THERM

PP-R PIPES & FITTINGS

Q-Therm,
The Quantum Quality

TECHNICAL MANUAL 2021

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INTRODUCTION

Q THERM
PP-R PIPES & FITTINGS

Having been supplying the electromechanical field for over a decade, I always dreamed of being able to manufacture what I am currently selling.

I often thought that one had to either be a trader or a manufacturer, but could never be both. I am here today to prove myself wrong.

Surrounded by a team of plastic experts (as I would like to call them), possessing more than 30 years of combined experience in plastics; investing in top notch technology, and sourcing superior raw materials from the world's best manufacturers; I formulated our strong trio, determined to deliver nothing less than world class quality to our valuable customers.

Quantum Industries started out with a few scribbles on a piece of paper, and as a result of the cross-pollination of theory, best practice and experience, coupled with a clear vision, today stretches across 45,000 Sq.Mtr., striving for global excellence, armed with the heartfelt diligent work every member of the Quantum team is putting in, associating its name with leaders of the industry, aspiring not only to raise the bar, but to set the standard for others.

Best regards,
Jawad Khawaja
CEO

PREFACE

Our Vision

> Aspiring to position Quantum Industries among the to the top piping systems manufacturers regionally, we commit to make Q-Therm a synonym to quality, safety and reliability.

Our Mission

Success is not accidental, we believe it's a journey of progressive pursuit of exellence in all what we do, having this mantra mind, our destination is clear, and the compass guideing us will never lead us astray because :

- **Our quality pledge,** to ourselves before others, mandates our commitment to international product norms and standards, and to consistently surpass the expectations while delivering our products and services to the world.

- **Our customers,** are our associates and partners, they are the capital we strive to thrive, we will be always the next-door neighbor for them, ventureing with them by all our expertise and resources, trying to be the reliable constant in their world of variable.

- **Our society in the core of our concerns,** with our relentless attempt to participate in sharing the social responsibility with others, we creat opportunities for training, qualifying, employing and even partnering with individual or societal organizations, in an approach to secure the future for all.

Q-THERM

What

Q-Therm, the PP-r piping systems, offered by Quantum Industries provides "a comprehensive piping solution" for all potable water transfer requirements, as Q-Therm products are:

DESIGNED
To replace conventional piping systems.

ENGINEERED
To withstand higher working pressures and temperatures.

MADE
Of the best PPR material.

PRODUCED
With the state of the art German technology and machinery.

CONTROLLED
By the top notch quality control equipments.

SUPPORTED
By a team of professionals, dedicated with all their expertise to deliver the best to all clients.

Q-Therm Polypropylene random copolymers (PP-R) are Thermoplastic material produced through the polymerization of propylene, with ethylene links introduced in the polymer chain. The Q-Therm material possesses a good durability, recyclability and environment friendly characteristics.

PP-R material

For about 5 decades, Polypropylene random copolymer (PP-R) has been globally used for potable water transfer across the world. PP-R's chemical and mechanical properties such as resistance to internal pressure, light weight, ease of leak-proof installation and impact strength, have made PP-R the material of choice for a safe and reliable piping system for potable water transport in areas such a domestic water transfer, such as hot and cold water distribution, under-floor heating, radiator connections or wall cooling and heating systems.

P-R piping system emerged as an efficient system and replaced conventional materials like copper and galvanised steel over the last decades.

Q-Therm uses the PP-R material from leading manufactures in the globe including Borouge, a joint venture of Borealis and Adnoc which have became top PP-R grades due to its distinctive material properties, performance and quality. Q-Therm uses PPR 80 and PPR 100 materials for various product ranges.

Material Data Sheet (Table – 1)

Properties	Test method	Unit	Typical Values
Density	DIN 53479	g/cm³	0.91
Melt index	ASTM D1238	g/10 min	0.25
Tensile strength (yield)	ASTM D638	kg/cm²	270
Elongation (Break)	ASTM D638	%	400
Flexible Modulus	ASTM D790	kg/cm²	8,50
Izod Impact Strength @23°C	ASTM D256	kg cm/cm	NB
Izod Impact Strength @-10°C	ASTM D256	kg cm/cm	4.5
Rockwell Hardness	ASTM D785	R-Scale	60
Vicat Softening Point	ASTM D1525	°C	130
Heat Deflection Temperature (4.6 kg/cm2)	ASTM D648	°C	85

* the data are relative and represent imperial values obtained in various test results.

Q-THERM

PP-RCT

PP-RCT is a modified PP-R, which has undergone a special ß-nucleation process which enhances the crystalline structure and provides a homogeneous crystallite size distribution. This contributes to the positive mechanical characteristics of the material. PP-RCT stands for Polypropylene Random Copolymer with modified crystalline structure and enhanced temperature performance.

PP-RCT pipe systems can be operated at higher stresses at elevated temperatures. The improved long-term strength of the PP-RCT material leads to a more economic set of dimensions of the pipe system. It enables designers to select thinner wall pipes and in some situations also smaller diameter pipes can be used. By choosing lesser wall thickness pipes and small diameters, the weight can be substantially reduced.

Glass Fiber Material

A pipe made of PPR has a normal tendency to expand when they are exposed to heat. Multilayered pipes with glass filled polypropylene are an answer to this expanding phenomenon.

The amount of glass in the PP resin restricts the expansion of the pipe when they are subjected to heat. Glass filled PP is extruded as a middle layer which would arrest the linear expansion to a considerably minimum value.

UV Layer

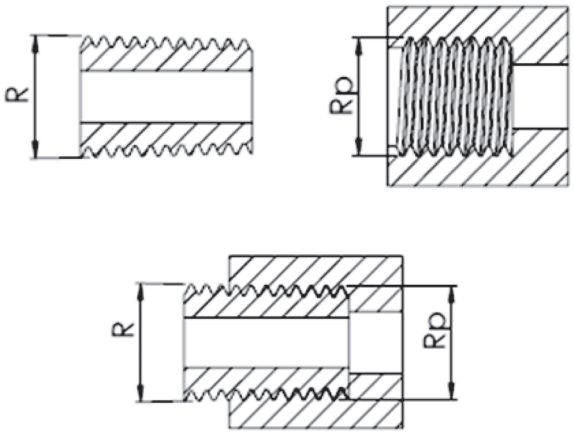
For the pipes that need to be exposed in outdoor conditions, they would experience prolonged UV exposure from sun, if not properly covered. Q-Therm offers pipes which come with a pre-jacketed UV layer evenly over the pipe's surface. This thin layer of UV jacket acts as a shield for the pipe against any UV radiation.

This UV protection layer is easily peelable from the pipe with a normal knife, without using any sophisticated or dedicated tool.

Brass Transition Fittings

Transition fittings and unions are used for connecting different piping systems together. They also play a role in providing maintenance options for the piping network, where necessary. Q-Therm fittings with male and female threaded parts are according to ISO 7/ EN 10226 standards (R and Rp threads).

Q-Therm uses a widely accepted CW617N grade brass for its transition fittings.



For joining these transition fittings, Q-Therm recommends to use PTFE tape for sealing.

Rubber gaskets / O-rings

For connections within metal transition parts, an EPDM rubber gasket is used in fittings, where required.

Why

Q-Therm When it comes to piping solutions, choosing the right one has always a major role to play, in terms of safety and reliability. What Q-Therm offers with its piping solutions are products made of environment friendly PP-r which has its unique physical and chemical properties. Q-Therm products stand as one of the safest means for potable water transfer. Its welding properties make it easy for quick installation by the end user in various applications. Hence, Q-Therm has been a primary consideration for present day piping solutions for its safety, service and reliability.

Advantages of Q-Therm products

Environment
Q-Therm's environment friendly materials contain no toxic wastes which would expose any hazard to the ecosystem we're living in. Polypropylene gives out no pollution when it is being produced or when disposed. Q-Therm exerts much care on the fact that its products or the production processes should not pollute our sensitive ecosystem.

Recycling
Q-Therm products are recyclable and can be ground and re-used. Recently, there has an increasing demand for polypropylene for recycling, as it could be recycled many times and used in various applications.

Hygienic Suitability
In this modern era, health and safety has always been under a critical eye. Transfer of potable water has to be through a reliable network system, which ensures the delivered fluid would not be subject to influence by any interactions within the carrier.

Non-Toxic
Q-Therm uses raw materials which are completely non-toxic for its production processes. Q-Therm maintains the up-to-date national and international regulations for complying with the same.

Smell and Taste Neutrality
Since Q-Therm products doesn't interact with the fluids within its system, it gives no smell or taste difference to the transferred material.

Opaqueness
Q-Therm products, which are opaque, would prevent sun light penetration in its piping system and thus resisting bacterial and fungal growth.

Corrosion resistance
Compared to the old metallic pipes, Q-Therm piping systems are corrosion free due to its' material properties and thus, lesser exposed to contamination. Also, the joints are connected through a weld-fusion process which eliminates not only the chances of corrosion within the piping system, but also gives Q-Therm a longer service life. Moreover, the metal parts of the system are made of brass, complying with WHO regulations.

Chemical resistance
Polypropylene by nature is highly chemical resistant at a wide range of temperature and pressure. Due to its higher molecular weight, it resists most of the acids, lime and cement.

Mechanical Properties
When it is designed to replace the conventional metal piping solutions, Q-Therm offers a better alternative to what has been offered in past. The mechanical properties of Q-Therm products are:

- High Impact Resistance
- Low Thermal conductivity
- Resistance to current strays
- High durability
- Light Weight

Sound Insulation
In comparison to the metallic pipes, the sound insulation qualities of Q-Therm pipe system related to water flow and hydraulic shock within a building reduces the noise transmission to a larger scope. This is due to the elasticity of Q-Therm products which makes it more workable to absorb and reduce almost all vibrations which would appear in conventional piping systems.

Flow Performance
The inner surface finishing of Q-Therm products are sleek, smooth and with very less irregularities which conveys a significant reduction in pressure loss. Thus, limestone build up is prevented inside the pipe.

Ease of Installation
One of the major attractions of Q-Therm products are its capability to be welded by fusion. Q-Therm pipes and fittings are comparatively light weight to the metallic pipes, which require a shorter time to establish a permanent connection/joint in the piping system. This is easily achieved with a suitable welding kit and following the instructions mentioned in our "how to install" chapter.

Long Service Life
Q-Therm piping systems are designed for a theoretical long service life of 50 years in application, subject to specific conditions. Though peak temperatures of 100°C arising within the system for shorter period are harmless, permanent temperature from 70°C up to 90°C might marginally reduce the service life of the pipe.

Where

When it comes to water, it's impossible to imagine life without it, and with today's life style, it is equally impossible to think of water apart from being safely and hygienically carried and transferred to us.

Q-Therm, the comprehensive fluid carrier (both liquid and gases), safely and carefully delivers every drop of it to a diversified range of applications mainly, but not limited to;

1. Pipe networks for potable (Drinking) water
   Transfer of fresh water for drinking, food preparation etc with a temperature of up to 25°C.

2. Hot water systems
   Heater drinking water with a temperature up to 60°C.

3. Floor heating purposes for residential houses
   Temperatures about 85°C are considered for heating applications

4. Industrial pipeline networks
   For water, air, other fluids and gases

5. Sanitary applications
   Applications where water quality is not important such as irrigation, washing or flushing systems

6. Pipe networks for agricultural and horticultural requirements

7. Pipe networks for connection of heat pumps

8. For transporting aggressive fluids and pneumatic systems (considering the chemical resistance)

To know about the chemical resistance of Polypropylene to various chemical fluids, you may refer to us by sending your enquiry to info@quantumindustries.ae

Our engineers shall be of assistance in providing general guidelines on possible utilization of polypropylene piping for conveying chemical fluids.

How

Pipe networks have never been easier to install, thanks to the fusion properties of Q-Therm products which made plumbing an easier job.

Advantages over conventional systems:

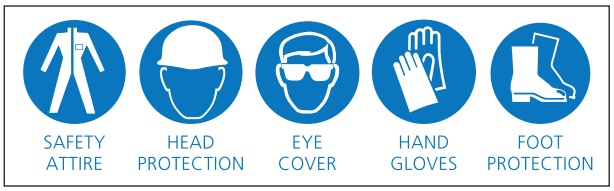
1. Easy installation by fusion technique
2. Easy Repair/Maintenance.
3. Energy and time saving.

Q-Therm products are coupled together by fusion techniques, accomplished by heating the pipe and fittings ends to a certain temperature using welding device. The heated ends are joined by pressing both the ends together. The fused joints are ready for use immediately after a short cooling period. To have perfect joints, the following steps must be adhered to:

Safety Instructions

The general industrial hygiene and accident prevention related rules and regulations must be followed by the user.

Recommended Protection/Safety Gears



Improper use can cause severe injury, burns or even cuts.

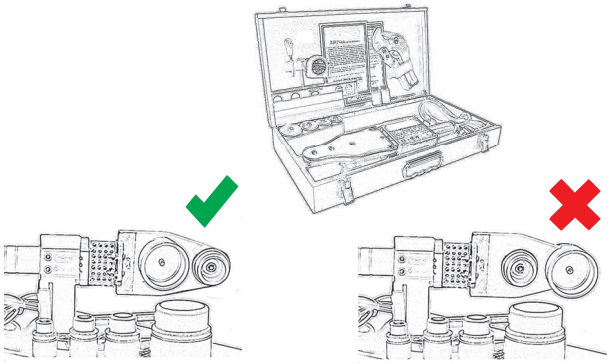
CAUTION

- Wear all adequate safety gears before carrying out the welding.
- Store equipments and tools in dry area.
- Metal part on the heating elements usually works up to a temperature of 300°C.
- Carryout welding procedures in a clean and tidy area.

Welding Device

Before the commencement of the fusion process, the welding device and the products require proper preparations for reliable and strong joints.
Always use proper welding devices and welding tools.

a. On cold conditions, fasten the required welding socket firmly on the welding device using correct tools in a way not allowing loose contact. The welding socket has to sit properly on the welding plate.
b. Fix smaller tools on the front and larger tools at the back to prevent the larger tools extending beyond the plate.
c. Check for any impurities on the tools and if required clean the tools using non-fibrous coarse tissue.
d. Switch on the welding device. The thermostat indicator should be lit and set the temperature to 260°C.
e. Wait for about 5 – 20 minutes for the machine to warm up and reach and stabilize itself on the set temperature. This can be ensured from thermostat lamp which will cut off once the temperature is attained.
f. Check the temperature of the welding device before welding by using suitable measuring instruments. (The temperature at the welding socket should be measured)
g. After usage, switch off the welding device and allow it to cool down in normal conditions.
h. Once cooled, remove any stains from welding and keep the device clean for next usage.
i. Store the device in a dry and dust free condition.



Socket Fusion Welding – Manual method

a. Prepare the welding device considering the points in Welding Device notes (reference) or the device manual.
b. Cut the pipe perpendicular to its axis and the ensure the edges are free from burrs.
c. For UV layered pipes and stabi with aluminum in external layer pipes, remove the PE by peeling it off and remove aluminum cover with the peeling tool up to the insertion depth (welding Depth).
d. For stabi with aluminum in the middle layer, use a special grooving device to take out a small layer of aluminum from the pipe surface.
e. Mark the welding depth on the pipe by referring to the table below.
f. Position the fitting with the aid of the compass rib marking on the fitting against the continuous line on the pipe.
g. Insert the pipe end into the heating socket up to the marking of the welding depth and the fitting onto the welding spigot up to the stop. Refer table for the heating-up time. The heating-up time begins once the pipe and fittings are fully inserted upto the welding depth.
h. At the end of the heating-up time, withdraw the pipe and fitting from the welding socket and spigot and push them immediately together up to the point that the welding depth marking is covered by the molten bead that has been formed.
i. Do not excessively insert the pipe far beyond the welding depth into the fitting as it may result in the internal diameter of the pipe to be reduced. Do not rotate the pipe and fitting relative to each other.

This welding joint can't be separated as the material of the fitting and pipe has fused together.

Pipe Diameter (mm)	Welding Depth (mm)	Heating Time* (sec)	Welding Time* (sec)	Cooling Time* (min)
20	14	5	4	2
25	15	7	6	2
32	16	8	6	4
40	18	12	6	4
50	20	18	8	4
63	26	24	8	6
75	29	30	8	8
90	32	40	10	8
110	35	50	10	8
125	41	60	10	8

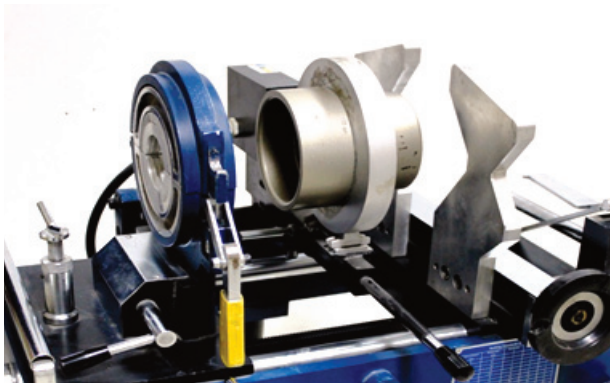
Table - 2

** General Guidelines for Heated Tool Socket Welding acc. to DVS 2207 Part 11*

Socket Fusion Welding – Mechanical

Q-Therm recommends using a large welding machine for mechanically welding pipes with diameters higher than 40 mm and for the pre-assembly of installation components. Welding of thermoplastics – Heated tool welding of pipes, pipeline, components and sheets out of PP acc. to DVS 2207, Sec. 11 apply.

Mechanical Welding Device



Mechanical Welding method

a. Inspect the machine for electrical components, cleanliness of socket devices and welding plates and switch on the device, with temperature set to 260°C.
b. Mark welding depth by referring to table 2.
c. Place the pipe on the adjustable locking clamp and fix the fitting on to the sliding clamps. Do not fasten the fitting too much as it might cause the fitting to be oval.
d. Keeping the welding handle in an upright position, adjust the alignment of the pipe and fitting by sliding in against each other in cold condition.
e. Once done, keep the pipe and fitting far from each other by rotating the crank.
f. After the temperature has been attained (indicated by the thermostat lamp), lower the welding plate.
g. Rotate the crank to insert the pipe and fitting to their respective heated welding socket tools till the stop.
h. Observe the heating time, and rotate the crank to pull out the pipe and fitting from the tools.
i. Lift the welding plate back in upright position and rotate the crank to fit the pipe and fitting together.
j. Remove the clamps and the fixture is ready to use after the cooling period is completed.

Electrofusion

jointing technique is used for sizes ranging from 20mm to 315mm

Electrofusion Method

1. Cut the pipe perpendicular to the axis of the pipe.
2. Clean the pipe ends thoroughly to make it free from dirt and burrs.
3. Mark the depth of electrofusion socket on the pipe.
4. Peel the surface of the both the pipes up to the welding depth mark (if the pipe is UV layered or Stabi with external layer)
5. Clean the outer surface of the pipe and inner surface of the pipe with absorbent.
6. Slide the coupler onto the pipe upto the welding depth mark. Lock the pipe to prevent from rolling or sliding away.
7. Connect the two welding cables to the contact pins of the coupler and start the welding process
8. Do not leave any gap inside the electrofusion fitting by not inserting the pipes to the required depths.
9. Start the fusion process and do not move or stress the pipe and fitting during the whole process and the cooling time.

Diameter (mm)	Cooling Time (sec)
16 - 32	10
40 - 63	25
75 -110	40
125	45
160 - 200	75
250 - 315	100

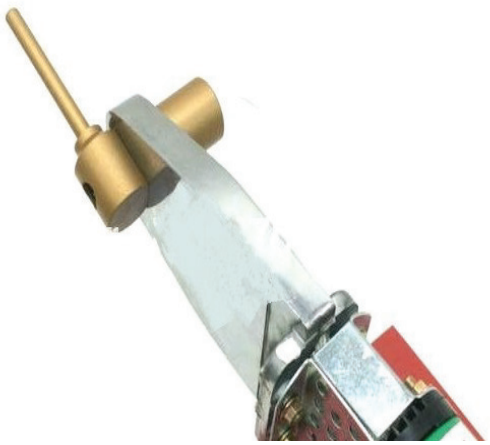
Table - 3

Q-THERM

Pipe Repair Pins

It is possible to repair a damaged (punctured/drilled) Q-Therm pipe using a special tool mounted on the welding device. In order to ensure that the repaired part can work under pressure, the following steps must be adhered to.

a. Drain the pipe to be empty
b. Uncover the damaged pipes.
c. Mark the required depth (as per the wall thickness of the pipe) on the repair plug.
d. Heat the repair plug and the drilled hole of the pipe using special mounted tools on the Q-Therm welding device.
e. Insert repair plug immediately after removing from the heated device and hold for 15 sec.
f. After the cooling time, cut the protruded end of the repair plug.

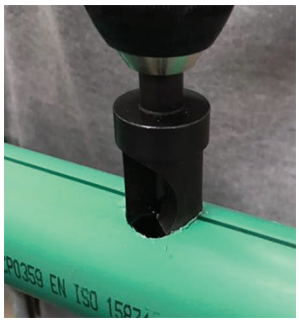


Weld-in Saddle Socket

Weld-in saddles are used as an extension of existing pipe systems. They are used as an alternative to Tees and Reducing Tees. It helps in direct branching of an already installed pipe without having the need to cut it and providing and Tee. Weld-in saddle could also be used for adding extra sensors after installation.

Welding method for saddle sockets

a. Drill a hole into the pipe with an appropriate drill bit, according to the required size.
b. Remove the burr and clean the drilled area neatly.
c. Moun t the special weld-in saddle welding tools to the welding device.
d. Follow welding machine operating procedures.
e. Heat up the hope and weld-in saddle simultaneously. (temperature 260°C)
f. Heat time starts once the saddle and the hole are fully inserted to the welding device.
g. After heating, remove the welding tool and weld the saddle to the hole.
h. Position the saddle firmly for 15 sec.
i. After a cooling period of 10 min, the weld-in saddle can be operational.

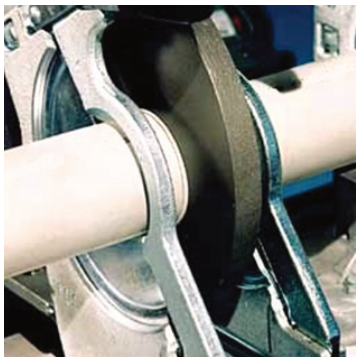


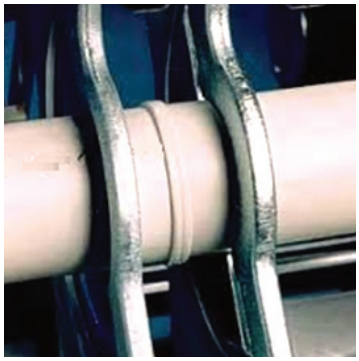
Butt-Welding

Butt-welding jointing technique is suitable for pipes with diameter 160mm to 315mm.

With the help of an additional tool, a reliable and non-detachable joint is established in a very economic method. Usually butt-welding is applied to pre-fabricated fitting elements from pipes.

The surfaces of the to-be-welded area are smoothly flattened to make it free from burrs and cut marks. This results in having plane ends that can be pressed against the heating element. The to-be-welded surfaces are lined up under a small alignment pressure. It is followed by holding it to a reduced pressure during the heating time. After the heating time is reached, the heating element is removed and the molten surfaces are pressed against each other under welding pressure.



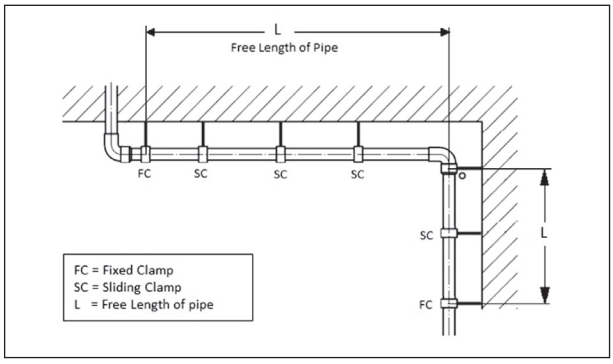


INSTALLATION GUIDELINES

Linear Expansion

Linear expansion is a very impor
tant design criterion for Q-Therm pipes. For effective piping networks, it is advised to consider linear expansion during the design stage of the piping network as polypropylene pipe systems expand/contract when subjected to heat in accordance with their material characteristics.

Longitudinal expansion is to be expected for a free length of pipe. The free pipe length is the length of the pipe between two points at which the pipe is secured or clamped in a fixed manner.



For determining the longitudinal expansion, the difference between the temperature at which the pipe network is installed and the maximum operating temperature to be expected, is most important.

$\Delta T\ (K) = T_{\text{Operating Temperature}} - T_{\text{Installation Temperature}}$

While using cold water piping network, the ΔT value might be negative which indicates that, cold water pipes have practically no linear expansion. They may experience some contraction, which is negligible. However, if required, sufficient compensation should be provided.

After the expected longitudinal expansion has been determined, a decision can be made if any of the possible measures should be taken to compensate it. It is recommended to have expansion control after 10 meters of straight pipelines.

Linear Expansion (ΔL) is calculated as per the formula stated below

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

Where

ΔL = Linear expansion in mm

L = Installed pipe length in meters

α = Linear expansion coefficient of Q-Therm solid pipe is 0.150 mm/m°K

$\Delta T\ (K) = T_{\text{Operating Temperature}} - T_{\text{Installation Temperature}}$

$T_{\text{Operating Temperature}}$ = *Maximum service operation temperature*

$T_{\text{Installation Temperature}}$ = *Installed condition temperature*

The linear expansion can be taken from the following table for a wide range of lengths (m) and temperatures, where the values are measured in millimeters (mm)

Pipe length	Linear Expansion Values (mm) Difference in Temperature ΔT (K)							
(m)	10	20	30	40	50	60	70	80
0.10	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20
0.20	0.30	0.60	0.90	1.20	1.50	1.80	2.10	2.40
0.30	0.45	0.90	1.35	1.80	2.25	2.70	3.15	3.60
0.40	0.60	1.20	1.80	2.40	3.00	3.60	4.20	4.80
0.50	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00
0.60	0.90	1.80	2.70	3.60	4.50	5.40	6.30	7.20
0.70	1.05	2.10	3.15	4.20	5.25	6.30	7.35	8.40
0.80	1.20	2.40	3.60	4.80	6.00	7.20	8.40	9.60
0.90	1.35	2.70	4.05	5.40	6.75	8.10	9.45	10.80
1.00	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00
2.00	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00
3.00	4.50	9.00	13.50	18.00	22.50	27.00	31.50	36.00
4.00	6.00	12.00	18.00	24.00	30.00	36.00	42.00	48.00
5.00	7.50	15.00	22.50	30.00	37.50	45.00	52.50	60.00
6.00	9.00	18.00	27.00	36.00	45.00	54.00	63.00	72.00
7.00	10.50	21.00	31.50	42.00	52.50	63.00	73.50	84.00
8.00	12.00	24.00	36.00	48.00	60.00	72.00	84.00	96.00
9.00	13.50	27.00	40.50	54.00	67.50	81.00	94.50	108.00
10.00	15.00	30.00	45.00	60.00	75.00	90.00	105.00	120.00
15.00	22.50	45.00	67.50	90.00	112.50	135.00	157.50	180.00
20.00	30.00	60.00	90.00	120.00	150.00	180.00	210.00	240.00
25.00	37.50	75.00	112.50	150.00	187.50	225.00	262.50	300.00
40.00	60.00	120.00	180.00	240.00	300.00	360.00	420.00	480.00
45.00	67.50	135.00	202.50	270.00	337.50	405.00	472.50	540.00
50.00	75.00	150.00	225.00	300.00	375.00	450.00	525.00	600.00

Table - 4

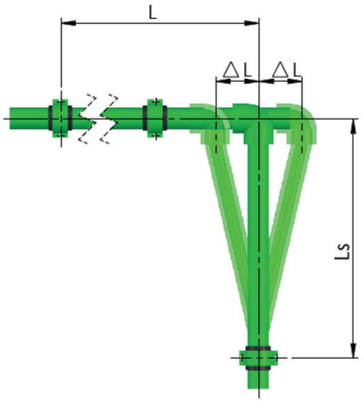
Q-THERM

Linear expansion compensation

Linear expansion can be compensated by different installation techinques in the piping network, either by Bend Technique or Expansion Loop technique.

Bend Technique

Frequent changes in the direction of a pipe line network, which is normal, will enable bending legs to be planned, inorder to compensate for the previously determined linear expansion. In this technique, linear expansion is compensated by providing change in direction in the piping network as shown in diagram.



Bend Length is calculated as per the formula stated below

$LBL\ (Ls) = K \times \sqrt{(d \times \Delta L)}$

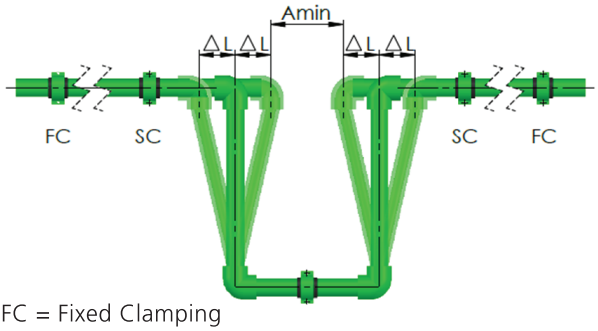
Where ΔL = Linear Expansion in mm
d = Outside Pipe Diameter in mm
K = Material Specific constant

The Material Specific constant (K) for Q-Therm pipes is 15.

Expansion Loop Technique

In this technique, linear expansion is compensated by installing expansion loop (U-Bend) using long and straight pipes in the piping network as shown in below figure Q-Therm recommends to use this technique in cases where linear expansion cannot be compensated by bending technique.

Q-Therm reccomends using a safety length (SL) of 150mm and a minimum width of expansion loop (WEL) of 200mm.



FC = Fixed Clamping
SC = Slide Clamping

The width (WEL) and the bend length (LBL) of the expansion loop are calculated as per the formula stated below.

$WEL = 2 \times \Delta L + SL$ and $LBL = K \times \sqrt{(d \times \Delta L)}$

Where ΔL = Linear Expansion in mm
SL = Safety length (150 mm)
d = Outside Pipe Diameter in mm
K = Material Specific constant

The Material Specific constant (K) for Q-Therm pipes is 15.

Mounting / Clamping of pipes and fittings

Depending on the area of application, the clamping is classified as Fixed Clamping and Slide Clamping. By definition the fixed point or fixed clamp holds the pipe in a fixed manner, in which in contrast a sliding point will permit the pipe to move in the axial direction of the pipe. It is available in wide range of sizes and the rubber lining available does not mechanically damage the pipe surface. Combination of both clamping system results in ideal installation of the piping network.

Fixed Clamping

Fixed Clamps normally divides the pipelines into individual sections, avoiding uncontrolled movements of the pipe. During the design of the piping network, fixed clamp positions should be calculated and installed in such a way that the forces of the linear expansions as well as probable additional loads are accommodated. Fixed points with long arms between the pipe and clamping position must be avoided, as in these cases; the clamps can act in a self-aligning manner and would not serve the function of a fixed point. Vertical column lines and pipes laid beneath plaster or concrete can also be laid in a rigid manner. Branch points, where the pipe branching off passes through a wall, must be mounted in a fixed manner or else, there is a chance of the branch to be cut off from the network due to load or stress.

Slide Clamping

Slide Clamps allows axial pipe movements without damaging the pipe. During the design of the piping network, slide clamps positions must be calculated and installed in such a way that the movements of the pipelines are not hindered by the fittings and are at a sufficient distance from the clamps installed in the piping network.

Clamping intervals

Clamping intervals for Q-Therm pipes in concurrence with temperature and outside diameter must be maintained as shown in table- 5 for effective clamping of the piping network.

Clamping Intervals for Q-Therm Solid Pipes

Temp. Diff ΔT (°C)	Pipe diameter Ø (mm) Clamping interval (mm)									
	20	25	32	40	50	63	75	90	110	125
0	85	105	125	140	165	190	205	220	250	250
20	60	75	90	100	120	140	150	160	180	190
30	60	75	90	100	120	140	150	160	180	190
40	60	70	80	90	110	130	140	150	170	180
50	60	70	80	90	110	130	140	150	170	180
60	55	65	75	85	100	115	125	140	160	170
70	50	60	75	80	95	105	115	125	140	150

Table - 5

For vertical lines, increase the relevant distances by 20%.

INSULATION

Insulation is provided as a protective measures for above ground pipe systems against loss of heat or cooling, scaling due to UV light etc. While calculating the bracket distances, it should be considered that the added weight of the insulation will cause higher deflection. Q-Therm Products offers significantly higher degree of insulation properties due to its low coefficient of Thermal conductivity of 0.20W/ (mK).

Insulating warm water pipes

It is highly recommended to insulate PP-R pipe systems, carrying warm and hot water lines, even though they have high levels of insulation properties. Insulation protects against physical contact with the hot surface, it reduces noise nuisance and reduces the heat loss of the water. It is important to prevent heat loss in hot water circulation systems to ensure that conditions are unfavorable for legionella bacteria. The boiler temperature is raised to compensate the heat loss. A raised boiler temperature requires additional energy and is often an additional attack on the applied (plastic) pipe work. At water temperatures above 70°C reduction of the life time expectancy of PP needs to be considered. With proper insulation the boiler temperature setting can be limited and the PP-R's material properties can be utilized fully.

Due to its high insulation properties, the insulation thickness can be reduced according to the following minimum insulation thickness.

Pipe Diameter (mm)	HOT WATER PIPE APPLICATIONS Insulation Thickness mm λ = 0.040 W/ (mK)	
	50%	100%
20	9.7	21.6
25	9.3	21
32	14.4	32.2
40	13.9	31.2
50	13.2	30.2
63	19	42.9
75	22.6	51.1
90	27.1	61.3
110	33.1	74.7

Table - 6

Insulating cold water pipes

Condensation is the precipitation of water vapour on a surface that is cooler than its environment. It is also called as sweating of pipes. Condensation arises when the humidity in the air is higher than the maximum quantity of water vapour that the air can contain at that temperature. It normally happens with chilled water network.

Type of installation	Insulation Thickness λ = 0.040 W/ (mK)
Exposed installed pipe, unheated room	4 mm
Exposed installed pipe, heated room	9mm
Pipe in duct, without hot water pipes	4 mm
Pipe in duct, besides hot water pipes	13mm
Pipe in Risers	4mm
Pipe in Risers, besides hot water pipes	13mm
Pipe on concrete floor	4 mm

Table - 7

Q-Therm recommends using open cell and fibrous insulation material with vapor barrier for hot water network insulation and closed cell insulation material with high moisture resistance for chilled water networks.

Installation Methods

There are various methods of installation of Q-Therm piping networks by the user.

Concealed Installation

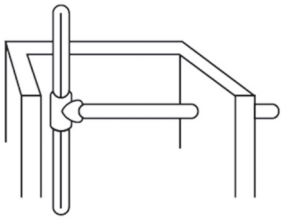
In this method of installation, Q-Therm piping network is embedded within the walls, floor or concrete slabs and they don't require any consideration for linear expansion. The compressive strain and tensile stresses arising are absorbed by the material itself.

Duct Installation

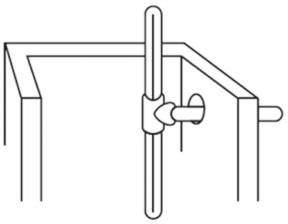
In this method of installation, branches are very common and these branches can be used to compensate linear expansion either by increasing the length of the branch in the utility duct, adequate large pipe sleeve to the branching pipe or by creating a elbow branch corner.

Exposed Installation

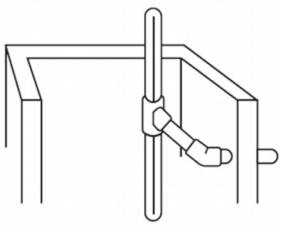
In this method of installation, Q-Therm pipes are installed either on the surface of walls, floors or concrete slabs and requires a thorough study of linear expansion and clamping intervals during the design stage of Q-Therm piping networks. Linear expansion and clamping intervals have been discussed in detail in above mentioned sections.



Utility Duct Branching



Pipe Branching



Elbow Branching

Calculation Guidelines For Piping Network

Numerous guidelines are required to determine the pipe diameter in potable networks such as pressure loss in pipes, length of the piping network, maximum permissible flow rate, quantity and size of the water points connected, minimum supply pressure including pressure boosters, head variations, pressure reduction using pressure release valves, pressure loss by filters or softeners, Pipe pressure loss and co-efficient of loss for fittings.

Q-Therm recommends using DIN1988 (Part 3) which specifies the calculation guidelines for the determination of the pipe diameter. The revised version of DIN 1988 provides simplified and differentiated methods of calculation. The simplified method is suitable for clearly arranged pipes as in residential buildings. Differentiated methods offer the highest accuracy as well as the most accurate approximation of real operating conditions.

Handling

During the installation process, utmost care should be taken to prevent damages by nicks and cuts to Q-Therm pipes surface. When temperatures get close to 0°C, Q-Therm products tends to become fragile. Extra care is specially required when cutting the pipes. In case of mechanical handling, use protective sling and padded supports. Avoid using metal chains and hooks as it will damage the pipe surface.

Transport

Always support Q-Therm pipes along their full length during transport. Avoid crossing, bending and over stacking of Q-Therm pipes during transport to avoid deformation.

Storage

Always Store Q-Therm products in clean and dry areas away from direct sunlight and UV radiation. The maximum height of Q-Therm pipes arranged in a pallet should not exceed height of 1.5meters. Always support the pipe along their full length by a solid base to avoid deformation of the pipes. For temporary outdoor storage or at site, Cover Q-Therm products from direct sunlight using tarpaulin sheets to avoid UV radiation.

Pressure Test

The pressure test has to be conducted according to DIN 1988, for the completely installed but not yet concealed pipe network. The test pressure has to be 1.5 times of the maximum operating/working pressure. Due to the thermal expansion of the PPR material, a change in temperature of 10°K results in change of pressure of 0.5 to 1 Bar. Therefore, the test should be conducted at an as far as possible, constant test medium temperature.

The pipe network has to be filled with filtered water until they are free from air. Pressure gauges allowing a perfect reading of 0.1 Bar pressure change should be used.
The testing procedure includes three stages.

Preliminary Stage: In this stage, the system is pressurized with 1.5 times of the maximum operating pressure. This test pressure has to be re-established twice within 30 minutes at 10 minutes intervals. After a test time of a further 30 minutes, the test pressure must not drop more than 0.6 Bar. No leakage may appear at this point. The preliminary stage is followed by the Principle stage.

Principle Stage: The principle stage is for 2 hours. The test pressure taken from the preliminary stage may not fall more than 0.2 Bar. No leakage shall be found at any section of the tested installation.

Final Test: The final test is made with changing the pressure of 1 Bar and 10 Bars alternating for four times at intervals of 5 minutes. The pipes system must be unpressurized between each test cycle. No leakage must appear at any point of the tested installation. Test record should be prepared and signed by the client and contractor.

Flushing of pipe system

Flushing should be done in accordance to DIN 1988, where it should be performed with an air/water mixture intermittently under pressure.

Generally, all drinking water systems, regardless of materials used, should be thoroughly flushed after completion. The following requirements are necessary for optimal service readiness:

- Securing of drinking water quality
- Prevention of corrosion damage
- Prevention of functional damage to fittings and equipment
- Cleaning of interior pipe surfaces
- These requirements are achieved using two flushing procedures, flushing with water or flushing with an air/water mixture. For drinking water systems in accordance with DIN 1988, assembled consisting exclusively of Q-Therm pipe system, flushing with water is sufficient.

Quality Control & Assurance:

As quality is a subjective term for which each person has his own definition, we in Quantum industries chose to have a definition that can serve as a way of life, stemming from all what we believed that quality should be, acting as the backbone of the quality culture we aspire to cultivate, not only in the products we make, but also in everything we do, as we know that quality is not luxury, it is a matter of existence.

Our definition of quality is dynamic, improving and evolving, it's a live definition, but is always resting on our five quality pillars, the 5 Cs…

01  Compliance with international norms and standards.

02  Customer satisfaction.

03  Commitment to timely delivery.

04  Consistency in all what we do.

05  Cost effectiveness.

Quantum industries/ quality department ensures that, Q-Therm piping systems are produced through a stringent supervision, strict adherence to regulations and proper control of all work related operations. Every carefully observed process and result obtained are recorded and documented.

Q-Therm products and its manufacturing processes conform to respective national and international regulations and Q-Therm's own Internal Quality System.

Q-Therm achieves its desired quality in all its products by using state-of-art machinery, strict process control, regular in-process inspection, adherence to standards and regulations supported with continuous research and development.

1. Machinery

To obtain products with best quality standards, the machinery to produce them should be equipped with modern technologies, capable of delivering such demanded quality. Q-Therm's carefully chosen machineries are specially designed to produce items, which excels in all quality aspects.

2. Testing Incoming Raw material

One of the contributing factors to Q-Therm's quality products is allowing only premium quality raw material to be used in its manufacturing processes. Thorough inspection and tests are conducted to ensure that the incoming material meets the required specification. Materials which do not conform to the specified requirements are not released for production.

3. Process Control

Before each start-up, the related process parameter and machines are checked and approved by QC. A sample taken before the start up of each production is submitted to QC for technicians to test and verify the,

- Visual Appearance and surface finish of product
- Dimensional conformance of samples to standards and norms
- Machine parameter data from Extrusion and Injection Machines

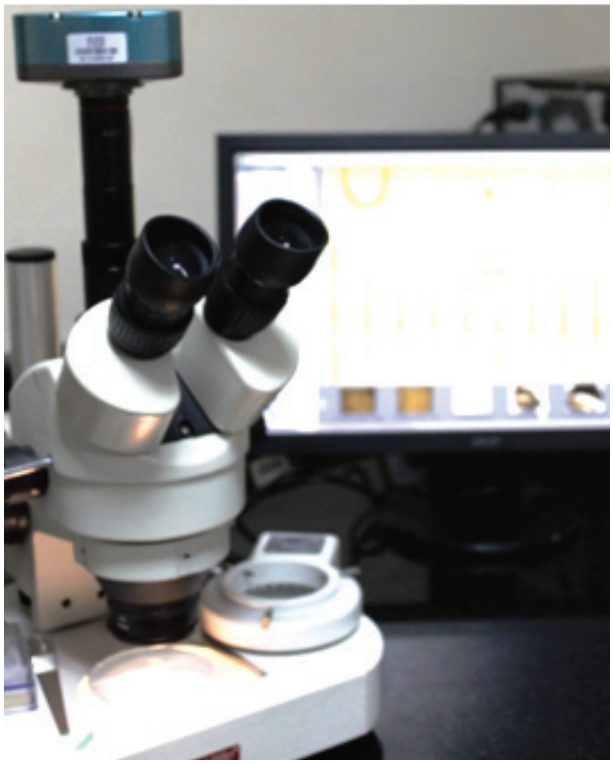
Once the test results attained are conforming to the required standards, the acceptance is endorsed by QC. The process mentioned above is embedded in Q-Therm's Internal Control System and is performed at the beginning of each production to ensure Q-Therm's adherence to its strict quality system procedures.

The production process is continuously monitored in regular intervals and the in-process data are recorded. This helps to alarm if there are any deviations in quality during the entire production process, and facilitates better traceability of the products.

QUALITY ASSURANCE

The magor tests conducted among other test during the production process for each product are;

- Dimensional accuracy throughout production process
- Surface finish and visual appearance of products
- Impact tests
- Heat reversion Tests
- Internal Pressure tests

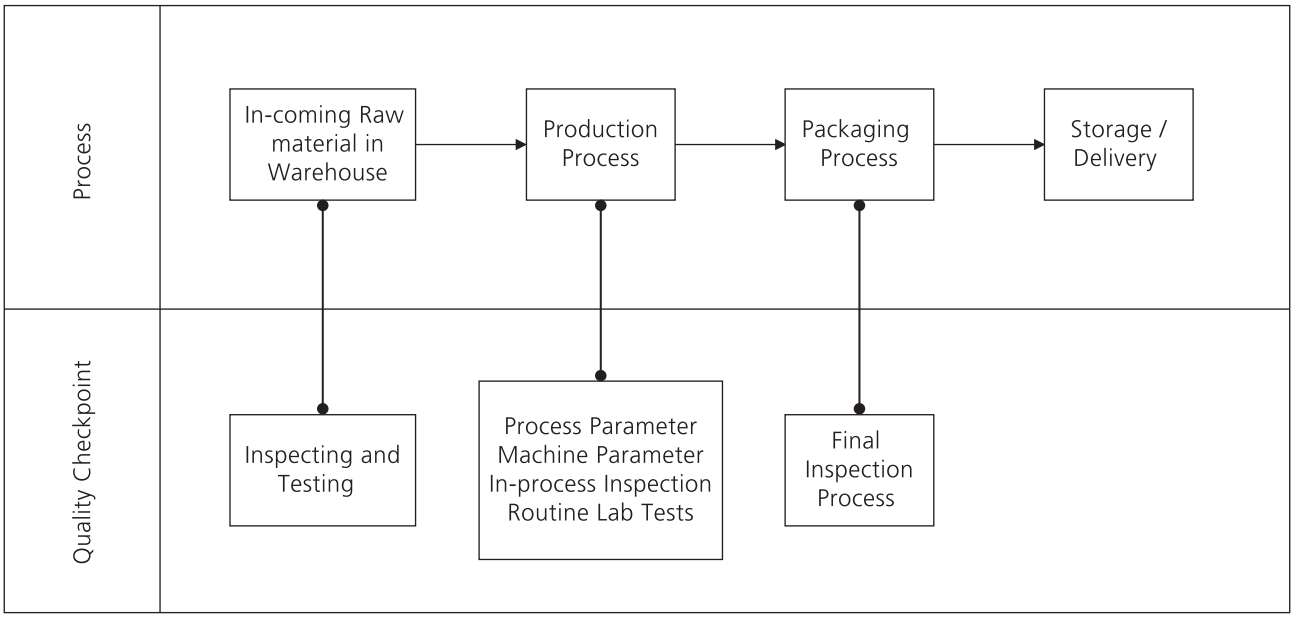


4. Final Inspection

All Q-Therm products go through inspections and tests conducted by the Quality Department. Once the test results conforms and passes all the pre-defined procedures and specifications, the finished goods are allowed to be released to warehouse for storage and delivery.

5. Employee Training

Apart from designing tight system procedures to ensure quality, Q-Therm provides its' employees, a continuous training which supports Q-Therm's commitment to deliver supreme quality in its products for all customers. Q-Therm's dedicated, qualified and well trained skilled professional supports the internal quality control system of Q-Therm products, using top notch QC equipments for their tests and analyses.



QUALITY ASSURANCE

Standards

Standard ISO 15874 - Plastic piping system for hot and cold water installations
Standard ISO 15874 is the international application standard for hot and cold water installations of Polypropylene.

	Standard	Title
	ISO 15874	Plastic Piping systems for hot and cold water installations - polypropylene (PP)
	Part 1	General
	Part 2	Pipes
	Part 3	Fittings
	Part 5	Fitness for purpose of the system
	Part 7	Recommendations for the assessment of conformity

Table - 8

Application Class	Design Temperature T_D °C	Service Time at TD Years	T_{max} °C	Service Time at T_{max} Years	T_{mal} °C	Service Time at T_{mal} hrs	Application
1 a	60	49	80	1	95	100	Hot Water Supply (60 °C)
2 a	70	49	80	1	95	100	Hot Water Supply (70 °C)
4 b	20 followed by 40 followed by 60	2.5 20 25	70	2.5	100	100	Underfloor heating and low temp. radiator connections (70 °C)
5 b	20 followed by 60 followed by 80	14 25 10	90	1	100	100	High temp. radiator connections (80 °C)

Table - 9

Note: For values of TD, Tmax and Tmal in excess of those in this table, this standard does not apply.

TD = Design temperature
T_{max} = Maximum temperature
T_{mal} = Malfunctioning temperature

a) A country may select either class 1 or class 2 to conform to its national regulations
b) Where more than one design temperature appears for any class, the times should be aggregated (e.g. the design temperature profile for 50 years for class 5 is: 20 °C for 14 years followed by 60 °C for 25 years, 80 °C for 10 years, 90 °C for 1 year and 100 °C for 100 h)

QUALITY ASSURANCE

Standard DIN 8077/8078 and DIN 16962

DIN 8077/8078 and DIN 16962 are German Standards for PP pipes and fittings. These standards apply, when the application class is not covered as in ISO 15874

Standard	Title
DIN 8077	Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT - dimensions
DIN 8078	Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT - general quality requirements and testing
DIN 16962	Pipe joints and fittings for pressure systems of polypropylene (PP)
Part 1	Segment welded bends for butt-welding
Part 2	Segment welded tees for butt-welding
Part 3	Seamless formed bends for butt-welding
Part 4	Stub ends, backing rings and gaskets for butt-welding
Part 5	General quality requirements, testing
Part 6	Injection moulded elbows for socket welding
Part 7	Injection moulded tees for socket welding
Part 8	Injection moulded sockets and end caps for socket welding
Part 9	Injection moulded reducers and nipples for socket welding
Part 10	Injection moulded fittings tees for butt-welding
Part 11	Machined reducers tees for butt-welding
Part 12	Stub ends, backing rings and gaskets for socket welding

Table - 10

Other standards

DIN 1988 DVGW Code of practice. (Drinking water supply systems; materials, components, appliances, design & installation).

DIN 8076 Standard for testing metal threaded joints DIN 2999 Standards for fittings with threaded metallic inserts.

DIN 16928 Installation, Pipes and fittings connection DIN 4109 Noise control in Buildings.

DVS 2207 Welding of Thermoplastic pipes and fittings.

DVS 2208 Welding machines and devises for Thermoplastic pipes and fittings.

DVGW W544 Plastic pipe system for drinking water-pipe.

Hygiene

BS 6920 Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of water.

DVGW W 270 Growth of microorganisms on Materials used in Drinking Water Installation – Tests and Assessment

KTW Guideline of the Federal Environment Agency on the assessment of organic materials in contact with drinking water

DIN standards and ISO standards are similar. A significant difference between the general SIN standard and application ISO standard is that some subjects are described in more detail. There is no clear dividing line between the standard that seems to exist.

QUALITY ASSURANCE

Product Certifications

Q-Therm pipe system undergoes various external and internal inspections. National and international authorities, whose reputation for neutrality is beyond doubt, check and certify our products regularly to endorse their constant high level of quality. This guarantees the user a high level of safety and reliability.

The external monitoring is performed by SKZ and HYG, two widely reputed organizations for its authenticity, reliability and neutrality. These tests and audits are authorized by DVGW (German Association of the Gas and Water Profession). The collect samples from our production directly and test it at their facility. The results are shared with DVGW and Quantum, for documentation.

Certification implies that, Q-Therm products are fit for their intended application and the following requirements are met;

- System is mechanically tested by independent body
- Quality Management System is ISO 9001 certified
- Material used is virgin and properly controlled
- Products do not pose any hygienic risks
- External surveillance on products and process is performed.

International Certifiers and Testing Partners

DVGW The DVGW is a recognized standardization body for the gas and water industry, a centre for technical and scientific know-how in the gas and water sectors, Germany.

SKZ The German Plastics Center is the leading service provider for the plastic industry in Europe. Scope of service ranges from product quality, 3rd party inspection, laboratory testing, training and certification.

Hy The Institute of Hygiene examines and evaluates the quality of drinking water and associated products, Germany.

WRAS Water Regulatory Advisory Scheme, UK.

NSF Independent laboratory in UK, testing hygienic requirements as per WRAS regulations.

Approvals from Regional Bodies

Certification and approvals from various Regional governing bodies has also been acquired from offices such as;

- Municipality of Dubai, UAE
- Municipality of Sharjah, UAE
- Municipality of Ajman, UAE
- Municipality of Ras Al Khaimah, UAE
- Municipality of Al Fujairah, UAE
- Ministry of Infrastructure Development

QUALITY ASSURANCE

Allowable operating pressure for PP-R pipes conveying water, safety factor (SF) = 1.25

Temperature °C	Service Years (yrs)	Allowable operating pressure (Bar)			
		SDR 11	SDR 7.4	SDR 6	SDR 5
10	1	21,1	33,4	42,1	53,0
	5	19,8	31,5	39,7	49,9
	10	19,3	30,7	38,6	48,7
	25	18,7	29,7	37,4	47,0
	50	18,2	28,9	36,4	45,9
	100	17,8	28,2	35,5	44,7
20	1	18,0	28,5	35,9	45,2
	5	16,9	26,8	33,7	42,5
	10	16,4	26,1	32,8	41,4
	25	15,9	25,2	31,7	39,9
	50	15,4	24,5	30,9	38,9
	100	15,0	23,9	30,1	37,8
30	1	15,3	24,2	30,5	38,5
	5	14,3	22,7	28,6	36,0
	10	13,9	22,1	27,8	35,0
	25	13,4	21,3	26,8	33,8
	50	13,0	20,7	26,1	32,9
	100	12,7	20,1	25,4	31,9
40	1	13,0	20,6	25,9	32,6
	5	12,1	19,2	24,2	30,5
	10	11,8	18,7	23,5	29,6
	25	11,3	18,0	22,6	28,5
	50	11,0	17,4	22,0	27,7
	100	10,7	16,9	21,4	26,9
50	1	11,0	17,4	21,9	27,6
	5	10,2	16,2	20,4	25,7
	10	9,9	15,7	19,8	25,0
	25	9,5	15,1	19,0	24,0
	50	9,2	14,7	18,5	23,3
	100	9,0	14,2	17,9	22,6
60	1	9,2	14,7	18,5	23,3
	5	8,6	13,6	17,2	21,6
	10	8,3	13,2	16,6	21,0
	25	8,0	12,7	16,0	20,1
	50	7,7	12,3	15,5	19,5
	1	7,8	12,3	15,5	19,6
70	5	7,2	11,4	14,4	18,1
	10	7,0	11,1	13,9	17,5
	25	6,0	9,6	12,1	15,2
	50	5,1	8,1	10,2	12,8
80	1	6,5	10,3	13,0	16,4
	5	5,7	9,1	11,5	14,5
	10	4,8	7,7	9,7	12,2
	25	3,9	6,2	7,8	9,8
95	1	4,6	7,3	9,2	11,6
	5	3,1	4,9	6,2	7,8

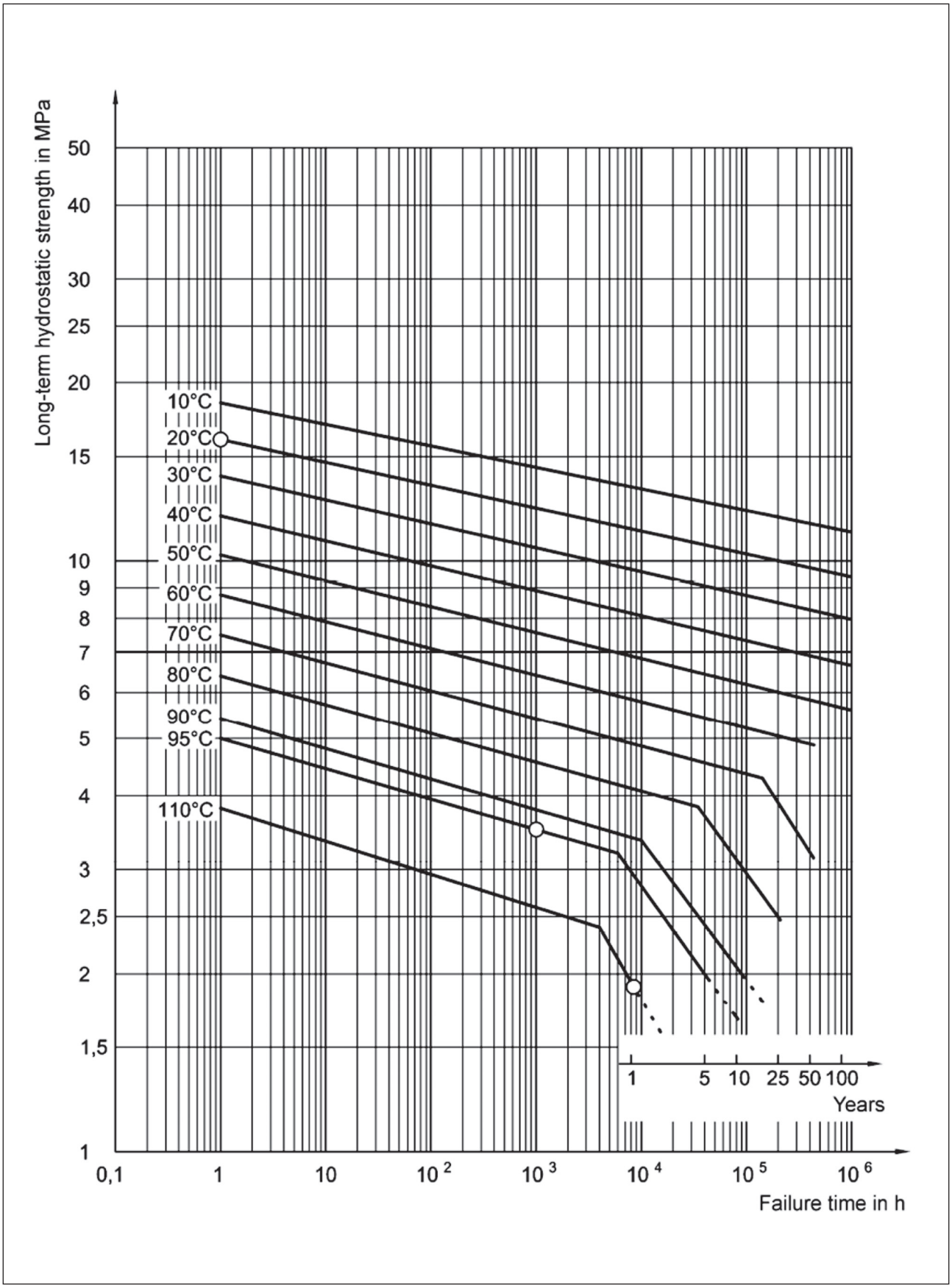
Table - 11

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

Temperature °C	Service Years (yrs)	Allowable operating pressure (Bar)			
		SDR 11	SDR 7.4	SDR 6	SDR 5
10	1	17,5	27,8	35,1	44,1
	5	16,5	26,2	33,0	41,6
	10	16,1	25,6	32,2	40,5
	25	15,6	24,7	31,1	39,2
	50	15,2	24,1	30,3	38,2
	100	14,8	23,5	29,6	37,2
20	1	15,0	23,7	29,9	37,7
	5	14,1	22,3	28,1	35,4
	10	13,7	21,7	27,4	34,5
	25	13,2	21,0	26,4	33,3
	50	12,9	20,4	25,7	32,4
	100	12,5	19,9	25,0	31,5
30	1	12,7	20,2	25,4	32,0
	5	11,9	18,9	23,8	30,0
	10	11,6	18,4	23,2	29,2
	25	11,2	17,7	22,3	28,1
	50	10,9	17,2	21,7	27,4
	100	10,6	16,8	21,1	26,6
40	1	10,8	17,1	21,6	27,2
	5	10,1	16,0	20,2	25,4
	10	9,8	15,5	19,6	24,7
	25	9,4	15,0	18,8	23,7
	50	9,2	14,5	18,3	23,1
	100	8,9	14,1	17,8	22,4
50	1	9,1	14,5	18,2	23,0
	5	8,5	13,5	17,0	21,4
	10	8,2	13,1	16,5	20,8
	25	7,9	12,6	15,9	20,0
	50	7,7	12,2	15,4	19,4
	100	7,5	11,8	14,9	18,8
60	1	7,7	12,2	15,4	19,4
	5	7,1	11,3	14,3	18,0
	10	6,9	11,0	13,9	17,5
	25	6,6	10,5	13,3	16,7
	50	6,4	10,2	12,9	16,2
	1	6,5	10,3	12,9	16,3
70	5	6,0	9,5	12,0	15,1
	10	5,8	9,2	11,6	14,6
	25	5,0	8,0	10,0	12,7
	50	4,2	6,7	8,5	10,7
80	1	5,4	8,6	10,8	13,7
	5	4,8	7,4	9,6	12,1
	10	4,0	6,4	8,1	10,2
	25	3,2	5,1	6,5	8,1
95	1	3,8	6,1	7,6	9,6
	5	2,6	4,1	5,2	6,5

Table - 12

QUALITY ASSURANCE



QUALITY ASSURANCE

Pipe Friction gradient/flow speed of Q-Therm SDR 6 pipes

Pipe friction gradient (R) and calculated flow rate (V) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m²/s

Temperature : 20°C

V = circulation (l/s)					R = pressure gradient (mbar/m)					v = speed	
	dxs	20x3,4	25x4,2	32x5,4	40x6,7	50x8,3	63x10,5	75x12,5	90x15,0	110x18,3	125x20,8
V	di	13,2 mm	16,6 mm	21,2 mm	26,6 mm	33,4 mm	42 mm	50 mm	60 mm	73,4 mm	83,4 mm
0.01	R	0.138	0.048	0.016	0.006	0.002	0.001	0.000	0.000	0.000	0.000
	v	0.073	0.046	0.028	0.018	0.011	0.007	0.005	0.004	0.002	0.002
0.02	R	0.425	0.146	0.047	0.017	0.006	0.002	0.001	0.000	0.000	0.000
	v	0.146	0.092	0.057	0.036	0.023	0.014	0.010	0.007	0.005	0.004
0.03	R	0.833	0.285	0.091	0.032	0.011	0.004	0.002	0.001	0.000	0.000
	v	0.219	0.139	0.085	0.054	0.034	0.022	0.015	0.011	0.007	0.005
0.04	R	1.352	0.461	0.147	0.051	0.018	0.006	0.003	0.001	0.000	0.000
	v	0.292	0.185	0.113	0.072	0.046	0.029	0.020	0.014	0.009	0.007
0.05	R	1.976	0.671	0.213	0.074	0.026	0.009	0.004	0.002	0.001	0.000
	v	0.365	0.231	0.142	0.090	0.057	0.036	0.025	0.018	0.012	0.009
0.06	R	2.699	0.914	0.289	0.100	0.035	0.012	0.005	0.002	0.001	0.001
	v	0.438	0.277	0.170	0.108	0.068	0.043	0.031	0.021	0.014	0.011
0.07	R	3.518	1.189	0.375	0.129	0.045	0.015	0.007	0.003	0.001	0.001
	v	0.512	0.323	0.198	0.126	0.080	0.051	0.036	0.025	0.017	0.013
0.08	R	4.431	1.494	0.471	0.162	0.056	0.019	0.008	0.004	0.001	0.001
	v	0.585	0.370	0.227	0.144	0.091	0.058	0.041	0.028	0.019	0.015
0.09	R	5.436	1.830	0.576	0.198	0.068	0.023	0.010	0.004	0.002	0.001
	v	0.658	0.416	0.255	0.162	0.103	0.065	0.046	0.032	0.021	0.016
0.10	R	6.530	2.195	0.689	0.236	0.081	0.028	0.012	0.005	0.002	0.001
	v	0.731	0.462	0.283	0.180	0.114	0.072	0.051	0.035	0.024	0.018
0.12	R	8.980	3.010	0.943	0.322	0.110	0.038	0.017	0.007	0.003	0.002
	v	0.877	0.554	0.340	0.216	0.137	0.087	0.061	0.042	0.028	0.022
0.14	R	11.774	3.936	1.230	0.420	0.143	0.049	0.022	0.009	0.004	0.002
	v	1.023	0.647	0.397	0.252	0.160	0.101	0.071	0.050	0.033	0.026
0.16	R	14.902	4.971	1.550	0.528	0.180	0.061	0.027	0.011	0.004	0.002
	v	1.169	0.739	0.453	0.288	0.183	0.115	0.081	0.057	0.038	0.029
0.18	R	18.358	6.111	1.902	0.647	0.220	0.075	0.033	0.014	0.005	0.003
	v	1.315	0.832	0.510	0.324	0.205	0.130	0.092	0.064	0.043	0.033
0.20	R	22.138	7.356	2.286	0.777	0.264	0.090	0.039	0.017	0.007	0.004
	v	1.461	0.924	0.567	0.360	0.228	0.144	0.102	0.071	0.047	0.037
0.30	R	45.764	15.094	4.658	1.574	0.533	0.180	0.079	0.033	0.013	0.007
	v	2.192	1.386	0.850	0.540	0.342	0.217	0.153	0.106	0.071	0.055
0.40	R	77.035	25.263	7.755	2.610	0.880	0.296	0.129	0.055	0.021	0.012
	v	2.923	1.848	1.133	0.720	0.457	0.289	0.204	0.141	0.095	0.073
0.50	R	115.750	37.782	11.549	3.874	1.302	0.437	0.191	0.080	0.031	0.017
	v	3.654	2.310	1.416	0.900	0.571	0.361	0.255	0.177	0.118	0.092
0.60	R	161.783	52.598	16.018	5.357	1.796	0.601	0.262	0.110	0.042	0.023
	v	4.384	2.772	1.700	1.080	0.685	0.433	0.306	0.212	0.142	0.110
0.70	R	215.047	69.672	21.150	7.056	2.360	0.788	0.343	0.144	0.055	0.030
	v	5.115	3.234	1.983	1.260	0.799	0.505	0.357	0.248	0.165	0.128
0.80	R	275.48	88.98	26.93	8.96	2.99	1.00	0.43	0.18	0.07	0.04
	v	5.85	3.70	2.27	1.44	0.91	0.58	0.41	0.28	0.19	0.15

Table - 13

QUALITY ASSURANCE

Pipe Friction gradient/flow speed of Q-Therm SDR 6 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m^2/s

Temperature : 20°C

V = circulation (l/s)					R = pressure gradient (mbar/m)				v = speed		
	dxs	20x3,4	25x4,2	32x5,4	40x6,7	50x8,3	63x10,5	75x12,5	90x15,0	110x18,3	125x20,8
V	di	13,2 mm	16,6 mm	21,2 mm	26,6 mm	33,4 mm	42 mm	50 mm	60 mm	73,4 mm	83,4 mm
0.90	R	343.03	110.49	33.36	11.08	3.69	1.23	0.53	0.22	0.09	0.05
	v	6.58	4.16	2.55	1.62	1.03	0.65	0.46	0.32	0.21	0.16
1.00	R	417.67	134.20	40.41	13.40	4.46	1.48	0.64	0.27	0.10	0.06
	v	7.31	4.62	2.83	1.80	1.14	0.72	0.51	0.35	0.24	0.18
1.20	R	588.09	188.13	56.42	18.64	6.18	2.05	0.89	0.37	0.14	0.08
	v	8.77	5.54	3.40	2.16	1.37	0.87	0.61	0.42	0.28	0.22
1.40	R	786.55	250.70	74.90	24.67	8.16	2.70	1.17	0.49	0.19	0.10
	v	10.23	6.47	3.97	2.52	1.60	1.01	0.71	0.50	0.33	0.26
1.60	R	1012.94	321.83	95.84	31.48	10.39	3.43	1.48	0.62	0.24	0.13
	v	11.69	7.39	4.53	2.88	1.83	1.15	0.81	0.57	0.38	0.29
1.80	R	1267.17	401.49	119.22	39.06	12.87	4.24	1.83	0.76	0.29	0.16
	v	13.15	8.32	5.10	3.24	2.05	1.30	0.92	0.64	0.43	0.33
2.00	R	1549.16	489.64	145.02	47.41	15.58	5.13	2.21	0.92	0.35	0.19
	v	14.61	9.24	5.67	3.60	2.28	1.44	1.02	0.71	0.47	0.37
2.20	R	1858.87	586.25	173.22	56.51	18.54	6.09	2.62	1.09	0.41	0.22
	v	16.08	10.17	6.23	3.96	2.51	1.59	1.12	0.78	0.52	0.40
2.40	R	2196.26	691.30	203.82	66.37	21.74	7.13	3.07	1.27	0.48	0.26
	v	17.54	11.09	6.80	4.32	2.74	1.73	1.22	0.85	0.57	0.44
2.60	R	2561.28	804.77	236.81	76.98	25.17	8.24	3.54	1.47	0.56	0.30
	v	19.00	12.01	7.37	4.68	2.97	1.88	1.32	0.92	0.61	0.48
2.80	R	2953.91	926.64	272.18	88.33	28.84	9.43	4.05	1.68	0.64	0.34
	v	20.46	12.94	7.93	5.04	3.20	2.02	1.43	0.99	0.66	0.51
3.00	R	3374.13	1056.91	309.92	100.42	32.75	10.70	4.59	1.90	0.72	0.39
	v	21.92	13.86	8.50	5.40	3.42	2.17	1.53	1.06	0.71	0.55
3.20	R	3821.92	1195.56	350.03	113.26	36.88	12.03	5.16	2.13	0.81	0.44
	v	23.38	14.79	9.07	5.76	3.65	2.31	1.63	1.13	0.76	0.59
3.40	R	4297.25	1342.57	392.50	126.83	41.25	13.44	5.76	2.38	0.90	0.49
	v	24.85	15.71	9.63	6.12	3.88	2.45	1.73	1.20	0.80	0.62
3.60	R	4800.12	1497.96	437.33	141.13	45.85	14.92	6.39	2.64	1.00	0.54
	v	26.31	16.63	10.20	6.48	4.11	2.60	1.83	1.27	0.85	0.66
3.80	R	5330.50	1661.69	484.52	156.17	50.67	16.48	7.05	2.91	1.10	0.59
	v	27.77	17.56	10.77	6.84	4.34	2.74	1.94	1.34	0.90	0.70
4.00	R	5888.40	1833.78	534.06	171.94	55.73	18.10	7.74	3.19	1.21	0.65
	v	29.23	18.48	11.33	7.20	4.57	2.89	2.04	1.41	0.95	0.73
4.20	R	6473.79	2014.21	585.95	188.45	61.02	19.80	8.46	3.49	1.32	0.71
	v	30.69	19.41	11.90	7.56	4.79	3.03	2.14	1.49	0.99	0.77
4.40	R	7086.67	2202.99	640.19	205.68	66.53	21.57	9.21	3.80	1.43	0.77
	v	32.15	20.33	12.46	7.92	5.02	3.18	2.24	1.56	1.04	0.81
4.60	R	7727.03	2400.09	696.77	223.63	72.27	23.41	9.99	4.12	1.55	0.84
	v	33.61	21.25	13.03	8.28	5.25	3.32	2.34	1.63	1.09	0.84
4.80	R	8394.86	2605.53	755.69	242.32	78.23	25.32	10.79	4.45	1.68	0.90
	v	35.08	22.18	13.60	8.64	5.48	3.46	2.44	1.70	1.13	0.88

Table - 14

QUALITY ASSURANCE

Pipe Friction gradient/flow speed of Q-Therm SDR 6 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m²/s

Temperature : 20°C

V = circulation (l/s)					R = pressure gradient (mbar/m)				v = speed		
	dxs	20x3,4	25x4,2	32x5,4	40x6,7	50x8,3	63x10,5	75x12,5	90x15,0	110x18,3	125x20,8
V	di	13,2 mm	16,6 mm	21,2 mm	26,6 mm	33,4 mm	42 mm	50 mm	60 mm	73,4 mm	83,4 mm
5.00	R	9090.16	2819.29	816.96	261.73	84.43	27.30	11.63	4.79	1.80	00.97
	v	36.54	23.10	14.16	9.00	5.71	3.61	2.55	1.77	1.18	0.92
5.20	R	9812.92	3041.38	880.56	281.87	90.84	29.36	12.50	5.14	1.94	1.04
	v	38.00	24.03	14.73	9.36	5.93	3.75	2.65	1.84	1.23	0.95
5.40	R	10563.14	3271.78	946.50	302.73	97.49	31.48	13.40	5.51	2.07	1.12
	v	39.46	24.95	15.30	9.72	6.16	3.90	2.75	1.91	1.28	0.99
5.60	R	11340.80	3510.51	1014.78	324.31	104.35	33.67	14.32	5.89	2.21	1.19
	v	40.92	25.88	15.86	10.08	6.39	4.04	2.85	1.98	1.32	1.03
5.80	R	12145.91	3757.55	1085.39	346.61	111.44	35.93	15.28	6.28	2.36	1.27
	v	42.38	26.80	16.43	10.44	6.62	4.19	2.95	2.05	1.37	1.06
6.00	R	12978.46	4012.90	1158.33	369.64	118.76	38.26	16.26	6.68	2.51	1.35
	v	43.84	27.72	17.00	10.80	6.85	4.33	3.06	2.12	1.42	1.10
6.20	R	13838.44	4276.56	1233.61	393.39	126.30	40.67	17.27	7.09	2.66	1.44
	v	45.31	28.65	17.56	11.16	7.08	4.48	3.16	2.19	1.47	1.13
6.40	R	14725.85	4548.53	1311.21	417.85	134.06	43.14	18.31	7.52	2.82	1.52
	v	46.77	29.57	18.13	11.52	7.30	4.62	3.26	2.26	1.51	1.17
6.60	R	15640.70	4828.80	1391.15	443.04	142.05	45.68	19.38	7.95	2.98	1.61
	v	48.23	30.50	18.70	11.88	7.53	4.76	3.36	2.33	1.56	1.21
6.80	R	16582.97	5117.38	1473.41	468.95	150.26	48.29	20.48	8.40	3.15	1.70
	v	49.69	31.42	19.26	12.24	7.76	4.91	3.46	2.41	1.61	1.24
7.00	R	17552.66	5414.27	1558.01	495.58	158.69	50.96	21.61	8.86	3.32	1.79
	v	51.15	32.34	19.83	12.60	7.99	5.05	3.57	2.48	1.65	1.28
7.50	R	20096.83	6192.79	1779.67	565.28	180.74	57.96	24.55	10.05	3.77	2.03
	v	54.81	34.65	21.25	13.50	8.56	5.41	3.82	2.65	1.77	1.37
8.00	R	22812.34	7023.17	2015.86	639.48	204.18	65.39	27.67	11.32	4.24	2.28
	v	58.46	36.96	22.66	14.40	9.13	5.77	4.07	2.83	1.89	1.46
9.00	R	28757.21	8839.45	2531.81	801.30	255.21	81.52	34.44	14.06	5.25	2.82
	v	65.77	41.58	25.50	16.20	10.27	6.50	4.58	3.18	2.13	1.65
10.00	R		10862.98	3105.78	980.99	311.75	99.36	41.90	17.08	6.37	3.42
	v		46.21	28.33	17.99	11.41	7.22	5.09	3.54	2.36	1.83

Table - 15

QUALITY ASSURANCE

Pipe Friction gradient/flow speed of Q-Therm SDR 6 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m^2/s

Temperature : 60°C

V = circulation (l/s)					R = pressure gradient (mbar/m)					v = speed	
	dxs	20x3,4	25x4,2	32x5,4	40x6,7	50x8,3	63x10,5	75x12,5	90x15,0	110x18,3	125x20,8
V	di	13,2 mm	16,6 mm	21,2 mm	26,6 mm	33,4 mm	42 mm	50 mm	60 mm	73,4 mm	83,4 mm
0.01	R	0.102	0.035	0.011	0.004	0.001	0.000	0.000	0.000	0.000	0.000
	v	0.073	0.046	0.028	0.018	0.011	0.007	0.005	0.004	0.002	0.002
0.02	R	0.325	0.111	0.035	0.012	0.004	0.001	0.001	0.000	0.000	0.000
	v	0.146	0.092	0.057	0.036	0.023	0.014	0.010	0.007	0.005	0.004
0.03	R	0.650	0.220	0.069	0.024	0.008	0.003	0.001	0.001	0.000	0.000
	v	0.219	0.139	0.085	0.054	0.034	0.022	0.015	0.011	0.007	0.005
0.04	R	1.068	0.360	0.113	0.039	0.013	0.005	0.002	0.001	0.000	0.000
	v	0.292	0.185	0.113	0.072	0.046	0.029	0.020	0.014	0.009	0.007
0.05	R	1.575	0.529	0.166	0.057	0.019	0.007	0.003	0.001	0.000	0.000
	v	0.365	0.231	0.142	0.090	0.057	0.036	0.025	0.018	0.012	0.009
0.06	R	2.168	0.726	0.227	0.078	0.027	0.009	0.004	0.002	0.001	0.000
	v	0.438	0.277	0.170	0.108	0.068	0.043	0.031	0.021	0.014	0.011
0.07	R	2.844	0.950	0.296	0.101	0.034	0.012	0.005	0.002	0.001	0.000
	v	0.512	0.323	0.198	0.126	0.080	0.051	0.036	0.025	0.017	0.013
0.08	R	3.602	1.200	0.374	0.127	0.043	0.015	0.006	0.003	0.001	0.001
	v	0.585	0.370	0.227	0.144	0.091	0.058	0.041	0.028	0.019	0.015
0.09	R	4.440	1.476	0.459	0.156	0.053	0.018	0.008	0.003	0.001	0.001
	v	0.658	0.416	0.255	0.162	0.103	0.065	0.046	0.032	0.021	0.016
0.10	R	5.356	1.777	0.551	0.187	0.064	0.022	0.009	0.004	0.002	0.001
	v	0.731	0.462	0.283	0.180	0.114	0.072	0.051	0.035	0.024	0.018
0.12	R	7.422	2.455	0.759	0.257	0.087	0.029	0.013	0.005	0.002	0.001
	v	0.877	0.554	0.340	0.216	0.137	0.087	0.061	0.042	0.028	0.022
0.14	R	9.794	3.230	0.996	0.337	0.114	0.038	0.017	0.007	0.003	0.002
	v	1.023	0.647	0.397	0.252	0.160	0.101	0.071	0.050	0.033	0.026
0.16	R	12.466	4.100	1.262	0.426	0.144	0.048	0.021	0.009	0.003	0.002
	v	1.169	0.739	0.453	0.288	0.183	0.115	0.081	0.057	0.038	0.029
0.18	R	15.435	5.064	1.555	0.524	0.177	0.059	0.026	0.011	0.004	0.002
	v	1.315	0.832	0.510	0.324	0.205	0.130	0.092	0.064	0.043	0.033
0.20	R	18.697	6.121	1.876	0.631	0.212	0.071	0.031	0.013	0.005	0.003
	v	1.461	0.924	0.567	0.360	0.228	0.144	0.102	0.071	0.047	0.037
0.30	R	39.342	12.767	3.882	1.296	0.434	0.145	0.063	0.027	0.010	0.006
	v	2.192	1.386	0.850	0.540	0.342	0.217	0.153	0.106	0.071	0.055
0.40	R	67.082	21.626	6.534	2.172	0.724	0.241	0.105	0.044	0.017	0.009
	v	2.923	1.848	1.133	0.720	0.457	0.289	0.204	0.141	0.095	0.073
0.50	R	101.815	32.650	9.814	3.248	1.079	0.358	0.155	0.065	0.025	0.014
	v	3.654	2.310	1.416	0.900	0.571	0.361	0.255	0.177	0.118	0.092
0.60	R	143.479	45.811	13.711	4.522	1.498	0.496	0.215	0.090	0.034	0.019
	v	4.384	2.772	1.700	1.080	0.685	0.433	0.306	0.212	0.142	0.110
0.70	R	192.035	61.089	18.215	5.989	1.979	0.654	0.282	0.118	0.045	0.024
	v	5.115	3.234	1.983	1.260	0.799	0.505	0.357	0.248	0.165	0.128
0.80	R	247.45	78.47	23.32	7.65	2.52	0.83	0.36	0.15	0.06	0.03
	v	5.85	3.70	2.27	1.44	0.91	0.58	0.41	0.28	0.19	0.15

Table - 16

QUALITY ASSURANCE

Pipe Friction gradient/flow speed of Q-Therm SDR 6 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m²/s

Temperature : 60°C

V = circulation (l/s)		R = pressure gradient (mbar/m)								v = speed	
	dxs	20x3,4	25x4,2	32x5,4	40x6,7	50x8,3	63x10,5	75x12,5	90x15,0	110x18,3	125x20,8
V	di	13,2 mm	16,6 mm	21,2 mm	26,6 mm	33,4 mm	42 mm	50 mm	60 mm	73,4 mm	83,4 mm
0.90	R	309.72	97.95	29.03	9.49	3.12	1.03	0.44	0.18	0.07	0.04
	v	6.58	4.16	2.55	1.62	1.03	0.65	0.46	0.32	0.21	0.16
1.00	R	378.81	119.51	35.32	11.53	3.78	1.24	0.53	0.22	0.08	0.05
	v	7.31	4.62	2.83	1.80	1.14	0.72	0.51	0.35	0.24	0.18
1.20	R	537.44	168.86	49.69	16.15	5.28	1.73	0.74	0.31	0.12	0.06
	v	8.77	5.54	3.40	2.16	1.37	0.87	0.61	0.42	0.28	0.22
1.40	R	723.27	226.49	66.39	21.51	7.01	2.29	0.98	0.41	0.15	0.08
	v	10.23	6.47	3.97	2.52	1.60	1.01	0.71	0.50	0.33	0.26
1.60	R	936.25	292.39	85.44	27.59	8.97	2.92	1.25	0.52	0.20	0.11
	v	11.69	7.39	4.53	2.88	1.83	1.15	0.81	0.57	0.38	0.29
1.80	R	1176.36	366.51	106.80	34.40	11.16	3.63	1.55	0.64	0.24	0.13
	v	13.15	8.32	5.10	3.24	2.05	1.30	0.92	0.64	0.43	0.33
2.00	R	1443.56	448.86	130.48	41.93	13.57	4.40	1.88	0.77	0.29	0.16
	v	14.61	9.24	5.67	3.60	2.28	1.44	1.02	0.71	0.47	0.37
2.20	R	1737.83	539.42	156.47	50.18	16.20	5.24	2.24	0.92	0.35	0.19
	v	16.08	10.17	6.23	3.96	2.51	1.59	1.12	0.78	0.52	0.40
2.40	R	2059.16	638.19	184.77	59.14	19.06	6.16	2.62	1.08	0.41	0.22
	v	17.54	11.09	6.80	4.32	2.74	1.73	1.22	0.85	0.57	0.44
2.60	R	2407.55	745.15	215.37	68.82	22.14	7.14	3.04	1.25	0.47	0.25
	v	19.00	12.01	7.37	4.68	2.97	1.88	1.32	0.92	0.61	0.48
2.80	R	2782.96	860.31	248.27	79.20	25.44	8.19	3.48	1.43	0.54	0.29
	v	20.46	12.94	7.93	5.04	3.20	2.02	1.43	0.99	0.66	0.51
3.00	R	3185.41	983.65	283.46	90.30	28.96	9.32	3.95	1.62	0.61	0.33
	v	21.92	13.86	8.50	5.40	3.42	2.17	1.53	1.06	0.71	0.55
3.20	R	3614.87	1115.17	320.95	102.11	32.70	10.50	4.45	1.83	0.68	0.37
	v	23.38	14.79	9.07	5.76	3.65	2.31	1.63	1.13	0.76	0.59
3.40	R	4071.35	1254.87	360.73	114.62	36.66	11.76	4.98	2.04	0.76	0.41
	v	24.85	15.71	9.63	6.12	3.88	2.45	1.73	1.20	0.80	0.62
3.60	R	4554.84	1402.75	402.81	127.84	40.84	13.09	5.54	2.27	0.85	0.46
	v	26.31	16.63	10.20	6.48	4.11	2.60	1.83	1.27	0.85	0.66
3.80	R	5065.33	1558.80	447.17	141.77	45.24	14.48	6.12	2.50	0.94	0.50
	v	27.77	17.56	10.77	6.84	4.34	2.74	1.94	1.34	0.90	0.70
4.00	R	5602.81	1723.02	493.82	156.40	49.85	15.94	6.74	2.75	1.03	0.55
	v	29.23	18.48	11.33	7.20	4.57	2.89	2.04	1.41	0.95	0.73
4.20	R	6167.29	1895.41	542.76	171.74	54.68	17.46	7.38	3.01	1.12	0.60
	v	30.69	19.41	11.90	7.56	4.79	3.03	2.14	1.49	0.99	0.77
4.40	R	6758.77	2075.96	593.99	187.78	59.73	19.06	8.04	3.28	1.23	0.66
	v	32.15	20.33	12.46	7.92	5.02	3.18	2.24	1.56	1.04	0.81
4.60	R	7377.22	2264.68	647.50	204.53	65.00	20.72	8.74	3.56	1.33	0.71
	v	33.61	21.25	13.03	8.28	5.25	3.32	2.34	1.63	1.09	0.84
4.80	R	8022.67	2461.56	703.30	221.98	70.48	22.44	9.46	3.85	1.44	0.77
	v	35.08	22.18	13.60	8.64	5.48	3.46	2.44	1.70	1.13	0.88

Table - 17

Pipe Friction gradient/flow speed of Q-Therm SDR 6 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m^2/s

Temperature : 60°C

V = circulation (l/s)					R = pressure gradient (mbar/m)				v = speed		
	dxs	20x3,4	25x4,2	32x5,4	40x6,7	50x8,3	63x10,5	75x12,5	90x15,0	110x18,3	125x20,8
V	di	13,2 mm	16,6 mm	21,2 mm	26,6 mm	33,4 mm	42 mm	50 mm	60 mm	73,4 mm	83,4 mm
5.00	R	8695.09	2666.61	761.38	240.13	76.18	24.24	10.21	4.16	1.55	0.83
	v	36.54	23.10	14.16	9.00	5.71	3.61	2.55	1.77	1.18	0.92
5.20	R	9394.50	2879.81	821.75	258.99	82.10	26.10	10.99	4.47	1.66	0.89
	v	38.00	24.03	14.73	9.36	5.93	3.75	2.65	1.84	1.23	0.95
5.40	R	10120.88	3101.18	884.39	278.54	88.23	28.03	11.79	4.80	1.78	0.96
	v	39.46	24.95	15.30	9.72	6.16	3.90	2.75	1.91	1.28	0.99
5.60	R	10874.23	3330.70	949.32	298.81	94.58	30.02	12.62	5.13	1.91	1.02
	v	40.92	25.88	15.86	10.08	6.39	4.04	2.85	1.98	1.32	1.03
5.80	R	11654.56	3568.38	1016.53	319.77	101.15	32.08	13.48	5.48	2.04	1.09
	v	42.38	26.80	16.43	10.44	6.62	4.19	2.95	2.05	1.37	1.06
6.00	R	12461.86	3814.22	1086.03	341.43	107.93	34.21	14.37	5.83	2.17	1.16
	v	43.84	27.72	17.00	10.80	6.85	4.33	3.06	2.12	1.42	1.10
6.20	R	13296.13	4068.21	1157.80	363.80	114.93	36.40	15.28	6.20	2.30	1.23
	v	45.31	28.65	17.56	11.16	7.08	4.48	3.16	2.19	1.47	1.13
6.40	R	14157.37	4330.36	1231.85	386.86	122.14	38.66	16.22	6.58	2.44	1.31
	v	46.77	29.57	18.13	11.52	7.30	4.62	3.26	2.26	1.51	1.17
6.60	R	15045.58	4600.66	1308.19	410.63	129.57	40.98	17.19	6.97	2.59	1.38
	v	48.23	30.50	18.70	11.88	7.53	4.76	3.36	2.33	1.56	1.21
6.80	R	15960.75	4879.12	1386.80	435.10	137.21	43.37	18.18	7.37	2.73	1.46
	v	49.69	31.42	19.26	12.24	7.76	4.91	3.46	2.41	1.61	1.24
7.00	R	16902.88	5165.73	1467.70	460.27	145.07	45.83	19.20	7.78	2.88	1.54
	v	51.15	32.34	19.83	12.60	7.99	5.05	3.57	2.48	1.65	1.28
7.50	R	19376.18	5917.91	1679.90	526.26	165.66	52.26	21.87	8.85	3.28	1.75
	v	54.81	34.65	21.25	13.50	8.56	5.41	3.82	2.65	1.77	1.37
8.00	R	22017.98	6721.04	1906.35	596.62	187.59	59.10	24.71	9.99	3.69	1.97
	v	58.46	36.96	22.66	14.40	9.13	5.77	4.07	2.83	1.89	1.46
9.00	R	27807.02	8480.10	2401.94	750.46	235.48	74.02	30.89	12.46	4.60	2.45
	v	65.77	41.58	25.50	16.20	10.27	6.50	4.58	3.18	2.13	1.65
10.00	R		10442.86	2954.47	921.79	288.73	90.57	37.73	15.19	5.60	2.98
	v		46.21	28.33	17.99	11.41	7.22	5.09	3.54	2.36	1.83

Table - 18

QUALITY ASSURANCE

Pipe Friction gradient/flow speed of Q-Therm SDR 7.4 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m²/s

Temperature : 20°C

V = circulation (l/s)		R = pressure gradient (mbar/m)								v = speed	
	dxs	20 x 2,8	25 x 3,5	32 x 4,4	40x5,5	50x6,9	63x8,6	75 x 10,3	90 x 12,3	110x15,1	125x17,1
V	di	14,4 mm	18 mm	23,2 mm	29 mm	36,2 mm	45,8 mm	54,4 mm	65,4 mm	79,8 mm	90,8 mm
0.01	R	0.092	0.033	0.010	0.004	0.001	0.000	0.000	0.000	0.000	0.000
	v	0.061	0.039	0.024	0.015	0.010	0.006	0.004	0.003	0.002	0.002
0.02	R	0.283	0.101	0.031	0.011	0.004	0.001	0.001	0.000	0.000	0.000
	v	0.123	0.079	0.047	0.030	0.019	0.012	0.009	0.006	0.004	0.003
0.03	R	0.554	0.195	0.060	0.021	0.008	0.003	0.001	0.001	0.000	0.000
	v	0.184	0.118	0.071	0.045	0.029	0.018	0.013	0.009	0.006	0.005
0.04	R	0.898	0.315	0.096	0.034	0.012	0.004	0.002	0.001	0.000	0.000
	v	0.246	0.157	0.095	0.061	0.039	0.024	0.017	0.012	0.008	0.006
0.05	R	1.311	0.459	0.140	0.049	0.018	0.006	0.003	0.001	0.000	0.000
	v	0.307	0.196	0.118	0.076	0.049	0.030	0.022	0.015	0.010	0.008
0.06	R	1.788	0.624	0.190	0.067	0.024	0.008	0.004	0.002	0.001	0.000
	v	0.368	0.236	0.142	0.091	0.058	0.036	0.026	0.018	0.012	0.009
0.07	R	2.329	0.811	0.246	0.086	0.031	0.010	0.005	0.002	0.001	0.000
	v	0.430	0.275	0.166	0.106	0.068	0.042	0.030	0.021	0.014	0.011
0.08	R	2.931	1.019	0.308	0.108	0.038	0.013	0.006	0.002	0.001	0.001
	v	0.491	0.314	0.189	0.121	0.078	0.049	0.034	0.024	0.016	0.012
0.09	R	3.593	1.247	0.376	0.132	0.047	0.016	0.007	0.003	0.001	0.001
	v	0.553	0.354	0.213	0.136	0.087	0.055	0.039	0.027	0.018	0.014
0.10	R	4.313	1.495	0.450	0.157	0.056	0.018	0.008	0.004	0.001	0.001
	v	0.614	0.393	0.237	0.151	0.097	0.061	0.043	0.030	0.020	0.015
0.12	R	5.926	2.048	0.615	0.215	0.076	0.025	0.011	0.005	0.002	0.001
	v	0.737	0.472	0.284	0.182	0.117	0.073	0.052	0.036	0.024	0.019
0.14	R	7.761	2.676	0.802	0.279	0.098	0.033	0.015	0.006	0.002	0.001
	v	0.860	0.550	0.331	0.212	0.136	0.085	0.060	0.042	0.028	0.022
0.16	R	9.815	3.377	1.010	0.351	0.123	0.041	0.018	0.008	0.003	0.002
	v	0.982	0.629	0.378	0.242	0.155	0.097	0.069	0.048	0.032	0.025
0.18	R	12.082	4.150	1.239	0.430	0.151	0.050	0.022	0.009	0.004	0.002
	v	1.105	0.707	0.426	0.273	0.175	0.109	0.077	0.054	0.036	0.028
0.20	R	14.559	4.992	1.488	0.516	0.181	0.060	0.026	0.011	0.004	0.002
	v	1.228	0.786	0.473	0.303	0.194	0.121	0.086	0.060	0.040	0.031
0.30	R	30.007	10.219	3.025	1.043	0.363	0.119	0.053	0.022	0.009	0.005
	v	1.842	1.179	0.710	0.454	0.291	0.182	0.129	0.089	0.060	0.046
0.40	R	50.396	17.073	5.028	1.727	0.600	0.196	0.087	0.036	0.014	0.008
	v	2.456	1.572	0.946	0.606	0.389	0.243	0.172	0.119	0.080	0.062
0.50	R	75.583	25.495	7.477	2.560	0.886	0.289	0.128	0.053	0.021	0.011
	v	3.070	1.965	1.183	0.757	0.486	0.303	0.215	0.149	0.100	0.077
0.60	R	105.476	35.447	10.358	3.537	1.222	0.398	0.175	0.073	0.029	0.015
	v	3.684	2.358	1.419	0.908	0.583	0.364	0.258	0.179	0.120	0.093
0.70	R	140.011	46.900	13.662	4.653	1.604	0.521	0.229	0.096	0.037	0.020
	v	4.298	2.751	1.656	1.060	0.680	0.425	0.301	0.208	0.140	0.108
0.80	R	179.14	59.84	17.38	5.91	2.03	0.66	0.29	0.12	0.05	0.03
	v	4.91	3.14	1.89	1.21	0.78	0.49	0.34	0.24	0.16	0.12

Table - 19

QUALITY ASSURANCE

Pipe Friction gradient/flow speed of Q-Therm SDR 7.4 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m^2/s

Temperature : 20°C

V = circulation (l/s)		R = pressure gradient (mbar/m)								v = speed	
	dxs	20 x 2,8	25 x 3,5	32 x 4,4	40x5,5	50x6,9	63x8,6	75 x 10,3	90 x 12,3	110x15,1	125x17,1
V	di	14,4 mm	18 mm	23,2 mm	29 mm	36,2 mm	45,8 mm	54,4 mm	65,4 mm	79,8 mm	90,8 mm
0.90	R	222.83	74.24	21.51	7.30	2.51	0.81	0.36	0.15	0.06	0.03
	v	5.53	3.54	2.13	1.36	0.87	0.55	0.39	0.27	0.18	0.14
1.00	R	271.05	90.09	26.04	8.82	3.02	0.98	0.43	0.18	0.07	0.04
	v	6.14	3.93	2.37	1.51	0.97	0.61	0.43	0.30	0.20	0.15
1.20	R	381.01	126.11	36.30	12.25	4.19	1.35	0.59	0.25	0.10	0.05
	v	7.37	4.72	2.84	1.82	1.17	0.73	0.52	0.36	0.24	0.19
1.40	R	508.88	167.84	48.13	16.20	5.53	1.78	0.78	0.32	0.12	0.07
	v	8.60	5.50	3.31	2.12	1.36	0.85	0.60	0.42	0.28	0.22
1.60	R	654.56	215.22	61.51	20.65	7.03	2.26	0.99	0.41	0.16	0.09
	v	9.82	6.29	3.78	2.42	1.55	0.97	0.69	0.48	0.32	0.25
1.80	R	817.98	268.23	76.44	25.60	8.70	2.79	1.22	0.50	0.19	0.10
	v	11.05	7.07	4.26	2.73	1.75	1.09	0.77	0.54	0.36	0.28
2.00	R	999.10	326.84	92.89	31.05	10.54	3.37	1.47	0.61	0.23	0.13
	v	12.28	7.86	4.73	3.03	1.94	1.21	0.86	0.60	0.40	0.31
2.20	R	1197.86	391.02	110.87	36.99	12.53	4.00	1.75	0.72	0.28	0.15
	v	13.51	8.65	5.20	3.33	2.14	1.34	0.95	0.65	0.44	0.34
2.40	R	1414.24	460.76	130.35	43.41	14.68	4.69	2.04	0.84	0.32	0.17
	v	14.74	9.43	5.68	3.63	2.33	1.46	1.03	0.71	0.48	0.37
2.60	R	1648.21	536.03	151.34	50.31	16.99	5.42	2.36	0.97	0.37	0.20
	v	15.96	10.22	6.15	3.94	2.53	1.58	1.12	0.77	0.52	0.40
2.80	R	1899.75	616.84	173.83	57.70	19.46	6.19	2.69	1.11	0.43	0.23
	v	17.19	11.00	6.62	4.24	2.72	1.70	1.20	0.83	0.56	0.43
3.00	R	2168.84	703.17	197.81	65.56	22.08	7.02	3.05	1.25	0.48	0.26
	v	18.42	11.79	7.10	4.54	2.91	1.82	1.29	0.89	0.60	0.46
3.20	R	2455.45	795.01	223.28	73.90	24.86	7.89	3.43	1.41	0.54	0.29
	v	19.65	12.58	7.57	4.84	3.11	1.94	1.38	0.95	0.64	0.49
3.40	R	2759.58	892.35	250.24	82.72	27.79	8.82	3.82	1.57	0.60	0.32
	v	20.88	13.36	8.04	5.15	3.30	2.06	1.46	1.01	0.68	0.53
3.60	R	3081.22	995.19	278.68	92.01	30.88	9.78	4.24	1.74	0.67	0.36
	v	22.10	14.15	8.52	5.45	3.50	2.19	1.55	1.07	0.72	0.56
3.80	R	3420.35	1103.52	308.61	101.77	34.11	10.80	4.68	1.92	0.74	0.40
	v	23.33	14.93	8.99	5.75	3.69	2.31	1.63	1.13	0.76	0.59
4.00	R	3776.97	1217.33	340.00	112.00	37.50	11.86	5.14	2.10	0.81	0.43
	v	24.56	15.72	9.46	6.06	3.89	2.43	1.72	1.19	0.80	0.62
4.20	R	4151.06	1336.63	372.88	122.69	41.05	12.97	5.61	2.30	0.88	0.47
	v	25.79	16.50	9.94	6.36	4.08	2.55	1.81	1.25	0.84	0.65
4.40	R	4542.63	1461.40	407.23	133.86	44.74	14.12	6.11	2.50	0.96	0.51
	v	27.02	17.29	10.41	6.66	4.28	2.67	1.89	1.31	0.88	0.68
4.60	R	4951.66	1591.65	443.05	145.50	48.58	15.32	6.62	2.71	1.04	0.56
	v	28.25	18.08	10.88	6.96	4.47	2.79	1.98	1.37	0.92	0.71
4.80	R	5378.14	1727.36	480.34	157.60	52.58	16.57	7.16	2.93	1.12	0.60
	v	29.47	18.86	11.35	7.27	4.66	2.91	2.07	1.43	0.96	0.74

Table - 20

QUALITY ASSURANCE

Pipe Friction gradient/flow speed of Q-Therm SDR 7.4 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m²/s

Temperature : 20°C

V = circulation (l/s)		R = pressure gradient (mbar/m)								v = speed	
	dxs	20 x 2,8	25 x 3,5	32 x 4,4	40x5,5	50x6,9	63x8,6	75 x 10,3	90 x 12,3	110x15,1	125x17,1
V	di	14,4 mm	18 mm	23,2 mm	29 mm	36,2 mm	45,8 mm	54,4 mm	65,4 mm	79,8 mm	90,8 mm
5.00	R	5822.08	1868.55	519.10	170.16	56.72	17.86	7.71	3.15	1.20	0.65
	v	30.70	19.65	11.83	7.57	4.86	3.03	2.15	1.49	1.00	0.77
5.20	R	6283.46	2015.20	559.32	183.19	61.02	19.20	8.28	3.39	1.29	0.69
	v	31.93	20.43	12.30	7.87	5.05	3.16	2.24	1.55	1.04	0.80
5.40	R	6762.29	2167.30	601.01	196.69	65.46	20.58	8.88	3.63	1.38	0.74
	v	33.16	21.22	12.77	8.18	5.25	3.28	2.32	1.61	1.08	0.83
5.60	R	7258.55	2324.87	644.17	210.65	70.05	22.01	9.49	3.87	1.48	0.79
	v	34.39	22.01	13.25	8.48	5.44	3.40	2.41	1.67	1.12	0.86
5.80	R	7772.25	2487.90	688.79	225.07	74.79	23.48	10.12	4.13	1.57	0.84
	v	35.61	22.79	13.72	8.78	5.64	3.52	2.50	1.73	1.16	0.90
6.00	R	8303.38	2656.38	734.87	239.95	79.68	25.00	10.77	4.39	1.67	0.90
	v	36.84	23.58	14.19	9.08	5.83	3.64	2.58	1.79	1.20	0.93
6.20	R	8851.94	2830.32	782.41	255.30	84.72	26.56	11.44	4.66	1.78	0.95
	v	38.07	24.36	14.67	9.39	6.02	3.76	2.67	1.85	1.24	0.96
6.40	R	9417.92	3009.70	831.42	271.11	89.90	28.17	12.12	4.94	1.88	1.01
	v	39.30	25.15	15.14	9.69	6.22	3.88	2.75	1.91	1.28	0.99
6.60	R	10001.32	3194.54	881.88	287.37	95.24	29.82	12.83	5.23	1.99	1.07
	v	40.53	25.94	15.61	9.99	6.41	4.01	2.84	1.96	1.32	1.02
6.80	R	10602.15	3384.83	933.81	304.10	100.72	31.52	13.55	5.52	2.10	1.12
	v	41.75	26.72	16.09	10.29	6.61	4.13	2.93	2.02	1.36	1.05
7.00	R	11220.39	3580.56	987.19	321.29	106.35	33.26	14.29	5.82	2.21	1.19
	v	42.98	27.51	16.56	10.60	6.80	4.25	3.01	2.08	1.40	1.08
7.50	R	12842.17	4093.72	1127.03	366.28	121.06	37.80	16.23	6.60	2.51	1.34
	v	46.05	29.47	17.74	11.35	7.29	4.55	3.23	2.23	1.50	1.16
8.00	R	14572.77	4640.91	1275.97	414.14	136.69	42.63	18.29	7.43	2.82	1.51
	v	49.12	31.44	18.92	12.11	7.77	4.86	3.44	2.38	1.60	1.24
9.00	R	18360.29	5837.29	1601.13	518.45	170.70	53.10	22.74	9.23	3.50	1.87
	v	55.26	35.37	21.29	13.63	8.74	5.46	3.87	2.68	1.80	1.39
10.00	R		7169.60	1962.62	634.20	208.36	64.66	27.65	11.20	4.24	2.26
	v		39.30	23.66	15.14	9.72	6.07	4.30	2.98	2.00	1.54

Table - 21

QUALITY ASSURANCE

Pipe Friction gradient/flow speed of Q-Therm SDR 7.4 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m^2/s

Temperature : 60°C

V = circulation (l/s)					R = pressure gradient (mbar/m)				v = speed	
	dxs	20 x 2,8	25 x 3,5	32 x 4,4	40x5,5	50x6,9	63x8,6	75 x 10,3	90 x 12,3	110x15,1	125x17,1
V	di	14,4 mm	18 mm	23,2 mm	29 mm	36,2 mm	45,8 mm	54,4 mm	65,4 mm	79,8 mm	90,8 mm
0.01	R	0.068	0.024	0.007	0.003	0.001	0.000	0.000	0.000	0.000	0.000
	v	0.061	0.039	0.024	0.015	0.010	0.006	0.004	0.003	0.002	0.000
0.02	R	0.216	0.076	0.023	0.008	0.003	0.001	0.000	0.000	0.000	0.000
	v	0.123	0.079	0.047	0.030	0.019	0.012	0.009	0.006	0.004	0.000
0.03	R	0.430	0.150	0.045	0.016	0.006	0.002	0.001	0.000	0.000	0.000
	v	0.184	0.118	0.071	0.045	0.029	0.018	0.013	0.009	0.006	0.000
0.04	R	0.706	0.245	0.074	0.026	0.009	0.003	0.001	0.001	0.000	0.000
	v	0.246	0.157	0.095	0.061	0.039	0.024	0.017	0.012	0.008	0.000
0.05	R	1.040	0.360	0.108	0.038	0.013	0.004	0.002	0.001	0.000	0.000
	v	0.307	0.196	0.118	0.076	0.049	0.030	0.022	0.015	0.010	0.000
0.06	R	1.430	0.494	0.148	0.052	0.018	0.006	0.003	0.001	0.000	0.000
	v	0.368	0.236	0.142	0.091	0.058	0.036	0.026	0.018	0.012	0.000
0.07	R	1.874	0.645	0.193	0.067	0.024	0.008	0.003	0.001	0.001	0.000
	v	0.430	0.275	0.166	0.106	0.068	0.042	0.030	0.021	0.014	0.000
0.08	R	2.371	0.815	0.243	0.085	0.030	0.010	0.004	0.002	0.001	0.000
	v	0.491	0.314	0.189	0.121	0.078	0.049	0.034	0.024	0.016	0.000
0.09	R	2.920	1.002	0.299	0.104	0.036	0.012	0.005	0.002	0.001	0.000
	v	0.553	0.354	0.213	0.136	0.087	0.055	0.039	0.027	0.018	0.000
0.10	R	3.520	1.206	0.359	0.124	0.043	0.014	0.006	0.003	0.001	0.000
	v	0.614	0.393	0.237	0.151	0.097	0.061	0.043	0.030	0.020	0.000
0.12	R	4.872	1.663	0.494	0.170	0.060	0.020	0.009	0.004	0.001	0.000
	v	0.737	0.472	0.284	0.182	0.117	0.073	0.052	0.036	0.024	0.000
0.14	R	6.421	2.186	0.647	0.223	0.078	0.025	0.011	0.005	0.002	0.000
	v	0.860	0.550	0.331	0.212	0.136	0.085	0.060	0.042	0.028	0.000
0.16	R	8.164	2.773	0.819	0.282	0.098	0.032	0.014	0.006	0.002	0.000
	v	0.982	0.629	0.378	0.242	0.155	0.097	0.069	0.048	0.032	0.000
0.18	R	10.099	3.423	1.009	0.346	0.120	0.039	0.017	0.007	0.003	0.000
	v	1.105	0.707	0.426	0.273	0.175	0.109	0.077	0.054	0.036	0.000
0.20	R	12.224	4.135	1.216	0.417	0.145	0.047	0.021	0.009	0.003	0.000
	v	1.228	0.786	0.473	0.303	0.194	0.121	0.086	0.060	0.040	0.000
0.30	R	25.631	8.599	2.509	0.855	0.295	0.096	0.042	0.018	0.007	0.000
	v	1.842	1.179	0.710	0.454	0.291	0.182	0.129	0.089	0.060	0.000
0.40	R	43.591	14.534	4.214	1.430	0.492	0.159	0.070	0.029	0.011	0.000
	v	2.456	1.572	0.946	0.606	0.389	0.243	0.172	0.119	0.080	0.000
0.50	R	66.025	21.904	6.319	2.137	0.732	0.236	0.104	0.043	0.017	0.000
	v	3.070	1.965	1.183	0.757	0.486	0.303	0.215	0.149	0.100	0.000
0.60	R	92.888	30.688	8.815	2.971	1.015	0.327	0.143	0.059	0.023	0.000
	v	3.684	2.358	1.419	0.908	0.583	0.364	0.258	0.179	0.120	0.000
0.70	R	124.150	40.870	11.696	3.931	1.340	0.431	0.188	0.078	0.030	0.000
	v	4.298	2.751	1.656	1.060	0.680	0.425	0.301	0.208	0.140	0.000
0.80	R	159.79	52.44	14.96	5.01	1.71	0.55	0.24	0.10	0.04	0.000
	v	4.91	3.14	1.89	1.21	0.78	0.49	0.34	0.24	0.16	0.000

Table - 22

QUALITY ASSURANCE

Pipe Friction gradient/flow speed of Q-Therm SDR 7.4 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m²/s

Temperature : 60°C

V = circulation (l/s)		R = pressure gradient (mbar/m)								v = speed	
	dxs	20 x 2,8	25 x 3,5	32 x 4,4	40x5,5	50x6,9	63x8,6	75 x 10,3	90 x 12,3	110x15,1	125x17,1
V	di	14,4 mm	18 mm	23,2 mm	29 mm	36,2 mm	45,8 mm	54,4 mm	65,4 mm	79,8 mm	90,8 mm
0.90	R	199.79	65.39	18.60	6.22	2.11	0.68	0.29	0.12	0.05	0.03
	v	5.53	3.54	2.13	1.36	0.87	0.55	0.39	0.27	0.18	0.14
1.00	R	244.14	79.72	22.61	7.55	2.56	0.82	0.36	0.15	0.06	0.03
	v	6.14	3.93	2.37	1.51	0.97	0.61	0.43	0.30	0.20	0.15
1.20	R	345.84	112.47	31.75	10.56	3.56	1.14	0.49	0.20	0.08	0.04
	v	7.37	4.72	2.84	1.82	1.17	0.73	0.52	0.36	0.24	0.19
1.40	R	464.86	150.67	42.37	14.04	4.73	1.50	0.65	0.27	0.10	0.06
	v	8.60	5.50	3.31	2.12	1.36	0.85	0.60	0.42	0.28	0.22
1.60	R	601.14	194.30	54.46	17.99	6.04	1.92	0.83	0.34	0.13	0.07
	v	9.82	6.29	3.78	2.42	1.55	0.97	0.69	0.48	0.32	0.25
1.80	R	754.67	243.35	68.01	22.41	7.51	2.38	1.03	0.42	0.16	0.09
	v	11.05	7.07	4.26	2.73	1.75	1.09	0.77	0.54	0.36	0.28
2.00	R	925.42	297.79	83.01	27.29	9.12	2.88	1.25	0.51	0.20	0.10
	v	12.28	7.86	4.73	3.03	1.94	1.21	0.86	0.60	0.40	0.31
2.20	R	1113.37	357.63	99.46	32.64	10.89	3.43	1.48	0.61	0.23	0.12
	v	13.51	8.65	5.20	3.33	2.14	1.34	0.95	0.65	0.44	0.34
2.40	R	1318.52	422.86	117.36	38.44	12.80	4.03	1.74	0.71	0.27	0.15
	v	14.74	9.43	5.68	3.63	2.33	1.46	1.03	0.71	0.48	0.37
2.60	R	1540.85	493.46	136.70	44.70	14.86	4.67	2.01	0.82	0.31	0.17
	v	15.96	10.22	6.15	3.94	2.53	1.58	1.12	0.77	0.52	0.40
2.80	R	1780.36	569.44	157.49	51.41	17.07	5.35	2.31	0.94	0.36	0.19
	v	17.19	11.00	6.62	4.24	2.72	1.70	1.20	0.83	0.56	0.43
3.00	R	2037.04	650.80	179.71	58.58	19.42	6.08	2.62	1.07	0.41	0.22
	v	18.42	11.79	7.10	4.54	2.91	1.82	1.29	0.89	0.60	0.46
3.20	R	2310.87	737.52	203.38	66.20	21.92	6.85	2.95	1.20	0.46	0.24
	v	19.65	12.58	7.57	4.84	3.11	1.94	1.38	0.95	0.64	0.49
3.40	R	2601.87	829.61	228.47	74.28	24.56	7.67	3.29	1.34	0.51	0.27
	v	20.88	13.36	8.04	5.15	3.30	2.06	1.46	1.01	0.68	0.53
3.60	R	2910.02	927.06	255.01	82.81	27.35	8.53	3.66	1.49	0.57	0.30
	v	22.10	14.15	8.52	5.45	3.50	2.19	1.55	1.07	0.72	0.56
3.80	R	3235.31	1029.88	282.98	91.79	30.28	9.44	4.05	1.64	0.62	0.33
	v	23.33	14.93	8.99	5.75	3.69	2.31	1.63	1.13	0.76	0.59
4.00	R	3577.75	1138.05	312.38	101.22	33.35	10.38	4.45	1.81	0.69	0.37
	v	24.56	15.72	9.46	6.06	3.89	2.43	1.72	1.19	0.80	0.62
4.20	R	3937.34	1251.58	343.21	111.11	36.57	11.37	4.87	1.98	0.75	0.40
	v	25.79	16.50	9.94	6.36	4.08	2.55	1.81	1.25	0.84	0.65
4.40	R	4314.06	1370.47	375.48	121.44	39.94	12.41	5.31	2.15	0.82	0.44
	v	27.02	17.29	10.41	6.66	4.28	2.67	1.89	1.31	0.88	0.68
4.60	R	4707.92	1494.71	409.18	132.23	43.44	13.48	5.77	2.34	0.88	0.47
	v	28.25	18.08	10.88	6.96	4.47	2.79	1.98	1.37	0.92	0.71
4.80	R	5118.91	1624.31	444.30	143.46	47.09	14.60	6.24	2.53	0.96	0.51
	v	29.47	18.86	11.35	7.27	4.66	2.91	2.07	1.43	0.96	0.74

Table - 23

Pipe Friction gradient/flow speed of Q-Therm SDR 7.4 pipes

Pipe friction gradient (R) and calculated flow rate (v) is depended on circulation (V)

Roughness : K = 0.007 mm

Density : 0.998 gm/cc

Viscosity : 1.004 x 10^{-6} m^2/s

Temperature : 60°C

V = circulation (l/s)		R = pressure gradient (mbar/m)								v = speed	
	dxs	20 x 2,8	25 x 3,5	32 x 4,4	40x5,5	50x6,9	63x8,6	75 x 10,3	90 x 12,3	110x15,1	125x17,1
V	di	14,4 mm	18 mm	23,2 mm	29 mm	36,2 mm	45,8 mm	54,4 mm	65,4 mm	79,8 mm	90,8 mm
5.00	R	5547.04	1759.25	480.86	155.14	50.89	15.76	6.73	2.72	1.03	0.55
	v	30.70	19.65	11.83	7.57	4.86	3.03	2.15	1.49	1.00	0.77
5.20	R	5992.30	1899.55	518.85	167.28	54.82	16.97	7.24	2.93	1.11	0.59
	v	31.93	20.43	12.30	7.87	5.05	3.16	2.24	1.55	1.04	0.80
5.40	R	6454.68	2045.20	558.26	179.86	58.90	18.22	7.77	3.14	1.19	0.63
	v	33.16	21.22	12.77	8.18	5.25	3.28	2.32	1.61	1.08	0.83
5.60	R	6934.20	2196.20	599.10	192.89	63.12	19.51	8.32	3.36	1.27	0.68
	v	34.39	22.01	13.25	8.48	5.44	3.40	2.41	1.67	1.12	0.86
5.80	R	7430.84	2352.55	641.38	206.37	67.49	20.84	8.88	3.58	1.35	0.72
	v	35.61	22.79	13.72	8.78	5.64	3.52	2.50	1.73	1.16	0.90
6.00	R	7944.60	2514.25	685.07	220.30	71.99	22.21	9.46	3.82	1.44	0.77
	v	36.84	23.58	14.19	9.08	5.83	3.64	2.58	1.79	1.20	0.93
6.20	R	8475.49	2681.30	730.20	234.67	76.64	23.63	10.06	4.06	1.53	0.81
	v	38.07	24.36	14.67	9.39	6.02	3.76	2.67	1.85	1.24	0.96
6.40	R	9023.49	2853.69	776.75	249.50	81.43	25.09	10.68	4.30	1.62	0.86
	v	39.30	25.15	15.14	9.69	6.22	3.88	2.75	1.91	1.28	0.99
6.60	R	9588.62	3031.43	824.73	264.77	86.37	26.59	11.31	4.56	1.72	0.91
	v	40.53	25.94	15.61	9.99	6.41	4.01	2.84	1.96	1.32	1.02
6.80	R	10170.87	3214.51	874.14	280.49	91.44	28.14	11.96	4.82	1.81	0.97
	v	41.75	26.72	16.09	10.29	6.61	4.13	2.93	2.02	1.36	1.05
7.00	R	10770.24	3402.94	924.97	296.66	96.66	29.73	12.63	5.08	1.91	1.02
	v	42.98	27.51	16.56	10.60	6.80	4.25	3.01	2.08	1.40	1.08
7.50	R	12343.55	3897.40	1058.28	339.03	110.32	33.88	14.38	5.78	2.17	1.16
	v	46.05	29.47	17.74	11.35	7.29	4.55	3.23	2.23	1.50	1.16
8.00	R	14023.83	4425.26	1200.51	384.20	124.87	38.29	16.24	6.52	2.45	1.30
	v	49.12	31.44	18.92	12.11	7.77	4.86	3.44	2.38	1.60	1.24
9.00	R	17705.28	5581.15	1511.67	482.91	156.63	47.91	20.28	8.13	3.05	1.62
	v	55.26	35.37	21.29	13.63	8.74	5.46	3.87	2.68	1.80	1.39
10.00	R		6870.57	1858.43	592.79	191.92	58.58	24.75	9.91	3.71	1.97
	v		39.30	23.66	15.14	9.72	6.07	4.30	2.98	2.00	1.54

Table - 24

THERM

PP-R PIPES & FITTINGS

"Q-Therm, The Quantum Quality"

Q-Therm The First **ESMA** Certified PP-R Piping System in **UAE**

علامة الجودة الإماراتية
Emirates Quality Mark

THERM

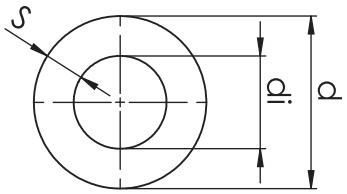
PP-R PIPES & FITTINGS

Q-Therm,
The Choice of Elite

PRODUCT RANGE
Pipes

Solid PPR Pipes
Unit pipe length = 4 m
Standard : DIN 8077/78, ISO 15874

PPR
Green

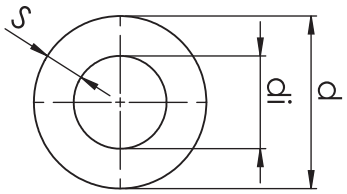


SDR / Series	Art. No.	Size / mm d x s	Packing unit / Pouch	Inner Diameter (di)	Water Content (l/m)
SDR 11	1701SP1001D	20 x 1.9	25	16.2	0.206
	1701SP1002D	25 x 2.3	25	20.4	0.327
	1701SP1003D	32 x 2.9	10	26.2	0.539
	1701SP1004D	40 x 3.7	10	32.6	0.834
	1701SP1005D	50 x 4.6	5	40.8	1.307
	1701SP1006D	63 x 5.8	5	51.4	2.074
	1701SP1007D	75 x 6.8	4	61.4	2.959
	1701SP1009D	90 x 8.2	3	73.6	4.252
	1701SP1010D	110 x 10	2	90.0	6.359
	1701SP1012D	125 x 11.4	1	102.2	8.199
	1701SP1016D	160 x 14.6	1	130.8	13.430
	1701SP1020D	200 x 18.2	1	163.6	21.010
SDR 7.4	1701SP1601D	20 x 2.8	25	14.4	0.163
	1701SP1602D	25 x 3.5	25	18.0	0.254
	1701SP1603D	32 x 4.4	10	23.2	0.423
	1701SP1604D	40 x 5.5	10	29.0	0.660
	1701SP1605D	50 x 6.9	5	36.2	1.029
	1701SP1606D	63 x 8.6	5	45.8	1.647
	1701SP1607D	75 x 10.3	4	54.4	2.323
	1701SP1609D	90 x 12.3	3	65.4	3.358
	1701SP1610D	110 x 15.1	2	79.8	4.999
	1701SP1612D	125 x 17.1	1	90.8	6.472
	1701SP1616D	160 x 21.9	1	116.2	10.599
SDR 6	1701SP2001D	20 x 3.4	25	13.2	0.137
	1701SP2002D	25 x 4.2	25	16.6	0.216
	1701SP2003D	32 x 5.4	10	21.2	0.353
	1701SP2004D	40 x 6.7	10	26.6	0.555
	1701SP2005D	50 x 8.3	5	33.4	0.876
	1701SP2006D	63 x 10.5	5	42.0	1.385
	1701SP2007D	75 x 12.5	4	50.0	1.963
	1701SP2009D	90 x 15.0	3	60.0	2.826
	1701SP2010D	110 x 18.3	2	73.4	4.229
	1701SP2012D	125 x 20.8	1	83.4	5.460
	1701SP2016D	160 x 26.6	1	106.8	8.954

Available Colors

PRODUCT RANGE
Pipes

Solid PP-RCT Pipes **PP-RCT**
Unit pipe length = 4 m *Green*
Standard : DIN 8077/78, ISO 15874

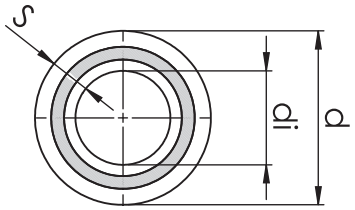


SDR / Series	Art. No.	Size / mm d x s	Packing unit / Pouch	Inner Diameter (di)	Water Content (l/m)
SDR 7.4	CT17SP2001D	20 x 2.8	25	14.4	0.163
	CT17SP2002D	25 x 3.5	25	18.0	0.254
	CT17SP2003D	32 x 4.4	10	23.2	0.423
	CT17SP2004D	40 x 5.5	10	29.0	0.660
	CT17SP2005D	50 x 6.9	5	36.2	1.029
	CT17SP2006D	63 x 8.6	5	45.8	1.647
	CT17SP2007D	75 x 10.3	4	54.4	2.323
	CT17SP2009D	90 x 12.3	3	65.4	3.358
	CT17SP2010D	110 x 15.1	2	79.8	4.999
	CT17SP2012D	125 x 17.1	1	90.8	6.472
	CT17SP2016D	160 x 21.9	1	116.2	10.599
SDR 6	CT17SP2501D	20 x 3.4	25	13.2	0.137
	CT17SP2502D	25 x 4.2	25	16.6	0.216
	CT17SP2503D	32 x 5.4	10	21.2	0.353
	CT17SP2504D	40 x 6.7	10	26.6	0.555
	CT17SP2505D	50 x 8.3	5	33.4	0.876
	CT17SP2506D	63 x 10.5	5	42.0	1.385
	CT17SP2507D	75 x 12.5	4	50.0	1.963
	CT17SP2509D	90 x 15.0	3	60.0	2.826
	CT17SP2510D	110 x 18.3	2	73.4	4.229
	CT17SP2512D	125 x 20.8	1	83.4	5.460
	CT17SP2516D	160 x 26.6	1	106.8	8.954

PRODUCT RANGE
Pipes

Multi Layer Fiber Pipes
Unit pipe length = 4 m
Standard : DIN 8077/78, ISO 15874

PPR & Glass fiber Layer
Green



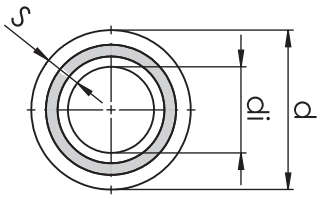
SDR / Series	Art. No.	Size / mm d x s	Packing unit / Pouch	Inner Diameter (di)	Water Content (l/m)
PN20	1701FP2001D	20 x 2.8	25	14.4	0.163
	1701FP2002D	25 x 3.5	25	18.0	0.254
	1701FP2003D	32 x 4.4	10	23.2	0.423
	1701FP2004D	40 x 5.5	10	29.0	0.660
	1701FP2005D	50 x 6.9	5	36.2	1.029
	1701FP2006D	63 x 8.6	5	45.8	1.647
	1701FP2007D	75 x 10.3	4	54.4	2.323
	1701FP2009D	90 x 12.3	3	65.4	3.358
	1701FP2010D	110 x 15.1	2	79.8	4.999
	1701FP2012D	125 x 17.1	1	90.8	6.472
	1701FP2016D	160 x 21.9	1	116.2	10.599
PN25	1701FP2501D	20 x 3.4	25	13.2	0.137
	1701FP2502D	25 x 4.2	25	16.6	0.216
	1701FP2503D	32 x 5.4	10	21.2	0.353
	1701FP2504D	40 x 6.7	10	26.6	0.555
	1701FP2505D	50 x 8.3	5	33.4	0.876
	1701FP2506D	63 x 10.5	5	42.0	1.385
	1701FP2507D	75 x 12.5	4	50.0	1.963
	1701FP2509D	90 x 15.0	3	60.0	2.826
	1701FP2510D	110 x 18.3	2	73.4	4.229

Available Colors

PRODUCT RANGE
Pipes

PPR-CT Multi Layer Fiber Pipes
Unit pipe length = 4 m
Standard : DIN 8077/78, ISO 15874

PPR-CT & Glass fiber Layer
Green

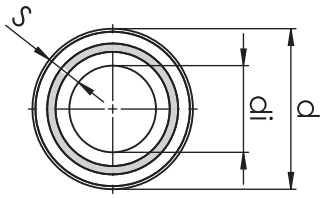


SDR / Series	Art. No.	Size / mm d x s	Packing unit / Pouch	Inner Diameter (di)	Water Content (l/m)
PN20	CT17FP2001D	20 x 2.8	25	14.4	0.163
	CT17FP2002D	25 x 3.5	25	18.0	0.254
	CT17FP2003D	32 x 4.4	10	23.2	0.423
	CT17FP2004D	40 x 5.5	10	29.0	0.660
	CT17FP2005D	50 x 6.9	5	36.2	1.029
	CT17FP2006D	63 x 8.6	5	45.8	1.647
	CT17FP2007D	75 x 10.3	4	54.4	2.323
	CT17FP2009D	90 x 12.3	3	65.4	3.358
	CT17FP2010D	110 x 15.1	2	79.8	4.999
	CT17FP2012D	125 x 17.1	1	90.8	6.472
	CT17FP2016D	160 x 21.9	1	116.2	10.599
PN25	CT17FP2501D	20 x 3.4	25	13.2	0.137
	CT17FP2502D	25 x 4.2	25	16.6	0.216
	CT17FP2503D	32 x 5.4	10	21.2	0.353
	CT17FP2504D	40 x 6.7	10	26.6	0.555
	CT17FP2505D	50 x 8.3	5	33.4	0.876
	CT17FP2506D	63 x 10.5	5	42.0	1.385
	CT17FP2507D	75 x 12.5	4	50.0	1.963
	CT17FP2509D	90 x 15.0	3	60.0	2.826
	CT17FP2510D	110 x 18.3	2	73.4	4.229

PRODUCT RANGE
Pipes

Multi Layer Fiber Pipes with UV Protection
Unit pipe length = 4 m
Standard : DIN 8077/78, ISO 15874

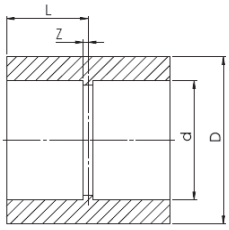
PPR & Glass fiber Layer with UV Layer (peelable)
Green - Black



SDR / Series	Art. No.	Size / mm d x s	Packing unit / Pouch	Inner Diameter (di)	Water Content (l/m)
PN20	1701FU2001D	20 x 2.8	25	14.4	0.163
	1701FU2002D	25 x 3.5	25	18.0	0.254
	1701FU2003D	32 x 4.4	10	23.2	0.423
	1701FU2004D	40 x 5.5	10	29.0	0.660
	1701FU2005D	50 x 6.9	5	36.2	1.029
	1701FU2006D	63 x 8.6	5	45.8	1.647
	1701FU2007D	75 x 10.3	4	54.4	2.323
	1701FU2009D	90 x 12.3	3	65.4	3.358
	1701FU2010D	110 x 15.1	2	79.8	4.999
PN25	1701FU2501D	20 x 3.4	25	13.2	0.137
	1701FU2502D	25 x 4.2	25	16.6	0.216
	1701FU2503D	32 x 5.4	10	21.2	0.353
	1701FU2504D	40 x 6.7	10	26.6	0.555
	1701FU2505D	50 x 8.3	5	33.4	0.876
	1701FU2506D	63 x 10.5	5	42.0	1.385
	1701FU2507D	75 x 12.5	4	50.0	1.963
	1701FU2509D	90 x 15.0	3	60.0	2.826
	1701FU2510D	110 x 18.3	2	73.4	4.229

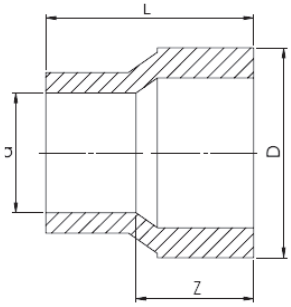
PRODUCT RANGE
Fittings & Accessories

SOCKET



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701SO0001N	20	29.0	16.0	1.5	10 / 800
	1701SO0002N	25	34.0	17.5	1.5	10 / 500
	1701SO0003N	32	43.0	20.0	1.5	5 / 300
6	1701SO0004N	40	52.0	22.5	1.5	5 / 190
	1701SO0005N	50	65.0	25.5	1.5	5 / 100
7.4	1701SO0006N	63	83.0	30.0	1.5	1 / 60
	1701SO0007N	75	100.0	32.5	2.0	1 / 40
9	1701SO0009N	90	120.0	36.0	2.5	1 / 27
	1701SO0010N	110	145.0	40.5	2.5	1 / 15
11	1701SO0012N	125	163.5	45.5	5.5	1 / 8
	1701SO0016N	160	213.0	54.5	6.5	1 / 4

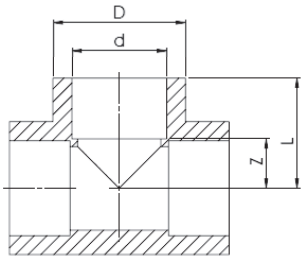
REDUCER SOCKET



SDR	Art. No.	Size D x d (mm)	D	L	Z	Packing Pouch / Box
5	1701RS0201N	25 x 20	20.0	33.0	18.5	10 / 850
	1701RS0301N	32 x 20	20.0	38.0	23.5	5 / 600
	1701RS0302N	32 x 25	25.0	38.5	22.5	5 / 500
	1701RS0401N	40 x 20	20.0	44.5	30.0	5 / 350
	1701RS0402N	40 x 25	25.0	44.5	28.5	5 / 300
	1701RS0403N	40 x 32	32.0	45.0	27.0	5 / 275
	1701RS0501N	50 x 20	20.0	46.0	31.5	5 / 250
	1701RS0502N	50 x 25	25.0	48.5	32.5	5 / 200
6	1701RS0503N	50 x 32	32.0	50.5	32.5	5 / 200
	1701RS0504N	50 x 40	40.0	53.0	32.5	5 / 150
	1701RS0601N	63 x 20	20.0	53.0	38.5	1 / 120
	1701RS0602N	63 x 25	25.0	55.5	39.5	1 / 100
7.4	1701RS0603N	63 x 32	32.0	57.0	39.0	1 / 100
	1701RS0604N	63 x 40	40.0	60.0	39.5	1 / 90
	1701RS0605N	63 x 50	50.0	64.0	40.5	1 / 80
	1701RS0704N	75 x 40	40.0	63.5	43.0	1 / 70
9	1701RS0705N	75 x 50	50.0	67.0	43.5	1 / 60
	1701RS0706N	75 x 63	63.0	70.5	43.0	1 / 48
	1701RS0905N	90 x 50	50.0	73.5	50.0	1 / 50
	1701RS0906N	90 x 63	63.0	77.5	50.0	1 / 45
	1701RS0907N	90 x 75	75.0	80.5	50.5	1 / 35
11	1701RS1006N	110 x 63	63.0	87.0	59.5	1 / 20
	1701RS1007N	110 x 75	75.0	89.0	59.0	1 / 18
	1701RS1009N	110 x 90	90.0	93.0	60.0	1 / 15
	1701RS1210N	125 x 110	110.0	84.0	48.0	1 / 8
	1701RS1610N	160 x 110	160.0	113.0	72.0	1 / 8
	1701RS2016N	200 x 160	160.0	113.0	72.0	1 / 8

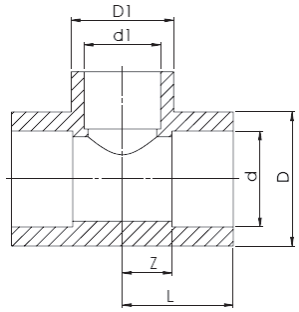
PRODUCT RANGE
Fittings & Accessories

EQUAL TEE



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701ET0001N	20	29.0	26.0	11.5	10 / 400
	1701ET0002N	25	34.0	30.0	14.0	10 / 250
	1701ET0003N	32	43.0	35.0	17.0	5 / 120
6	1701ET0004N	40	52.0	43.0	22.5	5 / 75
	1701ET0005N	50	65.0	51.0	27.5	5 / 40
7.4	1701ET0006N	63	83.0	62.5	35.0	1 / 25
	1701ET0007N	75	100.0	71.0	41.0	1 / 15
9	1701ET0009N	90	120.0	80.0	47.0	1 / 8
11	1701ET0010N	110	145.0	95.0	48.0	1 / 6
	1701ET0012N	125	164.5	122.8	82.8	1 / 3
	1701ET0016N	160	213.0	130.0	83.0	1 / 2
	1701ET0020N	200	155.0	132.8	77.5	----

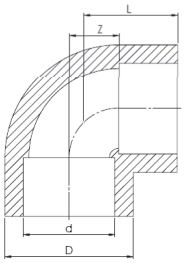
REDUCER TEE



SDR	Art. No.	Size d x d1 x d (mm)	D	L	Z	Packing Pouch / Box
5	1701RT0201N	25 x 20 x 25	34.0	27.5	11.5	10 / 270
	1701RT0301N	32 x 20 x 32	43.0	30.0	12.0	5 / 175
	1701RT0302N	32 x 25 x 32	43.0	32.0	14.0	5 / 160
	1701RT0401N	40 x 20 x 40	52.0	39.0	21.0	5 / 90
	1701RT0402N	40 x 25 x 40	52.0	39.0	18.5	5 / 90
	1701RT0403N	40 x 32 x 40	52.0	39.0	18.5	5 / 90
6	1701RT0501N	50 x 20 x 50	65.0	45.0	24.5	5 / 50
	1701RT0502N	50 x 25 x 50	65.0	45.0	21.5	5 / 50
	1701RT0503N	50 x 32 x 50	65.0	45.0	21.5	5 / 50
	1701RT0504N	50 x 40 x 50	65.0	51.0	27.5	5 / 40
7.4	1701RT0601N	63 x 20 x 63	83.0	55.5	28.0	1 / 35
	1701RT0602N	63 x 25 x 63	83.0	55.5	28.0	1 / 35
	1701RT0603N	63 x 32 x 63	83.0	55.5	28.0	1 / 35
	1701RT0604N	63 x 40 x 63	83.0	62.5	35.0	1 / 25
	1701RT0605N	63 x 50 x 63	83.0	62.5	35.0	1 / 25
9	1701RT0705N	75 x 50 x 75	100.0	71.0	41.0	1 / 15
	1701RT0706N	75 x 63 x 75	100.0	71.0	41.0	1 / 15
	1701RT0905N	90 x 50 x 90	120.0	80.0	47.0	1 / 12
	1701RT0906N	90 x 63 x 90	120.0	80.0	47.0	1 / 10
	1701RT0907N	90 x 75 x 90	120.0	80.0	47.0	1 / 10
11	1701RT1006N	110 x 63 x 110	145.0	95.0	58.0	1 / 6
	1701RT1007N	110 x 75 x 110	145.0	95.0	58.0	1 / 6
	1701RT1009N	110 x 90 x 110	145.0	95.0	58.0	1 / 6
	1701RT1207N	125 x 75 x 125	165.0	123.0	83.0	1 / 3
	1701RT1209N	125 x 90 x 125	165.0	123.0	83.0	1 / 3
	1701RT1210N	125 x 110 x 125	165.0	123.0	83.0	1 / 3
	1701RT1610N	160 x 110 x 160	213.0	103.0	83.0	1 / 2
	1701RT1612N	160 x 125 x 160	213.0	130.0	83.0	1 / 2
	1701RT2010N	200 x 110 x 200	155.0	170.0	72.5	---
	1701RT2016N	200 x 160 x 200	155.0	170.0	100.3	---

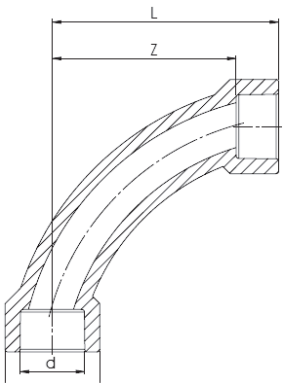
PRODUCT RANGE
Fittings & Accessories

ELBOW 90°



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701E90001N	20	29.0	25.5	11.0	10 / 600
	1701E90002N	25	34.0	29.5	13.5	10 / 350
	1701E90003N	32	43.0	35.0	17.0	5 / 175
6	1701E90004N	40	52.0	42.5	21.0	5 / 100
	1701E90005N	50	65.0	50.5	26.0	5 / 50
7.4	1701E90006N	63	83.0	62.0	32.5	1 / 30
	1701E90007N	75	100.0	70.0	38.5	1 / 15
9	1701E90009N	90	120.0	80.0	46.0	1 / 12
	1701E90010N	110	145.0	93.0	56.0	1 / 6
11	1701E90012N	125	165.0	124.0	84.0	1 / 3
	1701E90016N	160	213.0	127.0	83.0	1 / 2
	1701E90020N	200	155.0	69.8	170.0	---

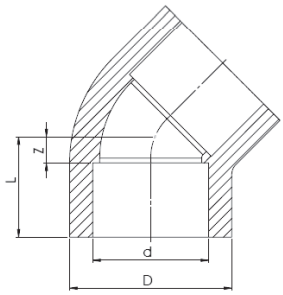
LONG ELBOW 90°



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
6, 7.4	1701LB0002N	25	35.0	85.0	69.0	10 / 150
9, 11	1701LB0003N	32	42.5	85.0	67.0	5 / 120

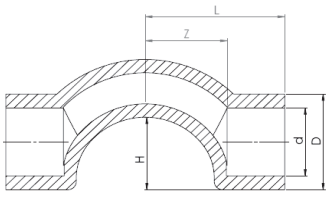
PRODUCT RANGE
Fittings & Accessories

ELBOW 45°



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701E45001N	20	29.0	19.5	5.0	10 / 600
	1701E45002N	25	34.0	22.0	6.0	10 / 450
	1701E45003N	32	43.0	25.5	7.5	5 / 220
6	1701E45004N	40	52.0	30.5	10.0	5 / 140
	1701E45005N	50	65.0	36.0	12.5	5 / 60
7.4	1701E45006N	63	83.0	44.0	16.5	1 / 35
	1701E45007N	75	100.0	47.5	17.5	1 / 25
9	1701E45009N	90	120.0	54.0	21.0	1 / 15
	1701E45010N	110	145.0	62.0	25.0	1 / 8
11	1701E45012N	125	165.0	77.0	37.0	1 / 3
	1701E45016N	160	213.0	79.0	40.0	1 / 2
	1701E45020N	200	163.0	201.0	41.5	--

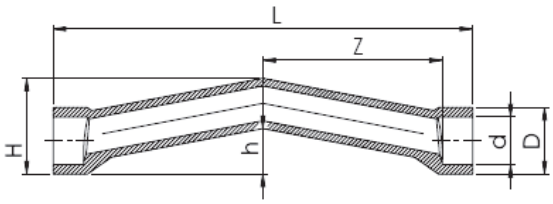
SHORT BRIDGE



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
6, 7.4, 9, 11	1701SB0001N	20	29.5	48.0	33.5	10 / 250
	1701SB0002N	25	34.0	48.0	32.0	10 / 200

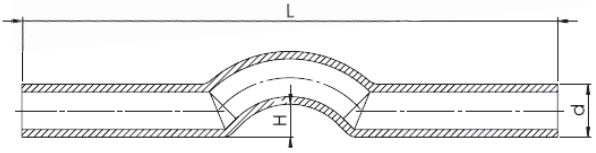
PRODUCT RANGE
Fittings & Accessories

BYPASS BEND



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
6 7.4 9 11	1701BB0001N	20	29.0	80.0	80.0	10 / 200
	1701BB0002N	25	34.0	100.0	84.0	10 / 110
	1701BB0003N	32	43.0	120.0	102.0	5 / 55

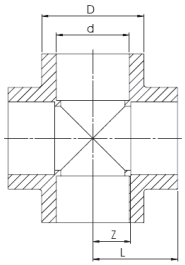
CROSS OVER BRIDGE



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
6 7.4 9 11	1701CO0001N	20	20.0	353.0	32.0	10 / 120
	1701CO0002N	25	25.0	353.0	30.0	10 / 80
	1701CO0003N	32	32.0	355.0	35.0	5 / 60

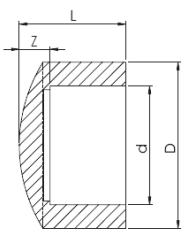
PRODUCT RANGE
Fittings & Accessories

CROSS



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
6 7.4 9 11	1701CR0001N	20	26.0	25.5	11.0	10 / 360
	1701CR0002N	25	34.0	30.0	14.0	10 / 200
	1701CR0003N	32	43.0	35.0	17.0	50 / 120

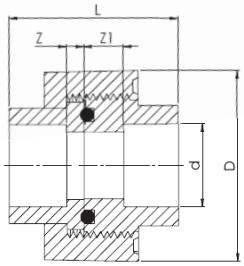
END CAP



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5 6 7.4 9 11	1701EC0001N	20	29.0	21.0	6.5	10 / 1100
	1701EC0002N	25	34.0	24.0	8.0	10 / 800
	1701EC0003N	32	43.0	27.0	9.0	5 / 450
	1701EC0004N	40	52.0	31.0	10.5	5 / 250
	1701EC0005N	50	65.0	36.0	12.5	5 / 160
	1701EC0006N	63	83.0	42.0	14.5	1 / 100
	1701EC0007N	75	100.0	48.0	18.0	1 / 55
	1701EC0009N	90	120.0	54.5	21.5	1 / 35
	1701EC0010N	110	145.0	60.0	23.0	1 / 20
	1701EC0012N	125	165.0	87.0	47.0	1 / 8
	1701EC0016N	160	213.0	95.0	50.0	1 / 4
	1701EC0020N	200				

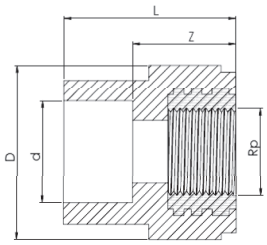
PRODUCT RANGE
Fittings & Accessories

PLASTIC UNION



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
6 7.4 9	1701PU0001N	20	46.0	47.0	18.0	10 / 240
	1701PU0002N	25	56.0	50.5	18.5	10 / 180
11	1701PU0003N	32	66.0	59.0	23.0	5 / 100

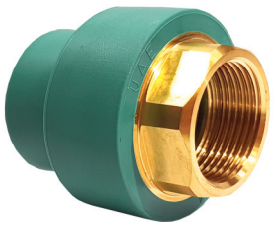
FEMALE ADAPTORS

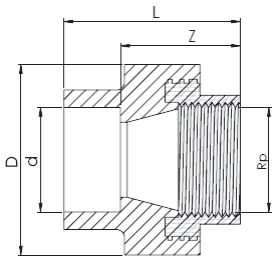


SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701FA0101B	20 x 1/2"	38.0	40.5	26.0	10 / 230
	1701FA0102B	20 x 3/4"	47.0	40.0	25.5	10 / 160
6	1701FA0201B	25 x 1/2"	40.5	40.5	24.5	10 / 200
7.4	1701FA0202B	25 x 3/4"	47.0	40.5	24.5	5 / 125
9	1701FA0301B	32 x 1/2"	42.0	42.3	24.3	5 / 125
	1701FA0302B	32 x 3/4"	42.0	42.3	24.3	5 / 125
11	1701FA0303B	32 x 1"	56.5	54.5	36.5	5 / 75
	1701FA0403B	40 x 1"	56.5	54.5	34.0	5 / 75

PRODUCT RANGE
Fittings & Accessories

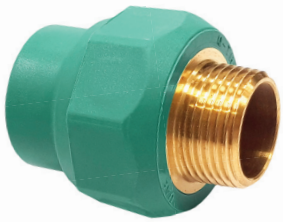
FEMALE ADAPTORS with HEX

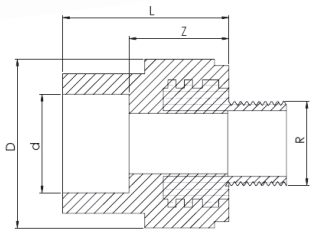




SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5 6 7.4 9 11	1701FA0404B	40 x 1 ¼"	71.0	65.0	44.5	5 / 30
	1701FA0505B	50 x 1 ½"	79.0	67.5	44.0	5 / 25
	1701FA0606B	63 x 2"	88.5	73.0	45.5	1 / 24
	1701FA0707B	75 x 2 ½"	110.5	77.0	47.0	1 / 15
	1701FA0908B	90 x 3"	131.5	84.0	51.0	1 / 8
	1701FA1009B	110 x 4"	161.0	100.5	63.5	1 / 5

MALE ADAPTORS

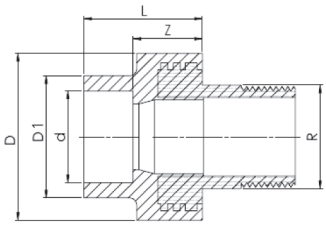




SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5 6 7.4 9 11	1701MA0101B	20 x 1/2"	38.0	40.5	26.0	10 / 170
	1701MA0102B	20 x 3/4"	47.0	40.0	25.5	10 / 130
	1701MA0201B	25 x 1/2"	40.5	40.5	24.5	10 / 160
	1701MA0202B	25 x 3/4"	47.0	40.5	24.5	10 / 140
	1701MA0301B	32 x 1/2"	42.0	42.3	24.3	5 / 120
	1701MA0302B	32 x 3/4"	42.0	42.3	24.3	5 / 120
	1701MA0303B	32 x 1"	56.5	54.5	36.5	5 / 60
	1701MA0403B	40 x 1"	56.5	54.5	34.0	5 / 70

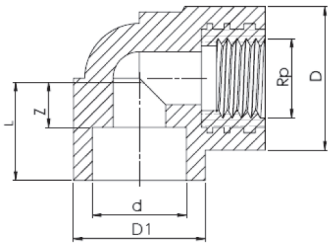
PRODUCT RANGE
Fittings & Accessories

MALE ADAPTORS with HEX



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701MA0404B	40 x 1 ¼"	71.0	87.0	66.5	5 / 30
6	1701MA0505B	50 x 1 ½"	79.0	89.5	66.0	5 / 25
7.4	1701MA0606B	63 x 2"	88.5	99.5	72.0	1 / 20
9	1701MA0707B	75 x 2 ½"	110.5	110.5	80.5	1 / 10
11	1701MA0908B	90 x 3"	131.5	125.5	92.5	1 / 5
	1701MA1009B	110 x 4"	161.0	151.5	114.5	1 / 4

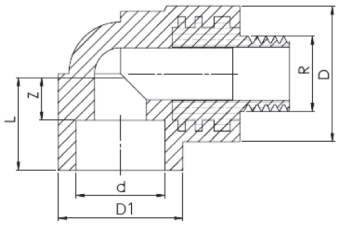
FEMALE ELBOW ADAPTORS



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701FE0101B	20 x 1/2"	38.0	25.0	10.0	10 / 180
6	1701FE0102B	20 x 3/4"	47.0	30.0	12.0	10 / 120
7.4	1701FE0201B	25 x 1/2"	41.0	30.0	12.0	10 / 130
9	1701FE0202B	25 x 3/4"	47.0	30.0	12.0	10 / 120
11	1701FE0301B	32 x 1/2"	47.0	36.0	18.0	5 / 85
	1701FE0302B	32 x 3/4"	47.0	36.0	18.0	5 / 85
	1701FE0303B	32 x 1"	56.0	36.0	18.0	5 / 65

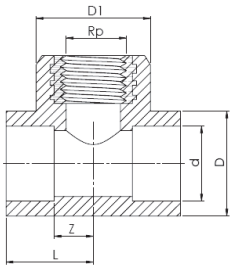
PRODUCT RANGE
Fittings & Accessories

MALE ELBOW ADAPTORS



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701ME0101B	20 x 1/2"	38.0	25.0	10.0	10 / 150
	1701ME0102B	20 x 3/4"	47.0	30.0	12.0	10 / 100
6	1701ME0201B	25 x 1/2"	41.0	30.0	12.0	10 / 120
7.4	1701ME0202B	25 x 3/4"	47.0	30.0	12.0	10 / 100
9	1701ME0301B	32 x 1/2"	47.0	36.0	18.0	5 / 85
11	1701ME0302B	32 x 3/4"	47.0	36.0	18.0	5 / 85
	1701ME0303B	32 x 1"	56.0	36.0	18.0	5 / 80

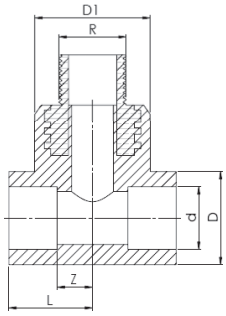
FEMALE TEE ADAPTORS



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701FT0101B	20 x 1/2"	29.0	25.5	11.0	10 / 150
	1701FT0102B	20 x 3/4"	29.0	28.0	13.5	10 / 100
6	1701FT0201B	25 x 1/2"	34.0	29.5	13.5	10 / 100
7.4	1701FT0202B	25 x 3/4"	34.0	29.5	13.5	10 / 90
9	1701FT0301B	32 x 1/2"	43.0	35.0	17.0	5 / 60
11	1701FT0302B	32 x 3/4"	43.0	35.0	17.0	5 / 60
	1701FT0303B	32 x 1"	43.0	35.0	17.0	5 / 50

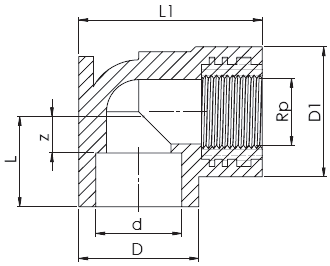
PRODUCT RANGE
Fittings & Accessories

MALE TEE ADAPTORS



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5, 6, 7.4 9, 11	1701MT0101B	20 x 1/2"	29.0	25.5	11.0	10 / 150
	1701MT0201B	25 x 1/2"	34.0	29.5	13.5	10/100
	1701MT0202B	25 x 3/4"	34.0	29.5	13.5	10/90

WALL MOUNT FEMALE ELBOW

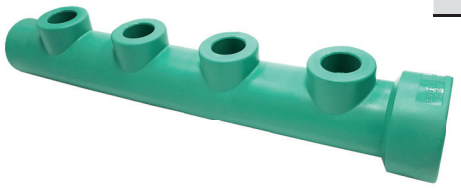


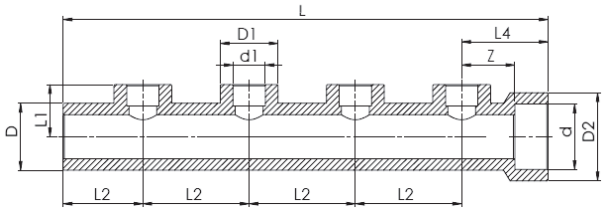
SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5, 6, 7.4, 9, 11	1701WM0101B	20 x 1/2"	29	30.0	15.5	10 / 130
	1701WM0201B	25 x 1/2"	34	30.0	14.0	10 / 120

PRODUCT RANGE
Fittings & Accessories

MANIFOLD 4 WAY WITHOUT STRAINER

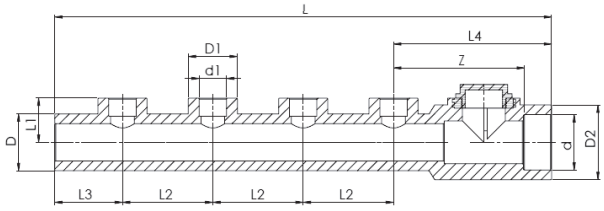
SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
6 7.4 9 11	1701MF4502N	50 x 25	50.0	365.0	41.0	3/30
	1701MF4503N	50 x 32	50.0	365.0	41.0	3/30
	1701MF4603N	63 x 32	63.0	390.0	50.0	3/30
	1701MF4602N	63 x 25	63.0	390.0	50.0	3/30





MANIFOLD 4 WAY WITH STRAINER

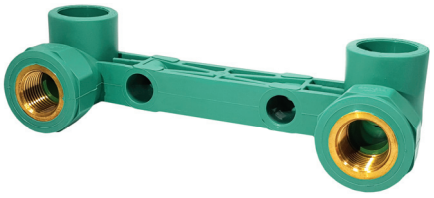
SDR	Art. No.	Size d (mm)	D	L	Z	Packing Box
6 7.4 9 11	1701MS4502B	50 x 25	50.0	440.0	116.0	18
	1701MS4503B	50 x 32	50.0	440.0	116.0	18
	1701MS4603B	63 x 32	63.0	465.0	125.0	18
	1701MS4602B	63 x 25	63.0	465.0	125.0	18

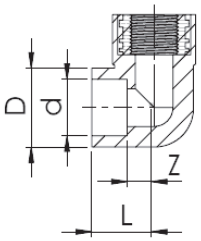


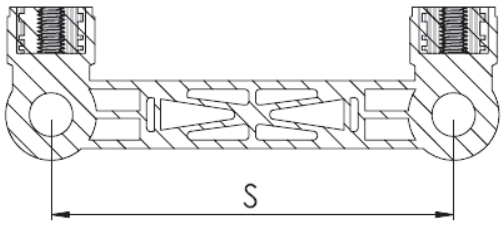
PRODUCT RANGE
Fittings & Accessories

MIXER MOUNT

SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5, 6, 7.4, 9, 11	1701MM0201B	25 x 1/2"	34	30.0	12.0	3 / 60
	1701MR0201B (w. ring)	25 x 1/2"	34	30.0	12.0	3 / 60

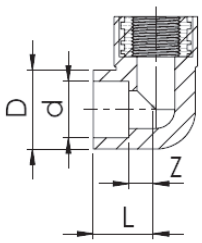


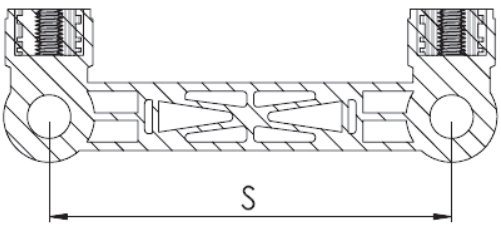




ADJUSTABLE MIXER MOUNT

SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5, 6, 7.4, 9, 11	1701AM0201B	25 x 1/2"	34	30.0	12.0	3 / 60
	1701AR0201B (w. ring)	25 x 1/2"	34	30.0	12.0	3 / 60

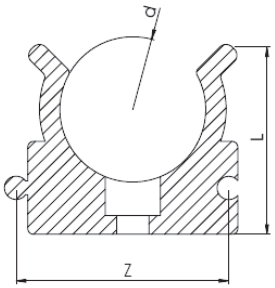




PRODUCT RANGE
Fittings & Accessories

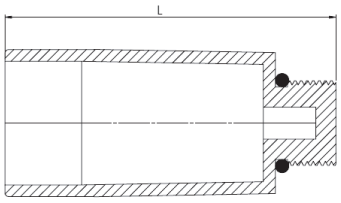
PLASTIC CLAMPS

Art. No.	Size d (mm)	L	Packing Pouch / Box
1701PC0001N	20	29.4	150 / 1500
1701PC0002N	25	34.4	100 / 1100
1701PC0003N	32	41.2	100 / 700
1701PC0004N	40	49.7	100 / 700



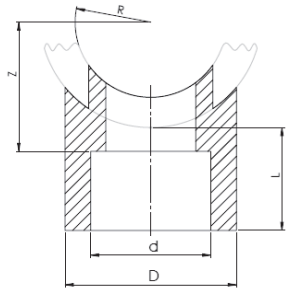
TEST PLUG

Art. No.	Size d (mm)	L	Packing Pouch / Box
1701TP0001N	20	75.0	10 / 250
1701TP0002N	25	75.0	10 / 250
1701TP0003N	32	80.0	10 / 230



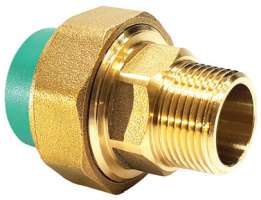
SADDLE SOCKET

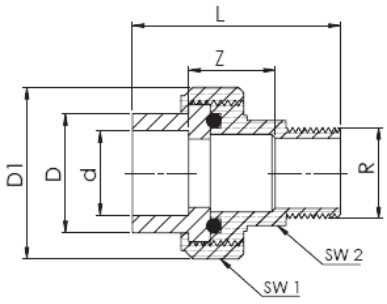
SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701SA0501N	50 x 20	29.0	19.0	30.0	10 / 400
6	1701SA0502N	50 x 25	34.5	21.0	30.0	10 / 350
7.4	1701SA0503N	50 x 32	43.0	21.0	28.0	10 / 200
9	1701SA0601N	63 x 20	29.0	19.0	36.5	10 / 400
11	1701SA0602N	63 x 25	34.5	21.0	36.5	10 / 350
	1701SA0603N	63 x 32	43.0	21.0	34.5	10 / 200



PRODUCT RANGE
Fittings & Accessories

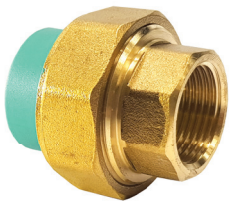
BRASS MALE UNIONS

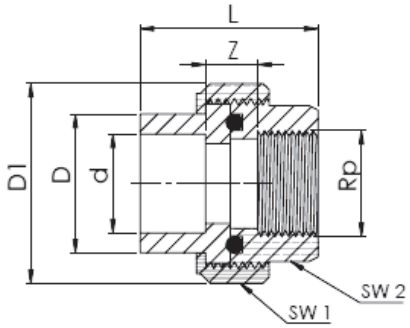




SDR	Art. No.	Size d (mm)	D1	L	Z	Packing Pouch / Box
5 6 7.4 9 11	1701HM0101B	20 x 1/2"	40.0	53.5	24.0	10 / 200
	1701HM0202B	25 x 3/4"	49.0	60.0	28.5	10 / 100
	1701HM0303B	32 x 1"	56.5	62.5	29.5	5 / 75
	1701HM0404B	40 x 1 ¼"	69.0	70.5	31.0	5 / 40
	1701HM0505B	50 x 1 ½"	86.5	80.0	35.5	5 / 24
	1701HM0606B	63 x 2"	109.0	85.0	36.5	1 / 14

BRASS FEMALE UNIONS

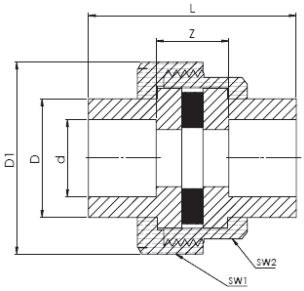




SDR	Art. No.	Size d (mm)	D1	L	Z	Packing Pouch / Box
5 6 7.4 9 11	1701HF0101B	20 x 1/2"	40.0	40.0	12.5	10 / 200
	1701HF0202B	25 x 3/4"	49.0	46.0	125.0	10 / 120
	1701HF0303B	32 x 1"	56.5	47.1	13.0	5 / 80
	1701HF0404B	40 x 1 ¼"	69.0	51.0	12.5	5 / 50
	1701HF0505B	50 x 1 ½"	86.5	59.5	12.0	5 / 30
	1701HF0606B	63 x 2"	109.0	64.5	14.0	1 / 16

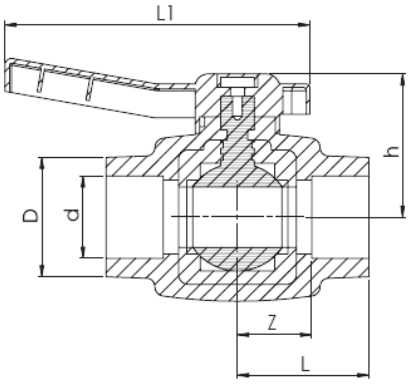
PRODUCT RANGE
Fittings & Accessories

DOUBLE UNION SOCKETS



SDR	Art. No.	Size d (mm)	D1	L	Z	Packing Pouch / Box
5, 6	1701DS0001B	20	42.5	40.0	4.0	10 / 120
7.4	1701DS0002B	25	53.0	44.0	4.0	10 / 100
9, 11	1701DS0003B	32	60.5	48.5	4.0	5 / 75

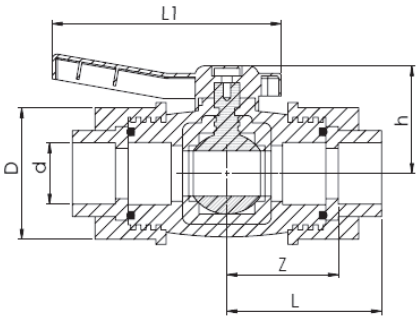
BALL VALVES



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701BV0001N	20	43.5	32.0	17.5	10 / 140
6	1701BV0002N	25	50.0	38.5	21.0	10 / 100
7.4	1701BV0003N	32	58.5	42.5	24.5	5 / 70
9	1701BV0004N	40	68.5	52.5	31.5	5 / 45
11	1701BV0005N	50	86.5	58.0	34.5	1 / 30
	1701BV0006N	63	106.0	73.0	45.5	1 / 12
	1701BV0007N	75	-	-	-	-

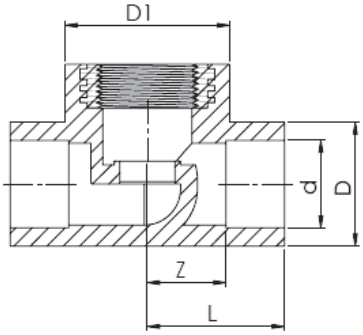
PRODUCT RANGE
Fittings & Accessories

DOUBLE UNION BALL VALVES



SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701DB0001N	20	43.5	32.0	17.5	10 / 140
6	1701DB0002N	25	50.0	38.5	21.0	10 / 100
7.4	1701DB0003N	32	58.5	42.5	24.5	5 / 70
9	1701DB0004N	40	68.5	52.5	31.5	5 / 45
11	1701DB0005N	50	86.5	58.0	34.5	1 / 30
	1701DB0006N	63	106.0	73.0	45.5	1 / 12

VALVE BODY

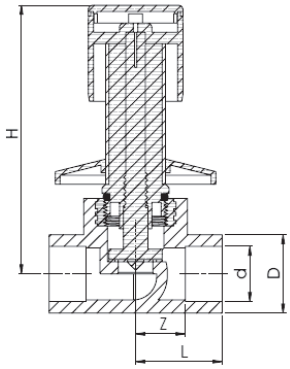


SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
6	1701VB0102B	20 x 3/4"	29.0	37.5	23.0	10 / 150
7.4	1701VB0202B	25 x 3/4"	34.0	37.5	21.5	10 / 120
9	1701VB0302B	32 x 3/4"	43.0	39.5	21.5	5 / 100
11	1701VB0403B	40 x 1"	52.0	43.0	22.5	5 / 75

PRODUCT RANGE
Fittings & Accessories

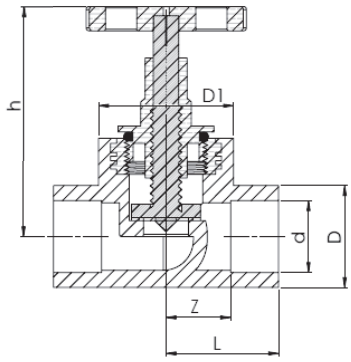
CONCEALED VALVES with BODY

SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
6 7.4 9 11	1701CV0001B	20	29.0	37.5	23.0	1 / 30
	1701CV0002B	25	34.0	37.5	21.5	1 / 30
	1701CV0003B	32	43.0	39.5	21.5	1 / 30
	1701CV0004B	40	52.0	43.0	22.5	1 / 35



STOP VALVES with BODY

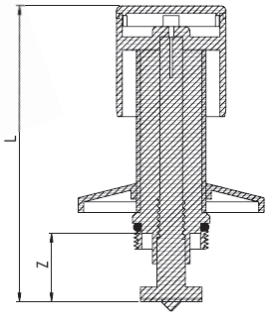
SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
6 7.4 9 11	1701SV0001B	20	29.0	37.5	23.0	1 / 80
	1701SV0002B	25	34.0	37.5	21.5	1 / 70
	1701SV0003B	32	43.0	39.5	21.5	1 / 60
	1701SV0004B	40	52.0	43.0	22.5	1 / 40



PRODUCT RANGE
Fittings & Accessories

CONCEALED VALVE HANDLE

Art. No.	Size d (mm)	H (mm)	Packing Pouch / Box
1701CH0002B	3/4"	127	1 / 40
1701CH0003B	1"	128	--

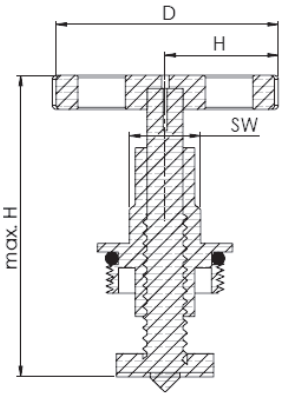


CONCEALED VALVE EXTENDER

Art. No.	Size d (mm)	H (mm)	Packing Pouch / Box
1701CE0002B	25	37	10 / 240

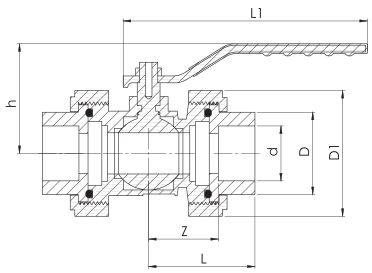
STOP VALVE HANDLE

Art. No.	Size d (mm)	H (mm)	Packing Pouch / Box
1701SH0002B	3/4"	78.5	1 / 150
1701SH0003B	1"	100	--



PRODUCT RANGE
Fittings & Accessories

DOUBLE UNION BRASS BALL VALVES



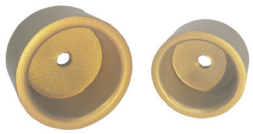
SDR	Art. No.	Size d (mm)	D	L	Z	Packing Pouch / Box
5	1701DV0001B	20	40.0	86.0	58.0	10 / 140
	1701DV0002B	25	48.0	95.0	63.5	10 / 100
6	1701DV0003B	32	55.5	108.0	74.5	5 / 70
	1701DV0004B	40	68.0	127.0	89.5	5 / 45
7.4	1701DV0005B	50	85.0	150.0	104.0	1 / 30
9	1701DV0006B	63	106.5	176.0	108.5	1 / 12
	1701DV0007B	75	-	-	-	-
11	1701DV0009B	90	-	-	-	-
	1701DV0010B	110	-	-	-	-

ANGLE VALVE

Art. No.	Size d (inch)	H (mm)	Packing Pouch / Box
1701AV0001B	1/2	64	1

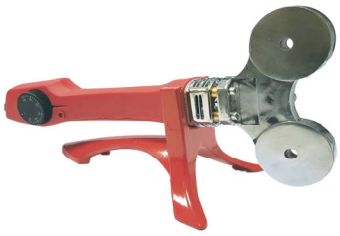
PRODUCT RANGE
Fittings & Accessories

WELDING SOCKET



Art. No.	Size d (mm)	Packing Pouch / Box
1701WS0501B	50 x 20	0
1701WS0502B	50 x 25	0
1701WS0503B	50 x 32	0
1701WS0601B	63 x 20	0
1701WS0602B	63 x 25	0
1701WS0603B	63 x 32	0

WELDING MACHINES



Art. No.	Size d (mm)	Packing Pouch / Box
1701WM0106B	20 - 63	1
1701WM0710B	75 - 110	1

FLANGE WITH GASKET

Art. No.	Size d (mm)	Packing Pouch / Box
1701FG0006N	63	1/50
1701FG0007N	75	1/40
1701FG0009N	90	1/30
1701FG0010N	110	1/20
1701FG0012N	125	1/10
1701FG0016N	160	1/7

FLANGE STEEL RING

Art. No.	Size d (mm)	Packing Pouch / Box
1701SF0006N	63	1/10
1701SF0007N	75	1/10
1701SF0009N	90	1/10
1701SF0010N	110	1/10
1701SF0012N	125	1/5
1701SF0016N	160	1/5

THERM
PP-R PIPES & FITTINGS

PEX & PE-RT Pipes

Q-Therm PEX & PE-RT systems are part of a water supply piping system that has several advantages over metal pipe or rigid plastic pipe systems. They are flexible, resistant to scale, corrosion and are faster to install than other piping systems. PEX & PE-RT pipes and has fewer connections and fittings.

PEX refers to cross-linked Polyethylene tubing that provides an excellent option for plumbing, radiant and heat-transfer systems in both residential and commercial plumbing applications.

Q-Therm produces PEX-b pipes, which are ideal for applications in high and low temperature. PEX-b is also flexible, non-brittle due to its cross-linked property. Q-Therm's PEX-b pipes can be used for under-floor Heating Systems, Central Heating Systems and Sanitary applications in residential and commercial buildngs.

Q-Therm PE-RT is a new class of polyethylene materials (Polyethylene of Raised Temperature resistance) for hot and cold water as well as industrial pipe applications. PE-RT material has a unique molecular structure, which provides excellent Long Term Hydrostatic Strength at high temperatures without the need for cross-linking the material.

Features of PEX and PE-RT Pipes

- No corrosion
- Taste and smell neutrality
- Easy handling due to less weight and flexibility
- Good Chemical Resistance
- High and Low Operating Temperatures
- Hygiene Requirement compliance
- Long term service life

PEX PIPING SYSTEM

Q-THERM PEX Piping System

PEX means cross-linked Polyethylene. "PE" means PolyEthylene and "X" refers to cross-linking.

PEX refers to cross-linked Polyethylene. Polyethylene molecules are chemically adjoined to result a stable performance in elevated temperatures. Cross linking makes PEX a thermoset polymer which acts enhances its long term stability. They are resistant to environmental stress crack, slow crack growth due to deterioration of material under continuous temperature application. PEX tubing serves as an excellent option for plumbing, radiant and heat-transfer systems in both residential and commercial plumbing applications.

Q-Therm produces PEX-b pipes, which are ideal for applications in high and low temperature. PEX-b is also flexible and non-brittle due to its cross-linked property. Q-Therm's PEX-b pipes can be used for under-floor heating systems, central heating systems and sanitary applications in residential and commercial buildings

PEX systems are widely approved and used for potable hot and cold water plumbing systems across different parts of the world. Their durability provides a secure water transport for drinking or related application. The connections for PEX piping system are easy and reliable.

Mechanical Characteristics of PEX

Temperature Resistance

Water deliverability of PEX systems has been proven for many years. The Q-Therm PEX-b pipe system is designed for continuous temperatures of 0 °C to 70 °C, short-term peak temperatures of up to 100 °C and a service life of minimum 50 years. The thermal stability is raised by careful cross-linking

The maximum continuous application temperature of Q-Therm PEX pipe is 95˚C. The permanent operating pressure is 10 bars at 0˚C, which far exceeds normal water delivery application. Q-Therm PEX makes an excellent underground water service piping which can sustained for a maximum of 100 hours per 50 years at 95˚C.

Pressure Resistance

As a resultant of effective Cross-linking, Q-Therm PEX-b pipe is resistant to creep which greatly enhances its pressure handling capabilities. The density is maintained to 0.945 to 0.950 gm/cc in order to meet and the required pressure regulations for under-floor heating pipes according to DIN 16892 standards. Under nominal circumstances, the service life of Q-Therm PEX-b pipes are expected to be 50 years.

Working Temperature & Pressure Table

Working Temperature	Working Pressure			Service Life
	PN 12.5	PN 16	PN 20	
Up to 60°C	12.5	16	20	50 years
From 60°C up to 80°C	8	10	13	50 years
From 80°C up to 95°C	8	10	13	10 years

Table - 25

Physical and Mechanical Properties

Parameter	Typical Value	Unit	Test Method
Density at 23°C	0.949	g/cc	ASTM D 792
MFI 190°C/2.16 kg MFI 190°C/5 kg	0.60 2.4	g/10min	ISO 1133
Tensile Strength Elongation at Break	> 25 >400	Mpa %	Astm D 638
Vicat Softening Temperature	127	°C	ASTM D 1525
Gel Content	> 65	%	EN 579
Specific Head at 23°C	1.8	J/(g°K)	ISO 11357-4
Coefficient of Linear Expansion at 20°C	1.6 x 10-4	1/°C	ASTM D 696
Thermal Conductivity at 23°C	0.48 ± 0.004	W.m/K	Hot Disk Method

Table - 26

PEX PIPING SYSTEM

Q-Therm PE-RT

Q-Therm PE-RT is a new class of polyethylene material (Polyethylene of Raised Temperature resistance) for hot and cold water as well as industrial pipe applications. PE-RT material has a unique molecular structure, which provides excellent long-term hydrostatic strength at high temperatures without the need for cross-linking the material. The installation guidelines outlined in this catalogue for PEX is applicable to PE-RT piping systems as well.

Features of PEX pipes

- No corrosion
- Taste and smell neutrality
- Easy handling due to less weight and flexibility
- Good chemical resistance
- High and Low operating temperatures
- Hygiene requirement compliance
- Long-term service life

Areas of application

- Hot and Cold water supply using Pipe in pipe manifold techniques and PPR mains
- Underfloor heating applications
- Heating systems using radiators
- Air Conditioning applications
- Transportaion of chemicals
- Fire suspension systems

Corrosion Resistant Brass Fittings

Brass components have been widely used in the water industry for various applications, mainly in connection fittings and threads. But due to combination of certain chloride and the acidic concentrations in a medium, corrosion of the alloy may occur. To counter this problem, alloys such as dezincification resistant brass alloys (DZR) and other brass compositions approved by German Water authority DVGW have proven to be effective in resisting this corrosion. They have a higher Copper content and are very carefully manufactures to maintain the chemical composition.

UV Resistance

Q-Therm PEX piping system is designed for indoor and buried applications only. It is not recommended for outdoor above ground use. Short indirect exposures to sunlight which do not exceed 30 days are however, permissible when storing Q-Therm PEX. However it is necessary that the pipes, if stored outside, be shielded from direct sunlight.

Durability

Based on extensive testing and material performance over the span of more than 30 years, PEX piping has proven to be a durable material that does not suffer from some of the historical problems associated with metallic piping, such as reduced interior dimension, corrosion, electrolysis, filming, mineral build-up, and water velocity wear. PEX piping will typically expand if the system is allowed to freeze, and regains to its original size when the water thaws.

Chemical Resistance

Due to the nature of polyethylene, Q-Therm PEX pipes are effectively chemical resistant at a wide range of temperatures and pressures. The basic cross linked structure physically provides resistance from the attack of aggressive chemicals.

Installation

The installation of PEX pipe is generally easier. The pipe is lightweighted compared to steel or copper pipes, making it easy to transport and safe to handle before and during installation. Q-Therm PEX pipes are produced in various length coil. Installation requires fewer coupling joints (fittings). In addition, no solvent, chemical, or solder joining is required, saving times and effort.

PEX PIPING SYSTEM

Standards

Standard	Title
DIN 16896	General requirements & testing (PE-X)
DIN 16893	Dimensions
DIN 16928	Installation, Pipes and fittings connection.
EN 579	Cross linking
ISO 15875	Plastics piping systems for hot and cold water installations - Cross linked polyethylene (PE-X)
BS 6920	Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water.
DIN 1988	DVGW Code of Practice. (Drinking water supply systems; materials, components, appliances, design & installation)

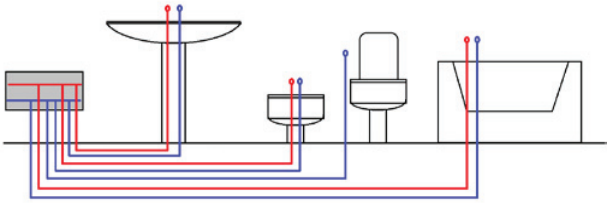
Table - 27

Installation

The installation of PEX pipe is generally easier. The pipe is lightweighted compared to steel or copper pipes, making it easy to transport and safe to handle before and during installation. Q-Therm PEX pipes are produced in various length coil. Installation requires fewer coupling joints (fittings). In addition, no solvent, chemical, or solder joining is required, saving times and effort.

Types of Manifold Collection Netorks

Standard Direct Connection



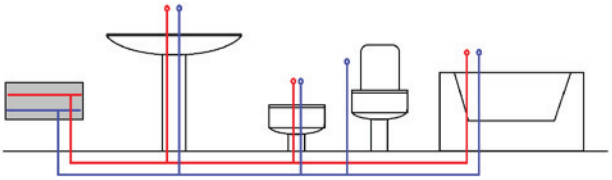
Here, both hot and cold water lines would go to each zones continuously from the manifolds. In such connections, the advantages are that;

- Zone maintenance is possible
- No effect of pressure or flow between appliances.

The disadvantage in such connections are;

- More piping quantity and space is required.

Distribution In-Series Connection



In this type of conncetions, the hot and cold lines would go to each zones seperately from the manifolds. Advantages of such connections are;

- Less piping required
- Fast Installation

The disadvantages are;

- Effect on one appliance on the next
- Maintenance requires complete shut-off of circuit

Corrugated Sleeves

Corrugates sleeves may be used as a protective jacket for PEX pipes while being installed in outdoors as well as concealed layouts. These sleeves protects the pipe from direct impact of the sun light and it also enables easy maintenance for the PEX pipes that are installed within the concrete walls.

Such sleeves usually come in two colors; RED and BLUE for easy identification for Hot and Cold water supply.

PEX PIPING SYSTEM

When installing it is necessary to follow the simple instructions referring to the connections of the pipes with the proper adaptors, bending of the pipes and possible damages of the pipe or the protective sleeve by cracking.

- The connection to manifolds or to sanitary connec tions for the taps must be done using adaptors in the correct size
- In order to make a correct connection, it is necessary to cut the pipe precisely and perpendicularly to its axis by the proper cutter.
- Pliability of the pipe is only guaranteed when the bends have a minimum radius eight times more than the outside diameter of the pipe.
- Do not heat the pipe with naked flame or any other heating sources with high temperatures, as this will cause the pipes to melt.
- Upon completing the installation of the pipe, it is recommended that the system be pressure tested to ensure there are no leakages.
- After the pressure test, the sleeves must be protected by covering them with concrete, to avoid cracking the pipes and movement of the installation.
- Where the pipes are visible they must be protected against ultra violet rays, capable of altering the chemical-physical features.
- When the pipe is installed without the protective sleeve, it must be covered by a screed of at least 1.5 cm, to avoid fissures due to expansion of the pipe.

Joining a PEX pipe to a Brass fitting

Inorder to get a leak proof connection, the connections between the Pipe and the brass fitting must be executed well.

- Select the right size screw brass fitting according to the pipe size. Put the nut on the pipe. Make sure the female side of the nut and the pipe end are on the same side. Slide the compression crimp ring over the pipe.
- Do not apply lubricant or pipe dope on the insert fitting.
- Position crimp ring 3 to 6mm from end of tubing. To prevent ring from moving, squeeze the ring slightly with spanner.
- Keeping both ring and tool square with tube.

DO NOT CRIMP TWICE. It is recommended that each crimped ring be checked with the appropriate gauge.



PEX Piping Supports

Plastic Brackets and or straps can be used. Supports that damage the pipes should not be used. Support should allow free pipe movement. Although metal supports which are designed for use with plastic pipes can be used, but should be avoided. In any case, all supports should be inspected for sharp edges before use to ensure that they do not damage the pipe.

Handling and Storing Q-Therm PEX Piping System

PEX pipes should be stored well covered in order to keep the pipes clean and avoid exposure to sunlight

- PEX pipes should be stored in a way to protect the system from mechanical damage (slitting, puncturing, etc.)
- Do not drag the pipes over rough terrain, rocks, or any surface that can cut, puncture, or damage the pipes wall.
- Inspect all pipes before and after installation.
- Cut out and replace all damaged sections.

PEX PIPING SYSTEM

Allowable operating pressure for pipes conveying water, safety factor (SF) = 1.25

Temperature °C	Service Years (yrs)	Allowable operating pressure (Bar)		
		SDR 11	SDR 9	SDR 7.4
10	1	17.9	22.5	28.3
	5	17.5	22.1	27.8
	10	17.4	21.9	27.6
	25	17.2	21.7	27.3
	50	17.1	21.5	27.1
	100	17.0	21.4	25.9
20	1	15.8	19.9	25.1
	5	15.5	19.6	24.6
	10	15.4	19.4	24.4
	25	15.2	19.2	24.2
	50	15.1	19.1	24.0
	100	15.0	18.9	23.8
30	1	14.0	17.7	22.3
	5	13.8	17.3	21.9
	10	13.7	17.2	21.7
	25	13.5	17.0	21.4
	50	13.4	16.9	21.3
	100	13.3	16.8	21.1
40	1	12.5	15.7	19.8
	5	12.2	15.4	19.4
	10	12.1	15.3	19.3
	25	12.0	15.1	19.1
	50	11.9	15.0	18.9
	100	11.8	14.9	18.7
50	1	11.1	14.0	17.7
	5	10.9	13.7	17.3
	10	10.8	13.6	17.2
	25	10.7	13.5	17.0
	50	10.6	13.4	16.8
	100	10.5	13.2	16.7
60	1	9.9	12.5	15.8
	5	9.7	12.3	15.5
	10	9.7	12.2	15.3
	25	9.5	12.0	15.2
	50	9.5	11.9	15.0
70	1	8.9	11.2	14.1
	5	8.7	11.0	13.8
	10	8.6	10.9	13.7
	25	8.5	10.8	13.6
	50	8.5	10.7	13.4
80	1	8.0	10.0	12.7
	5	7.8	9.8	12.4
	10	7.7	9.8	12.3
	25	7.6	9.6	12.1
90	1	7.2	9.0	11.4
	5	7.0	8.8	11.1
	10	6.9	8.8	11.0
95	1	6.8	8.6	10.8
	5	6.6	8.4	10.6

Table - 28

Allowable operating pressure for pipes conveying water, safety factor (SF) = 1.5

Temperature °C	Service Years (yrs)	Allowable operating pressure (Bar)		
		SDR 11	SDR 9	SDR 7.4
10	1	14.9	18.7	23.6
	5	14.6	18.4	23.2
	10	14.5	18.3	23.0
	25	14.4	18.1	22.8
	50	14.2	17.9	22.6
	100	14.1	17.8	22.4
20	1	13.2	16.6	20.9
	5	12.9	16.3	20.5
	10	12.8	16.2	20.4
	25	12.7	16.0	20.1
	50	12.6	15.9	20.0
	100	12.5	15.7	19.8
30	1	11.7	14.7	18.5
	5	11.5	14.4	18.2
	10	11.4	14.3	18.1
	25	11.3	14.2	17.9
	50	11.2	14.1	17.7
	100	11.1	14.0	17.6
40	1	10.4	13.1	16.5
	5	10.2	12.8	16.2
	10	10.1	12.7	16.1
	25	10.0	12.6	15.9
	50	9.9	12.5	15.7
	100	9.8	12.4	15.6
50	1	9.3	11.7	14.7
	5	9.1	11.4	14.4
	10	9.0	11.3	14.3
	25	8.9	11.2	14.1
	50	8.8	11.1	14.0
	100	8.8	11.0	13.9
60	1	8.3	10.4	13.1
	5	8.1	10.2	12.9
	10	8.0	10.1	12.8
	25	7.9	10.0	12.6
	50	7.9	9.9	12.5
70	1	7.4	9.3	11.8
	5	7.3	9.1	11.5
	10	7.2	9.1	114.0
	25	7.1	9.0	11.3
	50	7.0	8.9	11.2
80	1	6.6	8.4	10.5
	5	6.5	8.2	10.3
	10	6.4	8.1	10.2
	25	6.4	8.0	10.1
90	1	6.0	7.5	9.5
	5	5.8	7.4	9.3
	10	5.8	7.3	9.2
95	1	5.7	7.1	9.0
	5	5.5	7.0	8.8

Table - 29

PEX PIPING SYSTEM

Quality Control and Assuarnce

As quality is a subjective term for which each person has his own definition, we in Quantum industries chose to have a definition that can serve as a way of life, stemming from all what we believed that quality should be, acting as the backbone of the quality culture we aspire to cultivate, not only in the products we make, but also in everything we do, as we know that quality isnot luxury, it is a matter of existence.

Our definition of quality is dynamic, improving and evolving, it's a live definition, but is always resting on our five quality pillars, the 5 Cs…

01 Compliance with international norms and standards.

02 Customer satisfaction.

03 Commitment to timely delivery.

04 Consistency in all what we do.

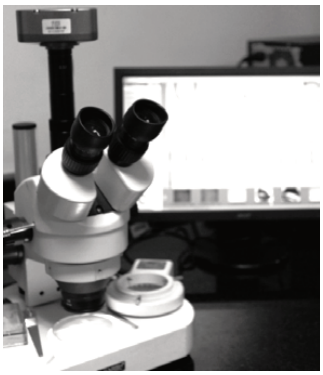
05 Cost effectiveness.

Quantum industries / quality department ensures that, Q-Therm piping systems are produced through a stringent supervision, strict adherence to regulations and proper control of all work related operations. Every carefully observed process and result obtained are recorded and documented.

Q-Therm products and its manufacturing processes conform to respective national and international regulations and Q-Therm's own internl Quality System.

Q-Therm achieves its desired quality in all its products by using state-of-art machinery, strict process control, regulat in-process inspection, adherence to standards and regulations supported with continuous research and development.

Q-Therm and PE-RT piping system are carefully manufactured under the stipulated standards and norms. They are tested and qualified in a well facilitated laboratory, before it leaves to the customers.



Certifications

Q-Therm pipe system undergoes various external and internal inspections. national and international authoritiesm whoes reputation for neutrality is beyond doubt, check and certify our products regularly to endorse their constant hig level of qulity. This guarantees the user a high level of safety and reliability.

Certifications implies that, Q-Therm products are fit to their intended applictaion and the following requirments are met;

PEX PIPING SYSTEM
Pipes & Fittings

Q-Therm (PEX Pipe)

Material: Cross-Linked Polyethlene
Standard Color: Natural
Standard Pipe Roll: 100 meters

SDR	Art. No.	Size / mm	Packing
SDR: 7.4 PN 20	PX00PS1600Y	16X2.2	100
	PX00PS1601Y	20X2.8	100
	PX00PS1602X	25X3.5	50
	PX00PS1603X	32X4.4	50

Q-Therm (PE-RT Pipe)

Material: Polyethlene - RT
Standard Color: Natural
Standard Pipe Roll: 100 meters

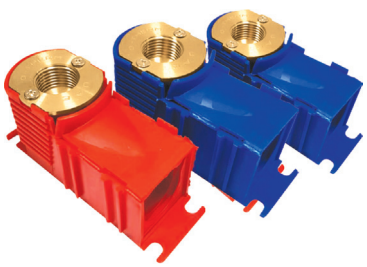
SDR	Art. No.	Size / mm	Packing
SDR: 7.4 PN 16	PT00PS1600Y	16X2.2	100
	PT00PS1601Y	20X2.8	100
	PT00PS1602X	25X3.5	50
	PT00PS1603X	32X4.4	50

Q-Therm (Corrugated Conduit Pipe)

Material: Polyethlene
Standard Color: Red & Blue
Standard Pipe Roll: 50 meters

Art. No.	Size / mm	Packing
PXBCCP0001X	20mm / Blue	50
PXBCCP0002X	25mm / Blue	50
PXBCCP0003X	32mm / Blue	50
PXBCCP0004X	40mm / Blue	20
PXRCCP0001X	20mm / Red	50
PXRCCP0002X	25mm / Red	50
PXRCCP0003X	32mm / Red	50
PXRCCP0004X	40mm / Red	20

Q-Therm (DZR Concealed Female Elbow with Box)



Material: Polyethlene
Standard Color: Red & Blue

Art. No.	Size / mm
PXYCBE0001R	16X 1/2" / Blue
PXYCBE0101R	20X 1/2" / Blue
PXYCBE0202R	25x 3/4' / Blue
PXYCRE0001R	16X 1/2" / Red
PXYCRE0101R	20X 1/2" / Red
PXYCRE0202R	25X 3/4" / Red

PEX PIPING SYSTEM
Fittings & Accessories

Q-therm DZR Male PE-X Adapter

Art. No.	Size / mm
PXYCMA0001R	16 X 1/2"
PXYCMA0101R	20 X 1/2"
PXYCMA0102R	20 X 3/4"
PXYCMA0202R	25 X 3/4"
PXYCMA0303R	32 X 1"

Q-therm DZR Female PE-X Adapter

Art. No.	Size / mm
PXYCFA0001R	16 X 1/2"
PXYCFA0101R	20 X 1/2"
PXYCFA0102R	20 X 3/4"
PXYCFA0202R	25 X 3/4"
PXYCFA0303R	32 X 1"

Q-therm DZR Male Pex Elbow

Art. No.	Size / mm
PXYCME0001R	16 X 1/2"
PXYCME0101R	20 X 1/2"
PXYCME0102R	20 X 3/4"
PXYCME0202R	25 X 3/4"
PXYCME0303R	32 X 1"

Q-therm DZR Female Pex Elbow

Art. No.	Size / mm
PXYCFE0001R	16 X 1/2"
PXYCFE0101R	20 X 1/2"
PXYCFE0102R	20 X 3/4"
PXYCFE0202R	25 X 3/4"
PXYCFE0303R	32 X 1"

Q-therm DZR Male Pex Tee

Art. No.	Size / mm
PXYCMT0001R	16 X 1/2"
PXYCMT0101R	20 X 1/2"
PXYCMT0102R	20 X 3/4"
PXYCMT0202R	25 X 3/4"
PXYCMT0303R	32 X 1"

Q-therm DZR Female Pex Tee

Art. No.	Size / mm
PXYCFT0001R	16 X 1/2"
PXYCFT0101R	20 X 1/2"
PXYCFT0102R	20 X 3/4"
PXYCFT0202R	25 X 3/4"
PXYCFT0303R	32 X 1"

Q-therm DZR PEX Connector Straight

Art. No.	Size / mm
PXYCSC0000R	16
PXYCSC0001R	20
PXYCSC0002R	25
PXYCSC0003R	32

Q-therm DZR Connector Elbow

Art. No.	Size / mm
PXYCEC0000R	16
PXYCEC0001R	20
PXYCEC0002R	25
PXYCEC0003R	32

Q-therm DZR Connector Tee

Art. No.	Size / mm
PXYCTC0000R	16
PXYCTC0001R	20
PXYCTC0002R	25
PXYCTC0003R	32

Q-therm DZR Female Pex Elbow Wall Mount

Art. No.	Size / mm
PXYCWM0001R	16 X 1/2"
PXYCWM0101R	20 X 1/2"

THERM
PP-R PIPES & FITTINGS

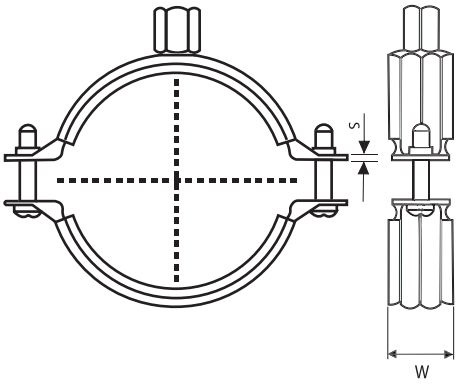
Q-Clamps,

www.quantumindustries.ae

Firmly Embracing your Pipes

- Range 20mm to 200mm
- Made from steel
- Zinc plated
- EPDM lining

Q-Clamps



Feature & Benefits

- Range 20mm - 200mm
- Made from Steel
- Zinc Plated
- EPDM Lining

Art No.	Size (mm)	Range	S X W (mm)	Breaking Load (Kg)	Safe Load (Kg)
1701RC0001N	20	19 - 25	1.2x19	600	200
1701RC0002N	25	24 - 30	1.2x19	600	200
1701RC0003N	32	31 - 36	1.2x19	600	200
1701RC0004N	40	38 - 43	1.2x19	600	200
1701RC0005N	50	47 - 51	1.2x19	600	200
1701RC0006N	63	60 - 64	1.2x19	600	200
1701RC0007N	75	74 - 80	2.0x20	600	200
1701RC0009N	90	82 - 87	2.0x20	600	200
1701RC0010N	110	108 - 113	2.0x20	600	200
1701RC0012N	125	123 - 130	2.0x25	600	200
1701RC0016N	160	159 - 166	2.0x25	600	200
1701RC0020N	200	198 - 205	2.0x25	600	200

NOTES

QUANTUM
INDUSTRIES

كوانتم اندستريز ذ.م.م
Quantum Industries L.L.C
P.O.Box 86488 RAK, UAE.

+971 7 25 89 177
+971 7 25 89 178
@ info@quantumindustries.ae
www.quantumindustries.ae