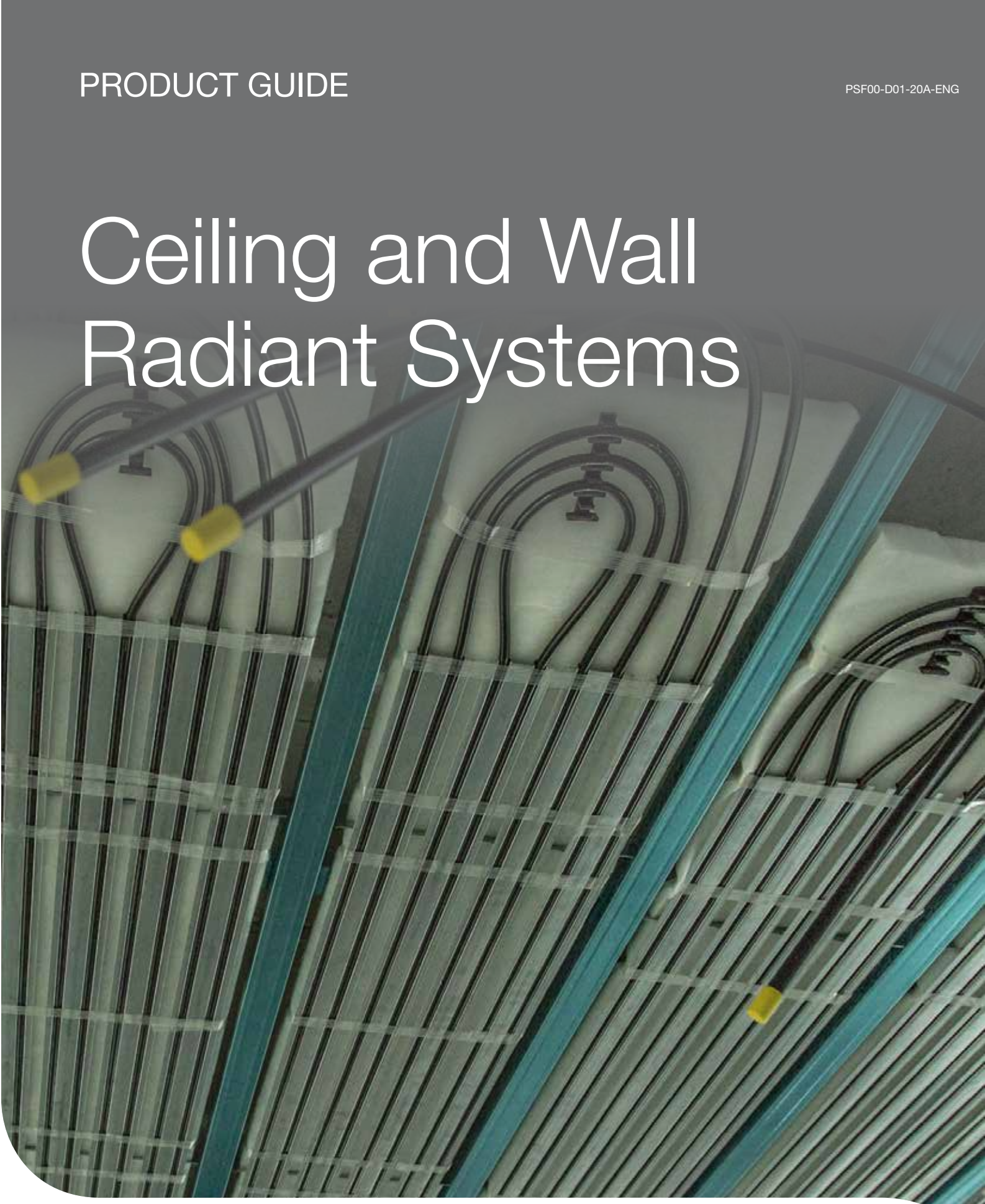
PRODUCT GUIDE

PSF00-D01-20A-ENG

Ceiling and Wall Radiant Systems



wavin

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Company presentation

Wavin Italia SpA

Wavin Italia SpA is part of the European Wavin Group, a world leader in plastic piping systems for residential, non-residential and civil engineering works.
It was founded in 1993 through the acquisition of Plastistamp by the Wavin Group. In subsequent years, the company, based in Santa Maria Maddalena, in the province of Rovigo, experienced a period of great expansion.
In 2000 it acquired MCM, a company that produces the EMU line of siphons and, in June 2004, it acquired Chemidro, a brand specialising in the production of supply systems for the distribution of sanitary and heating water, with particular focus on radiant heating and home comfort (underfloor, ceiling and water heating and cooling in addition to air treatment with dehumidification and controlled mechanical ventilation).
Two years later, Wavin Italia completed the acquisition of AFA, the Italian distributor of the PB Acorn (today Hep2O) supply and heating system.
Today, Wavin Italia has over 200 employees and a total area of more than 70,000 m^2, 9,000 of which dedicated to production.

The Wavin group

The Wavin Group is headquartered in Zwolle, Netherlands, and has a direct presence in 25 European countries. With 40 manufacturing systems and a total of about 5,500 employees, the Group generates annual revenue of about € 1.2 billion and, outside Europe, operates through a global network of agents, licensees and distributors. In 2012, Wavin became part of Mexichem Group, a Latin American leader in the petrochemical and pipeline systems industry.
Wavin provides effective solutions for the basic needs of daily life: safe distribution of drinking water, sustainable management of rainwater and sewage and energy-efficient heating and cooling for buildings.
Wavin's leadership in Europe, its local roots, constant commitment to innovation and technical assistance are big advantages for our customers. In fact, we guarantee full compliance with the highest standards of sustainability and reliability of supplies, allowing our partners to achieve their goals.

Market leader

Founded in 1955 based on an innovative idea by J.C. Keller, director of the company that managed the Dutch water supply, its more than 60 years of experience allows Wavin to connect the impossible to the possible.
Its innovations in plastic piping systems and water management solutions are the result of its on-going commitment and ability to bridge the gap between new challenges and known and traditional solutions.
The excellent performance and quality of its products guarantee that Wavin systems will have a long service life.

The activities and commitment of the Wavin Group are supported by four pillars:

Innovation
From the very beginning, Wavin has had a strong focus on innovation. In fact, the development of a new product or new solutions is the result of a dedicated team, able to transform ideas into reality. Wavin's challenge is to offer the market innovative technological solutions using plastic components, which is what the company is best at producing.

Sustainability
Wavin invests in research to offer real answers to the construction industry's future environmental challenges. In fact, climate change demands increasingly advanced and safe solutions for managing the storm water cycle, from collection to its natural reuse. Sustainability that the company guarantees not only through its products, but that also applies to its production processes in the Group's factories.

Social commitment
Since 2005, Wavin and UNICEF are active partners in providing essentials such as drinking water and sanitation to children around the world. Over the years, Wavin has supported several projects (in Mali, Papua New Guinea, Nepal and Bhutan), offering its products, but most of all providing money and expertise to bring drinking water to more than 200 schools and 60 health facilities, and to improve sanitation for over 96,000 people (especially children).

Comfort
Wavin devotes particular attention to solutions that ensure environmental comfort, where temperature, humidity and noise levels are the main factors that determine the state of well-being of the home environment. Soundproofed drain systems along with radiant heating and cooling systems are the ideal solutions for those who distinguish themselves in offering comfort.
It is precisely in this way that Wavin Italia distinguishes itself through the solutions of the Chemidro brand by offering a wide range of radiant heating and cooling systems articulated in numerous underfloor solutions that are ideal for any type of building and need, thermal insulation panels, dry solutions and low profile panels ideal for renovations and acoustic solutions.
Wavin offers innovative ceiling heating and cooling solutions that provide energy saving and environmental sustainability, such the CD-4 system, which allows realising radiating surfaces to measure, as a function of individual project, the CD- 10 system and the WD-10 and WW-10 wall systems.

Wavin by Chemidro offers its own CE-marked underfloor systems that, in addition to product quality, also provide the end user a guarantee of the thermal resistance characteristics of the insulating panel.
The solutions offered are the most technologically advanced, the production processes ensure reliability and Wavin technicians offer a wealth of knowledge with few equals in Europe.
All this for the benefit of our customers who can thus compete more successfully in the market.

The training centre
wavin | academy

Wavin Italia's point of pride is the Wavin Academy Training Centre, an innovative facility launched in 2014 where industry professionals and employees discover Wavin's multiple solutions and keep up-to-date on new products and new technologies. Each week, it organises training courses developed to enhance the professionalism of plumbing distributors, installers, designers, heating and cooling engineers, architects and students, who can participate in dedicated courses based on the type of application and design.
The courses are taught by highly qualified Wavin instructors with specific areas of expertise, who are available to respond to the many requests of the participants to train personnel who can propose, design and install Wavin's many solutions and ensure complete customer satisfaction.

Contact us:

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e-mail: wavin.academy.italy@wavin.com

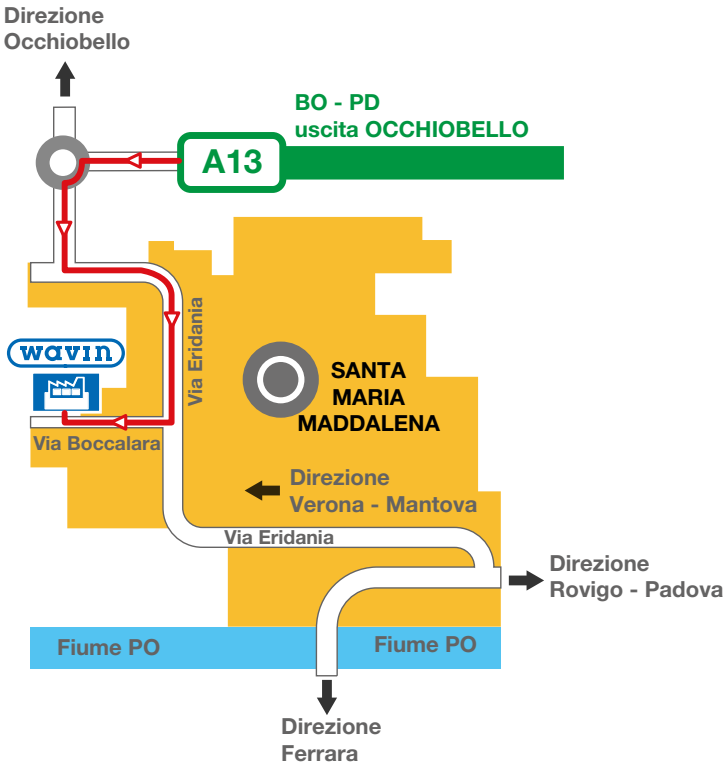
How to reach us:

Wavin Academy is located in our company, just 8 km from the old town centre of Ferrara and 1 km from the Occhiobello exit of the A 13 Bologna-Padua motorway.

Airport: Bologna Guglielmo Marconi (BLQ) 45 Km - Venezia Marco Polo (VCE) 104 Km

Motorway: A13 BOLOGNA-PADUA 1 Km

Ferrara - 8 km / Bologna - 50 Km
Rovigo - 25 Km / Padova - 60 Km



Ceiling and wall radiant systems

1. Thermal wellness and radiant systems

With the evolution of materials, construction techniques and people's needs, the ultimate goal of building construction is increasingly to provide a place to live or work that is also comfortable. The concepts of environmental well-being and comfort are thus increasingly important and become the goals to achieve in terms of acoustic, lighting and thermal comfort and air quality.
In this part we provide a general, easy-to-read overview of how to measure and achieve well-being. Obviously, this is a simplification because the conclusions discussed here are the final result of very complex considerations ranging from applied physics to the current standards.

Thermo-hygrometric well-being

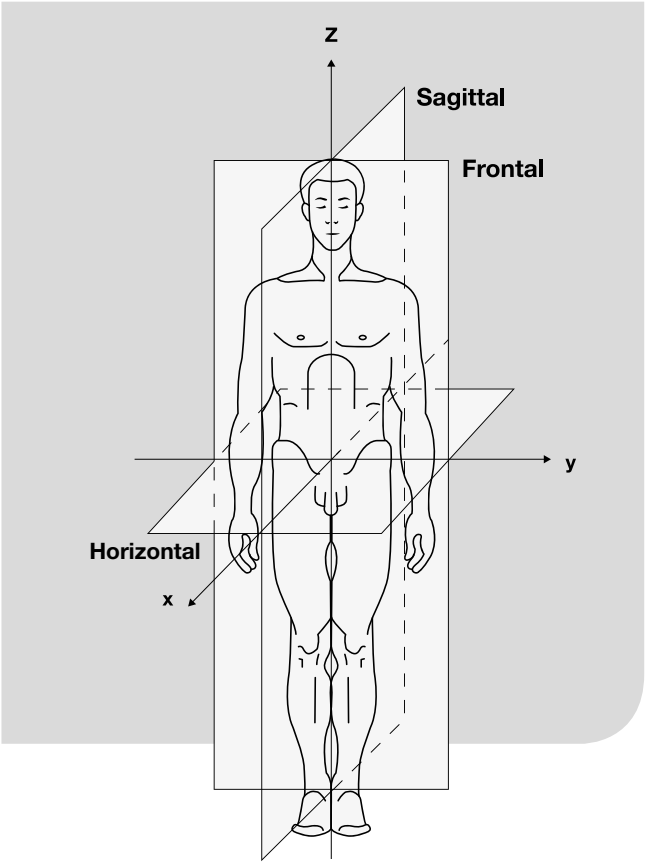
It is difficult to define the quality of life in a space because well-being is a subjective perception. Commonly, environmental well-being is defined as a condition in which people are neither too cold nor too warm and, thus, in a neutral state.
What we perceive is based on the thermal equilibrium of the human body and, in fact, feeling of cold or warm is nothing more than the expression of the condition in which we find ourselves. Our body is in a neutral condition, and therefore comfortable, when the energy we produce, depending on the type of physical activity we are doing, called metabolic activity, is equal to the energy that we release to the environment. If, for example, we are sitting in an office, our bodies have an, albeit low, metabolic activity, but at the same time we are releasing mechanical and thermal energy into the environment through respiration, convection, conduction, irradiation and evaporation from the skin. If the sum of these energy losses, which are affected by many factors as we shall see below, is equal to our energy metabolism, we are in condition of comfort.

The factors that affect well-being

The energy exchanges that occur between our bodies and the environment, and which, as seen above, affect comfort, are therefore basically of two types: environmental and physical.
The parameters related to people are:
- metabolism, which, as mentioned, depends on the person's type of physical activity, measured in METs (metabolic equivalents);
- the type of clothing, which for obvious reasons will vary depending on intended use of the space, the person's role, the type of activity performed (for example, an office manager will surely dress differently than a receptionist) measured in CLOs (clothing units).

The environmental parameters are:
- relative humidity of the environment measured as a %;
- air speed in m/s;
- air temperature in °C;
- mean radiant temperature in °C.

The mean radiant temperature is given by the temperatures of the surfaces that surround the person, corrected with view factors. In fact, the influence of the temperature of a surface on an occupant varies depending on the position of the surface in relation to the person. For example, in Figure 1, the temperature of a surface placed along the X axis (such as a window or wall), and thus in front of the person, will have a greater weight in the calculation of the mean radiant temperature than the temperature of a surface placed along the Z axis (for example, ceiling or floor). The influence of the temperature of the various surfaces also varies in relation to the occupant's position, sitting, standing or lying.
From the mean radiant temperature and the air temperature, we derive the operating temperature, which is taken into account in the analysis of environmental comfort defined in the UNI EN 7730 standard where, based on this temperature and other factors, it is possible to establish the degree of comfort that can be achieved. It seems clear that the operating temperature is particularly influenced by radiant systems. As we will see later, if positioned correctly radiant systems achieve excellent results without the risk of increasing or decreasing the air temperature too much and thus avoiding high vertical temperature differences (see below).



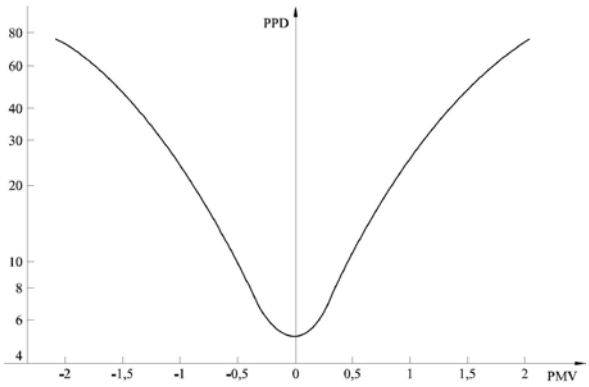
Measuring well-being

Even though well-being is subjective, there are methods for establishing if we are comfortable or not based on several parameters.
The UNI EN 7730 standard describes the method for measuring comfort and the first value to be defined is PMV, the Predicted Mean Vote that the people in a space would give to the feeling of warmth they are experiencing. In fact, PMV is based on the thermal energy balance we spoke of above and ranges from a value of -3 to +3 based on how the person feels.
PMV is thus linked to another parameter: PPD, the Predicted Percentage Dissatisfied, or the percentage of people who will be dissatisfied with the thermal condition in which they find themselves. For example, a PMV of 0.5 corresponds to a percentage of dissatisfied of 10%.
The same standard establishes the comfort classes, A, B and C. For these classes, benchmarks are indicated and even the limit values of discomfort to maintain (see next point). In any case, it is advisable to maintain PPD values below 10%

PMV index

+3	Hot
+2	Warm
+1	Fairly warm
0	Neither warm nor cold
-1	Fairly cold
-2	Cold
-3	Very cold

Indication of the percentage of dissatisfied



Comfort classes

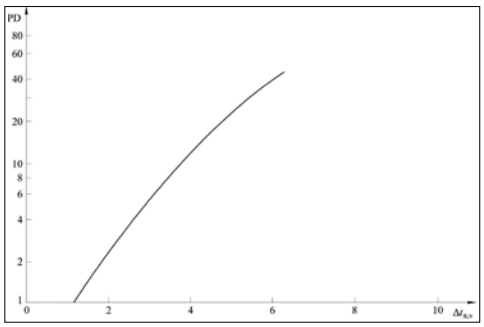
Category	Thermal state of the body as a whole		Local discomfort			
	PPD %	PMV	DR %	vertical difference of air temperature	PD % caused by hot or cold floor	radiant asymmetry Radiant
A	<6	-0.2 < PMV < +0.2	<10	<3	<10	<5
B	<10	-0.5 < PMV < +0.5	<20	<5	<10	<5
C	<15	-0.7 < PMV < +0.7	<30	<10	<15	<10

Discomfort elements

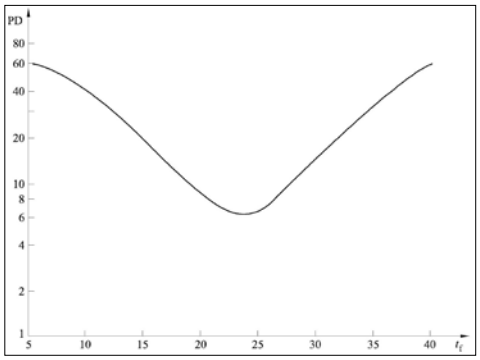
In addition to the calculation described above, in seeking environmental well-being, we must also take into account the thermal discomfort caused by other factors: discomfort due to draughts, the vertical difference in air temperature, the temperature of hot or cold floors, the temperature of hot or cold walls and the temperature of hot or cold ceilings.

It is advisable to maintain these parameters below:
- draught speed <0.3 m/s
- vertical difference of air temperature < 5 °C
- floor temperature between 19 °C and 29 °C
- temperature difference of a hot wall from the other structures < 23 °C
- temperature difference of a cold wall from other structures < 10 °C
- temperature difference of a hot ceiling from other structures < 5°C
- temperature difference of a cold ceiling from other structures < 14 °C

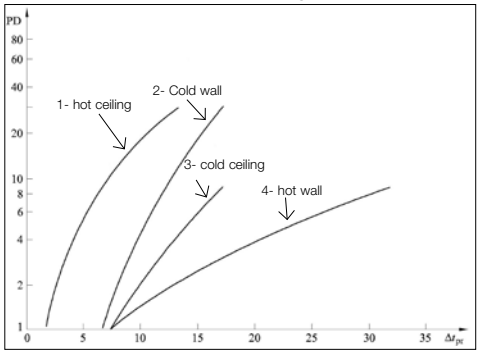
Vertical difference of air temperature



Percentage of dissatisfied based on the temperature of the floor



Percentage of dissatisfied based on the temperature difference between air and ceilings or walls



Radiant systems

Unlike traditional convection systems that change the temperature of the air, radiant systems are characterised by an emission of energy by a warm emitter system to a cold absorber system. A fundamental characteristic of these systems is that the flow of heat emitted by irradiation is much higher than emitted by convection which, though minimal, still exists, as we see in the points that follow. The exchange of energy between two bodies with different temperatures does not affect the air but only the two surfaces involved. In fact, an underfloor system exchanges heat with the surrounding structures such as walls, windows, ceilings, etc. This causes an increase in the surface temperature of the surfaces and benefits the mean radiant temperature mentioned previously.
To achieve comfort, it should be considered that, in addition to exchanging or subtracting heat from the surrounding surfaces, the system also acts on the occupants of a space.
Among the various advantages of a system of this kind, we can point to the absence of air movement, the modularity of the system, the quality of the comfort - given that we can change only the temperature of the structures without changing the air temperature - and the uniformity of heat distribution.
Not least, a great advantage of irradiation is on large volumes, where we do not warm or cool the entire volume of air, but only exchange heat with the surfaces, with obvious energy saving.

How radiant systems work

1. The structures of a space have internal temperatures that depend on the outside temperature, the ambient temperature and the transmittance of the structure itself. In the figures, the colour scale from blue to red indicates cold to hot.

2. When heating, the convection system heats the ambient air. If the structures have a very cold surface, to reach the appropriate operating temperature, the ambient temperature must be increased a lot. This can cause a high vertical temperature difference and possible air stratification.

3. Also, when in air-conditioning mode, the convection system treats the ambient air. If the structures have a very hot surface, to reach the appropriate operating temperature, the ambient temperature must be lowered a lot. This can cause a vertical temperature difference and stratification, making air distribution difficult.

4. Underfloor heating exchanges energy with adjacent structures, increasing their surface temperature. This increases the mean radiant temperature until reaching the desired operating temperature, all without excessively increasing the air temperature and causing the stratification.

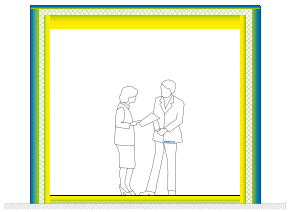
5. Underfloor cooling subtracts energy from the adjacent structures, decreasing their surface temperature. This reduces the mean radiant temperature until reaching the desired operating temperature, with the advantage of an adequate air temperature without air movement.

6. **Wall system** - Of the radiant systems, this provides the best exposure for those occupying the rooms. Particularly suitable as a supplement in bathrooms, where the demand for heating comfort is highest, or in stairwells. The small convective air movements, represented by the red arrow, assist the performance of the system in terms of winter power.

7. **Wall system** - One very important characteristic of wall systems is the possibility of balancing the heating and cooling performance, in terms of power, which is a characteristic not in common with other types of plants. Particularly suitable as a supplement on outer walls of spaces exposed to solar radiation.

8. **Ceiling system** - When operating in winter mode, the ceiling system is the best solution for the latest generation of buildings. Particularly fast and responsive, it has the lowest output temperature of radiant systems. Especially suitable for spaces where the occupants are lying down such as hospital admissions and patient rooms.

9. **Ceiling system**- In summer mode, this system makes it possible to work with higher surface temperatures than other radiant systems. In fact, the ceiling system is, among the radiant systems, the one that provides the highest cooling performance in terms of emitted power. Particularly suitable in highly crowded spaces.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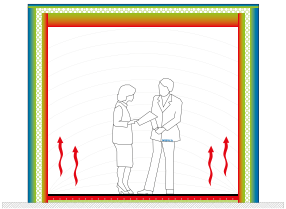

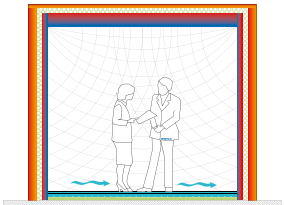
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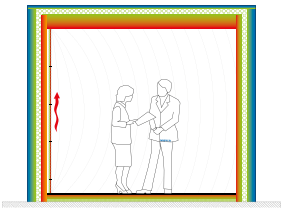
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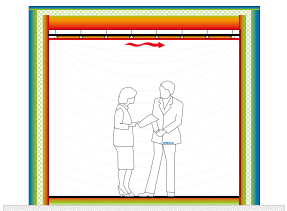
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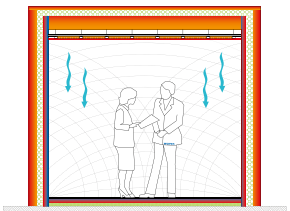
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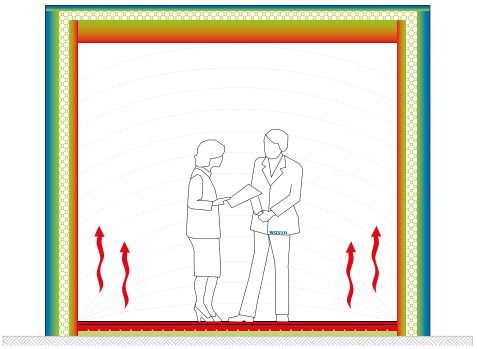
Thermal output of radiant systems

After having explained how radiant systems work in the previous part and having mentioned the small convective air movement that this type of system generates, here we discuss the thermal output that the Standard takes into account.



Heating

Underfloor system
10.8 Watts per m² for each °C of difference between the ambient and surface temperatures of the system

Wall system
8.0 Watts per m² for each °C of difference between the ambient and surface temperatures of the system

Ceiling system
6.5 Watts per m² for each °C of difference between the ambient and surface temperatures of the system

Cooling

Underfloor system
6.5 Watts per m² for each °C of difference between the ambient and surface temperatures of the system

Wall system
8.0 Watts per m² for each °C of difference between the ambient and surface temperatures of the system

Ceiling system
10.8 Watts per m² for each °C of difference between the ambient and surface temperatures of the system

As you can see, the three systems, floor, wall and ceiling, differ in terms of performance because of the action of the above-mentioned convective air movements. This results in different characteristics that make them suitable for different types of systems. For example, it is clear that the ceiling system is the ideal solution for cooling systems.
Beyond these characteristics, without going into details, one should consider that the average temperature of the water circulating in the system is about 5 °C lower than the surface temperature and about 3 °C lower in the wall and ceiling systems. For more precise indications see the technical data sheets contained in our documentation.
For a better understanding, here is an example:

In this case, the ceiling system is by far the most efficient system

To provide 35 W/m2 in cooling	Surface temp.	Average Water Temp.
underfloor system	20.7°C	15.7°C
wall system	21.6°C	18.8°C
ceiling system	22.8°C	19.8°C

with a surface temperature far from the dew point and an output 4 °C higher than the underfloor system.

Standards for radiant systems

The following standards are applied when sizing and installing ceiling and wall radiant systems:

UNI EN 1264 This standard is made up of 5 parts and is the technical regulation that defines all the elements that make up a radiant system built into the structures, fed with water, and installed in the floor, wall or ceiling, for heating and cooling. This same standard provides the methods for calculating the emissions of these systems.
In this chapter we simply summarise the key points related to what has been stated before in the part on environmental well-being, and try to indicate the parts that can be helpful in designing and installing these systems.

UNI EN 11855:2015 This standard applies to surface hydronic heating and cooling systems built into the structures of residential, commercial, and industrial buildings. The methods apply to wall, floor, or ceiling systems, without air gaps around them.
This standard overlaps with UNI EN 1264.

UNI EN 14240 This standard specifies the conditions and test methods for determining the cooling capacity of cold ceilings, that is, it defines the physical test used to calculate the thermal performance in cooling. In fact, there is currently no specific standard for ceiling units not built into the structures that defines a method for calculating these performance levels. ISO took a first step in this direction in 2016 when it published the ISO 18566 standard, not yet transposed in Italy.

UNI EN 14037:2016 This standard defines the technical specifications and requirements for prefabricated ceiling-mounted panels, which provide an air gap between the structure and the heating unit, fed with water at a temperature of less than 120°C.
It also provides indications for the physical tests for determining the thermal performance in heating and cooling, and so this point overlaps with UNI EN 14240.

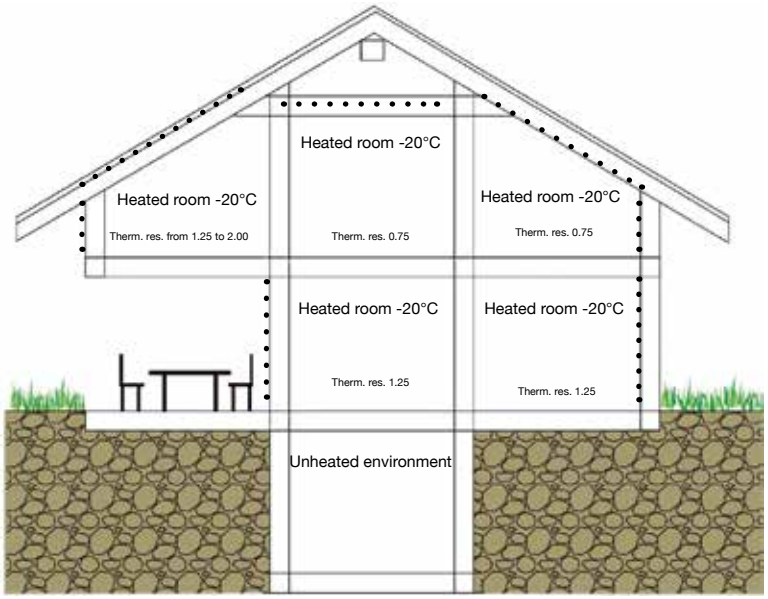
Insulating layers

Particular attention is paid to the thermal resistance of the insulating layer placed between the system and the outside or the adjacent environment.
The Standard considers the insulating layer to be the one placed immediately below the piping, even if resulting from the coupling of two or more panels. The thermal resistances to consider are:

	Underlying environment heated	Underlying environment unheated, not continuously heated or directly on the ground*	Temperature of the underlying outside air		
			Outside design temperature $T_d \geq 0$ °C	Outside design temperature 0 °C > $T_d \geq$ -15 °C	Outside design temperature -5 °C > $T_d \geq$ -15 °C
Thermal resistance (m^2·K/W)	0.75	1.25	1.25	1.50	2.00

*With a ground water level of ≤5 m, the value should be increased

In relation to wall and ceiling systems, be careful:
The thermal resistance is not only that in the single insulating layer behind the piping, but the thermal resistance of the entire structure behind the piping is taken into account. The thermal resistance values are the same as those in the table shown above.



Safety

A safety device must be installed on heating systems that, independently of the control unit, can also operate in the absence of electricity to cut off the supply of hot water to system circuits, so that the temperature around the heating elements does not exceed 50 °C for gypsum or lime plasters or sheets, 55 °C for screeds based on cement or calcium sulphate or 70°C for lime or cement rendering. These values can be reduced for other types of coatings, for example to 45 °C for asphalt support layers. In any case, the manufacturer's specifications must be followed for all types of coatings.
Cooling systems require a dew point detection device to cut off the supply of cold water before the formation of condensation, while the temperature around the cooling elements must not reach the dew point.

Clearances

The system piping must be positioned more than:
- 50 mm away from adjacent structures;
- 200 mm away from chimneys and open fireplaces, open or walled-up shafts and lift shafts.

Joints

Expansion joints must be formed in drop-ceilings, according to the rules laid down by the ceiling material manufacturers, while two successive expansion joints must not be more than 10 metres apart.

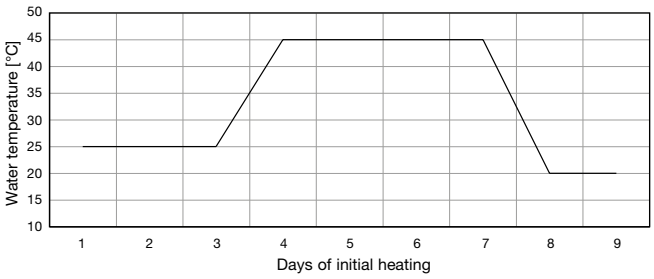
Leak testing

Leak testing can be performed with water or compressed air.
Before installing the support layer, the circuits must be leak tested with a pressure test.
The pressure used in the test must not be less than 4 bar and not more than 6 bar for standard systems.
The absence of leaks and the pressure used must be specified in a test report. Where there is risk of frost, suitable precautions must be taken, such as the use of anti-freeze products or heating of the building. When normal operation starts, the antifreeze should be drained and disposed of in compliance with current regulations and the system must be rinsed at least 3 times with clean water.

Initial heating

Leak testing can be performed with water or compressed air.
Before installing the support layer, the circuits must be leak tested with a pressure test.
The pressure used in the test must not be less than 4 bar and not more than 6 bar for standard systems.
The absence of leaks and the pressure used must be specified in a test report. Where there is risk of frost, suitable precautions must be taken, such as the use of anti-freeze products or heating of the building. When normal operation starts, the antifreeze should be drained and disposed of in compliance with current regulations and the system must be rinsed at least 3 times with clean water.

Thermal curve of initial heating according to EN 1264-4



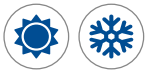
2. Types of ceiling and wall radiant systems

The initial distinction relates to the position in which the radiant systems are installed inside the building structures, and so we have:

- Ceiling systems
- Wall systems

For these two types of systems, the panel models are very similar to one another in terms of construction, but differ in how they function, due to their different installation positions.
They are both based on low thermal inertia solutions, which calls for a high response speed when heating or cooling of a space is required.

The main advantages that ceiling and wall systems have in common are:

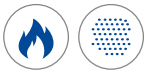


A single system for winter heating and summer conditioning.

A system that can be installed in new buildings and renovations.

A system that can be installed in the residential and services sectors.

Increased comfort: absence of air flows and stratification of heat.



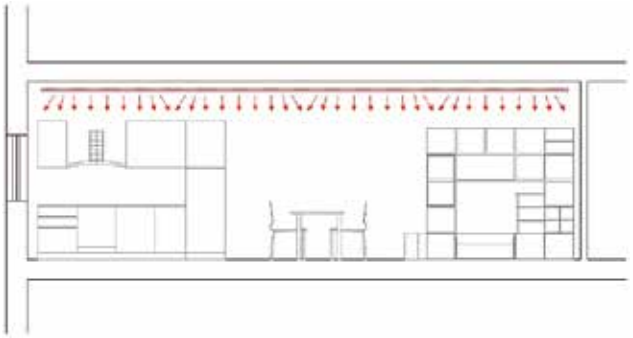
No high temperature sources
No combustion of dust.

Silent operation.

Minimal maintenance.

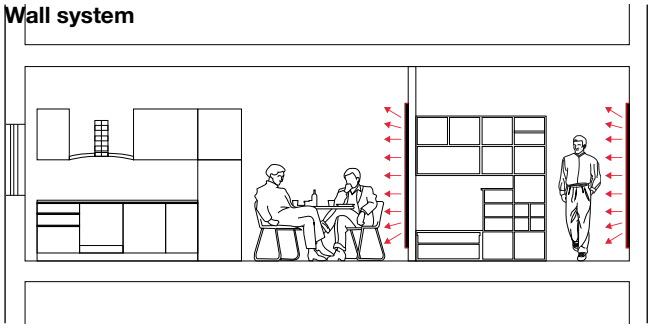
The specific advantages to the two radiant systems are:

Ceiling system



- Eliminates the onset of convection movements in the rooms.
- Uses the only surface in the rooms that is almost entirely clear.

Wall system



- Eliminates the movement of air and dust.
- Eliminates the problem of air stratification.
- Flows over the largest area of the human body.

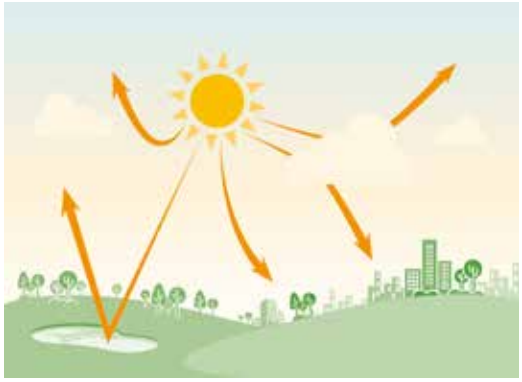
The second distinction lies in how the radiant system is installed, and so we have:

- **Systems built into the building's structures** in this case we talk about pipes embedded in the render on walls and ceilings.
- **Systems not built into the building's structures** and so we talk about dry radiant panels.

3. Ceiling radiant systems

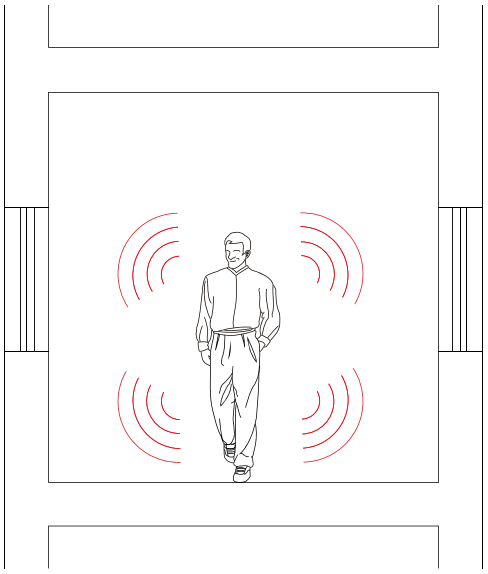
The first question people ask when you propose a ceiling system is: How can a ceiling system heat a space if hot air tends to gather in the upper part of the room?

The first comparison to make is with the primary source of heat - the sun.
By means of radiation it transfers heat to the structures around it.
Applying the same principle, the ceiling system transfers heat to the room's structures, increasing or reducing the mean surface temperature, and taking it as close as possible to the air temperature.

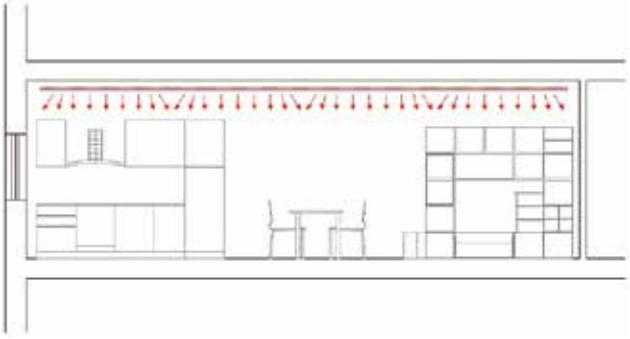


Optimum comfort inside a room is obtained when the human body is able to exchange heat with the structures around it, in the correct proportions:

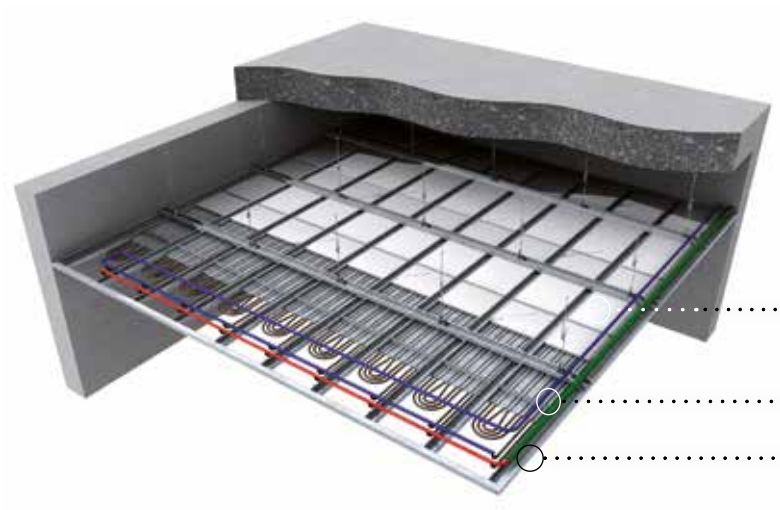
- 40-45% - RADIATION (depends on the mean temperature of the surfaces).
- 15-20% - CONVECTION (depends on the air temperature).
- 0,5-1% - CONDUCTION (depends on the points of contact with the structures).
- 30-40% - EVAPORATION (depends on the activity inside the room).



As can be seen, by guaranteeing an adequate surface temperature for the structures, we are able to guarantee optimum comfort inside the room.
One needs to get away from the idea that heat on the head is not comfortable. An adequately sized ceiling system does not create any bothersome sensation caused by heating the top of the head.



CD-4 ceiling system



This system is suitable for heating and cooling use.

Primary framework spaced at 80 cm

Primary framework spaced at 40 cm

CD-4 CM-70 ceiling panel with polystyrene insulation behind it

Feed pipe

Support structure

The CD-4 ceiling system is an innovative radiant heating and cooling system presented by WAVIN.
IT is built to optimise the thermal performance of panels, thereby making the use of heat pumps to produce water at low temperatures on the delivery side for heating, even more attractive.
IT is especially suitable for the services sector, but can also be used in residential buildings.
In addition, it constitutes a thermal barrier to the outside, irrespective of the insulation, and ensures an even temperature inside the room.

Sized to suit the site

Because it is possible to produce the radiant surface to size (fixed width and variable length), to suit design needs, this is by far the most versatile system on the market. The possibility of using panels up to 5 metres long, makes it particularly suitable for installation in large size rooms.

Design based on the individual environment

The various lengths available make it possible to design the maximum coverage of the surface possible, thereby guaranteeing satisfaction of even large work loads, but at optimum surface and delivery temperatures, thereby achieving significant energy savings. In addition, thanks to its versatility, it is easy to integrate with light points and any other systems in the ceiling space.

Reduced installation times

The particular module connecting system allows simply, quick installation by the installers. The radiant surfaces are installed and connected up, and the system is tested before the finishing sheets are installed, which are independent of the system. This important, exclusive characteristic of the CD-4 system therefore clearly separates the two work phases (unlike other ceiling systems on the market), avoiding wasting time and resources.

Suitable for all types of buildings

The possibility of activating a large percentage of the areas available, simplicity of integration with other plants, and the option of choosing the type of finish, make the CD-4 system suitable for small or large rooms, with low or high thermal loads, with or without other plants in place, and with or without needing special surface finishes. In addition, its low thermal inertia makes it suitable for on-off applications, whether they be homes, business offices, or other premises.

Installation

The CD-4 ceiling system is installed on a double metal framework for constructing plasterboard drop ceilings, the only requirement being that the second framework must be spaced 40 cm.

The panels are fitted with hooks that make fixing to the suspended ceiling structure possible.

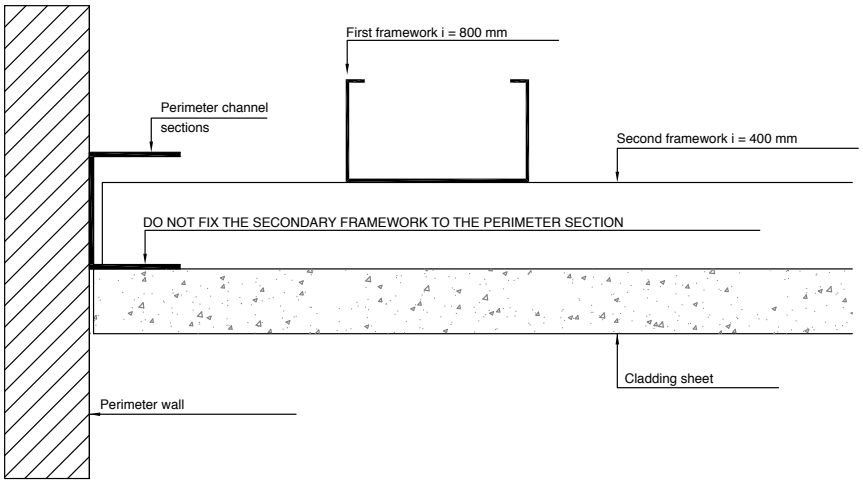
We recommend not screwing the profiles of the second framework to the perimeter profile, in order to be able to move them easily, thereby facilitating fixing the panels.

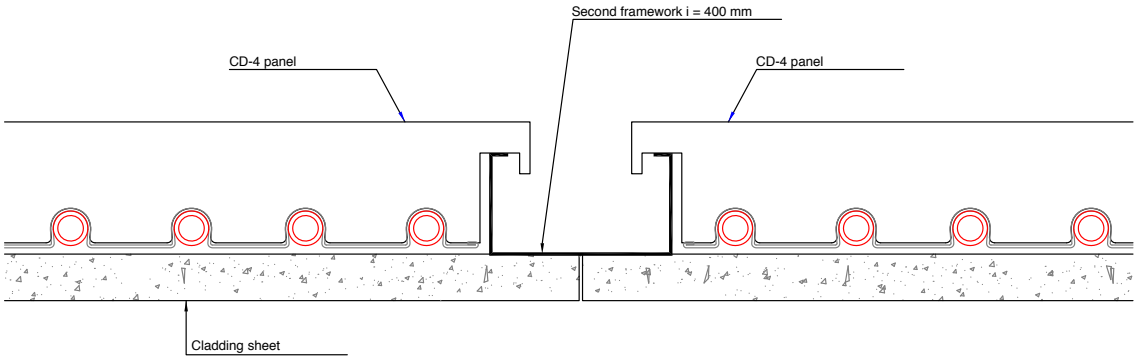
All hydraulic connections are formed using push-fit quick couplings.

The infill panels are fixed later, directly to the metal profiles that make up the second framework.

Installation - cladding

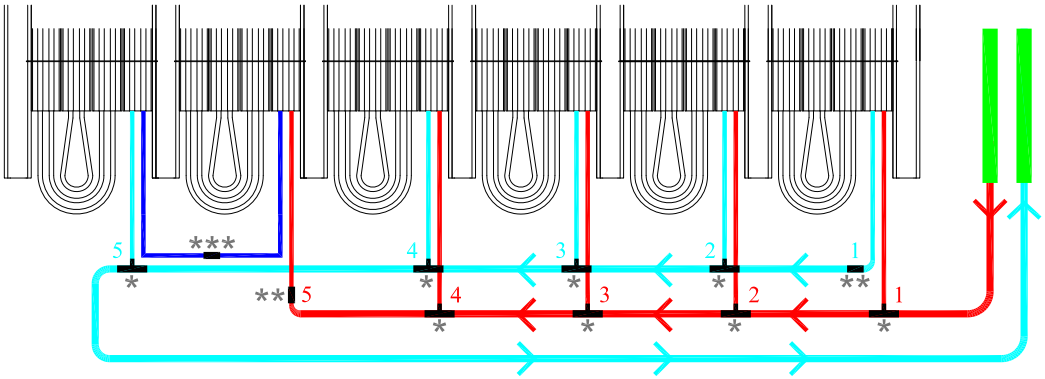
The CD-4 panels are completely separate from the cladding panels. This means that the edge joints and gaps must be made as prescribed by the panel suppliers.
HOWEVER, we recommend using micro-perforated paper, and not adhesive meshed tape, for covering the edge to edge distance between the panels.





Installation - hydraulic connection

In order to optimise the system's performance, we recommend connecting the panels using the Tichelmann system (with reverse return), thereby facilitating self-balancing of each individual outgoing circuit of the manifold.
The sum of the lengths of the panels in series must not differ from the lengths of the individual panels by more than 10% within the same circuit.

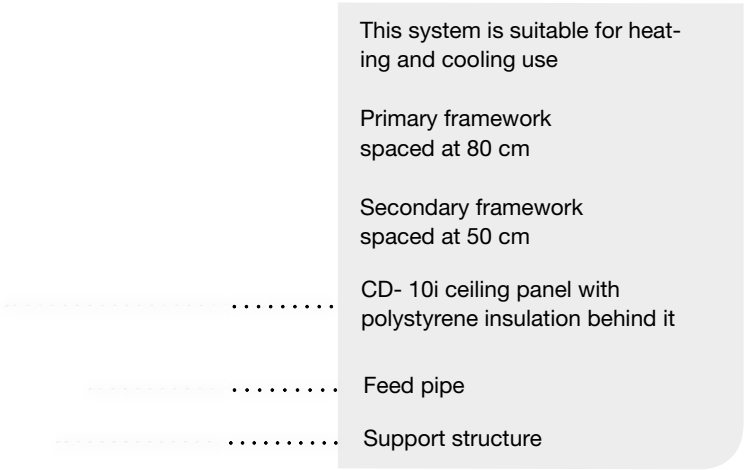


* Mixed press-fit, push-fit Tee 10 -16 -10 mm

** Mixed press-fit, push-fit coupling 16 - 10 mm

*** Press fitting 10 mm

CD-10i ceiling system



The CD-10i ceiling system was made for dry suspended radiant ceiling systems, and can be installed in both new buildings and when doing renovation works.

The CD-10i panels are modular and come in three different sizes 500x1200 mm, 1000x1200 mm, 2000x1200 mm, to allow the greatest possible percentage coverage of the ceiling area available, by combining them suitably to suit the design of the room.

The panels are made by combining a milled-out 15 mm plasterboard sheet, in which the pipe coils are inserted to allow hot or cold water to pass, with a sheet of EPS 200 polystyrene, in order to increase thermal efficiency towards the spaces involved.

Passive panels are used to close off the drop ceiling in non active zones, and are made of 15 mm plasterboard sheets coupled with EPS 200 polystyrene insulating panels, in order to form fully insulated ceilings.

The suspended ceiling supporting structure must be suitably sized in order to support the weight of the radiant panels, connecting and water piping, and any parts of other plants that pass through the suspended ceiling.

Installation - Hydraulic connections

In order to optimise the system's performance, we recommend connecting the panels using the Tichelmann system (with reverse return), thereby facilitating self-balancing of each individual outgoing circuit of the manifold.
The sum of the lengths of the panels in series must not differ from the lengths of the individual panels by more than 10% within the same circuit.

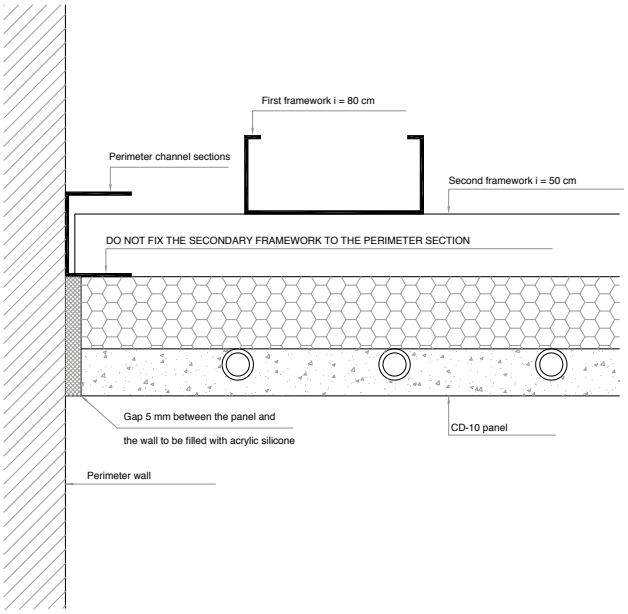
Installation - Structure and cladding

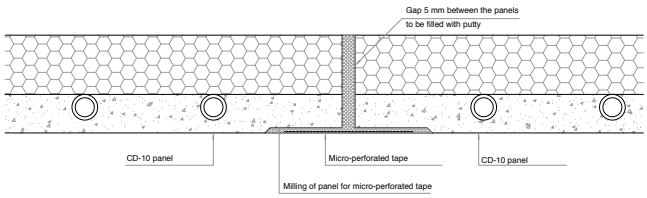
In order to obtain a radiant system with the maximum heat and structural performance, after taking the preliminary precautions listed above, it is best to follow this procedure:

1. The spacing of the secondary structure used for fixing the panels must be a maximum of 50 cm. The spacing of the primary structure must be determined by the plasterboard installer, according to the supporting structure, however, we recommend that this should not exceed 80 cm.
2. Never screw the secondary framework to the perimeter U profile - simply insert it and leave a gap of a few millimetres to allow for any expansion.
3. Always leave a 5 mm gap between the panel and the perimeter wall, to allow for any thermal expansion. This gap is to be filled with acrylic silicone.
4. Always leave a 5 mm gap between the panels, including the infill panels, to allow for any thermal expansion.
5. These gaps must later be filled with putty and micro-perforated tape must be laid as close as possible to the finished surface.
6. We recommend using 5 cm micro-perforated paper tape (not micro-perforated adhesive tape or glass fibre tape).
7. The panels have been planed about three centimetres wide on two sides. For laying the micro-perforated tape, we recommend also planing the other sides by about 2-3 mm, so that the tape finishing is on the same level as the panel's surface.
8. In order to take the preliminary indications into account as well, the finishing level recommended beforehand is Q3 in accordance with UNI 11424.

Preliminary precautions

Since the CD-10i panels are made of layers of different material, they are more prone than single-material panels to curve as storage heat and humidity conditions vary. The surface finishing level must therefore be assessed by the installer, in light of the site conditions and the end client's requirements.





WW-10 ceiling system

This system is suitable for heating and cooling use

Cover with render for a total thickness of 25 mm.

Render support mesh, flush with fibre or metal tubes at the installer's discretion.

This system is constructed on the ceiling using bars and support brackets, with the feed on the nearest wall.

The WW-10 radiant system is very simple, made of radiant panels built starting with a 10 mm Ø pipe laid out to form a coil using suitable fixing bars and support brackets. The brackets are then fixed to the wall using hot glue or screws that are suitable for the base. These panels can be prefabricated, rather than built on site.

When the WW-10 ceiling system is created, a "built on site" version is preferred, because each ceiling has its own length, and with this version there are no positioning constraints associated with the panels' modularity. This does not prevent the "prefabricated" version being used for particular designs.

This system solution makes it possible to:

- Reduce the problem of radiant asymmetry, that is, temperature differences between the outside walls and the internal space.
- Have a very limited vertical temperature gradient, of less than 0,5°C.
- Keep the relative humidity stable inside the rooms.
- Eliminate problems of surface condensation on cold walls in winter.
- Realize a system with low thermal inertia, allowing it to get to its working state very quickly.

Rules for dimensioning / constructing WW-10 systems built on site

1. Maximum active area of the radiant circuit 14,00 sq.m.
2. Maximum active area of the radiant panel 2,25 sq.m. equivalent to 30 ml of piping (25 recommended).
3. In order to optimise the system's performance, we recommend connecting the panels using the Tichelmann system (with reverse return), and therefore the length of pipe for each individual panel must not differ by more than 10% for all the panels that make up a specific circuit.
4. The panel can be rectangular or L-shaped.
5. Clip rails spaced at approx 30 cm (4 m/sq.m).
6. One support bracket for each curve in the panel (13 pcs/m of width of active panels).
7. To anchor the clip rails, use hot glue or screws suitable for the base.

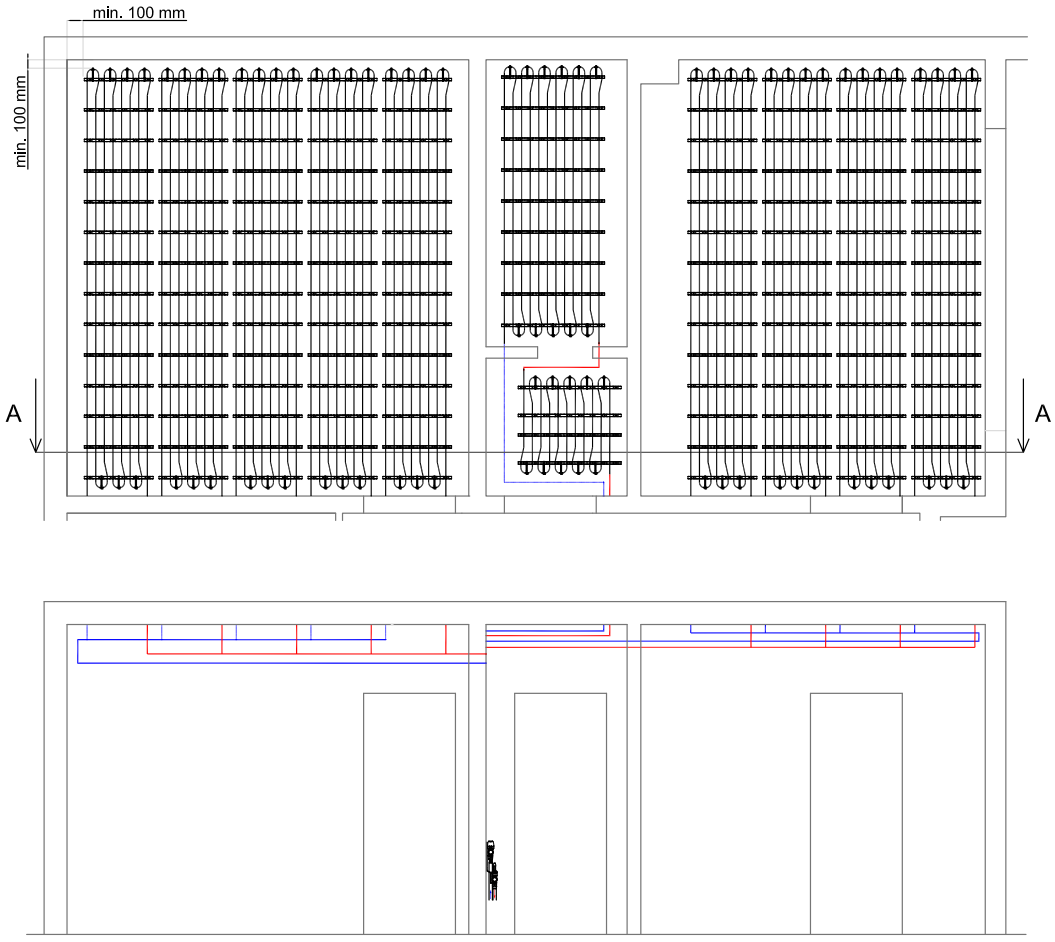
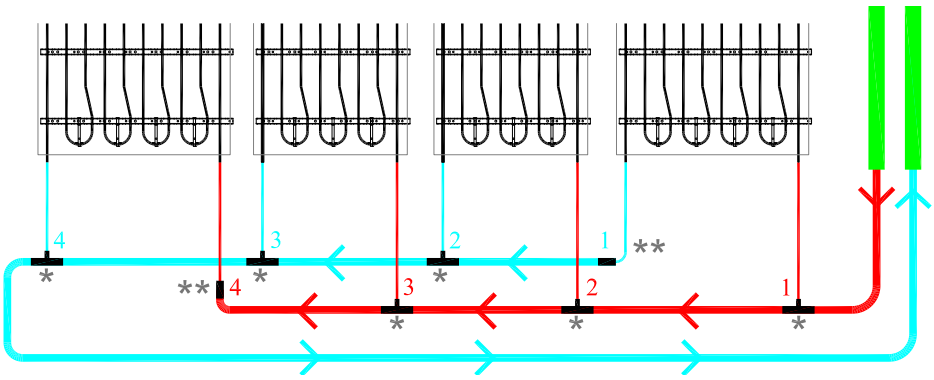


Fig. 1 Example of distribution for WW-10 ceiling panels

Installation - Hydraulic connections

In order to optimise the system's performance, we recommend connecting the panels using the Tichelmann system (with reverse return), thereby facilitating self-balancing of each individual outgoing circuit of the manifold.
The sum of the lengths of the panels in series must not differ from the lengths of the individual panels by more than 10% within the same circuit.



* Mixed press-fit, push-fit Tee 10 -16 -10 mm

** Mixed press-fit, push-fit coupling 16 - 10 mm

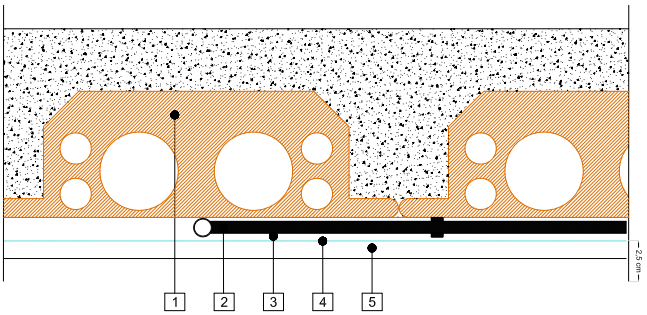
Preliminary indications

WE strongly advise against connecting 2 or more WW-10 panels in series, in order to avoid pressure losses that are too high, and problems with bleeding out the air.

If the panel is put in a position in which it is not possible to connect the WW-10 panel to the supply line directly, use an DN10 sleeve and a piece of DN10 pipe to form the extension.

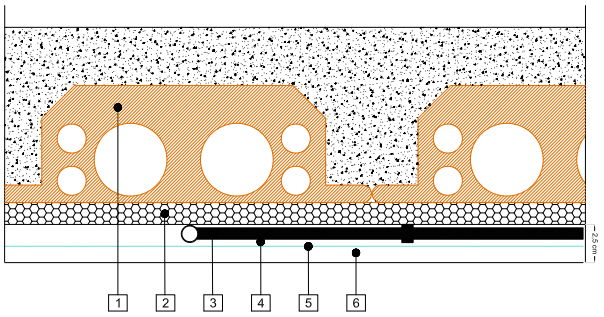
Installation

Sectional view of a ceiling radiant system, for structures made using premixed render.



1. Existing slab.
2. WW-10 panel with fixing supports.
3. First layer of render, 10 mm thick (flush finish with the panel).
4. Render support mesh in fibreglass, mesh 10x10 mm for ceilings that have optimum render bonding (e.g. new masonry), alternatively metal (50x50 mm) mesh with ceiling anchors.
5. Second layer of "fresh-on-fresh" laid render, after max 30 minutes, 15 mm thick.

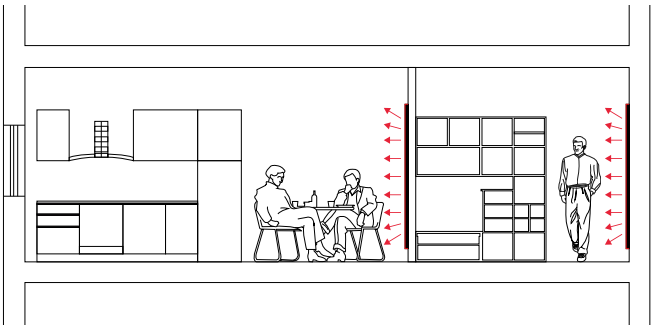
Sectional view of a ceiling radiant system, for structures made using premixed render, on insulated ceiling structures

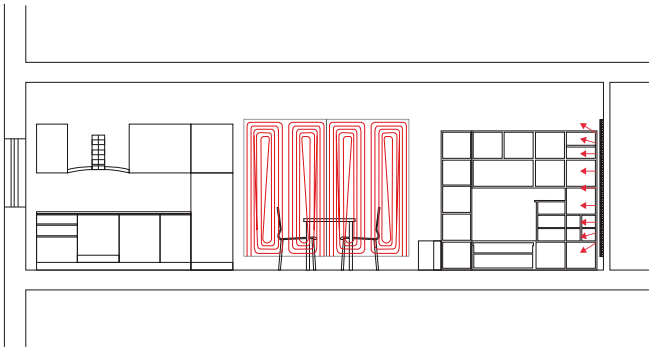


1. Existing ceiling structure.
2. Insulating layer - thickness at the designer's discretion.
3. WW-10 panel with fixing supports.
4. First layer of render, 10 mm thick (flush finish with the panel).
5. Metal mesh 50x50 mm, anchored to the ceiling supporting structure.
6. Second layer of "fresh-on-fresh" laid render, after max 30 minutes, 15 mm thick.

4. Wall radiant systems

Wall systems constitute the radiant technology that provides the greatest advantages in terms of environmental comfort, because the radiant effect flows over the largest area of the human body.
Positioning on the wall eliminates the problem of dust movement and air stratification, but is is difficult to apply in residential contexts as it requires clear wall spaces, not occupied by furnishings, pictures, and curtains.
It is more easy to use in stairwells, kitchens or laundries, where the spaces occupied are defined beforehand.
This system is often used as additional heating on bathrooms (for example, on one of the walls inside the shower cubicle or above the bath tub), to replace design radiators.





WD-10i wall system

This system is suitable for heating and cooling use

Distance between horizontal profiles (primary framework) 100 cm

Distance between vertical profiles (secondary framework) 60 cm

10X1.3 mm pipe

Indicating the circuit by marking out on the panel.

Mixed press-fit, push-fit tee

The WD-10i wall system was designed for forming dry radiant wall systems, and can be installed in both new buildings and when doing renovation works.

The panels are made by combining a milled 15 mm plasterboard sheet, in which 10 mm Ø pipe coils are inserted to allow water to pass, with a sheet of EPS 200 polystyrene, in order to increase thermal efficiency.

Passive panels are used to close off the false wall spaces in non active zones, and are made of 15 mm plasterboard sheets coupled with EPS 200 polystyrene insulating panels, in order to form fully insulated walls.

The false wall's supporting structure must be suitably sized in order to support the weight of the radiant panels, connecting piping, water, and any parts of other plants that pass through the false wall.

For wall systems installation on outside walls is always recommended because, besides being walls rarely covered completely in furniture, this method creates thermal barriers to the outside, preventing the walls from becoming cold in winter or hot in summer, thereby significantly improving comfort.

Installation - Hydraulic connections

In order to optimise the system's performance, we recommend connecting the panels using the Tichelmann system (with reverse return), thereby facilitating self-balancing of each individual outgoing circuit of the manifold.
The sum of the lengths of the panels in series must not differ from the lengths of the individual panels by more than 10% within the same circuit.

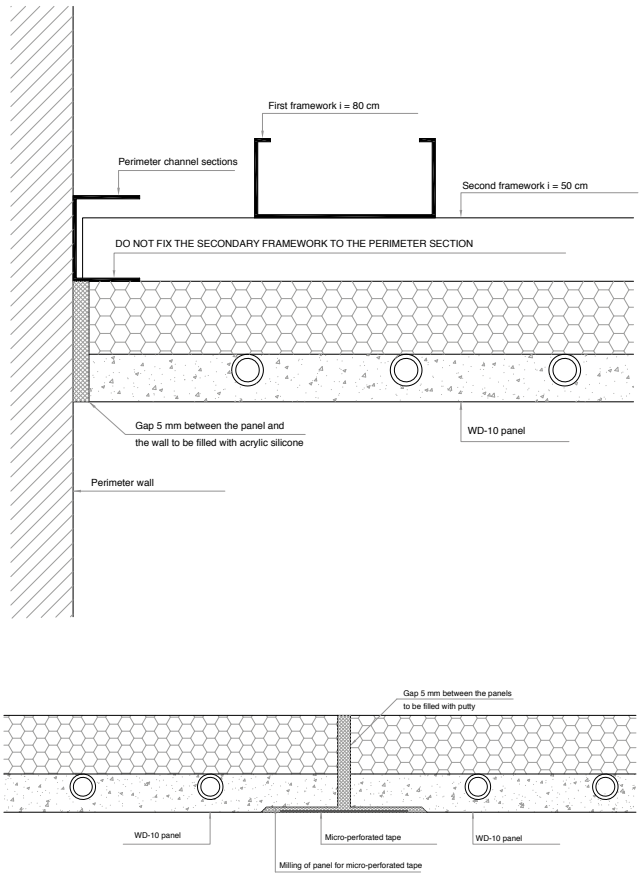
Installation - Structure and cladding

In order to obtain a radiant system with the maximum heat and structural performance, after taking the preliminary precautions listed above, it is best to follow this procedure:

1. The spacing of the secondary structure used for fixing the panels must be a maximum of 60 cm. The spacing of the primary structure must be determined by the plasterboard installer, according to the supporting structure, however, we recommend that this should not exceed 100 cm.
2. Never screw the secondary framework to the perimeter U profile - simply insert it and leave a gap of a few millimetres to allow for any expansion.
3. Always leave a 5 mm gap between the panel and the perimeter wall, to allow for any thermal expansion. This gap is to be filled with acrylic silicone.
4. Always leave a 5 mm gap between the panels, including the infill panels, to allow for any thermal expansion.
5. These gaps must later be filled with putty and micro-perforated tape must be laid as close as possible to the finished surface.
6. We recommend using 5 cm micro-perforated paper tape (not micro-perforated adhesive tape or glass fibre tape).
7. The panels have been planed about three centimetres wide on two sides. For laying the micro-perforated tape, we recommend also planing the other sides by about 2-3 mm, so that the tape finishing is on the same level as the panel's surface.
8. In order to take the preliminary indications into account as well, the finishing level recommended beforehand is Q3 in accordance with UNI 11424.

Preliminary precautions

Since the WD-10i panels are made of layers of different material, they are more prone than single-material panels to curve as storage heat and humidity conditions vary. Particularly wide spacing (60 cm) can give rise to a lack of planarity of the panel during installation.
The surface finishing level must therefore be assessed by the installer, in light of the site conditions and the end client's requirements.



WW-10 wall system

This system is suitable for heating and cooling use

Cover with render for a total thickness of 25 mm.

Render support mesh, flush with fibre or metal tubes at the installer's discretion.

10X1.3 mm pipe

Mixed press-fit, push-fit tee

The WW-10 radiant system is very simple, made of radiant panels built starting with a 10 mm Ø pipe laid out to form a coil using suitable fixing bars and support brackets. The brackets are then fixed to the wall using hot glue or screws that are suitable for the base. These panels can be prefabricated, rather than built on site.

When the WW-10 system is formed in the wall, the "prefabricated" version is to be preferred, as the useful wall height for air-conditioning the area occupied by people, does not exceed 200-250 cm. This does not prevent the use of the "built on site" version, especially for outside walls with little space available.

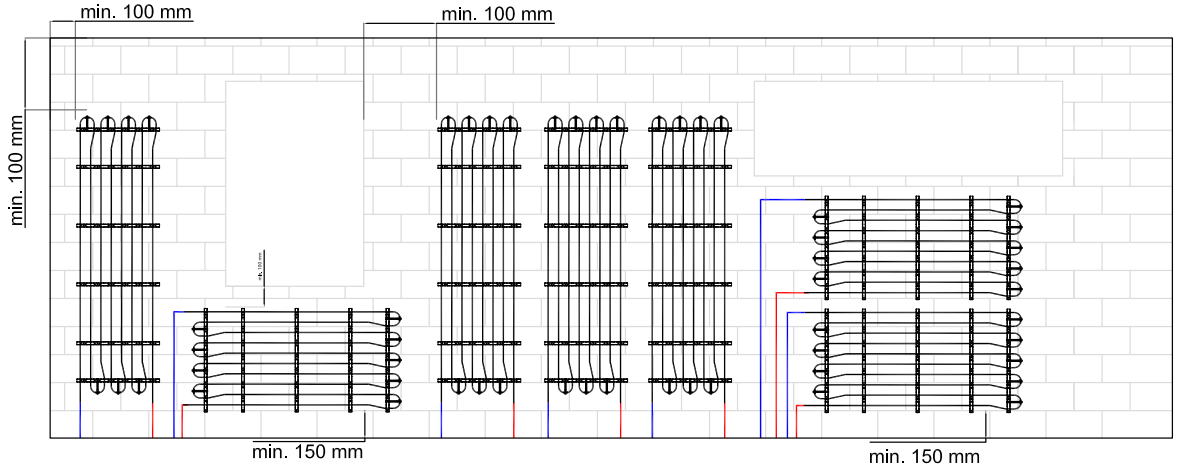
For wall systems installation on outside walls is always recommended because, besides being walls rarely covered completely in furniture, this method creates thermal barriers to the outside, preventing the walls from becoming cold in winter or hot in summer, thereby significantly improving comfort.

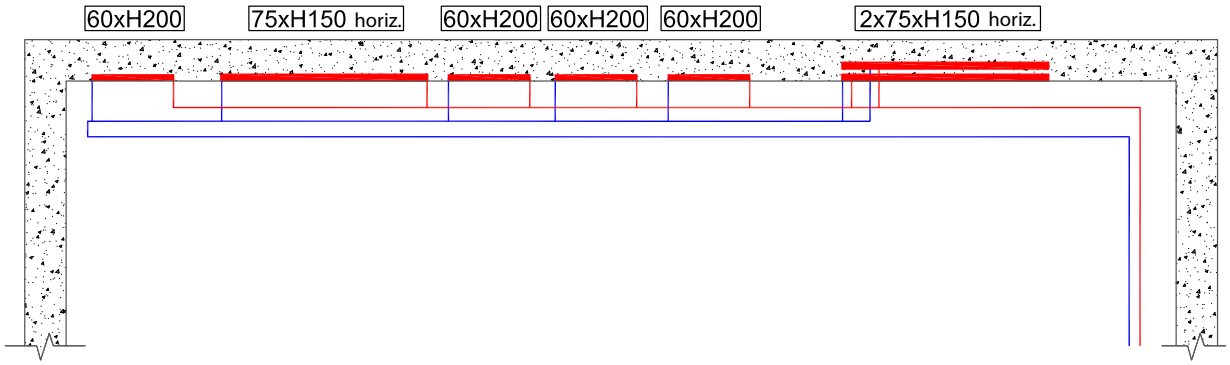
This system solution makes it possible to:

- Reduce the problem of radiant asymmetry, that is, temperature differences between the outside walls and the internal space.
- Keep the relative humidity stable inside the rooms.
- Eliminate problems of surface condensation on cold walls in winter.
- Realize a system with low thermal inertia, allowing it to get to its working state very quickly.

Rules for dimensioning / constructing WW-10 systems built on site

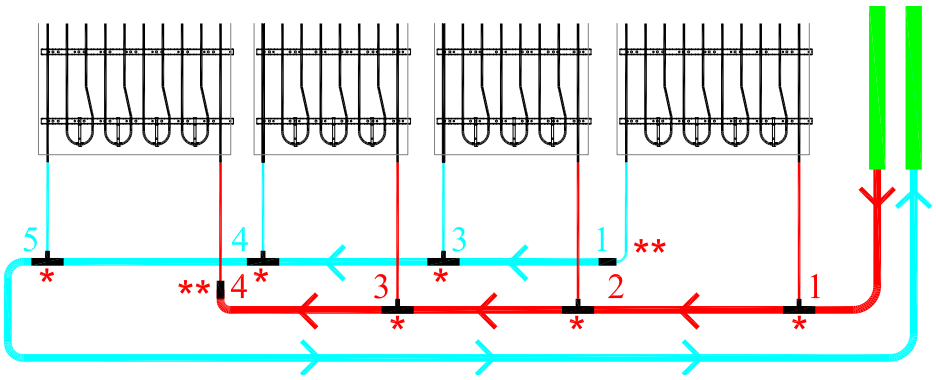
1. Maximum active area of the radiant circuit 11,00 sq.m.
2. Maximum active area of the radiant panel 1,875 sq.m. equivalent to 25 LM of piping (20 recommended).
3. In order to optimise the system's performance, we recommend connecting the panels using the Tichelmann system (with reverse return), and therefore the length of pipe for each individual panel must not differ by more than 10% for all the panels that make up a specific circuit.
4. The panel can be rectangular or L-shaped.
5. Clip rails at approx 35 cm spacing (3.5 m/sq.m).
6. One support bracket for each curve in the panel (13 pcs/m of width of active panel).
7. To anchor the clip rails, use hot glue or screws suitable for the base.





Installation - Hydraulic connections

In order to optimise the system's performance, we recommend connecting the panels using the Tichelmann system (with reverse return), thereby facilitating self-balancing of each individual outgoing circuit of the manifold.
The sum of the lengths of the panels in series must not differ from the lengths of the individual panels by more than 10% within the same circuit.



* Mixed press-fit, push-fit tee 10 -16 -10 mm

** Mixed press-fit, push-fit coupling 16 - 10 mm

Preliminary indications

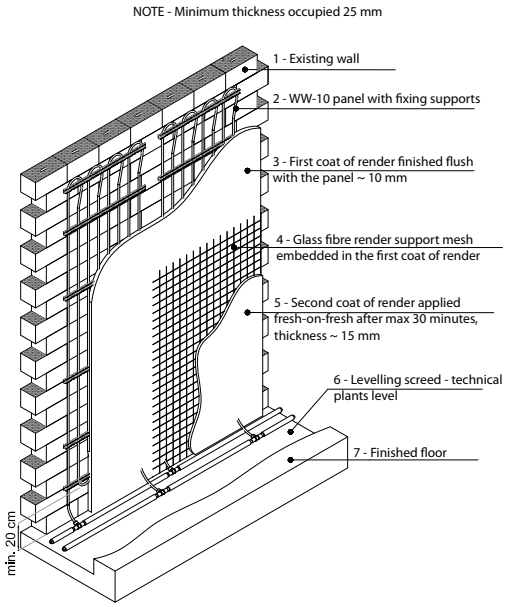
WE strongly advise against connecting 2 or more WW-10 panels in series, in order to avoid pressure losses that are too high, and problems with bleeding out the air.

If the panel is put in a position in which it is not possible to connect the WW-10 panel to the supply line directly, use an DN10 sleeve and a piece of DN10 pipe to form the extension.

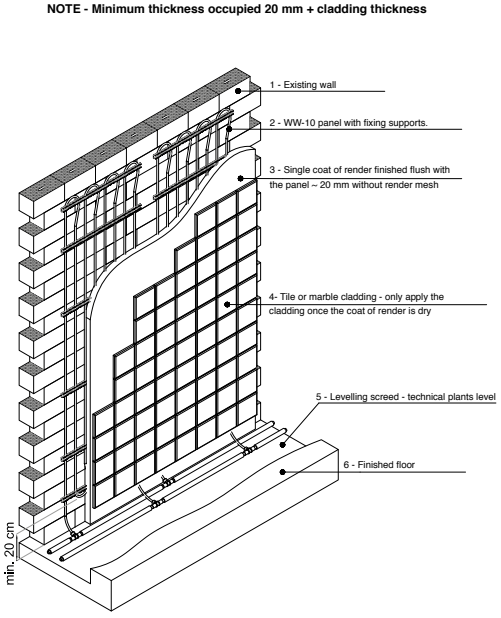
In order to avoid condensation forming on the mirror when using the shower or bath tub, a WW-10 panel can be positioned behind the mirror. However, what must be assured is that the mirror must sit perfectly flat on the rendered wall.

Installation

Sectional view of a wall radiant system, for structures made using premixed render, on a masonry support.



Sectional view of a wall radiant system, for structures made using premixed render, on a masonry support, and tile or marble cladding.



Bagno Comfort Kit

The Bagno Comfort Kit is designed especially to improve wellness in one of the most delicate rooms in the house, the bathroom.
In fact, air temperature in bathrooms is often required to be higher than the normal 19/20°C required for other living spaces, normally at 22-24°C. Often the underfloor system on its own is not able to guarantee this temperature for space related reasons (the presence of sanitary fittings, bath tubs, showers,and drain pipes often reduce the area available for the underfloor system), and, as a result for reasons related to wellness as well, as one would not want surface temperatures that are too high in the little space available.
The best solution in cases like this is to use a wall system, absolutely the most comfortable of heating systems (see the section on wellness at the beginning of this catalogue). What is especially recommended is to install panels near bath tubs and shower cubicles, and behind mirrors. Using a radiant wall system along with an underfloor system also simplifies distribution of the plant, as the two systems' operating temperatures are the same, and so it is not necessary to provide a number of different delivery temperatures, or oversize components, as is the case when adding radiators.

The Bagno Comfort Kit is made up of WW-10 wall panels for concealed mounting applications. These are the wall panels that require the least installation thickness, and are also more versatile and suitable for most installations. They can be installed on both rendered walls and walls clad with ceramic tiles (generally, in bathrooms).

The Bagno Comfort Kit can be used in all rooms in which an underfloor system on its own is unable to fully satisfy the heating need of the room itself. Specifically, besides bathrooms, it can be used in stairwells, where using vertical wall-mounted additional units can make even distribution of the air temperature possible, thereby preventing updraughts being created by the so-called chimney effect.

Preliminary indications

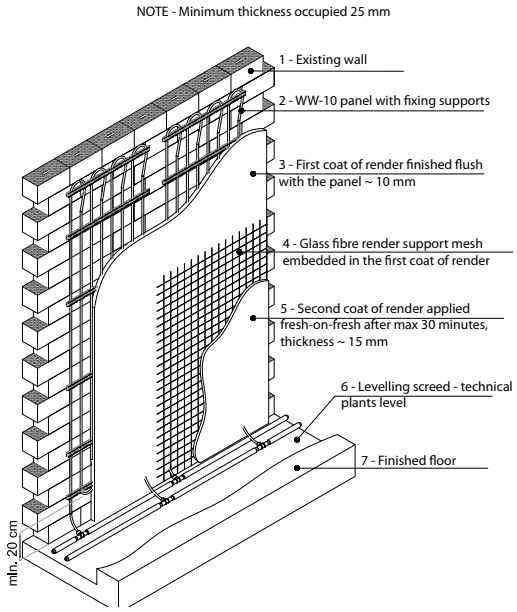
WE strongly advise against connecting 2 or more WW-10 panels in series, in order to avoid pressure losses that are too high, and problems with bleeding out the air.

If the panel is put in a position in which it is not possible to connect the WW-10 panel to the supply line directly, use an DN10 sleeve and a piece of DN10 pipe to form the extension.

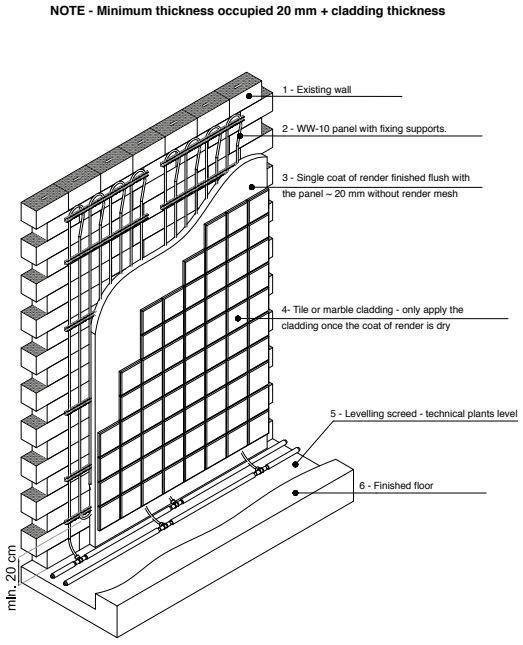
In order to avoid condensation forming on the mirror when using the shower or bath tub, a WW-10 panel can be positioned behind the mirror. However, what must be assured is that the mirror must sit perfectly flat on the rendered wall.

Installation

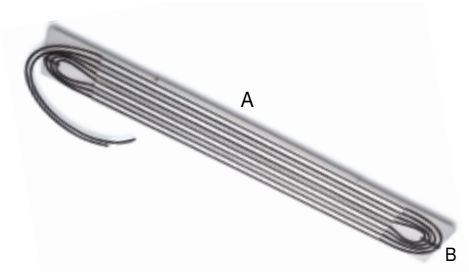
Sectional view of a wall radiant system, for structures made using premixed render, on a masonry support.



Sectional view of a wall radiant system, for structures made using premixed render, on a masonry support, and tile or marble cladding.



5. Panels for ceiling and wall systems



CD-4 ceiling panel

Code	Support framework C-profile spacing	Sur.	Weight	A	B	H
	mm	m^2	kg/m^2	mm	mm	mm
65 100	400	0,375	7	1000	400	35
65 120	400	0,450	7	1200	400	35
65 140	400	0,525	7	1400	400	35
65 160	400	0,600	7	1600	400	35
65 180	400	0,675	7	1800	400	35
65 200	400	0,750	7	2000	400	35
65 220	400	0,825	7	2200	400	35
65 240	400	0,900	7	2400	400	35
65 260	400	0,975	7	2600	400	35
65 280	400	1,050	7	2800	400	35
65 300	400	1,125	7	3000	400	35
65 320	400	1,200	7	3200	400	35
65 340	400	1,275	7	3400	400	35
65 360	400	1,350	7	3600	400	35
65 380	400	1,425	7	3800	400	35
65 400	400	1,500	7	4000	400	35
65 420	400	1,575	7	4200	400	35
65 440	400	1,650	7	4400	400	35
65 460	400	1,750	7	4600	400	35
65 480	400	1,800	7	4800	400	35
65 500	400	1,875	7	5000	400	35

Specifications

Prefabricated radiant panel for dry ceilings, including type II 10 x 1,3 mm PE-RT 5-layer pipe, with the central layer being an EVOH oxygen barrier, metal profiles for transmitting the heat, and polyester insulating backing.

NOTE: Panels lengths greater than those indicated, made to specific designs, available in 5 weeks.

Use

Prefabricated panel for creating dry radiant ceiling systems. This panel is designed to be suspended from the supporting structure of a double framework suspended ceiling, especially hanging on 50x27 mm channel sections of the secondary framework spaced at 40 cm. Minimum thickness between the rough and finished ceiling 12 cm (15 cm recommended). These panels' great modularity makes it possible to achieve high percentage coverage, up to 90% of the area available.
This type of panel allows the suspended ceiling to be clad in sheets of any type e.g. sheets with smooth or perforated finish, sheets suitable for fire protection, sheets of clad gypsum board (λ=0,21 W/m·K), gypsum fibre board (λ=0,29 W/m·K) or gypsum with added mineral fibres ($\lambda \geq$0,40 W/m·K). The hydraulic connections between the panels must be made using the Tichelmann system, that is reverse return, which ensures limited pressure loss, and the same supply temperature.

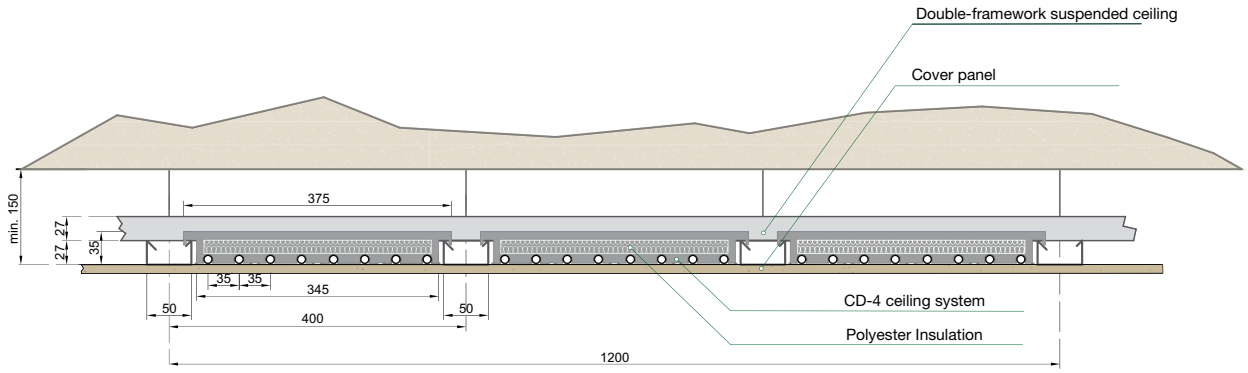
Technical characteristics

CD-4 Panel	UoM	Values
Standard length	mm	1000÷2800
Special lengths	mm	3000÷5000
Panel length modularity	mm	200
(Useful) length	mm	350
(Useful) thickness	mm	27
Width (overall)	mm	375
Thickness (overall)	mm	35
Weight	kg/m^2	7
Fire-reaction class EN13501-1	-	B-s1, d0
Circuit length of a panel of L meters	m	10+1,6x(L-1)

Insulation	UoM	Values
Material	-	Polyester
Colour	-	White
Thickness	mm	30
Thermal conductivity	W/mK	0.038
Thermal resistance	m^{2}K/W	0.75
Fire-reaction class DIN4120	-	81

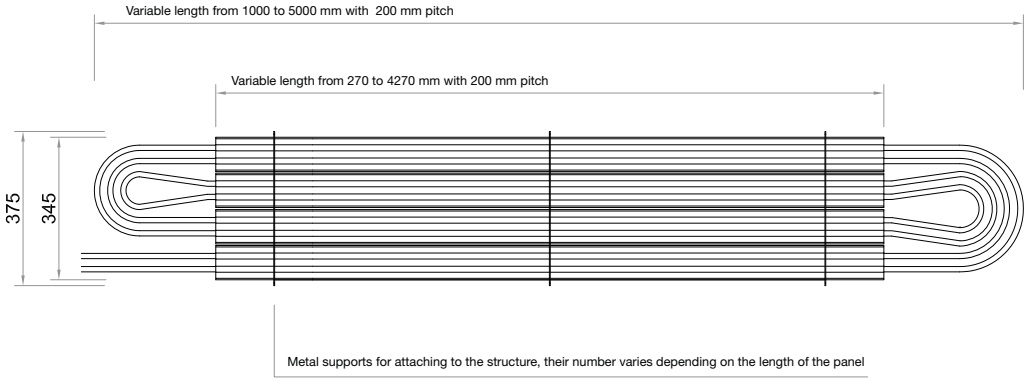
Pipe	UoM	Values
Material	-	PE-RT 5 layers Type II
Colour	-	Black
Dimensions	mm	10x1.3
Thermal conductivity	W/mK	0.40
Water content	l/m	0.043

Dimensional drawing

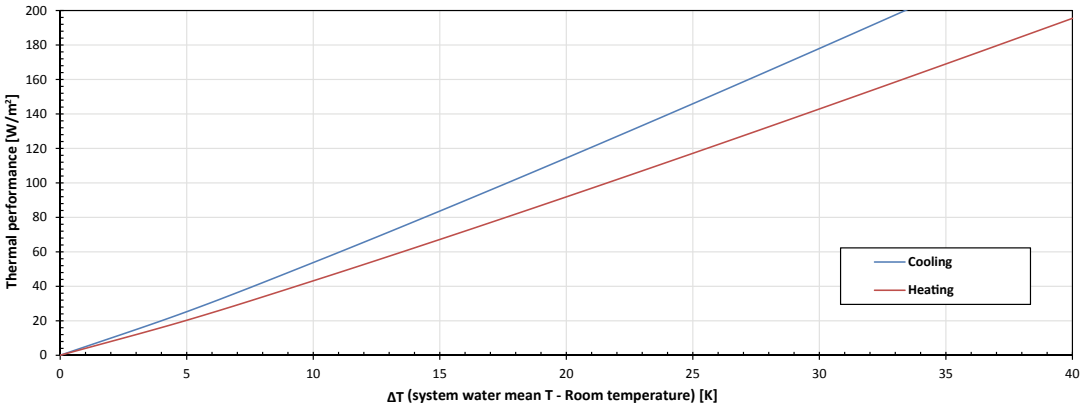


Dimensions

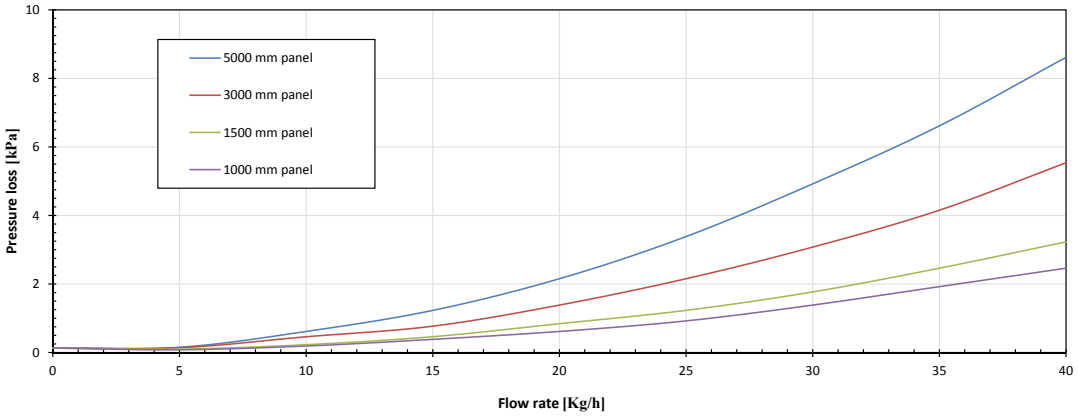
The panels are of identical width, and multiples of 200 mm long between 1000 mm and 5000 mm.
Lengths of 3000 mm to 5000 mm are specially manufactured and require minimum purchase quantities.

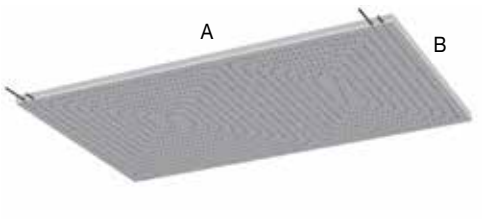


Thermal performance



Pressure loss





CD-10i ceiling panel

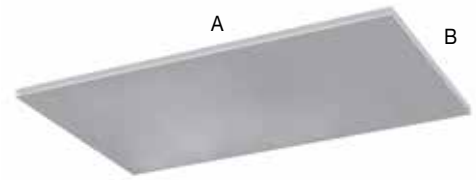
Code	Insulating material	Sur.	Weight	A	B	H
		m^2	kg/m^2	mm	mm	mm
31 103	EPS 200	2.40	13	2000	1200	45
31 104	EPS 200	1.20	13	1000	1200	45
31 105	EPS 200	0.60	13	500	1200	45

Specifications

CD-10i prefabricated radiant panel for suspended ceilings, made up of 15 mm plasterboard cladding combined with a 30 mm EPS 200 polystyrene panel in order to increase thermal efficiency towards the rooms to be heated. Inside the plasterboard sheet there is a type II PE-RT 10 x 1,3 mm, 5 layer pipe, the central layer being an EVOH oxygen barrier. The layout of the circuit spaced at 50 mm, is indicated on the face of the plasterboard sheet.

Use

Prefabricated panel for creating dry radiant ceiling systems.
This panel is designed to be suspended from the supporting structure of a double framework suspended ceiling, especially hanging on 50x27 mm channel sections of the secondary framework, spaced at 50 cm. Minimum thickness between the rough and finished ceiling 15 cm (18 cm recommended).
These panels' modularity makes it possible to achieve percentage coverage up to 65 -75% of the area available. The only type of cladding that can be used with this type of panel, is what makes up the panel itself, that is a smooth clad sheet of gypsum board (λ =0,21 W/m·K).
The hydraulic connections between the panels must be made using the reverse return system (Tichelmann), which ensures limited pressure loss, and the same supply temperature.



Passive infill panel

Code	Insulating material	Sur.	Weight	A	B	H
		m^2	kg/m^2	mm	mm	mm
31 901	EPS 200	2.40	13	2000	1200	45

Specifications

Prefabricated panel for suspended ceilings or wall lining, made up of 15 mm plasterboard cladding, combined with a 30 mm EPS 200 polystyrene panel.

Use

These are used to fill in spaces in the suspended ceiling not occupied by the CD-10i radiant panels.

Technical characteristics

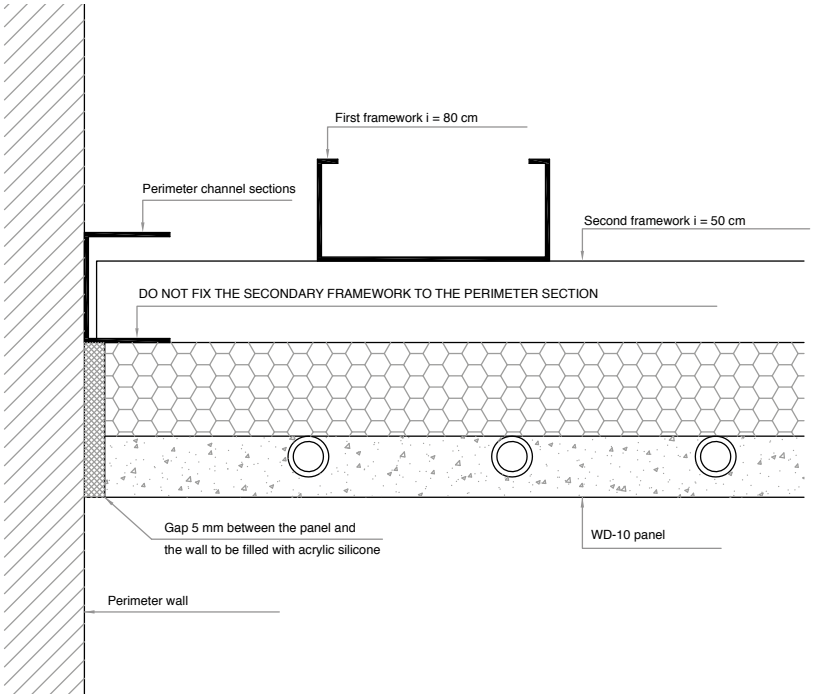
CD-10i Panel	UoM	Values
Length	mm	1200
Lengths	mm	500-1000-2000
Total thickness	mm	45
Weight	kg/m^3	13
Number of circuits per panel	-	1-1-2
Circuit lengths	m	11-22-22
Water content per panel	l	0.47-0.95-1.89

Cladding	UoM	Values
Material	-	Plasterboard
Thickness	mm	15
Strength and longitudinal bending (EN 520).	N	650
Strength and transverse bending (EN 520).	N	250
Thermal conductivity	W/mK	0.21
Fire-reaction class EN13501	m	A2 s1-d0

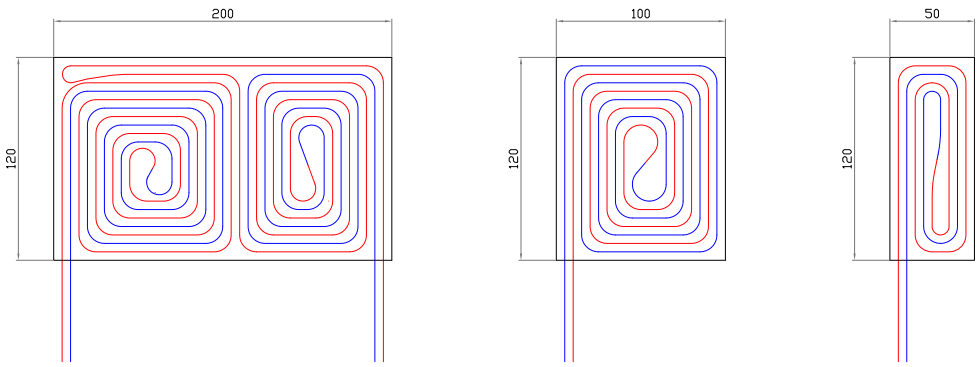
Insulating	UoM	Values
Material	-	Polystyrene
Colour	-	White
Thickness	mm	30
Resistance to compression at 10% crushing	kPa	200
Thermal conductivity	W/mK	0.035
Thermal resistance	m^{2}K/W	0.85
Fire-reaction class DIN4120	-	E

Pipe	UoM	Values
Material	-	PE-RT 5 layers Type II
Colour	-	Black
Dimensions	mm	10x1.3
Thermal conductivity	W/mK	0.40
Water content	l/m	0.043

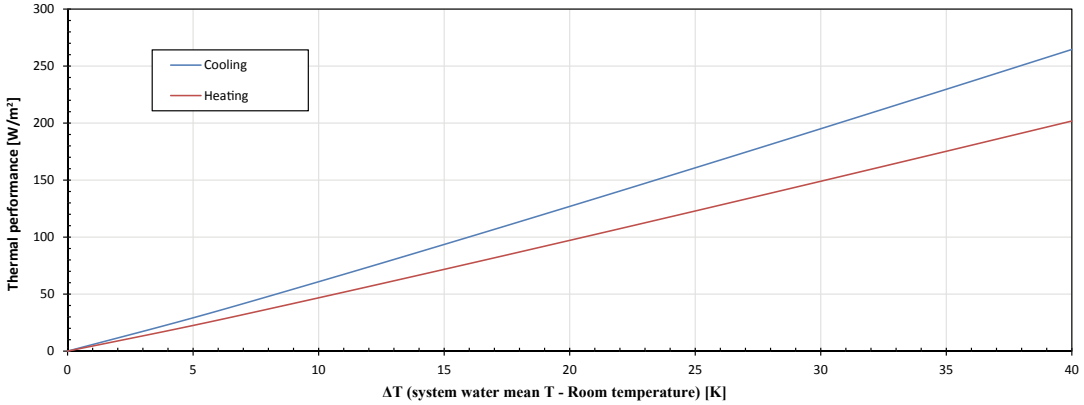
Vertical section of CD-10i ceiling panel



Dimensional drawing

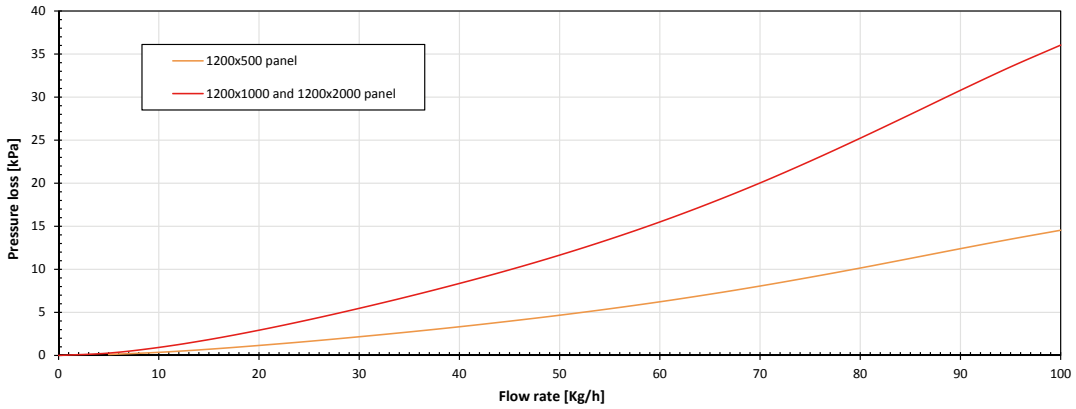


Thermal output

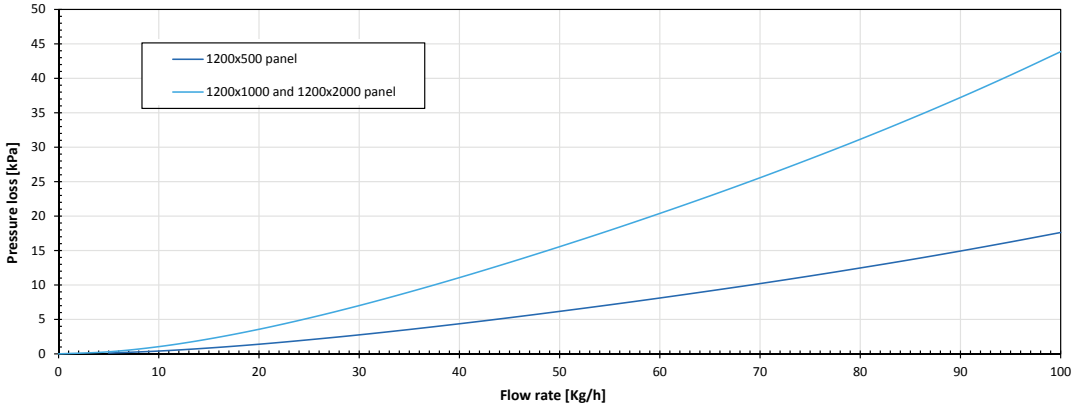


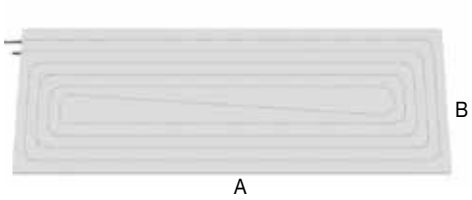
Pressure loss

Winter season - Delivery water temperature 45°C



Summer season - Delivery water temperature 15°C





WD-10i wall panel

Code	Insulating material	Sur.	Weight	A	B	H
		m^2	kg/m^2	mm	mm	mm
31 203	EPS 200	1.20	13	2000	600	45

Specifications

Wd-10i prefabricated radiant panel for wall lining, made up of 15 mm plasterboard cladding combined with a 30mm EPS 200 polystyrene panel in order to increase thermal efficiency towards the rooms to be heated. Inside the plasterboard sheet there is a type II PE-RT 10 x 1,3 mm, 5 layer pipe, the central layer being an EVOH oxygen barrier. The layout of the circuit spaced at 50 mm, is indicated on the face of the plasterboard sheet.

Use

Prefabricated panel for creating radiant drywall systems.
This panel is made to be screwed to the supporting structure of a wall lining, especially screwed to channel sections used to form vertical stud spaced at 60 cm.
Minimum thickness between the rough and finished wall 10 cm.
The only type of cladding that can be used with this type of panel, is what makes up the panel itself, that is a smooth clad sheet of gypsum board (λ =0,21 W/m·K).
The hydraulic connections between the panels must be made using the reverse return system (Tichelmann), which ensures limited pressure loss, and the same supply temperature.

Passive infill panel

Code	Insulating material	Sur.	Weight	A	B	H
		m^2	kg/m^2	mm	mm	mm
31 901	EPS 200	2.40	13	2000	1200	45

Specifications

Prefabricated panel for suspended ceilings or wall lining, made up of 15 mm plasterboard cladding, combined with a 30 mm EPS 200 polystyrene panel.

Use

These panels are used to fill in spaces in the suspended ceiling not occupied by the WD- 10i radiant panels.

Technical characteristics

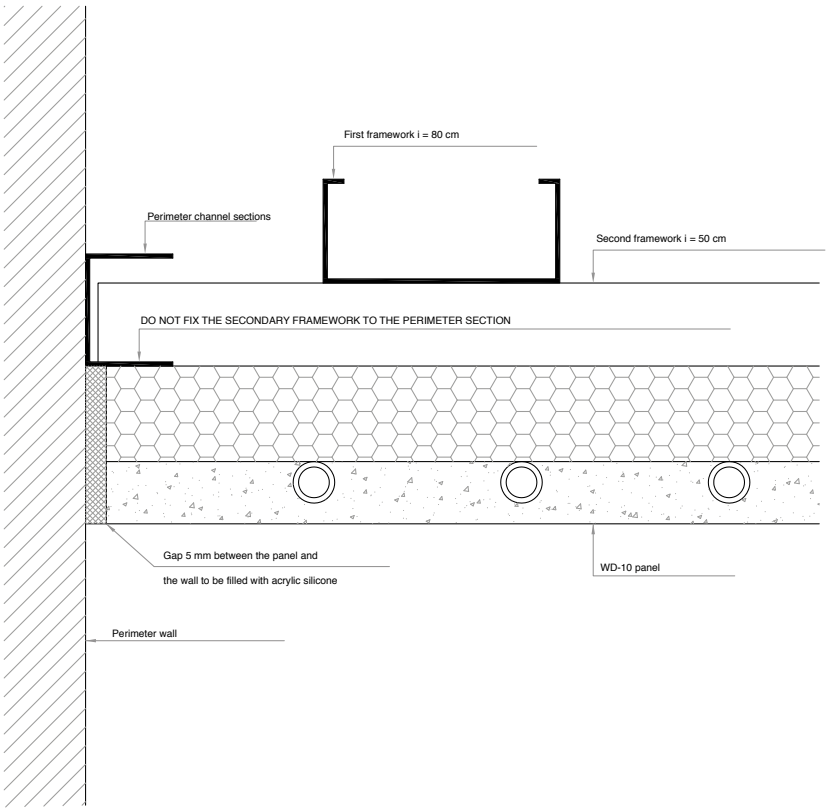
WD-10i Panel	UoM	Values
Length	mm	600
Lengths	mm	1200
Total thickness	mm	45
Weight	kg/m^3	13
Number of circuits per panel	-	1
Circuit lengths	m	11
Water content per panel	l	0.95

Cladding	UoM	Values
Material	-	Plasterboard
Thickness	mm	15
Strength and longitudinal bending (EN 520).	N	650
Strength and transverse bending (EN 520).	N	250
Thermal conductivity	W/mK	0.21
Fire-reaction class EN13501	m	A2 s1-d0

Insulating	UoM	Values
Material	-	Polystyrene
Colour	-	White
Thickness	mm	30
Resistance to compression at 10% crushing	kPa	200
Thermal conductivity	W/mK	0.035
Thermal resistance	m^{2}K/W	0.85
Fire-reaction class DIN4120	-	E

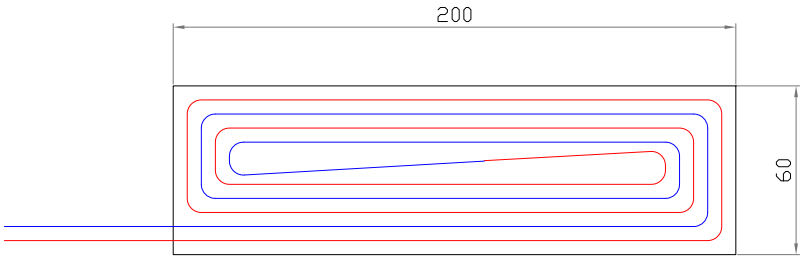
Pipe	UoM	Values
Material	-	PE-RT 5 layers Type II
Colour	-	Black
Dimensions	mm	10x1.3
Thermal conductivity	W/mK	0.40
Water content	l/m	0.043

Section

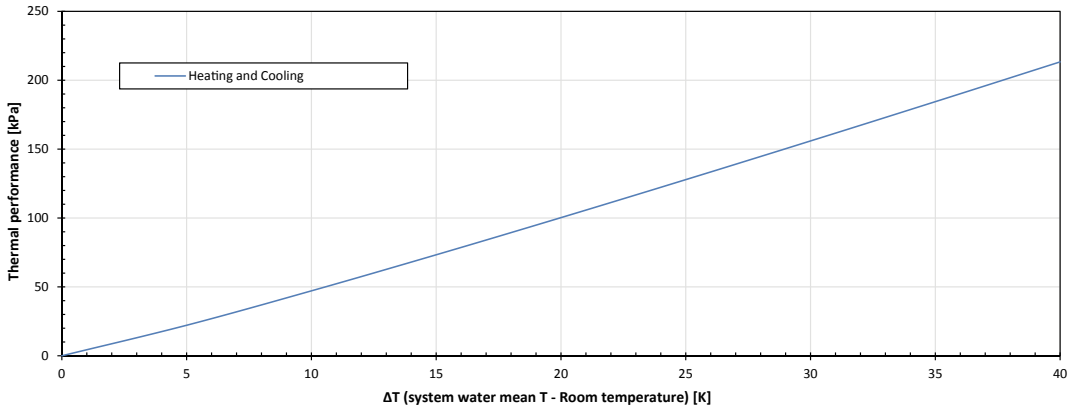


Dimensional drawing

Single size 600x1200 mm

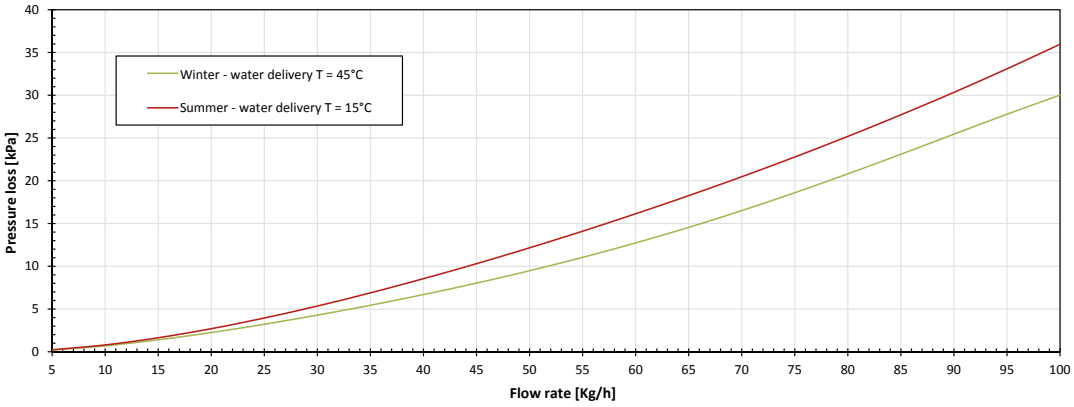


Thermal performance

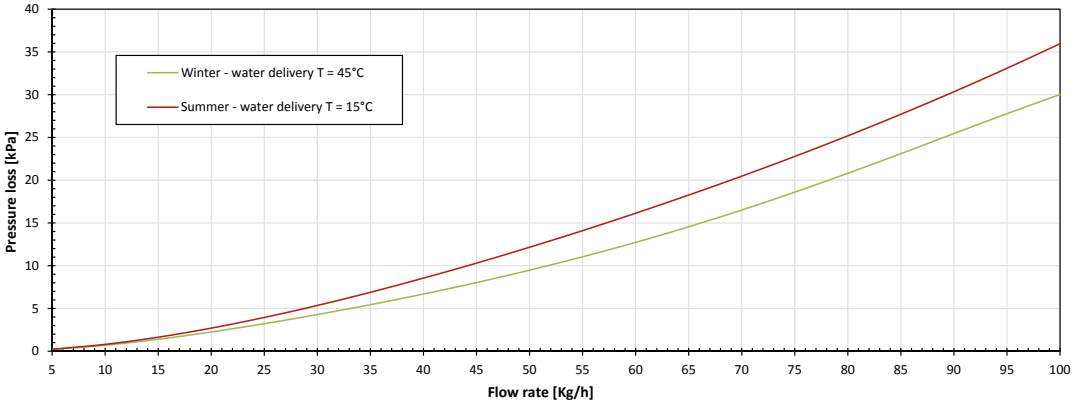


Pressure loss

Winter season - Delivery water temperature 45°C



Summer season - Delivery water temperature 15°C



PE-RT pipe for WW-10 systems

Code	L	Ø Pipe	Pipe thk.
	m	mm	mm
90 220	200	10	1.3

Specifications

PE-RT type II 5 layer pipe, especially made for radiant systems (application class 4/ 10 bar, according to ISO 10508). The central layer is an EVOH oxygen barrier.

Use

Panel to be made on site to form radiant wall or ceiling panels for concealed mounting applications.
The panel is designed to be fixed to the rough structure by means of metal anchors or hot glue. Minimum finished render thickness 25 mm.
WW-10 panels made on site are most frequently used to create ceiling systems, because it makes it possible to achieve percentage coverage of up to 100% of the ceiling area available.
They are also used for wall systems, where the spaces available do not allow pre-fabricated panels to be used.
There are no rules for the render to be used, other than that its must not be insulating render. We recommend adding a render support mesh between a first 15 mm layer covering the panel and a second 10 mm layer, applied to the first while it is still fresh, for finishing.
The hydraulic connections between the panels must be made using the reverse return system (Tichelmann), which ensures limited pressure loss, and the same supply temperature.

Bracket for WW-10 systems

Code	Ø Pipe
	mm
90 302	10

Specifications

Bracket to support pipe bends, to be used with the relevant clip rail.

Use

Support element to be used along with a clip rail in order to avoid the pipe moving in a direction perpendicular to the surface, after laying.

Clip rail for WW-10 systems

Code	Spacing mm	Ø Pipe mm	A mm	B mm	H mm
90 303	25	10	600	22	14

Specifications
Clip rail, made by moulding synthetic plastic, with pipe spacing at 25 mm.

Use
A mounting rail required to form the pipe coil in the radiant panel, and to fix the panel to the ceiling or wall.

Technical characteristics

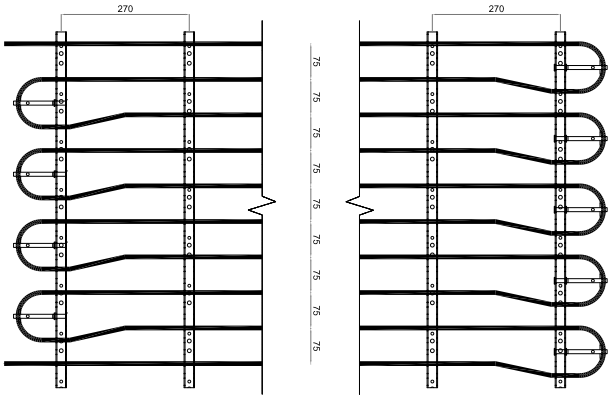
WW-10 panel made on site	UoM	Values
Length	mm	variable
Width	mm	variable
Maximum length of the pipe	m/m^2	13.5
Maximum pipe length per circuit	m	30
Total panel thickness	mm	14

Pipe	UoM	Values
Material		PE-RT
	-	5 layers
		Type II
Colour	-	Black
Dimensions	mm	10x1.3
Thermal conductivity	W/mK	0.40
Water content	l/m	0.043
Minimum bend radius	mm	60

Dimensional drawing

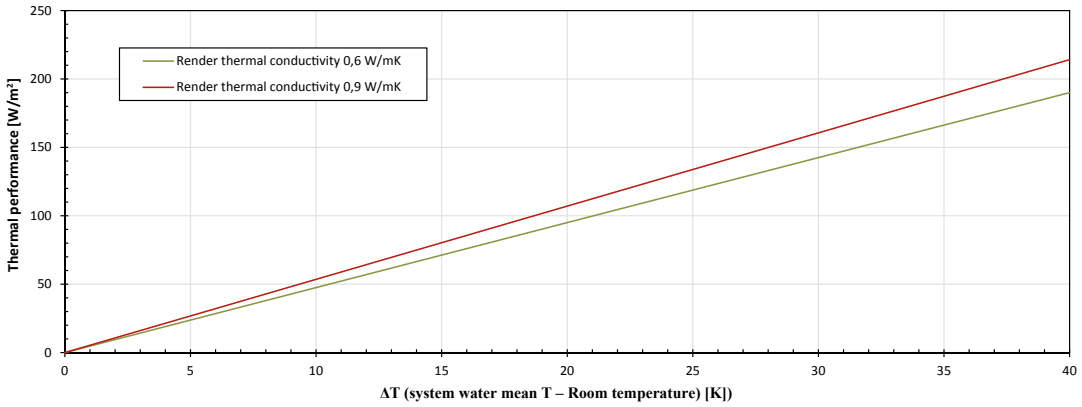
The intermediate clip rails must be spaced as follows:
- In the ceiling, approx 300 mm
- In the wall, approx 350 mm

The clip rails must be fixed to the support base using hot glue or screws suitable for the type of base.

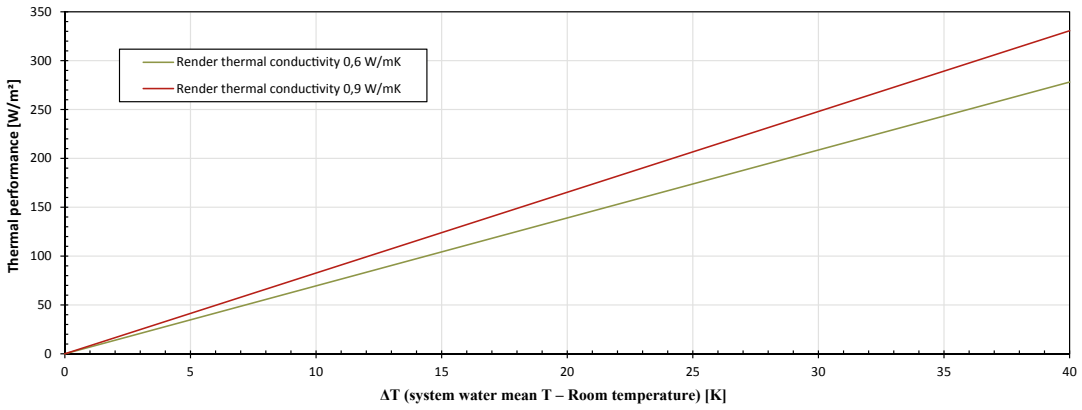


Characteristic curves

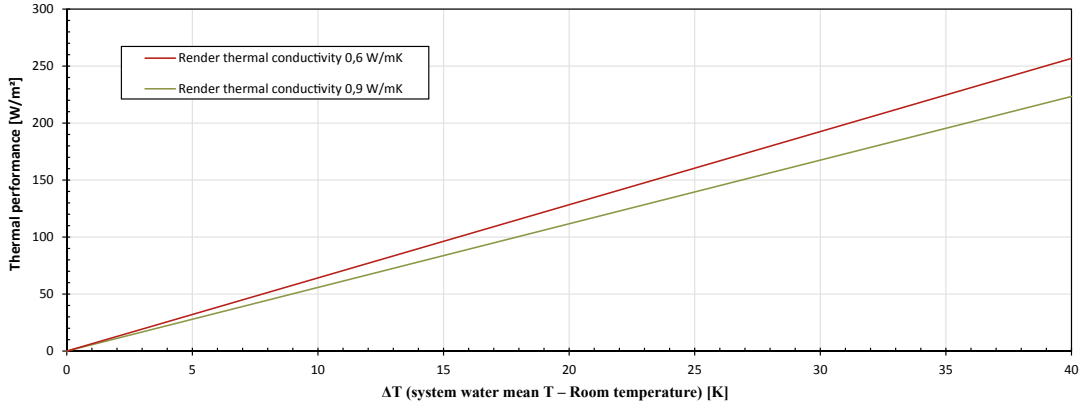
Ceiling
Thermal performance- heating



Thermal performance - cooling



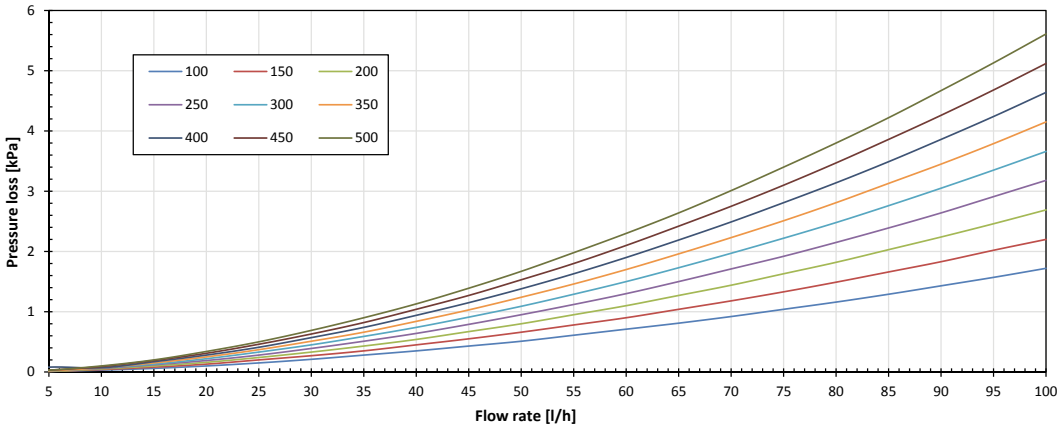
Wall
Thermal performance- heating and cooling



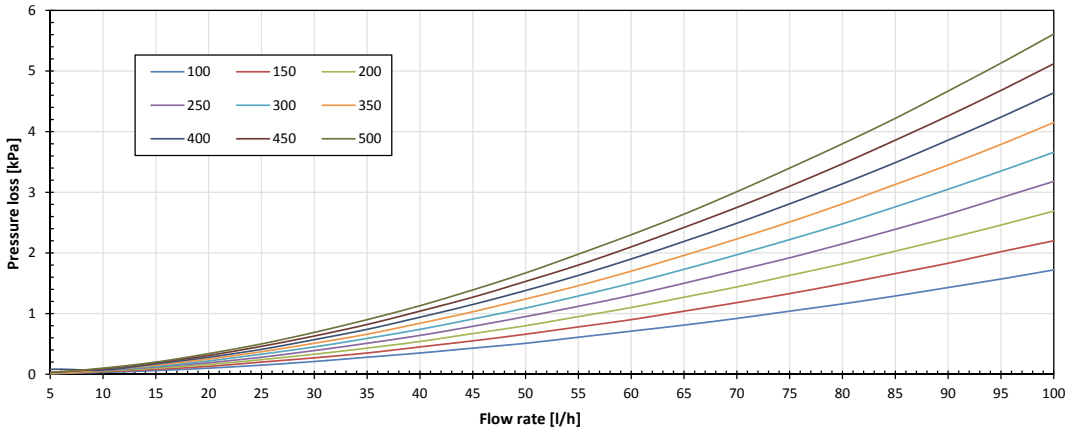
Pressure loss- WW-10 panel built on site

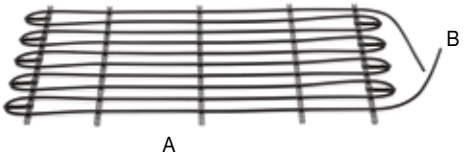
For these panels, choose the mean height of the panel (expressed in em) and the flow rate to determine the corresponding pressure loss per metre width of the panel. Multiply this value by the actual length of the individual panel, to get the total pressure loss in kPa.

Winter season– Delivery water temperature 45°C



Summer season– Delivery water temperature 15°C





Ceiling and wall panel WW-10

Code	Ø Pipe	Pipe thk.	Sur.	A	B	H
	mm	mm	m^2	mm	mm	mm
80 900	10	1.3	1.20	2000	600	14
80 902	10	1.3	1.13	1500	750	14

Specifications

WW-10 prefabricated radiant wall panel for concealed mounting applications, total thickness 14 mm, made up of a PE-RT type II, 10x1,3 mm, 5-layer pipe coil, the central layer being an EVOH oxygen barrier. The pipe coils are kept in position by clip rails and support brackets, to limit lifting in the bends, and to facilitate fixing to the wall.

Use

Prefabricated panel for creating radiant wall or ceiling panels for concealed mounting applications.
The panel is designed to be fixed to the rough structure by means of metal anchors or hot glue. Minimum finished render thickness 25 mm.
Prefabricated WW-10 panels are frequently used to make wall systems, but are also used to form ceiling systems.
There are no rules for the render to be used, other than that it must not be insulating render. We recommend adding a render support mesh between a first 15 mm layer covering the panel and a second 10 mm layer, applied to the first while it is still fresh, for finishing.
The hydraulic connections between the panels must be made using the reverse return system (Tichelmann), which ensures limited pressure loss, and the same supply temperature.

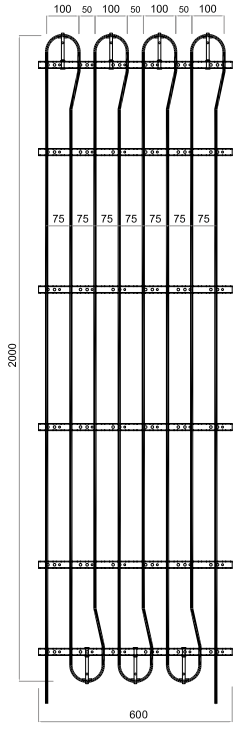
Technical characteristics

Prefabricated WW-10 panel	UoM	Values
Length	mm	1500-2000
Width	mm	750-600
Total panel thickness	mm	14
Circuit lengths	m	22
Water content per panel	l	0.47

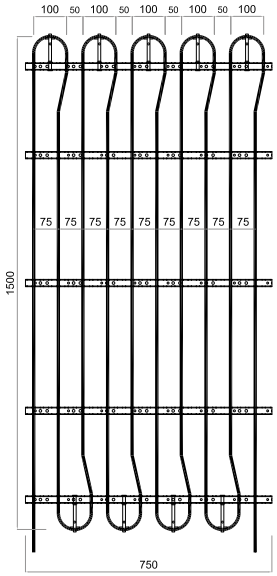
Pipe	UoM	Values
Material	-	PE-RT 5 layers Type II
Colour	-	Black
Dimensions	mm	10x1.3
Thermal conductivity	W/mK	0.40
Water content	l/m	0.043

Dimensional drawing

2000x600 Panel

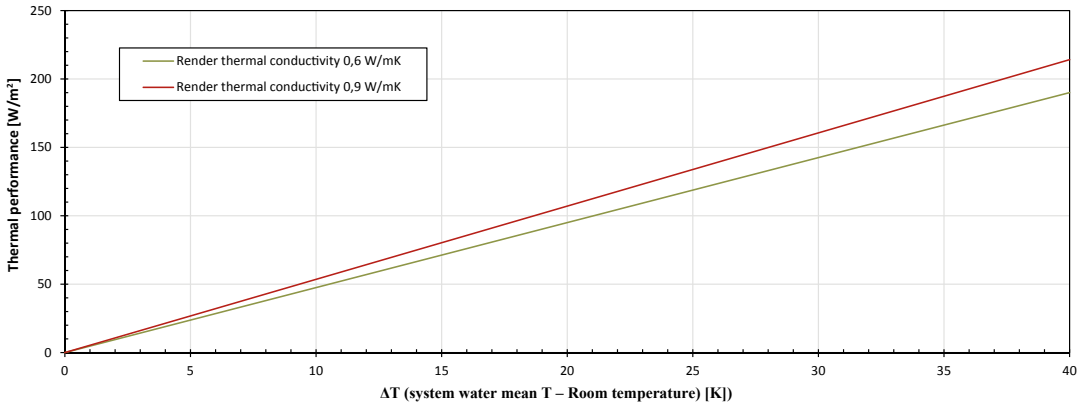


1500x750 Panel

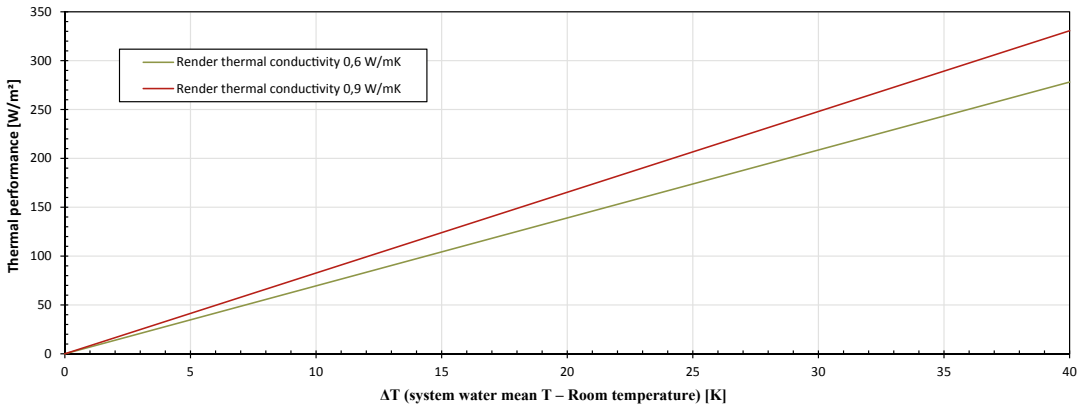


Characteristic curves

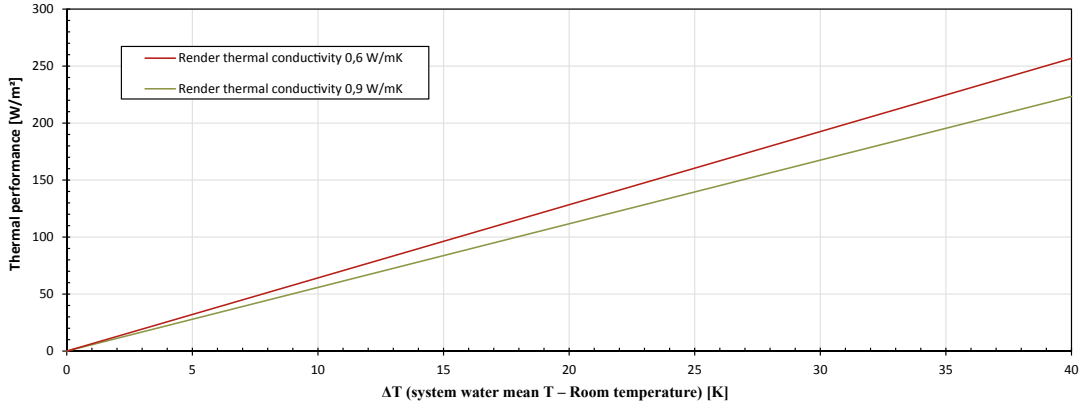
Ceiling
Thermal performance- heating



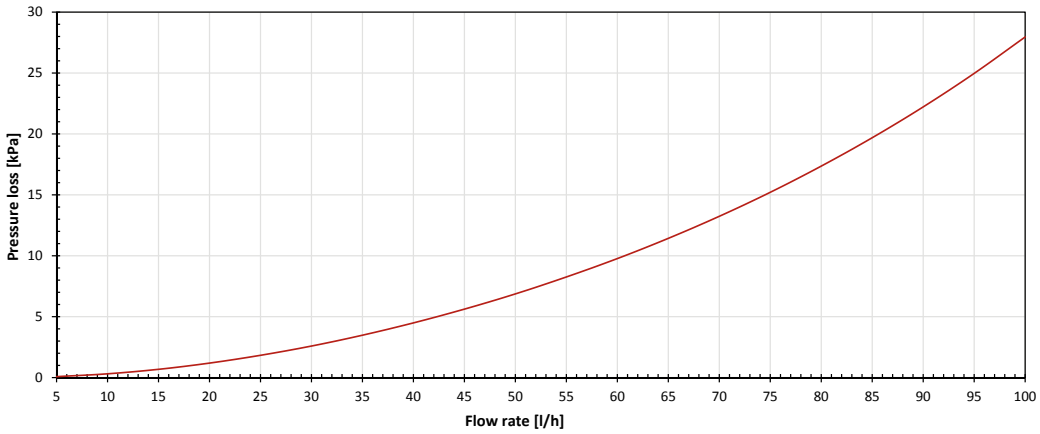
Thermal performance - cooling

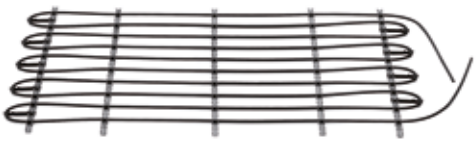


Wall
Thermal performance- heating and cooling



Pressure loss





80 902-4pcs

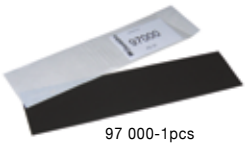
80 610-6pcs

80 710-4pcs

80 810-2pcs

73 002-4pcs

90 220-3mt



97 000-1pcs

Bagno Comfort Kit with WW-10 system

Code	Ø Pipe	Thk.	Sur.	A	B	H
	mm	mm	m^2	mm	mm	mm
80 910	10	1.3	4.50	1500	750	14

Specifications

Kit for creating additions to radiant wall systems for concealed mounting applications, intended for bathrooms and stairwells. The radiant panels can be installed behind wall tiles and marble, and on shower walls, below windows, and behind mirrors, as well as vertically in stairwells. Comprising: four 1500x750 WW-10 panels, mixed quick push-fit DN10 and press-fit DN16 pipe fittings for connecting to the feed line, DN10 piping and quick couplers for extensions to the DN10 line after positioning the panels vertically, and a heat sensitive strip to be used for thermal detection of the piping inside the wall.

Use

The Bagno Comfort Kit can be used in all rooms in which a floor system on its own is unable to fully satisfy the heating need of the room itself. In particular, it can be used in conjunction with floor systems in bathrooms and stairwells, where the space available for the floor system is very limited, and so an additional heat source is required.

In bathrooms it is normally necessary to reach air temperatures higher than the normal 19/20°C called for in other living spaces. Using an additional radiant wall system makes it possible to reach the required temperature (normally 22-24°C), while also guaranteeing optimum comfort.

In stairwells, on the other hand, using vertical wall-mounted additional units can make even distribution of the air temperature possible, thereby preventing up-draughts being created by the so-called chimney effect.

The kit comes with sufficient components to create two circuits. It can therefore be used in 2 rooms rather than just one.

The kit does not include the insulated 16 mm multilayer pipe required for connecting the rooms to the manifold. This must therefore be purchased separately (we suggest code 811516 in a 50 m roll).

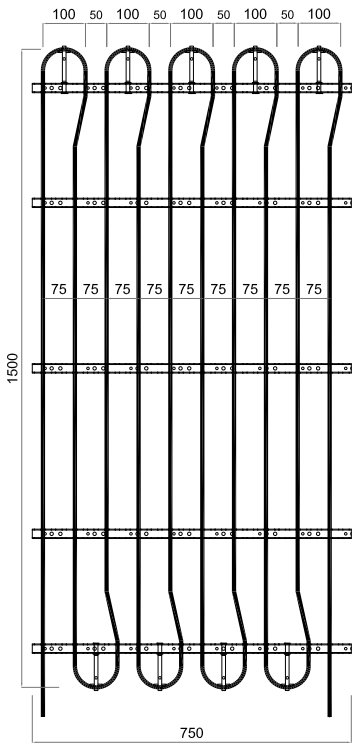
Technical characteristics

Prefabricated WW-10 panel	UoM	Values
Length	mm	1500
Width	mm	750
Total panel thickness	mm	14
Circuit lengths	m	22
Water content per panel	l	0.47

Pipe	UoM	Values
Material		PE-RT
	-	5 layers
		Type II
Colour	-	Black
Dimensions	mm	10x1.3
Thermal conductivity	W/mK	0.40
Water content	l/m	0.043

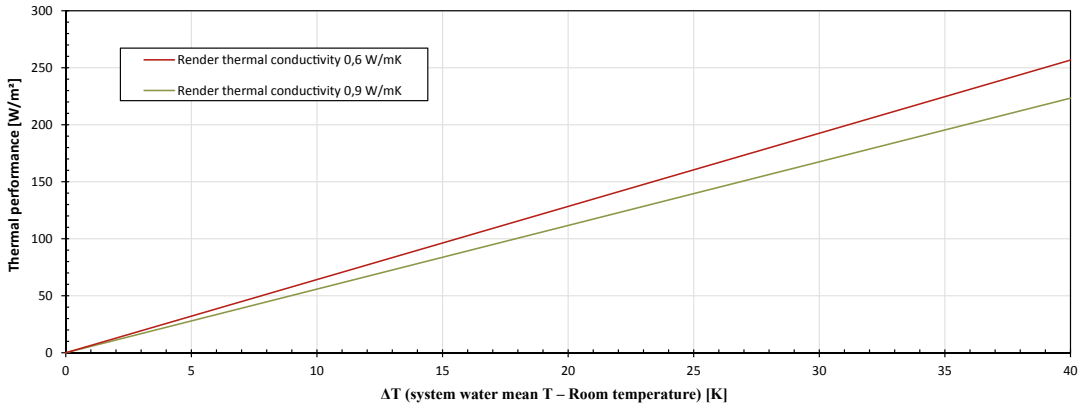
Dimensional drawing

1500x750 Panel

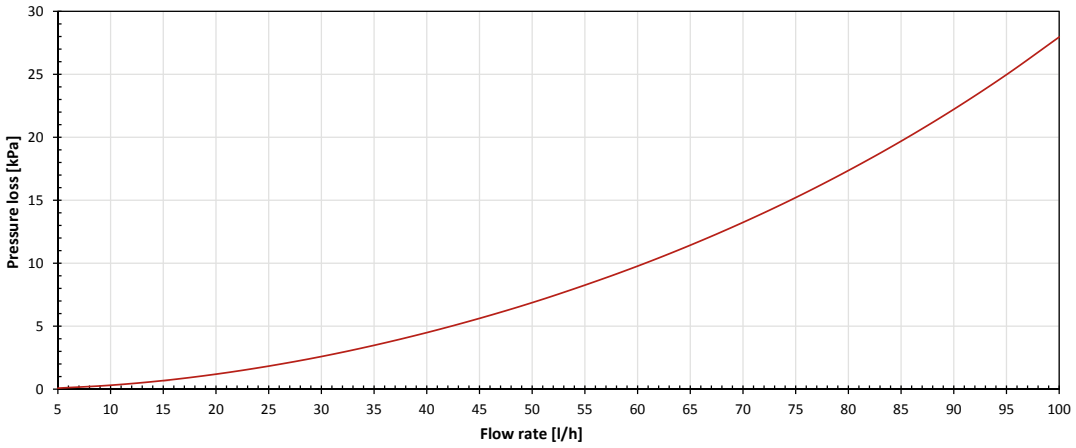


Characteristic curves

Wall
Thermal performance- heating and cooling



Pressure loss



6. Pipe and fittings Ø16mm for ceiling and wall systems

Insulated multilayer pipe for ceiling and wall systems

Code	Aluminium	Insulation	L	Ø Pipe	Pipe thk.
	mm	mm	m	mm	mm
81 15 16	0.20	6	50	16	2.0

Specifications

Multilayer PE-Xc polyethylene pipe, with high plasticity and resistance to high temperatures, application class 5/6 bar in conformity to ISO 10508 and ISO 21003 certified. The aluminium intermediate layer constitutes an oxygen absorption barrier. Equipped with CFC-free, closed cell, expanded PE insulation, class 1, with a protection film on the outside, and a green embossed surface. Thickness according to Law 10/91 case C, thermal conductivity λ=0,040 W/mK.

Use

Insulated piping for water distribution and supply to heating and cooling systems.

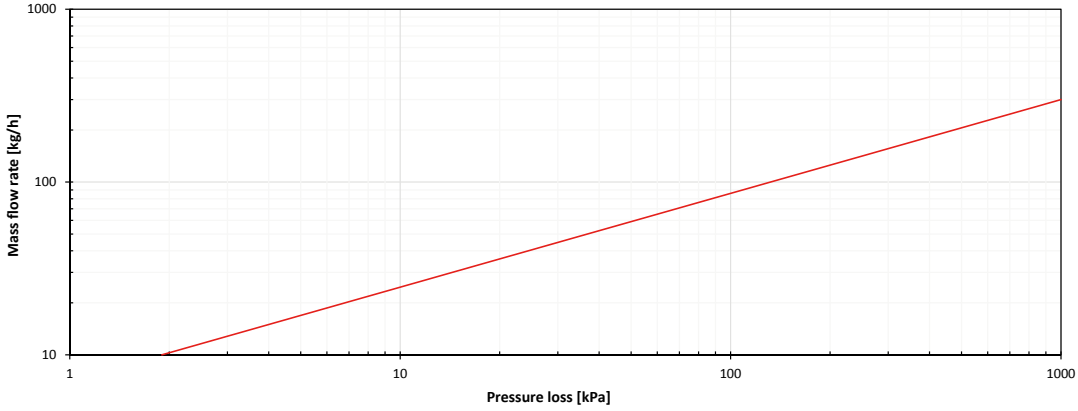
Technical characteristics

Pipe Ø 16x2.0	Unit of Measure	Values
Material	-	Multilayer PE-Xc
External diameter	mm	16
Internal diameter	mm	12
Aluminium layer thickness	mm	0.2
Linear expansion coefficient	mm/mK	0.025
Thermal conductivity	W/mK	0.43
Application class ISO 10508	-	Class "5/6 bar
Certificate of Conformity	-	UNI EN ISO 21003
Internal roughness (Prandtl-Colebrook)	mm	0.007
Minimum bend radius	mm	80
Water content	l/m	0.113
Weight	g/m	125
Pipe colour	-	white
Insulation characteristics	-	CFC-free, closed cell, PE foam
Insulation thickness	mm	6
Fire-reaction UNI 9177	-	Class 1
Thermal conductivity of insulation	W/mK	0.04
Vapour diffusion coefficient as per UNI 9233	μ	>5000
Insulation colour / surface	-	Green / embossed

*Class 1 = 60°C/49 years + 80°C/1 year + 95°C/100 hours
*Class 2 = 70°C/49 years + 80°C/1 year 95°C/100 hours
*Class 4= 60 °C/25 years + 40°C/20 years + 20°C/2.5 years + 70°C/2.5 years
*Class 5= 80°C/100 years + 60 °C/25 years + 20 °C /14 years + 90°C/1 year + 100 °C/100 hours

Pipe cross-section

Pressure loss- flow rate diagram



Mixed press-fit, push-fit tee

Code	Ø Pipe	Pipe thk.
	mm	mm
80 610	16-10	2.0-1.3-2.0

Specifications
Tee for quick push fitting for plastic pipes and press fitting for multilayer pipes.

Use
To be used for connecting 16x2 mm PE-Xc polyethylene feed pipes and cross connections with 10x1,3 mm PE-RT plastic pipes.

Mixed press-fit, push-fit coupling

Code	Ø Pipe	Pipe thk.
	mm	mm
80 710	16-10	2.0-1.3

Specifications
Quick push-fit coupling for plastic pipes and press fitting for multilayer pipes.

Use
To be used for connecting 16x2 mm PE-Xc polyethylene feed pipes and cross connections with 10x1,3 mm PE-RT plastic pipes.

Push-fit coupling

Code	Ø Pipe	Pipe thk.
	mm	mm
80 810	10	1.3

Specifications
Quick push-fit coupling for the connection of plastic pipes and press fitting for multilayer pipes.

Use
To be used for cross connections with 10x1,3 mm PE-RT plastic pipes.

Repair kit

Code	Ø Pipe	Pipe thk.
	mm	mm
85 600	10	1.3

Specifications
Quick push-fit coupling for repairing plastic pipes.

Use
Kit to be used to repair any holes or breaks in plastic pipes.

Compression coupling

Code	Ø Pipe	Pipe thk.
	mm	mm
85 00 10	16	2.0
85 00 12 20x20	20	2.5

Specifications
NG coupling

Use
Pipe fitting to be used for press-fit connections with multilayer pipes.

Compression coupling-reducer

Code	Ø Pipe	Pipe thk.
	mm	mm
85 00 21	20-16	2.5-2.0

Specifications
NG coupling reducer

Use
Pipe fitting to be used for press-fit connections with multilayer pipes.

90° compression bend

Code	Ø Pipe	Pipe thk.
	mm	mm
85 01 10	16	2.0
85 01 12	20	2.5

Specifications
90° NG bend

Use
Pipe fitting to be used for press-fit connections with multilayer pipes.

7. Accessories for ceiling and wall systems

Corrosion inhibitor additive with biocide SANOTHERM 400

Code	Material	Dosage kg/100l
10 50 30	Liquid	1.0

Specifications
Additive to inhibit corrosion and fouling for radiant systems with specific biocidal effect to reduce the formation of biological fouling. Application increases the heat transmission in the system, improving efficiency and durability. We recommend adding new inhibitor at least once every 12-24 months.
DOSAGE: 1 kilogram for each 100 liters of system water.

Use
SANOTHERM 400 is a multifunctional additive with biostatic action for full protection from fouling, corrosion and microbiological growth, in any underfloor, ceiling and wall radiant heating system, including those with aluminium parts.
Non-oxidising and non-foaming, it inhibits the growth and development of algae, bacteria and micro-organisms in heating circuits operating at low temperature, thus extending the life of the system and guaranteeing its maximum efficiency, with a consequent reduction in fuel consumption.
We recommend identifying systems protected with Sanotherm 400 and re-adding the additive in the case of large water changes, or at least once every 12-24 months depending on the age of the system to be treated and its leaks.

System cleaning additive SANOTHERM 700

Code	Material	Dosage kg/100l
10 50 40	Liquid	0.7÷1.0

Specifications
Alkaline additive that removes and disperses biological silt deposits, particularly suitable for cleaning underfloor radiant systems when the system does not contain aluminium, its alloys or zinc.
DOSAGE: 0.7÷1 kilograms for each 100 liters of system water.

Use
SANOTHERM 700 is a specific alkaline formulation for the removal and dispersion of deposits of biological silt or other organic matter. Organic fouling is caused by deposits that create obstructions, reduction of the diameter of the pipes and heat exchange. To restore the correct operation of the circuit you need to flush the fluid, clean it with Sanotherm 700 and refill.
Indicated for cleaning underfloor radiant heating systems and the like. The possible presence of aluminium and/or zinc leads to a reduction of residence times. The waste water from chemical cleaning must be disposed of in accordance with local laws.

8. Equipment for ceiling and wall systems

Pipe-coupling assembly kit

Code	Ø mm
95 700	10

Specifications
ND10/ND20 pipe-quick coupling assembly kit. Comprising DN10 pipe cutters, a DN 8-10-20 gauge for determining the depth to which the pipe is inserted into the quick coupling, a puller for removing DN10 quick couplings, and silicone lubricant spray.

Use
Tool kit required for correct connection of pipe-coupling.

Heat sensitive strip

Code
97 000

Specifications
Instrument for thermal detection of piping inside the structure.

Use
This heat sensitive sheet is ideal for detecting the presence of heating pipes, such as for a WW-10 or WD-10i wall heating system, or a WW-10 or CD-10i ceiling system.
Working temperature range 30°C - 40°C.

Pipe cutter

Code	Ø mm
85 00 02	14-75

Specifications
Wheel pipe cutter for cutting multilayer pipe.

Pipe cutter with holding function

Code	Ø mm
85 02 00	14-26

Specifications
Pipe cutter for cutting multilayer pipe.

Kalispeed handle

Code	Ø mm
89 71 01	14-32

Internal-external calibration tool for Kalispeed

Code	Ø mm
89 72 16	16x2.0
89 72 20	20x2.5

Specifications
Handle and calibration tools for pipes for ceiling, wall, underfloor radiant systems.

Use
These are used to calibrate the internal / external diameter as well as removing burrs where the pipe has been cut.

Electric pressing tool

Code	Mod.	Complete with plastic case.	Voltage V
86 00 18	ACO203	yes	18
86 02 30	ECO203	yes	230

Specifications
Tool for use with jaws for press fittings

Press jaw

Code	Mod.	Ø mm
86 02 16	PB2	16
86 02 20	PB2	20

Specifications
Jaws for press fittings.

Notes

Notes

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