Uponor Meltaway snow and ice melting system

EN Technical information

Table of contents

1 System description

When open areas are covered with snow and ice, Uponor Meltaway is the right solution. The surface heating system laid into the ground reliably keeps open traffic areas, house entrances, ramps, paths, driveways, etc. free of snow and ice. This prevents dangerous slippery snow and ice and eliminates the need for time-consuming and expensive salt spreading and snow clearing.

The Uponor Meltaway system needs a minimum of +35°C water temperature to perform which means that a wide variety of heat sources can be used, including district heating return water, waste heat from various processes, heat pumps, etc. The heat from any suitable source can be transferred through a heat exchanger to the Uponor Meltaway system.

The basic and easy design consists of Uponor Meltaway PE-Xa pipe with c/c 250 mm and a prefabricated Uponor Meltaway Manifold.

1.1 Applications

Meltaway PE-Xa pipe is used for snow and ice melting in larger premises, such as hangars, workshops and warehouse premises. The supply pipes and distribution pipes for such areas are made of plastic, copper or stainless steel.

The Uponor Meltaway system has been installed in numerous football pitches around Europe.

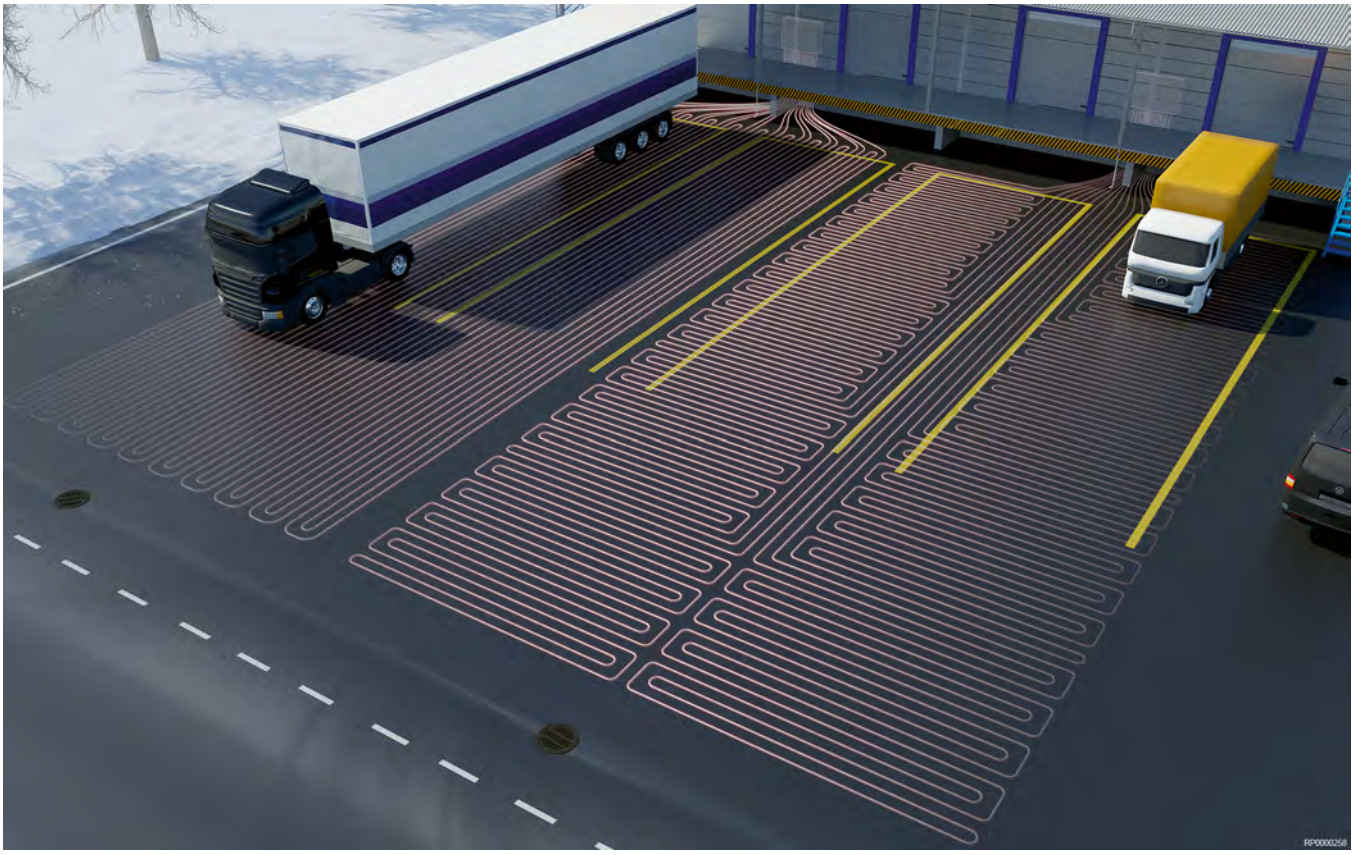
Supply and distribution pipes, including couplings, are of high-density polyethylene (HDPE), so all components are made of the same material, with the same coefficient of linear expansion.

Straight couplings for Meltaway PE-Xa pipe are made of HDPE and have O-ring seals.

1.2 Benefits

- Long-term proven system technology with robust Uponor Meltaway PE-Xa pipes
- Very few system components with only one pipe dimension
- Simple planning and installation
- Eliminates the time and personnel required for gritting and snow removal
- No damage to surfaces due to road salt
- Utilization of unused heat e.g. from industrial production possible

2 Planning/design



This illustration shows an example of a truck loading area with an Uponor Meltaway system design. There are four equal sized (160 m²) melting areas designed using two separate manifolds.

2.1 Basic principle

A fundamental principle of the Uponor Meltaway system is that all loops from a given manifold should be of equal lengths. The heat will then be distributed evenly, without the use of throttling valves. Distribution pipes should be designed using Uponor's Pre-insulated pipe system for industrial buildings. The pipes have an advantage of having a ready insulation and flexibility to install them either into the ground or to the walls.

Uponor Meltaway system can be rated for heat outputs ranging up to 350 W per m². The output required is dependent on the geographical location and the requirements of the system. Thanks to our research work and long experience, we can always recommend an optimum output. The depth of installation and the loop centre-to-centre distance are also matched to the relevant system.

2.2 Design data

Description	Value
Size of the area to be melted	160 m²
Designed effect of the system	200 W/m²
Supply water / return water	35/20 °C
Liquid used water / propylene glycol mix	~65/~35 %
Heat conductivity of the liquid	3,8 kJ/kg °C
Amount of snowfall	20 mm/h
Temperature of the environment	-5 °C
Speed of wind	8 m/s
Relative humidity of the air	40 %
Length of snowfall	5 h
Total amount of yearly snowfall in hours	600 h
Total yearly energy used in estimated area for snow & ice melting	26,100 kWh

The table shows design data and estimated energy consumption data from one of the four uniformly sized melting areas.

2.3 Surfaces

Caution!

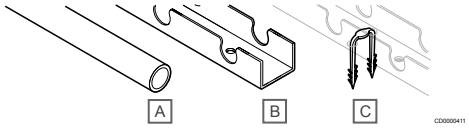
The pipe can be covered with asphalt surfacing at a maximum temperature of 120 °C, provided cold water flows through the pipes while the asphalt is being laid, and that the pipe is kept under pressure of 0,2 MPa.

The system is sufficiently flexible to be integrated with asphalt, gravel, sand or can be cast into concrete slab. For surface heating, the pipe should be laid about 100 mm below the finished surface level and at a pipe distance of 250 mm in order to ensure an uniform temperature at the surface. Mark the U-bends on site before laying the pipes. Fill the system with water and pressurize them before starting surfacing work (internal pressure of 0,2 MPa).

Asphalted surfaces

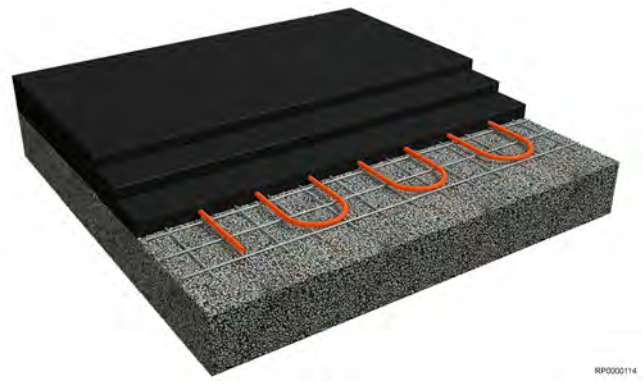
Low wear asphalt

The image shows the basic installation of an asphalted structure with low wear. Mainly used for parking areas and truck loading areas with low traffic.

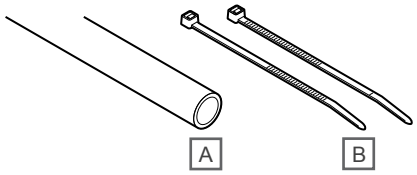


Item	Description
A	Uponor Meltaway PLUS PE-Xa orange
B	Uponor clamp track U-profile
C	Uponor clamp track nail

High wear asphalt



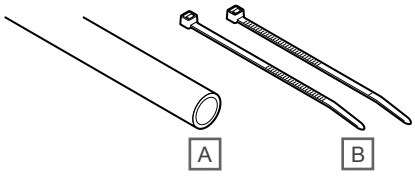
The image shows the installation of an asphalted structure with high wear. The main usage areas are parking area ramps, highly trafficked areas like roads and high truck traffic areas like the roads around logistic centers and so on.



Item	Description
A	Uponor Meltaway PLUS PE-Xa orange
B	Tying wire

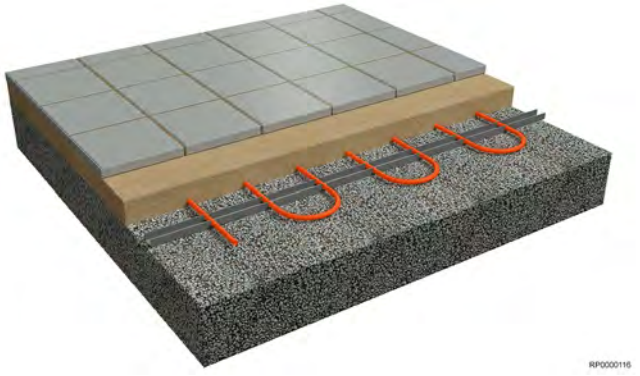
Paving stones

The image shows the installation of a Meltaway system under paving stones. Installation is done using Uponor industrial clamp tracks. The main usage for paving stone areas include pedestrian areas and roads.

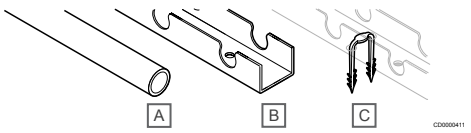


Item	Description
A	Uponor Meltaway PLUS PE-Xa orange
B	Tying wire

Slab-surfaced pavements and surfaces



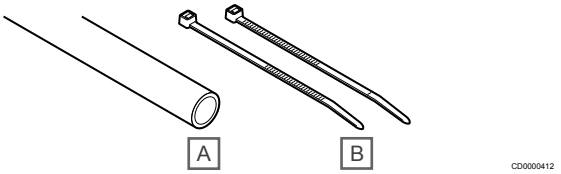
The image shows the installation of a Meltaway system under slab surfaced pavements and surfaces. The main usage is for pedestrian areas.



Item	Description
A	Uponor Meltaway PLUS PE-Xa orange
B	Uponor clamp track U-profile
C	Uponor clamp track nail

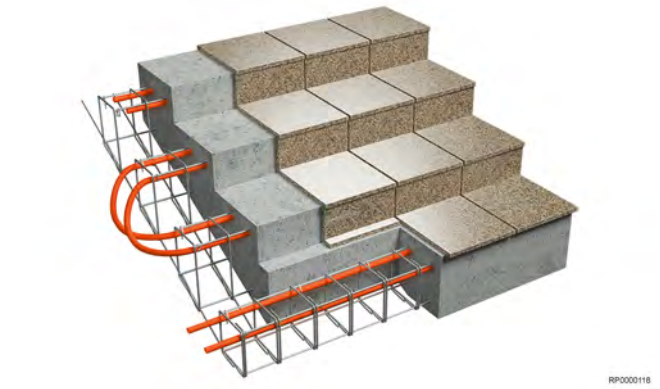
Concrete surfaces

The picture shows the installation of a Meltaway system into concrete cast. The actual concrete solution and its height is calculated according to structural requirements. Concrete structures might be used because of high loads - for example, aeroplane hangars. Another reason for using a concrete slab can be for walking areas that are tiled instead of laid using paving stones.

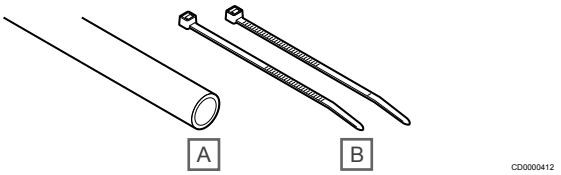


Item	Description
A	Uponor Meltaway PLUS PE-Xa orange
B	Tying wire

Stairs

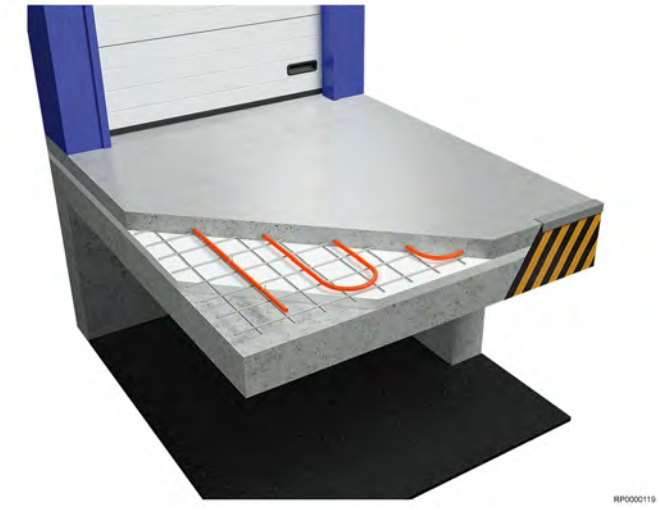


The image shows an example of an Uponor Meltaway system and how Uponor PE-Xa pipes can be installed to a steel reinforcement in concrete staircase.

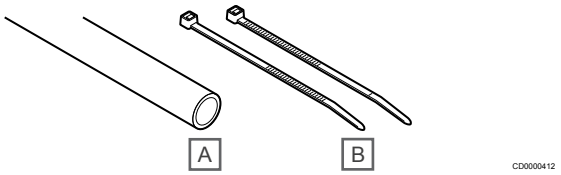


Item	Description
A	Uponor Meltaway PLUS PE-Xa orange
B	Tying wire

Deck structures



The need for insulation is normally low because of the high temperature difference between the heated surface outdoors and the ground. But when designing deck structures, like loading areas or bridges, the structure will also cool from underneath. In these cases it is recommended to use insulation in the structure to prevent heat loss downwards.



Item	Description
A	Uponor Meltaway PLUS PE-Xa orange
B	Tying wire

3 Installation and operation

The Uponor Meltaway system is normally installed just underneath the surface layers of the structure. The structural requirements and load-bearing characteristics of such areas must be determined to ensure that predicted loads will not cause the piping to break. The Uponor Meltaway system will not reduce structural requirements.

3.1 Installation technique

Uponor Meltaway is not an oxygen diffusion tight system and must not be connected to other heating systems without a heat exchanger between the two. Store Meltaway PE-Xa pipes indoors, or outdoors under a tarpaulin. Do not remove the black packaging. An extended period of storage in sunlight will damage the product.

The pipe can be covered with asphalt, gravel, sand and slab or can be cast into concrete. For surface heating, the pipe should be laid about 100 mm below the finished surface level and at a centre-to-centre distance of 250 mm in order to ensure a uniform temperature on the surface. Mark the U-bends on site before laying the pipes.

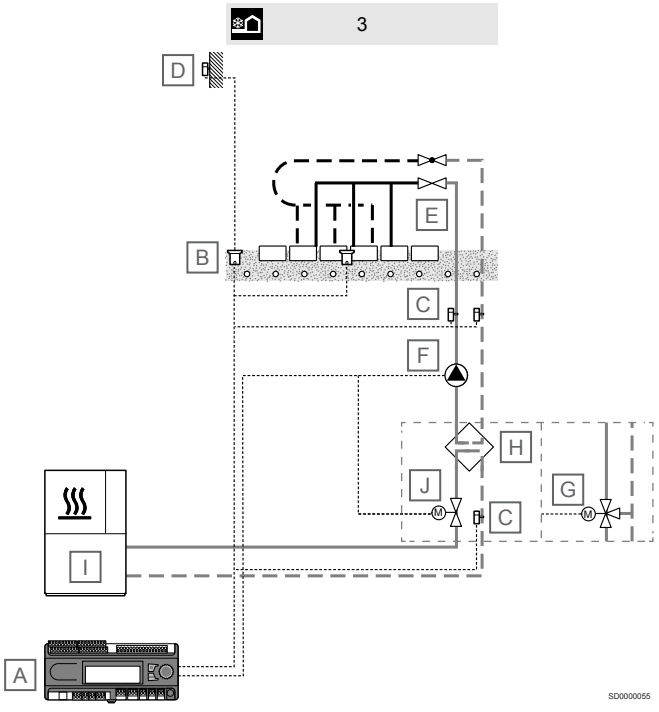
When Meltaway pipes are laid, they should be secured in position with spacers which should be removed when the pipes are covered, or using plastic holder bands that remain. In a concrete installation the pipe is fixed using tying wire. The pipe can be covered with asphalt surfacing at a maximum temperature of 120 °C, provided cold water flows through the pipes while the asphalt is being laid, and that the pipe is kept under pressure of 0,2 MPa.

The pipe is made of silane cross-linked polyethylene (XLPE). Meltaway PEX pipe is soft and easy to handle. Use butt welding for jointing the supply pipes and the distribution pipes.

3.2 Meltaway controls

Note

These are outline diagrams. Real systems must be installed according to applicable norms and regulations.



Item	Description
A	Uponor Smatrix Move PRO X-159 Supply temperature controller, with with heating application
B	Uponor Smatrix Move PRO S-158 Snow sensor
C	Uponor Smatrix Move S-152 Supply/return temperature sensor
D	Uponor Smatrix S-1XX Outdoor temperature sensor
E	Tichelmann Manifold/Manifold with actuator
F	Circulation pump
G	3 way mixing valve with 0-10 V actuator
H	Heat exchanger
I	Heat source
J	Valve with 0-10 V actuator

This application example shows an Uponor Smatrix Move PRO supply temperature controller (with the heating or heating/cooling application installed) in a Snow melt setup (Meltaway function).

More application and controls schemes including Meltaway with underfloor heating in commercial and residential applications can be found in Uponor TI Smatrix.

3.3 Ground installations

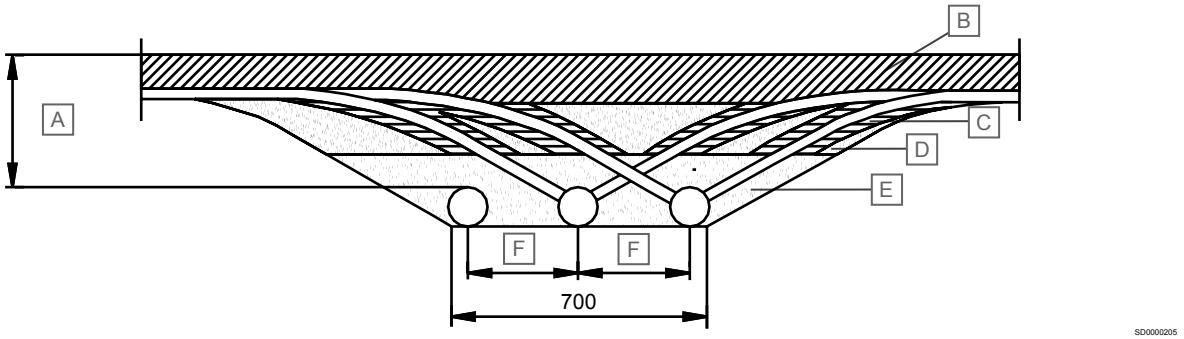
As a rule, cement-bound hard aggregate screeds are selected as the wearing course. In DIN 18560, Sheet 5, the respective layer thicknesses are arranged according to the stress groups. The supporting concrete, in which the heating emitters are laid, must meet the static and construction requirements as well as at least strength class B 25 according to DIN 1045.

Uponor PE-Xa pipes cannot assume any static function. The surface layer (roadway, ramp, etc.) must be calculated according to the expected loads. The Uponor support mat can be included in the calculation if necessary. In the case of asphalt pavements, it must be ensured that no hot asphalt reaches the pipes (e.g. by arranging a protective screed).

In addition, it is mandatory to have circulating water during the asphalt laying until asphalt surface temperature is below 50 °C.

Distribution pipes

Pipe trench for distribution pipes in roadways



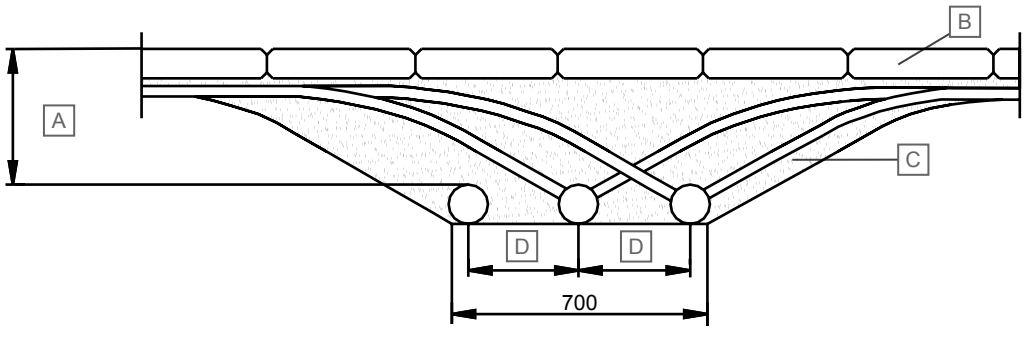
Item	Description
A	approximately 500 mm
B	Ordinary surfacing
C	Asphalt
D	Load-carrying layer of gravel
E	Sand

Item	Description
F	Center-to-Center 300 mm

The sand should be 10 cm above the crown of the pipe and should be compressed with water.

Bed in accordance with local standards.

Pipe trench for distribution pipes in pavements



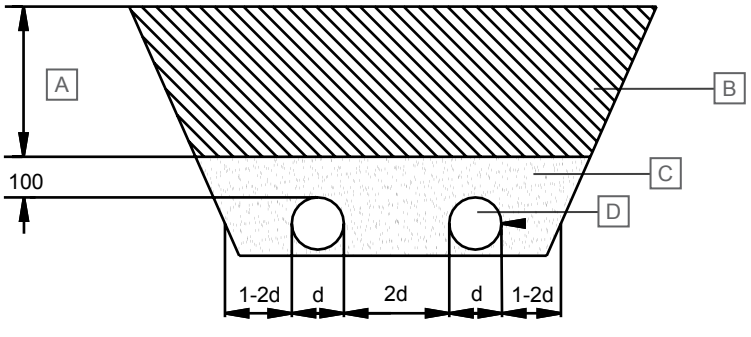
Item	Description
A	approximately 500 mm
B	Concrete slabs
C	Sand

Item	Description
D	Center-to-Center 300 mm

Bed in accordance with local standards.

Supply pipes

Pipe trench for supply pipe without insulation

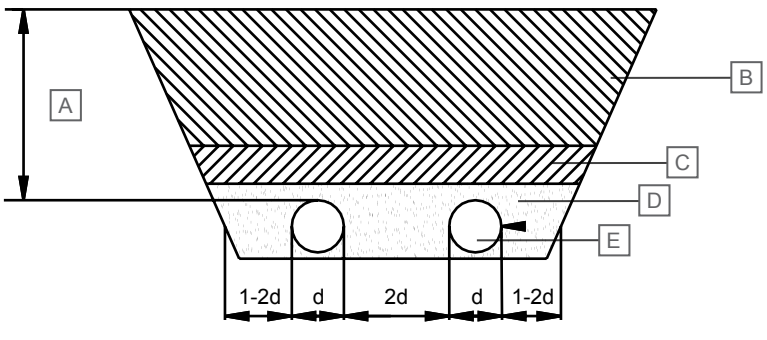


Item	Description
A	approximately 400 mm
B	Material excavated earlier, 50 mm max. stone size
C	Sand compressed with water

Item	Description
D	Supply pipe

Bed in accordance with local standards.

Pipe trench for supply pipe with insulation



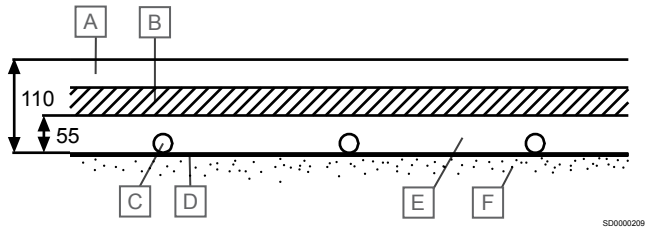
Item	Description
A	approximately 500 mm
B	Material excavated earlier, 50 mm max. stone size
C	Insulation

Item	Description
D	Sand compressed with water
E	Supply pipe

Bed in accordance with local standards.

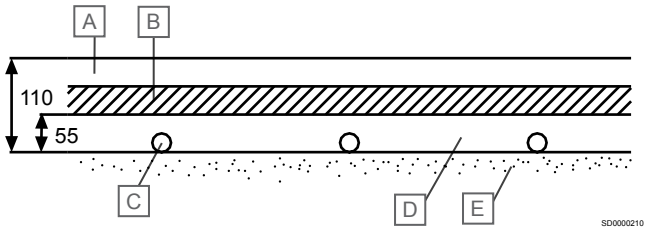
Uponor Surface Heating System

Asphalted surfaces

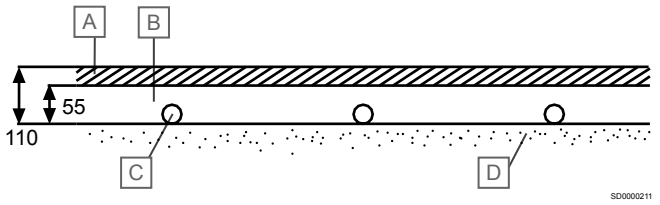


Item	Description
A	Wear layer of asphalt
B	Protective layer of asphalt
C	Heating loops
D	Asphalt support layer
E	Layer of asphalt (max 120 °C)
F	Support layer of natural gravel 0-18 mm* or crushed gravel 0-8 mm

*) A mixture of natural gravel with stones in sizes 0-18 mm



Item	Description
A	Wear layer of asphalt
B	Protective layer of asphalt
C	Heating loops
D	Layer of asphalt (max 120 °C)
E	Concrete



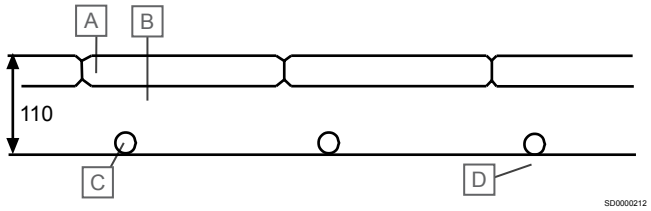
Item	Description
A	Wear layer of asphalt
B	Layer of natural gravel 0-18 mm* or crushed gravel 0-8 mm
C	Heating loops
F	Support layer of natural gravel 0-18 mm* or crushed gravel 0-8 mm

*) A mixture of natural gravel with stones in sizes 0-18 mm

Slab-surfaced pavements and roadways

Note

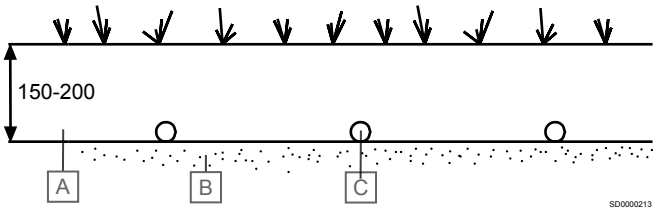
Special asphalt is to be used, "fluxed bitumen" (max 120 °C).
Follow the conditions outlined in 3.3 "Ground installations".



Item	Description
A	Concrete slabs
B	Sand or crushed gravel 0-4 mm
C	Heating loops
D	Support layer of natural gravel 0-18 mm* or crushed gravel 0-8 mm

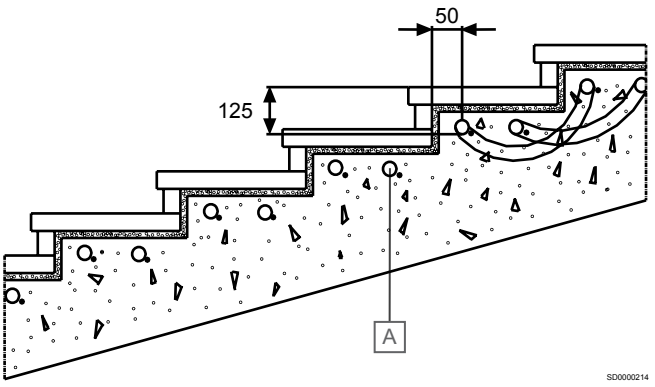
*) A mixture of natural gravel with stones in sizes 0-18 mm

Grassed surfaces



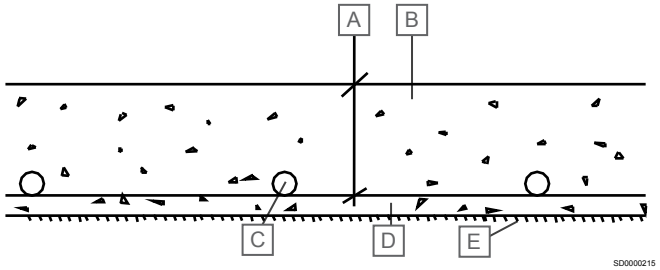
Item	Description
A	Grass bed
B	Drainage
C	Heating loops

Steps



Item	Description
A	Heating loops tied to the reinforcement

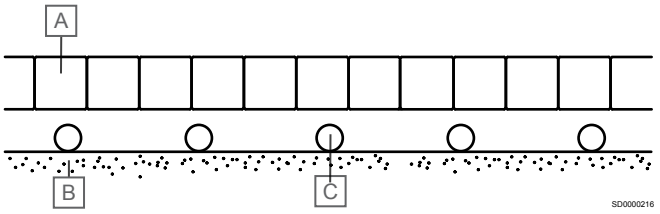
Concrete surfaces



Item	Description
A	90-145 mm (Ground heating) 75-250 mm (Surface heating)
B	Concrete
C	Heating loops
D	Reinforcement
E	Support layer: Concrete, Natural gravel 0-18 mm* or Crushed gravel 0-8 mm

*) A mixture of natural gravel with stones in sizes 0-18 mm

Paving stones



Item	Description
A	Paving stones
B	Support layer
C	Sand layer covering 30-40 mm above the pipe

3.4 Heating performance requirement

Outdoor temperature	Low wind location	Windy location
-5 °C	ca. 70 W/m²	ca. 120 W/m²
-10 °C	ca. 120 W/m²	ca. 220 W/m²
-15 °C	ca. 180 W/m²	ca. 350 W/m²

The power required to prevent ice and snow build-up depends on the minimum outside temperature. The table contains guide values.

With additional surface coverage, e.g. asphalt or gravel, the outputs are reduced in accordance with the least favorable thermal conductivity values or the required heating water temperatures are increased. To prevent heat loss, it is recommended to install a thermal insulation layer under the pipelines. This thermal insulation must be resistant to moisture; perimeter insulation has been tested in this application and should also largely retain its thermal insulation properties.

3.5 Frost protection

Note

Regional water regulations may require special requirements for the antifreeze to protect water bodies and groundwater in the event of an emergency.

Uponor Multi anti-freeze agent ethylen is released for use in Uponor Meltaway pipes. Please refer to the following table for the required mixing ratio:

Minimum heating water temperature	Volume-share GNF
-12 °C	25 %
-16 °C	30 %
-20 °C	35 %
-25 °C	40 %
-30 °C	45 %

3.6 Meltwater

The proper drainage of the thawed water is crucial for the function of Uponor Meltaway. Ensure that a sufficent number of water drains are included. It must be avoided that water runs off towards the cold edges and leads to ice formation there.

4 Technical data

4.1 Technical specification

Uponor Meltaway PEX Pipe

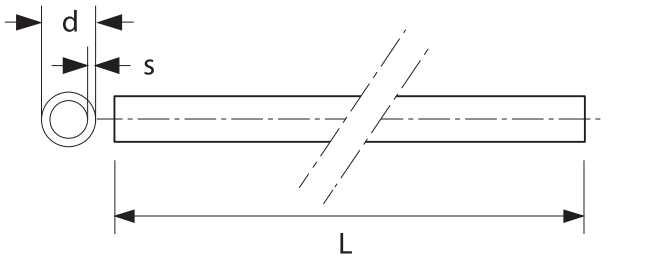
Description	Value
Pipe dimensions	25 x 2,3 mm
Material	PE-Xa
Manufacture	As per EN ISO 15875
Density	0,938 g/cm³
Thermal conductivity	0,35 W/mK
Linear expansion coefficient	
• 20 °C	1,4 x 10^{-4} 1/K
• 100 °C	2,05 x 10^{-4} 1/K
Crystalline melting temperature	133 °C
Material class	E
Min. bending radius	200 mm
Surface roughness of pipe	0,007 mm
Water content	0,33 l/m
Range of heating application	70 °C/7,2 bar
Maximum continuous operating pressure (water at 20 °C)	15,4 bar (safety factor ≥ 1,25)
Maximum continuous operating pressure (water at 70 °C)	7,2 bar (safety factor ≥ 1,5)
Pipe connections	Connector couplings and clamp ring screw connections, Q&E joints, type Uponor 25 x 2,3
Preferred installation temperature	≥ 0 °C
Approved water additive	Uponor Multi anti-freeze agent ethylen
UV protection	Use opaque cardboard (unused portion must be stored in the box)

Meltaway manifold

Description	Value
Connection dimensions	G 1½
Max. operating temperature	70 °C
Max. operating pressure	6 bar
Max. test pressure	10 bar (24 h, ≤ 30 °C)
kvs value inlet/outlet valves	2,35 m³/h
Max. flow rate per manifold	10 m³/h
Maximum number of loops	20

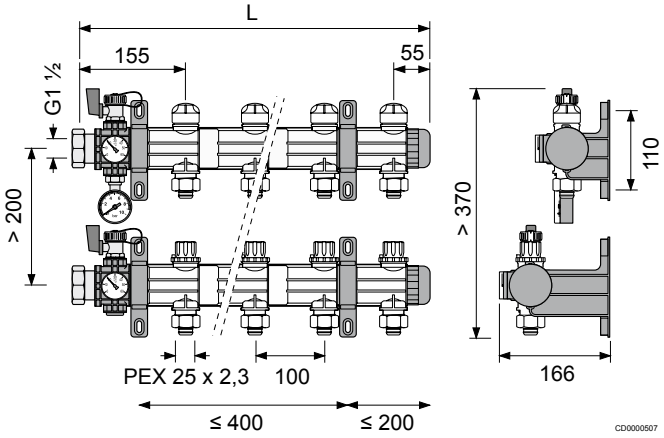
4.2 Dimensions

Meltaway pipe



d [mm]	s [mm]	L [m]
25	2,3	640

Meltaway manifold



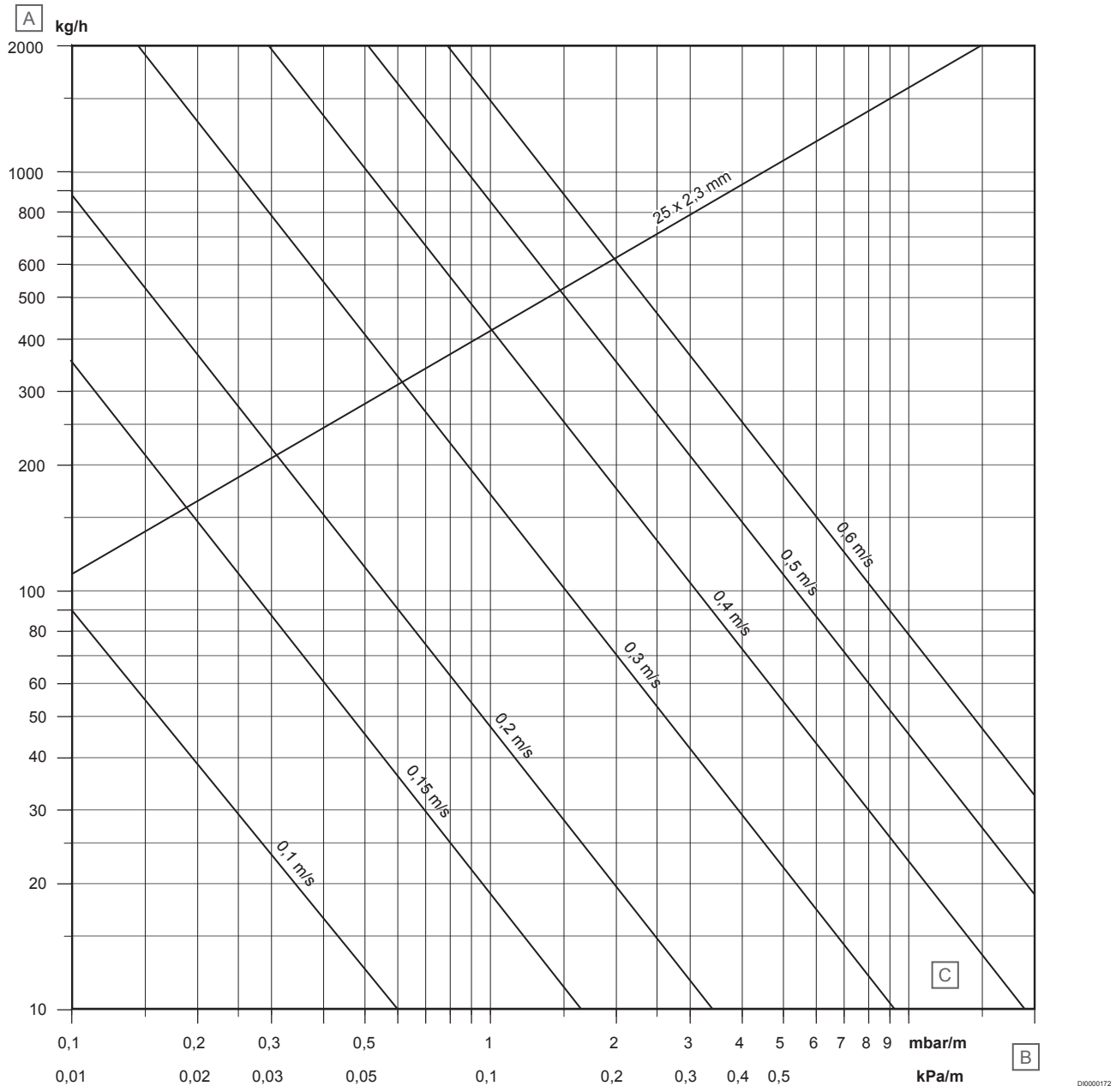
Circuits	2	3	4	5	6	7	8
L [mm]	310	410	510	610	710	810	910

Circuits	9	10	11	12	13	14
L [mm]	1010	1110	1210	1310	1410	1510

Circuits	15	16	17	18	19	20
L [mm]	1610	1710	1810	1910	2010	2110

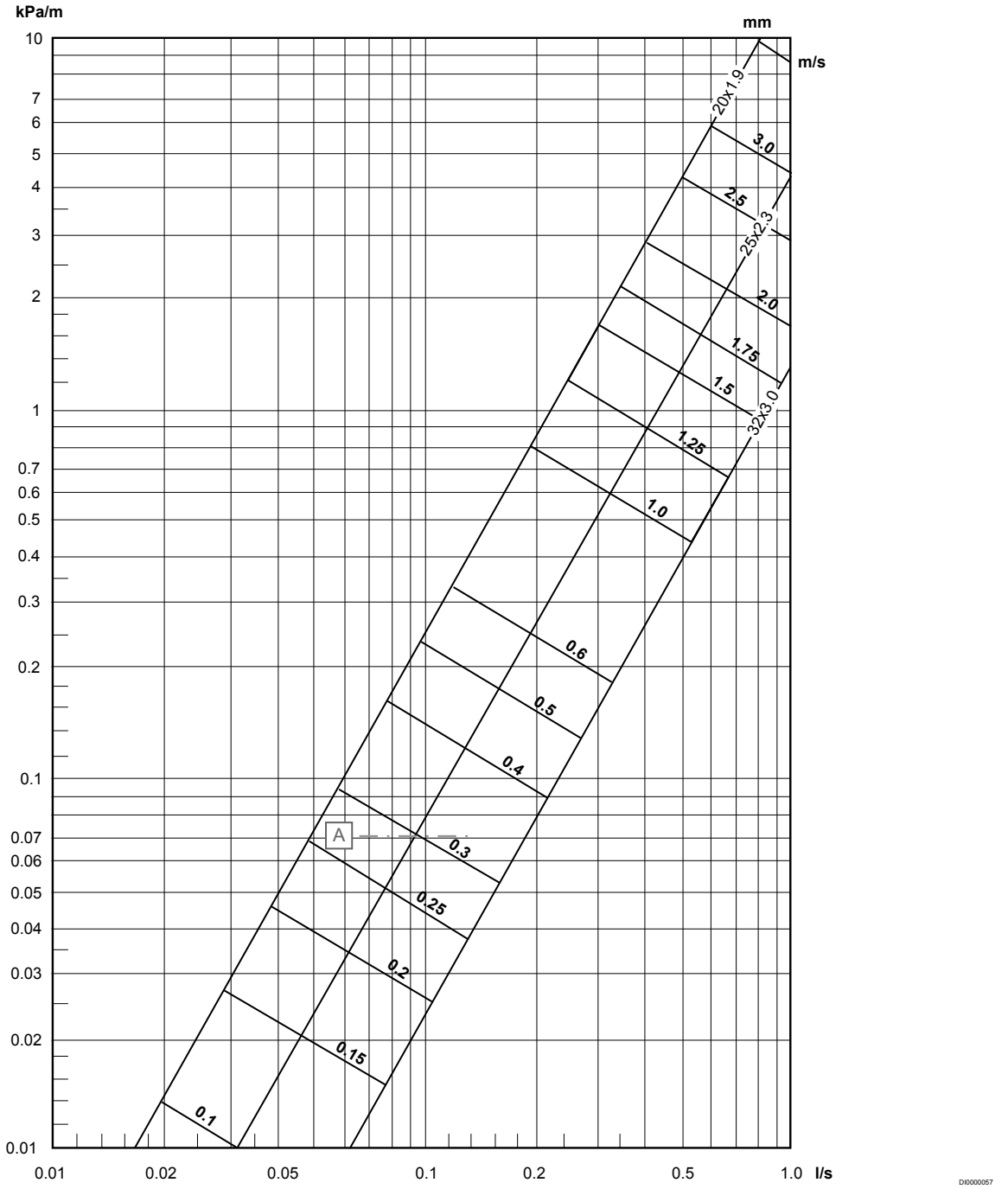
4.3 Pressure loss diagrams

Uponor PE-Xa pipe 25 x 2,3 mm



Item	Description
A	Mass flow rate [kg/h] m
B	Pressure difference R
C	Medium: water

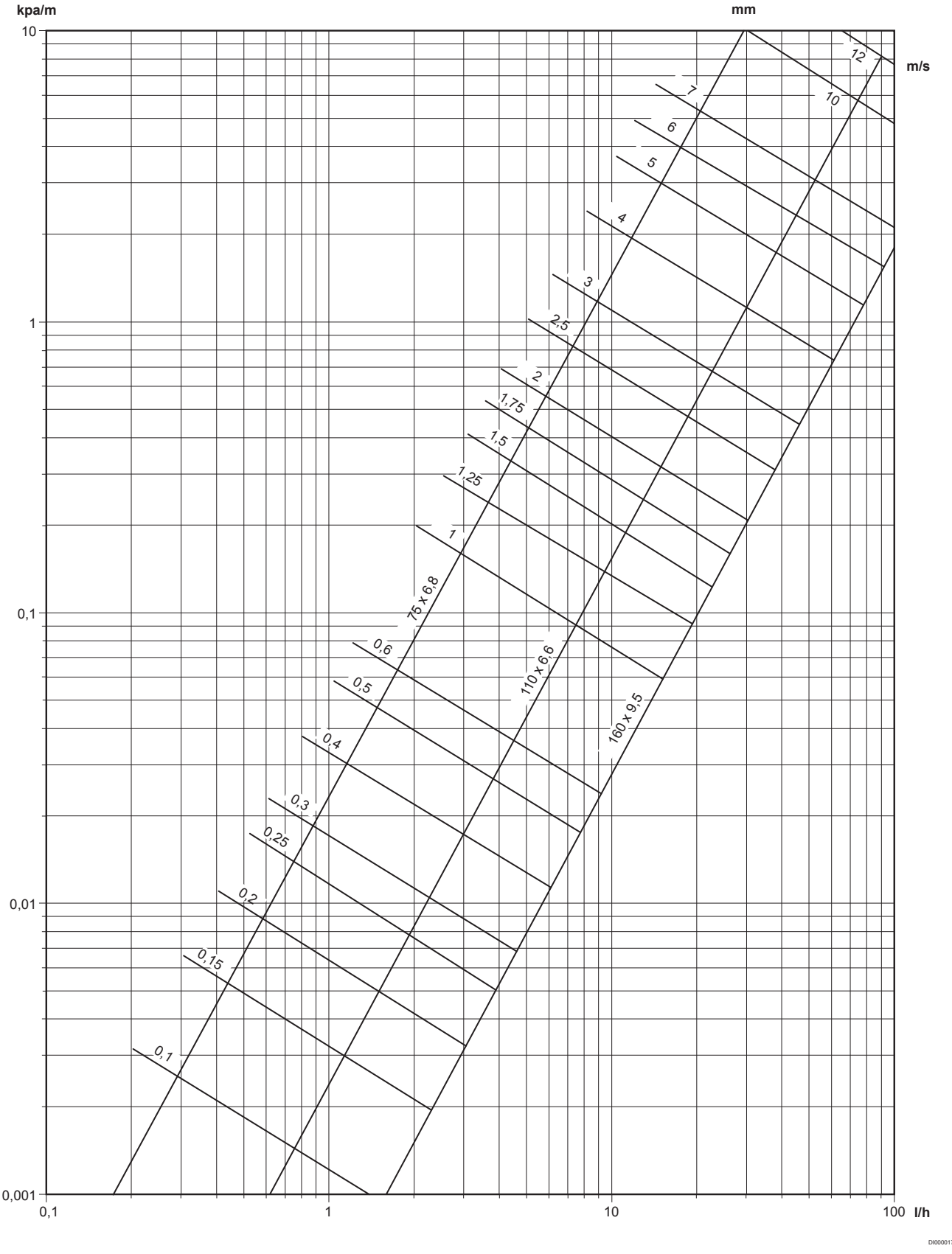
Uponor Meltaway PEX Pipe 25 x 2,3 mm



The nomogram is calculated at a water temperature of +70 °C.

Item	Description
A	Minimum water speed to achieve self-ventilating function.

Meltaway supply and distribution pipes



The nomogram is calculated at a water temperature of +20 °C.

Uponor GmbH

Industriestraße 56,
D-97437 Hassfurt, Germany

1121160 v1_12_2021_EN
Production: Uponor/ELO/ALO

www.uponor.com