INDOOR CLIMATE SOLUTIONS

TECHNICAL GUIDELINE

Uponor plaster system for ceiling and wall cooling/heating

Table of contents:

Convenient cooling and heating with the Uponor plaster system

System description/Field of application

Temperature control via room surfaces

Increasingly to meet the demand for maximum comfort with minimum investment- and running costs, room enclosure surfaces such as floors, walls and ceilings are being used for heating and cooling. The energy transfer between the occupants and the thermally activated surfaces in this case is predominantly radiant, which replicates natural relationships to regulate the heating balance for most living beings. This means that people in rooms heated or cooled by surface systems feel demonstrably well and their motivation and performance increases.

Dual benefit with the Uponor plaster system

When it comes to managing room temperature with comfort and cost in mind, the Uponor plaster system is truly multitalented as it can be used in ceilings or walls and for cooling as well as heating. If the requirement is predominantly cooling, the room ceilings serve as heat-transfer surfaces. Thanks to the high heat transfer coefficients in cooling mode it is possible to achieve an impressive cooling output.

Total spatial freedom with the Uponor plaster system

How you benefit

- Minimum installation height
- A universal system for ceilings and walls mounting
- Very few, optimally interacting system components
- Choice of preference for decades Uponor PE-Xa pipe 9,9 x 1,1 mm
- Q&E fitting system for fast, economical installation
- Quick reaction time thanks to slim plaster coverage
- Saves energy thanks to optimum operating temperatures

If heating is the prime concern, wall surfaces are excellently suited. The slim plaster coverage also makes the Uponor plaster system highly controllable. Ceiling and wall-applications can of course be used together in any combination.

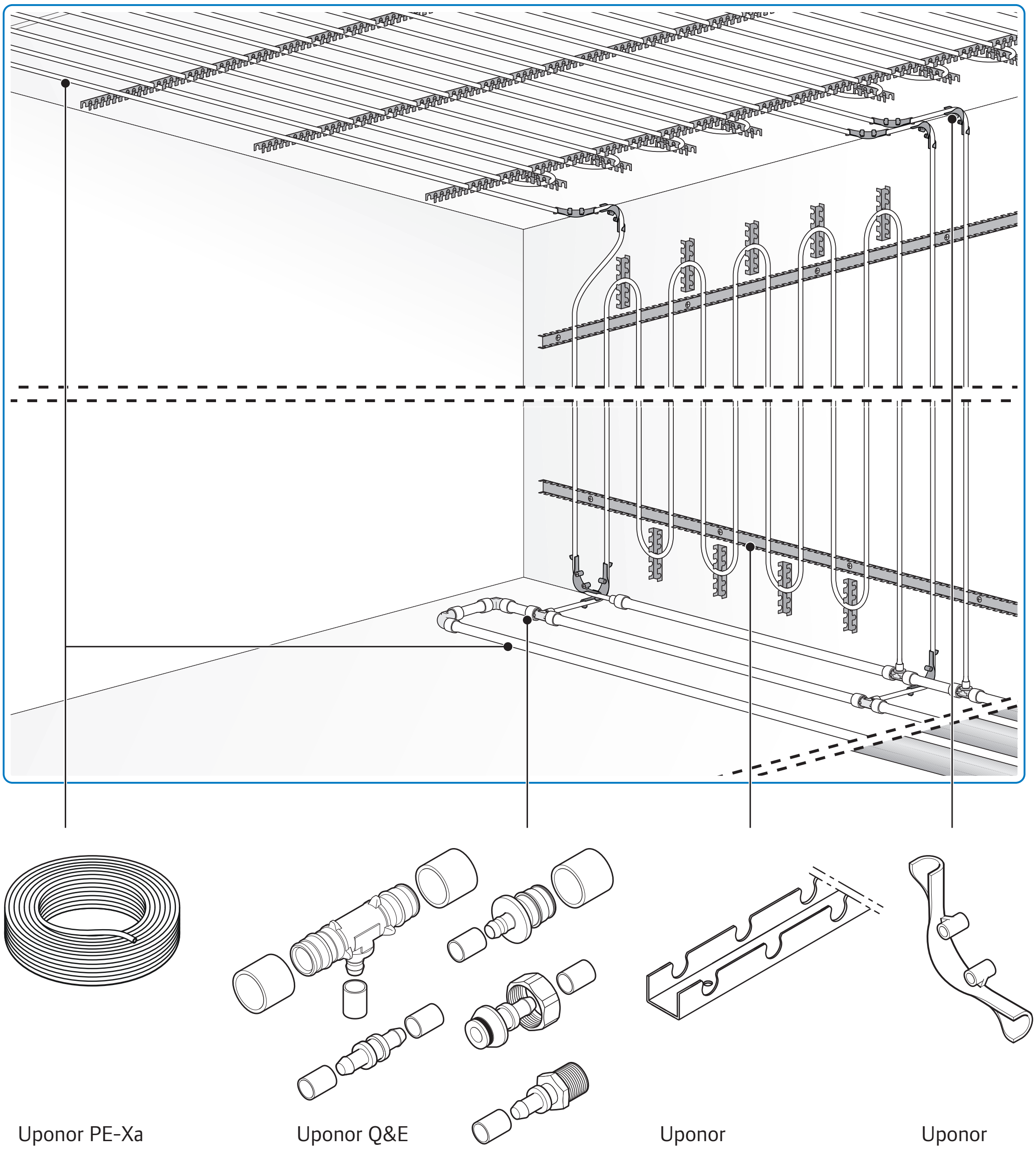
The plaster system from Uponor therefore offers dual benefit: keeping rooms pleasantly cool in the Summer, pleasantly warm in the Winter and flexible enough to respond to the rapid temperature changes in Spring and Autumn.

Uponor plaster system, wall

Uponor plaster system, ceiling

System components

The Uponor plaster system involves very few, optimally-matched system components which can be used both for the ceiling as well as for the wall. The system is completed with distribution and control components from the Uponor range. This enables the single-sourced production of complex systems.



Uponor PE-Xa pipe 9.9 x 1.1 mm and 20 x 2 mm

Uponor Q&E fittings

Uponor clamp track 9.9

Uponor pipe bend support

Application notes

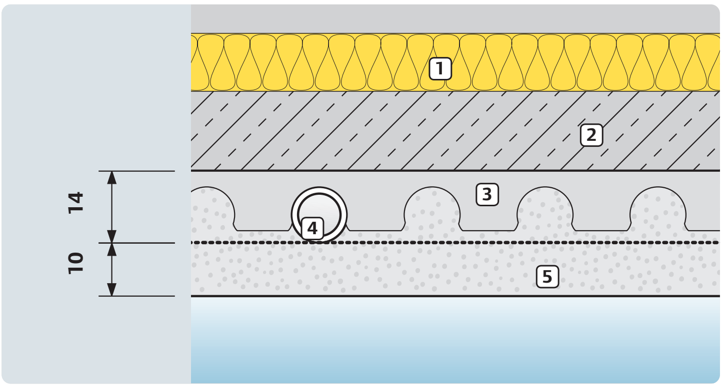
Technical design notes

General

The design of a heated/cooled ceiling-/wall construction must take into account all respective laws, regulations, guidelines and standards. You can find a list of the most important documents at the end of this chapter. Since it is usual for several crafts to participate in these kinds of technical projects, the building processes must be coordinated accordingly (interface coordination) between the planning engineer/architect/specialist.

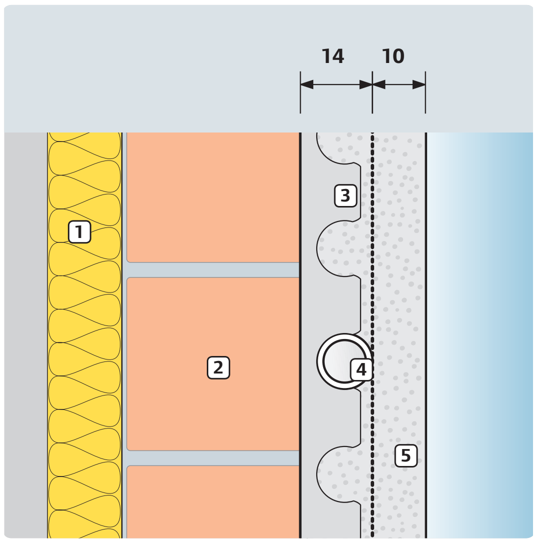
Ceiling and wall applications

Ceiling application with the Uponor plaster system (Example)



1 Heat insulation in accordance with specifications
2 Concrete slab (thickness in accordance with statics)
3 Uponor clamp track 9.9
4 Uponor PE-Xa pipe 9.9 x 1.1 mm
5 Gypsum plaster (e.g. Knauf MP75 G/Flight)

Wall application with the Uponor plaster system (Example)



1 Heat insulation in accordance with specifications
2 Brickwork
3 Uponor clamp track 9.9
4 Uponor PE-Xa pipe 9.9 x 1.1 mm
5 Gypsum plaster (e.g. Knauf MP75 Diamant)

Heat insulation

Thermal insulation requirements for external components with radiant heating

If radiant heating is planned for the structural floor or walls adjoining an unheated room or outside air, its structural thermal insulation is generally subject to national or international regulations and laws. The required insulation layers should be applied preferably to the outside of the ceiling/walls. If the insulation is to be installed between the heating system and the exterior component it is necessary to use insulating materials which are a suitable plastering base. The temperature and particularly the moisture distribution (dew point) within the component must be computer-calculated.

Thermal insulation requirements for internal components with radiant heating

In certain cases thermal insulation is also recommended and sometimes stipulated in the case of heated interior components to reduce unwanted heat flows from room to room. It is therefore sensible to incorporate thermal insulation (R_λ = 1.25 m²K/W) into interior walls which border onto unheated rooms and/or rooms with limited heating or onto rooms of other users. For radiant heating on walls between similarly heated rooms, thermal insulation in which R_λ = 0.75 m²K/W is generally sufficient.

Load bearing substructure

The Uponor plaster system can be applied to practically any load-bearing substucture. The fixing materials used to attach the clamp tracks must be suitable for the respective substucture.

Suitable plaster types

For optimum heat transfer, particularly in the case of chilled ceilings, use plasters with good thermal conductivity. In addition, the plaster types must be suitable for the expected temperature load. Possible plaster mortars with binding agents include:

- Gypsum/lime plaster
- Lime plaster
- Lime/cement plaster
- Cement plaster
- Special plasters, e.g. clay plaster

You can also use manufacturer-specific plasters designed specifically for radiant heating/cooling systems.

Plasters with a higher thermal conductivity (e.g. acoustic plasters) should be considered for heating engineering designs. Lightweight- and thermal insulation plasters are not suitable for radiant heating/cooling.

The need for plaster reinforcement depends on the plaster system used and must be agreed therefore with the plasterer. Plaster reinforcements are added inserts, e.g. mineral fibres, synthetic fibres, glass fibre woven scrim, which reduce crack formation.

Plaster base
The contractor must inspect the plaster base for suitability before starting the plastering.

All traditional solid materials such as concrete, brick, lightweight cavity brick, natural stone, sand lime brick, clay brick, existing mineral-plastered walls and also lightweight structures made of wood wool-, wood fibre- or gypsum fibre boards are suitable substructures.

The plaster base must be
- even and flat,
- load-bearing and firm,
- sufficiently form-stable,
- not water-repelling, evenly absorbent, homogeneous,
- rough, dry, dust-free, free of impurities,
- free of efflorescences,
- frost-free and/or temperated above +5 °C.

Plaster surface
Gypsum plasters can be smoothed or felted. Silicate and plastic finishings can be used as the finishing (second) coat. These must be prepared according to the manufacturer's instructions.

Important design advice

- **Check the process specifications from Uponor and the plaster manufacturer when carrying out the required plaster work.**

It must be clarified with the plastering contractor prior to the installation of the Uponor plaster system whether any plaster basic treatment is required (e.g. priming, spreading of a self-etch primer or sprayed-on rendering).

The plaster manufacturer must be consulted with regard to the max. temperature load of the plaster.

Jointing methods

Structural joints

The surface heating/cooling system is to be interrupted in the region of structural joints. Heating/cooling pipes may not cross structural joints. Structural joints have to taken over as far as visible surfaces and sealed under customer responsibility with suitable coverings (profiles).

Expansion joints/border joints

A joints scheme shall be produced showing the type and arrangement of these joints. The joints scheme is to be produced by the structural planner and submitted to the executing party as a component of the performance specification. When defining the joint distances and area dimensions, account must be taken of the type of substucture, the plaster, the wall covering and the load e.g. exerted by temperature.

Manifolds arrangement

The Uponor heating-/cooling system manifolds should be placed such that the connection pipes of the individual heating/cooling circuits are as short as possible. If the manifolds are to be housed in recessed/concealed manifold cabinets it makes sense to make the required wall openings for this purpose at the shell construction phase.

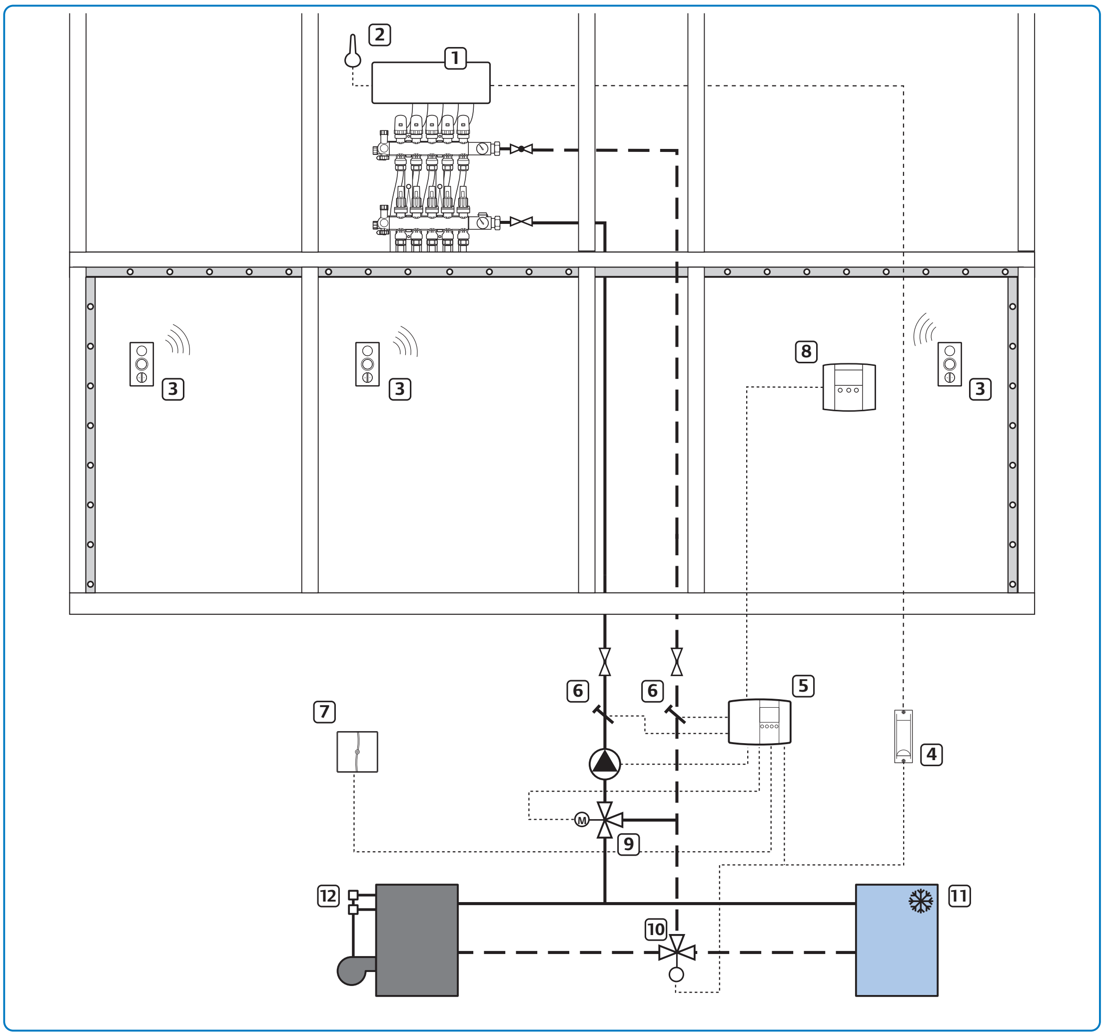
The same applies for the use of Uponor Tichelmann manifolds. If these are to be installed in the wall e.g. beneath the ceiling or above the Structural Floor Level, the required recesses can often be incorporated into the shell construction phase which can substantially reduce the assembly time and expense of the Uponor plaster system.

Control concept

Example: Supply temperature control with automatic heating/cooling switching of structural heating/refrigeration equipment and radio-control for individual rooms

Field of use
Uponor control components enable convenient and user-friendly control of heating and cooling surfaces.

Function description
Depending on the external and room temperature the heating/cooling-controller (5) switches the switch valve (9) from the heating to the cooling source. The H/C relay (4) also causes the radio controller (1) to switch from heating to cooling because in cooling mode the manifold valves automatically open as the room temperature increases (reversing the action of the actuators). When cooling, unlike a simple individual room heating control, the relative humidity of the interior air is determined as well as the room temperature by the heating/cooling remote control (8) to prevent cooling below dew point which would cause condensation to form on cold system components. The heating/cooling control regulates the cooling water supply temperature via the control valve (9) within a range above the dewpoint temperature. The system components downstream from the control valve are thus protected from cooling below dew point. System components from the cooling unit to the control valve must be insulated to prevent diffusion depending on the cooling water temperature.



Components

1. Controller, radio
2. Antenna
3. Thermostat display, radio
4. H/C relay
5. Heating/cooling-controller
6. Supply and return sensor
7. Outdoor sensor
8. Heating/cooling remote control
9. Switch valve
10. Control valve
11. Cooling unit
11. Heating unit

The circuit diagram shown here is a simplified illustration showing the essential control components. You can find detailed information about installation and operation in the instructions which are included with the components.

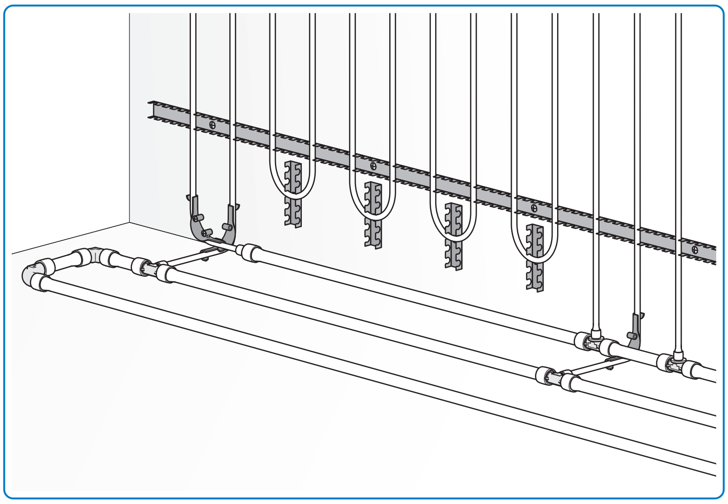
System concepts

Hydraulic connection to the network

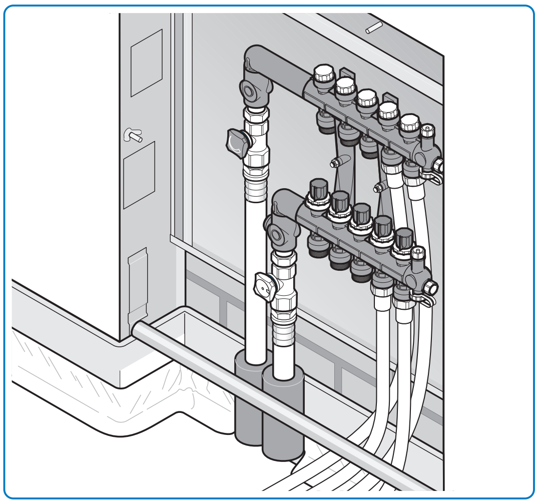
Depending on the respective system- and control concept there are different ways to integrate the heating/cooling surfaces with the Uponor plaster system into the network. The connecting lines of the individual heating/cooling surfaces are connected to the Uponor manifold either directly or via a collecting main. In a further variant the heating/cooling loops are connected to a Tichelmann ring.

Manifold connection
In the case of the manifold connection the PE-Xa 9.9 system pipes of the individual heating/cooling loops are connected directly to the manifold using Q&E connectors and a 3/4" euro cone threaded connector. This connecting variant makes sense when the room temperatures of several small zones and/or rooms are to be controlled separately which is possible using the actuators on the manifolds and the Uponor single room control.

Connection to a Tichelmann-ring
The Uponor plaster system includes fittings and pipes, with which quick and simple Tichelmann supply lines for the individual heating/cooling circuits can be produced using Q&E connectors. This makes sense when fitting large zones and/or rooms with heating/cooling circuits of largely similar lengths. This enables zone-control valves in the supply line to control the room temperature and carry out hydraulic balancing. If the individual Tichelmann rings are connected in turn to the Uponor manifolds the Uponor single room control can be used conveniently for the control of zone- and/or room temperatures.



Connection of the PE-Xa 9.9 system pipes to a PE-Xa Tichelmann ring using Q&E connectors.



Connection of the PE-Xa 9.9 system pipes or PE-Xa 20 zone supply lines to the plastic Uponor manifold

Laws, regulations, standards and guidelines

The valid laws, regulations, standards and guidelines along with the manufacturer's information, must be observed and/or applied in the design, construction, installation and commissioning of the Uponor plaster system, particularly in the following areas:

- Building shell/structure
- Heat insulation
- Energy-efficiency
- Fire safety
- Sound protection.

The following table contains a list of the most important standards and regulatory documents.

Standards and regulatory documents	Meaning
DIN EN 1991-1-1	Actions on structures
DIN 1055 Part 3	Design loads for buildings
DIN 4102	Fire safety
DIN 4108	Heat insulation
DIN 4109	Sound protection
DIN EN 12831	Calculating the standard heating load of buildings
DIN EN 1264 (1-4)	Underfloor heating - systems and components
DIN 4726	Pipework made of plastic materials for hot water underfloor heating
DIN EN ISO 15875	Plastic pipework systems for hot and cold water installation - interlinked polyethylene (PE-X)
DIN EN 12828	Safety equipment in heat generation systems
DIN EN 13162 to DIN EN 13171	Factory produced thermal insulation materials for buildings
DIN EN 13831	Expansion vessels with integrated membrane
DIN 18195	Building seals
DIN 18202	Tolerances in civil engineering
DIN 18336	Sealing works
DIN 18352	Tiling- and slab work
DIN 18353	Screed work
DIN 18356	Parquet work
DIN 18365	Floor covering work
DIN 18380	Heating systems and central water heating systems
DIN 18560	Screeds in the construction industry
VDI 2035 Part 2	Avoiding damage in hot water heating systems, water-end corrosion

Design and calculation

Design instructions

Temperatures

Room temperatures
Radiant heating/cooling systems are designed such that the desired room temperatures are achieved under design conditions.
Normal design room temperatures for the heating mode are:

- Living rooms, offices 20 °C
- Bathrooms 24 °C
- Corridors 15 °C

A maximum room temperature of 26 °C is desirable in cooling mode. To achieve this maximum room temperature with a radiant cooling system it is necessary to use constructive measures under certain circumstances to reduce the cooling loads in the room (e.g. shading large glazed areas) and/or to dehumidify the interior air.

Surface temperatures
In heating mode the maximum surface temperatures for radiant ceiling/wall heating must be limited as follows for comfort reasons but also from the building design aspect:

- $\vartheta_{ceiling}$ < 35 °C
- ϑ_{wall} < 40 °C

In this case, check the information from the plaster manufacturer and if necessary the coating manufacturer.

The minimum admissible surface temperature in cooling mode and thereby also the achievable cooling capacity depends on the room humidity and/or the dewpoint temperature of the ambient air.

Operating temperatures
Radiant heating/cooling systems can be operated at temperatures which are close to the respectively desired room temperature. These systems are used ideally therefore with energy-efficient heating and refrigeration equipment, e.g. (reversible) heat pumps.
The design of the system should provide for variation of the supply temperatures in the following bandwidths:

- $\vartheta_{Supply,\ ceiling}$ 16 - 40 °C
- $\vartheta_{Supply,\ wall}$ 16 - 50 °C

The maximum design supply-temperature should be the agreed maximum temperature load of the plasters and coatings.

Design instructions for radiant cooling

To achieve maximum cooling outputs with maximum design supply-temperatures, radiant cooling is usually designed with very small temperature differences (≤ 5K). This means however that relatively high mass flows must be transported through the piping. Therefore detailed hydraulic system design and layout planning is particularly important for the cooling mode . Rooms which are excluded from the cooling mode, e.g. the bathroom and kitchen, should be connected if possible to separate manifolds which are to be connected to their own control circuit (only heating). The following parameters also contribute to achieving the maximum cooling output from a surface heating/cooling system:

1. Small pipe spacing:
   ➔ greater cooling capacities at a higher supply temperature
2. Short heating/cooling loop lengths:
   ➔ less temperature differences equals less pressure loss
3. Ceiling-/wall plaster with good thermal conductivity:
   ➔ better heat transfer
4. Minimum plaster coverage:
   ➔ improved control if temperature threatens to drop below dew point

Cooling power
The achievable cooling output depend on several factors. As well as the technical design factors (e.g. pipe spacing, pipe coverage, top layer) the dewpoint of the room air also affects the cooling output. Basically cooling water temperatures should be maintained above 15 – 16 °C to minimise the potential for formation of condensation water (cooling below dew point) on system components.

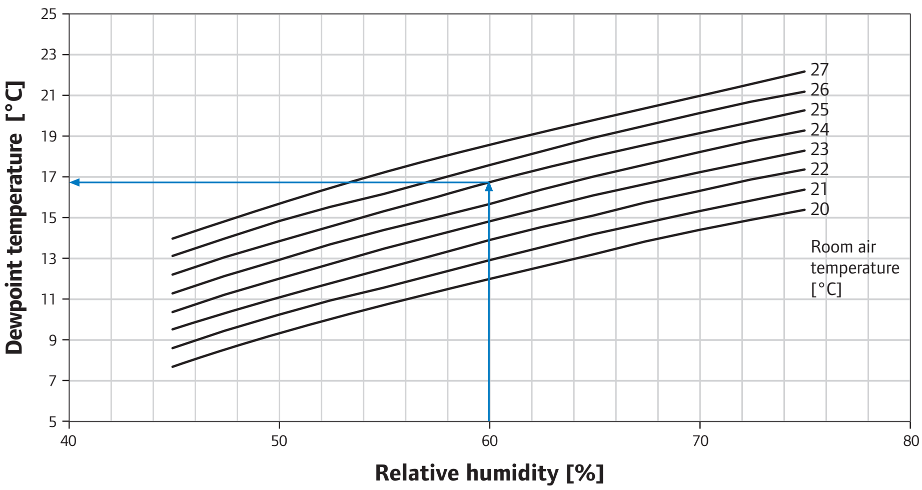
Design diagrams for detailed calculation

The design diagrams for the respective Uponor radiant heating/cooling systems help to make a comprehensive manual design of the surface heating/cooling system using standard templates and also provide an overview of the following influencing variables and their relationships to one another:

1. Heat flow density of the radiant heating/cooling system q in [W/m²]
2. Thermal resistance of the floor covering $R_{\lambda,B}$ in [m²K/W]
3. Pipe spacing Vz in [cm]
4. Heating medium differential temperature $\Delta\vartheta_H = \vartheta_H - \vartheta_i$ in [K]
5. Limit heat flow density following limit curve
6. Floor surface differential temperature $\Delta\vartheta_H - \vartheta_i$ in [K]

If you have respectively three influencing variables you can work out the remainder with just one diagram.

Determining dewpoint (example)
Room air temperature 25 °C, rel. humidity 60 %, dewpoint temperature 16.8 °C



Note:

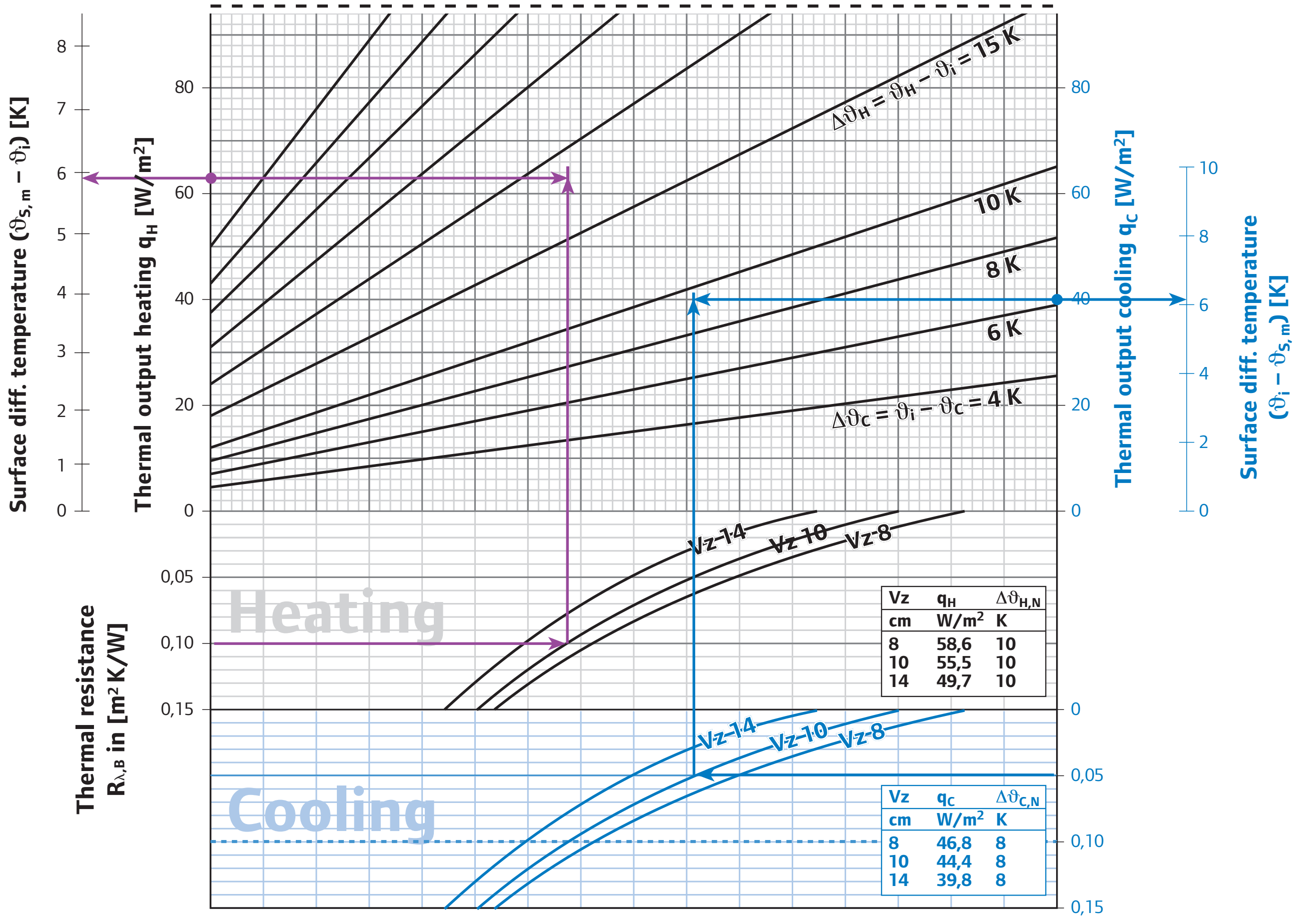
The desired cooling output can be achieved only when both the average surface temperature as well as the design flow temperature are above the dewpoint temperature of the ambient air (h-x diagram).

To prevent condensation forming on system components, a dewpoint-guided flow temperature control is required.

Design diagrams

Design diagrams for detailed calculation

The design diagrams help to plan a comprehensive manual radiant heating/cooling surface using standard templates for the Uponor plaster system. In addition, they represent the influencing variables and their relationship to one another.



[1] Temperature diff. between heating medium and room [2] Temperature diff. between room and cooling medium
At cooling the supply temperature to be controled by dew point temperature, humidity sensor to be included

Sample reading, cooling

Determining the design flow temperature $\vartheta_{V,\ des.}$

Reference:
q_C = 40 W/m²
ϑ_i = 26 °C
$R_{\lambda,B}$ = 0,05 m² K/W

Chosen:
Pipe spacing = Vz 10
Temperature difference:
$\vartheta_R - \vartheta_F = 2$ K

Reading:
$\Delta\vartheta_C = 9{,}2$ K
$\vartheta_{F,m} - \vartheta_i = 6{,}2$ K

Calculated:
$\vartheta_{F,m} = \vartheta_i + 6{,}2$ K
$\vartheta_{F,m} = 19{,}8$ °C

$\vartheta_{V,\ des.} = \vartheta_i + \Delta\vartheta_C + (\vartheta_R - \vartheta_F)/2$
$\vartheta_{V,\ des.} = 26 - 9{,}2 - 2/2$
$\vartheta_{V,\ des.} = 15{,}8$ °C

Sample reading, heating

Determining the design flow temperature $\vartheta_{V,\ des.}$

Reference:
q_H = 62 W/m²
ϑ_i = 20 °C
$R_{\lambda,B}$ = 0,1 m² K/W

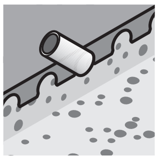
Chosen:
Pipe spacing = Vz 10
Temperature difference:
$\vartheta_F - \vartheta_R = 5$ K

Reading:
$\Delta\vartheta_H = 17{,}7$ K
$\vartheta_{F,m} - \vartheta_i = 5{,}8$ K

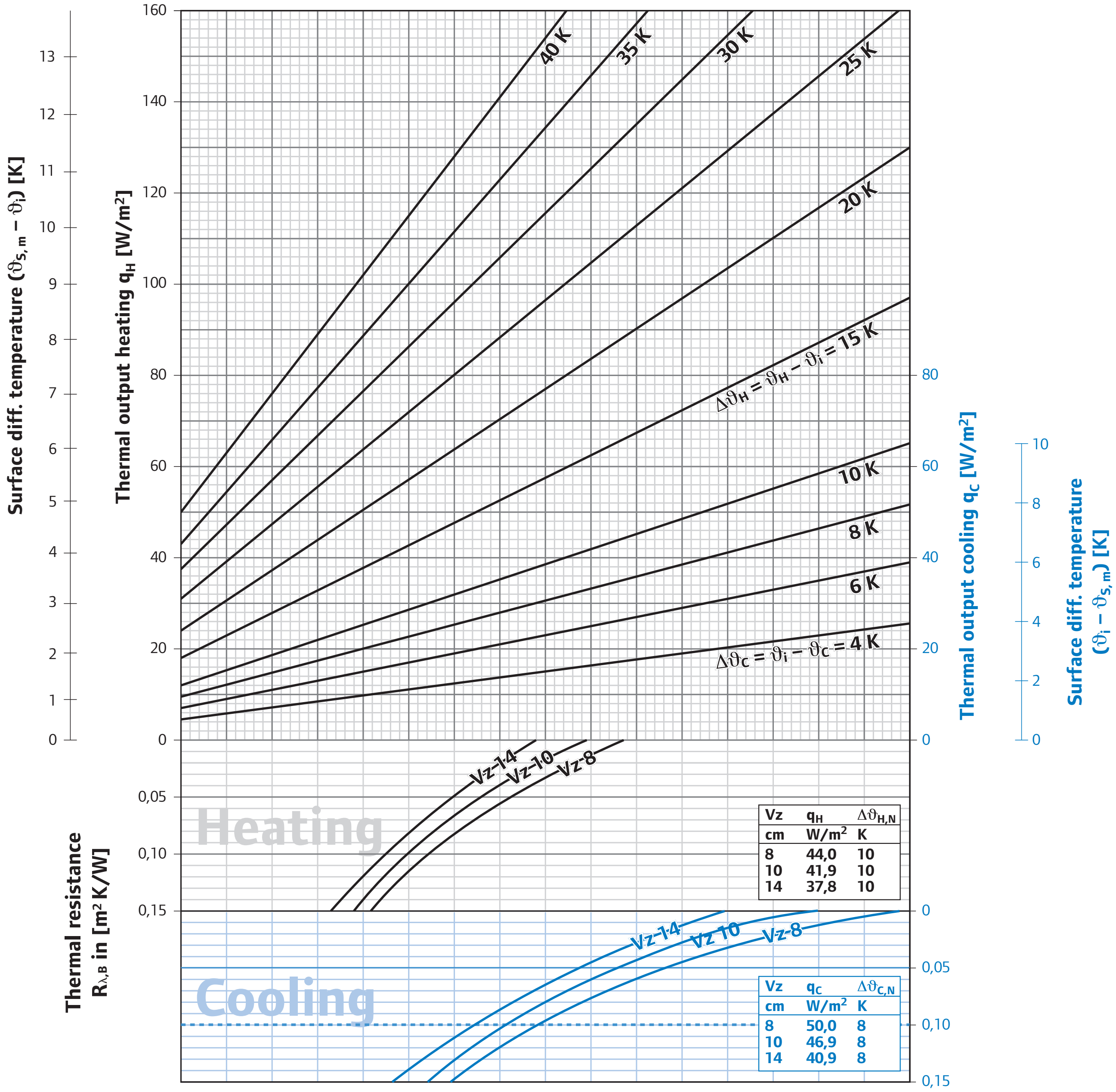
Calculated:
$\vartheta_{F,m} = \vartheta_i + 5{,}8$ K
$\vartheta_{F,m} = 25{,}8$ °C

$\vartheta_{V,\ des.} = \vartheta_i + \Delta\vartheta_H + (\vartheta_F - \vartheta_R)/2$
$\vartheta_{V,\ des.} = 20 + 17{,}7 + 5/2$
$\vartheta_{V,\ des.} = 40{,}2$ °C

Design diagram, radiant ceiling cooling/heating



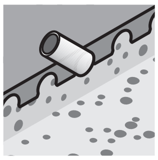
Calculation diagram Heating/Cooling, Uponor Ceiling System 9,9 mm PEX pipe, with plaster layer ($s_ü$ = 10 mm with $\lambda_ü$ = 0,5 W/mK)



Vz	q_H	$\Delta\vartheta_{H,N}$
cm	W/m²	K
8	44,0	10
10	41,9	10
14	37,8	10

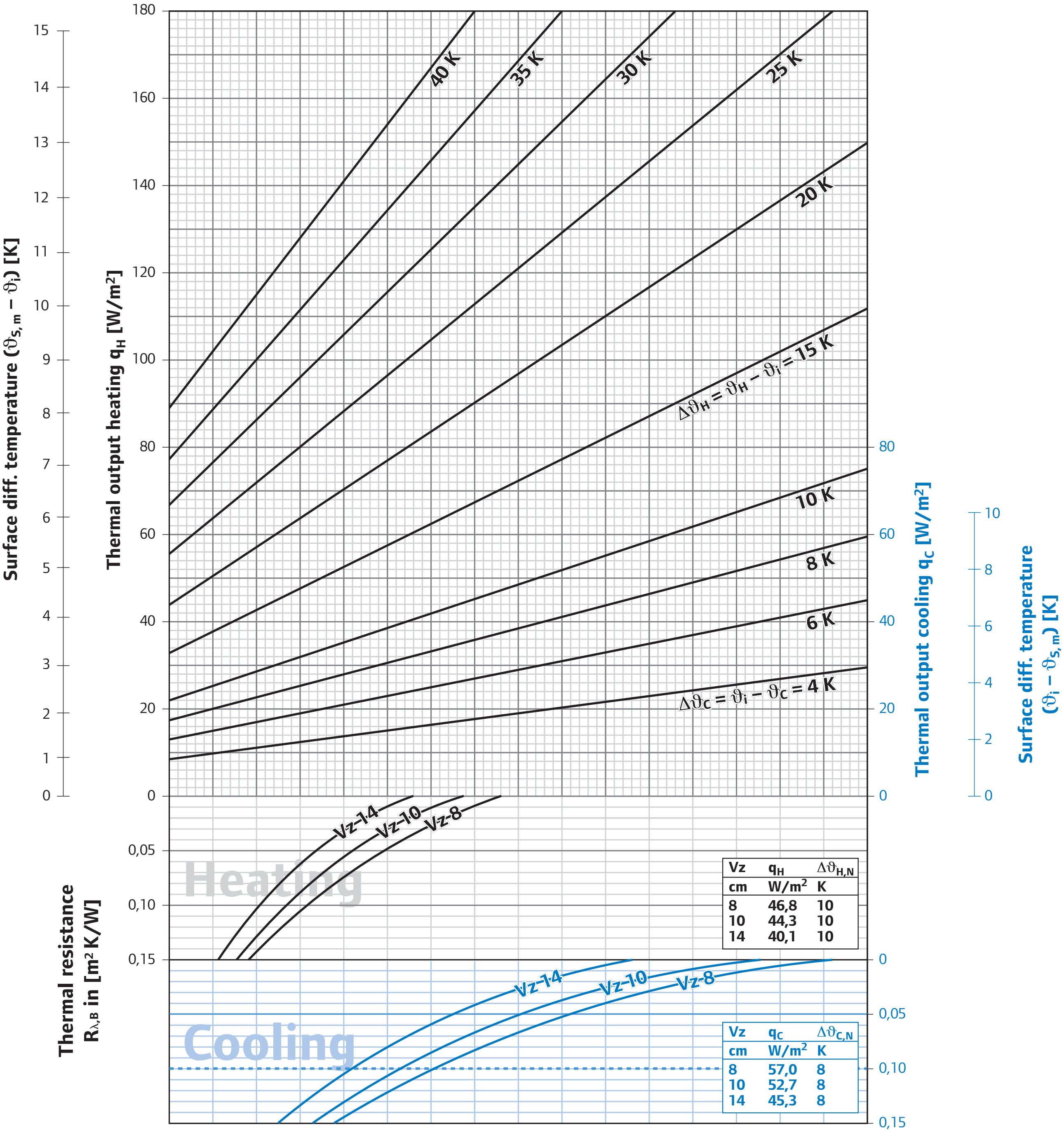
Vz	q_C	$\Delta\vartheta_{C,N}$
cm	W/m²	K
8	50,0	8
10	46,9	8
14	40,9	8

[1] Temperature diff. between heating medium and room [2] Temperature diff. between room and cooling medium
At cooling the supply temperature to be controled by dew point temperature, humidity sensor to be included



Design diagram, radiant ceiling cooling/heating

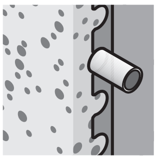
Calculation diagram Heating/Cooling, Uponor Ceiling System 9,9 mm PEX pipe, with plaster layer ($s_{ü}$ = 10 mm with $\lambda_{ü}$ = 0,8 W/mK)



Vz	q_H	$\Delta\vartheta_{H,N}$
cm	W/m²	K
8	46,8	10
10	44,3	10
14	40,1	10

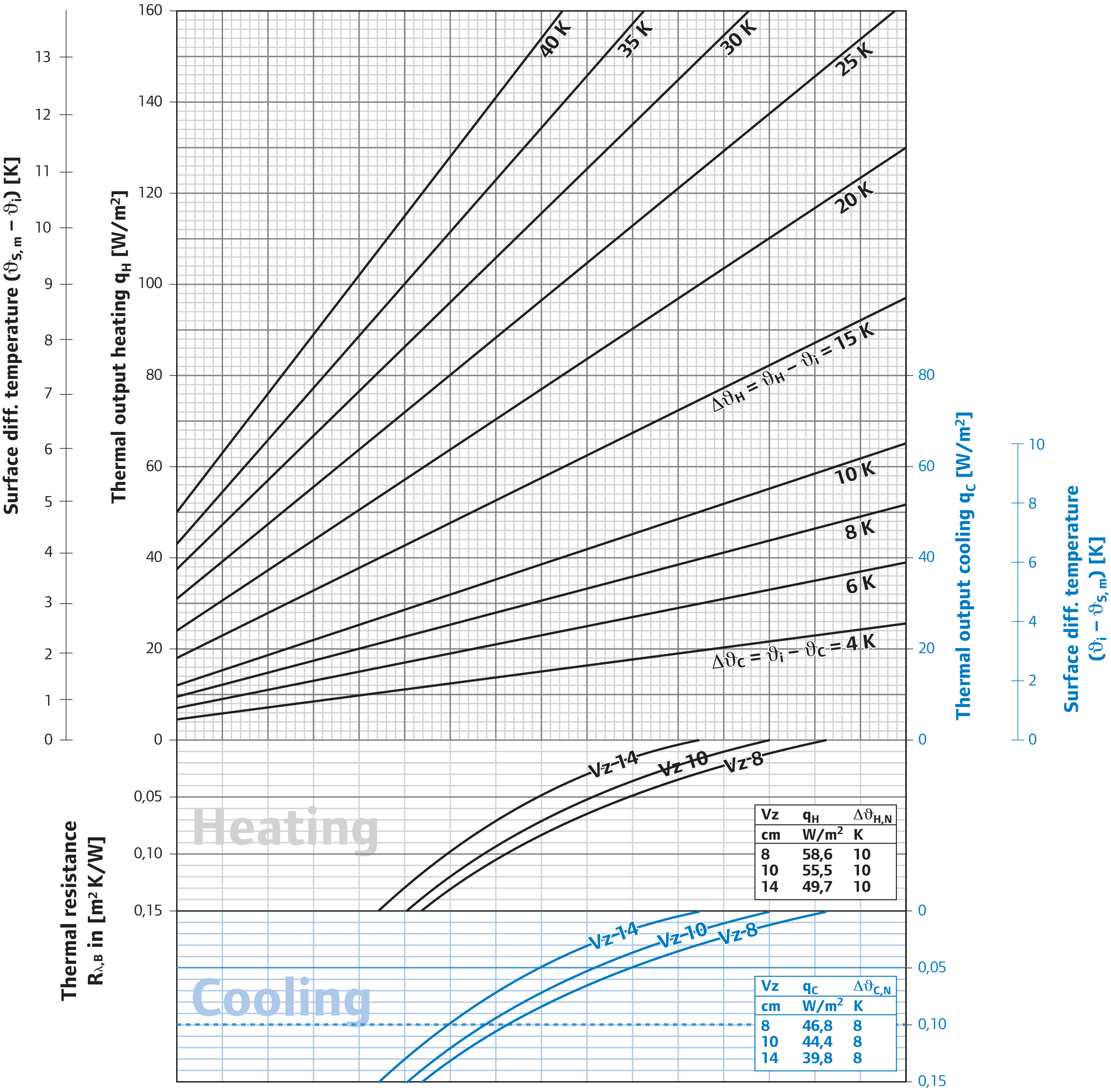
Vz	q_C	$\Delta\vartheta_{C,N}$
cm	W/m²	K
8	57,0	8
10	52,7	8
14	45,3	8

[1] Temperature diff. between heating medium and room [2] Temperature diff. between room and cooling medium
At cooling the supply temperature to be controled by dew point temperature, humidity sensor to be included



Design diagram, radiant wall heating/-cooling

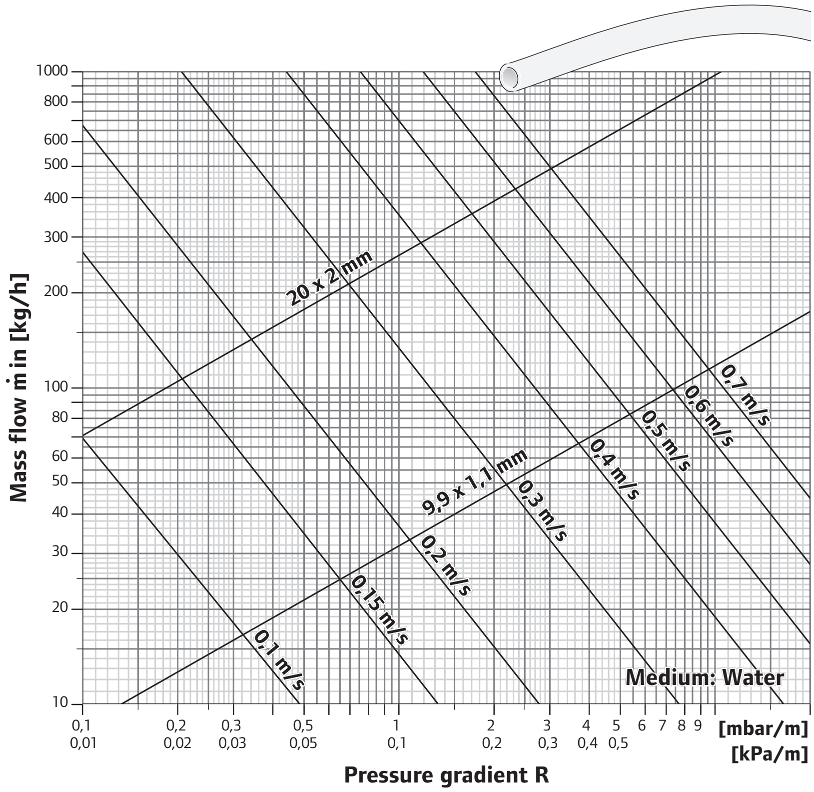
Calculation diagram Heating/Cooling, Uponor Wall System 9,9 mm PEX pipe, with plaster layer ($s_ü$ = 10 mm with $\lambda_ü$ = 0,7 W/mK)



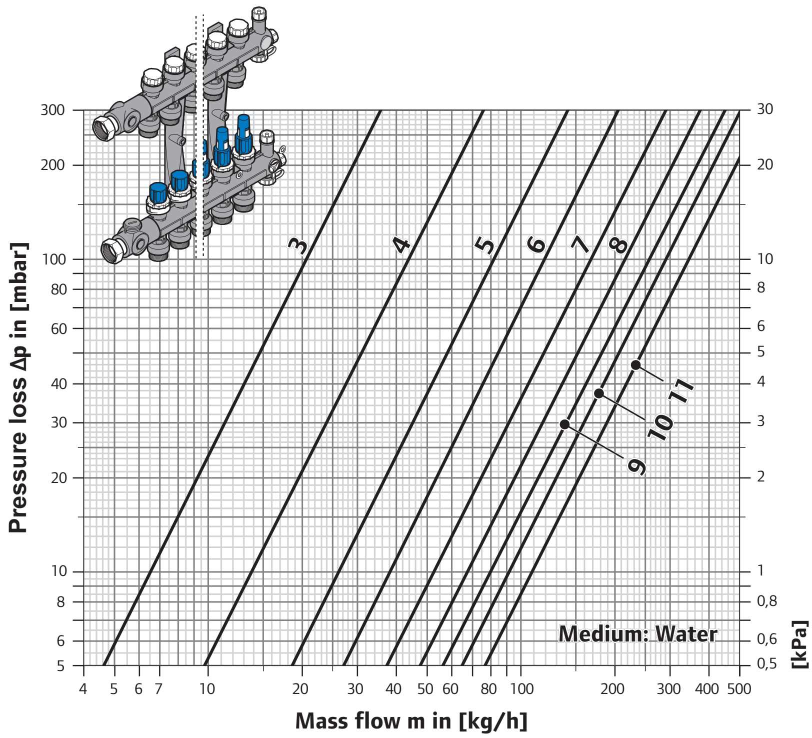
[1] Temperature diff. between heating medium and room [2] Temperature diff. between room and cooling medium
At cooling the supply temperature to be controled by dew point temperature, humidity sensor to be included

Pressure loss diagrams

Uponor PE-Xa pipe
The pressure losses in the Uponor PE-Xa pipes can be determined with the aid of the diagram

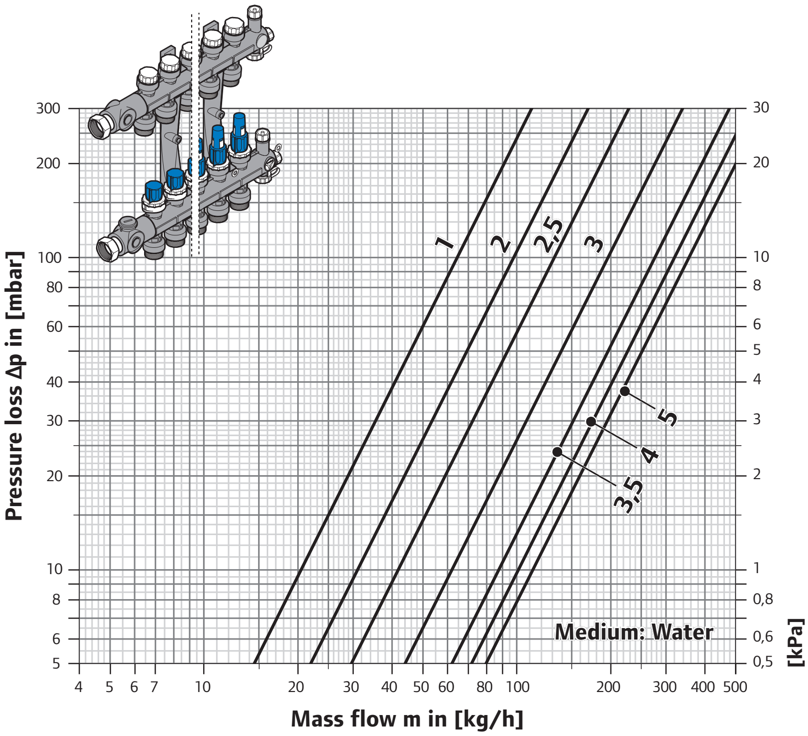


Uponor Provario PV Manifold
Diagram showing how to carry out tool-free valve pre-setting (number on the setting ring) for the regulating valves in the Uponor Provario Manifold



Uponor modular manifold

Diagram showing how to carry out tool-free valve pre-setting (number on the setting ring) for the regulating valves in the Uponor modular manifold



Hydraulic adjustment

General

The varying performance requirements and loop lengths in the various rooms and/or heating areas make it necessary to pump precisely the quantity of water through the heating/cooling loops required to meet the heating/cooling demand at any time. Innovative intelligent control systems such as the DEM (Dynamic Energy Management) control system from Uponor, achieve this by cycling the respectively required and self-adjusting quantity of water for the loop depending on use (auto-balancing), which makes static hydraulic balancing, as required in the case of conventional systems, superfluous.

Static hydraulic balancing

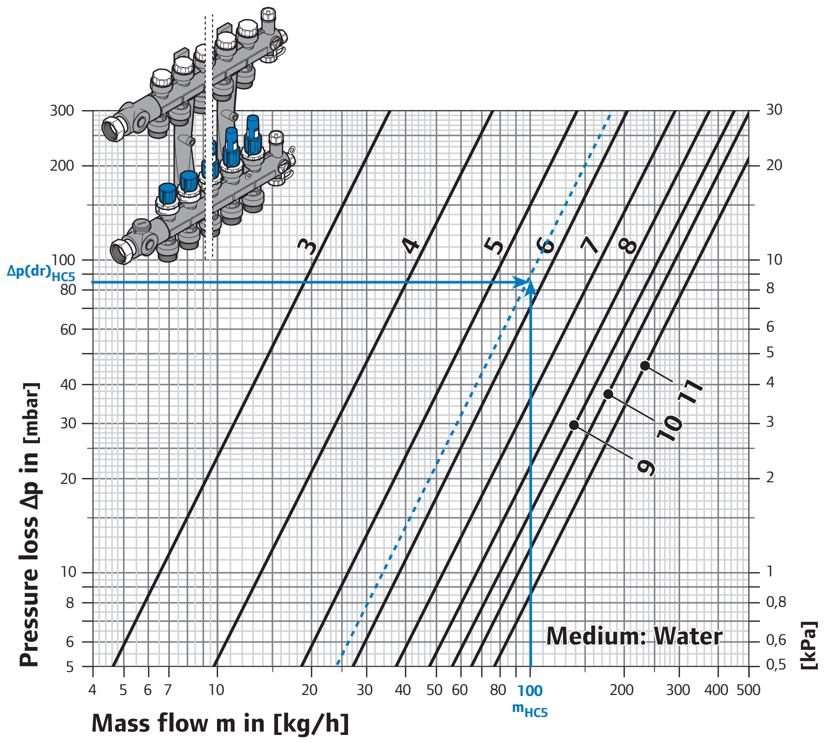
In hydraulic balancing all heating/cooling loops on the manifold must be balanced to the least favourable loop (greatest pressure loss). This is known as "static hydraulic balancing" and is described using the following example:

Note:

Static hydraulic balancing is not required with the DEM control system from Uponor if the ratio of loop lengths per control zone 2:1 is not exceeded.

Manifold (example)

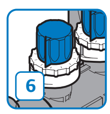
Loop	Mass flow rate loop [kg/h]	Pressure loss loop [mbar]	Differential pressure at the supply valve to be choked [mbar]
L 1	100	215	0
L 2	90	140	215 - 140 = 75
L 3	80	160	215 - 160 = 55
L 4	90	195	215 - 195 = 20
L 5	100	130	215 - 130 = 85



Manifold diagram example: Provario

m_{L5} Loop mass flow rate (in this case: L 5 loop)

$\Delta p(dr)_{L5}$ Differential pressure at the supply valve to be choked (in this case: L 5 loop)



For this example the Provario supply valve presetting for the loop L 5 must be set to "6".

All other loops are balanced as described.

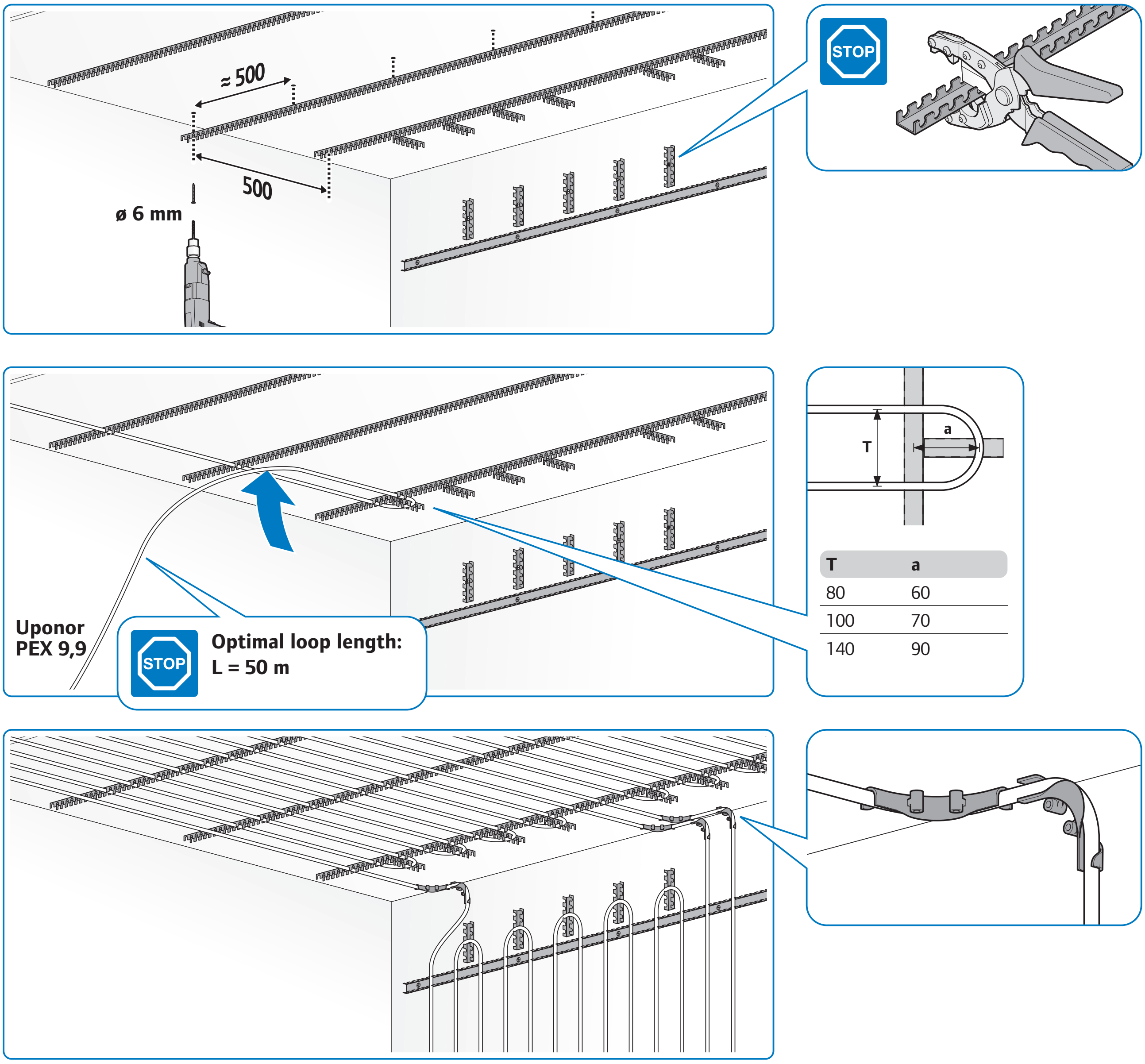
For further information see the Uponor Provario assembly instructions.

Mounting instructions

Installation Instructions

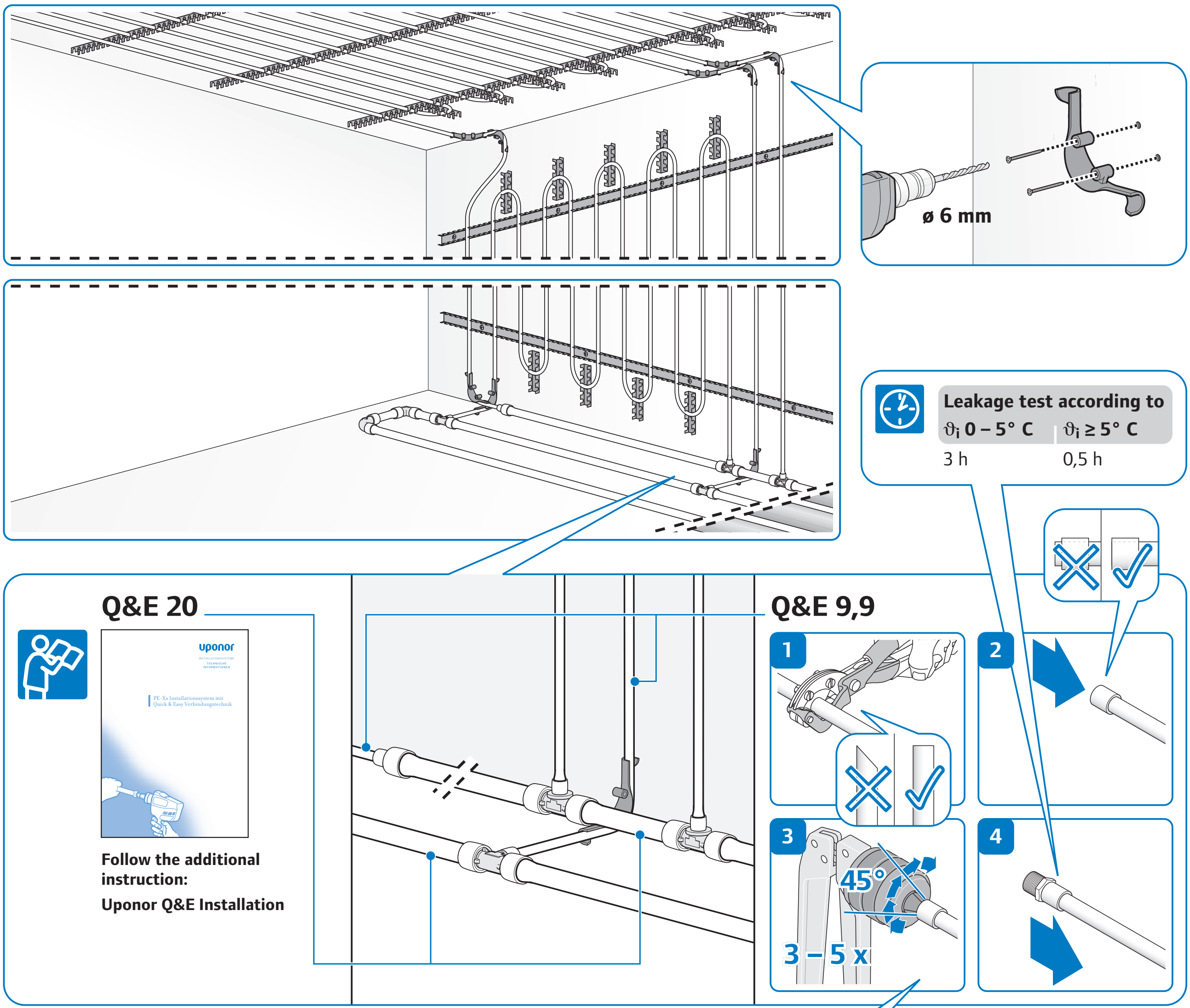
The Uponor plaster system must be installed by expert installers only. Observe the following assembly instructions and additional instructions which are provided with the components and tools or which can be downloaded from www.uponor.com.

Mounting pipe system

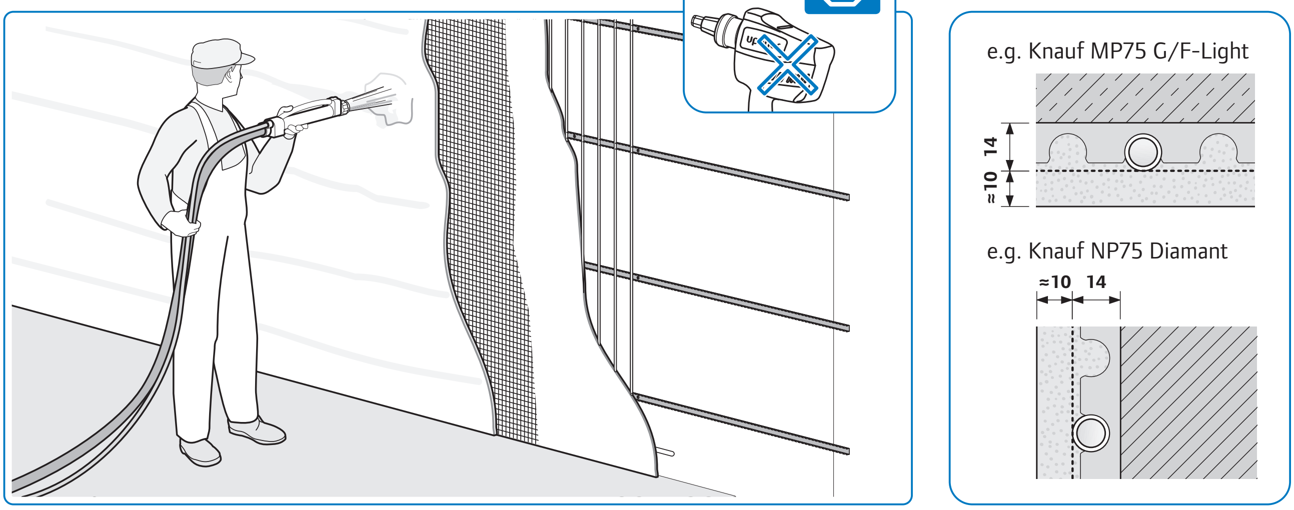


T	a
80	60
100	70
140	90

Installing supply pipes



Plastering



Commissioning

Pressure and leak testing

Requirement
The heating engineer/plumber must subject the pipe system to a leak test after the installation and before rendering and closure of the wall channels and wall- and slab piercings. System components, safety valve and expansion vessel whose nominal pressure rating does not at least correspond to the test pressure are to be excluded from the test. If there is a freezing hazard, raise the building temperature, use antifreeze or carry out the pressure test with air or inert gases.

If extra antifreeze is not required for normal operation of the system, remove antifreeze by draining and rinsing. Water must be replaced at least three times.

Execution of the leak test

The pipe system must be flushed, slowly filled and fully bled (a section at a time if necessary). The test pressure must be twice the operating pressure or at least 6 bar. Temperature equalisation between the ambient temperature and the temperature of the water with which the pipes are filled is to be achieved by a suitable waiting time after establishing the test pressure. After this waiting period it may be necessary to re-establish the test pressure. The final test pressure must be maintained for 2 hours and must not fall by more than 0.2 bar. There must be no leaks in either the pipe system or the connectors.

The test process must be logged. You will find a corresponding copy of the report at the end of this technical information.

Function heating

After plastering, a function test is carried out for radiant ceiling and wall heating/cooling systems. The system function is tested with the heating function process and must not cause unwanted drying out of the plaster.

Start of heating

- Cement-bonded plaster
  The earliest possible start of heating is 21 days after plastering
- Gypsum-bonded plaster
  The earliest possible start of heating is 7 days after plastering and/or according to the manufacturer's information.

Procedure
The heating function test starts with a flow temperature of between 20 °C and 25 °C which is maintained for at least 3 days. The temperature is then increased to the max. design temperature (gypsum-bound plaster max. 50 °C and/or according to manufacturer's information) and is maintained for at least another 4 days.

The room is vented and aerated throughout. Draughts are to be avoided as far as possible.

The heating function process must be manually controlled or controlled by a special control program and logged. You will find a corresponding copy of the report at the end of this technical information.

If an additional coating is to be applied to the plaster, the coating firm must check that the substrate has cured before commencing work. Further heating may be required if the residual moisture of the plaster after the heating function test is still too high.

Pressure test report for the Uponor plaster system

Note: Please observe the accompanying explanations and descriptions in the latest technical documentation from Uponor

Building project ______________________________

____

Section ______________________________

Test personnel ______________________________

____

Requirement (in accordance with EN 1264-4)

Before applying the plaster, carry out a leak test on the heating/cooling circuits with a water pressure test. The test pressure must be twice the operating pressure or at least 6 bar.

Temperature equalisation between the ambient temperature and the temperature of the water with which the pipes are filled is to be achieved by a suitable waiting time after establishing the test pressure. After this waiting period it may be necessary to re-establish the test pressure.

Any containers, devices or fittings such as safety valves and expansion vessels that are not suitable for the pressure test must be disconnected from the installation that is being tested during the pressure test.
The installation is filled with filtered water and fully vented. A visual check of the pipe joints is carried out during the test.

Start Date ________ Time ________ Test pressure ________ bar

End Date ________ Time ________ Pressure drop ________ bar (max. 0,2 bar!)

The leak test was started in the case of $\vartheta_i \geq 5$ °C no earlier than 0.5 hours and in the case of $\vartheta_i = 0 - 5$ °C no earlier than 3 hours after the manufacture of the pipe connection. ☐ Yes ☐ No

Ambient temperature during the pipe connection assembly ________ °C

On the ________ the installation identified above was heated to the design temperatures, and no leaks could be found. After cooling, it was still not possible to find leaks. Suitable measures (e.g. the use of antifreeze, temperature control of the building) should be taken if there is a risk of freezing. If antifreeze is no longer required for operation of the plant in accordance with specifications the antifreeze should be removed by emptying and flushing the installation, using at least a 3-fold water exchange.

Antifreeze was added to the water ☐ Yes ☐ No

Procedure as described above ☐ Yes ☐ No

The pressure test has been carried out in accordance with the report

______________________________ ______________________________

Installing plumber - date/signature Client: - date/signature

Heating function report according to DIN EN 1264-4 for the Uponor plaster system

(to be completed by the heating system company and supplied with the contract documents)

Client/ Construction project* ______________________________

Building management/ Architect* ______________________________

____

Heating company* ______________________________

____

Screed company* ______________________________

____

System

☐ Uponor plaster system (wall) Surface area ________ m^2

☐ Uponor plaster system (ceiling) Surface area ________ m^2

Type of plaster

Make ______________________________

Heating/cooling pipe coverage ________________ cm

Plastering work completed on ________________

Heating function process

External temperature at start of heating approx. ________ °C

Start of function heating on ________________ at ________ °C

max. design temperature from ________________ at ________ °C

The max. design temperature was maintained for ________ days without falling at night (at least 4 days)

The heating function test was interrupted from ________________ to ________________

Heating recommenced on ________________

The heated area was free from coverage or building materials ☐ Yes ☐ No

Heating in operation ☐ Yes ☐ No

System handover on the ________ Supply temperature ________ °C External temperature ________ °C

Building owner/Client Date/Stamp/Signature	Building management/Architect Date/Stamp/Signature	Heating system company Date/Stamp/Signature

* full address **Follow the information provided by the manufacturer!

Notes

Uponor offers construction professionals uncompromising quality, leading-edge expertise and long-lasting partnerships. As a leading international company, we are known for our solutions that help create better human environments.

Uponor's Simply More philosophy includes services for all stages of the construction process – from the first concept of a project to a building in use.

Concept and planning | Design | Construction | Buildings in use

simply more

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