

## Hybrid Ceiling Module

U44<sup>Hybrid</sup> | U45<sup>Hybrid</sup> | U46<sup>Hybrid</sup>





# The Hybrid Ceiling Module U44<sup>Hybrid</sup>

## Introduction

The Hybrid Ceiling Module U44<sup>Hybrid</sup> simply combines the systemic functions required in an office to ensure thermal and acoustical comfort. Depending on the hydraulic connection to the cooling/heating water network and the free choice of control strategy, the effect of the Hybrid Ceiling Module U44<sup>Hybrid</sup> reaches from a self-regulating thermo active component system to a powerful «Cooling Ceiling System» with high radiation area. It is equally suitable for rooms with higher thermal loads.

The consistent implementation of a thermo active component system and a high specific output results in energy savings albeit high media temperatures during cooling mode and allows the use of alternative energy sources (cooling tower, geothermal energy, seawater etc.).

## Use

The Hybrid Ceiling Module U44<sup>Hybrid</sup> provides thermal and acoustical comfort in offices with low level (e.g. technical offices) and high level technologies (e.g. trader offices). Further implementations are recommended in rooms with a visible concrete ceiling such as shops, schools or assembly rooms.

## What does thermo active mean?

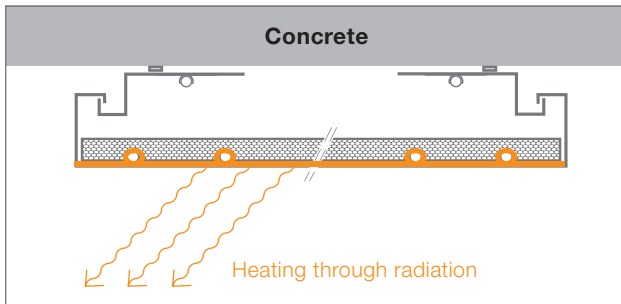
Thermo active means integrating the building mass into the energy management of a building. From a thermal perspective, therefore, the building shows a dynamic pattern. It infers that thermal loads are removed in- and outside operating hours, whereas the entire heat has to be dispersed during operating hours when in static mode. Therefore, thermal loads are dispersed during both, day and night cycles, while the system is in its dynamic mode. Generated heat will be partially removed throughout the day, while the other part is stored within the concrete ceiling. At night the stored heat is completely dispersed, thus restoring the full concrete storage capacity for optimal heat absorption on the following day.

# System functions of the Hybrid Ceiling Module U44<sup>Hybrid</sup> at a glance

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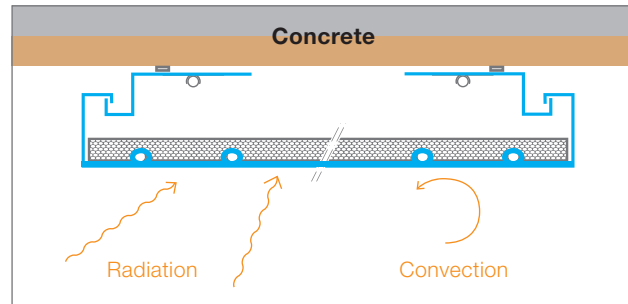
## No. 1: Heating

The fast reacting radiation surface is optimally positioned towards the room and provides thermal comfort even at low water temperatures. It generally obviates the need for static radiators in window areas ( $U\text{-value} < 1.2 \text{ W/m}^2 \text{ K}$ ).



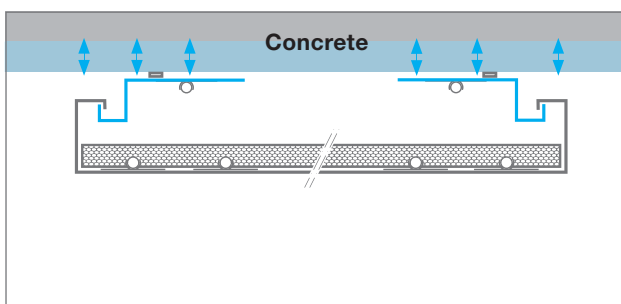
## No. 3: Cooling

Ceiling modules are equipped with a built-in cooling water system that balances the temperature in the comfort zone if the thermal load should exceed the absorption capacity of the active concrete ceiling. High thermal loads can be handled by the use of this additional cooling function.



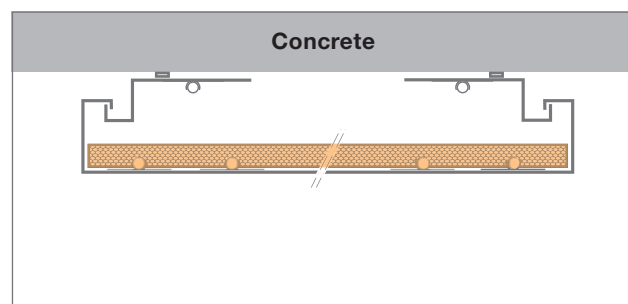
## No. 2: Thermo active concrete ceiling

Energy efficient cooling during the night supported by cooling water (free cooling). It thermally conditions the ceiling so that thermal loads are dispersed during the day due basis of thermo active component system.



## No. 4: Sound absorption

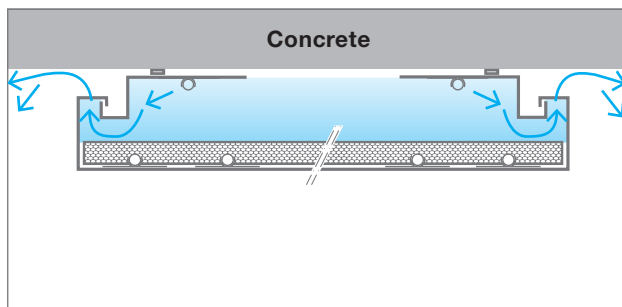
The design of a large-scale horizontal layout of sound absorbing elements causes the correct reverberation period for offices.





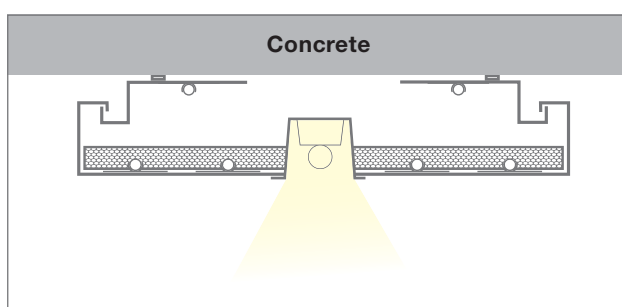
#### No. 5: Air Intake U45<sup>Hybrid</sup>

The Hybrid Ceiling Module can be combined with any office ventilating system. The additional function No. 5 integrates the air mix function in a quite sophisticated way for aesthetic and thermal comfort. The design for downstream fresh air supply into the room provides an absolutely draught-free environment (within SIA parameters, i.e. Swiss Society of Engineers and Architects). High ventilation efficiency is guaranteed at all times.



#### No. 6: Lighting U46<sup>Hybrid</sup>

Upon request, direct or indirect lighting can be integrated into the system. The range of different lighting systems can be viewed at any time.

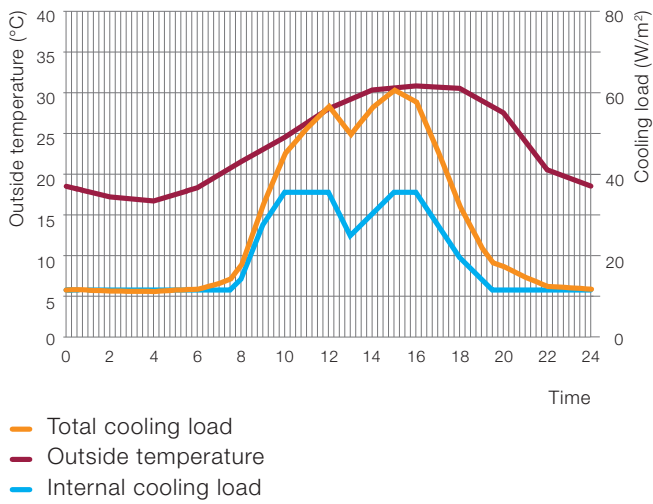


# Performance characteristics of the Hybrid Ceiling Module U44<sup>Hybrid</sup>

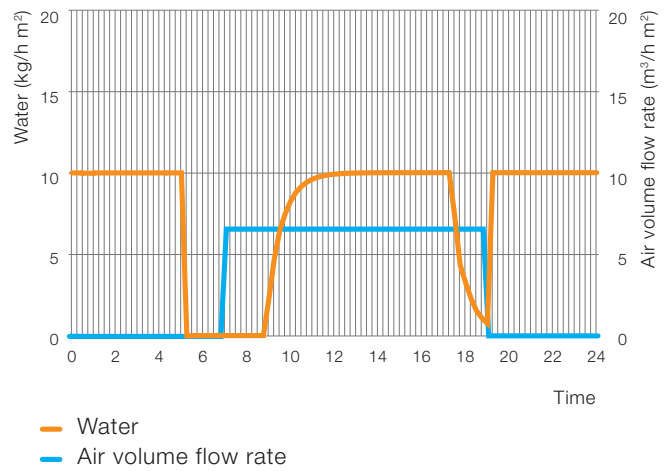
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## Example of a dynamic simulation

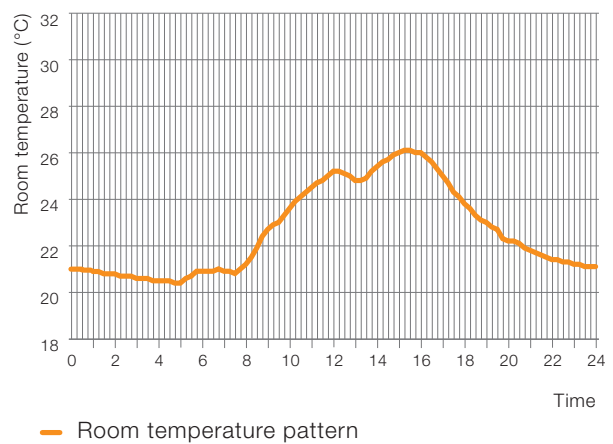
### Cooling load – outside temperature pattern



### Amount of water – air volume flow rate



### Room temperature pattern



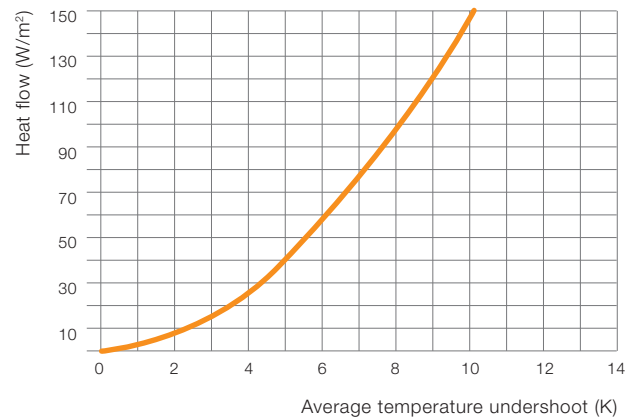


### Installation Layout

The layout of the Hybrid Ceiling Module U44<sup>Hybrid</sup> is, on the one hand a static design and for the other aided by dynamic thermal simulations. This for the purpose of evaluating the 24-hour temperature pattern relative to corresponding parameters. The simulation is under virtual conditions in such a way that initial and end values of the 24-hours cycle are identical. Such simulations provide data about thermal patterns and how they develop over a longer yet equal period. One can then determine the necessary installation layout with adequate certainty because supplied and extracted warm air volumes are congruent and prevent upswings in room temperature.

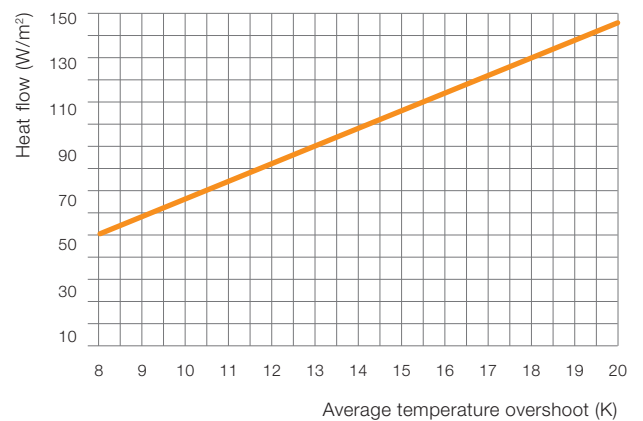


### Static cooling capacity U44



— Static cooling capacity

### Static heating capacity U44



— Static heating capacity

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