uponor

Build on Uponor with Thermatop M

Suspended, seamless heating/cooling ceilings

BUILD ON uponor 100 YEARS

Uponor Thermatop M – the seamless plasterboard heating

System description/fields of application

Uponor Thermatop M is a water-based heating and cooling ceiling system that operates primarily according to the radiation principle and is characterised by a variety of application and design options.

With this design seamless and directionless ceiling surfaces can be created for special architectural demands. The construction method adjusts itself to the requirements for flexible room design, high heating and cooling output and difficult room geometries with unvarying functionality. The Uponor Thermatop M heating / cooling ceiling system allows a comfortable room climate. Illumination elements and further components, such as loudspeakers, sprinklers, etc., can be integrated into the ceiling without any problems.

Quick and tool-free installation of the standardised registers by clicking the fixing rails into the CD profiles of the ceiling substructure.

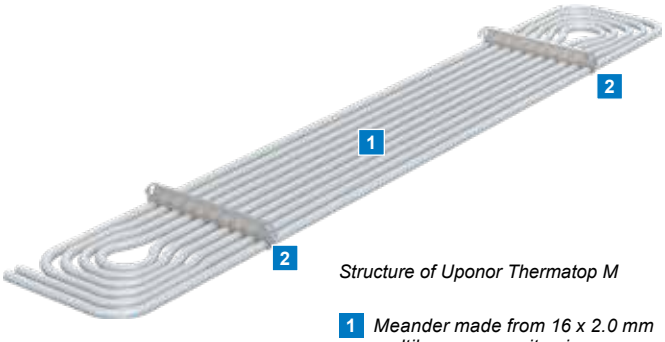
Your benefits:

- Seamless and directionless ceiling surfaces for special architectural requirements
- High heating and cooling capacities thanks to large, thermally-active pipe surface and good contact with gypsum board
- High sound absorption coefficients thanks to open cross-section between the profiles
- Clear separation of trades between drywall construction and building technology
- Idealy suited for renewable energy sources, e.g. geothermal energy and heat pumps
- 100% diffusion resistance thanks to use of multilayer composite pipe
- No draughts and no noise
- Integration of lighting, air vents, fi re alarm systems, sprinklers, speakers etc. possible

Construction

Structure of the heating/cooling elements

The heating and cooling elements consist of machine-made meanders made from multilayer composite piping that is fixed in place with fixing rails. The fixing rails have spring clips that allow quick, easy and tool-free assembly on the CD profiles of the ceiilng substructure.



Structure of Uponor Thermatop M

1 *Meander made from 16 x 2.0 mm multilayer composite pipe*

2 *Fixing rail with spring clip*

Ceiling structure

The Uponor Thermatop M heating and cooling elements can be installed on conventional substructures (on site) in the same way as is familiar from drywall construction (CD profiles). For this, the heating and cooling elements are suspended between the CD profiles. The on side cladding of the ceiling with gypsum boards (perforated or non-perforated, standard or with high thermal conductivity) and filling are performed in accordance with drywall construction guidelines. Conventional emulsion paint is used to treat the surface of the panels. The panels are primed before applying the paint or coating.

Ceiling panel with plaster/thermoboard

The plaster/thermoboards are designed especially for use with ceiling or wall cooling and heating systems. Their special material properties ensure optimum heat transfer. Because of the good thermal conductivity optimum surface area-related capacity values can be expected. The boards are non-combustible and fall under building material class A2. They can be efficiently processed with the conventional drywall construction tools.

In addition to the plaster/thermoboards described, other variations of ceiling lining can be used for customized panelling of the heating/cooling coils.

Surface treatment
Various options are available for the finishing the visible surface including: filling of the joints and terminations for different levels of quality or painting with opaque latex paint. For acoustically effective surfaces with hidden perforation, open pore special paints and an additional protection against air fl ow are required. The use of acoustic plasters reduces the capacity of the chilled ceiling. The boards are primed before applying paint or a coating. We recommend the following coatings:

Paint
Wash and scrub resistant
synthetic latex paint
Oil paint
Matt lacquer paint
Alkyd resin paint
Polymer resin paint
Polyurethane paint (PUR)

Wall paper
Paper, textile and synthetic wallpaper

Plasters
Mineral-based acoustic plaster for excellent acoustics (carrier fleece laminated to perforated ceiling panels – perforation is therefore not visible)

Surface qualities
Proper surface fi nishing is regulated according to DIN 18180 and includes the following levels:

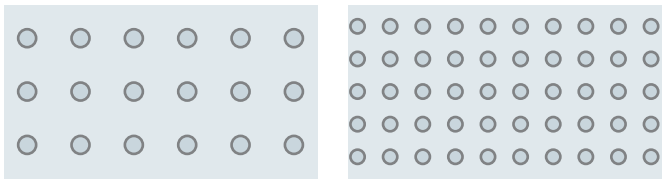
- Quality Level 1 (Q1) – a basic filling (Q1) is sufficient for surfaces with no special requirements. This includes filling the joints and the concealment of fastening elements.
- Quality Level 2 (Q2) – corresponds to standard quality and meets the normal requirements for wall and ceiling surfaces with medium to coarse-textured wall coverings or matt fi lling paints and top coats.
- Quality Level 3 (Q3) – increased demands on the fi lled surface.
- Quality Level 4 (Q4) – highest demands on the fi lled surface. In addition, the manufacturer's specifi cations are to be observed.

Perforation
The ceiling panels are available with different perforations, as random, regular, staggered or square perforations. Even demanding custom-made perforation patterns or designs are available on request. Perforated ceiling panels come equipped with acoustic fl eece as a standard.

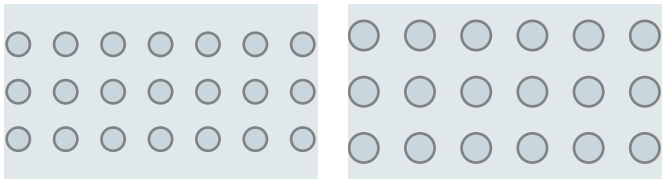
Sound absorption cooling/heating ceilings with plasterboard lining:
- Ceiling panel with visible perforation
- Ceiling panel with hidden perforation through acoustic paint coating
- The selected perforation pattern affects the sound absorption performance of the ceiling panels. The highest sound absorption coefficient is usually obtained with a perforation percentage between 10 and 20 %.

The sound absorption values move into the high frequency range at suspension heights less than 120 mm (special case). Greater suspension heights, however, lead to an increase of the sound absorption coefficient in the low frequency range. There is only a slight change in the values once the air cavity reaches 500 mm.

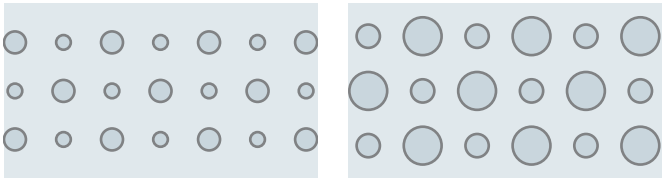
Examples of perforation patterns (not to scale)



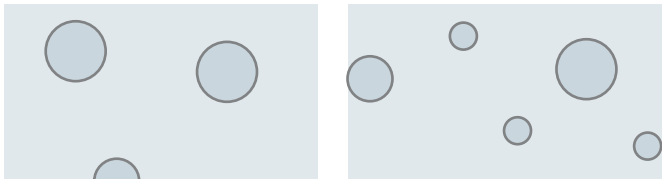
Regular perforation
on the left 6/18
on the right 8/18



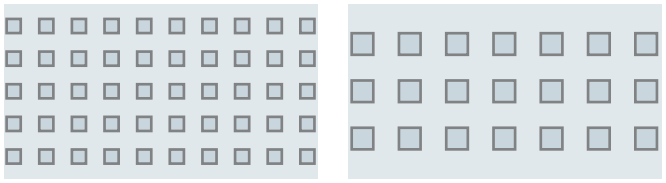
on the left 12/25
on the right 15/30



Staggered perforation
on the left 8-12/50
on the right 12-20/66



Random perforation
on the left 8-15-20
on the right 12-20-35

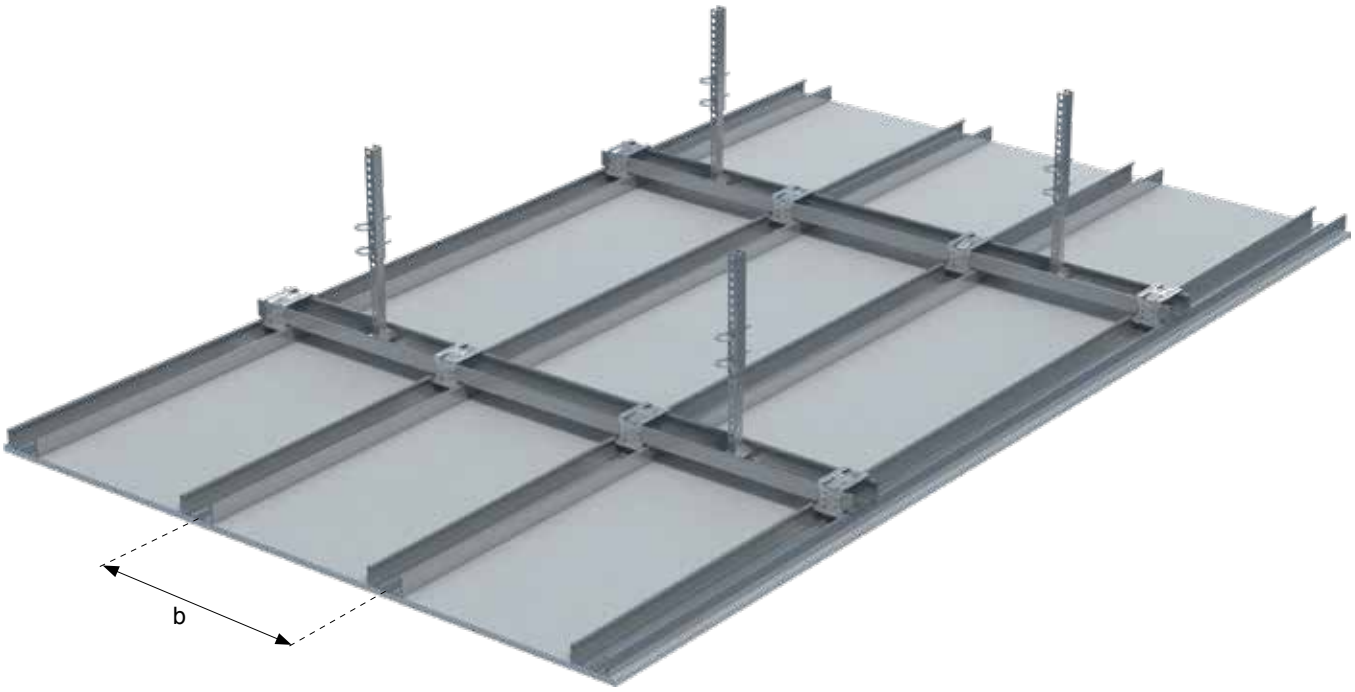


Regular
square perforation
on the left 8/18Q
on the right 12/25Q

Planning instructions

Substructure (on site)

The substructure is made from CD 60/27 ceiling profiles according to DIN 18182 and DIN EN 14195. The planning/ assembly guidelines of the ceiling manufacturer must also be observed here. The axial spacing between the furring channels is 333 mm.



Design instructions

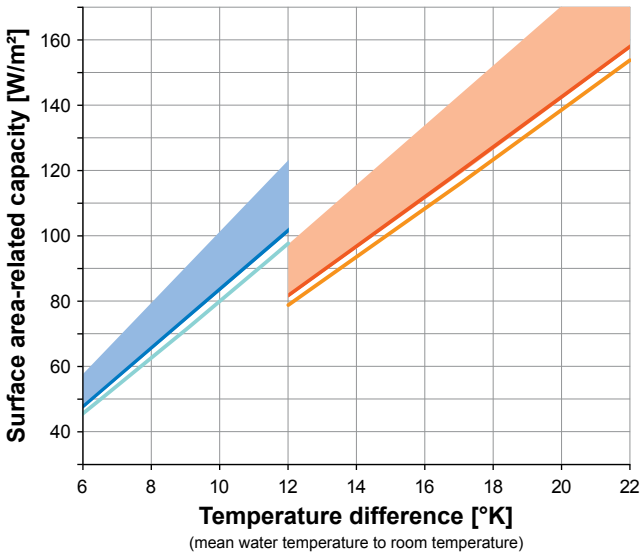
Cooling and heating capacity

The heat transfer in closed, flat chilled ceilings under the test conditions according to DIN EN 14240 (closed test chamber, evenly distributed heat sources, adiabatic boundary surfaces) is characterized largely by radiative heat exchange with the surrounding surfaces and heat sources as well as convection on the bottom side of the cooling ceiling.

The conditions specified in the norm test represent the worst-case scenario. Under practical operating conditions a higher surface areарelated cooling capacity is achieved.

The approximate cooling and heating values under standard conditions or realistic installation conditions can be taken from diagram on the right. The capacity is read as a function of the temperature difference between the mean water temperature and the room temperature.

Heating/cooling capacity of Uponor Thermatop M, tested according to DIN EN 14240 and DIN EN 14037



- nominal cooling capacity of non-perforated panel
- nominal cooling capacity of perforated panel
- nominal heating capacity of non-perforated panel
- nominal heating capacity of perforated panel

Areas of capacity increase under actual installation conditions:

- Area of capacity increase up to 22 % (warm façade and edge joint)
- Area of capacity increase up to 20 % (ventilation control, air movement from ceiling to floor)

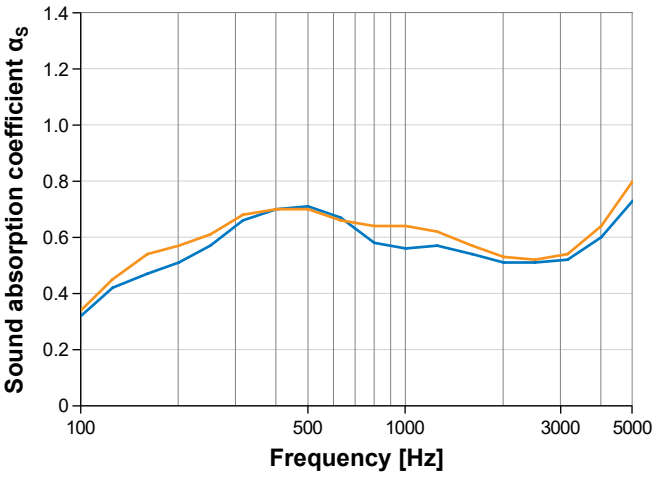
Sound absorption

The sound absorption values of the systems with visible perforated ceiling panel with and without mineral wool are listed in the diagram on the right as a sound absorption coefficient αS. The weighted sound absorption coefficient αW was calculated according to DIN EN ISO 11654.

Note

Installing Uponor Thermatop M heating/cooling registers changes the sound absorption level only very slightly compared to a standard ceiling.

Sound absorption of Uponor Thermatop M, tested according to DIN EN ISO 354

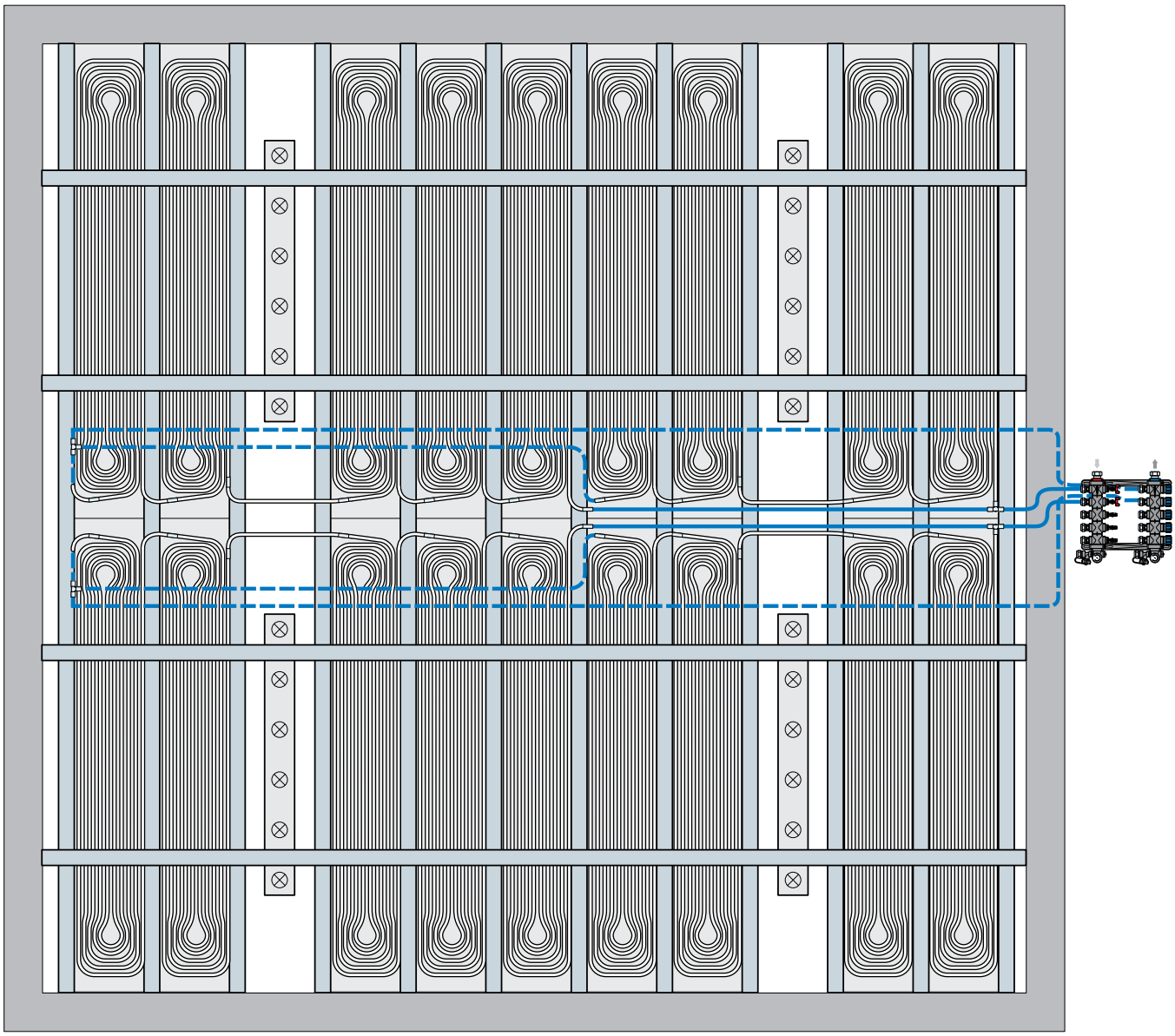


- Uponor Thermatop M, with mineral wool layer α_w = 0.65 (sound absorption class C)
- Uponor Thermatop M, without mineral wool layer α_w = 0.55 (sound absorption class D)

Suspension height 200 mm,
mineral wool layer 20 mm, Knauf Insulation TP 120A approx. 0.54 kg/m²,
weighted sound absorption coefficient α_w according to DIN EN ISO 11654

Design example

Ceiling design and hydraulic connection of Uponor Thermatop M



A reflected ceiling plan should be used as a basis for planning. If this does not exist, it must be checked whether the ceiling has fittings and if so, where. The furring channel grid with a spacing of 333 mm (the guidelines for drywall construction must be observed) is drawn onto the reflected ceiling plan. The requisite quantity and length (according to design) of Uponor Thermatop M registers are configured between the furring channels. Recesses can easily be made for fittings such as lamps, air outlets or speakers.

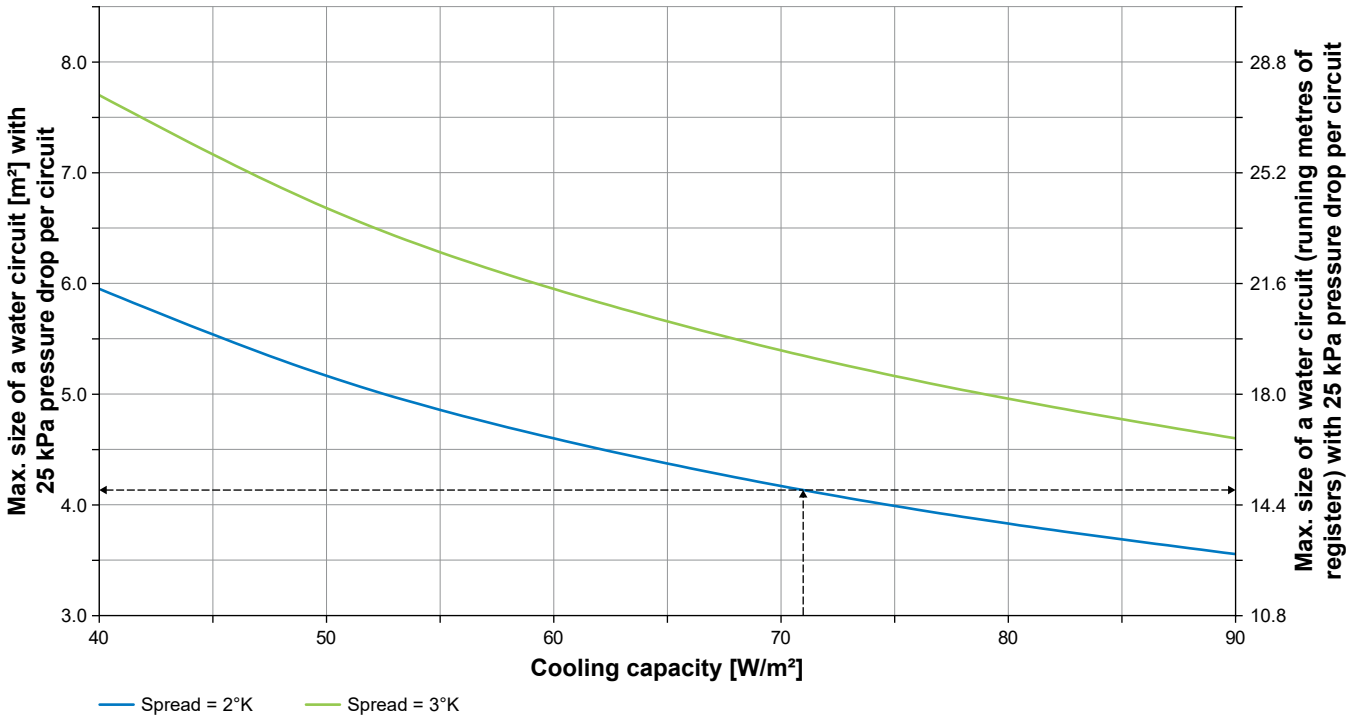
The registers are connected to water circuits (observe max. water circuit size) in series. The individual water circuits are connected through connection line direct or at the Tichelmann principle (please note that the water circuits should be the same size) to a manifold or a floor pipework.

Please refer to the charts on pages 7, 9 and 10 for the values for the capacity, maximum water circuit size and the pressure loss in the registers and connecting lines.

Calculation of maximum size of a water circuit (example)

Room	Office, with perforated gypsum board ceiling
Room temperature	26°C
Cooling load	1,000 W
Supply temperature	16°C
Return temperature	18°C
Linear temperature difference	9 K
Spread ΔT	**2 K**
Cooling capacity	**71 W/m²** (from heating/cooling capacity table for Uponor Thermatop M)
Max. size of a water circuit	**4.1 m²** (from chart below)
Requisite laid area	1,000 W/71 W/m² = 14.1 m²
Selected register	2,150 x 277 mm = 0.60 m²
Number of registers	14.1 m²/0.6 m² = 23.5 pieces -> 24 pieces
Total area of registers	24 x 0.60 m² = 14.40 m²
Total cooling capacity	14.40 m² x 71 W/m² = 1,022 W
Total flow rate	m = Q/c x ΔT m = 1,022 Watt / 1.163 Wh/kg*K x 2 K = 439 kg/h (l/h)

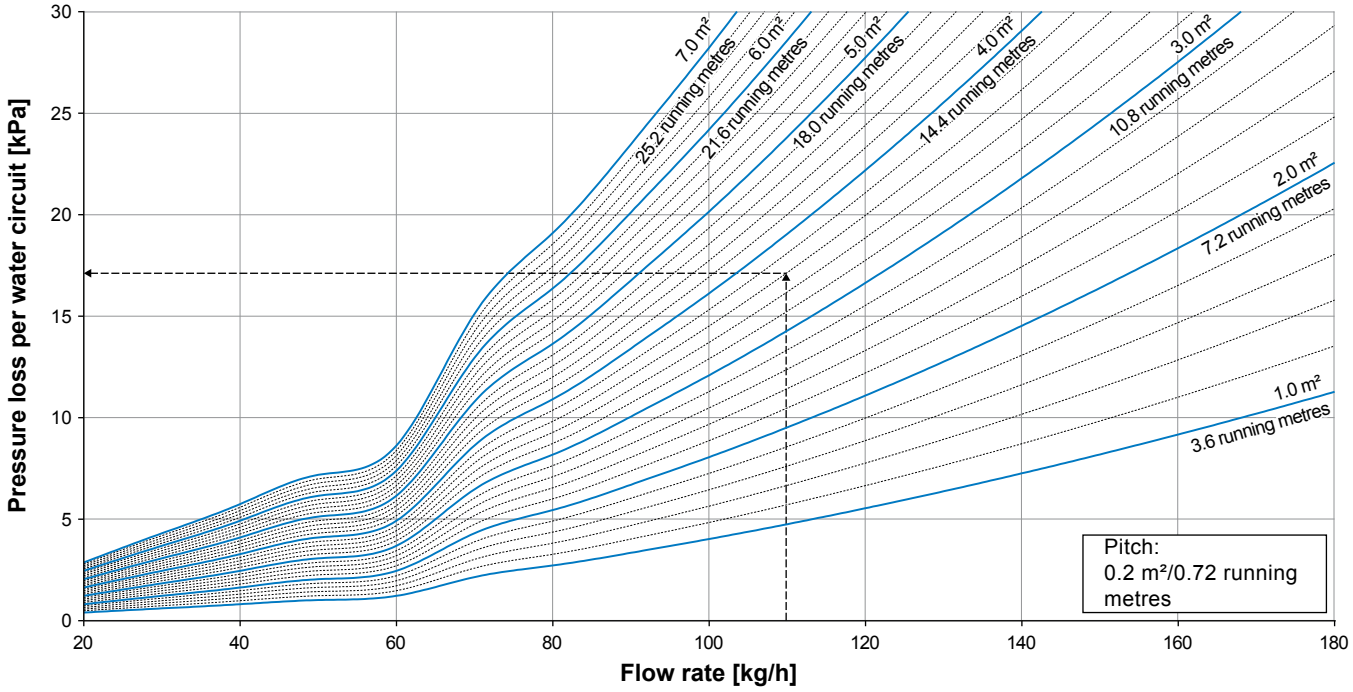
Cooling capacity	71 W/m² x 0.277 m = 19.8 W/running metre of register
Max. size of a water circuit	14.8 running metres of register
Requisite laid length	1,000 W / 19.8 W/running metre = 50.5 running metres
Selected register	2,150 x 277 mm
Number of registers	50.5 running m/2.15 m = 23.5 pieces -> 24 pieces
Total length of registers	24 x 2.15 m = 51.6 running metres of register
Total cooling capacity	51.6 running metres x 19.8 W/running metre = 1,022 W



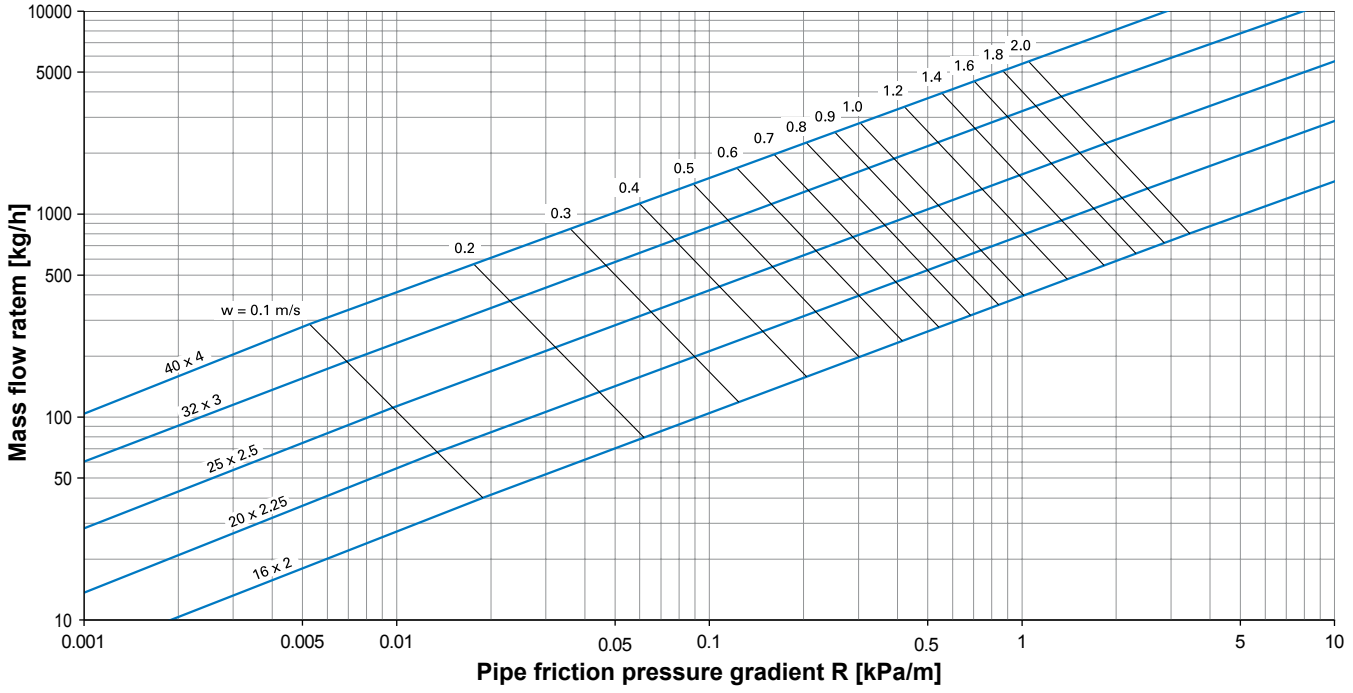
Calculation of pressure loss per water circuit (example)

Size of water circuit in m²	6 x 0.60 m² = **3.60 m²**
Water circuit cooling capacity	3.60 m² x 71 W/m² = 256 W
Water circuit flow rate	m = 256 Watt / 1.163 Wh/kg*K x 2 K = **110 kg/h**
Water circuit pressure loss	**17 kPa** No connecting line (from chart below)

Size of water circuit in running metres of register	6 x 2.15 m = **12.9 running metres**
Water circuit cooling capacity	12.9 running metres x 19.8 W/ running metre = 256 W



Pressure loss in connecting line



Technical features

Uponor Thermatop M	
Ceiling cladding	Plaster/Thermoboard (standard board thickness s = 10 mm), other ceiling claddings available on request
Ceiling design	Non-perforated, or with visible or hidden perforation
Surfaces	Paints, wallpapers or plasters
Standard module lengths	95 cm, 135 cm, 175 cm, 215 cm, 255 cm
Multilayer composite pipe	Outer diameter d_a = 16 x 2.0 mm
Surface weight	approx. 8.5 kg/m² (operating weight)
Water content	approx. 4.3 l/m²
Construction height	54 mm (without the board thickness)
Cooling capacity in accordance with DIN EN 14240	At $\Delta\vartheta$ = 8 K, non-perforated panel 65 W/m² With asymmetrical load distribution and 30 mm edge joint At $\Delta\vartheta$ = 8 K, non-perforated panel 79 W/m² (common case)
Heating capacity based on DIN EN 14037	At $\Delta\vartheta$ = 15 K, non-perforated panel 103 W/m² with ventilation control at $\Delta\vartheta$ = 15 K, non-perforated panel 124 W/m² (movement of air from ceiling to floor)
Acoustics	Weighted sound absorption coefficient α_W according to DIN EN ISO 11654 α_W = 0.65 with visible perforation (sound absorption class C)
Sound insulation (longitudinal sound)	Simple passage based on DIN 4109, non-perforated ceiling and closed wall connection 37 dB
Recommended media temperature	Cooling water temperature: 16°C Heating water temperature: 35°C to max. 45°C
Operating conditions	Temperature heating mode max. +50 °C Condensation must be prevented
Recommended pressure drop	max. 25 kPa per water circuit
Suspension height (recommended)	min. of 120 mm (distance between the concrete ceiling and the underside of the installed ceiling)

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TI_Thermatop M_EN_1092568_12-2018

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