre-stress for Aquatherm piping systems

The length of the bending side with pre-stress L_{BSV} can be taken from the following tables and diagrams with consideration of the applied pipe dimensions and determined linear expansion.

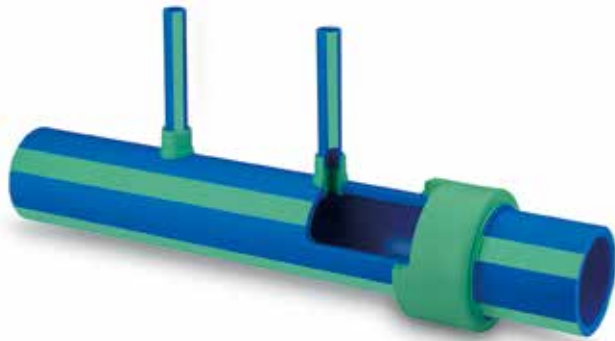
Pipe dimension in inches (mm)	Linear expansion											
	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"	11"	12"
	Length of bending side (in)											
½" (20)	9	13	16	19	21	23	25	27	28	30	31	33
¾" (25)	11	15	18	21	24	26	28	30	32	34	35	37
1" (32)	12	17	21	24	27	29	32	34	36	38	40	42
1¼" (40)	13	19	23	27	30	33	35	38	40	42	44	46
1½" (50)	15	21	26	30	34	37	40	42	45	47	50	52
2" (63)	17	24	29	34	38	41	45	48	51	53	56	58
2½" (75)	18	26	32	37	41	45	49	52	55	58	61	64
3" (90)	20	28	35	40	45	49	53	57	60	64	67	70
3½" (110)	22	31	39	44	50	54	59	63	67	70	74	77
4" (125)	24	34	41	47	53	58	63	67	71	75	79	82
6" (160)	27	38	46	54	60	66	71	76	80	85	89	93
8" (200)	30	42	52	60	67	73	79	85	90	95	99	104
10" (250)	34	47	58	67	75	82	89	95	101	106	111	116
12" (315)	38	53	65	75	84	92	100	106	113	119	125	130
14" (355)	40	56	69	79	89	97	105	112	119	126	132	138
16" (400)	42	60	73	84	94	103	112	119	126	133	140	146
18" (450)	45	63	77	89	100	109	118	126	134	141	148	155
20" (500)	47	67	82	94	105	115	125	133	141	149	156	163
22" (560)	50	71	86	100	112	122	132	141	150	158	165	173
24" (630)	53	75	92	106	118	130	140	150	159	167	175	183

Fusion outlets

For installations with branch lines, fusion outlets offer many advantages over traditional reducing tees. Fusion outlets are installed directly onto the side of the pipe and can be added after the main lines are already in place. Fusion outlets also generate less friction than a reducing tee, lowering the pressure loss of the entire system.

Fusion outlets are installed by drilling out a properly sized hole and then fusing the fitting in place using socket fusion tools. The drilling bores offered by Aquatherm will produce properly sized holes, but the bits larger than 2" require a drill press to operate. Bores produced by other companies must be at least 1 mm smaller than the intended branch, and should be no more than 3 mm smaller.

The table below can help determine if a fusion outlet is available for a particular branch size. The table to the right helps determine if a threaded outlet is available for a particular branch size.



Branching options

Pipe size	Outlets available
1 ¼" (40 mm)	½" (20 mm) — ¾" (25 mm)
1 ½" (50 mm)	½" (20 mm) — ¾" (25 mm)
2" (63 mm)	½" (20 mm) — 1" (32 mm)
2 ½" (75 mm)	½" (20 mm) — 1 ¼" (40 mm)
3" (90 mm)	½" (20 mm) — 1 ¼" (40 mm)
3 ½" (110 mm)	½" (20 mm) — 1 ½" (50 mm)
4" (125 mm)	½" (20 mm) — 2" (63 mm)
6" (160 mm)	½" (20 mm) — 3" (90 mm)
8" (200 mm)	½" (20 mm) — 4" (125 mm)
10" (250 mm)	½" (20 mm) — 4" (125 mm)
12" (315 mm)	2" (63 mm) — 6" (160 mm)
14" (355 mm)	2" (63 mm) — 8" (200 mm)
16" (400 mm)	2" (63 mm) — 10" (250 mm)
18" (450 mm)	2 ½" (75 mm) — 12" (315 mm)
20" (500 mm)	2 ½" (75 mm) — 12" (315 mm)
22" (560 mm)	2 ½" (75 mm) — 12" (315 mm)
24" (630 mm)	2 ½" (75 mm) — 12" (315 mm)

Fusion outlets with threaded transitions

Pipe size	Thread size		
	½"	¾"	1"
1 ¼" (40 mm)	M/F	M/F	
1 ½" (50 mm)	M/F	M/F	
2" (63 mm)	M/F	M/F	
2 ½" (75 mm)	M/F	M/F	F
3" (90 mm)	M/F	M/F	F
3 ½" (110 mm)	M/F	M/F	F
4" (125 mm)	M/F	M/F	F
6" (160 mm)	M/F	M/F	F
8" (200 mm)	F	F	F
10" (250 mm)	F	F	F

M = male thread available, F = female thread available



Fusion outlets installed on a pipe for use as an extended manifold.

Transition fittings

Copper stub outs



and other terminations. It is compatible with both compression and solder-type connections.

To facilitate transitions to fixture units or copper components, Aquatherm offers a PP-R to copper stub out, intended for use with angle stops, flush valves,

These fittings are combination of a custom Aquatherm PP-R socket with a gasket and copper stub added by Sioux Chief Manufacturing. The fused PP-R portion is covered under Aquatherm's warranty. The copper portion and gasket are covered under a warranty from Sioux Chief.

These fittings are available in 1/2", 3/4" and 1" sizes. Instructions are included with the fitting. Always follow these directions to avoid damaging the fitting.

Brass transitions

To make integration with non-fusible system components easier, Aquatherm offers a wide range of threaded transitions. These transitions consist of a PP-R base that has been mold-injected around a machined brass or stainless steel thread for maximum strength.

These fittings are available in male and female thread types. They can include a hex head for ease of installation. Installation instructions can be found in the Aquatherm Installer Manual.

The standard lead-free brass fittings are made with marine-grade DZR brass and are acceptable under the Safe Drinking Water Act and NSF 61.

The zero-lead fittings are compliant with the new Reduction of Lead in Drinking Water Act and are recommended for areas specifically requiring 0.25% lead content or less.

Stainless steel fittings are made from Type 316 stainless steel, and are recommended for all chemically sensitive applications.



Stainless steel



Lead-free brass



Zero-lead brass

PEX transitions



PP-R and PEX via a crimped connection without the need for threads, nipples, gaskets, or other failure-prone methods.

Featuring a PP-R socket on one end and a barbed brass end for PEX tubing, the PEX transition fitting has been manufactured to ASTM F1807 standards and offers a simple solution for installing a system with both

Aquatherm does not currently offer a PEX or PERT line to use with these fittings in North America. As always, the Aquatherm warranty covers the PP-R and brass portions of this fitting. Any tubing that is attached to this fitting is considered to be covered under its own manufacturer's warranty, as is the crimp ring. Brass portion may not be acceptable for chemically aggressive applications.

Flanges



For transitioning between larger sizes of pipe, attaching pre-fabricated sections, or connecting to pumps, valves, and other mechanical equipment, Aquatherm produces fusible flange adapters with steel flange rings. The rings are designed to match up metric pipes with ANSI bolt patterns.

Aquatherm recommends using a full face rubber (black EPDM or red SBR) gasket with its flanges. Viton® gaskets may also be used if needed for chemical resistance. Ring gaskets may be used for lower pressure systems and smaller diameters (4" and down), but there may be blow-outs during pressure testing. Ring gaskets are also more susceptible to leaking if the flanges and connected piping are not aligned properly during installation.

As of 2013, Aquatherm will only produce flange adapters that are compatible with ANSI butterfly valves. Some older flange adapters may not be compatible with all ANSI butterfly valves, but will work with other types of equipment. These older flange adapters may be exchanged for the new style through Aquatherm.

Aquatherm distribution blocks

Aquatherm distribution blocks are designed to help save time and space for parallel hot and cold water lines. The distribution block allows for $\frac{3}{4}$ " hot and cold lines to run through the block with outlets for $\frac{1}{2}$ " branches. This eliminates the need to use a cross-over or bridge and keeps the installation simple, square, and clean.

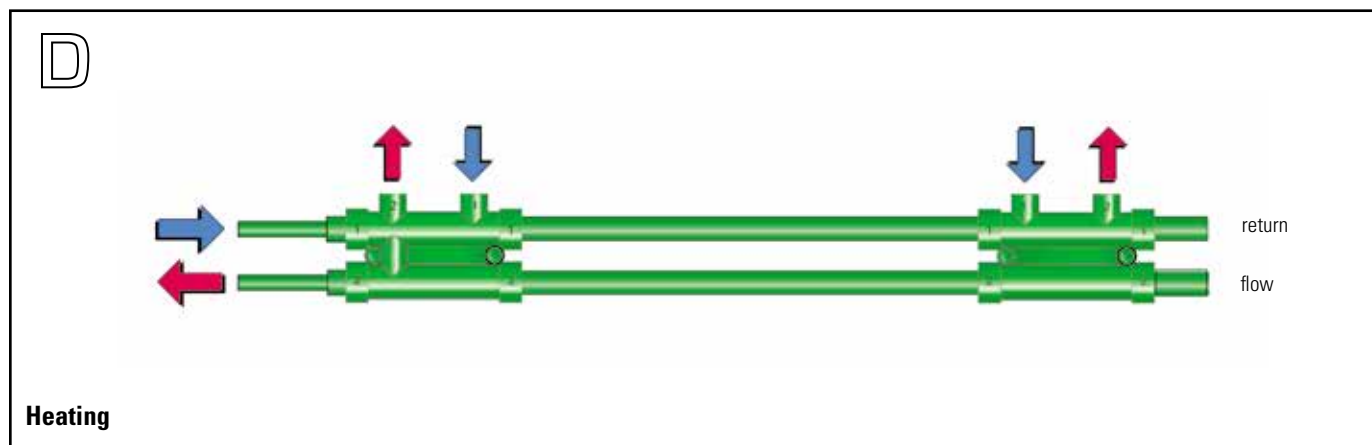
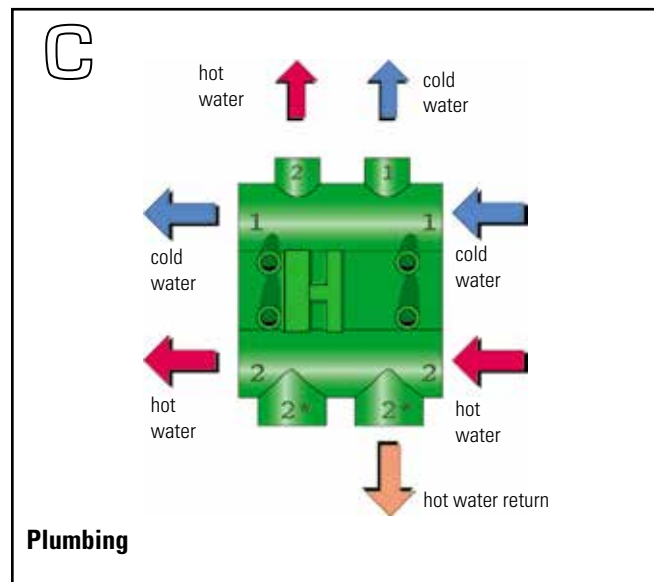
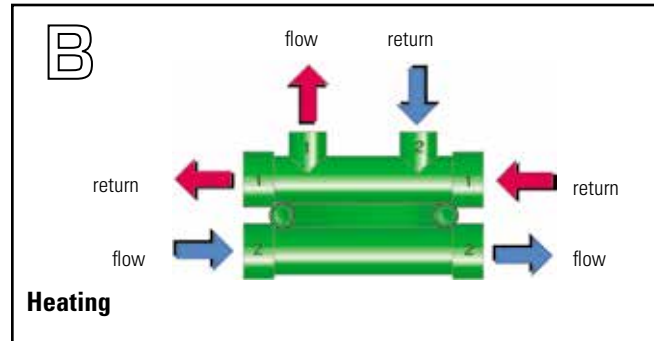
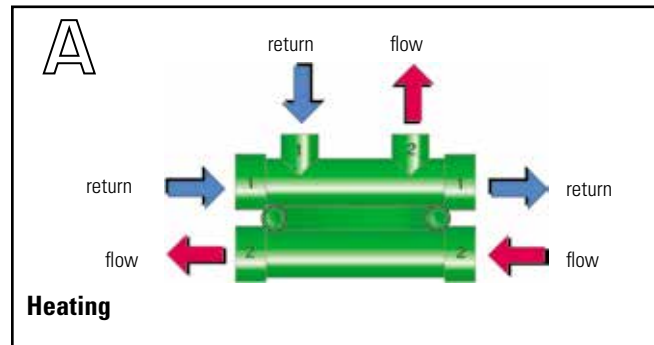
The stamped numbers 1 and 2 indicate the proper connection of the Aquatherm distribution block and provide assistance with the installation. Branches with the same number are connected by channels inside the distribution block. The natural insulation value of the PP-R block helps prevent heat exchange between the hot and cold lines.

For a heating or cooling connection, the return is connected to the channel marked 1 and the supply to the channel marked 2 (fig. A). The connections can also be used in reverse (fig. B).

For a potable water connection, channel 1 is intended for the cold water pipe and channel 2 for the hot water pipe connection. In factory condition, the lower outlets are closed. A return connection with channel 2 can be made by drilling out the opening with a $\frac{1}{2}$ " outlet drill bit, allowing an additional pipe to be connected (fig. C).

The block can be reversed to match up with existing or planned fixture units. The order of the hot and cold or supply and return lines does not matter as long as the number remains consistent (fig. D).

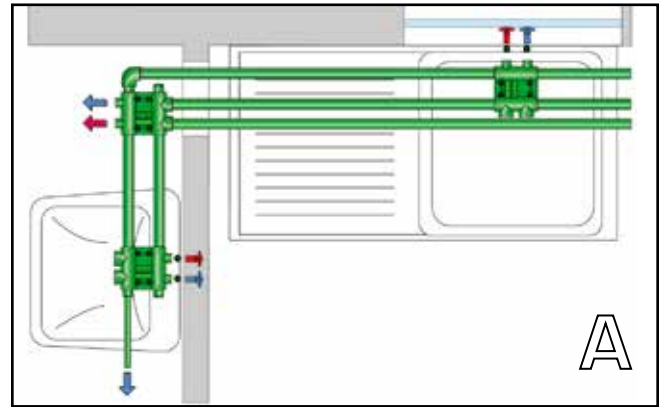
The distribution blocks are designed for use with $\frac{1}{2}$ " and $\frac{3}{4}$ " Aquatherm pipes and can be used with [aquatherm green pipe](#)[®], [aquatherm blue pipe](#)[®], and [aquatherm lilac pipe](#)[®]. If smaller sizes of piping are needed, bushings can be fused directly into the distribution block.



Aquatherm distribution blocks

With careful planning, the distribution blocks can be turned, drilled out, connected, reduced, and even capped off to accommodate a wide variety of fixtures and layouts in limited spaces (fig. A). Each block has two sets of 3/4" connections and two sets of 1/2" connections, allowing the blocks to have up to three branches from a single supply. Effective use of the distribution block can help improve overall design efficiency and simplify installation.

The distribution block comes from the factory with the inlets and outlets sealed. Leaving the outlets sealed can act as a cap for a particular line (fig. B). The 3/4" outlets can also be reduced and used to directly supply the last fixture unit in the line.



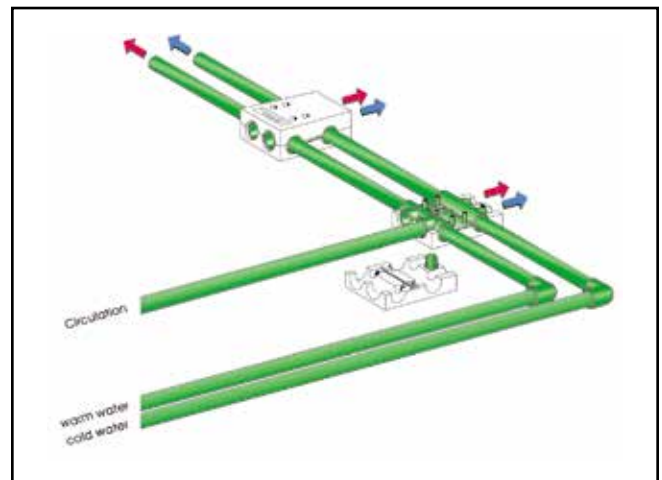
Distribution block insulation

Because the unique shape of the distribution block makes it difficult to insulate with regular insulation, Aquatherm has developed a special insulation block that is designed to fit perfectly over the distribution block. The insulation for the distribution block is made from high-quality PPO/PS rigid expanded polyurethane.

Dimensions of insulation:

- Thermal conductivity: 0.28 BTU-in/hr • °F • ft²
- Length: 7.25 in
- Width: 4.69 in
- Height: 2.76 in

The accessories (1 plug, 2 fastening plugs) are integrated in the insulation of an Aquatherm distribution block with insulation tray.



Flushing the pipes

All piping systems, regardless of their intended medium, should be flushed thoroughly after installation. The following concerns should be addressed before the installation can be put into service:

- protection of the water quality
- avoidance of corrosion damage
- avoidance of malfunctions of pumps and equipment
- cleanliness of the inner surface of the pipe

These requirements can be met by:

- flushing the system with water
- flushing the system with a mixture of air and water

The flushing medium may be determined by local codes, engineering specifications, or the needs of the mechanical equipment used.

Where no requirements are established, potable water is sufficient for flushing Aquatherm piping materials.

UV protection

In applications where the installed pipe will be exposed to UV radiation (such as outdoor applications), it is recommended that Aquatherm UV pipe be used. This pipe is engineered with an outer coating of black polyethylene that protects the pipe from the aging and discoloration that can occur from prolonged exposure to UV radiation. This coating must be removed at the points of connection prior to heat fusion. Instructions can be found in the Installer Manual.

Aquatherm pipes come from the factory packed in UV-resistant bags, which protect the pipes until they are removed. All Aquatherm pipes and fittings have UV stabilizers to bridge transport and installation times. Maximum recommended storage time exposed to UV radiation is six months.

Plastic-safe paint can be used to protect the pipe from UV damage, but most paints will not adhere well to PP-R. Painted pipe may need to be re-coated or maintained, and this is the responsibility of the installer or owner. Aquatherm recommends using an elastomeric paint, which will expand and contract with the pipes, but does not endorse any particular brand of paint. The pipe may also be painted for reasons unrelated to UV protection, if needed.

Painting the pipe is considered an aftermarket modification to the Aquatherm pipe, so Aquatherm does not assume any responsibility for the performance of the paint. Always use a paint that is safe with PP-R. Damage caused by painting is not covered under the Aquatherm warranty.

Freeze protection

Aquatherm piping systems can be installed in applications and conditions where freezing may occur.

Generally, freezing the pipes and the water in them will not cause problems for the piping materials. However, freezing may cause problems for the user if the system is required to be operational during these freezing periods.

To avoid this, anti-freeze (glycerin or glycol are safe at any concentration) or heating cables applied externally or inside the pipe may be used to ensure that the system does not freeze. Alternatively, providing a means for a minimum constant flow even during a power outage will prevent freezing.

Regardless of the method chosen, all products must be used in accordance with the freeze protection system manufacturer's recommendations, the product listings, and in compliance with all applicable local codes.

When using any type of external heat source applied to the piping such as heat tape or heating cables, the product must be suitable for use with plastic piping. Additionally, the heat system must be self-regulating and ensure the surface temperature of the Aquatherm pipe and fittings will not exceed 160 °F (71 °C).

Grounding

Most building codes require that grounding be provided for all conductive components inside the structure. It is important to note that Aquatherm pipes do not carry electrical currents and cannot be used to provide grounding. Where metal pipes are replaced by PP-R pipes, the ground cannot be created by the piping system. An alternative ground system must be installed. The grounding system should be inspected by a qualified electrician.

Transport and storage

Aquatherm pipes may be stored outside at any temperature, but it is preferable to store the pipes inside. Providing a solid, flat, and level base for the pipe is very important to avoid a deformation of the pipes during transport and storage. Improper storage of the pipe can cause bowing.

The pipe should always be handled with care, particularly in cold weather. Cold temperatures reduce the flexibility of the pipe, making it brittle and increasing the chances of it cracking or breaking.

Additional instructions regarding care and handling can be found on page <?> and in the Aquatherm Installer Manual.

Pressure test

While still accessible, all pipelines must be pressure tested using water, air, or a mix of the two. The test pressure must be 1.5 times the operating pressure or 150 psi, whichever is higher. If the system has a low operating pressure and is comprised of SDR 17.6, the required minimum pressure can be reduced to 100 psi or 1.5 times operating pressure, whichever is higher. Testing below 150 psi may not reveal joints that have been improperly fused. Please note that when testing with only air, restraining the pipe within 3 ft of each connection being tested is required.

When performing the pressure test, the material properties of Aquatherm pipes can lead to an expansion of the pipe. This influences the test results. The coefficient of thermal expansion of Aquatherm pipes can also further influence the test results. Different temperatures of the pipe and the test medium lead to alterations of pressure. A temperature change of 18 °F corresponds to a pressure difference of 7.25 to 14.5 psi (0.5 to 1 bar). Therefore the highest possible constant temperature of the test medium must be measured during the pressure test. If possible, allow for the temperature between the pipes and the test medium to reach equilibrium before reading the meter. Remove all fusion equipment and tool clamps before testing the system.

The pressure test consists of a preliminary, principal, and final test. For the preliminary test, pressurize the system to the test pressure. Expansion of the pipe and changes in temperature may cause the system to drop below test pressure during this test. If necessary, the tester may add pressure until the system stabilizes at the test pressure. Once the system is stable, begin timing 30 minutes. The system must not lose more than 9 psi (0.6 bar) in that time. If any leakage appears, stop the test and repair the leaks before proceeding.

Immediately after successfully completing the preliminary test, begin the primary test. For the primary test, monitor the system for 2 hours, making sure that it does not lose more than 3 psi (0.2 bar) in that time.

Following a successful completion of the primary test, bring the pressure down to 0. Then repressurize the system to test pressure again. After 2 minutes, bring the system down to 15 PSI. After 2 more minutes, bring the system back to 0 and repeat this process 3 more times, with a final interval of 5 minutes. This rapid cycling of the pressure will help ensure that all the fused connections were properly installed.

The times for the preliminary and primary tests are based on large installations, where small leaks may take longer to manifest as a pressure loss. For smaller installations such as single family homes, the times may be reduced up to 50% if no loss of pressure is detected in that time. The times on the final test do not change in any circumstances. A similar principle applies for the pressure loss tolerances. In a smaller installation, a small loss of pressure (3-9 psi) is likely indicative of a leak and the system should be inspected before proceeding.

Measuring the test pressures

Measuring must be done with a pressure gauge allowing a reading to 0.5 psi. When a multi-story installation with water only, the pressure test should be conducted at the lowest point in the building that can be easily accessed.

Test record

A record of the pressure test must be prepared and signed by the client and contractor stating place, contractor installer number (found on the training certificate), and date. For an example, see page 4.22. A system can be tested in phases provided that every heat-fused connection is eventually tested and that the tests are properly documented upon completion. The most recent version of the test record can be found at the Aquatherm website at www.aquatherm.com/pressure-test

This test is designed to identify damaged pipe, manufacturer's defects, and poor workmanship. It is required by the manufacturer for the validation of the Aquatherm warranty*. This does not supersede or replace regulations placed by the local code authority having jurisdiction. To prevent back-dating, Aquatherm requires that this test be submitted before the system begins full operation.

Test should be faxed to Aquatherm at:

- 801-847-6554

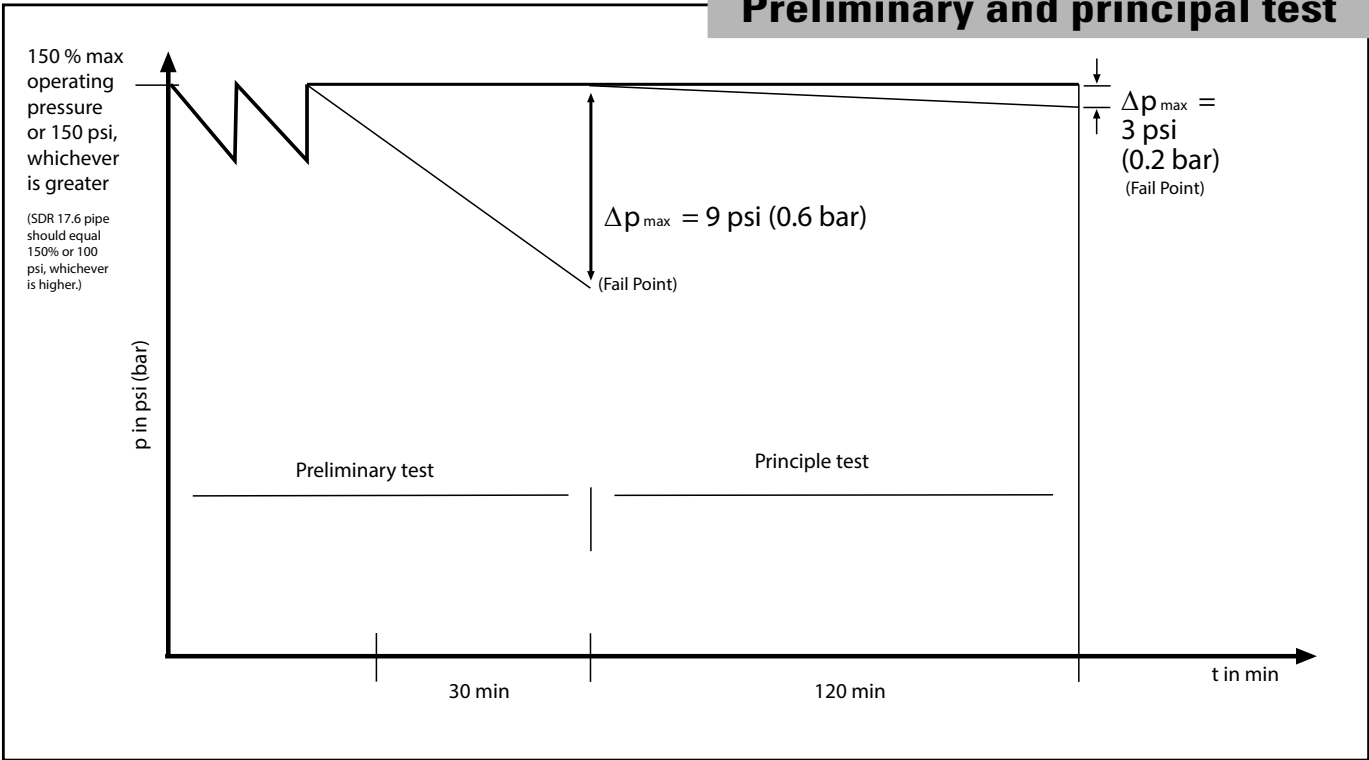
Tests may also be e-mailed to: technical@aquatherm.com

*Aquatherm's warranty does not cover failures caused by improper installation, operation outside of the recommended parameters, or damage from mishandling after the pipe has left possession of the manufacturer. Completing the pressure test does not guarantee coverage in the event of a failure caused by improper installation.

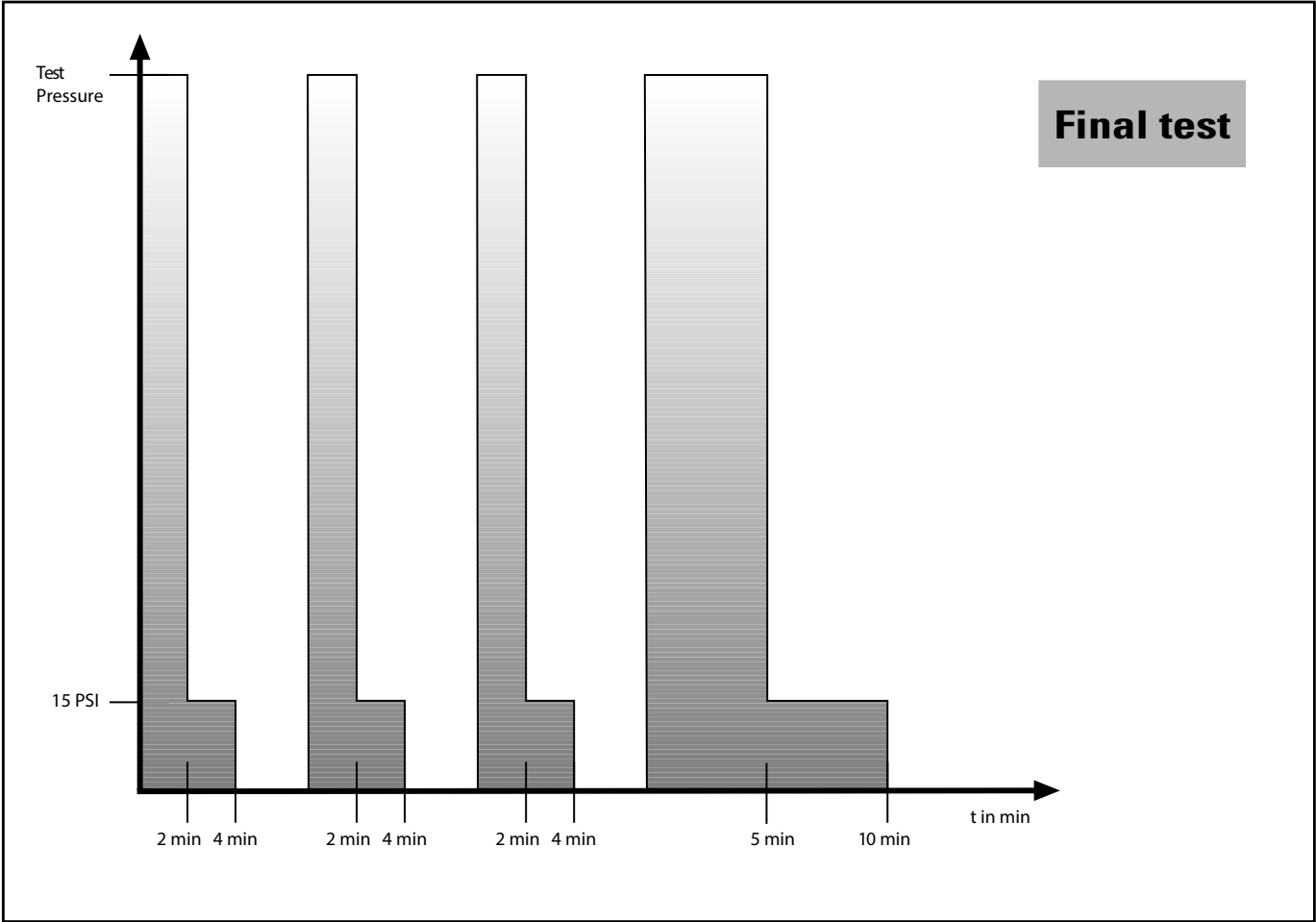
Additional testing

For larger systems, Aquatherm recommends performing a sustained pressure test. This test is performed by leaving the system at operating pressure (or higher) for a period of at least 24 hours. The air temperature around the system should be the same at the start and the completion of the test. Any drop in pressure over that time may be indicative of a slow leak in the system, which could cause damage over time. This test, while not required by Aquatherm, is recommended for the protection of the installer and the building owner. Slow leaks are very rare, but they can occur and are generally the result of avoidable installation error.

Preliminary and principal test



Final test



Preliminary & principal test:

1. Bring pressure in system up to 150% of the maximum operating pressure, or 150 psi, whichever is higher. This is now the "Test Pressure".
2. Wait 10 minutes then read pressure. If there has been any decrease due to expansion of the piping, raise system back to Test Pressure.
3. Repeat step 2 until the system has stabilized. Small systems should stabilize quickly, while larger systems may take longer. If the system pressure does not stabilize, inspect the system for leaks or air pockets when hydrostatic testing.
4. Wait 30 minutes then read pressure. Pressure must not drop more than 9 psi (0.6 bar) below the Test Pressure. Reduce tolerance for smaller installations.
5. Wait 120 minutes (2 hours) then read pressure. Pressure must not drop more than 3 psi (0.2 bar) from previous reading in step 4.
6. If the system has met the requirements of steps 4 and 5, continue to the final test.
7. If the system pressure cannot be stabilized or fails to meet the requirements of steps 4 and 5, inspect the system for leaks. Make any necessary repairs and begin test again. Take any major variations in temperature into consideration when performing these tests.

Final test:

1. Bring the system pressure up to Test Pressure and wait 2 minutes.
2. Reduce system to 15 PSI and wait 2 minutes. Drop pressure to 0.
3. Bring system back up to Test Pressure and wait 2 minutes.
4. Reduce system to 15 PSI and wait 2 minutes. Drop pressure to 0.
5. Bring system back up to Test Pressure and wait 2 minutes.
6. Reduce system to 15 PSI and wait 2 minutes. Drop pressure to 0.
7. Bring system back up to Test Pressure and wait 5 minutes.
8. Reduce system to 15 PSI and wait 5 minutes. Drop pressure to 0.

No leakage may appear at any point of the tested installation. This test is designed to expose cracks and break open faulty fusions. Installer may also want to preform a sustained pressure test at this point to verify the system integrity.

Description of the installation

Project Name: _____

Systems installed: _____

Units used on report:

ft. or m
 psi or bar

Length of pipe used:

½" (20 mm) _____	6" (160 mm) _____
¾" (25 mm) _____	8" (200 mm) _____
1" (32 mm) _____	10" (250 mm) _____
1 ¼" (40 mm) _____	12" (315 mm) _____
1 ½" (50 mm) _____	14" (355 mm) _____
2" (63 mm) _____	16" (400 mm) _____
2 ½" (75 mm) _____	18" (450 mm) _____
3" (90 mm) _____	20" (500 mm) _____
3 ½" (110 mm) _____	22" (560 mm) _____
4" (125 mm) _____	24" (630 mm) _____

Highest point: _____
 (over pressure gauge)

Start time: _____

End time: _____

Test duration: _____

Building address:

Contractor contact information:

Installer number (found on training certificate)

Building owner/manager: _____

Date: _____

Stamp / Signature _____

Preliminary test

Test pressure: _____
 (use min. 150 psi)

Pressure drop after 30 minutes: _____
 (max. 8.7psi / 0.6 bar)

Principal test

Principal test pressure: _____

Time elapsed: _____

Pressure after: _____

Final test*

1. Test Pressure: _____
 at least 2 minutes, then
 15 PSI : _____
 at least 2 minutes

2. Test Pressure: _____
 at least 2 minutes, then
 15 PSI : _____
 at least 2 minutes

3. Test Pressure: _____
 at least 2 minutes, then
 15 PSI : _____
 at least 2 minutes

4. Test Pressure: _____
 at least 5 minutes, then
 15 PSI : _____
 at least 5 minutes

*Depressurize the pipe between each cycle.

All fields are required on this test record.

Test should be faxed to **aquatherm** at:

- 801-847-6554

Tests may also be e-mailed to:
 technical@aquatherm.com.

use online version only

Chapter 5

Product Range

aquatherm green pipe® faser-composite pipe SDR 7.4

aquatherm green pipe SDR 11

aquatherm green pipe faser-composite pipe SDR 7.4 UV

aquatherm blue pipe® faser-composite pipe SDR 7.4 / 11

aquatherm blue pipe faser-composite pipe SDR 17.6

aquatherm blue pipe faser-composite pipe SDR 7.4 / 11 UV

aquatherm blue pipe faser-composite pipe SDR 17.6 UV

aquatherm lilac pipe® SDR 7.4 / 11

Accessories

Fittings

Flanges

Couplings

PP-R to metal

Distributors

Valves

Tools

Note: Dimensional data for the fittings has been added to this edition of Aquatherm catalog. However, due to the ongoing expansion and improvement of the Aquatherm line, the dimension data was not completed at the time of printing. The dimensional data here is derivative of other documents and should not be considered absolute. It is included in this catalog for the user's convenience. If an error is found between this chapter and an actual part, please inform Aquatherm so that this, and the documents it derives from, can be updated and corrected.



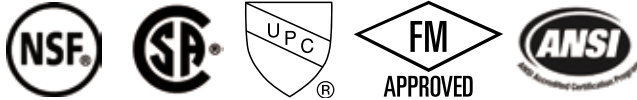
aquatherm green pipe®

faser-composite pipe SDR 7.4

Material: fusiole® PP-R faser-composite

In accordance with:

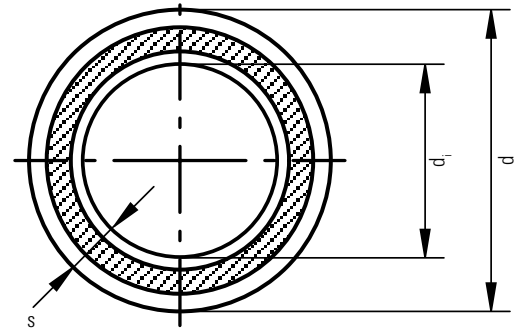
- NSF 14, 51 & 61
- CSA-B137.11
- ICC AC 122
- ICC ESR 1613
- ASTM F2389
- CFIA #A508
- FM 1635
- NFPA 13D



Appearance: Light green with dark green stripe.

NSF system certification: Including fittings, connection pieces, and connection techniques.

Fields of application: For high temperature, moderate pressure systems, particularly domestic hot water systems.



Pipe ^a			Diameter ^b	Wall thickness	Internal diameter	Water capacity	Weight ^c
Part no.	Dimension ND — OD	Packing unit	d (mm)	s (mm)	d _i (mm)	gal/ft	lb/ft
0670708	½" — 20 mm	25	20	2.8	14.4	0.013	0.11
0670710	¾" — 25 mm	25	25	3.5	18	0.024	0.17
0670712	1" — 32 mm	10	32	4.4	23.2	0.034	0.27
0670714	1 ¼" — 40 mm	10	40	5.5	29	0.053	0.41
0670716	1 ½" — 50 mm	5	50	6.9	36.2	0.083	0.64
0670718	2" — 63 mm	5	63	8.6	45.8	0.133	1.01
0670720	2 ½" — 75 mm	5	75	10.3	54.4	0.187	1.44
0670722	3" — 90 mm	3	90	12.3	65.4	0.270	2.06
0670724	3 ½" — 110 mm	2	110	15.1	79.8	0.402	3.08
0670726	4" — 125 mm	1	125	17.1	90.8	0.521	3.96
0670730	6" — 160 mm	1	160	21.9	116.2	0.854	6.41
0670734	8" — 200 mm	1	200	27.4	145.2	1.333	10.11
0670738	10" — 250 mm	1	250	34.2	181.6	2.084	15.78
0070742	12" — 315 mm	1	315	42.6	229.8	3.340	25.05
0070744	14" — 355 mm	1	355	48.0	259.0	4.242	31.82

^a ½" - 4" pipes come in standard 13 ft lengths (4 m). 6" - 14" pipes come in standard 19 ft lengths (5.8 m).

^b To calculate exact dimensions of the pipe in imperial inches, divide the metric measurement by 25.4.

^c To calculate the weight of the pipe in kg/m, multiply the measurement by 1.5.

aquatherm green pipe® pipe SDR 11

Material: fusiole® PP-R

In accordance with:

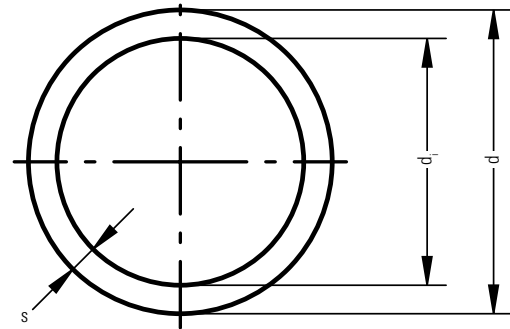
- NSF-14
- NSF-51
- NSF-61
- CSA-B137.11
- ICC AC 122
- ICC ESR 1613
- ASTM F 2389
- CFIA #A508



Appearance: Light green with light blue stripe.

NSF system certification: Including fittings, connection pieces, and connection techniques.

Fields of application: Potable water, preferably domestic cold. Low pressure installations, such as well casings, food processing, etc.



Pipe ^a			Diameter ^b	Wall thickness	Internal diameter	Water capacity	Weight ^c
Part no.	Dimension ND — OD	Packing unit	d (mm)	s (mm)	d _i (mm)	gal/ft	lb/ft
0610208	½" — 20 mm	25	20	1.9	16.2	0.017	0.07
0610210	¾" — 25 mm	25	25	2.3	20.4	0.026	0.11
0610212	1" — 32 mm	10	32	2.9	26.2	0.043	0.18
0610214	1 ¼" — 40 mm	10	40	3.7	32.6	0.067	0.28
0610216	1 ½" — 50 mm	5	50	4.6	40.8	0.105	0.43
0610218	2" — 63 mm	5	63	5.8	51.4	0.167	0.68
0610220	2 ½" — 75 mm	5	75	6.8	61.4	0.237	0.95
0610222	3" — 90 mm	3	90	8.2	73.6	0.343	1.37
0610224	3 ½" — 110 mm	2	110	10.0	90.0	0.512	2.11
0610226	4" — 125 mm	1	125	11.4	102.2	0.661	2.64
0610230	6" — 160 mm	1	160	14.6	130.8	1.082	4.31
0610234	8" — 200 mm	1	200	18.2	163.6	1.692	6.71
0610238	10" — 250 mm	1	250	22.7	204.6	2.646	10.44
0010242	12" — 315 mm	1	315	28.6	257.8	4.201	16.56
0010244	14" — 355 mm	1	355	33.3	290.5	5.340	21.03
0010246 ^d	16" — 400 mm	19	400	36.3	327.6	6.787	26.74
0010248 ^d	18" — 450 mm	19	450	40.9	368.2	8.573	33.84
The following items are supplied in coils:							
0010308	½" — 20 mm	328 ft	20	1.9	16.2	0.017	0.73
0010310	¾" — 25 mm	328 ft	25	2.3	20.4	0.026	0.11
0010312	1" — 32 mm	164 ft	32	2.9	26.2	0.043	0.17

^a ½" - 4" pipes come in standard 13 ft lengths (4 m). 6" - 14" pipes come in standard 19 ft lengths (5.8 m).^b To calculate exact dimensions of the pipe in imperial inches, divide the metric measurement by 25.4.^c To calculate the weight of the pipe in kg/m, multiply the measurement by 1.5.^d Mechanically stabilized with a fiber-composite layer in the center of the pipe.

aquatherm green pipe® UV faser-composite pipe
SDR 7.4

Material: fusiolen® PP-R faser-composite

In accordance with:

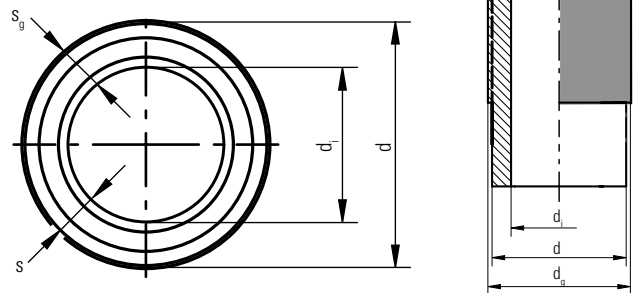
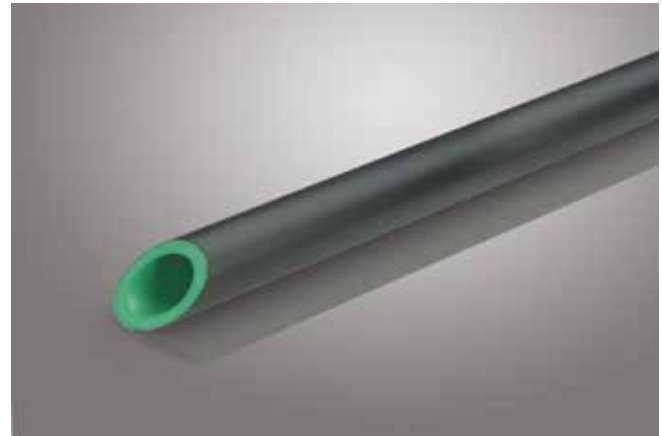
- NSF-14
- NSF-51
- NSF-61
- CSA-B137.11
- ICC AC 122
- ICC ESR 1613
- ASTM F 2389
- CFIA #A508



Appearance: Light green with black exterior.

NSF system certification: Including fittings, connection pieces and connection techniques.

Fields of application: All the same applications as the standard aquatherm green pipe® SDR 7.4 faser-composite, but for installations where the pipe is exposed to UV radiation.



Pipe ^a			Diameter ^b	Wall thickness	Internal diameter	(d) total	(s) total	Water capacity	Weight ^c
Part no.	Dimension ND — OD	Packing unit	d (mm)	s (mm)	d _i (mm)	d _g (mm)	s _g (mm)	gal/ft	lb/ft
0670758	½" — 20 mm	25	20	2.8	14.4	22	3.8	0.013	0.14
0670760	¾" — 25 mm	25	25	3.5	18	27	4.5	0.024	0.21
0670762	1" — 32 mm	10	32	4.4	23.2	34	5.4	0.034	0.32
0670764	1 ¼" — 40 mm	10	40	5.5	29	42	6.5	0.053	0.48
0670766	1 ½" — 50 mm	5	50	6.9	36.2	52	7.9	0.083	0.72
0670768	2" — 63 mm	5	63	8.6	45.8	65	9.6	0.133	1.10
0670770	2 ½" — 75 mm	5	75	10.3	54.4	77	11.3	0.187	1.53
0670772	3" — 90 mm	3	90	12.3	65.4	92	13.3	0.270	2.21
0670774	3 ½" — 110 mm	2	110	15.1	79.8	113	16.1	0.402	3.31
0670776	4" — 125 mm	1	125	17.1	90.8	127	18.1	0.521	4.19
0670780	6" — 160 mm	1	160	21.9	113.2	162	22.9	0.810	6.81
0670784	8" — 200 mm	1	200	27.4	141.8	202	28.4	1.271	10.59
0670788	10" — 250 mm	1	250	34.2	177.6	252	35.2	1.994	16.48

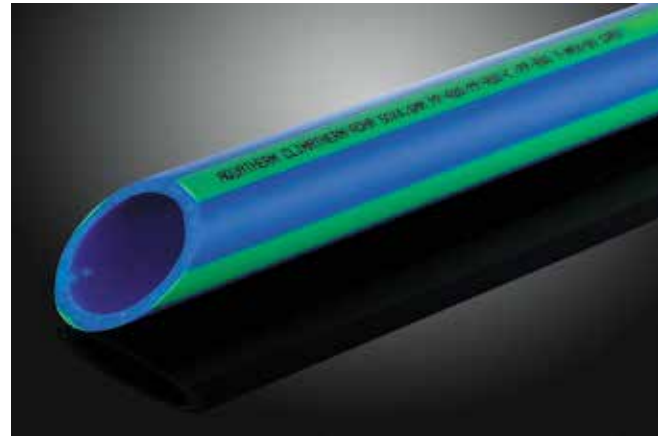
^a ½" - 4" pipes come in standard 13 ft lengths (4 m). 6" - 14" pipes come in standard 19 ft lengths (5.8 m).
^b To calculate exact dimensions of the pipe in imperial inches, divide the metric measurement by 25.4.
^c To calculate the weight of the pipe in kg/m, multiply the measurement by 1.5.

aquatherm blue pipe® faser-composite pipe
SDR 7.4/11

Material: fusiolen® PP-R faser-composite

In accordance with:

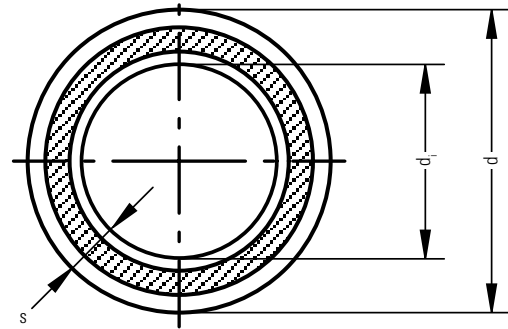
- NSF-14
- CSA-B137.11
- ICC AC 122
- ICC ESR 1613
- ASTM F 2389



Appearance: Blue with light green stripe.

NSF system certification: Including fittings, connection pieces, and connection techniques.

Fields of application: Heating and cooling applications, industrial applications, compressed air.



Pipe ^a			Diameter ^b	Wall thickness	Internal diameter	Water capacity	Weight ^c
Part no.	Dimension ND — OD	Packing unit	d (mm)	s (mm)	d _i (mm)	gal/ft	lb/ft
2670708	½" — 20 mm SDR 7.4	25	20	2.8	14.4	0.013	0.11
2670710	¾" — 25 mm SDR 7.4	25	25	3.5	18	0.024	0.17
2670112	1" — 32 mm SDR 11	10	32	2.9	26.2	0.043	0.19
2670114	1 ¼" — 40 mm SDR 11	10	40	3.7	32.6	0.067	0.29
2670116	1 ½" — 50 mm SDR 11	5	50	4.6	40.8	0.105	0.45
2670118	2" — 63 mm SDR 11	5	63	5.8	51.4	0.167	0.72
2670120	2 ½" — 75 mm SDR 11	5	75	6.8	61.4	0.237	1.00
2670122	3" — 90 mm SDR 11	3	90	8.2	73.6	0.343	1.44
2670124	3 ½" — 110 mm SDR 11	2	110	10	90	0.512	2.13
2670126	4" — 125 mm SDR 11	1	125	11.4	102.2	0.661	2.77
2670130	6" — 160 mm SDR 11	1	160	14.6	130.8	1.082	4.52
2670134	8" — 200 mm SDR 11	1	200	18.2	163.6	1.692	7.04
2670138	10" — 250 mm SDR 11	1	250	22.7	204.6	2.646	10.95
2070142	12" — 315 mm SDR 11	1	315	28.6	257.8	4.201	17.26
2070144	14" — 355 mm SDR 11	1	355	33.3	290.5	5.387	21.91
2070146	16" — 400 mm SDR 11	6	400	36.3	327.6	6.787	27.82
2070148	18" — 450 mm SDR 11	6	450	40.9	368.2	8.573	35.21
The following items are supplied in coils (non-faser)							
2010308	½" — 20 mm SDR 11	328 ft	20	1.9	16.2	0.017	0.11
2010310	¾" — 25 mm SDR 11	328 ft	25	2.3	20.4	0.026	0.16
2010312	1" — 32 mm SDR 11	164 ft	32	2.9	26.2	0.043	0.26

^a ½" - 4" pipes come in standard 13 ft lengths (4 m). 6" - 14" pipes come in standard 19 ft lengths (5.8 m).

^b To calculate exact dimensions of the pipe in imperial inches, divide the metric measurement by 25.4.

^c To calculate the weight of the pipe in kg/m, multiply the measurement by 1.5.

aquatherm blue pipe® fiber-composite pipe SDR 17.6

Material: fusiole® PP-R fiber-composite

In accordance with:

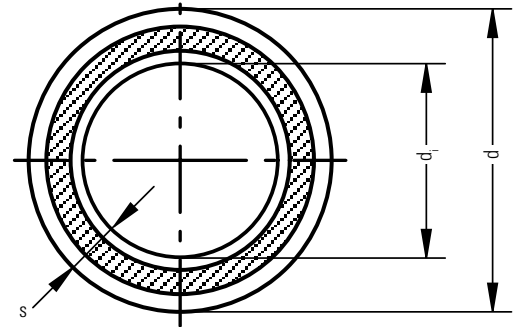
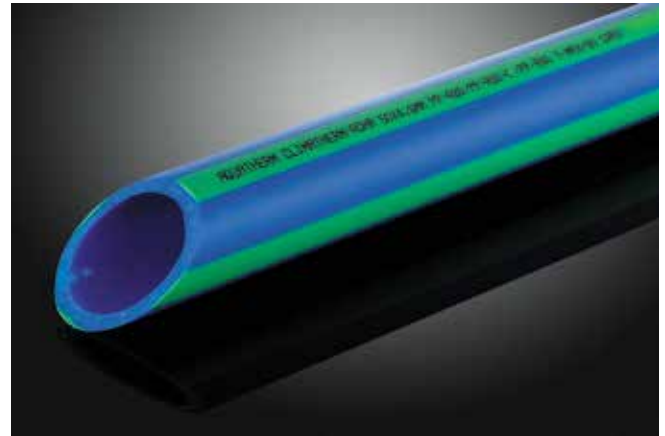
- NSF-14
- CSA-B137.11
- ICC AC 122
- ICC ESR 1613
- ASTM F 2389



Appearance: Blue with light green stripe.

NSF system certification: Including fittings, connection pieces, and connection techniques.

Fields of application: Cooling distribution, condenser water, industrial applications, compressed air, and limited heating applications.



Pipe ^a			Diameter ^b	Wall thickness	Internal diameter	Water capacity	Weight ^c
Part no.	Dimension ND — OD	Packing unit	d (mm)	s (mm)	d, (mm)	gal/ft	lb/ft
2570130	6" — 160 mm	6	160	9.1	141.8	1.272	2.93
2570134	8" — 200 mm	6	200	11.4	177.2	1.986	4.57
2570138	10" — 250 mm	6	250	14.2	221.6	3.105	7.11
2570142	12" — 315 mm	6	315	17.9	279.2	4.930	11.25
2570144	14" — 355 mm	6	355	20.1	314.8	6.267	14.25
2570146	16" — 400 mm	11.8	400	22.7	354.6	7.952	18.10
2570148	18" — 450 mm	11.8	450	25.5	399.0	10.068	22.86
2570150	20" — 500 mm	11.8	500	28.4	443.2	12.422	28.27
2570152	22" — 560 mm	11.8	560	31.7	496.6	15.596	35.31
2570154	24" — 630 mm	11.8	630	35.7	558.6	19.733	44.71

^a Pipes come in standard 19 ft lengths (5.8 m).

^b To calculate exact dimensions of the pipe in imperial inches, divide the metric measurement by 25.4.

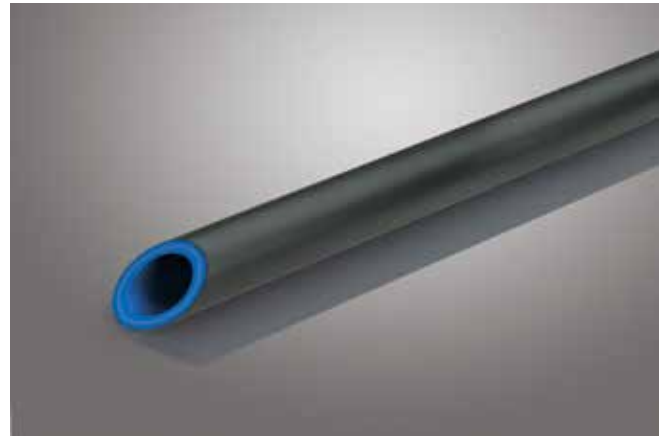
^c To calculate the weight of the pipe in kg/m, multiply the measurement by 1.5.

aquatherm blue pipe® UV faser-composite pipe
SDR 7.4/11

Material: fusiolen® PP-R

In accordance with:

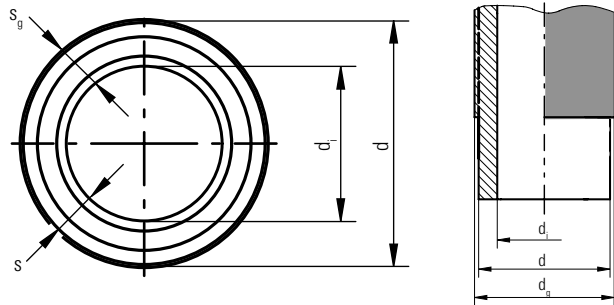
- NSF-14
- CSA-B137.11
- ICC AC 122
- ICC ESR 1613
- ASTM F 2389



Appearance: Light blue with black exterior.

NSF system certification: Including fittings, connection pieces and connection techniques.

Fields of application: All the same applications as the standard aquatherm blue pipe® SDR 11 faser-composite, but for installations where the pipe is exposed to UV radiation.



Pipe ^a			Diameter ^b	Wall thickness	Internal diameter	(d) total	(s) total	Water capacity	Weight ^c
Part no.	Dimension ND — OD	Packing unit	d (mm)	s (mm)	d _i (mm)	d _g (mm)	s _g (mm)	gal/ft	lb/ft
2670758	½" — 20 mm SDR 7.4	25	20	2.8	14.4	22	3.8	0.013	0.14
2670760	¾" — 25 mm SDR 7.4	25	25	3.5	18.0	27	4.5	0.020	0.21
2670162	1" — 32 mm SDR 11	10	32	2.9	26.2	34	3.9	0.043	0.25
2670164	1 ¼" — 40 mm SDR 11	10	40	3.7	32.6	42	4.7	0.067	0.37
2670166	1 ½" — 50 mm SDR 11	5	50	4.6	40.8	52	5.6	0.105	0.55
2670168	2" — 63 mm SDR 11	5	63	5.8	51.4	65	6.8	0.167	0.84
2670170	2 ½" — 75 mm SDR 11	5	75	6.8	61.4	77	7.8	0.238	1.14
2670172	3" — 90 mm SDR 11	3	90	8.2	73.6	92	9.2	0.342	1.66
2670174	3 ½" — 110 mm SDR 11	2	110	10.0	90.0	112	11.0	0.512	2.46
2670176	4" — 125 mm SDR 11	1	125	11.4	102.2	127	12.4	0.660	3.12
2670180	6" — 160 mm SDR 11	1	160	14.6	130.8	162	15.6	1.032	4.88
2670184	8" — 200 mm SDR 11	1	200	18.2	163.6	202	19.2	1.622	7.54
2670188	10" — 250 mm SDR 11	1	250	22.7	204.6	252	23.7	2.544	11.69

^a ½" - 4" pipes come in standard 13 ft lengths (4 m). 6" - 14" pipes come in standard 19 ft lengths (5.8 m).

^b To calculate exact dimensions of the pipe in imperial inches, divide the metric measurement by 25.4.

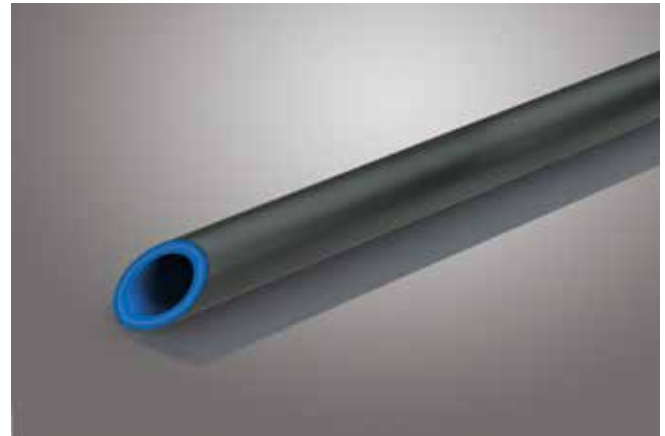
^c To calculate the weight of the pipe in kg/m, multiply the measurement by 1.5.

aquatherm blue pipe® UV faser-composite pipe
SDR 17.6

Material: fusiolen® PP-R

In accordance with:

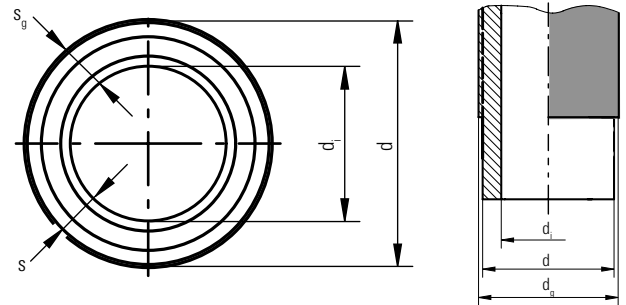
- NSF-14
- CSA-B137.11
- ICC AC 122
- ICC ESR 1613
- ASTM F 2389



Appearance: Light blue with black exterior.

NSF system certification: Including fittings, connection pieces and connection techniques.

Fields of application: All the same applications as the standard aquatherm blue pipe® SDR 17.6 faser-composite, but for installations where the pipe is exposed to UV radiation.



Pipe ^a			Diameter ^b	Wall thickness	Internal diameter	(d) total	(s) total	Water capacity	Weight ^c
Part no.	Dimension ND — OD	Packing unit	d (mm)	s (mm)	d _i (mm)	d _g (mm)	s _g (mm)	gal/ft	lb/ft
2570180	6" — 160 mm	25	20	2.8	14.4	22	3.8	0.013	0.14
2570184	8" — 200 mm	25	25	3.5	18.0	27	4.5	0.020	0.21
2570188	10" — 250 mm	10	32	4.4	23.6	34	5.4	0.034	0.33
2570192	12" — 315 mm	10	32	2.9	26.2	34	3.9	0.043	0.25
2570194	14" — 355 mm	10	40	3.7	32.6	42	4.7	0.067	0.37
2570196	16" — 400 mm	5	50	4.6	40.8	52	5.6	0.105	0.55
2570198	18" — 450 mm	5	63	5.8	51.4	65	6.8	0.167	0.84
2570200	20" — 500 mm	5	75	6.8	61.4	77	7.8	0.238	1.14
2570202	22" — 560 mm	3	90	8.2	73.6	92	9.2	0.342	1.66
2570204	24" — 630 mm	2	110	10.0	90.0	112	11.0	0.512	2.46

^a ½" - 4" pipes come in standard 13 ft lengths (4 m). 6" - 14" pipes come in standard 19 ft lengths (5.8 m).

^b To calculate exact dimensions of the pipe in imperial inches, divide the metric measurement by 25.4.

^c To calculate the weight of the pipe in kg/m, multiply the measurement by 1.5.

aquatherm lilac pipe[®] SDR 7.4/11
for recycled / reclaimed water

Material: fusiolen[®] PP-R

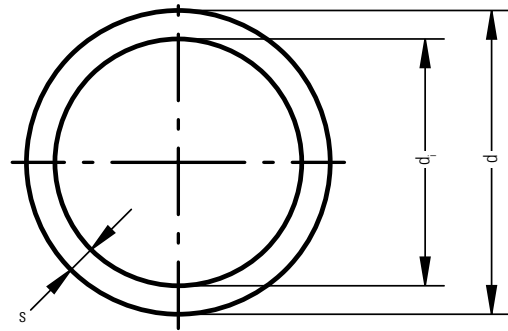
In accordance with:

- NSF-14
- CSA B 137.11



Appearance: Light purple.

Fields of application: For rainwater and reclaimed water systems, greywater supply.



Pipe ^a			Diameter ^b	Wall thickness	Internal diameter	Water capacity	Weight ^c
Part no.	Dimension ND — OD	Packing unit	d (mm)	s (mm)	d _i (mm)	gal/ft	lb/ft
9010808	½" — 20 mm SDR 7.4	25	20	2.8	14.4	0.013	0.10
9010810	¾" — 25 mm SDR 7.4	25	25	3.5	18.0	0.020	0.16
9010212	1" — 32 mm SDR 11	10	32	2.9	26.2	0.043	0.18
9010214	1 ¼" — 40 mm SDR 11	10	40	3.7	32.6	0.067	0.28
9010216	1 ½" — 50 mm SDR 11	5	50	4.6	40.8	0.105	0.43
9010218	2" — 63 mm SDR 11	5	63	5.8	51.4	0.167	0.68
9010220	2 ½" — 75 mm SDR 11	5	75	6.8	61.4	0.238	0.95
9010222	3" — 90 mm SDR 11	3	90	8.2	73.6	0.342	1.36
9010224	3 ½" — 110 mm SDR 11	2	110	10.0	90.0	0.512	2.02
9010226	4" — 125 mm SDR 11	1	125	11.4	102.2	0.660	2.63
9010230	6" — 160 mm SDR 11	1	160	14.6	130.8	1.081	4.29
9010234	8" — 200 mm SDR 11	1	200	18.2	163.6	1.692	6.69
9010238	10" — 250 mm SDR 11	1	250	22.7	204.6	2.646	10.42

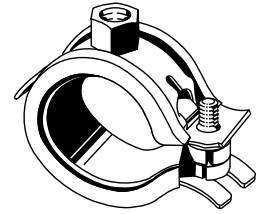
^a ½" - 4" pipes come in standard 13 ft lengths (4 m). 6" - 14" pipes come in standard 19 ft lengths (5.8 m).

^b To calculate exact dimensions of the pipe in imperial inches, divide the metric measurement by 25.4.

^c To calculate the weight of the pipe in kg/m, multiply the measurement by 1.5.

Pipe clamps for aquatherm pipes

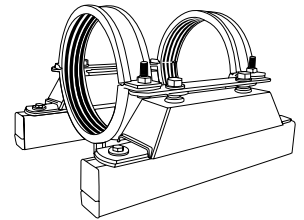
Part no.	Dimension ND — OD	[lb]
0060520	½" — 20 mm	0.11
0060525	¾" — 25 mm	0.11
0060532	1" — 32 mm	0.13
0060540	1 ¼" — 40 mm	0.15
0060550	1 ½" — 50 mm	0.17
0060563	2" — 63 mm	0.20
0060575	2 ½" — 75 mm	0.23
0060590	3" — 90 mm	0.28
0060594	3 ½" — 110 mm	0.34
0060595	4" — 125 mm	0.47
0060597	6" — 160 mm	0.75
0060650	8" — 200 mm	2.24
0060654	10" — 250 mm	2.63
0060658	12" — 315 mm	3.73
0060660	14" — 355 mm	-



Suitable for sliding and fixed point installation.

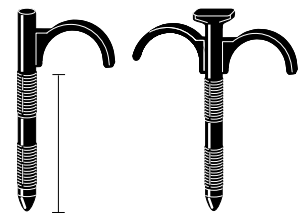
Pipe clamps for aquatherm pipe fixed point installation

Part no.	Dimension ND — OD	[lb]
0060668	6" — 160 mm	8.89
0060670	8" — 200 mm	22.26
0060674	10" — 250 mm	23.37
0060678	12" — 315 mm	-



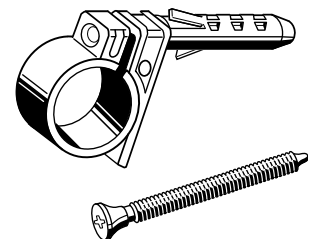
Pipe fastening strap suitable for ¾" - 1" (16 - 32 mm) pipe

Part no.	Dimension	[lb]
0060604	Single — 1 ⅜" (45 mm)	0.01
0060606	Single — 2 ½" (75 mm)	0.02
0060608	Double — 1 ⅜" (45 mm)	0.02
0060610	Double — 2 ½" (75 mm)	0.02

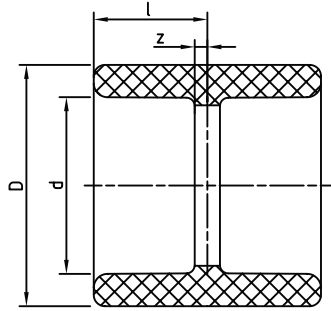


Plastic pipe clamps for aquatherm pipe

Part no.	Dimension ND — OD	[lb]
0060620	½" — 20 mm	0.02
0060625	¾" — 25 mm	0.04

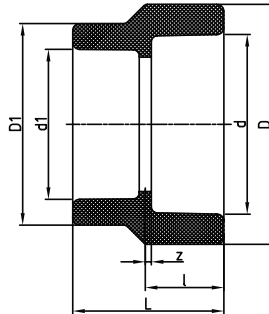


aquatherm green pipe® coupling



Part no.	Dimension ND — OD	d	l	z	D	Weight
		[in]	[in]	[in]	[in]	
0111008	½" — 20 mm	0.79	0.63	0.06	1.16	0.02
0111010	¾" — 25 mm	0.98	0.69	0.06	1.34	0.04
0111012	1" — 32 mm	1.26	0.80	0.09	1.69	0.06
0111014	1¼" — 40 mm	1.57	0.94	0.13	2.05	0.10
0111016	1½" — 50 mm	1.97	1.04	0.12	2.68	0.19
0111018	2" — 63 mm	2.48	1.19	0.11	3.31	0.28
0111020	2½" — 75 mm	2.95	1.31	0.13	3.94	0.46
0111022	3" — 90 mm	3.54	1.43	0.13	4.72	0.73
0111024	3½" — 110 mm	4.33	1.61	0.16	5.79	1.31
0111026	4" — 125 mm	4.92	1.77	0.20	6.57	1.78

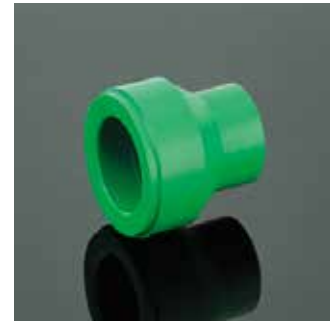
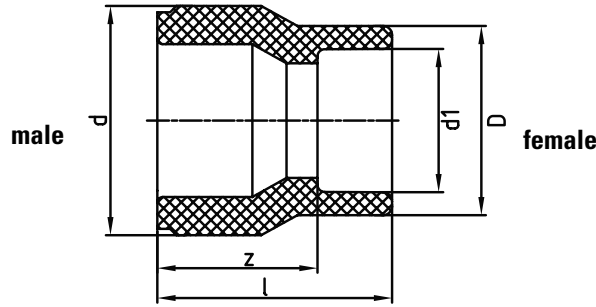
aquatherm green pipe® reducing coupling female/female



Part no.	Dimension ND — OD	d	d1	L	l	z	D	D1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	
0111222	1 ¼" to 1" — 40 to 32 mm	1.57	1.26	1.73	0.94	0.14	2.05	1.69	0.08
0111228	1 ½" to 1" — 50 to 32 mm	1.97	1.26	1.85	1.04	0.12	2.68	1.69	0.25
0111230	1 ½" to 1 ¼" — 50 to 40 mm	1.97	1.57	1.99	1.04	0.12	2.68	2.05	0.15
0111236	2" to 1 ¼" — 63 to 40 mm	2.48	1.57	2.13	1.20	0.12	3.31	2.05	0.23
0111238	2" to 1 ½" — 63 to 50 mm	2.48	1.97	2.20	1.18	0.10	3.31	2.68	0.26
0111240	2 ½" to 1 ½" — 75 to 50 mm	2.95	1.97	2.36	1.32	0.14	3.94	2.68	0.38
0111242	2 ½" to 2" — 75 to 63 mm	2.95	2.48	2.46	1.28	0.10	3.94	3.31	0.41
0111252	3" to 2" — 90 to 63 mm	3.54	2.48	2.62	1.44	0.14	4.72	3.31	0.61
0111253	3" to 2 ½" — 90 to 75 mm	3.54	2.95	2.72	1.42	0.12	4.72	3.94	0.34
0111257	3 ½" to 2 ½" — 110 to 75 mm	4.33	2.95	2.93	1.61	0.16	5.79	3.94	1.21
0111259	3 ½" to 3" — 110 to 90 mm	4.33	3.54	3.05	1.61	0.16	5.79	4.72	1.19
0111263	4" to 3" — 125 to 90 mm	4.92	3.54	3.27	1.81	0.24	6.57	4.72	1.65
0111265	4" to 3 ½" — 125 to 110 mm	4.92	4.33	3.43	1.81	0.24	6.57	5.79	1.67

aquatherm green pipe® bushing
(female to male for use with standard fitting)

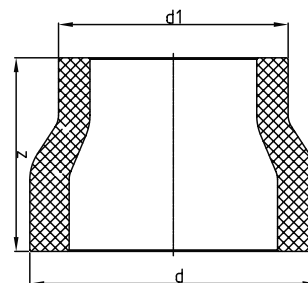
Appearance of bushing will vary by dimension. Female side is identified by a socket-fitting structure. Male side is identified with a beveled edge.



Part no.	Dimension ND — OD (M to F)	d	d1	l	z	D	Weight
		[in]	[in]	[in]	[in]	[in]	[lb]
0111112	¾" to ½" — 25 to 20 mm	0.98	0.79	1.52	0.94	1.16	0.03
0111114	1" to ½" — 32 to 20 mm	1.26	0.79	1.48	0.91	1.16	0.04
0111116	1" to ¾" — 32 to 25 mm	1.26	0.98	1.50	0.87	1.34	0.05
0111118	1 ¼" to ½" — 40 to 20 mm	1.57	0.79	1.77	1.20	1.16	0.06
0111120	1 ¼" to ¾" — 40 to 25 mm	1.57	0.98	1.97	1.34	1.34	0.08
0111122	1 ¼" to 1" — 40 to 32 mm	1.57	1.26	1.97	1.26	1.69	0.08
0111124	1 ½" to ½" — 50 to 20 mm	1.97	0.79	2.17	1.59	1.16	0.10
0111126	1 ½" to ¾" — 50 to 25 mm	1.97	0.98	2.17	1.54	1.34	0.09
0111128	1 ½" to 1" — 50 to 32 mm	1.97	1.26	2.13	1.42	1.69	0.12
0111130	1 ½" to 1 ¼" — 50 to 40 mm	1.97	1.57	2.07	1.26	2.05	0.13
0111131	2" to ½" — 63 to 20 mm	2.48	0.79	2.56	1.99	1.16	0.16
0111132	2" to ¾" — 63 to 25 mm	2.48	0.98	2.56	1.93	1.34	0.15
0111134	2" to 1" — 63 to 32 mm	2.48	1.26	2.44	1.73	1.69	0.19
0111136	2" to 1 ¼" — 63 to 40 mm	2.48	1.57	2.56	1.75	2.05	0.20
0111138	2" to 1 ½" — 63 to 50 mm	2.48	1.97	2.50	1.57	2.68	0.26
0111143	2 ½" to ½" — 75 to 20 mm	2.95	1.57	2.74	1.93	2.05	0.24
0111144	2 ½" to ¾" — 75 to 25 mm	2.95	1.97	2.48	1.56	2.68	0.24
0111145	2 ½" to 1" — 75 to 32 mm	2.95	2.48	2.80	1.71	3.31	0.29
0111139	2 ½" to 1 ¼" — 75 to 40 mm	2.95	0.79	2.58	2.01	1.36	0.29
0111140	2 ½" to 1 ½" — 75 to 50 mm	2.95	0.98	2.58	1.95	1.36	0.34
0111142	2 ½" to 2" — 75 to 63 mm	2.95	1.26	2.74	2.03	2.05	0.40
0111151	3" to 1 ½" — 90 to 50 mm	3.54	1.97	2.95	2.03	2.68	0.46
0111152	3" to 2" — 90 to 63 mm	3.54	2.48	3.07	1.99	3.31	0.54
0111153	3" to 2 ½" — 90 to 75 mm	3.54	2.95	3.21	2.03	3.94	0.64
0111155	3 ½" to 2" — 110 to 63 mm	4.33	2.48	3.39	2.30	3.31	0.77
0111157	3 ½" to 2 ½" — 110 to 75 mm	4.33	2.95	3.50	2.32	3.94	0.89
0111159	3 ½" to 3" — 110 to 90 mm	4.33	3.54	3.90	2.60	4.72	1.17
0111161	4" to 2 ½" — 125 to 75 mm	4.92	2.95	3.98	2.80	3.94	1.17
0111163	4" to 3" — 125 to 90 mm	4.92	3.54	3.90	2.60	4.72	1.17
0111165	4" to 3 ½" — 125 to 110 mm	4.92	4.33	4.41	2.95	5.79	1.81

aquatherm green pipe® butt weld reducer

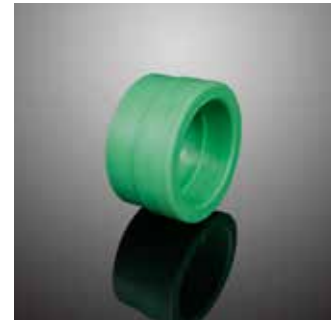
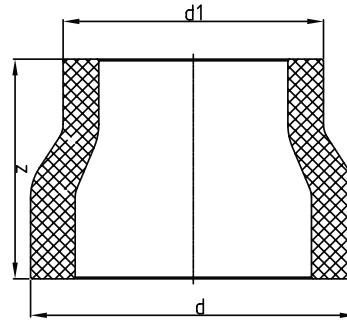
SDR	Part no.	Dimension ND — OD	d	d1	z	Weight
			[in]	[in]	[in]	[lb]
7.4	0111184	8" to 6" — 200 to 160 mm	7.87	6.30	5.31	3.46
	0111188	10" to 6" — 250 to 160 mm	9.84	6.30	6.80	6.39
	0111190	10" to 8" — 250 to 200 mm	9.84	7.87	6.89	7.08
	0111192	12" to 8" — 315 to 200 mm	12.40	7.87	8.86	-
	0111194	12" to 10" — 315 to 250 mm	12.40	9.84	8.86	-
	0111196	14" to 10" — 355 to 250 mm	13.98	9.84	6.69	11.64
	0111198	14" to 12" — 355 to 315 mm	13.98	12.40	6.30	-
11	0111185	8" to 6" — 200 to 160 mm	7.87	6.30	5.31	2.58
	0111189	10" to 6" — 250 to 160 mm	9.84	6.30	6.89	7.65
	0111191	10" to 8" — 250 to 200 mm	9.84	7.87	6.89	5.14
	0111193	12" to 8" — 315 to 200 mm	12.40	7.87	8.86	7.52
	0111195	12" to 10" — 315 to 250 mm	12.40	9.84	9.17	10.25
	0111197	14" to 10" — 355 to 250 mm	13.98	9.84	9.65	8.69
	0111199	14" to 12" — 355 to 315 mm	13.98	12.40	6.30	9.58
	0111201	16" to 10" — 400 to 250 mm	15.75	9.84	10.24	-
	0111203	16" to 12" — 400 to 315 mm	15.75	12.40	10.24	-
	0111204	16" to 14" — 400 to 355 mm	15.75	13.98	10.24	-
	0111206	18" to 12" — 450 to 315 mm	17.72	12.40	9.05	-
	0111207	18" to 14" — 450 to 355 mm	17.72	13.98	9.05	-
0111208	18" to 16" — 450 to 400 mm	17.72	15.75	9.05	-	
17.6	2511184	8" to 6" — 200 to 160 mm	7.87	6.30	5.31	2.29
	2511188	10" to 6" — 250 to 160 mm	9.84	6.30	6.80	4.55
	2511190	10" to 8" — 250 to 200 mm	9.84	7.87	6.80	4.55
	2511193	12" to 8" — 315 to 200 mm	12.40	7.87	6.80	9.30
	2511195	12" to 10" — 315 to 250 mm	12.40	9.84	8.86	10.05
	2511197	14" to 10" — 355 to 250 mm	13.98	9.84	9.65	9.10
	2511199	14" to 12" — 355 to 315 mm	13.98	12.40	6.30	10.20
	2511201	16" to 10" — 400 to 250 mm	15.75	9.84	10.24	9.88
	2511203	16" to 12" — 400 to 315 mm	15.75	12.40	10.24	10.50
	2511204	16" to 14" — 400 to 355 mm	15.75	13.98	10.24	12.68
	2511206	18" to 12" — 450 to 315 mm	17.72	12.40	9.05	11.10
	2511207	18" to 14" — 450 to 355 mm	17.72	13.98	9.05	10.34
	2511208	18" to 16" — 450 to 400 mm	17.72	15.75	9.05	9.45
	2511209	20" to 12" — 500 to 315 mm	19.68	12.40	9.05	17.86
	2511210	20" to 14" — 500 to 355 mm	19.68	13.98	9.05	14.33
	2511211	20" to 16" — 500 to 400 mm	19.68	15.75	9.05	14.77
	2511212	20" to 18" — 500 to 450 mm	19.68	17.72	9.05	12.13
	2511213	22" to 16" — 560 to 400 mm	22.05	15.75	9.05	19.84
	2511214	22" to 18" — 560 to 450 mm	22.05	17.72	7.87	19.96
2511215	22" to 20" — 560 to 500 mm	22.05	19.68	7.87	16.76	
2511216	24" to 16" — 630 to 400 mm	24.80	15.75	9.05	33.29	
2511217	24" to 18" — 630 to 450 mm	24.80	17.72	7.87	30.20	
2511218	24" to 20" — 630 to 500 mm	24.80	19.68	7.87	24.25	
2511219	24" to 22" — 630 to 560 mm	24.80	22.02	7.87	19.84	



The butt weld reducer can be used with either the **aquatherm green pipe®** or **aquatherm blue pipe®** systems, but are all molded from the green **fusiolen®** material. The SDR of the fittings must match the SDR of the pipe.

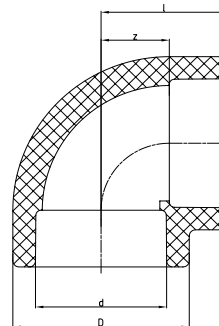
aquatherm green pipe® reducing coupling
socket welded on one side, butt welded on the other

The following fittings can be used with either the **aquatherm green pipe®** or **aquatherm blue pipe®** systems, but are all molded from the green **fusiolen®** material. The SDR of the fittings must match the SDR of the pipe.



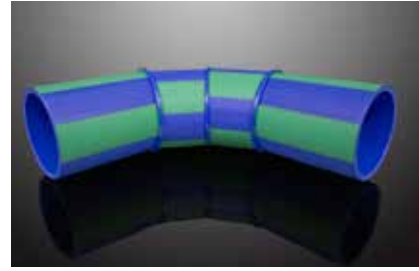
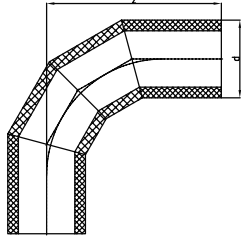
SDR	Part no.	Dimension ND — OD	d	d ₁	l	z	D	Weight
			[in]	[in]	[in]	[in]	[in]	[lb]
7.4	0111174	6" to 3 1/2" — 160 to 110 mm	6.30	4.33	3.43	1.97	5.79	1.59
	0111176	6" to 4" — 160 to 125 mm	6.30	4.92	3.54	1.97	6.57	1.80
	0111182	8" to 4" — 200 to 125 mm	7.87	4.92	5.31	3.74	6.57	3.53
11	0111175	6" to 3 1/2" — 160 to 110 mm	6.30	4.33	3.54	2.09	5.79	1.31
	0111177	6" to 4" — 160 to 125 mm	6.30	4.92	3.54	1.97	6.57	1.55
	0111183	8" to 4" — 200 to 125 mm	7.87	4.92	5.31	3.74	6.57	2.99
17.6	2511174	6" to 3 1/2" — 160 to 110 mm	6.30	4.33	3.54	2.09	5.79	-
	2511176	6" to 4" — 160 to 125 mm	6.30	4.92	3.54	1.97	6.57	1.39
	2511182	8" to 4" — 200 to 125 mm	7.87	4.92	5.31	3.74	6.57	2.33

aquatherm green pipe® elbow 90° (socket)



Part no.	Dimension ND — OD	d	z	l	D	Weight
		[in]	[in]	[in]	[in]	[lb]
0112108	1/2" — 20 mm	0.79	0.43	1.00	1.16	0.04
0112110	3/4" — 25 mm	0.98	0.53	1.16	1.34	0.05
0112112	1" — 32 mm	1.26	0.67	1.38	1.69	0.09
0112114	1 1/4" — 40 mm	1.57	0.83	1.63	2.05	0.16
0112116	1 1/2" — 50 mm	1.97	1.02	1.95	2.68	0.36
0112118	2" — 63 mm	2.48	1.28	2.36	3.31	0.64
0112120	2 1/2" — 75 mm	2.95	1.52	2.70	3.94	0.98
0112122	3" — 90 mm	3.54	1.81	3.11	4.72	1.64
0112124	3 1/2" — 110 mm	4.33	2.20	3.66	5.79	2.83
0112126	4" — 125 mm	4.92	3.01	4.59	6.57	4.42

aquatherm green pipe® elbow 90°



SDR	Part no.	Dimension ND — OD	d	z	Weight
			[in]	[in]	[lb]
7.4	0112130 ^a	6" — 160 mm	6.30	5.71	5.64
	0112130L ^b	6" — 160 mm	6.30	17.46	18.44
	0112134	8" — 200 mm	7.87	17.72	25.76
	0112138	10" — 250 mm	9.84	24.61	57.32
	0112142	12" — 315 mm	12.40	30.43	54.01
	0112144	14" — 355 mm	13.98	32.79	-
11	0112131	6" — 160 mm	6.30	5.71	4.22
	0112131LG ^b	6" — 160 mm	6.30	17.46	13.26
	0112135	8" — 200 mm	7.87	17.72	17.95
	0112139	10" — 250 mm	9.84	24.61	39.69
	0112143	12" — 315 mm	12.40	30.43	83.45
	0112145	14" — 355 mm	13.98	32.79	82.45
	0112147 ^c	16" — 400 mm	15.75	35.43	89.56
	0112149 ^c	18" — 450 mm	17.72	38.39	119.99

^a Molded fitting, made from green **fusiolen**®.

^b Molded fitting, made from green **fusiolen**® with 1-ft extension on each end.

^c Mechanically stabilized with a fiber-composite layer in the center of the pipe.

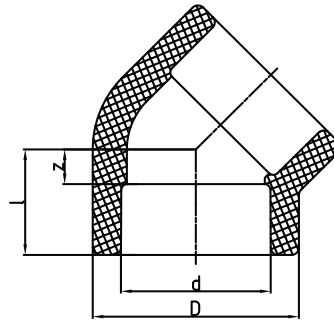
aquatherm blue pipe® elbow 90°

SDR	Part no.	Dimension ND — OD	d	z	Weight
			[in]	[in]	[lb]
11	0112131 ^a	6" — 160 mm	6.30	5.71	4.22
	0112131LB ^b	6" — 160 mm	6.30	17.46	13.26
	2612135	8" — 200 mm	7.87	17.72	24.08
	2612139	10" — 250 mm	9.84	21.61	46.38
	2012143	12" — 315 mm	12.40	30.43	82.23
	2012145	14" — 355 mm	13.98	32.79	58.75
	2012147	16" — 400 mm	15.75	35.43	164.24
	2012149	18" — 450 mm	17.72	38.39	176.05
17.6	2512130	6" — 160 mm	6.30	15.35	7.06
	2512134	8" — 200 mm	7.87	17.72	15.99
	2512138	10" — 250 mm	9.84	24.61	28.44
	2512142	12" — 315 mm	12.40	30.41	52.91
	2512144	14" — 355 mm	13.98	32.79	70.55
	2512146	16" — 400 mm	15.75	35.43	85.07
	2512148	18" — 450 mm	17.72	38.39	114.30
	2512150	20" — 500 mm	19.69	43.31	155.49
	2512152	22" — 560 mm	22.05	46.85	204.80
	2512154	24" — 630 mm	24.80	50.98	268.26

^a Molded fitting, made from green **fusiolen**®.

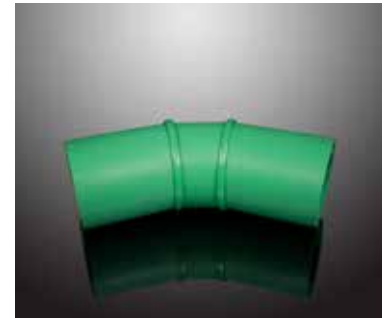
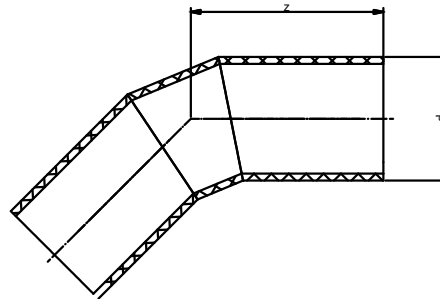
^b Molded fitting, made from green **fusiolen**® with 1-ft extension on each end.

aquatherm green pipe® elbow 45° (socket)



Part no.	Dimension ND — OD	d	z	l	D	Weight
		[in]	[in]	[in]	[in]	[lb]
0112508	½" -- 20 mm	0.79	0.20	0.77	1.16	0.02
0112510	¾" -- 25 mm	0.98	0.24	0.87	1.34	0.03
0112512	1" -- 32 mm	1.26	0.30	1.00	1.69	0.08
0112514	1 ¼" -- 40 mm	1.57	0.37	1.18	2.05	0.12
0112516	1 ½" -- 50 mm	1.97	0.45	1.38	2.68	0.25
0112518	2" -- 63 mm	2.48	0.55	1.63	3.31	0.49
0112520	2 ½" -- 75 mm	2.95	0.65	1.83	3.94	0.77
0112522	3" -- 90 mm	3.54	0.77	2.07	4.72	1.26
0112524	3 ½" -- 110 mm	4.33	0.93	2.38	5.79	2.25
0112526	4" -- 125 mm	4.92	1.06	2.64	6.57	2.89

aquatherm green pipe® elbow 45°



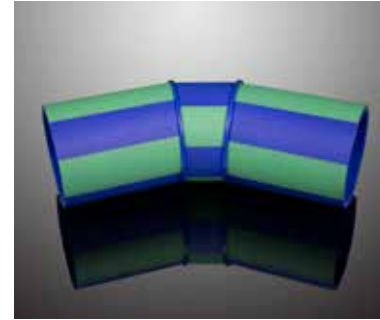
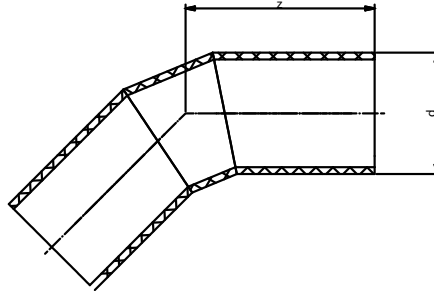
SDR	Part no.	Dimension ND — OD	d	z	Weight
			[in]	[in]	
7.4	0112530 ^a	6" — 160 mm	6.30	3.74	4.14
	0112530L ^b	6" — 160 mm	6.30	15.49	16.96
	0112534	8" — 200 mm	7.87	10.79	18.02
	0112538	10" — 250 mm	9.84	16.22	28.66
	0112542	12" — 315 mm	12.40	20.35	62.63
	0112544	14" — 355 mm	13.98	20.47	79.55
11	0112531 ^a	6" — 160 mm	6.30	3.74	3.04
	0112531LG ^b	6" — 160 mm	6.30	15.49	12.08
	0112535	8" — 200 mm	7.87	10.79	12.64
	0112539	10" — 250 mm	9.84	16.22	28.66
	0112543	12" — 315 mm	12.4	20.35	60.19
	0112545	14" — 355 mm	13.98	20.47	58.75
	0112547 ^c	16" — 400 mm	15.75	21.57	105.49
0112549 ^c	18" — 450 mm	17.72	22.83	138.56	

^a Molded fitting, made from green fusiole®.

^b Molded fitting, made from green fusiole® with 1-ft extension on each end.

^c Mechanically stabilized with a fiber-composite layer in the center of the pipe.

aquatherm blue pipe® elbow 45°

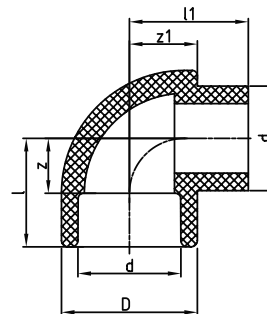


SDR	Part no.	Dimension ND — OD	d	z	Weight
			[in]	[in]	
11	0112531 ^a	6" — 160 mm	6.30	3.74	3.04
	0112531LB ^b	6" — 160 mm	6.30	15.49	12.08
	2612535	8" — 200 mm	7.87	10.79	14.08
	2612539	10" — 250 mm	9.84	16.22	27.38
	2012543	12" — 315 mm	12.4	20.35	59.75
	2012545	14" — 355 mm	13.98	20.47	92.59
	2012547	16" — 400 mm	15.75	21.57	-
	2012549	18" — 450 mm	17.72	22.83	-
17.6	2512530	6" — 160 mm	6.30	9.80	5.37
	2512534	8" — 200 mm	7.87	10.79	8.57
	2512538	10" — 250 mm	9.84	16.22	20.72
	2512542	12" — 315 mm	12.40	19.60	36.05
	2512544	14" — 355 mm	13.98	20.47	51.15
	2512546	16" — 400 mm	15.75	21.47	67.90
	2512548	18" — 450 mm	17.73	22.83	87.65
	2512550	20" — 500 mm	19.69	26.18	-
	2512552	22" — 560 mm	22.05	27.48	-
	2512554	24" — 630 mm	24.80	29.17	-

^a Molded fitting, made from green fusiolen®.

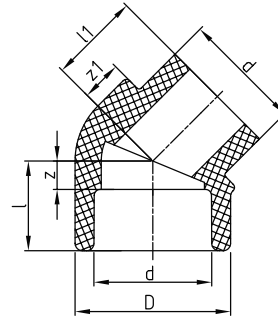
^b Molded fitting, made from green fusiolen® with 1-ft extension on each end.

aquatherm green pipe® street 90° female/male



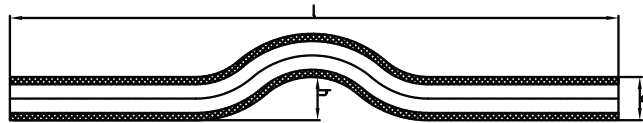
Part no.	Dimension ND — OD	d	z	l	D	l1	z1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	
0112308	½" — 20 mm	0.79	0.43	1.00	1.16	1.00	0.59	0.40
0112310	¾" — 25 mm	0.98	0.53	1.16	1.34	1.16	0.67	0.05
0112312	1" — 32 mm	1.26	0.67	1.38	1.69	1.54	0.85	0.10
0112314	1 ¼" — 40 mm	1.57	0.83	1.63	2.05	1.79	1.02	0.18

aquatherm green pipe® street 45° female/male



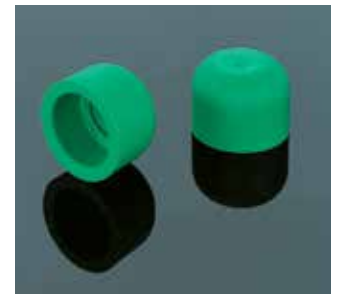
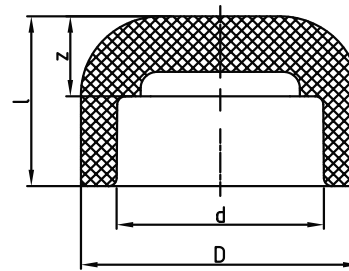
Part no.	Dimension ND — OD	d	z	l	D	l1	z1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0112708	½" — 20 mm	0.79	0.20	0.77	1.16	0.77	0.35	0.03
0112710	¾" — 25 mm	0.98	0.24	0.87	1.34	0.87	0.33	0.04
0112712	1" — 32 mm	1.26	0.30	1.00	1.69	1.12	0.45	0.08
0112714	1 ¼" — 40 mm	1.57	0.37	1.18	2.05	1.20	0.53	0.13

aquatherm green pipe® cross-over



Part no.	Dimension ND — OD	d	h	l	Weight
		[in]	[in]	[in]	[lb]
0116108	½" — 20 mm	0.79	0.87	13.86	0.13
0116110	¾" — 25 mm	0.98	0.98	13.86	0.20
0116112	1" — 32 mm	1.26	1.26	13.86	0.34

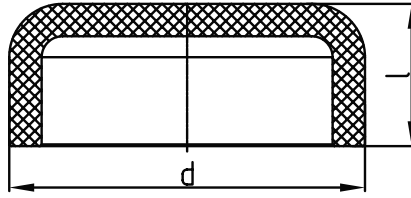
aquatherm green pipe® end cap



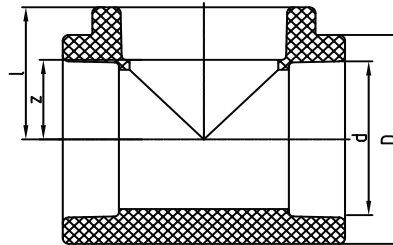
Part no.	Dimension ND — OD	d	z	l	D	Weight
		[in]	[in]	[in]	[in]	[lb]
0114108	½" — 20 mm	0.79	0.94	0.37	0.37	0.02
0114110	¾" — 25 mm	0.98	0.94	0.31	0.16	0.02
0114112	1" — 32 mm	1.26	1.24	0.53	1.69	0.04
0114114	1 ¼" — 40 mm	1.57	1.50	0.69	2.05	0.10
0114116	1 ½" — 50 mm	1.97	1.75	0.83	2.68	0.18
0114118	2" — 63 mm	2.48	2.05	0.96	3.31	0.32
0114120	2 ½" — 75 mm	2.95	2.30	1.12	3.94	0.54
0114122	3" — 90 mm	3.54	2.26	1.36	4.72	0.81
0114124	3 ½" — 110 mm	4.33	2.56	1.10	5.79	1.30
0114126	4" — 125 mm	4.92	2.76	1.18	6.57	1.90

aquatherm end cap

The following fittings can be used with either the **aquatherm green pipe®** or **aquatherm blue pipe®** systems, but are all molded from the green **fusiole®** material. The SDR of the fittings must match the SDR of the pipe.

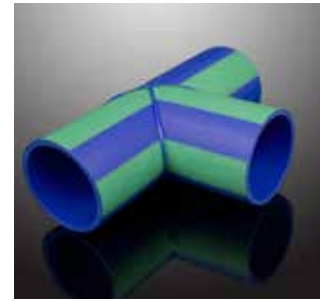
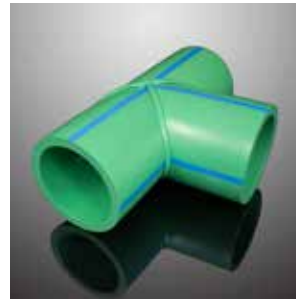
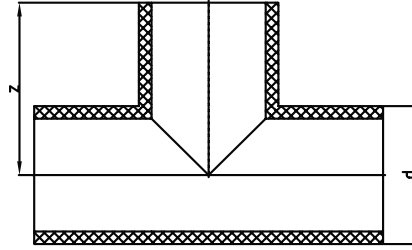


SDR	Part no.	Dimension ND — OD	d		l		Weight	
			[in]	[in]	[in]	[in]	[lb]	[lb]
7.4	0114130	6" — 160 mm	6.30	2.76	2.76	2.76	2.02	
	0114134	8" — 200 mm	7.87	3.15	3.15	3.15	3.04	
	0114138	10" — 250 mm	9.84	3.54	3.54	3.54	5.58	
	0114142	12" — 315 mm	12.40	-	-	-	-	
	0114144	14" — 355 mm	13.98	-	-	-	-	
11	0114131	6" — 160 mm	6.30	2.76	2.76	2.76	1.80	
	0114135	8" — 200 mm	7.87	3.15	3.15	3.15	2.36	
	0114139	10" — 250 mm	9.84	3.54	3.54	3.54	4.39	
	0114143	12" — 315 mm	12.40	10.63	10.63	10.63	13.67	
	0114145	14" — 355 mm	13.98	2.56	2.56	2.56	20.94	
	0114147	16" — 400 mm	15.75	2.36	2.36	2.36	-	
17.6	0114149	18" — 450 mm	17.72	2.76	2.76	2.76	-	
	2514130	6" — 160 mm	6.30	2.84	2.84	2.84	1.50	
	2514134	8" — 200 mm	7.87	3.10	3.10	3.10	2.04	
	2514138	10" — 250 mm	9.84	-	-	-	4.65	
	2514142	12" — 315 mm	12.40	1.98	1.98	1.98	6.53	
	2514144	14" — 355 mm	13.98	-	-	-	8.66	
	2514146	16" — 400 mm	15.75	2.36	2.36	2.36	12.83	
	2514148	18" — 450 mm	17.72	2.76	2.76	2.76	18.78	
	2514150	20" — 500 mm	19.69	2.99	2.99	2.99	27.56	
	2514152	22" — 560 mm	22.05	3.15	3.15	3.15	35.27	
2514154	24" — 630 mm	24.80	3.54	3.54	3.54	51.81		

aquatherm green pipe® tee (socket)

Part no.	Dimension ND — OD	d		z		l		D		Weight	
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]	[lb]
0113108	½" — 20 mm	0.79	0.43	1.00	1.00	1.16	1.16	0.05			
0113110	¾" — 25 mm	0.98	0.59	1.22	1.22	1.34	1.34	0.07			
0113112	1" — 32 mm	1.26	0.67	1.38	1.38	1.69	1.69	0.12			
0113114	1 ¼" — 40 mm	1.57	0.79	1.59	1.59	2.05	2.05	0.22			
0113116	1 ½" — 50 mm	1.97	1.02	1.95	1.95	2.68	2.68	0.39			
0113118	2" — 63 mm	2.48	1.28	2.36	2.36	3.31	3.31	0.82			
0113120	2 ½" — 75 mm	2.95	1.52	2.70	2.70	3.94	3.94	1.19			
0113122	3" — 90 mm	3.54	1.81	3.11	3.11	4.72	4.72	2.04			
0113124	3 ½" — 110 mm	4.33	2.20	3.66	3.66	5.79	5.79	3.55			
0113126	4" — 125 mm	4.92	3.01	4.59	4.59	6.57	6.57	5.85			

aquatherm green pipe tee



SDR	Part no.	Dimension ND — OD	d	z	Weight
			[in]	[in]	[lb]
7.4	0113130 ^a	6" — 160 mm	6.30	5.71	7.88
	0113130L ^b	6" — 160 mm	6.30	17.46	27.11
	0113134	8" — 200 mm	7.87	9.84	21.66
	0113138	10" — 250 mm	9.84	14.76	48.50
	0113142	12" — 315 mm	12.40	18.11	100.20
	0113144	14" — 355 mm	13.98	18.90	143.19
11	0113131 ^a	6" — 160 mm	6.30	5.71	6.15
	0113131LG ^b	6" — 160 mm	6.30	17.46	19.08
	0113135	8" — 200 mm	7.87	9.84	15.14
	0113139	10" — 250 mm	9.84	14.76	35.28
	0113143	12" — 315 mm	12.40	18.11	45.09
	0113145	14" — 355 mm	13.98	18.90	94.46
	0113147 ^c	16" — 400 mm	15.75	19.69	105.50
	0113149 ^c	18" — 450 mm	17.72	20.67	138.56

^a Molded fitting, made from green **fusiolen**®.

^b Molded fitting, made from green **fusiolen**® with 1-ft extension on each end.

^c Mechanically stabilized with a fiber-composite layer in the center of the pipe.

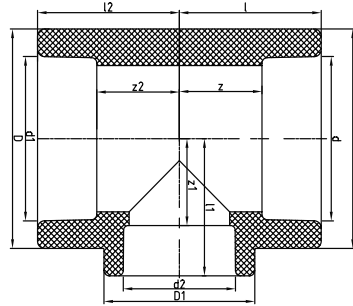
aquatherm blue pipe tee

SDR	Part No.	Dimension ND — OD	d	z	Weight
			[in]	[in]	lb/pc
11	0113131 ^a	6" — 160 mm	6.30	5.71	7.88
	0113131LB ^b	6" — 160 mm	6.30	17.46	12.40
	2613135	8" — 200 mm	7.87	9.84	15.14
	2613139	10" — 250 mm	9.84	14.76	35.27
	2013143	12" — 315 mm	12.40	18.11	45.09
	2013145	14" — 355 mm	13.98	18.90	92.59
	2013147	16" — 400 mm	15.75	19.69	130.75
	2013149	18" — 450 mm	17.76	20.67	176.05
17.6	2513130	6" — 160 mm	6.30	5.71	5.99
	2513134	8" — 200 mm	7.87	9.84	15.99
	2513138	10" — 250 mm	9.84	14.76	25.35
	2513142	12" — 315 mm	12.40	18.11	48.50
	2513144	14" — 355 mm	13.98	18.90	60.63
	2513146	16" — 400 mm	15.75	19.69	90.50
	2513148	18" — 450 mm	17.76	20.67	125.73
	2513150	20" — 500 mm	19.69	23.62	169.62
	2513152	22" — 560 mm	22.05	24.80	247.17
	2513154	24" — 630 mm	24.05	26.18	312.97

^a Molded fitting, made from green **fusiolen**®.

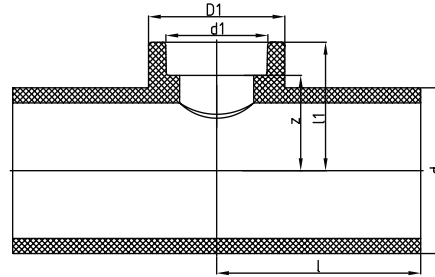
^b Molded fitting, made from green **fusiolen**® with 1-ft extension on each end.

aquatherm green pipe® reducing tee (inlet, outlet, branch)



Part no.	Dimension ND — OD	d	d1	d2	l	l1	l2	z	z1	z2	D	D1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0113511	½" x ½" x ¾" — 20 x 20 x 25 mm	0.79	0.79	0.98	1.22	1.20	1.22	0.65	0.57	0.65	1.34	1.34	0.09
0113520	¾" x ½" x ½" — 25 x 20 x 20 mm	0.98	0.79	0.79	1.22	1.20	1.22	0.59	0.63	0.65	1.34	1.34	0.08
0113522	¾" x ¾" x ½" — 25 x 25 x 20 mm	0.98	0.98	0.79	1.22	1.20	1.22	0.59	0.63	0.59	1.34	1.34	0.08
0113532	1" x ½" x ½" — 32 x 20 x 20 mm	1.26	0.79	0.79	1.44	1.46	1.44	0.74	0.89	0.88	1.69	1.69	0.17
0113534	1" x 1" x ½" — 32 x 32 x 20 mm	1.26	1.26	0.79	1.38	1.22	1.38	0.67	0.65	0.67	1.69	1.16	0.11
0113538	1" x ¾" x ¾" — 32 x 25 x 25 mm	1.26	0.98	0.98	1.38	1.36	1.38	0.67	0.73	0.59	1.69	1.69	0.15
0113540	1" x 1" x ¾" — 32 x 32 x 25 mm	1.26	1.26	0.98	1.38	1.36	1.38	0.67	0.73	0.67	1.69	1.69	0.11
0113542	1 ¼" x 1 ¼" x ½" — 40 x 40 x 20 mm	1.57	1.57	0.79	1.63	1.42	1.63	0.83	0.85	0.83	2.05	1.34	0.20
0113544	1 ¼" x 1 ¼" x ¾" — 40 x 40 x 25 mm	1.57	1.57	0.98	1.63	1.42	1.63	0.83	0.79	0.83	2.05	1.34	0.20
0113546	1 ¼" x 1 ¼" x 1" — 40 x 40 x 32 mm	1.57	1.57	1.26	1.65	1.59	1.65	0.85	0.89	0.85	2.05	2.05	0.20
0113547	1 ½" x 1 ½" x ½" — 50 x 50 x 20 mm	1.97	1.97	0.79	1.95	1.59	1.95	1.02	1.02	1.02	2.68	1.16	0.35
0113548	1 ½" x 1 ½" x ¾" — 50 x 50 x 25 mm	1.97	1.97	0.98	1.95	1.75	1.95	1.02	1.12	1.02	2.68	1.69	0.35
0113550	1 ½" x 1 ½" x 1" — 50 x 50 x 32 mm	1.97	1.97	1.26	1.95	1.75	1.95	1.02	1.04	1.02	2.68	1.69	0.35
0113551	1 ½" x 1 ½" x 1 ¼" — 50 x 50 x 40 mm	1.97	1.97	1.57	1.95	1.95	1.95	1.02	1.14	1.02	2.68	2.68	0.36
0113552	2" x 2" x ½" — 63 x 63 x 20 mm	2.48	2.48	0.79	2.36	1.91	2.36	1.28	1.34	1.28	3.31	1.34	0.74
0113554	2" x 2" x ¾" — 63 x 63 x 25 mm	2.48	2.48	0.98	2.36	1.91	2.36	1.28	1.28	1.28	3.31	1.34	0.73
0113556	2" x 2" x 1" — 63 x 63 x 32 mm	2.48	2.48	1.26	2.36	2.11	2.36	1.28	1.40	1.28	3.31	2.05	0.75
0113558	2" x 2" x 1 ¼" — 63 x 63 x 40 mm	2.48	2.48	1.57	2.36	2.11	2.36	1.28	1.30	1.28	3.31	2.05	0.73
0113560	2" x 2" x 1 ½" — 63 x 63 x 50 mm	2.48	2.48	1.97	2.36	2.36	2.36	1.28	1.44	1.28	3.31	3.31	0.89
0113561	2 ½" x 2 ½" x ½" — 75 x 75 x 20 mm	2.95	2.95	0.79	2.70	2.15	2.70	1.52	1.57	1.52	3.94	1.34	1.10
0113562	2 ½" x 2 ½" x ¾" — 75 x 75 x 25 mm	2.95	2.95	0.98	2.70	2.15	2.70	1.52	1.52	1.52	3.94	1.34	1.10
0113564	2 ½" x 2 ½" x 1" — 75 x 75 x 32 mm	2.95	2.95	1.26	2.70	2.32	2.70	1.52	1.61	1.52	3.94	2.05	1.12
0113566	2 ½" x 2 ½" x 1 ¼" — 75 x 75 x 40 mm	2.95	2.95	1.57	2.70	2.32	2.70	1.52	1.52	1.52	3.94	2.05	1.09
0113568	2 ½" x 2 ½" x 1 ½" — 75 x 75 x 50 mm	2.95	2.95	1.97	2.70	2.60	2.70	1.52	1.67	1.52	3.94	3.31	1.22
0113570	2 ½" x 2 ½" x 2" — 75 x 75 x 63 mm	2.95	2.95	2.48	2.70	2.60	2.70	1.52	1.52	1.52	3.94	3.31	1.14
0113576	3" x 3" x 1" — 90 x 90 x 32 mm	3.54	3.54	1.26	3.11	2.56	3.11	1.81	1.85	1.81	4.72	2.05	1.94
0113578	3" x 3" x 1 ¼" — 90 x 90 x 40 mm	3.54	3.54	1.57	3.11	2.56	3.11	1.81	1.75	1.81	4.72	2.05	1.92
0113580	3" x 3" x 1 ½" — 90 x 90 x 50 mm	3.54	3.54	1.97	3.11	2.95	3.11	1.81	2.03	1.81	4.72	3.31	2.00
0113582	3" x 3" x 2" — 90 x 90 x 63 mm	3.54	3.54	2.48	3.11	2.95	3.11	1.81	1.87	1.81	4.72	3.31	1.93
0113584	3" x 3" x 2 ½" — 90 x 90 x 75 mm	3.54	3.54	2.95	3.11	3.19	3.11	1.81	2.01	1.81	4.72	4.72	2.19
0113586	3 ½" x 3 ½" x 2" — 110 x 110 x 63 mm	4.33	4.33	2.48	3.66	3.44	3.66	2.20	2.36	2.20	5.79	3.94	3.45
0113588	3 ½" x 3 ½" x 2 ½" — 110 x 110 x 75 mm	4.33	4.33	2.95	3.66	3.44	3.66	2.20	2.26	2.20	5.79	3.94	3.31
0113590	3 ½" x 3 ½" x 2 ½" — 110 x 110 x 90 mm	4.33	4.33	3.54	3.66	3.50	3.66	2.20	2.20	2.20	5.79	4.72	3.38
0113592	4" x 4" x 2 ½" — 125 x 125 x 75 mm	4.92	4.92	2.95	4.59	4.19	4.59	3.01	3.01	3.01	6.57	3.94	5.34
0113594	4" x 4" x 3" — 125 x 125 x 90 mm	4.92	4.92	3.54	4.59	4.31	4.59	3.01	3.01	3.01	6.57	4.72	5.55
0113596	4" x 4" x 3 ½" — 125 x 125 x 110 mm	4.92	4.92	4.33	4.59	4.47	4.59	3.01	3.01	3.01	6.57	5.79	5.65

aquatherm green pipe® reducing tee (inlet, outlet, branch)

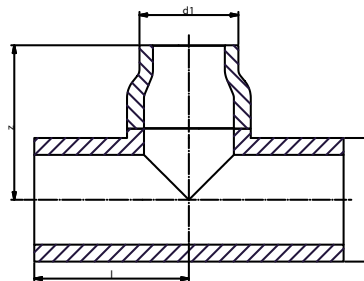


SDR	Part no.	Dimension ND — OD	d	d1	l	l1	z	D	Weight
			[in]	[in]	[in]	[in]	[in]	[in]	[lb]
7.4	0113600	6" x 6" x 2 1/2" — 160 x 160 x 75 mm	6.30	2.95	9.06	4.80	11.02	3.94	9.73
	0113602	6" x 6" x 3" — 160 x 160 x 90 mm	6.30	3.54	9.06	4.92	11.02	4.27	9.95
	0113604L ^a	6" x 6" x 4" — 160 x 160 x 125 mm	6.30	4.92	21.06	8.87	7.25	6.57	-
	0113608	8" x 8" x 2 1/2" — 200 x 200 x 75 mm	7.87	2.95	9.84	5.59	4.41	3.94	15.68
	0113610	8" x 8" x 3" — 200 x 200 x 90 mm	7.87	3.54	9.84	5.71	4.41	4.27	16.62
	0113612	8" x 8" x 3 1/2" — 200 x 200 x 110 mm	7.87	4.33	9.84	5.87	4.41	5.79	16.15
	0113614	8" x 8" x 4" — 200 x 200 x 125 mm	7.87	4.92	9.84	6.10	4.53	6.57	16.85
	0113624	10" x 10" x 2 1/2" — 250 x 250 x 75 mm	9.84	2.95	14.76	6.57	5.39	3.94	36.40
	0113626	10" x 10" x 3" — 250 x 250 x 90 mm	9.84	3.54	14.76	6.69	5.39	4.27	37.04
	0113628	10" x 10" x 3 1/2" — 250 x 250 x 110 mm	9.84	4.33	14.76	6.85	5.39	5.79	37.04
	0113630	10" x 10" x 4" — 250 x 250 x 125 mm	9.84	4.92	14.76	7.09	5.51	6.57	37.48
	0113904	12" x 12" x 4" — 315 x 315 x 125 mm	12.40	4.92	18.11	8.39	6.81	6.57	-
	0113916	14" x 14" x 4" — 355 x 355 x 125 mm	13.98	4.92	18.90	9.17	7.60	6.57	-
11	0113601	6" x 6" x 2 1/2" — 160 x 160 x 75 mm	6.30	2.95	9.06	4.80	11.02	3.94	6.92
	0113603	6" x 6" x 3" — 160 x 160 x 90 mm	6.30	3.54	9.06	4.92	11.02	4.27	7.00
	0113605LG ^a	6" x 6" x 4" — 160 x 160 x 125 mm	6.30	4.92	21.06	8.87	7.25	6.57	-
	0113609	8" x 8" x 2 1/2" — 200 x 200 x 75 mm	7.87	2.95	9.84	5.59	4.41	3.94	11.65
	0113611	8" x 8" x 3" — 200 x 200 x 90 mm	7.87	3.54	9.84	5.71	4.41	4.27	11.39
	0113613	8" x 8" x 3 1/2" — 200 x 200 x 110 mm	7.87	4.33	9.84	5.87	4.41	5.79	12.46
	0113615	8" x 8" x 4" — 200 x 200 x 125 mm	7.87	4.92	9.84	6.10	4.53	6.57	26.46
	0113625	10" x 10" x 2 1/2" — 250 x 250 x 75 mm	9.84	2.95	14.76	6.59	5.39	3.94	12.76
	0113627	10" x 10" x 3" — 250 x 250 x 90 mm	9.84	3.54	14.76	6.69	5.39	4.27	26.46
	0113629	10" x 10" x 3 1/2" — 250 x 250 x 110 mm	9.84	4.33	14.76	6.85	5.39	5.79	28.67
	0113631	10" x 10" x 4" — 250 x 250 x 125 mm	9.84	4.92	14.76	7.09	5.51	6.57	26.46
	0113651	12" x 12" x 4" — 315 x 315 x 125 mm	12.40	4.92	18.11	8.39	6.81	6.57	55.45
	0113663	14" x 14" x 4" — 355 x 355 x 125 mm	13.98	4.92	18.90	9.17	7.60	6.57	-
	0113676 ^b	16" x 16" x 4" — 400 x 400 x 125 mm	15.75	4.92	19.69	10.04	8.46	6.57	-
0113690 ^b	18" x 18" x 4" — 450 x 450 x 125 mm	17.72	4.92	20.67	11.02	9.45	6.57	-	

^a Includes 1-ft extension of aquatherm green pipe®.

^b Mechanically stabilized with a fiber-composite layer in the center of the pipe.

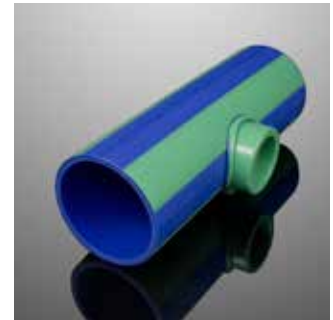
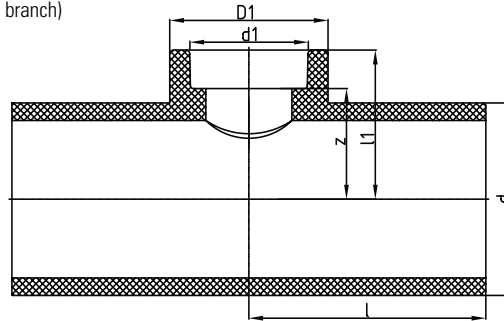
aquatherm green pipe® reducing tee (inlet, outlet, branch)



SDR	Part no.	Dimension ND — OD	d	d1	l	z	Weight
			[in]	[in]	[in]	[in]	[lb]
7.4	0113618	8" x 8" x 6" — 200 x 200 x 160 mm	7.87	6.30	9.84	9.84	-
	0113634	10" x 10" x 6" — 250 x 250 x 160 mm	9.84	6.30	14.76	26.85	61.73
	0113640	10" x 10" x 8" — 250 x 250 x 200 mm	9.84	7.87	14.76	21.57	59.53
	0113906	12" x 12" x 6" — 315 x 315 x 160 mm	12.40	6.30	18.11	9.37	-
	0113908	12" x 12" x 8" — 315 x 315 x 200 mm	12.40	7.87	18.11	18.11	-
	0113910	12" x 12" x 10" — 315 x 315 x 250 mm	12.40	9.84	18.11	18.11	-
	0113918	14" x 14" x 6" — 355 x 355 x 160 mm	13.98	6.30	18.90	10.16	-
	0113920	14" x 14" x 8" — 355 x 355 x 200 mm	13.98	7.87	18.90	10.55	-
	0113922	14" x 14" x 10" — 355 x 355 x 250 mm	13.98	9.84	18.90	18.90	-
0113924	14" x 14" x 12" — 355 x 355 x 315 mm	13.98	12.40	18.90	18.90	-	
11	0113619	8" x 8" x 6" — 200 x 200 x 160 mm	7.87	6.30	9.84	9.84	17.15
	0113635	10" x 10" x 6" — 250 x 250 x 160 mm	9.84	6.30	14.76	26.85	-
	0113641	10" x 10" x 8" — 250 x 250 x 200 mm	9.84	7.87	14.76	21.57	42.99
	0113653	12" x 12" x 6" — 315 x 315 x 160 mm	12.40	6.30	18.11	9.37	40.79
	0113655	12" x 12" x 8" — 315 x 315 x 200 mm	12.40	7.87	18.11	18.11	54.79
	0113657	12" x 12" x 10" — 315 x 315 x 250 mm	12.40	9.84	18.11	18.11	64.82
	0113665	14" x 14" x 6" — 355 x 355 x 160 mm	13.98	6.30	18.90	10.16	66.69
	0113667	14" x 14" x 8" — 355 x 355 x 200 mm	13.98	7.87	18.90	10.55	-
	0113669	14" x 14" x 10" — 355 x 355 x 250 mm	13.98	9.84	18.90	18.90	-
	0113671	14" x 14" x 12" — 355 x 355 x 315 mm	13.98	12.40	18.90	13.94	-
	0113678 ^a	16" x 16" x 6" — 400 x 400 x 160 mm	15.75	6.30	19.69	12.52	-
	0113680 ^a	16" x 16" x 8" — 400 x 400 x 200 mm	15.75	7.87	19.69	11.02	-
	0113682 ^a	16" x 16" x 10" — 400 x 400 x 250 mm	15.75	9.84	19.69	19.69	-
	0113684 ^a	16" x 16" x 12" — 400 x 400 x 315 mm	15.75	12.40	19.69	19.69	-
	0113685 ^a	16" x 16" x 14" — 400 x 400 x 355 mm	15.75	13.98	19.69	14.92	-
	0113692 ^a	18" x 18" x 6" — 450 x 450 x 160 mm	17.72	6.30	20.67	13.50	-
	0113694 ^a	18" x 18" x 8" — 450 x 450 x 200 mm	17.72	7.87	20.67	12.01	-
	0113696 ^a	18" x 18" x 10" — 450 x 450 x 250 mm	17.72	9.84	20.67	12.40	-
	0113698 ^a	18" x 18" x 12" — 450 x 450 x 315 mm	17.72	12.40	20.67	20.67	-
	0113699 ^a	18" x 18" x 14" — 450 x 450 x 355 mm	17.72	13.98	20.67	20.67	-
0113700 ^a	18" x 18" x 16" — 450 x 450 x 400 mm	17.72	15.75	20.67	20.67	-	

^a Mechanically stabilized with a fiber-composite layer in the center of the pipe.

aquatherm blue pipe® reducing tee (inlet, outlet, branch)

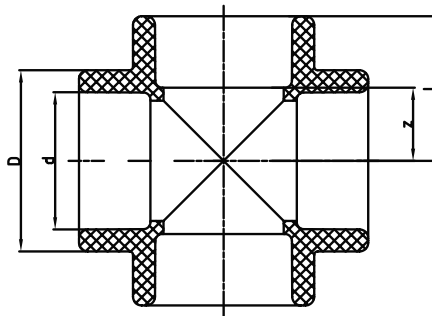


SDR	Part no.	Dimension ND — OD	d	d1	l	l1	z	D1	Weight
			[in]	[in]	[in]	[in]	[in]	[in]	[lb]
11	0113601 ^a	6" x 6" x 2 1/2" — 160 x 160 x 75 mm	6.30	2.95	9.06	4.84	11.02	3.94	6.92
	0113603 ^a	6" x 6" x 3" — 160 x 160 x 90 mm	6.30	3.54	9.06	4.92	11.02	4.27	7.00
	0113605LB ^b	6" x 6" x 4" — 160 x 160 x 125 mm	6.30	4.92	21.06	8.87	7.25	6.57	-
	2613609	8" x 8" x 2 1/2" — 200 x 200 x 75 mm	7.87	2.95	9.84	5.59	4.41	3.94	-
	2613611	8" x 8" x 3" — 200 x 200 x 90 mm	7.87	3.54	9.84	5.71	4.41	4.27	-
	2613613	8" x 8" x 3 1/2" — 200 x 200 x 110 mm	7.87	4.33	9.84	5.87	4.41	5.79	-
	2613615	8" x 8" x 4" — 200 x 200 x 125 mm	7.87	4.92	9.84	6.10	4.53	6.57	-
	2613625	10" x 10" x 2 1/2" — 250 x 250 x 75 mm	9.84	2.95	14.76	6.57	5.39	3.94	-
	2613627	10" x 10" x 3" — 250 x 250 x 90 mm	9.84	3.54	14.76	6.69	5.39	4.27	-
	2613629	10" x 10" x 3 1/2" — 250 x 250 x 110 mm	9.84	4.33	14.76	6.85	5.39	5.79	-
	2613631	10" x 10" x 4" — 250 x 250 x 125 mm	9.84	4.92	14.76	7.09	5.51	6.57	-
	2013651	12" x 12" x 4" — 315 x 315 x 125 mm	12.40	4.92	18.11	8.39	6.81	6.57	55.12
	2013663	14" x 14" x 4" — 355 x 355 x 125 mm	13.98	4.92	18.90	9.17	7.60	6.57	-
	2013676	16" x 16" x 4" — 400 x 400 x 125 mm	15.75	4.92	19.69	10.04	8.46	6.57	-
2013690	18" x 18" x 4" — 450 x 450 x 125 mm	17.72	4.92	20.67	11.02	9.45	6.57	-	
17.6	2513600	6" x 6" x 2 1/2" — 160 x 160 x 75 mm	6.30	2.95	9.06	4.80	11.02	3.94	5.20
	2513602	6" x 6" x 3" — 160 x 160 x 90 mm	6.30	3.54	9.06	4.92	11.02	4.27	-
	2513608	8" x 8" x 2 1/2" — 200 x 200 x 75 mm	7.87	2.95	9.84	5.59	4.41	3.94	-
	2513610	8" x 8" x 3" — 200 x 200 x 90 mm	7.87	3.54	9.84	5.71	4.41	4.27	-
	2513612	8" x 8" x 3 1/2" — 200 x 200 x 110 mm	7.87	4.33	9.84	5.87	4.41	5.79	-
	2513614	8" x 8" x 4" — 200 x 200 x 125 mm	7.87	4.92	9.84	6.10	4.53	6.57	-
	2513624	10" x 10" x 2 1/2" — 250 x 250 x 75 mm	9.84	2.95	14.76	6.57	5.39	3.94	-
	2513626	10" x 10" x 3" — 250 x 250 x 90 mm	9.84	3.54	14.76	6.69	5.39	4.27	-
	2513628	10" x 10" x 3 1/2" — 250 x 250 x 110 mm	9.84	4.33	14.76	6.85	5.39	5.79	-
	2513630	10" x 10" x 4" — 250 x 250 x 125 mm	9.84	4.92	14.76	7.09	5.51	6.57	-
	2513651	12" x 12" x 4" — 315 x 315 x 125 mm	12.40	4.92	18.11	8.39	6.81	6.57	-
	2513663	14" x 14" x 4" — 355 x 355 x 125 mm	13.98	4.92	18.90	9.17	7.68	6.57	47.40
	2513676	16" x 16" x 4" — 400 x 400 x 125 mm	15.75	4.92	19.69	10.04	8.46	6.57	-
	2513690	18" x 18" x 4" — 450 x 450 x 125 mm	17.72	4.92	20.67	11.02	9.45	6.57	-
	2513804	20" x 20" x 4" — 500 x 500 x 125 mm	19.69	4.92	23.62	12.01	10.43	6.57	-
	2513821	22" x 22" x 4" — 560 x 560 x 125 mm	22.05	4.92	24.80	13.19	11.61	6.57	-
	2513839	24" x 24" x 4" — 630 x 630 x 125 mm	24.80	4.92	26.18	14.57	12.99	6.57	-

^a Molded fitting, made from green **fusiolen**®.

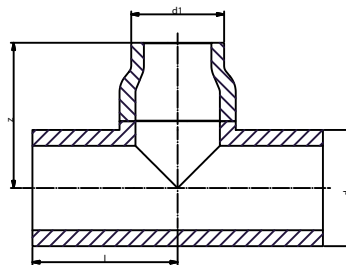
^b Molded fitting, made from green **fusiolen**® with 1-ft extension on each end.

aquatherm green pipe® cross



Part no.	Dimension ND — OD	d	z	l	D	Weight
		[in]	[in]	[in]	[in]	[lb]
0113708	½" — 20 mm	0.79	0.45	1.02	1.16	0.06
0113710	¾" — 25 mm	0.98	0.53	1.16	1.34	0.08
0113712	1" — 32 mm	1.26	0.67	1.38	1.69	0.15
0113714	1 ¼" — 40 mm	1.57	0.83	1.63	2.05	0.23

aquatherm blue pipe® reducing tee (inlet, outlet, branch)

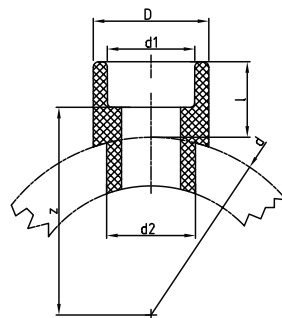


SDR	Part no.	Dimension ND — OD	d	d1	l	z	Weight
			[in]	[in]	[in]	[in]	[lb]
11	2613619	8" x 8" x 6" — 200 x 200 x 160 mm	7.87	6.30	9.84	9.84	-
	2613635	10" x 10" x 6" — 250 x 250 x 160 mm	9.84	6.30	14.76	26.85	-
	2613641	10" x 10" x 8" — 250 x 250 x 200 mm	9.84	7.87	14.76	21.57	-
	2013653	12" x 12" x 6" — 315 x 315 x 160 mm	12.40	6.30	18.11	9.37	55.12
	2013655	12" x 12" x 8" — 315 x 315 x 200 mm	12.40	7.87	18.11	18.11	-
	2013657	12" x 12" x 10" — 315 x 315 x 250 mm	12.40	9.84	18.11	18.11	-
	2013665	14" x 14" x 6" — 355 x 355 x 160 mm	13.98	6.30	18.90	10.16	-
	2013667	14" x 14" x 8" — 355 x 355 x 200 mm	13.98	7.87	18.90	10.55	66.58
	2013669	14" x 14" x 10" — 355 x 355 x 250 mm	13.98	9.84	18.90	18.90	88.19
	2013671	14" x 14" x 12" — 355 x 355 x 315 mm	13.98	12.40	18.90	18.90	88.19
	2013678	16" x 16" x 6" — 400 x 400 x 160 mm	15.75	6.30	19.69	13.94	-
	2013680	16" x 16" x 8" — 400 x 400 x 200 mm	15.75	7.87	19.69	12.52	-
	2013682	16" x 16" x 10" — 400 x 400 x 250 mm	15.75	9.84	19.69	11.02	101.41
	2013684	16" x 16" x 12" — 400 x 400 x 315 mm	15.75	12.40	19.69	19.69	-
	2013685	16" x 16" x 14" — 400 x 400 x 355 mm	15.75	13.98	19.69	19.69	-
	2013692	18" x 18" x 6" — 450 x 450 x 160 mm	17.72	6.30	20.67	14.92	-
	2013694	18" x 18" x 8" — 450 x 450 x 200 mm	17.72	7.87	20.67	13.50	-
	2013696	18" x 18" x 10" — 450 x 450 x 250 mm	17.72	9.84	20.67	12.01	-
	2013698	18" x 18" x 12" — 450 x 450 x 315 mm	17.72	12.40	20.67	12.40	-
	2013699	18" x 18" x 14" — 450 x 450 x 355 mm	17.72	13.98	20.67	20.67	-
2013700	18" x 18" x 16" — 450 x 450 x 400 mm	17.72	15.75	20.67	20.67	-	

aquatherm blue pipe® reducing tee - continued (inlet, outlet, branch)

SDR	Part no.	Dimension ND — OD	d	d1	l	z	Weight
			[in]	[in]	[in]	[in]	[lb]
17.6	2513618	8" x 8" x 6" — 200 x 200 x 160 mm	7.87	6.30	9.84	9.84	10.65
	2513634	10" x 10" x 6" — 250 x 250 x 160 mm	9.84	6.30	14.76	14.76	-
	2513640	10" x 10" x 8" — 250 x 250 x 200 mm	9.84	7.87	14.76	14.76	-
	2513653	12" x 12" x 6" — 315 x 315 x 160 mm	12.40	6.30	18.11	9.37	-
	2513655	12" x 12" x 8" — 315 x 315 x 200 mm	12.40	7.87	18.11	18.11	-
	2513657	12" x 12" x 10" — 315 x 315 x 250 mm	12.40	9.84	18.11	18.11	39.58
	2513665	14" x 14" x 6" — 355 x 355 x 160 mm	13.98	6.30	18.90	10.16	47.40
	2513667	14" x 14" x 8" — 355 x 355 x 200 mm	13.98	7.87	18.90	10.55	42.74
	2513669	14" x 14" x 10" — 355 x 355 x 250 mm	13.98	9.84	18.90	18.90	51.11
	2513671	14" x 14" x 12" — 355 x 355 x 315 mm	13.98	12.40	18.90	18.90	53.01
	2513678	16" x 16" x 6" — 400 x 400 x 160 mm	15.75	6.30	19.69	13.94	-
	2513680	16" x 16" x 8" — 400 x 400 x 200 mm	15.75	7.87	19.69	12.52	-
	2513682	16" x 16" x 10" — 400 x 400 x 250 mm	15.75	9.84	19.69	11.02	63.93
	2513684	16" x 16" x 12" — 400 x 400 x 315 mm	15.75	12.40	19.69	19.69	78.93
	2513685	16" x 16" x 14" — 400 x 400 x 355 mm	15.75	13.98	19.69	19.69	-
	2513692	18" x 18" x 6" — 450 x 450 x 160 mm	17.72	6.30	20.67	14.92	-
	2513694	18" x 18" x 8" — 450 x 450 x 200 mm	17.72	7.87	20.67	13.50	-
	2513696	18" x 18" x 10" — 450 x 450 x 250 mm	17.72	9.84	20.67	12.01	-
	2513698	18" x 18" x 12" — 450 x 450 x 315 mm	17.72	12.40	20.67	12.40	-
	2513699	18" x 18" x 14" — 450 x 450 x 355 mm	17.72	13.98	20.67	20.67	-
	2513700	18" x 18" x 16" — 450 x 450 x 400 mm	17.72	15.75	20.67	20.67	-
	2513806	20" x 20" x 6" — 500 x 500 x 160 mm	19.69	6.30	23.62	15.91	-
	2513808	20" x 20" x 8" — 500 x 500 x 200 mm	19.69	7.87	23.62	14.49	-
	2513810	20" x 20" x 10" — 500 x 500 x 250 mm	19.69	9.84	23.62	12.99	-
	2513812	20" x 20" x 12" — 500 x 500 x 315 mm	19.69	12.40	23.62	13.39	-
	2513813	20" x 20" x 14" — 500 x 500 x 355 mm	19.69	13.98	23.62	23.62	-
	2513814	20" x 20" x 16" — 500 x 500 x 400 mm	19.69	15.75	23.62	23.62	-
	2513815	20" x 20" x 18" — 500 x 500 x 450 mm	19.69	17.72	23.62	23.62	-
	2513823	22" x 22" x 6" — 560 x 560 x 160 mm	22.05	6.30	24.80	17.09	-
	2513825	22" x 22" x 8" — 560 x 560 x 200 mm	22.05	7.87	24.80	15.67	-
	2513827	22" x 22" x 10" — 560 x 560 x 250 mm	22.05	9.84	24.80	14.17	-
	2513829	22" x 22" x 12" — 560 x 560 x 315 mm	22.05	12.40	24.80	14.57	-
	2513830	22" x 22" x 14" — 560 x 560 x 355 mm					
	2513831	22" x 22" x 16" — 560 x 560 x 400 mm	22.05	15.75	24.80	24.80	-
	2513832	22" x 22" x 18" — 560 x 560 x 450 mm	22.05	17.72	24.80	24.80	-
	2513833	20" x 20" x 20" — 560 x 560 x 500 mm	22.05	19.69	24.80	24.80	-
	2513841	24" x 24" x 6" — 630 x 630 x 160 mm	24.80	6.30	26.18	18.66	-
	2513843	24" x 24" x 8" — 630 x 630 x 200 mm	24.80	7.87	26.18	17.24	-
	2513845	24" x 24" x 10" — 630 x 630 x 250 mm	24.80	9.84	26.18	15.75	-
	2513847	24" x 24" x 12" — 630 x 630 x 315 mm	24.80	12.40	26.18	15.95	-
2513848	24" x 24" x 14" — 630 x 630 x 355 mm						
2513849	24" x 24" x 16" — 630 x 630 x 400 mm	24.80	15.75	26.18	26.18	-	
2513850	24" x 24" x 18" — 630 x 630 x 450 mm	24.80	17.72	26.18	26.18	-	
2513851	24" x 24" x 20" — 630 x 630 x 500 mm	24.80	19.69	26.18	26.18	-	
2513852	24" x 24" x 22" — 630 x 630 x 560 mm	24.80	22.05	26.18	26.18	-	

aquatherm green pipe® fusion outlet

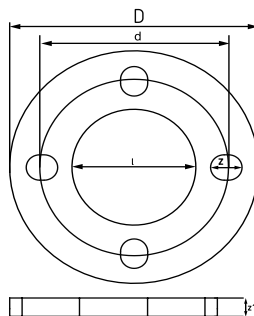


Part no.	Dimension ND — OD (pipe x outlet)	d	d1	d2	l	z	D	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0115156	1 ¼" x ½" — 40 x 20 mm	1.57	0.79	0.98	1.06	1.28	1.16	0.04
0115158	1 ¼" x ¾" — 40 x 25 mm	1.57	0.98	0.98	1.12	1.28	1.34	0.04
0115160	1 ½" x ½" — 50 x 20 mm	1.97	0.79	0.98	1.08	1.50	1.16	0.04
0115162	1 ½" x ¾" — 50 x 25 mm	1.97	0.98	0.98	1.12	1.48	1.34	0.04
0115164	2 x ½" — 63 x 20 mm	2.48	0.79	0.98	1.08	1.75	1.16	0.04
0115166	2" x ¾" — 63 x 25 mm	2.48	0.98	0.98	1.12	1.73	1.34	0.04
0115168	2" x 1" — 63 x 32 mm	2.48	1.26	1.26	1.18	1.71	1.69	0.06
0115170	2 ½" x ½" — 75 x 20 mm	2.95	0.79	0.98	1.08	1.99	1.16	0.04
0115172	2 ½" x ¾" — 75 x 25 mm	2.95	0.98	0.98	1.12	1.97	1.34	0.04
0115174	2 ½" x 1" — 75 x 32 mm	2.95	1.26	1.26	1.18	1.95	1.69	0.06
0115175	2 ½" x 1 ¼" — 75 x 40 mm	2.95	1.57	1.57	1.34	2.01	2.05	0.11
0115176	3" x ½" — 90 x 20 mm	3.54	0.79	0.98	1.08	2.28	1.16	0.04
0115178	3" x ¾" — 90 x 25 mm	3.54	0.98	0.98	1.12	2.26	1.34	0.04
0115180	3" x 1" — 90 x 32 mm	3.54	1.26	1.26	1.18	2.24	1.69	0.06
0115181	3" x 1 ¼" — 90 x 40 mm	3.54	1.57	1.57	1.34	2.30	2.05	0.11
0115182	3 ½" x ½" — 110 x 20 mm	4.33	0.79	0.98	1.08	2.68	1.16	0.04
0115184	3 ½" x ¾" — 110 x 25 mm	4.33	0.98	0.98	1.12	2.70	1.34	0.04
0115186	3 ½" x 1" — 110 x 32 mm	4.33	1.26	1.26	1.18	2.64	1.69	0.07
0115188	3 ½" x 1 ¼" — 110 x 40 mm	4.33	1.57	1.57	1.34	2.70	2.05	0.11
0115189	3 ½" x 1 ½" — 110 x 50 mm	4.33	1.97	1.97	1.34	2.58	2.68	0.20
0115190	4" x ½" — 125 x 20 mm	4.92	0.79	0.98	1.08	2.97	2.64	0.04
0115192	4" x ¾" — 125 x 25 mm	4.92	0.98	0.98	1.12	2.95	1.34	0.04
0115194	4" x 1" — 125 x 32 mm	4.92	1.26	1.26	1.18	2.93	1.69	0.06
0115196	4" x 1 ¼" — 125 x 40 mm	4.92	1.57	1.57	1.34	2.99	2.05	0.11
0115197	4" x 1 ½" — 125 x 50 mm	4.92	1.97	1.97	1.34	2.87	2.68	0.20
0115198	4" x 2" — 125 x 63 mm	4.92	2.48	2.48	1.50	2.87	3.31	0.33
0115206	6" x ½" — 160 x 20 mm	6.30	0.79	0.98	1.08	3.66	1.16	0.05
0115208	6" x ¾" — 160 x 25 mm	6.30	0.98	0.98	1.12	3.64	1.34	0.05
0115210	6" x 1" — 160 x 32 mm	6.30	1.26	1.26	1.18	3.62	1.69	0.08
0115212	6" x 1 ¼" — 160 x 40 mm	6.30	1.57	1.57	1.34	3.68	2.05	0.12
0115214	6" x 1 ½" — 160 x 50 mm	6.30	1.97	1.97	1.34	3.56	3.31	0.21
0115216	6" x 2" — 160 x 63 mm	6.30	2.48	2.48	1.50	3.56	3.31	0.25
0115218	6" x 2 ½" — 160 x 75 mm	6.30	2.95	2.95	1.65	3.62	3.94	0.50
0115220	6" x 3" — 160 x 90 mm	6.30	3.54	3.54	1.77	3.62	4.72	0.80
0115228	8 to 10" x ½" — 200 to 250 x 20 mm	7.87/9.84	0.79	0.98	1.08	4.45	1.16	0.04
0115229	8 to 10" x ¾" — 200 to 250 x 25 mm	7.87/9.84	0.98	0.98	1.12	4.43	1.34	0.05
0115230	8 to 10" x 1" — 200 to 250 x 32 mm	7.87/9.84	1.26	1.26	1.18	4.41	1.69	0.07
0115231	8" x 1 ¼" — 200 x 40 mm	7.87	1.57	1.57	1.34	4.47	2.05	0.11

aquatherm green pipe® fusion outlet - continued

Part no.	Dimension ND — OD (pipe x outlet)	d	d1	d2	l	z	D	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0115232	8" x 1 1/2" — 200 x 50 mm	7.87	1.97	1.97	1.34	4.35	2.68	0.19
0115233	8" x 2" — 200 x 63 mm	7.87	2.48	2.48	1.48	4.33	3.31	0.32
0115234	8" x 2 1/2" — 200 x 75 mm	7.87	2.95	2.95	1.65	4.41	3.94	0.49
0115235	8" x 3" — 200 x 90 mm	7.87	3.54	3.54	1.77	4.41	4.72	0.75
0115236	8" x 3 1/2" — 200 x 110 mm	7.87	4.33	4.33	1.93	4.41	5.79	1.27
0115237	8" x 4" — 200 x 125 mm	7.87	4.92	4.92	2.17	4.53	6.57	1.92
0115251	10" x 1 1/4" — 250 x 40 mm	9.84	1.57	0.00	1.34	5.45	2.05	0.12
0115252	10" x 1 1/2" — 250 x 50 mm	9.84	1.97	1.97	1.34	5.33	2.68	0.20
0115253	10" x 2" — 250 x 63 mm	9.84	2.48	2.48	1.48	5.31	3.31	0.34
0115254	10" x 2 1/2" — 250 x 75 mm	9.84	2.95	2.95	1.65	5.39	3.94	0.49
0115255	10" x 3" — 250 x 90 mm	9.84	3.54	3.54	1.77	5.39	4.72	0.77
0115256	10" x 3 1/2" — 250 x 110 mm	9.84	4.33	4.33	1.93	5.39	5.79	0.12
0115257	10" x 4" — 250 x 125 mm	9.84	4.92	4.92	2.17	5.51	6.57	1.81
0115260	12" to 14" x 2" — 315 to 355 x 63 mm	12.40/13.98	2.48	2.48	1.48	6.59	3.31	0.34
0115261	12" to 14" x 2 1/2" — 315 to 355 x 75 mm	12.40/13.98	2.95	2.95	1.65	6.67	3.94	0.51
0115262	12" x 3" — 315 x 90 mm	12.40	3.54	3.54	1.77	6.67	4.27	0.77
0115263	12" x 3 1/2" — 315 x 110 mm	12.40	4.33	4.33	1.93	6.67	5.79	1.25
0115264	12" x 4" — 315 x 125 mm	12.40	4.92	4.92	2.17	6.79	6.57	1.83
0115265	12" x 6" — 315 x 160 mm	12.40	6.30	6.30	3.15	9.35	-	1.91
0115268	14" x 3" — 355 x 90 mm	13.98	3.54	3.54	1.77	7.46	4.27	0.78
0115269	14" x 3 1/2" — 355 x 110 mm	13.98	4.33	4.33	1.93	7.46	5.79	1.29
0115270	14" x 4" — 355 x 125 mm	13.98	4.92	4.92	2.17	7.58	6.57	1.77
0115271	14" x 6" — 355 x 160 mm	13.98	6.30	6.30	3.15	10.14	-	1.86
0115272	14" x 8" — 355 x 200 mm	13.98	7.87	7.87	3.55	9.29	7.87	3.56
0115275	16" to 20" x 2 1/2" — 400 to 500 x 75 mm	15.75/17.72	2.95	2.95	1.65	4.76	3.94	0.46
0115277	16" to 18" x 3 1/2" — 400 to 450 x 110 mm	15.75/17.72	4.33	4.33	1.93	4.76	5.79	1.16
0115278	16" x 4" — 400 x 125 mm	15.75	4.92	4.92	2.17	8.46	6.57	1.70
0115280	16" x 6" to 10" — 400 x 160 - 250 mm	15.75	-	-	-	-	-	-
0115288	16" to 20" x 3" — 400 to 500 x 90 mm	15.75/19.69	3.54	3.54	1.77	9.33	4.27	0.72
0115290	18" to 20" x 4" — 450 to 500 x 125 mm	17.72/19.69	4.92	4.92	2.17	9.45	6.57	1.71
0115292	18" x 6" to 10" — 450 x 160 to 250 mm	17.72	-	-	-	-	-	-
0115298	18" x 12" — 450 x 315 mm	17.72	-	-	-	-	-	-
0115300	16" to 24" x 2" — 400 to 630 x 63 mm	15.75/24.80	2.48	2.48	1.48	10.24	3.31	0.33
0115303	20" to 22" x 3 1/2" — 500 to 560 x 110 mm	19.69/22.05	4.33	4.33	1.93	10.31	5.79	1.19
0115306	20" x 6" to 10" — 500 x 160 to 250 mm	19.69	-	-	-	-	-	-
0115312	20" x 12" — 500 x 315 mm	19.69	-	-	-	-	-	-
0115315	22" to 24" x 2 1/2" — 560 to 630 x 75 mm	22.05/24.80	2.95	2.95	1.65	11.50	3.94	0.49
0115316	22" to 24" x 3" — 560 to 630 x 90 mm	22.05/24.80	3.54	3.54	1.77	11.50	4.27	0.75
0115318	22" to 24" x 4" — 560 - 630 x 125 mm	22.05/24.80	4.92	4.92	2.17	11.02	6.57	1.75
0115331	24" x 3 1/2" — 630 x 110 mm	24.80	4.33	4.33	1.93	12.87	5.79	1.24
0115334	24" x 6" to 10" — 630 x 160 to 250 mm	24.80	-	-	-	-	-	-
0115340	24" x 12" — 630 x 315 mm	24.80	-	-	-	-	-	-

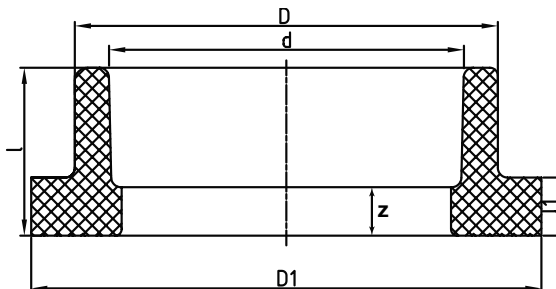
aquatherm flange ring



Part no.	Dimension ND — OD	No. of bolt holes	d	l	z	D	z1	Weight
			[in]	[in]	[in]	[in]	[in]	[lb]
3315712	1" — 32 mm	4	3.38	1.63	0.56	4.25	0.50	1.53
3315714	1 ¼" — 40 mm	4	3.94	2.00	0.69	5.56	0.50	2.73
3315716	1 ½" — 50 mm	4	4.31	2.44	0.69	5.94	0.50	3.03
3315718	2" — 63 mm	4	4.94	3.06	0.69	6.56	0.50	3.53
3315720	2 ½" — 75 mm	4	5.69	3.63	0.81	7.31	0.50	4.19
3315722	3" — 90 mm	8	6.31	4.31	0.69	7.94	0.63	5.45
3315724	3 ½" — 110 mm	8	7.06	5.25	0.69	8.69	0.63	6.21
3315726	4" — 125 mm	8	7.06	5.25	0.69	9.00	0.63	6.78
3315730	6" — 160 mm	8	9.50	7.00	0.88	11.00	0.69	10.15
3315734	8" — 200 mm	8	11.75	9.25	0.88	13.50	0.69	13.70
3315738	10" — 250 mm	12	13.75	11.31	0.88	16.00	0.81	21.35
3315742	12" — 315 mm	12	17.00	13.38	1.25	19.00	1.25	46.95
3315744	14" — 355 mm	12	18.75	14.81	1.38	21.00	1.38	45.35
3315746	16" — 400 mm	16	21.25	16.88	1.38	23.50	1.44	77.95
3315748	18" — 450 mm	16	25.00	20.315	0.630	27.52	43.00	119.10
3315750	20" — 500 mm	20	-	-	-	-	-	111.65
3315752	22" — 560 mm	20	-	-	-	-	-	137.20
3315754	24" — 630 mm	20	29.49	25.35	0.69	32.05	1.89	150.40

For flange bolt torque and size, refer to appendix A.

aquatherm green pipe® flange adapter
(socket welded, gasket not included)

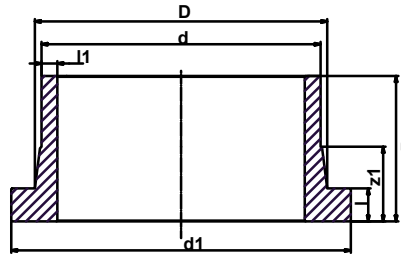


Part no.	Dimension ND — OD	d	l	z	D	D1	l1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0115512	1" — 32 mm	1.26	1.38	0.67	1.61	2.68	0.43	0.12
0115514	1 ¼" — 40 mm	1.57	1.44	0.65	1.97	3.07	0.49	0.16
0115516	1 ½" — 50 mm	1.97	1.56	0.63	2.40	3.46	0.47	0.21
0115518	2" — 63 mm	2.48	1.71	0.63	2.99	4.02	0.61	0.29
0115520	2 ½" — 75 mm	2.95	1.81	0.63	3.54	4.80	0.63	0.42
0115522	3" — 90 mm	3.54	1.97	0.67	4.25	5.43	0.67	0.57
0115524	3 ½" — 110 mm	4.33	2.19	0.73	5.16	6.22	0.73	0.73
0115526 ^a	4" — 125 mm	4.92	7.95	0.52	4.92	6.22	0.53	2.93
0115527	4" — 125 mm	4.92	2.48	0.91	6.50	7.40	0.79	1.60

^aPart no. 0115526 must be paired with a coupling (part no. 0111026, sold separately).

aquatherm green pipe® flange adapter
(butt welded, gasket not included)

If the flange adapter is being used to connect to a butterfly valve, select the appropriate part from the "Part no. for butterfly valve" column to ensure flange adapter compatibility. The dimensional data does not apply to the butterfly valve compatible flange adapters. Contact Aquatherm for the dimensional data.

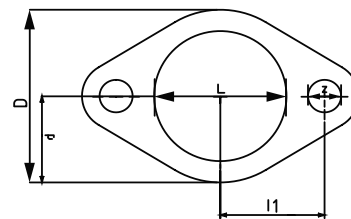
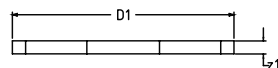


SDR	Part no.	Part no. for butterfly valve	Dimension ND — OD	d	l	z	D	D1	l1	z1	Weight
				[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
7.4	0115530	0115530BV	6" — 160 mm	6.30	0.98	3.66	6.89	8.35	0.86	2.09	2.56
	0115530L ^a	0115530LBV ^a	6" — 160 mm	6.30	0.98	15.41	6.89	8.35	0.86	2.09	8.97
	0115534	0115534BV	8" — 200 mm	7.87	1.26	5.12	9.13	10.55	1.08	2.83	5.05
	0115538	0115538BV	10" — 250 mm	9.84	1.38	5.12	11.22	12.60	1.35	2.95	7.27
	0115542	0115542BV	12" — 315 mm	12.40	1.38	6.69	13.11	14.57	1.13	3.54	-
	0115544	0115544BV	14" — 355 mm	13.98	1.65	7.28	14.57	17.01	1.27	3.74	-
11	0115531	0115531BV	6" — 160 mm	6.30	0.98	3.66	6.89	8.35	0.57	2.09	2.11
	0115531LB ^b	0115531LBBV ^b	6" — 160 mm	6.30	0.98	15.41	6.89	8.35	0.57	2.09	6.63
	0115531LG ^a	0115531LGBV ^a	6" — 160 mm	6.30	0.98	15.41	6.89	8.35	0.57	2.09	6.42
	0115535	0115535BV	8" — 200 mm	7.87	1.26	5.12	9.13	10.55	0.72	2.83	4.31
	0115539	0115539BV	10" — 250 mm	9.84	1.38	5.12	11.22	12.60	0.89	2.95	5.99
	0115543	0115543BV	12" — 315 mm	12.40	1.38	6.69	13.11	14.57	1.13	3.54	12.46
	0115545	0115545BV	14" — 355 mm	13.98	1.65	7.28	14.57	17.01	1.27	3.74	19.84
	0115547	0115547BV	16" — 400 mm	15.75	1.30	7.83	16.73	19.06	0.89	3.50	-
	0115549	0115549BV	18" — 450 mm	17.72	1.81	5.51	16.73	23.07	1.01	2.99	-
17.6	2515530	2515530BV	6" — 160 mm	6.30	0.98	3.66	6.89	8.35	0.36	2.09	1.809
	2515534	2515534BV	8" — 200 mm	7.87	1.26	5.12	9.13	10.55	0.45	2.83	-
	2515538	2515538BV	10" — 250 mm	9.84	1.38	5.12	11.22	12.60	0.56	2.95	6.03
	2515542	2515542BV	12" — 315 mm	12.40	1.38	6.69	13.11	14.57	0.70	3.54	9.92
	2515544	2515544BV	14" — 355 mm	13.98	1.65	7.28	14.57	17.01	0.79	3.74	14.33
	2515546	2515546BV	16" — 400 mm	15.75	1.30	7.83	16.73	19.06	0.89	3.50	18.74
	2515548	2515548BV	18" — 450 mm	17.72	1.81	5.51	20.16	23.07	1.01	2.99	26.46
	2515550	2515550BV	20" — 500 mm	19.69	1.85	5.51	20.67	23.03	1.12	2.91	21.11
	2515552	2515552BV	22" — 560 mm	22.05	1.97	5.55	24.09	26.97	1.25	3.19	30.42
	2515554	2515554BV	24" — 630 mm	24.80	1.97	5.59	25.20	27.09	1.41	3.23	27.78

^a Includes 1-ft extension of aquatherm green pipe®.

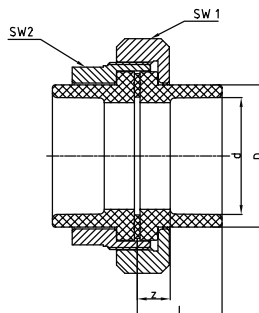
^b Includes 1-ft extension of aquatherm blue pipe®.

aquatherm green pipe® pump flange adapter ring
American bolt pattern



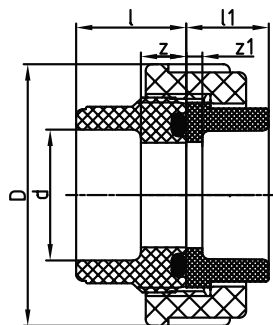
Part no.	Dimension ND — OD	d	L	z	D	l1	D1	z1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
5515712	1" — 32 mm pump flange ring - blue (used with part no. 0115512)	1.33	1.75	0.50	2.66	1.58	4.18	0.25	0.36
5515713	1 ¼" — 40 mm pump flange ring (used with part no. 0115514)	1.33	2.00	0.50	2.66	1.58	4.18	0.25	0.30
5515714	1 ¼" — 40 mm pump flange ring (used with part no. 0115514, fitted Grundfos model UP4375)	1.50	2.00	0.50	3.00	1.75	4.80	0.25	0.43

aquatherm green pipe® union with brass nut



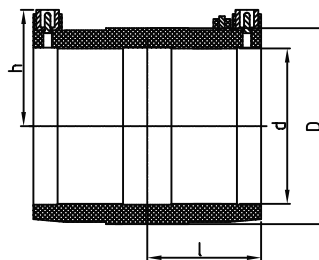
Part no.	Dimension ND — OD	d	l	z	D	SW1	SW2	Weight [lb]
		[in]	[in]	[in]	[in]	[in]	[in]	
0115812	1" — 32 mm	1.26	1.44	0.73	1.61	2.56	1.97	1.06
0115814	1 ¼" — 40 mm	1.57	1.50	0.69	1.97	3.15	2.36	1.86
0115816	1 ½" — 50 mm	1.97	1.61	0.69	2.40	3.39	2.76	1.81
0115818	2" — 63 mm	2.48	1.77	0.69	2.99	4.25	3.74	3.30
0115820	2 ½" — 75 mm	2.95	1.87	0.69	3.54	5.12	4.13	4.41

aquatherm green pipe® union with PP-R nut



Part no.	Dimension ND — OD	d	l	z	l1	z1	D	Weight [lb]
		[in]	[in]	[in]	[in]	[in]	[in]	
0115838	½" — 20 mm	0.79	1.02	0.47	0.79	0.22	1.81	0.08
0115840	¾" — 25 mm	0.98	1.10	0.47	0.83	0.20	2.20	0.13
0115842	1" — 32 mm	1.26	1.26	0.47	0.91	0.20	2.60	0.20
0115844	1 ¼" — 40 mm	1.57	1.50	0.55	1.00	0.20	3.11	0.30
0115846	1 ½" — 50 mm	1.97	1.77	0.63	1.12	0.20	3.43	0.38
0115848	2" — 63 mm	2.48	2.19	0.79	1.28	0.20	4.21	0.53
0115850	2 ½" — 75 mm	2.89	1.97	1.02	1.43	0.20	5.08	1.20

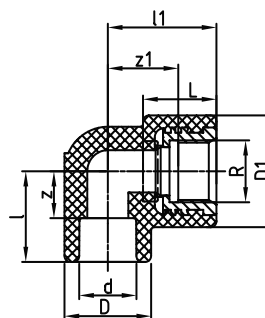
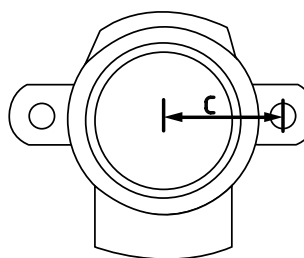
aquatherm green pipe® electrofusion coupling



Part no.	Dimension ND — OD	d	l	l1	D	Weight
		[in]	[in]	[in]	[in]	[lb]
0117208	½" — 20 mm	0.79	1.38	1.42	1.24	0.11
0117210	¾" — 25 mm	0.98	1.54	1.52	1.44	0.13
0117212	1" — 32 mm	1.26	1.57	1.67	1.77	0.17
0117214	1 ¼" — 40 mm	1.57	1.81	1.85	2.13	0.23
0117216	1 ½" — 50 mm	1.97	2.03	2.05	2.56	0.31
0117218	2" — 63 mm	2.48	2.32	2.28	3.21	0.53
0117220	2 ½" — 75 mm	2.95	2.56	2.54	3.78	0.77
0117222	3" — 90 mm	3.54	2.85	2.83	4.47	1.11
0117224	3 ½" — 110 mm	4.33	3.15	3.25	5.47	1.89
0117226	4" — 125 mm	4.92	3.39	3.54	6.14	2.42
0117230 [°]	6" — 160 mm	6.30	3.66	4.31	7.76	3.87
0117234 [°]	8" — 200 mm	7.87	4.13	5.28	9.57	7.99
0117238 [°]	10" — 250 mm	9.84	4.92	6.69	12.40	15.75

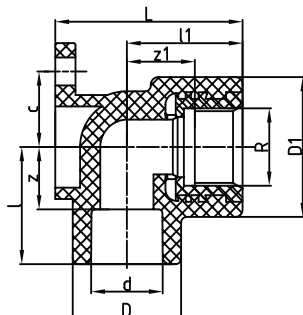
[°] Cannot be used in conjunction with UV pipe.

aquatherm green pipe® wing back 90° elbow



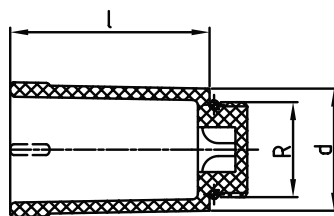
Lead-free brass part no. (NPT)	Stainless steel part no. (ISO)	Zero-lead brass part no. (NPT)	Dimension	d	R	l	z	D	l1	z1	D1	L	c	Weight
				[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
0120158	920158	0620158	20 mm x ½" F	0.79	0.50	1.18	0.61	1.16	1.46	0.94	1.46	0.98	2.32	0.42

aquatherm green pipe® back plate elbow threaded



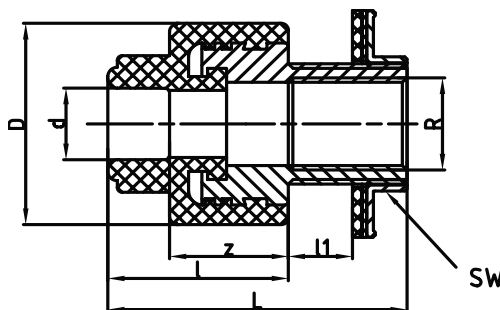
Lead-free brass part no. (NPT)	Stainless steel part no. (ISO)	Zero-lead brass part no. (NPT)	Dimension PP-R (ND — OD) x thread	d	R	l	z	D	l1	z1	D1	L	c	Weight
				[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
0120108	920108	0620108	(½" — 20 mm) x ½" F	0.79	0.50	1.22	0.65	1.16	1.24	0.73	1.46	2.01	0.79	0.08
0120110	920110	0620110	(½" — 20 mm) x ¾" F	0.79	0.75	1.46	0.89	1.34	1.46	0.94	1.73	2.13	0.98	0.23
0120112	920112	0620112	(¾" — 25 mm) x ¾" F	0.98	0.75	1.46	0.83	1.34	1.46	0.94	1.73	2.13	0.98	0.23
0120113	920113	0620113	(¾" — 25 mm) x ½" F	0.98	0.50	1.32	0.69	1.34	1.22	0.73	1.46	2.09	0.79	0.18

aquatherm green pipe® ISO plug for pressure tests with gasket



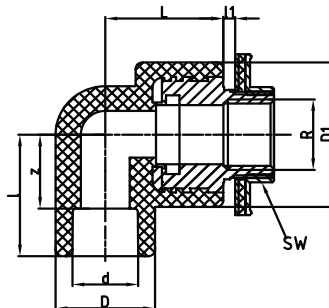
Part no.	Dimension	d	R	l	Weight
		[in]	[in]	[in]	[lb]
0050708	½" M	1.10	0.50	2.19	0.05
0050710	¾" M	1.34	0.75	2.19	0.06

aquatherm green pipe® ISO transition piece with counter nut, gasket and tension washer



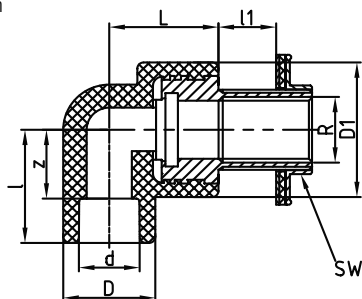
Part no.	Dimension	d	R	l	z	D	l1	L	SW	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0120204	20 mm x ½" F x ¾" M	0.79	0.50	1.57	1.00	1.71	0.53	2.56	1.14	0.45

aquatherm green pipe® ISO transition elbow with counter nut, gasket and tension washer



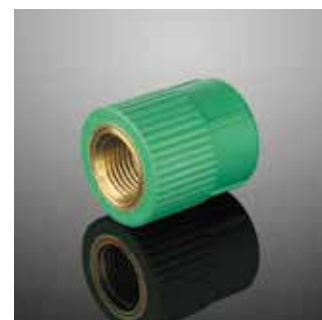
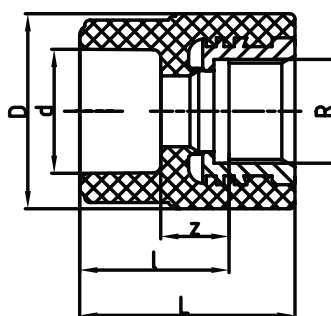
Part no.	Dimension	d	R	l	z	D	l1	L	D1	SW	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0120208	20 mm x 1/2" F x 3/4" M	0.79	0.50	1.46	0.89	1.16	0.14	1.38	1.73	1.14	0.34
0120209	25 mm x 1/2" F x 3/4" M	0.98	0.50	1.46	0.83	1.34	0.14	1.46	1.73	1.14	0.45

aquatherm green pipe® ISO transition elbow for dry construction



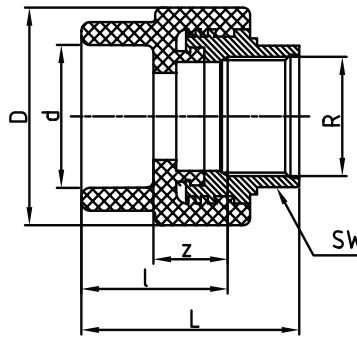
Part no.	Dimension (ND — OD)	d	R	l	z	D	l1	L	D1	SW	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0120210	20 mm x 1/2" F x 3/4" M	0.79	0.50	1.46	0.89	1.16	0.73	1.38	1.73	1.14	0.49

aquatherm green pipe® transition piece round



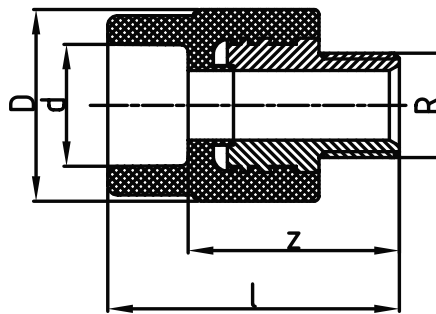
Lead-free brass part no. (NPT)	Stainless steel part no. (ISO)	Zero-lead brass part No. (NPT)	Dimension PP-R (ND — OD) x thread	d	R	l	z	D	L	Weight
				[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0121008	921008	0621008	[1/2" — 20 mm] x 1/2" F	0.79	0.50	1.10	0.53	1.16	1.61	0.14
0121010	921010	0621010	[1/2" — 20 mm] x 3/4" F	0.79	0.75	1.08	0.51	1.34	1.59	0.20
0121011	921011	0621011	[3/4" — 25 mm] x 1/2" F	0.98	0.50	1.16	0.53	1.34	1.67	0.14
0121012	921012	0621012	[3/4" — 25 mm] x 3/4" F	0.98	0.75	1.08	0.45	1.34	1.59	0.19
0121013	921013	0621013	[1" — 32 mm] x 3/4" F	1.26	0.75	1.20	0.49	1.69	1.71	0.20

aqualtherm green pipe® NPT transition piece with hex-shaped threaded transition



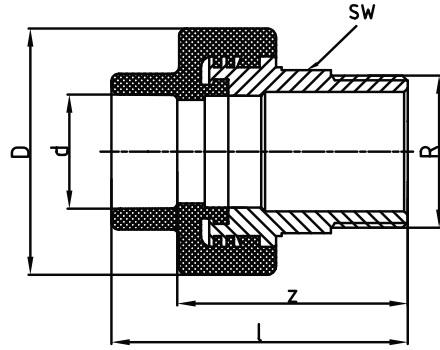
Lead-free brass part no. (NPT)	Stainless steel part no. (ISO)	Zero-lead brass part no. (NPT)	Dimension PP-R (ND — OD) x thread	d	R	l	z	D	L	SW	Weight
				[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
0121108	-	0621108	(1/2" — 20 mm) x 1/2" F	0.79	0.50	1.28	0.71	1.52	1.99	0.94	0.19
0121110	-	0621110	(1/2" — 20 mm) x 3/4" F	0.79	0.75	1.06	0.49	1.71	1.97	1.22	0.25
0121111	-	0621111	(3/4" — 25 mm) x 1/2" F	0.98	0.50	1.34	0.71	1.52	2.05	0.94	0.20
0121112	-	0621112	(3/4" — 25 mm) x 3/4" F	0.98	0.75	1.06	0.43	1.71	1.97	1.22	0.24
0121113	-	0621113	(1" — 32 mm) x 3/4" F	1.26	0.75	1.18	0.47	1.71	2.09	1.22	0.25
	(NPT)										
0121114	1121114	0621114	(1" — 32 mm) x 1" F	1.26	0.75	1.48	0.77	2.36	2.34	1.54	0.53
0121115	1121115	0621115	(1 1/4" — 40 mm) x 1" F	1.57	1.00	1.57	0.77	2.36	2.44	1.54	0.54
0121116	1121116	0621116	(1 1/4" — 40 mm) x 1 1/4" F	1.57	1.25	1.65	0.85	2.91	2.56	1.97	0.85
0121117	1121117	0621117	(1 1/2" — 50 mm) x 1 1/4" F	1.97	1.25	1.77	0.85	2.91	2.68	1.97	0.89
0121118	1121118	0621118	(1 1/2" — 50 mm) x 1 1/2" F	1.97	1.50	1.77	0.85	3.37	2.64	2.17	0.94
0121119	1121119	0621119	(2" — 63 mm) x 1 1/2" F	2.48	1.50	2.03	0.94	3.31	2.89	2.17	0.97
0121120	-	0621120	(2" — 63 mm) x 2" F	2.48	2.00	1.97	0.89	3.98	2.99	2.64	1.30
0121122	-	0621122	(2 1/2" — 75 mm) x 2" F	2.95	2.00	2.01	0.83	3.94	3.03	2.64	1.35

aqualtherm green pipe® transition piece round (male)



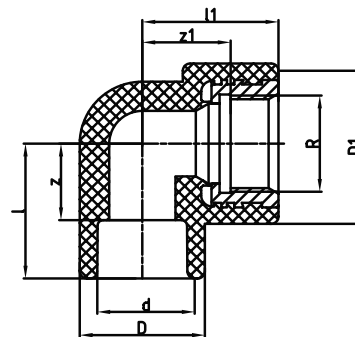
Lead-free brass part no. (NPT)	Stainless steel part no. (ISO)	Zero-lead brass part no. (NPT)	Dimension PP-R (ND — OD) x thread	d	R	l	z	D	Weight
				[in]	[in]	[in]	[in]	[in]	[lb]
0121208	921208	0621208	(1/2" — 20 mm) x 1/2" M	0.79	1/2"	2.22	1.65	1.52	0.21
0121210	921210	0621210	(1/2" — 20 mm) x 3/4" M	0.79	3/4"	2.26	1.69	1.52	0.24
0121211	921211	0621211	(3/4" — 25 mm) x 1/2" M	0.98	1/2"	2.28	1.65	1.52	0.22
0121212	921212	0621212	(3/4" — 25 mm) x 3/4" M	0.98	3/4"	2.26	1.63	1.52	0.24
0121213	921213	0621213	(1" — 32 mm) x 3/4" M	1.26	3/4"	2.34	1.63	1.69	0.25

aquatherm green pipe® NPT transition piece hex-shaped threaded transition



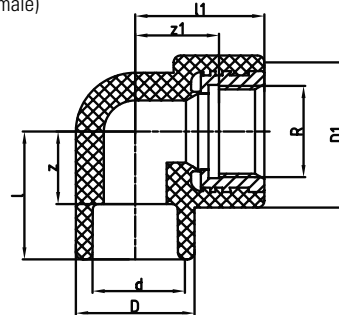
Lead-free brass part no. (NPT)	Zero-lead brass part no. (NPT)	Dimension PP-R (ND — OD) x thread	d	R	l	z	D	SW	Weight
			[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0121308	0621308	[1/2" — 20 mm] x 1/2" M	0.79	0.50	2.62	2.05	1.52	0.87	0.23
0121310	0621310	[1/2" — 20 mm] x 3/4" M	0.79	0.75	2.66	2.09	1.52	0.94	0.28
0121312	0621312	[3/4" — 25 mm] x 3/4" M	0.98	0.75	2.66	2.03	1.52	0.94	0.23
0121314	0621314	[1" — 32 mm] x 1" M	1.26	1.00	3.09	2.38	2.09	1.26	0.48
0121316	0621316	[1" — 32 mm] x 1 1/4" M	1.26	1.25	3.19	2.48	2.68	1.61	0.71
0121317	0621317	[1 1/4" — 40 mm] x 1" M	1.57	1.00	3.19	2.38	2.05	1.26	0.49
0121318	0621318	[1 1/4" — 40 mm] x 1 1/4" M	1.57	1.25	3.33	2.52	2.68	1.61	0.72
0121319	0621319	[1 1/2" — 50 mm] x 1 1/4" M	1.97	1.25	3.37	2.44	2.68	1.61	0.78
0121320	0621320	[1 1/2" — 50 mm] x 1 1/2" M	1.97	1.50	3.48	2.56	2.91	1.81	0.95
0121321	0621321	[2" — 63 mm] x 1 1/2" M	2.48	1.50	3.90	2.81	2.85	1.81	1.03
0121322	0621322	[2" — 63 mm] x 2" M	2.48	2.00	4.04	2.95	3.31	1.97	1.50
0121323	0621323	[2 1/2" — 75 mm] x 2" M	2.95	2.00	4.09	2.91	3.31	1.97	1.61
0121324	0621324	[2 1/2" — 75 mm] x 2 1/2" M	2.95	2.50	4.13	2.95	3.94	2.56	2.14
0121325	0621325	[3" — 90 mm] x 3" M	3.54	3.00	4.96	3.66	4.72	3.35	2.90
0121327	-	[3 1/2" — 110 mm] x 4" M	4.33	4.00	5.83	4.37	5.79	4.13	5.95

aquatherm green pipe® transition elbow



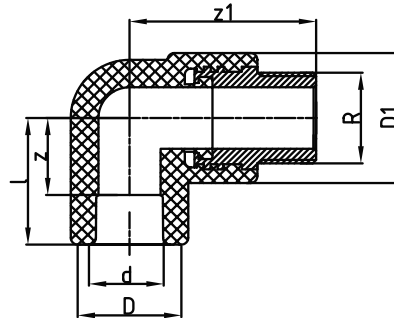
Lead-free brass part no. (NPT)	Stainless steel part no. (ISO)	Zero-lead brass part no. (NPT)	Dimension PP-R (ND — OD) x thread	d	R	l	z	D	l1	z1	D1	Weight
				[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0123008	923008	0623008	[1/2" — 20 mm] x 3/4" F	0.79	0.75	1.46	0.89	1.34	1.46	0.94	2.32	0.23
0123010	923010	0623010	[1/2" — 20 mm] x 1/2" F	0.79	0.50	1.24	0.67	1.16	1.46	0.94	1.97	0.16
0123012	923012	0623012	[3/4" — 25 mm] x 3/4" F	0.98	0.75	1.46	0.83	1.34	1.46	0.94	2.32	0.22
0123014	923014	0623014	[3/4" — 25 mm] x 1/2" F	0.98	0.50	1.34	0.71	1.34	1.46	0.94	2.07	0.16
0123016	923016	0623016	[1" — 32 mm] x 3/4" F	1.26	0.75	1.08	0.37	1.69	2.01	1.50	1.95	0.23
	(NPT)											
0123018	1123018	0623018	[1" — 32 mm] x 1" F	1.26	1.00	1.26	0.55	1.69	2.62	1.91	2.45	0.55

aquatherm green pipe® NPT transition street elbow (male/female)



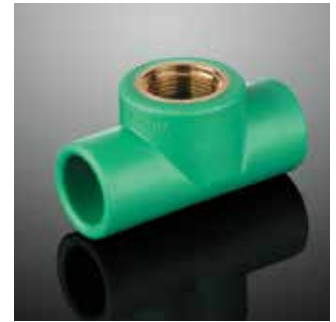
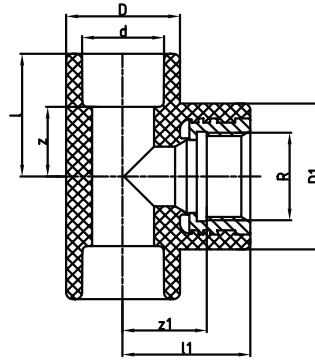
Lead-free brass part no. (NPT)	Zero-lead brass part no. (NPT)	Dimension PP-R (ND — OD) x thread	d	R	l	z	D	l1	z1	D1	Weight
			[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
0123208	0623208	½" — 20 mm) x ½" F	0.79	0.50	1.32	0.73	1.16	1.46	0.94	1.46	0.17

aquatherm green pipe® transition elbow (male)



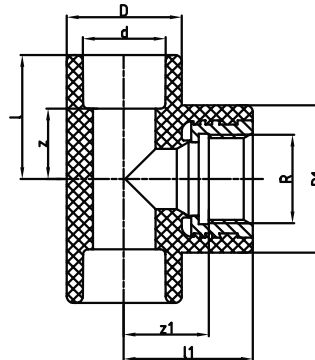
Lead-free brass part no. (NPT)	Stainless steel part no. (ISO)	Zero-lead brass part no. (NPT)	Dimension PP-R (ND — OD) x thread	d	R	l	z	D	z1	D1	Weight
				[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
0123506	923506	0623506	½" — 20 mm) x ½" M	0.79	0.50	1.24	0.67	1.16	2.09	1.46	0.24
0123508	923508	0623508	½" — 20 mm) x ¾" M	0.79	0.75	1.46	0.89	1.34	2.13	1.50	0.28
0123510	923510	0623510	¾" — 25 mm) x ¾" M	0.98	0.75	1.46	0.83	1.34	2.13	1.50	0.23
0123512	923512	0623512	1" — 32 mm) x ¾" M	1.26	0.75	1.08	0.37	1.69	2.68	1.50	0.25
0123514	-	0623514	1" — 32 mm) x 1" M	1.26	1.00	1.22	0.51	1.69	3.37	2.05	0.51

aquatherm green pipe® transition tee (female)



Lead-free brass part no. (NPT)	Stainless steel part no. (ISO)	Zero-lead brass part no. (NPT)	Dimension PP-R (ND — OD) x thread	d	R	l	z	D	l1	z1	D1	Weight
				[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
0125006	925006	0625006	(½" — 20 mm) x (½" — 20 mm) x ½" F	0.79	0.50	1.24	0.67	1.16	1.46	0.94	1.46	0.19
0125008	925008	0625008	(½" — 20 mm) x (½" — 20 mm) x ¾" F	0.79	0.75	1.46	0.89	1.34	1.50	0.98	1.73	0.27
0125010	925010	0625010	(¾" — 25 mm) x (¾" — 25 mm) x ½" F	0.98	0.50	1.34	0.71	1.34	1.50	0.98	1.46	0.20
0125012	925012	0625012	(¾" — 25 mm) x (¾" — 25 mm) x ¾" F	0.98	0.75	1.46	0.83	1.34	1.50	0.98	1.73	0.20
0125014	925014	0625014	(1" — 32 mm) x (1" — 32 mm) x ¾" F	1.26	0.75	1.08	0.37	1.69	2.01	1.50	1.73	0.25
	(NPT)											
0125016	1125016	0625016	(1" — 32 mm) x (1" — 32 mm) x 1" F	1.26	1.00	1.22	0.53	1.69	2.64	1.93	2.36	0.56
0125022	-	0625022	(1 ½" — 50 mm) x (1 ½" — 50 mm) x 1" F	1.97	1.00	1.95	1.02	2.68	2.50	1.71	2.68	0.82

aquatherm green pipe® NPT transition tee (male)



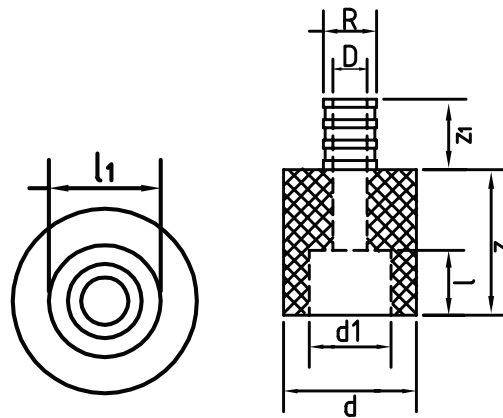
Lead-free brass part no. (NPT)	Zero-lead brass part no. (NPT)	Dimension ND — OD	d	R	l	z	D	z1	D1	Weight
			[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
0125506	0625506	(½" — 20 mm) x ½" M x (½" — 20 mm)	0.79	0.50	1.24	0.67	1.16	2.09	1.46	0.23

aquatherm green pipe® transition to compression fitting (PP-R to brass)



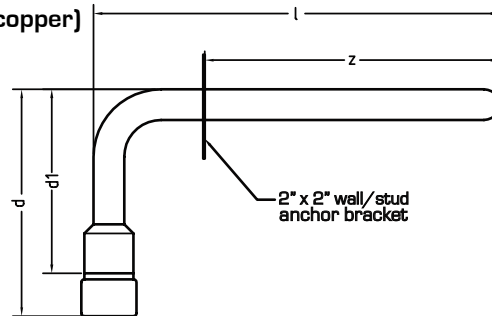
Part no.	Dimension ND — OD	Weight
		[lb]
0099013	½" (20 mm) PP-R to ½" Compression	0.214

aquatherm green pipe® PEX adapter
built to ASTM F1807 standard



Part no.	Dimension ND — OD	d	R	l	z	D	l1	z1	d1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0099840	½" — 20 mm	1.125	0.5	0.625	1.25	0.25	0.75	0.625	0.75	-
0099841	¾" — 25 mm	1.375	0.625	0.625	1.375	0.5	1.00	0.625	0.875	-
0099842	1" — 32 mm	1.75	0.875	0.875	1.625	0.625	1.25	0.75	1.25	-

aquatherm green pipe® Stub out (PP-R to copper)

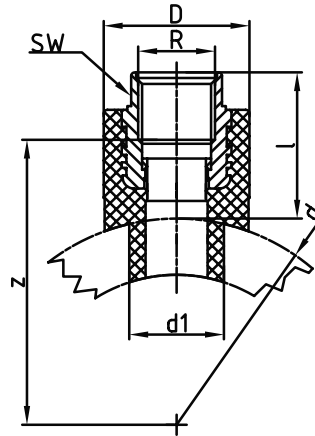


Part no.	Dimension ND — OD	d	d1	l	z	Weight
		[in]	[in]	[in]	[in]	[lb]
630P248E	½" — 20 mm	4.625	3.75	8.25	6	-
630P368E	¾" — 25 mm	7.5	6.625	8.5	6	-
630P41110	1" — 32 mm	12.25	11.25	10.5	7.5	-

These fittings are combination of a custom Aquatherm PP-R socket with a gasket and copper stub added by Sioux Chief Manufacturing. The fused PP-R portion is covered under Aquatherm's warranty. The copper portion and gasket are covered under a warranty from Sioux Chief.

aquatherm green pipe® NPT fusion outlet

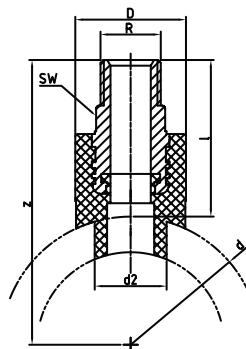
with hex shaped female thread, weld-in surface and weld-in socket for fusion with the inner wall of the pipe



Lead-free brass part no. (NPT)	Stainless steel part no. (ISO)	Zero-lead brass part no. (NPT)	Dimension pipe x outlet (ND-OD) x thread	d	d1	R	l	z	D	SW	Weight
				[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
0128214	928214	0628214	1 ¼" x ¾" — 40 x 25 mm x ½" F	1.57	0.98	0.50	1.54	1.61	1.52	0.94	0.19
0128216	928216	0628216	1 ½" x ¾" — 50 x 25 mm x ½" F	1.97	0.98	0.50	1.54	1.81	1.52	0.94	0.20
0128218	928218	0628218	2" x ¾" — 63 x 25 mm x ½" F	2.48	0.98	0.50	1.54	2.07	1.52	0.94	0.20
0128220	928220	0628220	2 ½" x ¾" — 75 x 25 mm x ½" F	2.95	0.98	0.50	1.54	2.30	1.52	0.94	0.18
0128222	928222	0628222	3" x ¾" — 90 x 25 mm x ½" F	3.54	0.98	0.50	1.54	2.60	1.52	0.94	0.20
0128224	928224	0628224	3 ½" x ¾" — 110 x 25 mm x ½" F	4.33	0.98	0.50	1.54	2.99	1.52	0.94	0.20
0128226	928226	0628226	4" x ¾" — 125 x 25 mm x ½" F	4.92	0.98	0.50	1.54	3.29	1.52	0.94	0.20
0128230	928230	0628230	6" x ¾" — 160 x 25 mm x ½" F	6.30	0.98	0.50	1.54	3.98	1.52	0.94	0.20
0128232	928232	0628232	8 to 10" x ¾" — 200 to 250 x 25 mm x ½" F	7.87	0.98	0.50	1.54	-	1.52	0.94	0.20
0128234	928234	0628234	1 ¼" x ¾" — 40 x 25 mm x ¾" F	1.57	0.98	0.50	1.54	1.42	1.71	1.22	0.24
0128236	928236	0628236	1 ½" x ¾" — 50 x 25 mm x ¾" F	1.97	0.98	0.50	1.54	1.61	1.71	1.22	0.24
0128238	928238	0628238	2" x ¾" — 63 x 25 mm x ¾" F	2.48	0.98	0.50	1.54	1.87	1.71	1.22	0.24
0128240	928240	0628240	2 ½" x ¾" — 75 x 25 mm x ¾" F	2.95	0.98	0.50	1.54	2.11	1.71	1.22	0.24
0128242	928242	0628242	3" x ¾" — 90 x 25 mm x ¾" F	3.54	0.98	0.50	1.54	2.40	1.71	1.22	0.24
0128244	928244	0628244	3 ½" x ¾" — 110 x 25 mm x ¾" F	4.33	0.98	0.50	1.54	2.80	1.71	1.22	0.24
0128246	928246	0628246	4" x ¾" — 125 x 25 mm x ¾" F	4.92	0.98	0.50	1.54	3.09	1.71	1.22	0.25
0128250	928250	0628250	6" x ¾" — 160 x 25 mm x ¾" F	6.30	0.98	0.50	1.54	3.78	1.71	1.22	0.25
0128254	928254	0628254	8 to 10" x ¾" — 200 to 250 x 25 mm x ¾" F	7.87	0.98	0.50	1.54	-	1.71	1.22	0.25
	(NPT)										
0128260	1128260	0628260	2 ½" x 1" — 75 x 32 mm x 1" F	2.95	1.26	1.00	1.69	2.30	2.36	1.54	0.50
0128262	1128262	0628262	3" x 1" — 90 x 32 mm x 1" F	3.54	1.26	1.00	1.69	2.60	2.36	1.54	0.50
0128264	1128264	0628264	3 ½" x 1" — 110 x 32 mm x 1" F	4.33	1.26	1.00	1.69	2.99	2.36	1.54	0.50
0128266	1128266	0628266	4" x 1" — 125 x 32 mm x 1" F	4.92	1.26	1.00	1.69	3.29	2.36	1.54	0.05
0128270	1128270	0628270	6" x 1" — 160 x 32 mm x 1" F	6.30	1.26	1.00	1.69	3.98	2.36	1.54	0.50
0128274	1128274	0628274	8 to 10" x 1" — 200 to 250 x 32 mm x 1" F	7.87	1.26	1.00	1.69	4.76	2.36	1.54	0.54

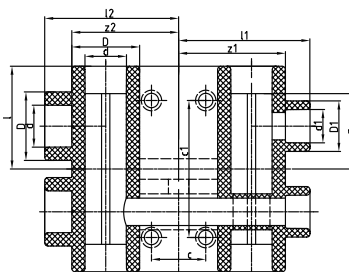
The necessary heads for the fusion of aquatherm green pipe® fusion outlets are listed on page 5.48 (part no. 0050614 - 0050640).

aquatherm green pipe® NPT fusion outlet
with hex shaped male thread, weld-in surface and weld-in socket for fusion with the inner wall of the pipe



Lead-free brass part no. (NPT)	Zero-lead brass part no. (NPT)	Dimension pipe x outlet (ND-OD) x thread	d	d2	l	z	D	R	SW	Weight [lb]
			[in]	[in]	[in]	[in]	[in]	[in]	[in]	
0128314	0628314	1" x 3/4" — 40 x 25 mm x 1/2" M	1.57	0.98	2.17	2.95	1.52	0.50	0.83	0.19
0128316	0628316	1 1/2" x 3/4" — 50 x 25 mm x 1/2" M	1.97	0.98	2.17	3.15	1.52	0.50	0.83	0.20
0128318	0628318	2" x 3/4" — 63 x 25 mm x 1/2" M	2.48	0.98	2.17	3.41	1.52	0.50	0.83	0.20
0128320	0628320	2 1/2" x 3/4" — 75 x 25 mm x 1/2" M	2.95	0.98	2.17	3.64	1.52	0.50	0.83	0.21
0128322	0628322	3" x 3/4" — 90 x 25 mm x 1/2" M	3.54	0.98	2.17	3.94	1.52	0.50	0.83	0.20
0128324	0628324	3 1/2" x 3/4" — 110 x 25 mm x 1/2" M	4.33	0.98	2.17	4.33	1.52	0.50	0.83	0.20
0128326	0628326	4" x 3/4" — 125 x 25 mm x 1/2" M	4.92	0.98	2.17	4.63	1.52	0.50	0.83	0.20
0128330	0628330	6" x 3/4" — 160 x 25 mm x 1/2" M	6.30	0.98	2.17	5.31	1.52	0.50	0.83	0.20
0128334	0628334	1" x 3/4" — 40 x 25 mm x 3/4" M	1.57	0.98	2.20	2.99	1.71	0.75	0.94	0.24
0128336	0628336	1 1/2" x 3/4" — 50 x 25 mm x 3/4" M	1.97	0.98	2.20	3.19	1.71	0.75	0.94	0.24
0128338	0628338	2" x 3/4" — 63 x 25 mm x 3/4" M	2.48	0.98	2.20	3.44	1.71	0.75	0.94	0.24
0128340	0628340	2 1/2" x 3/4" — 75 x 25 mm x 3/4" M	2.95	0.98	2.20	3.68	1.71	0.75	0.94	0.24
0128342	0628342	3" x 3/4" — 90 x 25 mm x 3/4" M	3.54	0.98	2.20	3.98	1.71	0.75	0.94	0.24
0128344	0628344	3 1/2" x 3/4" — 110 x 25 mm x 3/4" M	4.33	0.98	2.20	4.37	1.71	0.75	0.94	0.24
0128346	0628346	4" x 3/4" — 125 x 25 mm x 3/4" M	4.92	0.98	2.20	4.67	1.71	0.75	0.94	0.25
0128350	0628350	6" x 3/4" — 160 x 25 mm x 3/4" M	6.30	0.98	2.20	5.35	1.71	0.75	0.94	0.25

aquatherm green pipe® distribution block plumbing including 1 plug and 2 fasteners

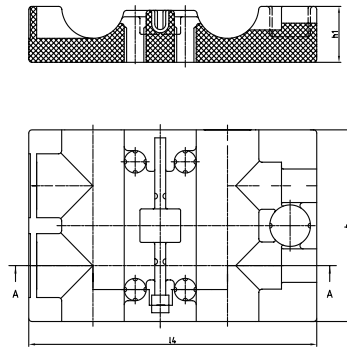


Part no.	Dimension ND — OD	d	l	z	D	d1	l1	z1	D1	l2	z2	c	c1	cl	l3	h	Weight [lb]
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	
0130115	3/4" x 1/2" — 25 x 20 mm	0.98	2.36	1.73	1.57	0.79	3.05	2.48	1.16	3.11	2.48	1.26	3.15	3.94	1.42	2.01	0.61

Material: **fusiolen® PP-R**

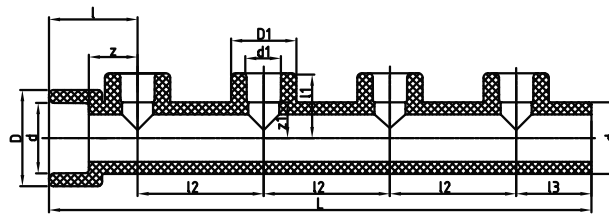
Passage: 25 mm (socket) / 2 branches: 20 mm (sockets).

aquatherm green pipe® distribution block plumbing with insulation block (3" x 3" — 70 x 70 mm)



Part no.	Dimension ND — OD	l4	b	h1	Weight
		[in]	[in]	[in]	[lb]
0130130	¾" x ½" — 25 x 20 mm	7.24	4.72	1.38	0.70

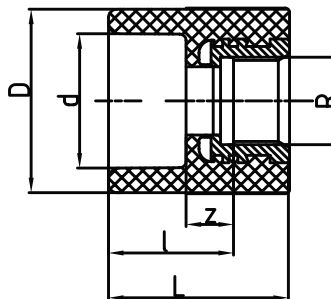
aquatherm green pipe® distribution pipe (246 mm long, with four branch connections)



Part no.	Dimension ND — OD	d	d1	l	z	D	l1	z1	D1	l2	l3	L	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0130604	1" x ½" — 32 x 20 mm	1.26	0.79	1.57	0.87	1.69	1.14	0.57	1.16	2.24	1.42	9.65	0.30

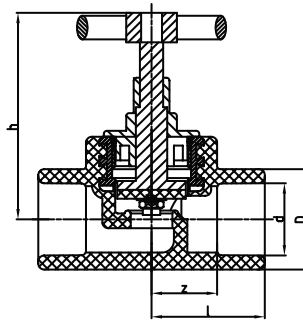
The distribution pipe can be shortened or supplemented by fusion with further distribution pipes as needed.

aquatherm green pipe® distributor end piece with female thread **NPT** to empty or aerate the distribution pipe



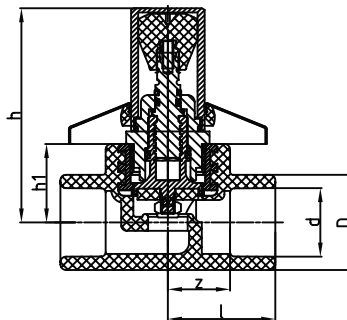
Part no.	Dimension (ND — OD) x thread	d	l	z	D	L	R	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0130804	{1" — 32 mm} x ½" F	1.26	1.14	0.43	1.69	1.65	0.50	0.17

aquatherm green pipe® screw-down stop globe valve
for surface installation



Part no.	Dimension ND — OD	d	l	z	D	h	Weight
		[in]	[in]	[in]	[in]	[in]	[lb]
0140808	½" — 20 mm	0.79	1.38	0.81	1.56	2.76	0.36
0140810	¾" — 25 mm	0.98	1.50	0.87	1.34	2.76	0.38
0140812	1" — 32 mm	1.26	1.93	1.22	1.69	3.41	0.69
0140814	1 ¼" — 40 mm	1.57	2.36	1.56	2.05	3.96	1.29

aquatherm green pipe® concealed valve
chromium-plated, tamper proof, short design

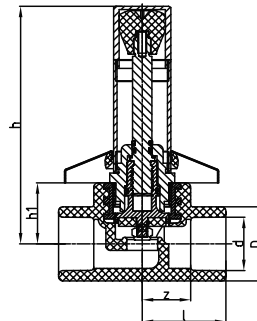


Part no.	Dimension ND — OD	d	l	z	D	h	h1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0140868	½" — 20 mm	0.79	1.38	0.81	1.16	2.81	1.10	0.57
0140870	¾" — 25 mm	0.98	1.50	0.87	1.34	2.81	1.10	0.64
0140872	1" — 32 mm	1.26	1.93	1.22	1.69	3.25	1.34	0.83

Part no. 0140868 - 0140870 suitable for construction depths up to 1".

Part no. 0140872 suitable for construction depths up to 1 ⅛".

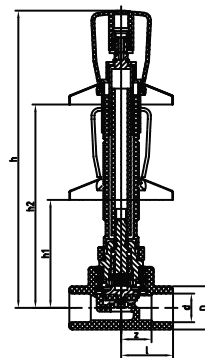
aquatherm green pipe® concealed valve chromium-plated, tamper proof



Part no.	Dimension ND — OD	d	l	z	D	h	h1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0140888	½" — 20 mm	0.79	1.38	0.81	1.16	4.29	1.10	0.75
0140890	¾" — 25 mm	0.98	1.50	0.87	1.34	4.29	1.10	0.77
0140892	1" — 32 mm	1.26	1.93	1.22	1.69	4.53	1.34	0.95

Suitable for construction depths up to 2 ⅛".

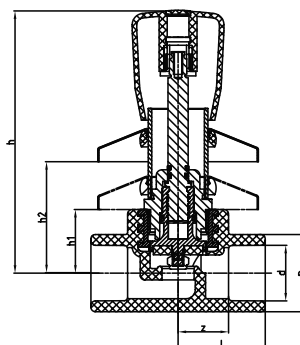
aquatherm green pipe® concealed valve chromium-plated



Part no.	Dimension ND — OD	d	l	z	D	h	h1	h2	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0140878	½" — 20 mm	0.79	1.38	0.81	1.16	8.39	5.79	2.32	0.79
0140880	¾" — 25 mm	0.98	1.50	0.87	1.34	8.39	5.79	2.32	0.81
0140882	1" — 32 mm	1.26	1.93	1.22	1.69	8.62	6.02	2.56	1.00

Suitable for construction depths from 2 ⅞" - 4".

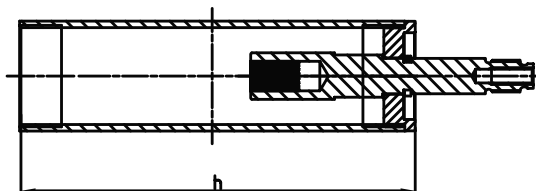
aquatherm green pipe® concealed valve chromium-plated



Part no.	Dimension ND — OD	d	l	z	D	h	h1	h2	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0140858	½" — 20 mm	0.79	1.38	0.81	1.16	4.57	1.10	2.32	0.70
0140860	¾" — 25 mm	0.98	1.50	0.87	1.34	4.57	1.10	2.32	0.73
0140862	1" — 32 mm	1.26	1.93	1.22	1.69	4.76	1.34	2.32	0.92

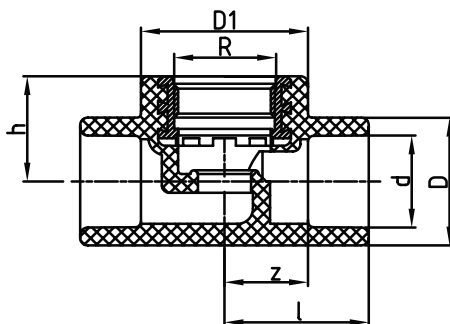
Extension for aquatherm green pipe® concealed valve

chromium-plated for part no. 0040858 - 0040862



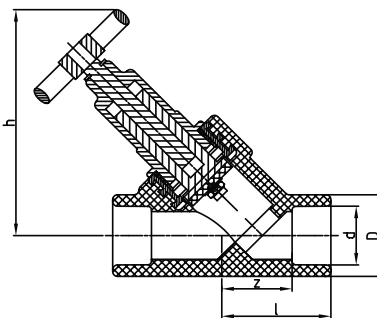
Part no.	Dimension	h	Weight
		[in]	[lb]
0040900	3.2" extension (92 mm)	3.62	0.33
0040902	4.25" extension (132 mm)	5.20	0.46

aquatherm green pipe® stop valve body ISO



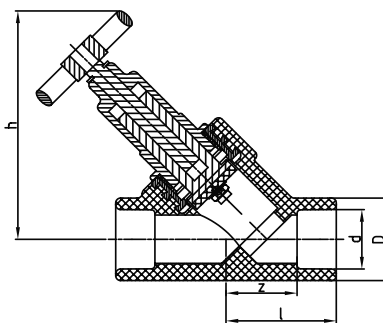
Part no.	Dimension PP-R (ND — OD) x thread	d	l	z	D	h	D1	R	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0040908	[1/2" — 20 mm] x 3/4" F	0.79	1.38	0.79	1.16	1.10	1.73	0.75	0.21
0040910	[3/4" — 25 mm] x 3/4" F	0.98	1.50	0.87	1.34	1.10	1.73	0.75	0.22
0040912	[1" — 32 mm] x 1" F	1.26	1.93	1.22	1.69	1.34	2.05	1.00	0.32
0040914	[1 1/4" — 40 mm] x 1 1/4" F	1.57	2.36	1.56	2.05	1.61		1.25	0.69

aquatherm green pipe® inclined valve without drain



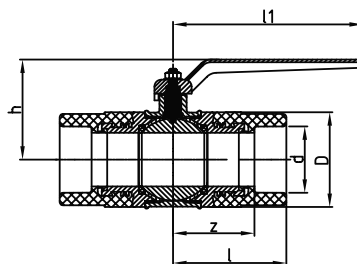
Part no.	Dimension ND — OD	d	l	z	D	h	Weight
		[in]	[in]	[in]	[in]	[in]	[lb]
0041108	1/2" — 20 mm	0.79	1.77	1.20	1.34	3.76	0.65
0041110	3/4" — 25 mm	0.98	1.77	1.14	1.34	3.76	0.62
0041112	1" — 32 mm	1.26	2.20	1.50	1.69	4.39	0.93
0041114	1 1/4" — 40 mm	1.57	2.56	1.75	2.05	5.31	1.84

aquatherm green pipe® inclined check valve without drain



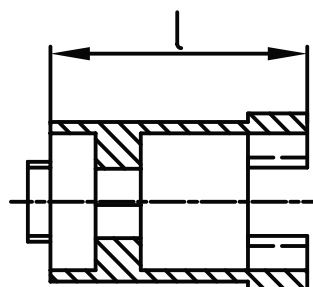
Part no.	Dimension ND — OD	d	l	z	D	h	Weight
		[in]	[in]	[in]	[in]	[in]	[lb]
0041208	1/2" — 20 mm	0.79	1.77	1.20	1.34	3.76	0.65
0041210	3/4" — 25 mm	0.98	1.77	1.14	1.34	3.76	0.64
0041212	1" — 32 mm	1.26	2.20	1.50	1.69	4.39	0.95
0041214	1 1/4" — 40 mm	1.57	2.56	1.75	2.05	5.31	1.85

aquatherm green pipe® ball valve without drain



Part no.	Dimension ND — OD	d	l	z	D	h	l1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0041308	½" — 20 mm	0.79	2.17	1.59	1.26	2.60	3.35	0.62
0041310	¾" — 25 mm	0.98	2.17	1.54	1.61	2.87	3.35	0.83
0041312	1" — 32 mm	1.26	2.50	1.79	1.85	3.23	4.25	1.31
0041314	1 ¼" — 40 mm	1.57	2.85	2.05	2.28	3.66	4.25	2.28
0041316	1 ½" — 50 mm	1.97	3.29	2.36	2.78	4.49	5.51	2.95
0041318	2" — 63 mm	2.48	4.04	2.95	3.43	5.20	5.51	5.63

Extension for aquatherm green pipe® ball valve



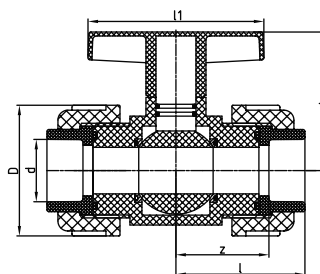
Part no.	Dimension ND — OD x length	l	Weight
		[in]	[lb]
0041378	½" to ¾" — 20 to 25 mm x 35 mm	1.38	0.27
0041382	1" to 1 ¼" — 32 to 40 mm x 35 mm	1.38	0.27
0041386	1 ½" to 2" — 50 - 63 mm x 46 mm	1.81	0.60

Part no. 0041378 suitable for part no. 0041308 / 0041310.

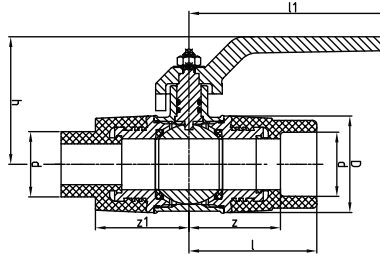
Part no. 0041382 suitable for part no. 0041312 / 0041314.

Part no. 0041386 suitable for part no. 0041316 / 0041318.

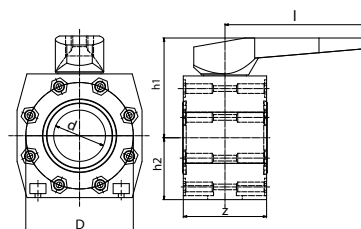
aquatherm green pipe® ball valve polypropylene



Part no.	Dimension ND — OD	d	l	z	D	h	L2	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0041488	½" — 20 mm	0.79	2.03	1.46	1.81	2.01	2.68	0.26
0041490	¾" — 25 mm	0.98	2.30	1.67	2.20	2.40	3.07	0.41
0041492	1" — 32 mm	1.26	2.48	1.77	2.60	2.76	3.46	0.61
0041494	1 ¼" — 40 mm	1.57	2.83	2.03	3.11	3.19	3.86	0.96
0041496	1 ½" — 50 mm	1.97	2.99	2.07	3.43	3.54	4.25	1.21
0041498	2" — 63 mm	2.48	3.56	2.48	4.21	4.33	4.65	2.03
0041400	2 ½" — 75 mm	2.95	9.84	5.71	7.32	7.32	15.35	5.77

aquatherm green pipe® ball valve (male/female)


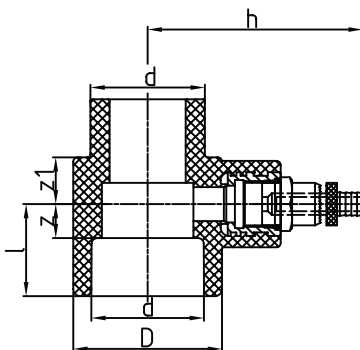
Part no.	Dimension ND — OD	d	l	z	D	z1	h	l1	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0078000	(1" — 32 mm) M/F	1.26	2.48	1.77	1.87	1.83	3.07	4.25	1.27

aquatherm green pipe® ball valve polypropylene (European flange ring)


Part no.	Dimension ND — OD	d	l	z	D	h1	h2	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0041602	3" — 90 mm	3.03	8.27	4.88	6.30	5.91	3.66	9.20
0041604 ^a	3 ½" to 4" — 110 to 125 mm	3.70	10.24	5.71	7.09	6.50	4.06	12.37
0041607	6" — 160 mm	5.31	12.20	8.07	9.45	8.27	5.37	12.38

^aFor a 4" connection, use part no. 0115526 and part no. 3315724. For a 3 ½" connection, use part no. 0115524 and part no. 3315724.

Note: Screws and washers not included in delivery. Use hexagon screw M16 x 60 mm for part no. 41602/41604, M16 x 80 mm for part no. 41607, and flat washer M16.

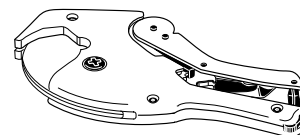
aquatherm green pipe® draining branch to weld in aquatherm green pipe valves


Part no.	Dimension ND — OD	d	l	z	D	z1	h	Weight
		[in]	[in]	[in]	[in]	[in]	[in]	[lb]
0041408	½" — 20 mm	0.79	0.45	1.02	1.34	0.65	2.64	0.22
0041410	¾" — 25 mm	0.98	0.39	1.02	1.34	0.65	2.64	0.21
0041412	1" — 32 mm	1.26	0.55	1.26	1.69	0.67	2.78	0.26
0041414	1 ¼" — 40 mm	1.57	0.47	1.28	2.05	0.65	3.01	0.31
0041416	1 ½" — 50 mm	1.97	0.61	1.54	2.68	0.67	3.30	0.45
0041418	2" — 63 mm	2.48	0.65	1.73	3.31	0.65	3.66	0.64

aquatherm pipe cutter

Part no.	Dimension	Weight [lb]
0050104	($\frac{3}{8}$ " - 1 $\frac{1}{4}$ ") — (16 - 40 mm)	1.31

Note: Intended for use with PP-R pipe and fittings only.

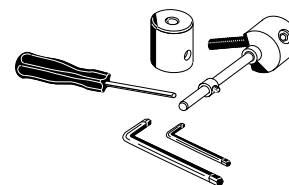


aquatherm temperature protective gloves for welding head changing

Part no.	Dimension
0050195	-

aquatherm repair set to close pipe holes up to 0.4 in (repair stick part no. 0060600)

Part no.	Dimension	Weight [lb]
0050307	$\frac{1}{4}$ " — 7 mm	0.37
0050311	$\frac{7}{16}$ " — 11 mm	0.37

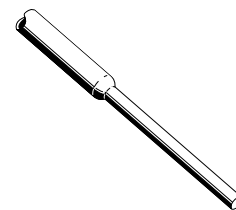


aquatherm green pipe® repair plug

Part no.	Dimension OD for each end	Weight [lb]
0060600	$\frac{7}{16}$ " x $\frac{1}{4}$ " — 11 x 7 mm	0.02

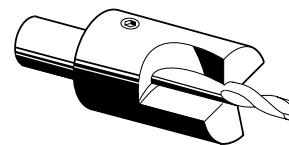
Material: fusiolen® PP-R to close pipe holes up to 0.4 in.

Tool: aquatherm repair set (part no. 0050307 & 0050311).



aquatherm drill bit for the mounting of weld in fusion outlets

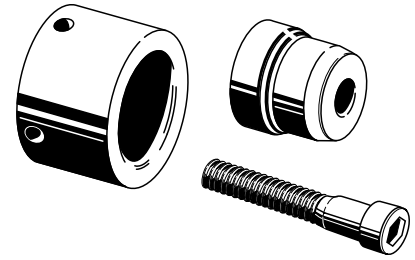
Part no.	Dimension	Weight [lb]
0050940	$\frac{1}{2}$ " & $\frac{3}{4}$ " — 20 & 25 mm (for pipes 1 $\frac{1}{4}$ " - 6" — 40 - 160 mm)	0.31
0050941	$\frac{1}{2}$ " & $\frac{3}{4}$ " — 20 & 25 mm (for pipes 2" - 10" — 63 - 160 mm)	0.35
0050942	1" — 32 mm	0.46
0050944	1 $\frac{1}{4}$ " — 40 mm	0.63
0050946	1 $\frac{1}{2}$ " — 50 mm	0.70
0050948	2" — 63 mm	1.00
0050950 ^a	2 $\frac{1}{2}$ " — 75 mm	3.12
0050952 ^a	3" — 90 mm	3.56
0050954 ^a	3 $\frac{1}{2}$ " — 110 mm	4.80
0050956 ^a	4" — 125 mm	4.42
0050958 ^a	6" — 160 mm	8.81
0050960 ^a	8" — 200 mm	-



^a Must be used in fixed drilling machine. Morse taper shank.

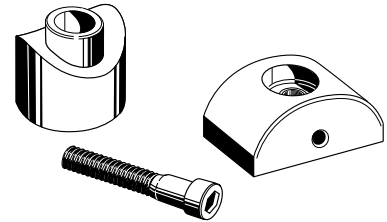
aquatherm welding heads

Part no.	Dimension	Weight
		[lb]
0050206	$\frac{3}{8}$ " — 16 mm	0.24
0050208	$\frac{1}{2}$ " — 20 mm	0.25
0050210	$\frac{3}{4}$ " — 25 mm	0.31
0050212	1" — 32 mm	0.46
0050214	1 $\frac{1}{4}$ " — 40 mm	0.68
0050216	1 $\frac{1}{2}$ " — 50 mm	1.00
0050218	2" — 63 mm	1.50
0050220	2 $\frac{1}{2}$ " — 75 mm	2.02
0050222	3" — 90 mm	3.12
0050224	3 $\frac{1}{2}$ " — 110 mm	5.40
0050226	4" — 125 mm	7.33



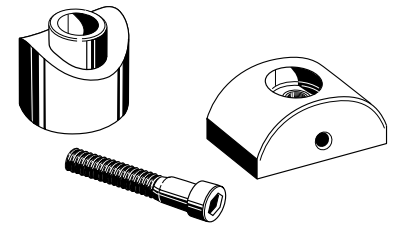
aquatherm fusion outlet welding heads

Part no.	Dimension	Weight
		[lb]
0050614	1 $\frac{1}{4}$ " x $\frac{1}{2}$ " & $\frac{3}{4}$ " — 40 x 20 & 25 mm	0.41
0050616	1 $\frac{1}{2}$ " x $\frac{1}{2}$ " & $\frac{3}{4}$ " — 50 x 20 & 25 mm	0.49
0050619	2" x $\frac{1}{2}$ " & $\frac{3}{4}$ " — 63 x 20 & 25 mm	0.53
0050620	2" x 1" — 63 x 32 mm	0.54
0050623	2 $\frac{1}{2}$ " x $\frac{1}{2}$ " & $\frac{3}{4}$ " — 75 x 20 & 25 mm	0.56
0050624	2 $\frac{1}{2}$ " x 1" — 75 x 32 mm	0.57
0050625	2 $\frac{1}{2}$ " x 1 $\frac{1}{4}$ " — 75 x 40 mm	0.99
0050627	3" x $\frac{1}{2}$ " & $\frac{3}{4}$ " — 90 x 20 & 25 mm	0.59
0050628	3" x 1" — 90 x 32 mm	0.60
0050629	3" x 1 $\frac{1}{4}$ " — 90 x 40 mm	1.02
0050631	3 $\frac{1}{2}$ " x $\frac{1}{2}$ " & $\frac{3}{4}$ " — 110 x 20 & 25 mm	0.61
0050632	3 $\frac{1}{2}$ " x 1" — 110 x 32 mm	0.63
0050634	3 $\frac{1}{2}$ " x 1 $\frac{1}{4}$ " — 110 x 40 mm	1.06
0050635	3 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ " — 110 x 50 mm	1.72
0050636	4" x $\frac{1}{2}$ " & $\frac{3}{4}$ " — 125 x 20 & 25 mm	0.64
0050638	4" x 1" — 125 x 32 mm	0.66
0050640	4" x 1 $\frac{1}{4}$ " — 125 x 40 mm	1.12
0050642	4" x 1 $\frac{1}{2}$ " — 125 x 50 mm	1.75
0050644	4" x 2" — 125 x 63 mm	2.69
0050648	6" x $\frac{1}{2}$ " & $\frac{3}{4}$ " — 160 x 20 & 25 mm	0.71
0050650	6" x 1" — 160 x 32 mm	0.74
0050652	6" x 1 $\frac{1}{4}$ " — 160 x 40 mm	1.20
0050654	6" x 1 $\frac{1}{2}$ " — 160 x 50 mm	1.85
0050656	6" x 2" — 160 x 63 mm	2.82
0050657	6" x 2 $\frac{1}{2}$ " — 160 x 75 mm	-
0050658	6" x 3" — 160 x 90 mm	-
0050660	8" x $\frac{1}{2}$ " & $\frac{3}{4}$ " — 200 x 20 & 25 mm	0.44
0050662	8" x 1" — 200 x 32 mm	0.51
0050664	8" x 1 $\frac{1}{4}$ " — 200 x 40 mm	0.89
0050666	8" x 1 $\frac{1}{2}$ " — 200 x 50 mm	1.42



aquatherm fusion outlet welding heads (continued)

Part no.	Dimension	Weight
		[lb]
0050667	8" x 2 1/2" — 200 x 75 mm	3.98
0050668	8" x 2" — 200 x 63 mm	2.30
0050669	8" x 3" — 200 x 90 mm	5.53
0050670	8" x 3 1/2" — 200 x 110 mm	-
0050671	8" x 4" — 200 x 125 mm	-
0050672	10" x 1/2" & 3/4" — 250 x 20 & 25 mm	0.45
0050674	10" x 1" — 250 x 32 mm	0.51
0050676	10" x 1 1/4" — 250 x 40 mm	0.89
0050678	10" x 1 1/2" — 250 x 50 mm	1.46
0050680	10" x 2" — 250 x 63 mm	2.35
0050682	10" x 2 1/2" — 250 x 75 mm	4.01
0050684	10" x 3" — 250 x 90 mm	5.66
0050686	10" x 3 1/2" — 250 x 110 mm	8.05
0050688	10" x 4" — 250 x 125 mm	13.16
0050690	12" x 2" — 315 x 63 mm	2.41
0050692	12" x 2 1/2" — 315 x 75 mm	4.22
0050694	12" x 3" — 315 x 90 mm	7.11
0050696	12" x 3 1/2" — 315 x 110 mm	10.55
0050698	12" x 4" — 315 x 125 mm	13.23
0050699	12" x 6" — 315 x 160 mm	18.96
0050712	14" x 2" — 355 x 63 mm	-
0050714	14" x 2 1/2" — 355 x 75 mm	-
0050716	14" x 3" — 355 x 90 mm	-
0050718	14" x 3 1/2" — 355 x 110 mm	-
0050720	14" x 4" — 355 x 125 mm	-
0050722	14" x 6" — 355 x 160 mm	-
0050724	14" x 8" — 355 x 200 mm	-
0050726	16" - 24" x 2" — 400-630 x 63 mm	-
0050728	16" - 20" x 2 1/2" — 400-500 x 75 mm	-
0050730	22" - 24" x 2 1/2" — 560-630 x 75 mm	-
0050732	16" - 20" x 3" — 400-500 x 90 mm	-
0050734	22" - 24" x 3" — 560-630 x 90 mm	-
0050736	16" - 18" x 3 1/2" — 400-450 x 110 mm	-
0050738	20" - 22" x 3 1/2" — 500-560 x 110 mm	-
0050740	24" x 3 1/2" — 630 x 110 mm	-
0050742	16" x 4" — 400 x 125 mm	-
0050744	18" - 1/2" x 4" — 450-500 x 125 mm	-
0050746	22" - 24" x 4" — 560-630 x 125 mm	-



Glossary

Aquatherm Green Pipe

A polypropylene pressure piping system designed for potable and food-grade applications. It is identified by its green color and joined using heat fusion. Hot water pipes have a faser-composite layer as well as dark green stripes, while cold water pipes have light blue stripes and no faser-composite layer.

Butt welding

A heat fusion connection where the face of one pipe is fused directly to the face of another pipe. Fittings are sized to be even with the pipe walls and are joined the same way. This process is only used on sizes above 4 inches.

Aquatherm Blue Pipe®

Formerly known as Climatherm, **aquatherm blue pipe®** is a polypropylene pressure piping system designed for non-potable applications such as heating and cooling, chemical transport, compressed air, etc. **aquatherm blue pipe®** is blue, has a faser-composite layer and thick green stripes, and is also joined using heat fusion.

Extrusion

The process by which Aquatherm's pipes are manufactured. The **fusiolen®** material is shaped and pushed from the extrusion machine in three layers and cooled in long tanks, forming the uniquely designed Aquatherm pipes.

Faser-composite

A patented mixture of **fusiolen® PP-R** and fiberglass, specially engineered to increase structural strength and reduce linear expansion.

Fusiolen PP-R

The basic material used in all of Aquatherm's polypropylene piping systems. This resin is produced exclusively by Aquatherm using only the purest raw polypropylene.

Fusion outlet

A special fitting designed to fuse directly onto the side of a pipe. These fittings were once called saddles but have been renamed to distinguish them from less reliable mechanical fittings.

Heat fusion (or heat welding)

The process of simultaneously heating two similar plastics and allowing them to cool together under pressure. This process forms a seamless bond between the materials.

Aquatherm Lilac Pipe

A special formulation of the Aquatherm piping systems engineered for use in rainwater and reclaimed water. This system is distinguished by the purple color of the pipe.

Linear (thermal) expansion

The growth in a pipe that occurs when hot water is run through the system. Contraction can also occur under cold temperatures.

Mold injection

The process through which Aquatherm's fittings are manufactured. Heated **fusiolen®** is pressed into molds and cooled under high pressure, creating strong fittings with no mechanical weaknesses.

Polypropylene random (PP-R)

A unique formulation of the thermoplastic polymer used to create all the Aquatherm pipe and fittings. Random lengths of polypropylene molecules ensure chemical uniformity throughout the connection.

Socket fusion

A heat fusion connection using welding heads and special fittings. The inside of the fitting is fused to the outside of the pipe, forming a quick and simple leak-proof connection. This process is only used on sizes from 4 inches and smaller.

Transition, flange

A flange connection using a polypropylene flange, a steel flange ring, and a gasket that can be attached to a same-size flange of any other piping material.

Transition, threaded

A special fitting with a brass or stainless steel insert mold injected into the polypropylene. The insert is threaded for use with any other type of threaded connection.

Welding heads

Teflon-coated molds designed to match specific sizes of pipe and fittings. The welding heads are engineered for direct contact with the pipe and fittings and generally contain one male side and one female side in order to heat both sides of a connection at the same time.

Welding iron

An electronic heating device with a large, flat heating surface. This surface is designed to heat the welding heads to the proper welding temperature and should never be in direct contact with the material.

Glossary

being welded.

Welding jig

A portable clamping system that assists with moving the pipe and fitting during the fusion process.

Appendix A

Aquatherm flange bolt torque and size

Nominal pipe size	Torque		Bolts		
	N-m	ft-lb	Number	Diameter	Washers
½" (20mm)	10	14	4	½	Yes
¾" (25mm)	15	20	4	½	Yes
1" (32mm)	15	20	4	½	Yes
1 ¼" (40mm)	20	27	4	½	Yes
1 ½" (50 mm)	30	41	4	½	Yes
2" (63mm)	35	47	4	5/8	Yes
2 ½" (75mm)	40	54	4	5/8	Yes
3" (90mm)	40	54	8	5/8	Yes
3 ½" (110mm)	50	68	8	5/8	Yes
4" (125mm)	50	68	8	5/8	Yes
6" (160mm)	60	81	8	¾	Yes
8" (200mm)	75	102	8	¾	Yes
10" (250mm)	95	129	12	7/8	Yes
12" (315 mm)	100	136	12	7/8	Yes
14" (355 mm)	100	136	12	1	Yes
16" (400 mm)	100	136	16	1	Yes
18" (450 mm)	100	136	16	1 1/8	Yes
20" (500 mm)	100	136	20	1 1/8	Yes
22" (560 mm)	100	136	20	1 1/8	Yes
24" (630 mm)	100	136	20	1 1/8	Yes

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