

# VARICOOL Spectra

THE HEATING/COOLING  
CEILING SYSTEM FOR  
CLOSED SHEET METAL CEILINGS



# 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 CO<sub>2</sub> 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.



**uponor**

## 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

## System description/applications



VARICOOL Spectra heating/cooling ceiling system as a closed metal ceiling

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). The system operates primarily on the radiation principle, which provides the best indoor comfort, maximum energy efficiency and a draught-free comfortable climate. In addition, a specially designed acoustic fleece is glued-in to the perforated ceiling

panels which results in excellent room acoustics. Indirect lighting via the reflective ceiling surface makes glare-free illumination of the room possible.

The ceiling system is characterized by a variety of application and design options. It is used primarily in office and administration buildings, retail outlets, in rooms for seminars and conferences, as well as in treatment rooms of hospitals.

### Your benefits

- Attractive ceiling surface from an architectural perspective
- High heating and cooling capacity with excellent heat transfer between profile system and ceiling panels
- Combination of active and passive thermal ceiling areas possible
- High sound absorption coefficients through perforated metal ceiling panels with acoustic fleece
- Ideally suited for renewable energy sources such as geothermal energy and heat pumps
- Combination with lighting of different shapes, recessed lighting or other surface mountings such as sprinklers are no problem
- Existing metal ceilings can be retrofitted with the magnet system VARICOOL Spectra M

## Design

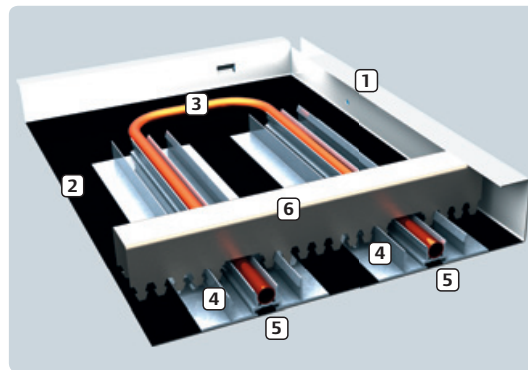
The components responsible for air conditioning in the heating/cooling ceiling system are the heating/cooling coils positioned behind the ceiling panel. They consist of high-quality machined copper serpentine pipework which is pressed into the aluminium heat conducting profiles.

Depending on the design chosen either the magnetic or adhesive technique is used to connect the coils to the ceiling panel. The individual heating/cooling coils are connected to form water circuits with hoses that are sheathed with flexible stainless steel wire. The

water circuits are hydraulically connected to the distribution system and hydraulically balanced. Multilayer composite pipe is preferred for each branch of the distribution network but black steel pipe may be used as well.

### 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.

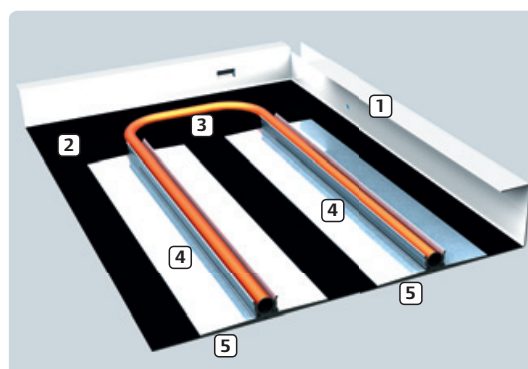


Structure of VARICOOL Spectra M

- 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. Depending on the acoustic requirements, the ceiling panels can be equipped with an acoustic fleece. 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

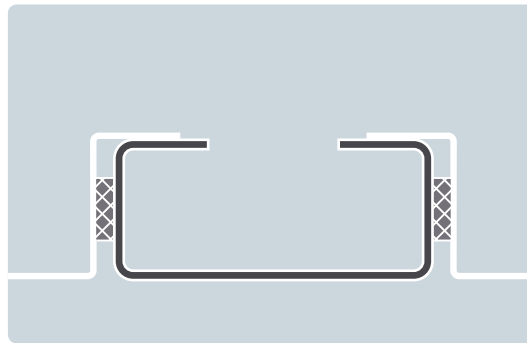
### Ceiling construction

Each ceiling construction that is individually tailored to a respective construction project also requires its own ceiling mounting system. Therefore, depending on the

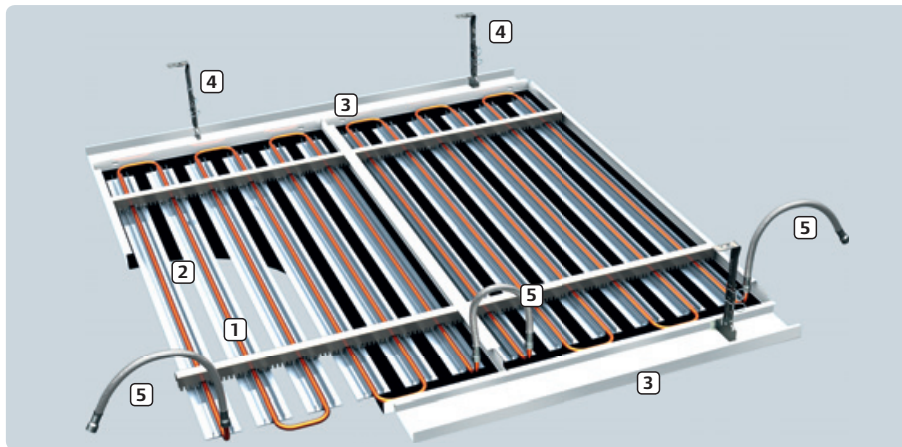
requirements, different mounting systems for mounting the VARICOOL Spectra heating/cooling ceilings are used.

### Bandraster system

The bandraster system is a very practical sheet metal ceiling system which is based on a construction grid. It allows for the easy attachment of lightweight partition walls in the construction grid. It also allows for the arrangement of sound insulation bulkhead and longitudinal sound insulation. Spacers between the elements and the bandraster system provide for a uniform joint structure.



Bandraster system diagram



Bandraster system structure

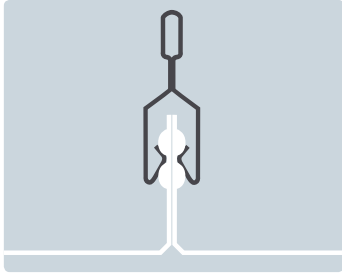
- 1 Heating/cooling coil
- 2 Ceiling panel
- 3 Bandraster elements
- 4 Nonius hanger
- 5 Flexible hydraulic hoses

Design example of a bandraster ceiling - simplified only including one row of ceiling panels.



### Clamping system

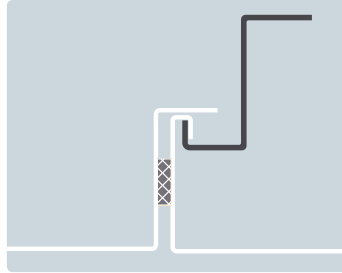
A virtually seamless ceiling with no visible structural components is possible by using clamping cartridges.



Clamping system diagram

### Hooking system

The ceiling elements are attached to the ceiling mounting system via a single hook profile. Then the rectangular folded edge of the next



Hooking system diagram

element is placed onto the preceding element. The ceiling mounting system itself is not visible. Knobs or spacers between the elements provide for a uniform joint structure.

### Coffered ceiling as insertion system

A particularly economical cooling/heating ceiling system which can be implemented by using coffered

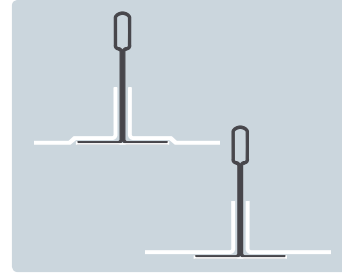
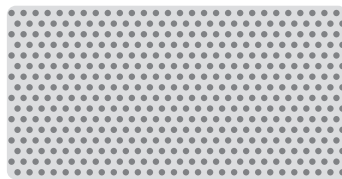


Diagram of coffered ceiling as insertion system

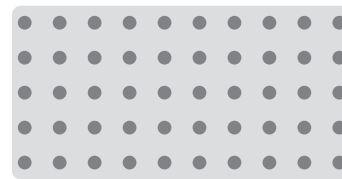
ceilings in standard formats (600 x 600/625 x 625/1,200 x 600/1,250 x 625 mm). VARICOOL Spectra K coils are glued into the standard cassettes. The finished cassettes are simply placed on-location between the suspended T-mounting rails, which are mounted at standard spacing. As an alternative, mounting can also be carried out using a clamping system.

### Ceiling panel

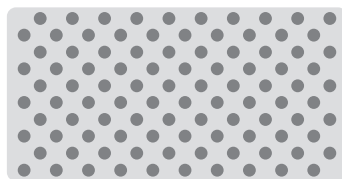
In order to provide good acoustics in not only small but also large rooms, many elements in the room must be designed to absorb sound. Therefore, the ceiling panel is usually perforated and lined with acoustic fleece on the backside. Depending on the ceiling design, different perforation variations can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



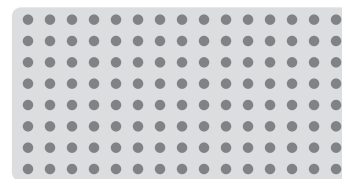
Rv 1620  
Hole diameter 1.6 mm  
Open area 20 %



Rg 3310  
Hole diameter 3.3 mm  
Open area 10 %



Rd 320  
Hole diameter 3 mm  
Open area 20 %



Rg 2516  
Hole diameter 2.5 mm  
Open area 16 %

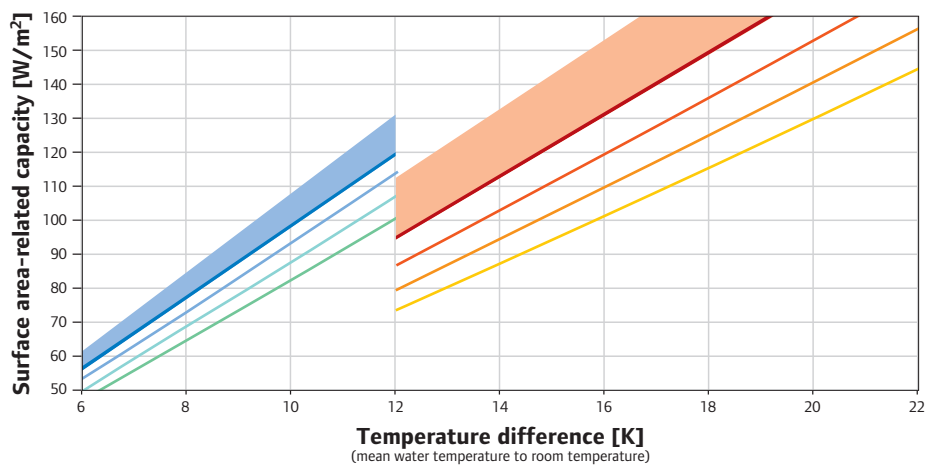
## Planning and dimensioning

### Cooling/heating capacity

The approximate cooling and heating values under standard conditions or realistic installation conditions can be taken from the capacity diagram. The ca-

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



- Nominal cooling capacity RA 80
- Nominal cooling capacity RA 100
- Nominal cooling capacity RA 120
- Nominal cooling capacity RA 140
- Nominal heating capacity RA 80
- Nominal heating capacity RA 100
- Nominal heating capacity RA 120
- Nominal heating capacity RA 140

Areas of capacity increase under actual installation conditions:

— Area of capacity increase 11 % (36 °C warm façade)

— Area of capacity increase 20 % (ventilation control, air movement from ceiling to floor)

Performance data based on panel coverage of 81%



### 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.

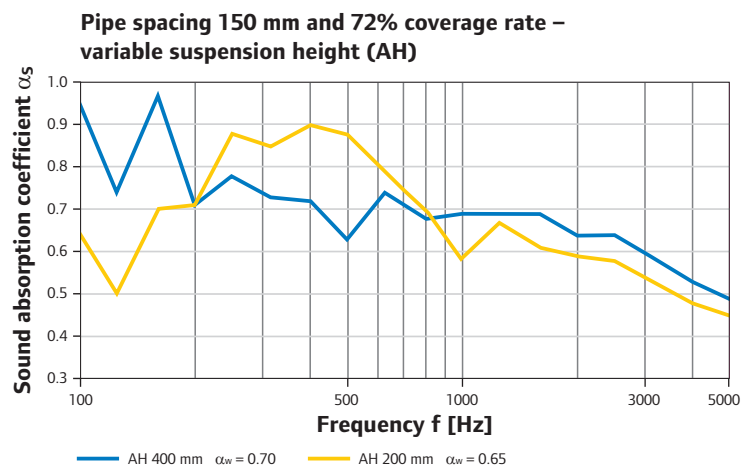
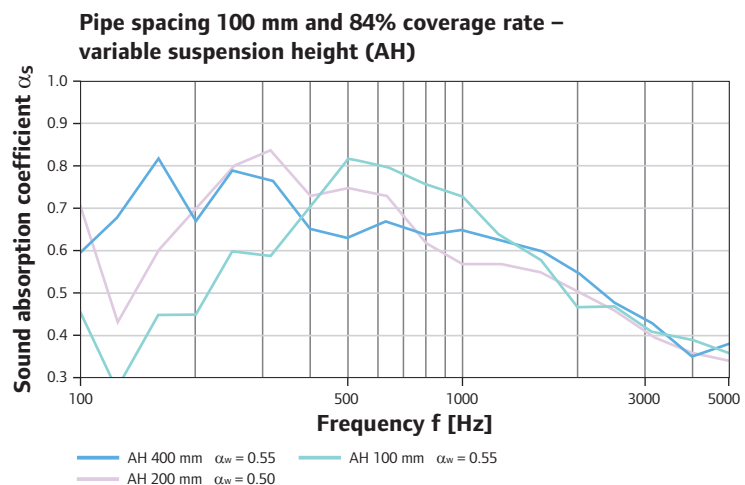
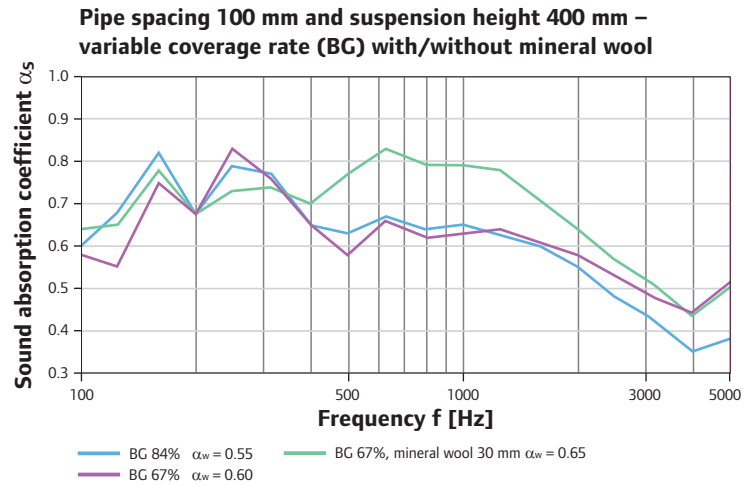
The sound absorption values of the VARICOOL Spectra system are indicated in the three diagrams below as a sound absorption coefficient  $\alpha_s$  depending on the coverage rate (BG), mineral wool lining, suspension height (AH) and the pipe spacing. The weighted sound absorption coefficient  $\alpha_w$  was calculated according to EN ISO 11654. The sound absorption values for perforations with an open area of FQ = 10.. 20 % (measured Rg 2516 with FQ = 16 %) are nearly identical.

### Light reflection, lighting

VARICOOL Spectra can be easily combined with recessed and surface mounted lights, ceiling spotlights or lamps and pendant lighting.

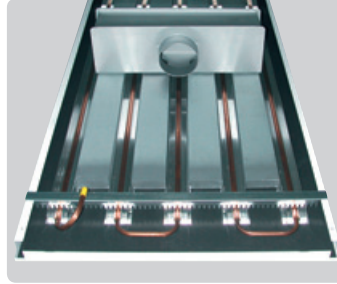
Due to the high reflection factor, relative to short-wave light, the ceiling panels are best suited for indirect lighting techniques.

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



### 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 examples for VARICOOL Spectra



Cassette heating/cooling ceiling with standard spacing 625 mm special perforation and recessed lighting



Sheet metal heating/cooling ceiling with VARICOOL Spectra as a bandrastrer construction



Sheet metal heating/cooling ceiling with VARICOOL Spectra in combination with various fixtures such as sprinklers, smoke detectors and pendant lighting

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

## Building temperature control

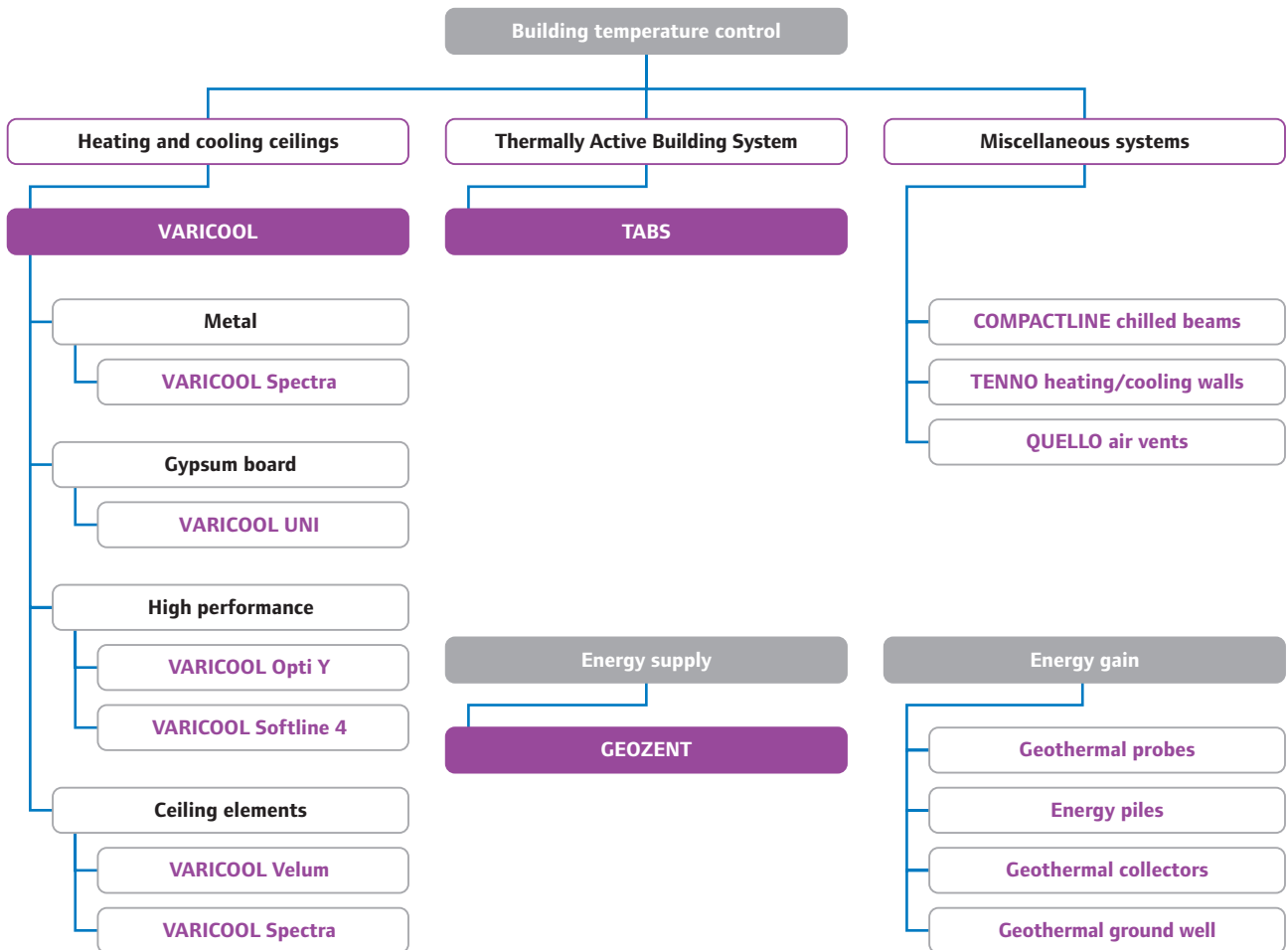
Uponor Energy Solutions surface systems, such as heating and cooling ceilings and concrete core temperature control are established technologies for regulating room temperature and have been a market leader for more than 50 years. The numerous technical developments have made us a pioneer in the field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



## Technical features

VARICOOL	Spectra M	Spectra K
Ceiling panel	Sheet steel	Steel or aluminum 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 <sup>2</sup>	approx. 15 kg/m <sup>2</sup>
Water content	approx. 1 l/m <sup>2</sup>	
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 84 W/m <sup>2</sup> (common case) at $\Delta\theta = 8$ K, RA = 80 mm 76 W/m <sup>2</sup> with asymmetrical load distribution and 30 mm edge joint and ventilation	
Heating capacity according to EN 14037	at $\Delta\theta = 15$ K, RA 80 mm 108 W/m <sup>2</sup> at $\Delta\theta = 15$ K, RA 80 mm 130 W/m <sup>2</sup> with ventilation control (air moving from area to bottom)	
Acoustics	Weighted sound absorption coefficient $\alpha_w$ according to EN ISO 11654 $\alpha_w = 0.6$ (sound absorption class C) (Pipe spacing RA 100 mm, suspension height 400 mm, Coverage rate (BG) approx. 70 %)	
Fire performance	Fire material class A2 - s1 d0 according to EN 13501-1	
Media temperature (recommended)	Cooling water temperature: 16 °C Recommended temperature difference cold water 2 to 4K Heating water temperature: 35 °C bis 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 150 mm (distance between the concrete ceiling and the underside of the installed ceiling)	

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