

uponor

## VARICOOL Velum

HIGH PERFORMANCE CEILING  
CANOPY FOR HEATING AND  
COOLING WITH INTEGRATED  
SOUND ABSORBER



# Our experience, your added value

Uponor provide cost effective design solutions for many building schemes including office developments, health and education projects, production plants and airports. We support architects, engineers and end user clients with feasibility through to construction and handover.

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<sup>2</sup> 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 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 completion

## 1. Feasibility analysis

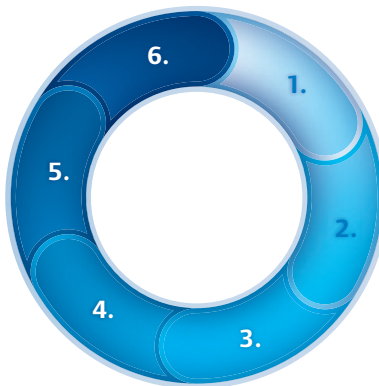
Based on the customer's individual requirements in terms of efficiency, sustainability and energy efficiency, we provide targeted advice with respect to the most appropriate solutions for a building.

## 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.



## 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.

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# VARICOOL Velum

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# VARICOOL velum, the high-performance ceiling canopy for heating and cooling with integrated sound absorber

## System description and applications

VARICOOL velum heating and cooling ceiling panels combine high cooling capacity with draught-free comfort, are sound-absorbing and reflect diffused light onto the work area. The elegant, compact design meets high architectural standards and fits perfectly into the modern office environment.

The extremely flat, visually floating in space, VARICOOL velum canopies can be used to cool and heat rooms according to the comfortable radiation principle. The mild radiant heat is absorbed directly from the surrounding areas and is perceived by people as a uniform and very comfortable

warming of the room. In cooling mode the ceiling canopy in the room acts as a radiation absorber as it soaks up – like a solar collector – the heat in the room to remove it. At the same time the air rising in the room is cooled on the structure's surface. Unlike a conventional air conditioner, which circulates a large volume of air, the heating/cooling ceiling system creates a pleasant draught-free climate with no dust circulation or ventilation noise. Heated or cooled water in a closed circuit is the medium used.

The sound-absorbing elements integrated in the ceiling canopy provide excellent room acoustics. VARICOOL velum is a hybrid ceiling system that thermally activates the overlying concrete slab with its radiation active surface.



VARICOOL velum as edge strip elements in combination with CCTC (installation next to the façade).



VARICOOL velum heating and cooling canopies

### Your benefits

- Extremely flat design
- High cooling capacity
- Utilisation of the concrete ceiling's thermal mass - hybrid canopies
- Excellent room acoustics through integrated, sound-absorbing elements
- Pleasant, draught-free room air without dust circulation
- Visually appealing design

## Design

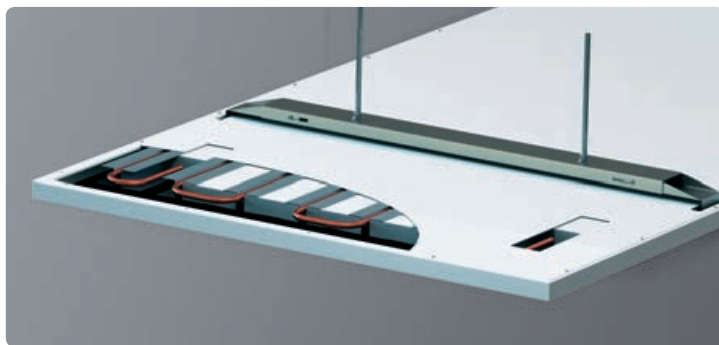
### Structure

A VARICOOL velum canopy consists of an enclosed metal cassette in which a heating/cooling coil is integrated along with additional sound absorbing material. The canopy surfaces are made of powder-coated aluminium or galvanized sheet steel. The special heating/cooling coil made of dual heat conducting profiles with copper serpentine pipework is form-fit and friction-locked to the double-sided sheet metal covering of the ceiling canopy. The innovative sandwich construction results in an extremely rigid structure. The installation height is only 30 mm.

The ceiling panels are available in sizes up to 2,500 mm in length and 1,300 mm in width.

The deflection of the canopy is well below the limits of the Technical Working Group on Industrial Metal Corner Manufacturers (TAIM).

The canopies are fixed to the concrete ceiling point by point with threaded rods.



Structure of a VARICOOL velum ceiling panel with mounting rail for suspension of the component using threaded rods (folding and three-dimensionally adjustable)

The surface of the ceiling canopy can be delivered in a smooth (sound reflecting) or perforated design (sound absorbing) with different hole-patterns, colours and gloss levels.

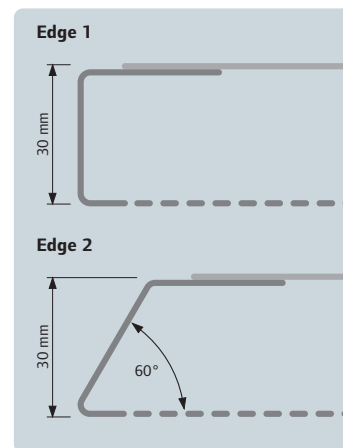
### Design at a glance:

- Ceiling canopies with double-sided sheet metal cover made of aluminium or sheet steel, surface perforated, powder-coated
- Integrated dual heat conducting profile
- Integrated copper serpentine pipework,  $d_a = 12 \text{ mm}$
- Integrated acoustic fleece and sound-absorbing insulation material
- Canopy length: max. 2.500 mm, one-piece; max. 5.000 mm, two-piece
- Canopy width: max. 1.300 mm, one-piece
- Canopy height: 30 mm

### Application

The velum VARICOOL canopies are delivered as ready-to-assemble

components and hung with specially designed mounting rails and threaded rods. The tapered mounting rails at an angle of  $15^\circ$  are hardly visible from the side. The mounting rails allow the folding down of the ceiling canopies at any time for inspection work. Flexible stainless steel braided hoses (DN 12 mm) are available as accessories and are used to carry out the hydraulic connection with the public grid.

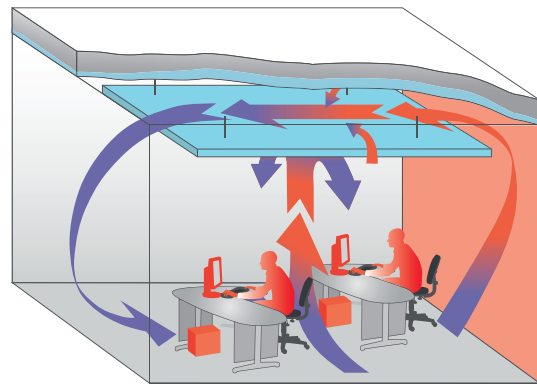


Edge variations

### Hybrid-ceiling system

The thermal storage capacity of the concrete ceiling is activated via the direct radiation exchange with the velum ceiling canopy. A so-called "cold storage" period can take place during the night time and then used to cool the room in a time delayed and automatic regulating mode of operation. This feature is particularly advantageous and utilises natural geothermal energy or free cooling during the night hours.

During the day, refrigerating machine power can be temporarily turned off to help prevent current peaks. The required cooling output may be spread over a longer service life. In laboratory tests at the Fraunhofer Institute for Solar Energy Systems ISE, energy savings of up to 30% could be proven.

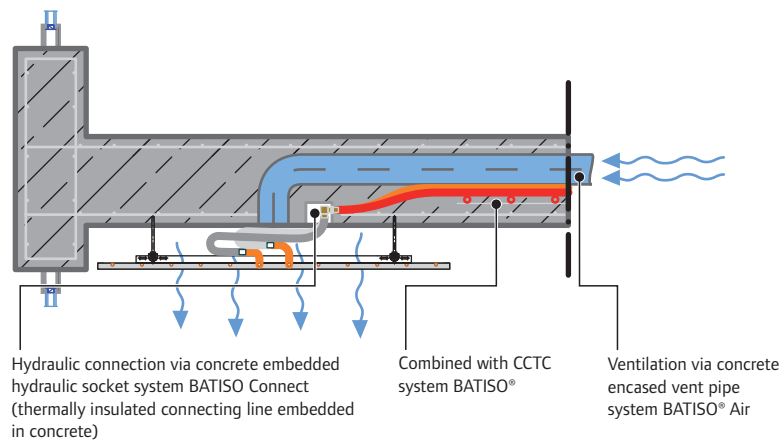


Operating principle of a hybrid cooling ceiling canopy with use of the thermal mass of the floor separating ceiling natural room air currents develop from internal heat sources and the warmth of the façade

### Application example

**VARICOOL Velum 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.



### VARICOOL Velum as supply air outlet

The VARICOOL velum ceiling canopy can be designed similar to that of a displacement diffuser. An optional air terminal box mounted on the top side or on the side of the canopy can be installed as a supply air connection. The supply air is guided through the

heat conducting profile. It flows through the ceiling canopy, through the perforated ceiling panel and down into the room virtually turbulence-free. For proper functioning and to ensure the air quality, the supply air must be conditioned and filtered in the central ventilation system.



VARICOOL velum heating and cooling canopies as a supply air outlet with top side ventilation box.

## Planning and dimensioning

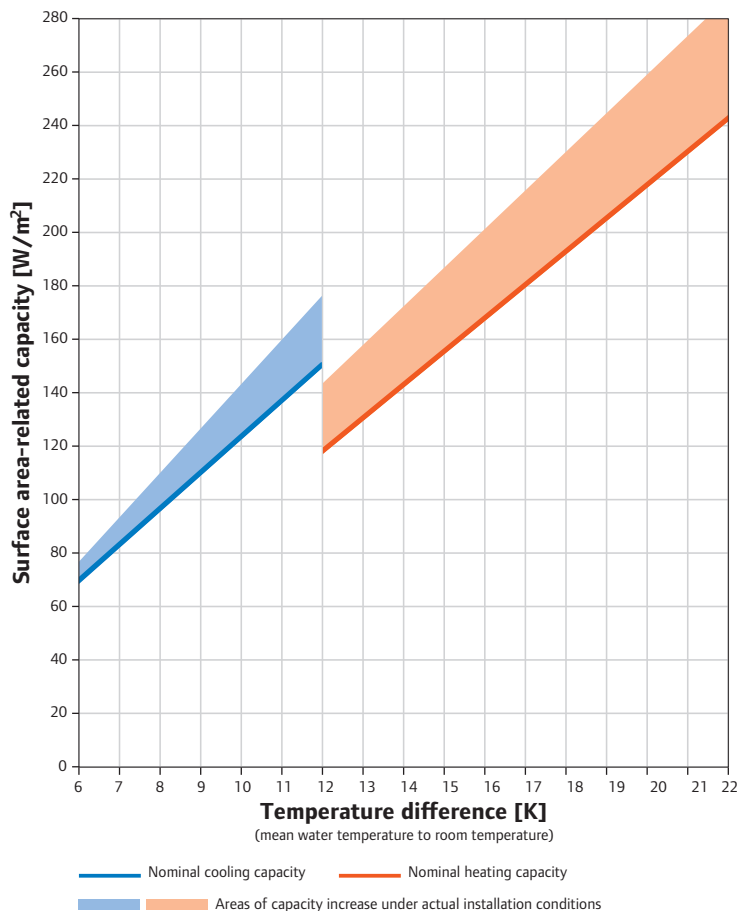
### Cooling/heating capacity

With the double-sided heat transfer surfaces the VARICOOL Velum ceiling canopy attains a high surface area-related heating and cooling capacity. The top side of the canopy is thermally active due to the integrated sound absorber. The heat exchange takes place between the reflecting surface of the canopy and the concrete slab it faces.

The cooling and heating values under standard conditions or realistic installation conditions can be taken from diagram 1. The capacity is read as a function of the temperature difference between the mean water temperature and the room temperature.

Compared to the measuring conditions specified in the standard, a higher level of performance is usually achieved under realistic installation conditions since higher temperatures normally exist between the radiating surfaces and the convective impact - from asymmetric heat loads or - the effects of ventilation in the room.

**Diagram 1: Heating/cooling capacity of the ceiling canopy system VARICOOL velum, tested according to EN 14240 and EN 14037**



### Acoustics

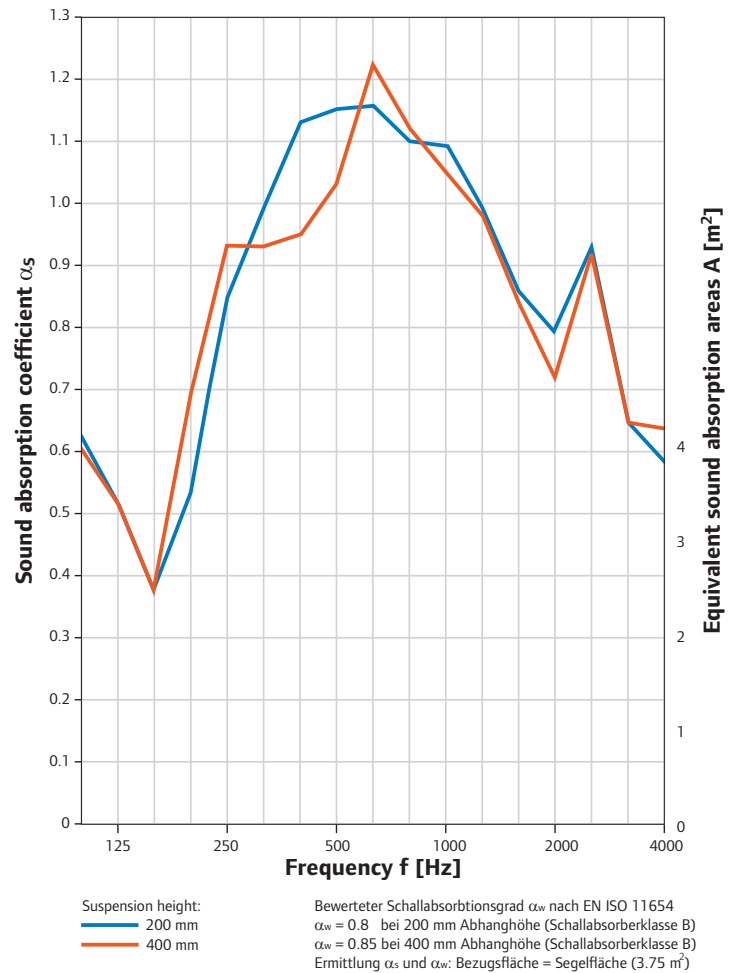
The integrated acoustic fleece and the sound absorbing insulation filling provide very effective sound absorption and excellent room acoustics. Due to the sound absorbing elements integrated in the ceiling canopy the cooling capacity remains high.

The sound absorption values for the suspension heights of 200 mm and 400 mm are indicated as equivalent sound absorption areas in diagram 2. The sound absorption coefficient  $\alpha_s$  was calculated from the equivalent sound absorption area and the canopy surface. The weighted sound absorption coefficient  $\alpha_w$  was calculated according to EN ISO 11654.

### Lighting

The ceiling canopy is compatible with various lighting concepts, such as mirrors with integrated specular louver luminaire or pendant lighting fixtures. Indirect lighting via the reflective surface of the ceiling canopy makes glare-free illumination of the room possible.

**Diagram 2: Sound absorption of the ceiling canopy system VARICOOL velum with acoustic fleece and insulating material tested according to EN ISO 354**





## Technical features

VARICOOL Velum	
Cover plates	Aluminium or steel sheet
Standard-surface	RAL 9010, other RAL colours and degrees of gloss available on request
Standard perforation	<ul style="list-style-type: none"> <li>– Hole diameter 1,5 mm or 1,6 mm, diagonal rows, open area 20–22 %</li> <li>– Hole diameter 2,5 mm, straight rows, open area 16 %</li> <li>– Additional perforations available on request</li> </ul>
Edge formation	<ul style="list-style-type: none"> <li>– 90° or 60° edge formation (45° on request)</li> <li>– Holeless edge on the bottom side and circumference of the canopy</li> <li>– Board edge completely perforated</li> </ul> (only recommended for 1.5 or 1.6 mm perforations)
Dimensions	Length      min. 1,500 mm      to max. 2,500 mm Width        min. 600 mm        to max. 1,300 mm Element height 30 mm
Copper serpentine pipework	Outer diameter $d_a = 12$ mm
Surface weight	Aluminium sheet design      approx. 17 kg/m <sup>2</sup> (operating weight) Sheet steel design              approx. 23 kg/m <sup>2</sup> (operating weight)
Cooling capacity	According to EN 14240 at $\Delta\theta = 8$ K      97 W/m <sup>2</sup> with asymmetric load distribution at $\Delta\theta = 8$ K      112 W/m <sup>2</sup> (common case)
Heat output	According to EN 14037 at $\Delta\theta = 15$ K      156 W/m <sup>2</sup> with ventilation control at $\Delta\theta = 15$ K      187 W/m <sup>2</sup> (movement of air from ceiling to floor)
Acoustics	Weighted sound absorption coefficient $\alpha_w$ according to EN ISO 11654 (calculation $\alpha_s$ and $\alpha_w$ : Reference area = canopy surface) $\alpha_w = 0,8$ at 200 mm suspension height (sound absorption class B) $\alpha_w = 0,85$ at 400 mm suspension height (sound absorption class B) (with acoustic fleece and sound-absorbing insulation material)
Fire performance	Fire material class A2 - s1 d0 according to EN 13501-1 (with acoustic fleece) Fire material class B1 according to DIN 4102 (with acoustic fleece and insulating material)
Recommended medium temperature	Cooling water temperature: 16 °C Heating water temperature: 35 to 40 °C
Operating conditions	Threshold temperature heating mode max. +50 °C Condensation must be prevented
Recommended drop in pressure	Max. 25 kPa per water circuit
Suspension	Specially designed mounting rail with threaded rod suspension
Suspension height (recommended)	Min. of 90 mm (distance between the concrete slab and the underside of the element)
Recesses	For recessed lighting or the installation of sprinkler lines or fire detectors etc., at the factory

# Notes

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

## Building temperature control

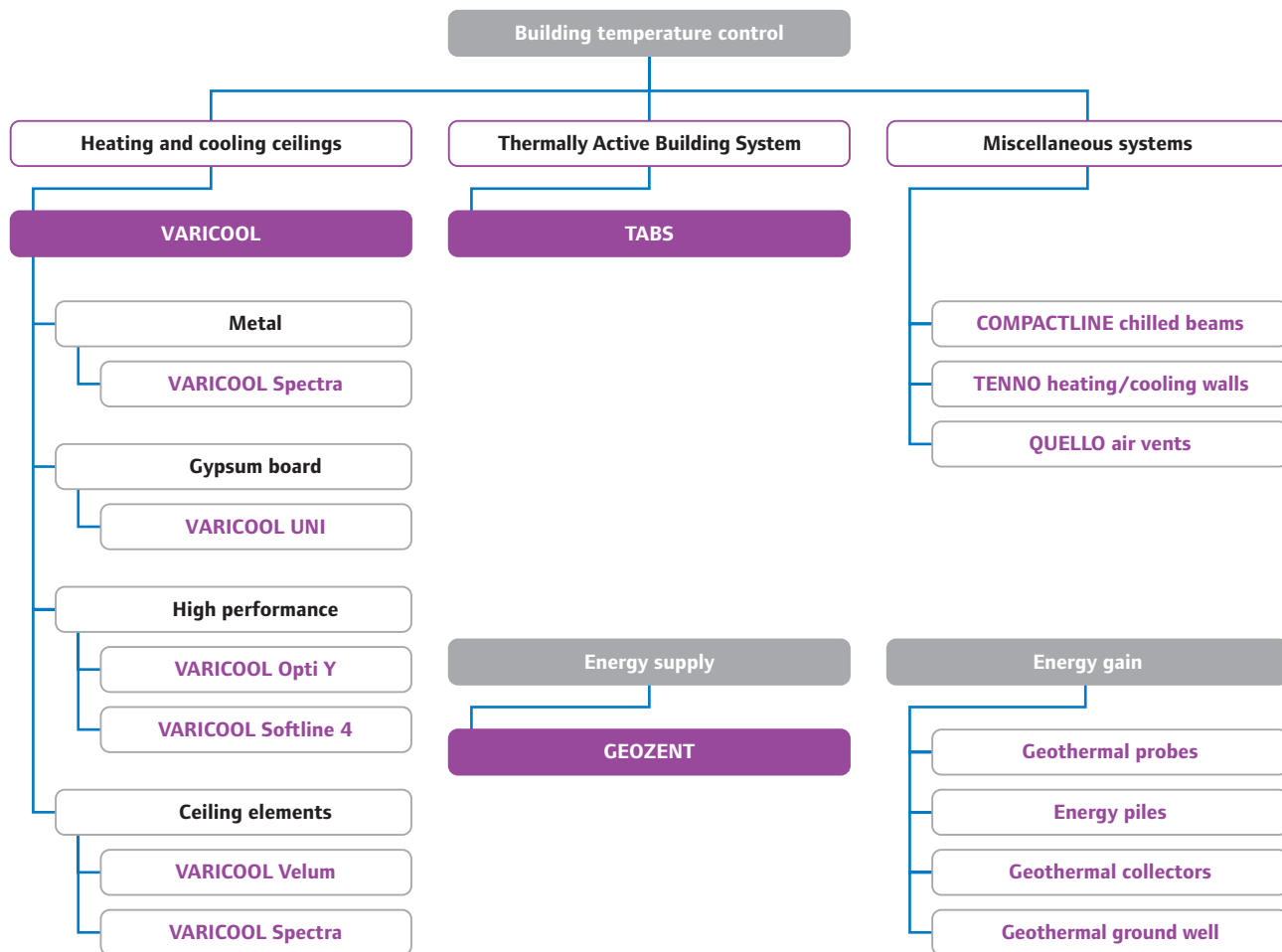
Uponor surface systems, such as heating and cooling ceilings and concrete core temperature control are established technologies for regulating room temperature and have been a market leader for more than 50 years. The numerous technical developments have made us a pioneer in the field of advanced building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

## Energy supply

For commercial buildings, we have 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 properties with thermal energy, Uponor 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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