Uponor Aqua PEX piping system

EN Technical information

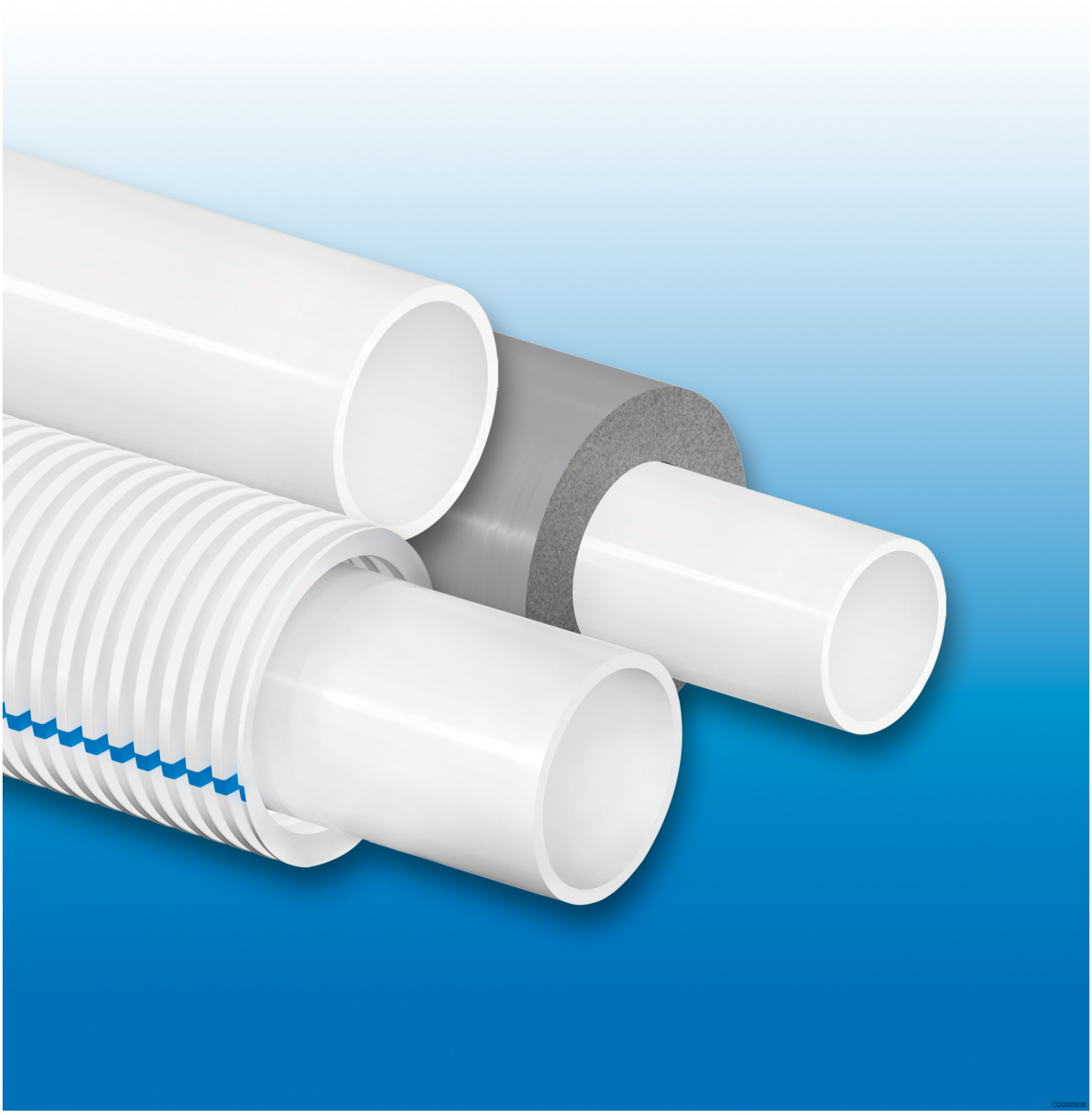
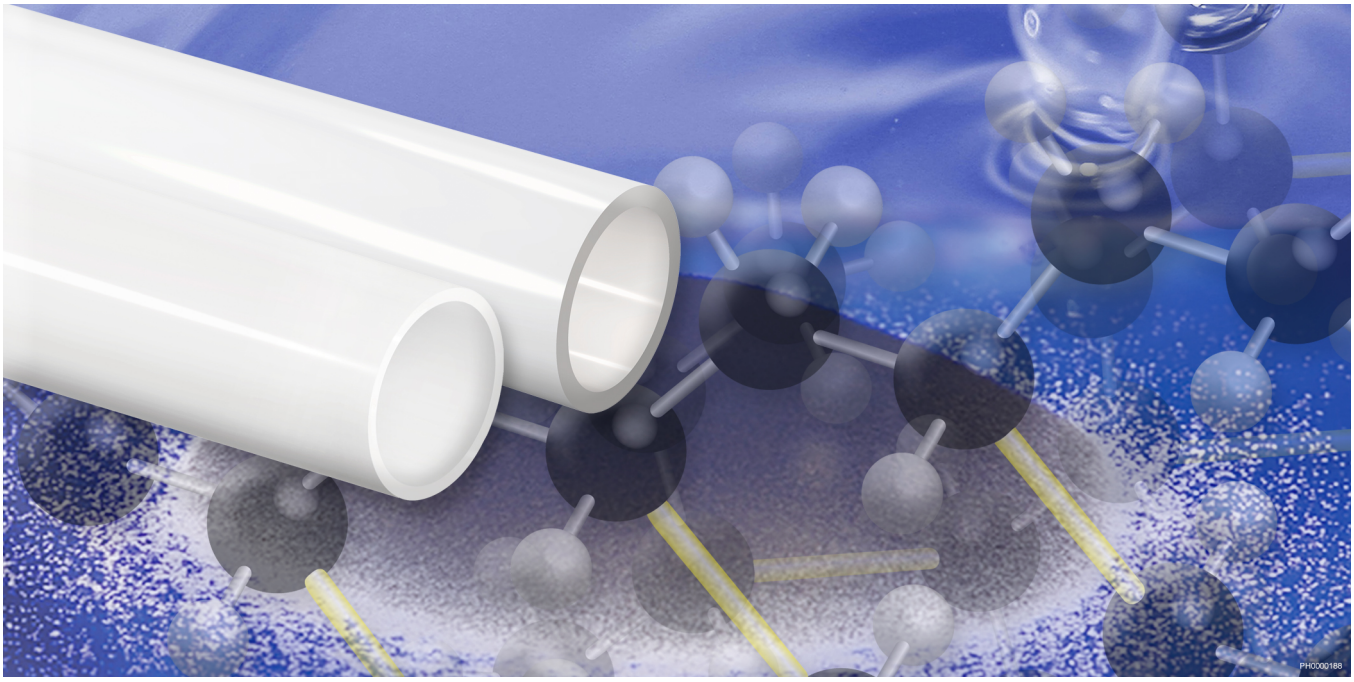
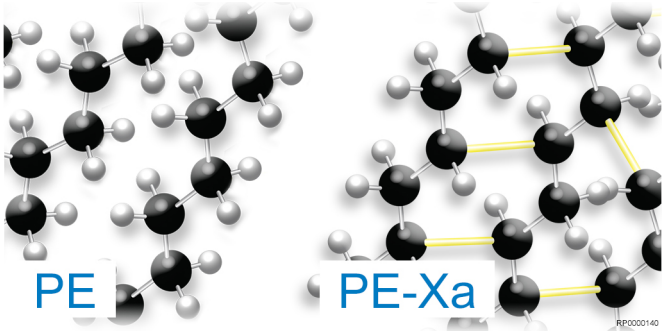


Table of contents

1 Material, conduits and pipe marking



1.1 Uponor PEX, cross-linked polyethylene



The basic Uponor PEX pipe is made from a high-density polyethylene (HDPE) with an extremely high molecular weight. At high pressure and temperature, chemical bonds – a network of cross-links – are formed between the polyethylene's long molecular chains (Engel process). The three-dimensional network that this creates, improves the properties of the raw material to such an extent that it is transformed into a completely new material , PE-Xa, with superior characteristics.

The difference between normal polyethylene and cross-linked polyethylene (PE-Xa) is analogous to that between over cooked spaghetti and fishing net. In the first case, the molecular chains are loosely arranged while, in the second, the chains are joined or cross-linked.

The Uponor PEX pipe and its further developed pipes are suitable for cold and hot water installations and heating applications. Uponor PEX pipes without a diffusion barrier must, however, not be installed for distribution of water in heating systems.

1.2 Pipe marking

Note

Always check that the correct type of pipe is used for the installation.

Uponor PEX pipes can always be identified, thanks to marking along the entire pipe length. The pipes are always marked with product name, outer diameter, pipe wall thickness, production date, consecutive metre-marking, as well as pressure and temperature classes. Depending on pipe type, the current standard or norm, as well as a type approval mark, may also be shown.

1.3 Conduits

The conduit is manufactured from HD polyethylene in different colours. All conduits can be used in an ambient temperature range of –20 °C to +120 °C. The pipes are corrugated, which provides great flexibility and great load-bearing capacity.

Uponor conduits fulfil the Norwegian requirements, Nordtest method, NT VVS 129 including test method no. 02-2014 also KIWA BRL K536 part D.

The conduit insulates the inner pipe and prevents water damage to the body of the building in the event of any pipe leakage, as well as facilitating pipe replacement.

1.4 Insulation

The insulation consists of grey cross-linked polyolefin foam with or without an outer layer of polyethylene (PE).

Insulation, physical and chemical properties

	Value	Unit	Test norm
Insulation thickness	20	mm	
Thermal conductivity (at 23 °C)	0.037-0.042	W/mK	DIN 52612
Density	0.025-0.3	g/cm³	DIN 53420
Fire rate	B2		DIN 4102
Weight	31.2	g/m	
Volume	1039.1	cm³/m	
Melting point	105-110	°C	
Flash point	420-440	°C	ASTM 1929
Combustion temperature	430-450	°C	DIN 54836
Solubility in water	Insoluble		

1.5 Approved pipes and conduits

The Uponor PEX pipe undergoes works testing and inspection before the product is delivered. These highly comprehensive procedures cover all aspects, from the raw material to the appearance of the packaging. Dimensions, physical and chemical properties, appearance, markings and so on are all checked.

In addition, inspectors from various national testing bodies visit the works at certain intervals (usually 2-3 times per year) to check our internal testing and control procedures, records, test methods, etc. The inspectors also take random product samples for testing in their own laboratories in accordance with specified test programmes. The results of these quality supervision measures are reported directly to the type approval authorities.

In most countries, components used in tap water and heating systems must be type approved. Uponor PEX received its first type approval from the Swedish Board of Physical Planning and Building in 1973. In 1977 the pipe was type approved by DVGW, based on testing by international testing institutes. Uponor Aqua pipes are Watermark approved.

Since then the Uponor PEX pipes have been approved for distribution of cold and hot domestic water and heating installations in more than 30 countries. In countries where the pipes are type approved, there are also type approved fittings available.

2 Material and pipe properties

Note

Technical specifications for mechanical, thermal and electrical pipe properties are available in the chapter "Technical data".

2.1 Hygienic and non-toxicological

Uponor Aqua pipes (PE-Xa) have been tested at a number of laboratories throughout the world and are approved for tap water distribution, i.e. the pipes release neither taste, odour nor unhealthy substances regardless of water quality.

2.2 Long-term stability

Few materials have undergone such extensive endurance testing as Uponor PEX. Ten years of continuous pressure testing at 95 °C and an uninterrupted endurance test since 1972 are just a couple of examples. Stress tests show that at a temperature of 70 °C and a pressure level of 1 MPa in continuous operation, the pipe has an estimated service life of more than 50 years.

2.3 Thermal memory

When a Uponor PEX pipe is heated to its softening temperature (129-131 °C), the material returns to its original shape. This characteristic is used to give a very reliable method for shrink mounting sealing devices, for example.

2.4 Temperature resistance

The PE-Xa pipes can be used at a temperature up to 95 °C within time and pressure limits. Uponor PEX has unchanged impact strength even at temperatures below -100 °C.

Freezing

However, Uponor PEX pipes, like all water filled pipes, must be protected against freezing. The material is elastic and can normally tolerate freezing. In the event of freezing, the pipe expands, but returns to its original shape once the ice plug melts. Repeated freezing weakens the pipe.

Uponor PEX pipes without conduit, cast in concrete, will not tolerate freezing. Small air bubbles or cavities are always present in concrete. If the cavities are touching the pipe and freezing occurs, the pipe wall is forced into these cavities and the pipe is perforated, which results in leakage.

2.5 Low friction

The extremely low friction coefficient of Uponor PEX yields low pressure drops and minimises the risk of deposits.

2.6 Resistance of abrasion

The abrasion characteristics are very good: erosion corrosion does not occur even at high water velocity. Consequently Uponor PEX pipes are used to transport highly abrasive sand slurry, for example.

2.7 Chemical resistance

The Uponor PEX pipe has a very high resistance to chemicals. Building materials such as concrete, mortar, plaster, etc. do not affect the pipes negatively.

Tape, paint or sealing compounds containing softening agent must not be used directly on the pipe; softening agents have a negative effect on the pipe's long-term properties.

If in doubt about the chemical resistance, please consult Uponor for further information.

2.8 Scratch resistant

Uponor PEX can withstand minor scratches without being weakened, because the material is resistant to crack growth. This property makes it possible to lay pipes directly in stony ground without costly preparation.

Uponor system seals the joint from inside of the pipe, therefore minor scratches will not jeopardies the seal.

2.9 Sound absorbing

The material in Uponor PEX pipes is elastic and provides a shock-absorbing function in the event of rapid shut-off of a solenoide valve, for example.

2.10 Vibration absorbing

Uponor PEX can absorb and withstand vibrations. Thanks to the elasticity action of the PEX material, the surge is reduced to 30 %. This helps maintaining longer lasting joints in comparison with other similar systems.

2.11 Electrical insulation

The electrical insulation properties of Uponor PEX are in the same class as the best insulating materials. The material is non-polar and totally free of impurities.

2.12 Low environmental impact

Uponor PEX is a material with minimal environmental impact in both production and energy recovery. In the event of complete combustion, only carbon dioxide and water are formed.

2.13 UV light

Uponor PEX pipes must not be stored or fitted where they are exposed to direct sunlight. UV radiation affects the material, impairing its long-term properties.

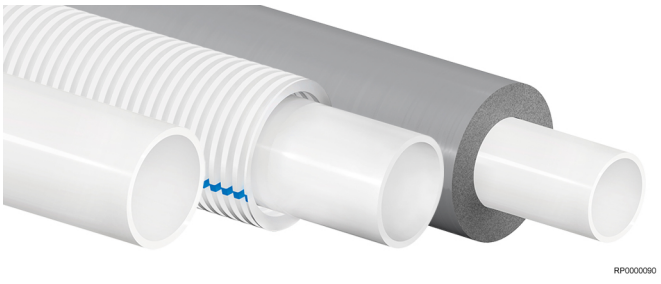
3 System description

Tap water systems influence the quality of the drinking water and moisture protection. Therefore the choice of system is a central decision in the building project. A built-in Uponor PEX system is a complete solution that contains all needed components.

This chapter gives a short overview of the use of Uponor Aqua pipes in tap water applications.

For more detailed information, product range and documentation please visit the Uponor website: www.uponor.com.

3.1 Uponor Aqua Pipes



Uponor Aqua pipes (PE-Xa) are used in tap water systems. The pipes are produced according to AS2492.

Uponor Aqua pipes are treated in accordance with the hygienic requirement in the standard AS/NZS 4020:2018.

Applications

Pipe	Application
Uponor Aqua Pipe	Tap water systems
Uponor Aqua Pipe in conduit	Tap water systems in concealed installations with conduit
Uponor Aqua Pipe insulated	Tap water systems where there is a risk of condensation or freezing

Pipe dimensions

Note

Detailed information about the range of components, dimensions etc is available in the price list.

OD = outer diameter, ID = inner diameter.

Pipe OD x material thickness, mm	Pipe ID, mm	Weight, kg/ 100 m	Volume, l/ 100 m
16x2.2	11.6	8.9	10.6
20x2.8	14.4	14.2	16.3
25x3.5	18.0	22.2	25.4

Uponor Aqua Pipe in conduit

Pipe OD x material thickness, mm	Conduit OD/ID, mm	Weight, kg/ 100 m	Volume, l/ 100 m
16x2.2	25/20	8.9	10.6
20x2.8	28/23	14.2	16.3

3.2 Uponor Q&E fittings

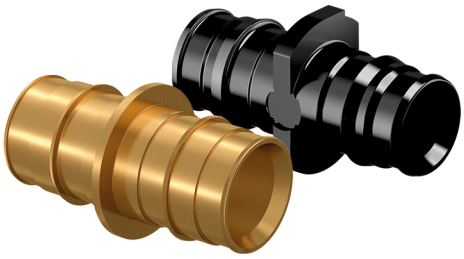
Note

Only use fittings recommended by Uponor or its representatives.

Note

This section briefly describes some of the components in the Uponor PEX product family.

For more detailed information, product range and documentation please visit the Uponor website: www.uponor.com.



RP0000101

The Uponor Q&E fitting is developed based on a method where a Uponor PEX pipe (PE-Xa) is gradually expanded with a Q&E (PEX) ring fitted on the outside, and then allowing it to shrink back onto the fitting. The technique can be used due to the fact that the Uponor PEX material is capable of shrinking back to almost its original size, even after a very large amount of extensions (elongation).

By this type of connection, the reduction of inner diameter is much less than on ordinary fittings. It is almost the same as the inner diameter of the pipe.

The components of the Uponor Q&E system have been very carefully designed to ensure optimum ease of fitting and the best possible sealing function. The designs of the fittings and the expander segments have been carefully matched to one another, to the Uponor PEX pipe and to the Q&E ring. Design modifications and/or dimensional changes to the fittings, expander segments or the expanding procedure will entirely alter all of the basic conditions.

Testing and approvals

The Uponor Aqua PEX pipe (PE-Xa) and the Uponor Q&E system are Watermark certified as per AS/NZS 2537 and AS 2492 also tested and approved as per AS 4020.

The manufacturing of both fittings and pipes is subject of periodic inspections by ATG, KIWA, MPA, SP and Australian Standard.

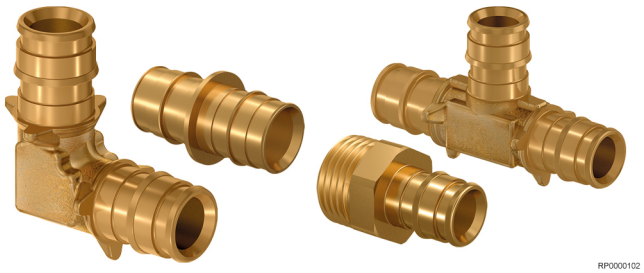
Uponor Q&E fittings got their first certifications in 1995. Since then they have been tested in performance and certified by several independent official accredited laboratories, such as ATG (Belgium), DVGW (Germany), KIWA (the Netherlands), MPA (Germany), SP (Sweden), TGM (Austria), and AS (Australian Standard), as well as in Uponor's own laboratories.

Range of fittings

Uponor Q&E fittings are available in lead free brass according to A5G4 of NCC 2022 and a durable, proven plastic called polyphenylsulphone (PPSU).

No other tool than an expander tool is needed for connecting the pipe to the fitting.

Brass



RP0000102

Fittings are made of lead free brass according to A5G4 of NCC 2022.

Plastic (PPSU)

RP0000100

Uponor Q&E fittings made of polyphenylsulfone (PPSU) have low weight and very low internal roughness. They are non-toxic with good chemical resistance.

Uponor Q&E rings

RP0000310

Item	Description	Colour	Dimension, mm
A	Uponor Q&E evolution ring	White; Blue; Red	16, 20, 25

The function of the Q&E ring is to enhance the shrinking force after expansion and strengthen the tightness of the connection.

4 Installation and operation

4.1 Installation configuration

Note

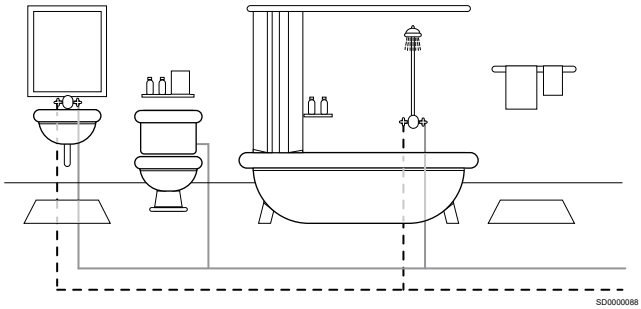
The installation must be carried out as per National Construction Code (NCC), volume three, Plumbing Code of Australia (PCA), AS/NZS 3500, and any other local authority regulations when applicable to the installation.

Always follow the local standards and regulations while installing Uponor systems.

Tap water installations can follow the tee configuration or can be configured with manifolds.

The Uponor tap water system Q&E (PPSU and brass) can be used in both types of installations.

Traditional tee system installation



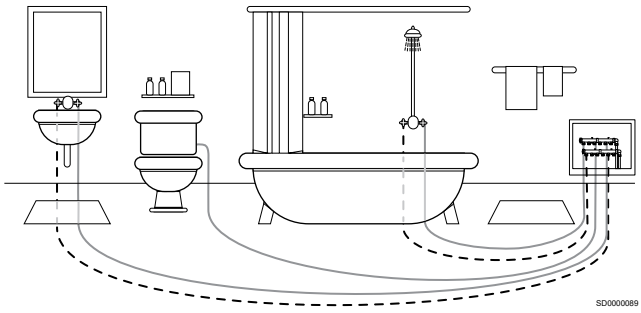
Uponor Tap Water System can be installed in the same fashion as a traditional system made of metal pipes i.e. a ”Tee system”. The advantage with this installation method is the use of less pipes than the manifold system described below. However, the traditional method has some inherent disadvantages that should be taken into consideration.

The design work for example is more complicated. Most engineers wish to reduce the pipe dimension, from a larger one at the beginning of the system to a smaller one at the end, which is why calculations are needed to determine the various pipe sizes.

Also, there are temperature and pressure variations due to the fact that one supply pipe normally has more than one draw-off point. In addition, there are more connection points than with the manifold system and these are often inaccessibly situated within the walls.

Furthermore, because of the various pipe dimensions and the large number of corresponding fittings, stock keeping is more complicated on-site.

Manifold system



The manifold system does not present any of the above-mentioned difficulties. It can be designed with one single pipe dimension from the manifold to the draw-off point, which simplifies design and installation work.

With connection points only at the manifold and the tap, the risk of leakage from joints is considerably reduced and there are no awkward connections within the walls. Since there are no other draw-off points on the same supply pipe, pressure and temperature variations are minimal when taps are turned on and off in varying sequences.

Furthermore fewer pipe dimensions and fittings allow for easier stock keeping and save on installation time and labour costs.

4.2 Installation process

Note

Installation must be performed by a licensed plumber as per National Construction Code (NCC), volume three, Plumbing Code of Australia (PCA), AS/NZS 3500, and any other local authority regurgitations when applicable to the installation.

Always follow the local standards and regulations whenever the Uponor systems should be installed.

As a guidance, always read and follow the instructions given in respective Uponor installation manual.

4.3 Pressure and tightness testing

For thermoplastic and multi-layer pipe in tap water and radiator heating installations, tests must be carried out as per AS/NZS 3500.

- Once the required test has been carried out, the installation will be connected to the taps and consumption devices and subjected to the test again.
- The pressure gauge used in this test must detect pressure intervals of at least 0,1 bar.
- These pressures refer to street level.

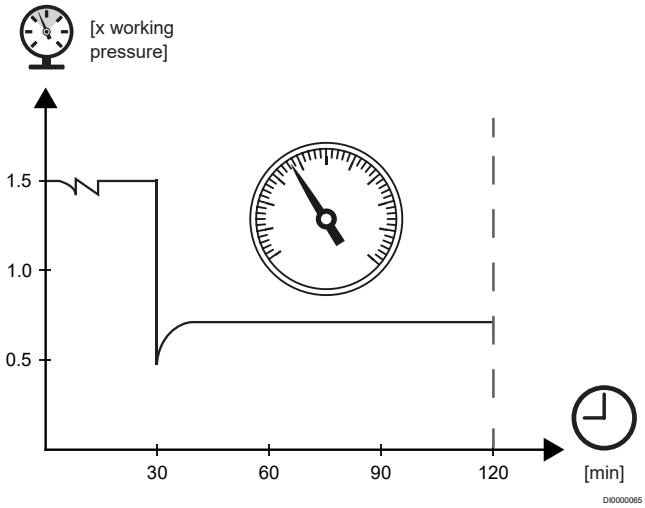
Test method

Warning!

Stagnated water can cause harmful bacterial growth in the water lines.

Note

Always drain after testing is completed.



The test consists of the following steps:

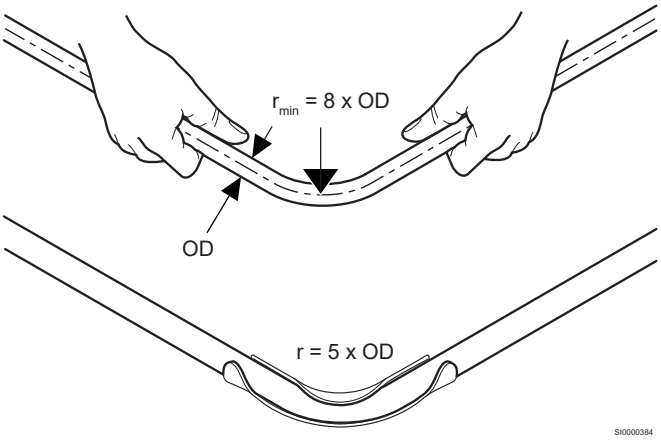
1. Vent and fill the system with potable drinking water.
2. Visually inspect the whole system for leaks.
3. Pressurise the installation to a test pressure of not less than 1.5 times the maximum working pressure.
4. Apply the test pressure by pumping for a period of 30 minutes. Inspect for leaks.
5. Reduce the pressure in the pipework by bleeding water from the system to 0.5 times the maximum working pressure.
6. Close the bleed valve.
7. Visually check for leakage and monitor for 90 minutes. If there is no reduction in pressure the system is regarded as leak tight.
8. Flush the system as required.

4.4 Shrinking

Permitted shrinking in lengths as per standards for PEX pipes, EN ISO 15875 is a maximum of 3 %.

Always consider the shrinking in length of the Uponor PEX pipes when planning the installation.

4.5 Bending radius



Minimum recommended bending radius in general pipes is 8 x outer diameter (OD).

Minimum recommended radius with hot bending is 5 x outer diameter (OD) when using a bending support.

Narrower bending radii occur when using bending supports as well as various other fittings, such as wall elbows. These have been tested for Uponor PEX pipes and do not have any negative effect on the long-term properties of the pipes.

5 Technical data

5.1 Technical specifications

Mechanical properties

Description		Value	Unit	Test norm
Density		0.938	g/cm³	
Tensile strength	(20 °C) (100 °C)	19-26 9-13	N/mm² N/mm²	DIN 53455
E-module	(20 °C) (80 °C)	800-900 300-350	N/mm² N/mm²	DIN 53457
Ultimate elongation	(20 °C) (100 °C)	350-550 500-700	% %	DIN 53455
Impact strength	(20 °C) (-140 °C)	No rupture No rupture	kJ/m² kJ/m²	DIN 53453
Moisture absorption	(22 °C)	0.01	mg/4 d	DIN 53472
Friction coefficient against steel		0.08-0.1	—	
Surface energy		$34x10^{-3}$	N/mm²	
Oxygen permeability	(20 °C) (55 °C)	$0.8x10^{-9}$ $3.0x10^{-9}$	g m/m²s bar g m/m²s bar	DIN 4726

Thermal properties

Description		Value	Unit	Test norm
Temperature range		-100 to +100	°C	
Linear expansion coefficient	(20 °C) (100 °C)	$1.4x10^{-4}$ $2.05x10^{-4}$	m/m°C m/m°C	DIN 53752
Softening temperature		+130	°C	DIN 53460
Specific heat		2.3	kJ/kg°C	
Coefficient of thermal conductivity	(20 °C)	0.35	W/m°C	DIN 52612

Electrical properties

Description		Value	Unit	Test norm
Specific internal resistance	(20 °C)	10^{15}	W m	
Dielectric constant	(20 °C)	2.3	—	DIN 53483
Dielectric loss factor	(20 °C/ 50 Hz)	$1x10^{-3}$	—	DIN 53483
Disruptive voltage (0.5 mm foil)	(20 °C)	2.3	kV/mm	DIN 53481, VDE 0303

Pipe properties

Description	Value	Unit	Test norm
Cross-linking level			
PE-Xa	>70	%	EN ISO 15875
Min. laying temperature			DIN 53460
Uponor Aqua Pipe	-20	°C	DIN 52612
Max. operating temperature			
Uponor Aqua Pipe insulated	+95	°C	

Approvals

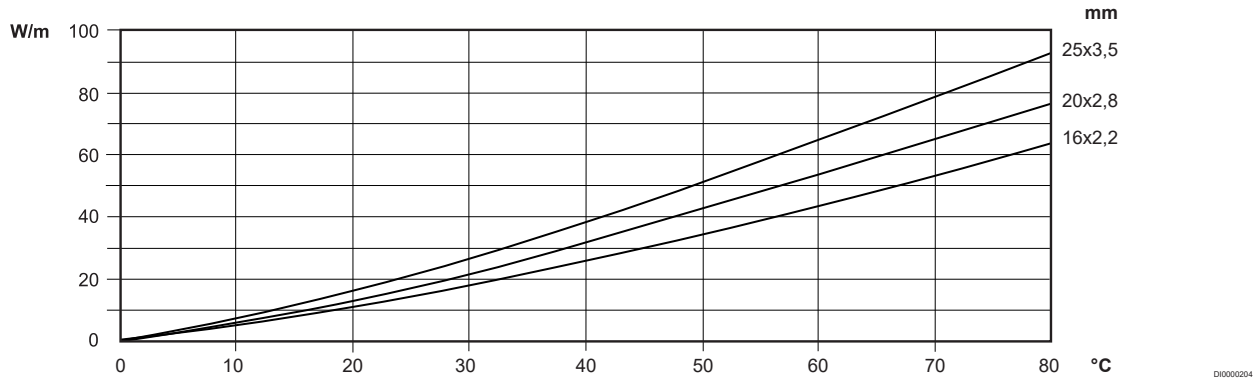
WaterMark™

LT0000069

The pipes and fittings described in this document are tested and approved in water supply applications as follows:

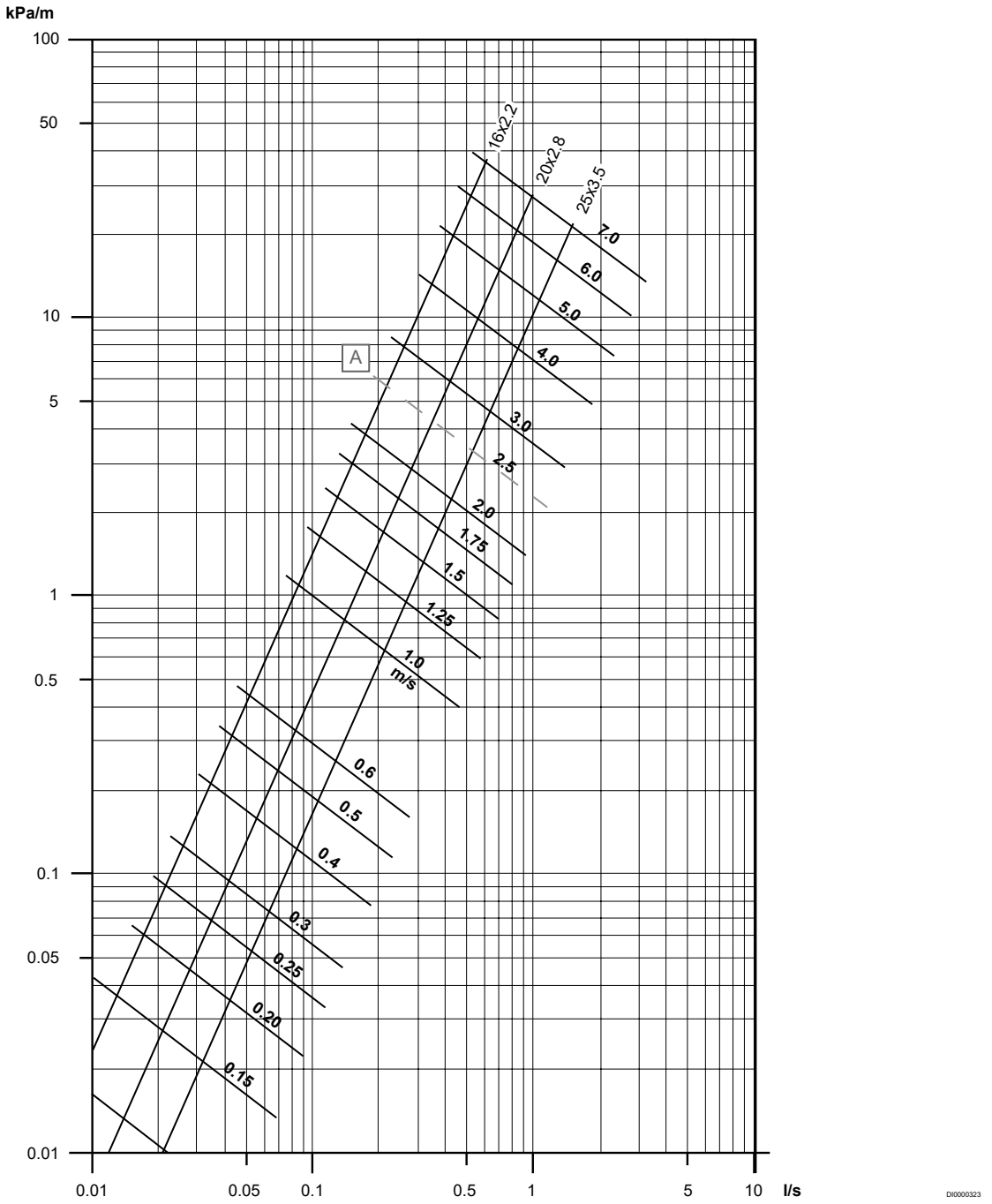
- Uponor Aqua cross-linked polyethylene (PE-X) pipes – Certificate No. 1570
- Uponor Q&E fittings in polyphenylsulfone (PPSU) and brass – Certificate No. 23058

5.2 Heat emission loss diagram



5.3 Pressure drop nomogram

Uponor Aqua Pipe



Item	Description
A	Recommended max. water speed with continuous flow versus high pressure drops and sound levels (2,5 m/s)

Uponor GmbH

Industriestraße 56,
D-97437 Hassfurt, Germany

1135536 v3_10_2023_EN
Production: Uponor/SDE

www.uponor.com