

VARICOOL Spectra

FREE HANGING

HEATING/COOLING ELEMENTS



Our experience, your added value

Uponor Energy Solutions offer integrated concepts for energy solutions and support non-residential construction projects in all project phases starting with initial design up to building utilisation.

The solutions for building temperature control, energy supply and energy distribution ensure the most comfortable climate in living and work areas. They also optimise costs and contribute to reducing energy consumption and CO₂ emissions for sustaining a comfortable living environment.

You will receive an energy-efficient building tailored to your needs with virtually no maintenance and low operating costs – a building that offers its users an optimum and comfortable working environment all year round.

Solutions from Uponor Energy Solutions stand for excellent quality and ensure easy integration into the construction process.

We provide safe and efficient installation technologies for heating/cooling and for the installation of potable water which guarantee the long-term, sustainable and trouble free operation of your building – all at low maintenance costs.

- Energy-efficient and sustainable solutions
- High comfort for an optimum working environment
- Easy integration of the systems into the building process
- High reliability and low maintenance costs
- Technical support starting with the initial design up to installation and building utilisation

1. Feasibility analysis

Based on the customer's individual requirements in terms of efficiency, sustainability and energy efficiency, we provide targeted advice with respect to the most appropriate solutions for a building.

2. Solutions and concepts

Using advanced engineering software, we develop design proposals according to customer needs, taking into account the specific circumstances.

3. Technical planning

We transform ideas into technical implementation, taking into account all relevant data and the applicable standards. Our Uponor planning experts, who manage your specific project, have many years of experience.



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4. Installation and project management

We support your project team in planning, organization and in the management of resources. In close cooperation with neighbouring trades we provide for an optimum flow of materials and efficient and trouble-free installation.

5. Commissioning and handover

The systems undergo extensive testing and are commissioned by us before they are handed over to you.

6. Customer services

To ensure long-term system availability, we offer professional inspections and maintenance along with quality control using modern testing techniques, such as thermographs, flow measurements and water quality analysis.

VARICOOL Spectra

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VARICOOL Spectra — free hanging heating/cooling elements

System description and applications



VARICOOL Spectra ceiling elements - high performance with concealed hydraulic connection

VARICOOL Spectra is a water-based heating and cooling ceiling system in which the heating/cooling coil is securely connected to the ceiling panels either through a unique magnetic connection (VARICOOL Spectra M) or with an adhesive bond (VARICOOL Spectra K). Both versions are also available as special variant VARICOOL Spectra MOD in which individual ceiling elements are enclosed on the circumference with an attractive aluminum frame.

VARICOOL Spectra operates primarily on the radiation principle, which provides the best indoor comfort, maximum energy efficiency and a draught-free comfortable climate. The modular construction method allows for the individual temperature control of rooms according to personal temperature sensitivity. Depending on the system design, a zone-basis temperature control utilising

an island ceiling solution can be implemented in large offices. This sets the stage for the individual thermal comfort of the users and provides a high level of satisfaction and motivation.

In addition, a specially designed acoustic fleece is glued into the perforated ceiling panel which results in excellent room acoustics. Indirect lighting via the reflective ceiling surface makes glare-free illumination of the room possible. The visually attractive design and the filigree method of construction of the "free-floating" VARICOOL Spectra heating/cooling ceiling elements blend harmoniously with the surroundings and set the architectural tone.

VARICOOL Spectra is characterized by a variety of application and design options. Its preferred use is as a ceiling canopy or ceiling island

Your benefits

- High surface area-based cooling and heating capacities
- Utilisation of the concrete ceiling's thermal mass
- Individual room temperature through zone basis heating for isolated applications
- High level of user acceptance and satisfaction
- Ideally suited for renewable energy sources such as geothermal energy and heat pumps
- Filigree and visually appealing design of the canopies
- Combinable with the CCTC Uponor TAB System - for room control, peak loads and sound absorption
- Hidden hydraulic connection of the ceiling elements via piping embedded in the concrete ceiling and the "thermal socket" Uponor TAB System connect

in office and administrative buildings, retail outlets, in rooms for seminars and conferences, either as a full system load or peak load system in combination with the Uponor TAB System concrete core activation. The canopies/ceiling islands can be connected to the pipes in the concrete ceiling via the "thermal sockets" Uponor TAB System Connect.

Design variants

VARICOOL Spectra elements are very flexible depending on the required capacity, the distribution of that capacity within in the

room and the interior design requirements. Some common variants are described below.



Island design

Several ceiling elements are strung together to form a large ceiling island in the island design. The ceiling is not closed completely. This results in the formation of a modern and interesting ceiling. The thermal mass of the concrete ceiling is preserved which also has a positive effect on the room temperature.



Canopies

Canopies are individual ceiling elements which hang in the room and provide either the entire heating/cooling capacity or cover peak loads in a CCTC Uponor TAB System application. Excellent acoustics are created with canopies.



Canopies and island ceilings with surrounding frame (VARICOOL Spectra MOD)

Several rows of smaller ceiling elements are strung together to form large canopies inside a round aluminium frame. This creates cohesive and also attractive heating/cooling surfaces when viewed from the side.



Edge strip elements

It often makes sense to place heating/cooling ceiling elements directly on the façade, where the largest heating/cooling loads originate. As a peak load system it is an ideal complement to the CCTC Uponor TAB System and the thermal socket Uponor TAB System Connect with very efficient absorption of sound waves accumulating in the corner.

Design

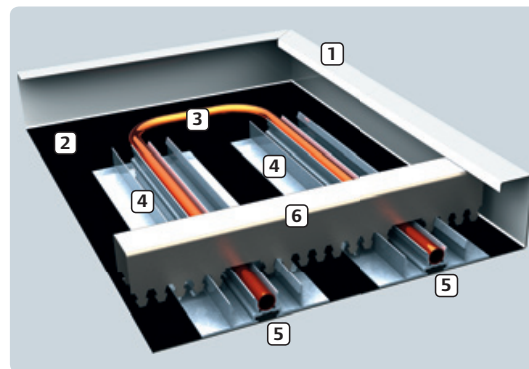
The components responsible for air conditioning in the heating/cooling ceiling system are the heating/cooling coils positioned behind the ceiling panel. They consist of high-quality machined copper serpentine pipework which is pressed into the aluminium heat conducting profiles. Depending on the design chosen either the magnetic or adhesive technique is used to connect the coils to the ceiling panel. For ceiling islands with several

elements each heating/cooling coil is connected to a water circuit via a flexible hose sheathed with flexible stainless steel wire. The water circuits or the individual heating/cooling ceiling elements are connected hydraulically to the distribution network and balanced. Multilayer composite pipe is preferred for each branch of the distribution network but black steel pipe may be used as well. For new buildings it is also possible to install the connecting pipes of

the ceiling panels in the concrete ceiling. The ceiling elements can be connected via a concrete embedded thermal power socket system Uponor TAB System Connect. Due to this type of connection no connecting pipes on the ceiling are visible - see following application example or the product information of the thermal socket Uponor TAB System Connect.

VARICOOL Spectra M

For the design variant using magnetic technology, the heating/cooling coil and sheet steel ceiling panels are delivered separately to the building site where the modules are then joined together. This reduces the time required to complete the entire ceiling due to the simultaneous pre-assembly of the components. The U-mounting rails, which fix and stabilize the coils, also minimize the sag of the ceiling panels thereby allowing for the installation of large unit sizes. Additional VARICOOL Spectra M coils can be easily retrofitted at a later date if only partial coverage is required at first.

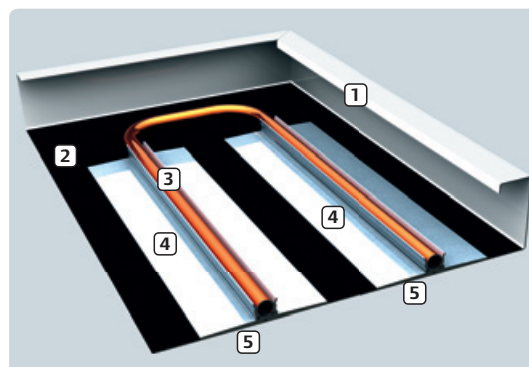


Structure of VARICOOL Spectra M

- ① Sheet steel ceiling panel
- ② Acoustic fleece
- ③ Copper serpentine pipework $d_a = 10 \text{ mm}$
- ④ Aluminium heat-conducting profile
- ⑤ Magnetic strip
- ⑥ U-mounting rail

VARICOOL Spectra K

For this affordable variant the heating/cooling coils are glued into the ceiling with acoustic fleece made of aluminium or sheet steel. The recommended maximum size of the elements is 1,500 x 800 mm.

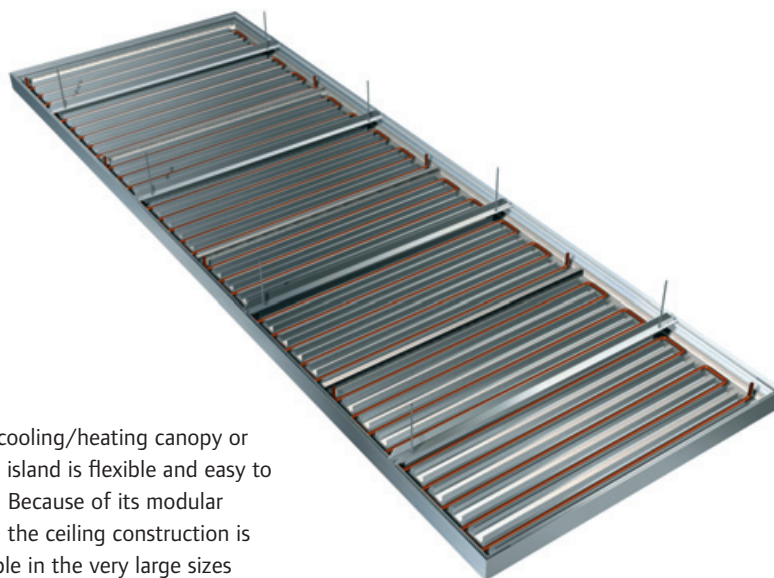


Structure of VARICOOL Spectra K

- ① Sheet metal ceiling panel
- ② Acoustic fleece
- ③ Copper serpentine pipework $d_a = 10 \text{ mm}$
- ④ Aluminium heat-conducting profile
- ⑤ Adhesive surface

VARICOOL Spectra MOD (special variant)

A special variant of large canopies and ceiling islands is the modular construction ceiling system VARICOOL Spectra MOD in which either VARICOOL Spectra M or VARICOOL Spectra Spectra K heating/cooling coils can be used. The individual ceiling elements are enclosed on the edge with an attractive aluminium profile frame. From the side this system almost appears as a one-piece ceiling element. During assembly the panels are simply inserted one by one into the frame. Due to the light weight of the individual parts and the practical dimensions the VARICOOL Spectra cooling



MOD cooling/heating canopy or ceiling island is flexible and easy to install. Because of its modular design the ceiling construction is available in the very large sizes of 6,000 x 3,000 mm.

Ceiling mounting system

The type of ceiling suspension depends on the variation of VARICOOL Spectra design chosen.

Suspension

VARICOOL Spectra M

The VARICOOL Spectra M ceiling elements are attached with specially designed hooks and threaded rods. The threaded rods are anchored in the concrete ceiling and the hooks are engaged with the U-mounting rails of the coils.

This allows the ceiling elements to be adjusted for height and also to a limited extent in the horizontal direction.

For inspection work the ceiling elements can be easily removed from the hook and suspended with cable.



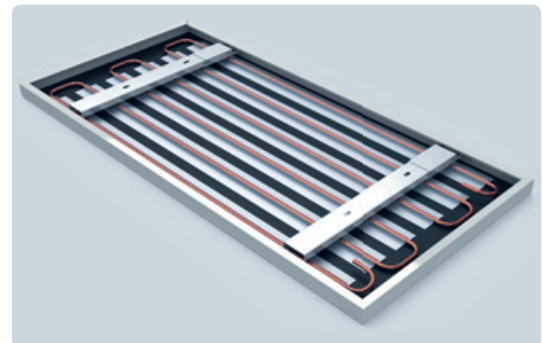
Heating/cooling coil with magnet technology suspended on threaded rods. Subsequent mounting of ceiling panels complete the ceiling island.

Suspension

VARICOOL Spectra K

The VARICOOL Spectra K ceiling elements are also mounted to the ceiling with threaded rods. Special mounting rails allow for

vertical and horizontal alignment of the canopies. In addition, the elements can be folded down for inspection work because of the mounting rails and the G-fold of the ceiling panels.



Suspension of ceiling panels with mounting rails. This allows the elements to fold down.

Suspension

VARICOOL Spectra MOD

The VARICOOL Spectra M or VARICOOL Spectra K cooling canopy or island is constructed from individual elements and attached to the ceiling on the surrounding

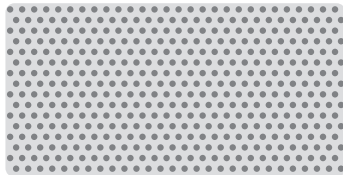
aluminium frame via transverse mounting rails with threaded rods. For inspection work the individual elements can be easily removed from the frame and suspended with cable.



Suspension of the ceiling elements to form a large ceiling island over the surrounding frame with threaded rods hidden from sight.

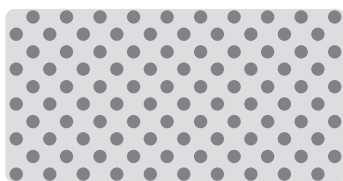
Ceiling panel

In order to provide good acoustics in not only small but large rooms as well, many elements in the room must be designed to absorb sound. Therefore, the ceiling panel is usually perforated and lined with acoustic fleece on the backside. Depending on the ceiling design, different perforation variations can be selected – see perforation examples on the right.



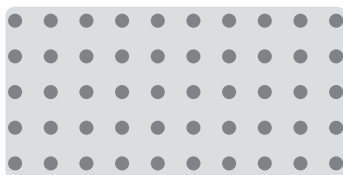
Rv 1620

Hole diameter 1.6 mm
Open area 20 %



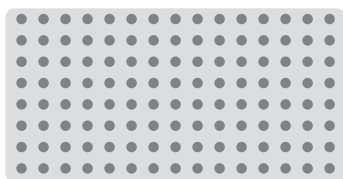
Rd 320

Hole diameter 3 mm
Open area 20 %



Rg 3310

Hole diameter 3.3 mm
Open area 10 %



Rg 2516

Hole diameter 2.5 mm
Open area 16 %

Planning and dimensioning

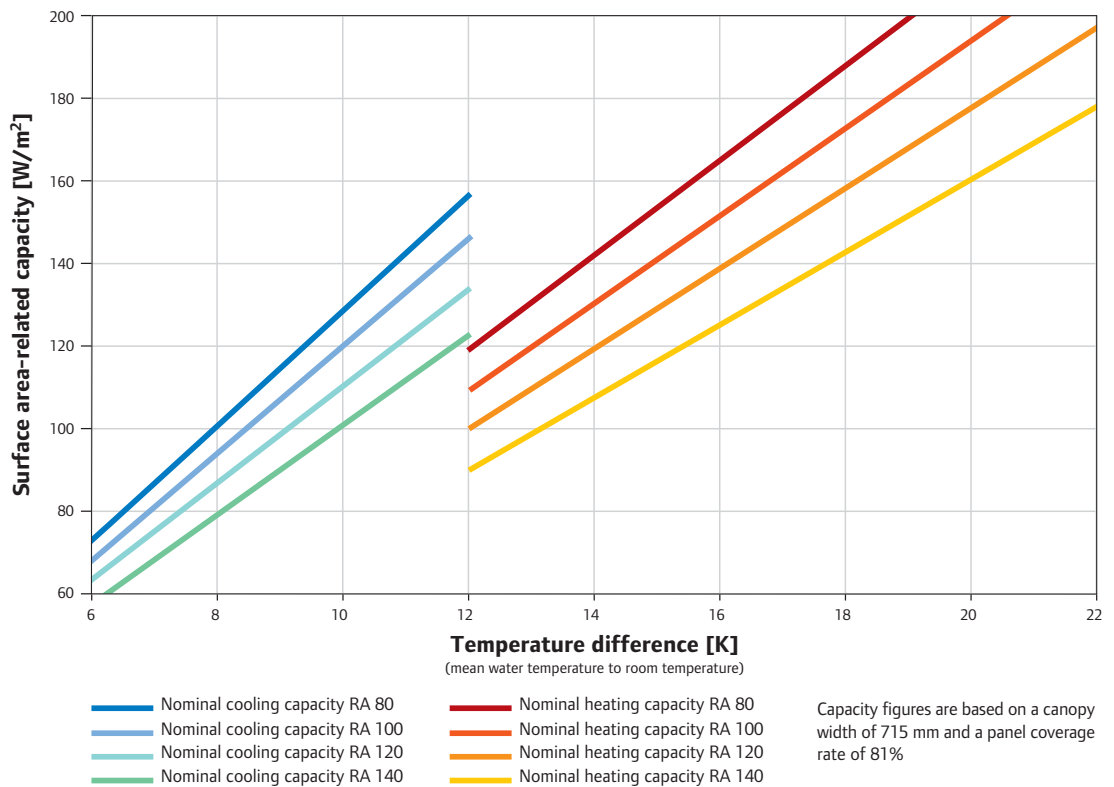
Cooling/heating capacity

The approximate cooling and heating values under standard

conditions or realistic installation conditions can be taken from the capacity diagram. The capacity is read as a function of the

temperature difference between the mean water temperature and the room temperature.

Heating/cooling capacity of system VARICOOL Spectra (version with sheet steel) tested according to EN 14240 and EN 14037



Sound absorption

The metal acoustic panels of perforated sheet metal and acoustic fleece absorb ambient sound very effectively. An additional layer of mineral wool is usually not required. In larger rooms with several people, sound absorption is important to ensure a comfortable level of sound

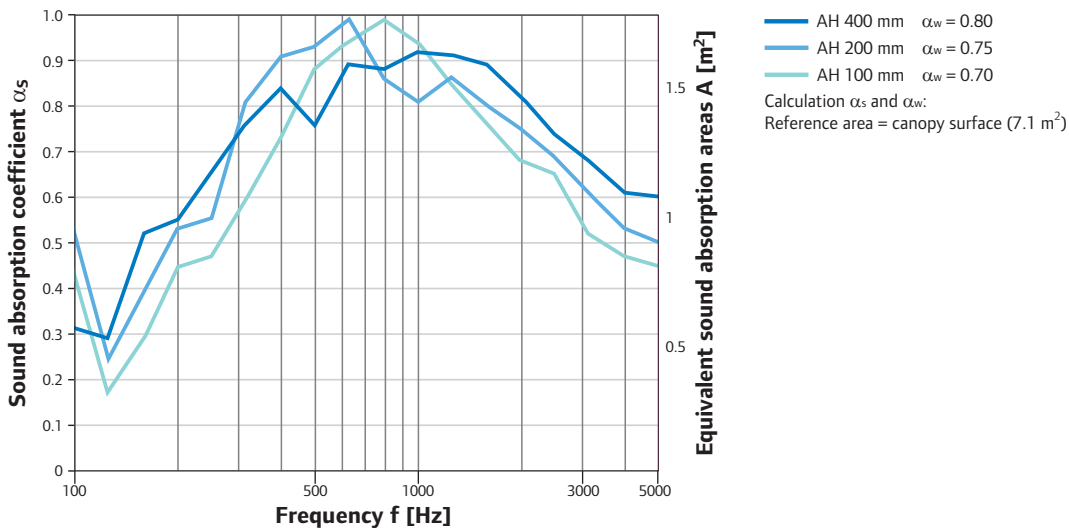
and minimal reverberation time in the room.

The sound absorption values of the two VARICOOL Spectra systems are indicated as equivalent sound absorption areas in the diagrams below depending on the suspension height, mineral wool lining and spacing of the piping.

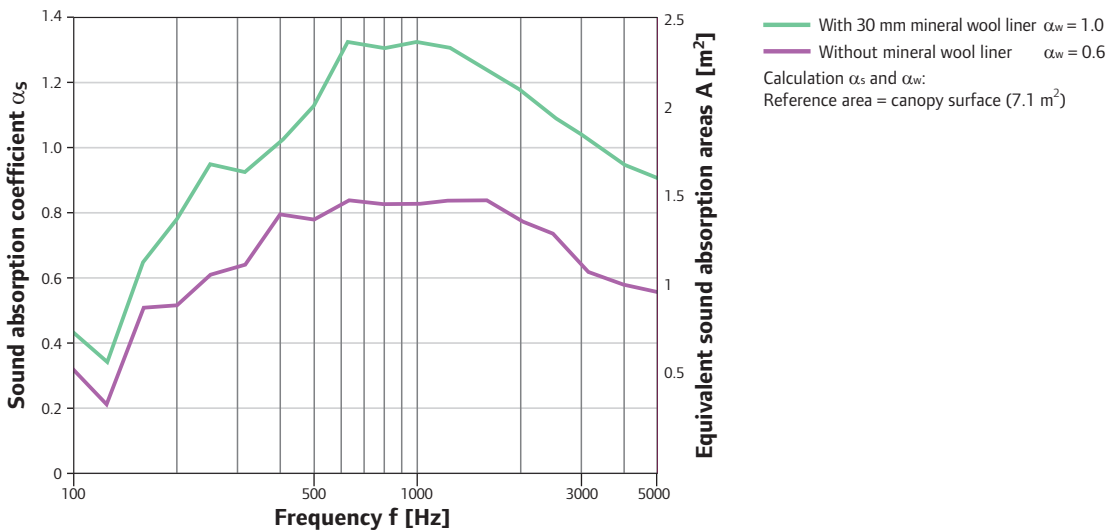
The sound absorption coefficient α_s was calculated from the equivalent sound absorption area and the canopy surface. The sound absorption values for perforations with an open area of $FQ = 10 \dots 20 \%$ (measured Rg 2516 with $FQ = 16 \%$) are nearly identical).

Sound absorption for system VARICOOL Spectra tested according to EN ISO 354

Pipe spacing 100 mm and coverage rate [BG] 95% – variable suspension height [AH]



Pipe spacing 80 mm, suspension height 400 mm and coverage rate 87% – with/without the mineral wool liner



Light reflection, lighting

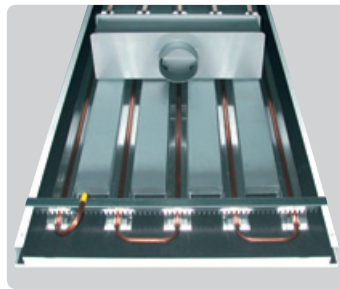
VARICOOL Spectra can be easily combined with recessed and surface mounted lights, ceiling spotlights or lamps and pendant lighting. Due to the high reflection factor, relative to short-wave light, the ceiling panels are best suited for indirect lighting techniques.

Thermally inactive elements

For architectural or room acoustic reasons, it may be required in some cases to also use thermally inactive elements. These elements can then be combined as acoustic canopies with the heating/cooling canopies.

Room ventilation

Air exchange outlets are integrated into the ceiling to ensure that the minimum amount of air is exchanged for proper room air hygiene. The System QUELLO is not visible from the room. The supply air is blown into the room draught-free via a junction box, air supply rails installed between the heat conducting profiles, and through the perforations in the ceiling.



Air displacement diffuser system QUELLO

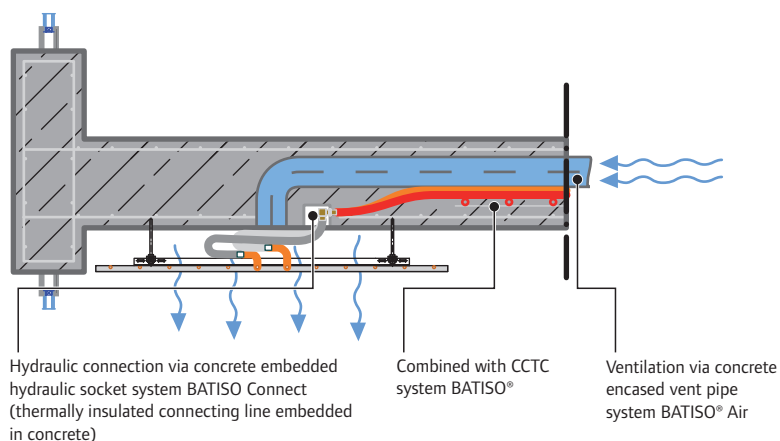
System QUELLO

The ceiling system VARICOOL Spectra M can be combined with the air displacement diffuser QUELLO which is not visible from the room. More information can be found in the product brochure Quello. Inspection openings must be provided for cleaning purposes according to VDI 6022.

Application example

VARICOOL Spectra peripheral zone element can be combined with concealed ventilation and concealed hydraulic connections.

Complete supply of fresh air, cold or heat via pipe lines embedded in concrete.



Technical features

VARICOOL	Spectra M	Spectra K
Ceiling panel	Sheet steel	Steel or aluminium sheet
Pipe spacing	RA = 80 to 150 mm (in 10 mm increments)	
Copper serpentine pipework	Outer diameter $d_a = 10$ mm	
Surface weight at RA = 100 mm (operating weight with substructure)	approx. 15 kg/m ²	approx. 11 kg/m ²
Water content	approx. 1 l/m ²	
Plate height (Ph)	30/40/50 mm	
Standard-surface	RAL colours	
Standard perforation	Rv 1620 – round hole diameter 1.6 mm, staggered rows, open area 20 % Rg 2516 – round hole diameter 2.5 mm, straight rows, open area 16 %	
Recesses	for recessed lighting or the installation of sprinkler lines or fire detectors etc., at the factory	
Cooling capacity according to EN 14240 at $\Delta\theta = 8$ K, RA 80 mm	101 W/m ²	
Heating capacity according to EN 14037 at $\Delta J = 15$ K, RA 80 mm	153 W/m ²	
Acoustics	Weighted sound absorption coefficient α_w according to EN ISO 11654 $\alpha_w = 0.8$ (sound absorption class B) (pipe spacing RA 100 mm, suspension height 400 mm, with full plate coverage)	
Fire performance	Fire material class A2-s1 d0 according to EN 13501-1	
Mean temperature (recommended)	Cooling water temperature: 16 °C recommended temperature difference chilled water 2 to 4K heating water: 35 to 40 °C	
Operating conditions	Threshold temperature heating mode max. +50 °C Condensation must be prevented	
Drop in pressure (recommended)	Max. 25 kPa per water circuit	
Suspension height (recommended)	Min. of 90 mm (distance between the concrete slab and the underside of the element)	

Building temperature control, energy supply and power generation with Uponor Energy Solutions everything under one-roof

Building temperature control

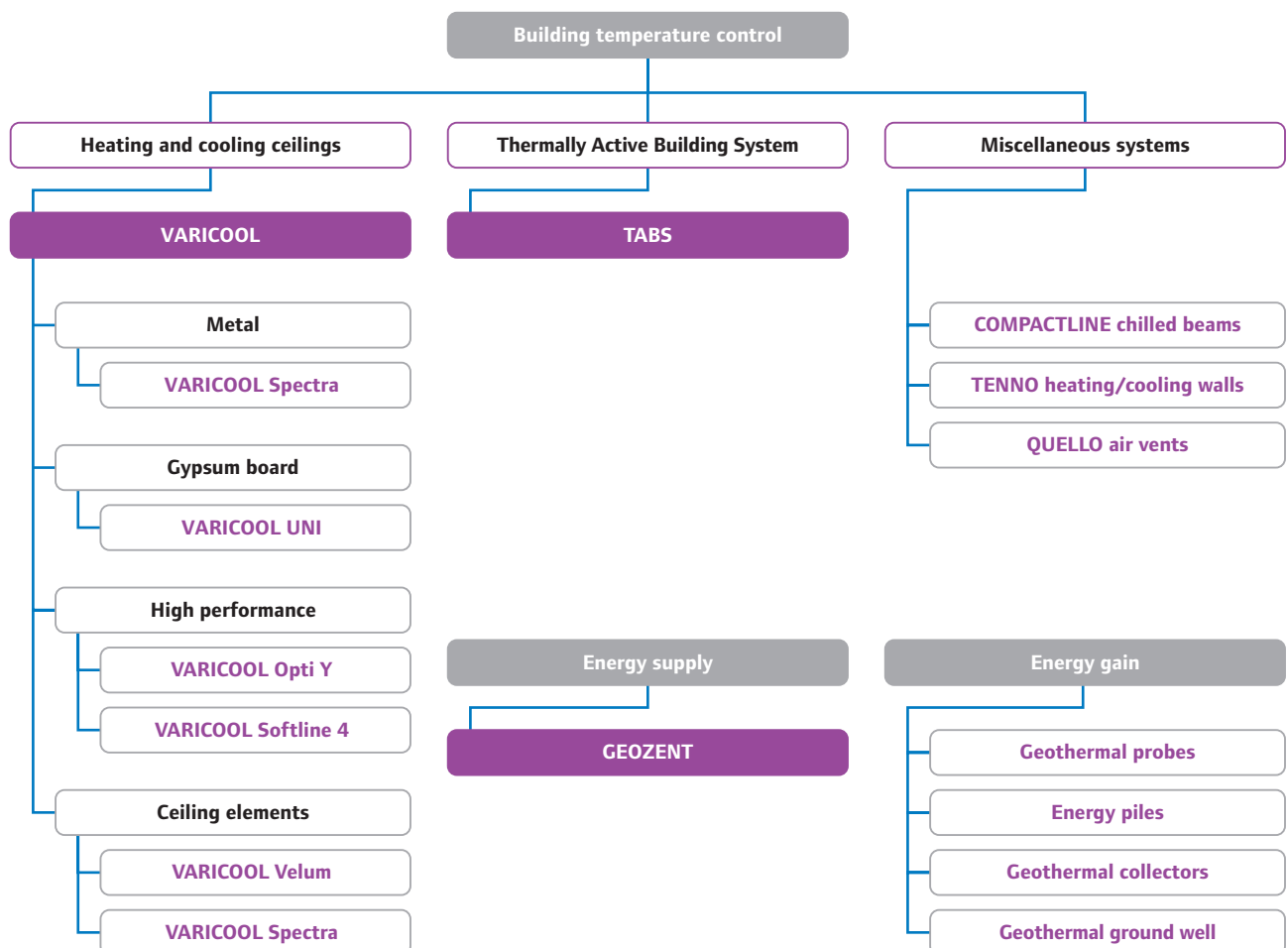
Uponor Energy Solutions surface systems, such as heating and cooling ceilings and concrete core temperature control are established technologies for regulating room temperature and have been a market leader for more than 50 years. The numerous technical developments have made us a pioneer in the field of advanced building system technology.

Energy supply

For commercial buildings, we have developed a large geothermal heat pump, as a ready for connection power station with its own integrated hydraulic system: The multifunctional heat pump simultaneously produces heating and cooling energy as needed and is manufactured according to individual requirements in modular design ready for connection.

Power generation

As an ideal basis for the sustainable, ecological and highly economical supply of commercial real estate with thermal energy, Uponor Energy Solutions have many years of know-how in the use of geothermal probes, energy piles, ground heat collectors and geothermal groundwater wells.



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