



Kranz

Cooling ceiling technology

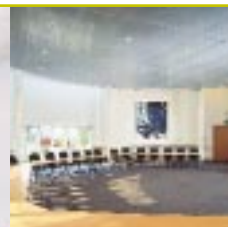


Page 4-5

Individuality is a hallmark of our society today on the threshold to the next millennium.

Individuality is what has character, stands out, is distinctive and has a clear shape.

For many it is a purpose in life, but for everyone it is an established part of a free society.



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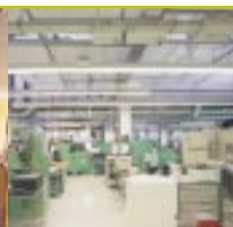


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Room for creativity

For KRANTZ KOMPONENTEN individuality also means being able to choose the best design. The freedom to put one's own ideas and vision into practice without having to deal with the many technical details often involved. For about 10 years now, we have been one of the leading manufacturers of innovative cooling ceiling systems and for more than 30 years we have specialized in air distribution in the commercial and industrial sectors. We have an international reputation for fitting our systems to architectural requirements.

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For us, meeting the highest quality requirements (certification to DIN ISO 9001) and finding the best all-round solutions is part of our job.

Read this brochure and find out for yourself.

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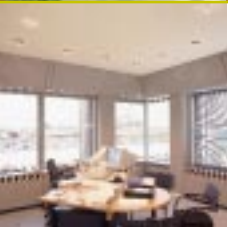
Architecture



Efficiency

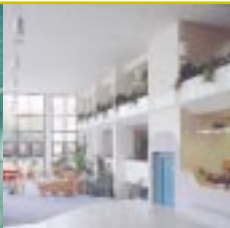


Practice



Planning

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Statement

Technical information



"I want to stress certain structural features and so I need a highly adaptable and technically flawless system."

For us, your design requirements are

You are free to plan the architecture of ceilings for various types of room as you see fit. Usually, your design needs can be combined extremely well with the functional requirements of a cooling ceiling.



Business consultants, Wiesbaden

Special ceiling panel with rib mesh frieze, combinable with SKS and KKS cooling elements

This is possible thanks to our complete and developing programme of assorted cooling ceiling systems. With the requisite system options, KRANTZ KOMPONENTEN can provide the answer for every ceiling in every room.

This is the way we can put individual, unconventional and visually interesting ideas into practice.



Baffle ceiling (wood) combined with SKS-4 elements for cooling and heating

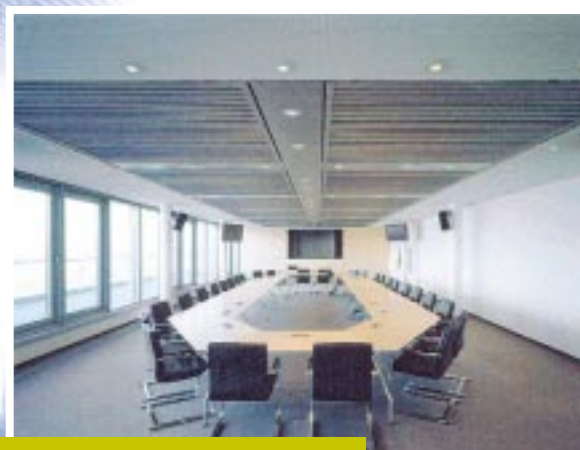


Museum Het Valkhof, Nijmegen / NL

the measure of all things



SKS-5 cooling ceiling elements equilevel with perforated gypsum plasterboard ceiling and metal square tiles



DB Cargo, Mainz, meeting room

Choose between open and closed ceilings, metal or dry construction ceiling types or create a chilled sail – in any shape you want. Tell us what individual design you are thinking of! You couldn't have more choice as a designer.

Talk to us. Ideally in the planning stage.
Catchword:
Simultaneous Engineering.



ZDF, Mainz



Rectangular metal tiles, perforated, combinable with SKS and KKS cooling elements



HNF Heinz Nixdorf Museums
Forum GmbH, Paderborn



SKS cooling elements
visibly built into the ceiling

Cooling cei

Let's start with the basics: As of a specific cooling load of 40 to 50 W/m² the actual investment costs for a cooling ceiling system combined with an air-conditioning system for minimum outside air flow are lower than with an 'air-only system'. In addition, there are also a number of business advantages:

Thanks to lower storey heights, smaller shafts and central stations, the building volume is smaller. Using our cooling ceiling systems can make for considerable savings in operating costs. The separation of 'cooling' and 'ventilation' enables a more adaptable chilled water supply better suited to the building and its use. Integrating 'free' cooling for example reduces the operating hours of the refrigeration machines. Our cooling ceiling systems can be adjusted to changes in room use. This is an economical feature for all users and investors, particularly with rental space.



AUDI Forum Ingolstadt, museummobile



Rectangular metal tiles (40 % open perforations), combinable with DK-F chilled beams or SKS cooling elements

lings are a



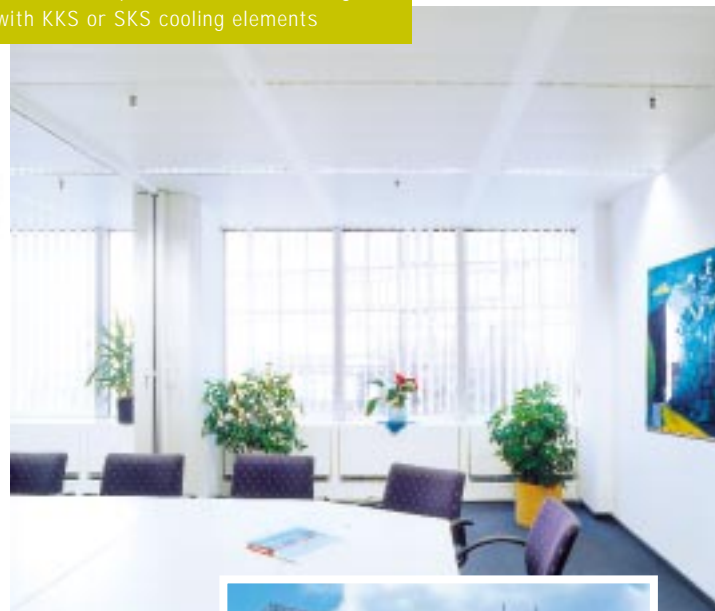
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When it comes to maintenance KRANTZ cooling ceiling systems also pay – they are absolutely maintenance-free. This means that you can reckon with about 50% cost savings as compared with conventional air-conditioning systems. When refurbishing buildings, installing a cooling ceiling system is often the best option for maximizing space use with up-to-date comfort.

"An investment that pays in every respect - when it comes to cost-benefit there is no better alternative."

Rectangular metal tiles (perforated) with linear grids, combinable with KKS or SKS cooling elements

paying proposition



»Eurohaus« office building, Frankfurt / Main

Minimum outside air flow (to DIN 1946 Part 2)			
Room type	Examples	Outside air flow	
		Persons m ³ /h	Surface area m ² /(m ² *h)
Work rooms	Single office Open plan office	40	4
		60	6
Assembly rooms	Concert hall, theatre, conf. room	20	10 to 20
Teaching rooms	Reading room, classroom and seminar room, lecture hall	20	12
		30	15
Public rooms	Sales room restaurant	20	3 to 12
		30	8

Reference values for air exchange in window ventilation	
	Per hour
Windows, doors closed	0 to 0,5
Windows tilted	0,3 to 1,5
Windows half open	5 to 10
Windows fully open	10 to 15
Windows, doors open opposite	to 40



Showroom of Bugatti International S.A.,
Domaine St. Jean, Dorlisheim

Rectangular metal tiles (perforated) in the shape of a semicircular vault, combinable with KKS or SKS cooling elements

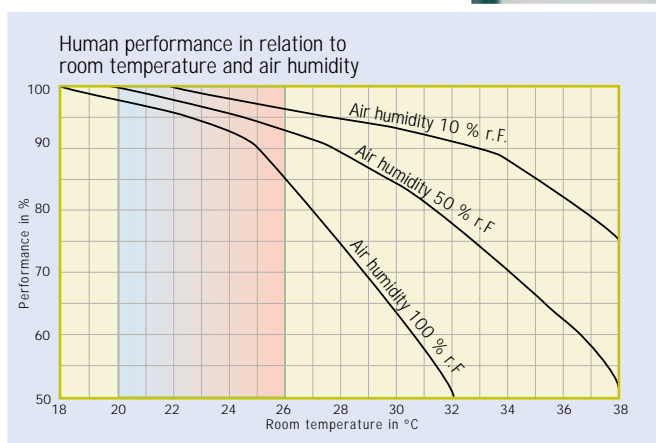
The same applies for booking and cashier halls as for offices, congress halls, teaching rooms, etc.: Room temperature and air humidity have a large effect on people's well-being and efficiency. So it is essential to supply enough fresh air and remove heat, pollutants and humidity at the same time.

Allround HVAC solutions from KRANTZ KOMPONENTEN with air outlets and cooling ceiling systems as high-end components from our company provide the best answer to meet every requirement.

Central Brandenburg Savings Bank
– Rathenow branch



Grid ceiling with gypsum plasterboard frieze,
combinable with SKS cooling elements



Feeling comfortable



Special open ceiling (pyramidal wooden bars) combined with SKS cooling elements

Axel Springer Arcade, Hamburg

le even in busy rooms



"Clients and employees praise the good 'climate'. Incidentally, we also recorded a distinct fall in absenteeism due to sickness."





"The outlines of the room design are clear - now let's talk about the best air-conditioning options."



Talk to us while you des



SKS cooling elements visibly built into ceiling



Gypsum plasterboard ceiling, perforated Knauf thermal panel with non-woven fabric and Scherf acoustic plaster, combinable with KKS cooling elements

Kreditanstalt für Wiederaufbau, Behrenstrasse 34, Berlin

ign. Start early.



Early consultation amongst architects, planning engineers and the engineering experts from KRANTZ KOMPONENTEN is the best way to make sure you get a cooling ceiling system that is visually attractive, economical and technically top rate.

We also call it 'simultaneous engineering'. Because in this early important stage, we can find timely alternative solutions and apply these to arrive at the best interior design.

»Pariser Atelier, Boutique Theatinerstrasse GmbH«, Munich



Square metal tiles (perforated) combinable with SKS or KKS cooling elements



Aachen Savings Bank, headoffice Münsterplatz

Rib mesh ceiling,
combinable with SKS cooling elements

Rely on us

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ORB East German Radio Brandenburg,
Potsdam Babelsberg



SKS cooling elements built
visibly into ceiling

to take care

Cooling ceiling and air distribution systems as integral components of allround HVAC solutions in a variety of designs calls for know-how and innovative competence. This is why KRANTZ KOMPONENTEN has been an efficient and reliable partner in this area for more than 30 years.

Thanks to our experience and top qualification, precise knowledge of the practical tasks and problems, the innovations from our own research and development as well as the feedback from our many clients, users and our plant construction department we have the competence to help you design your cooling ceiling system.



Metal lengthwise ceiling with acoustic coating (micropore)

ADK headoffice, Bergisch Gladbach



SKS-5 cooling ceiling elements, equilevel with a metal acoustic ceiling

Korschenbroich Savings Bank, extension headoffice, Hindenburgstr. 23

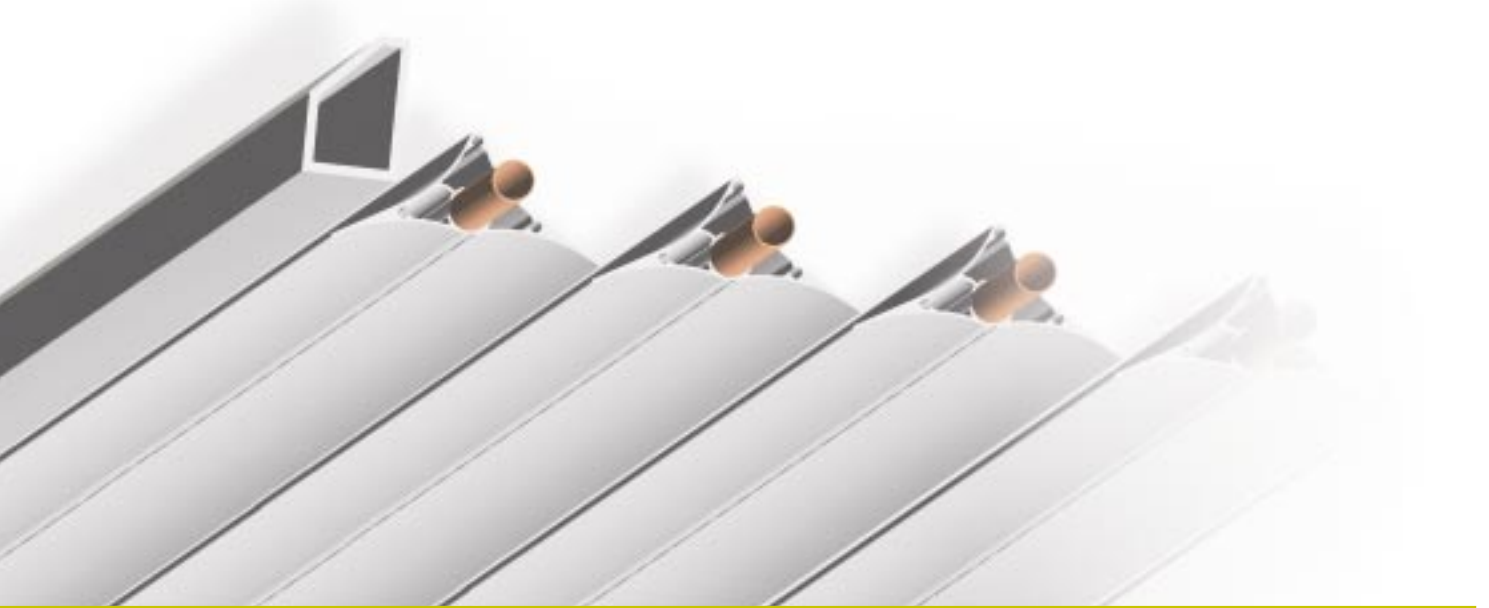
of everything

And we also cater for your project as a whole, so rely on us to take care of everything.



SKS cooling elements built visibly into ceiling

ORB, Studio A, Potsdam-Babelsberg



How does a cooling ceiling system work and what is its job?

Cooling ceiling technology made easy(ier)

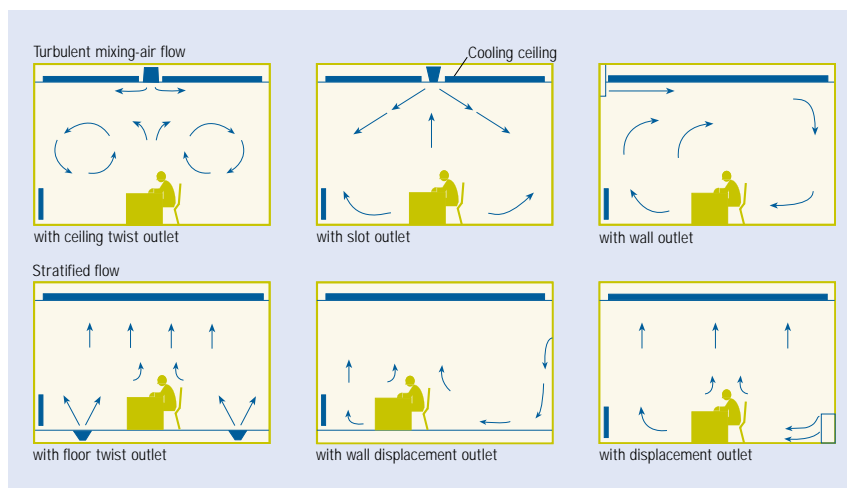
Since the early nineties, cooling ceilings have proved to be useful alternatives for building air conditioning in several parts of Europe. They make a major contribution to ensuring the well-being and efficiency of personnel the whole year round, also in the fast-changing world of office work.

For over 30 years, KRANTZ KOMPONENTEN has been a dedicated, innovative problem-solver in allround HVAC. In the following pages, you can find information on how to design modern allround HVAC solutions faster and easier, incorporating all kinds of cooling ceiling options.

The way cooling ceilings work is to cool the visible ceiling surface. To do this, KRANTZ KOMPONENTEN uses special cooling ceiling elements with chilled water flow tailored to the ceiling features and the requisite capacity.

Via radiation and natural convection (air flow due solely to density differentials), the chilled ceiling surfaces absorb heat from people, objects and other room surfaces as well as indoor air, which is then removed by means of water.

The cooling ceiling removes heat only. It does not affect indoor air quality. To meet the hygienic need for outside air supply, remove pollutants (CO₂, tobacco smoke, etc.) and control air humidity, mechanical ventilation with HVAC is the most suitable method. Another alternative is natural ventilation through windows or similar openings.



Conventional 'air-only air-conditioning systems' are usually scaled to the requisite cooling capacity. This is why they need larger air volume flow rates than required for minimum outside air supply for hygienic purposes. So they call for larger technical plant and if improperly executed are prone to cause noise and – as a result of low supply air temperatures – draughts.

Effects of ceiling design

Of course, your decision for a certain ceiling, e.g. a suspended metal ceiling or a gypsum plasterboard ceiling, also has implications for the major features of the cooling ceiling. These are for example specific cooling capacity, construction sequence and time, etc. Inform yourself about the qualitative effects.

Please proceed as follows:

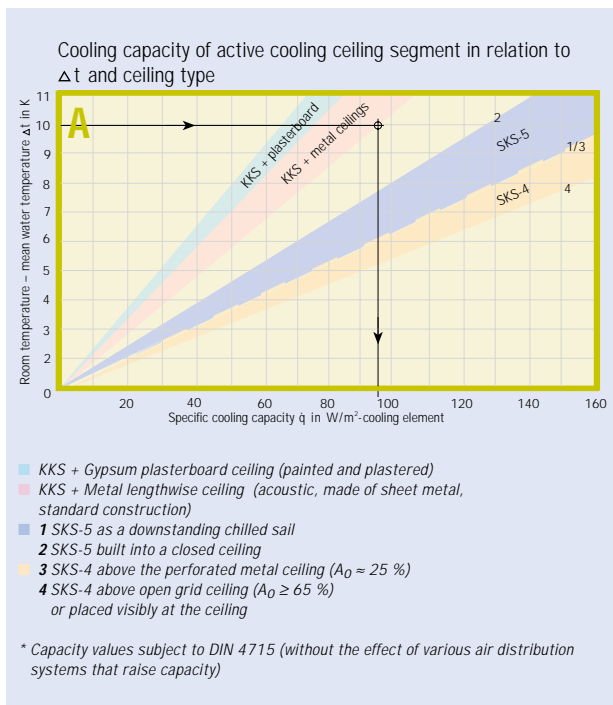
Step 1: Accounting for the room ground plan, the ceiling plan with the requisite fittings (lights, air outlets and so on), locally reduced suspension heights (girders and the like), determine the anticipated segment β (1) of the overall ceiling surface occupied by the cooling ceiling elements.

(1): Occupied segment β of cooling ceiling = active cooling ceiling area as a percentage of the whole ceiling surface area (more than 75 % is rarely feasible)

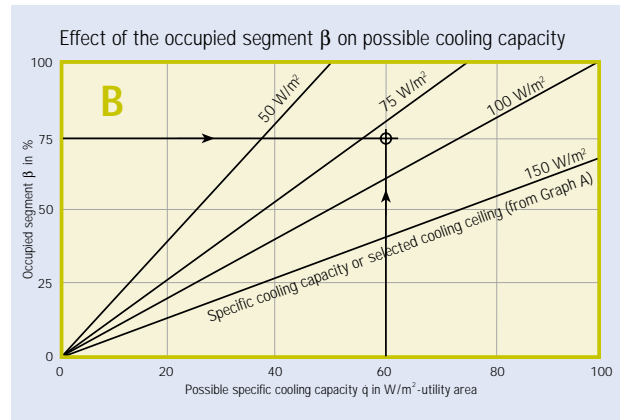
Step 2: From Graph A take the reference value for the specific cooling capacity of the ceiling of your choice. As a rule, the parameters are as follows:

- Room temperature ≤ 26 °C
- Mean chilled water temperature ≥ 17 °C ... 18 °C
- (with chilled water flow temperature ≥ 16 °C and
- chilled water temperature difference = 2 ... 4 K)

Most frequently, the difference between room temperature and mean water temperature amounts to $\Delta t = 8 \dots 9$ K



Step 3: Using Graph B, check whether the cooling load (estimated values to the VDI guideline or calculated by means of building simulation) can be removed with the selected type of ceiling and the feasible occupied segment.



Effects of building air conditioning on cooling ceiling capacity requirements

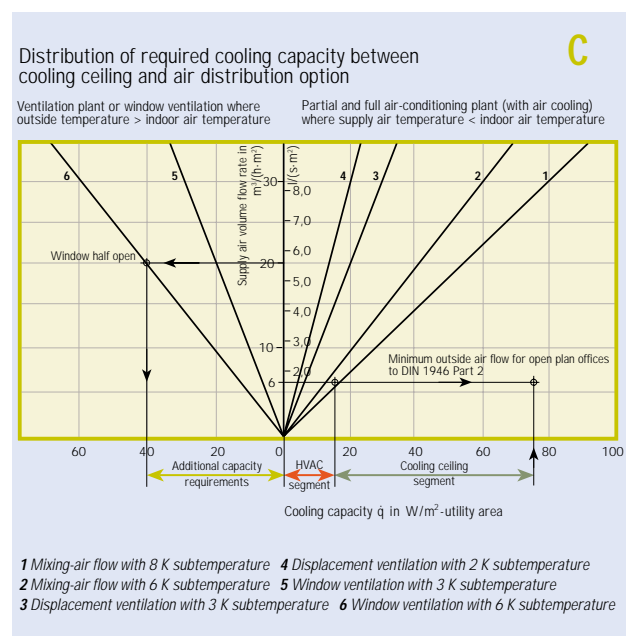
In a similar way your design affects building air conditioning,

- cooling ceiling + controlled ventilation by means of HVAC plant or
- cooling ceiling + natural ventilation through windows or similar openings,

as well as the type of air distribution and the supply air volume flow rate not only the well-being and efficiency of personnel, but also possible total cooling capacity.

Assess your plan as follows:

From Graph C you can read off the cooling capacity in correlation with ventilation type and supply air volume flow rate. Caution: With window ventilation and outside temperature > room temperature the cooling ceiling must provide additional cooling capacity. Read off the requisite proportionate cooling capacity of the cooling ceiling as a segment (see readoff example). This cooling capacity must be provided by the chosen cooling ceiling type with the estimated size of occupied segment. At high cooling loads therefore a form of turbulent mixing air flow is advantageous.



Effect of outside air on controlling and preventing condensation

If untreated outside air can enter the room or if there are considerable sources of humidity, measures must be taken to prevent condensation at the cooling ceiling (see also Graph D).

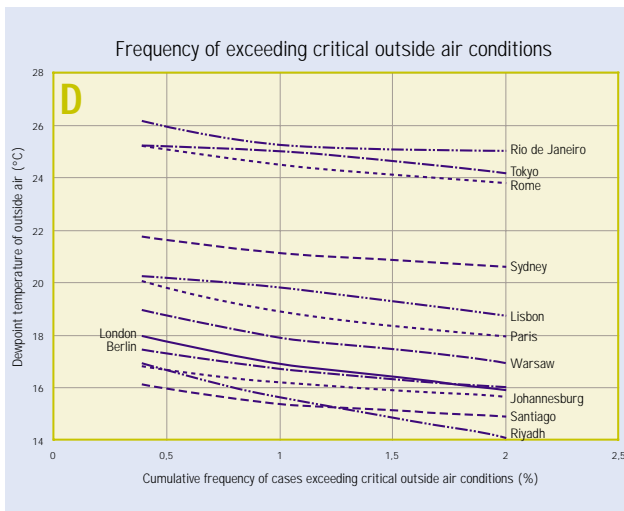
The best method here is to alter the chilled water flow temperature, e.g. in response to outside air humidity. When there is a danger of condensation the flow temperature is raised (room temperature rises as cooling capacity declines).

Alternatively the chilled water supply can be completely shut off (room temperature will rise more rapidly as the cooling function is no longer active).

The building air conditioning design and the kind of cooling ceiling control can therefore impair comfort and the client and user should be informed and advised about this early on.

Cooling ceiling types with high specific cooling capacity, such as all the SKS types from KRANTZ KOMPONENTEN, allow for operation with higher flow temperatures from the outset.

This reduces the danger of condensation, simplifies control and enables longer operating times with environment-friendly and economical free cooling.



In general, cooling ceilings can also be used for **heating** – an interesting option in view of the possible savings in static heating. To ensure thermal comfort in this situation, however, the following factors must be carefully checked:

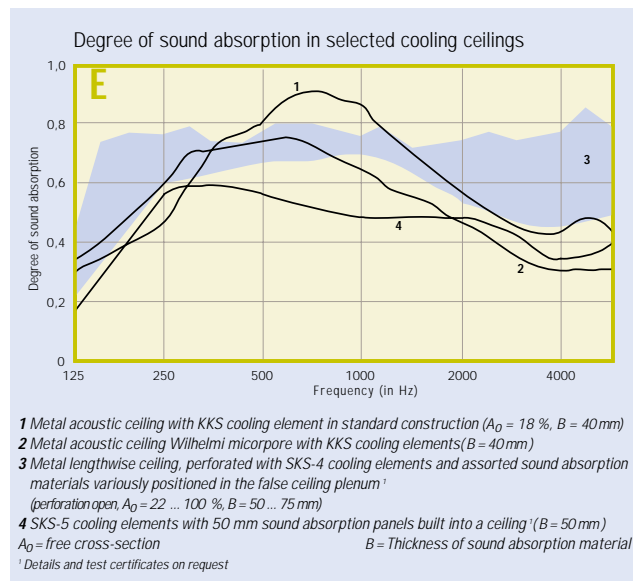
- vertical thermal stratification
- radiation temperature asymmetry
- local radiation temperature
- cold air drop at the outer facade

Talking to an expert about this is worthwhile in every respect!

Often, active cooling ceiling areas must also help with **sound absorption** or they must be combinable with sound-absorbant elements. All cooling ceilings from KRANTZ KOMPONENTEN are designed for this. Graph E shows some possibilities and the attainable sound absorption coefficients.

The **colour scheme options** are (almost) limitless. Due to the proportionate heat transfer via radiation the degree of emission ϵ of the surface influences the capacity of the cooling ceiling, in some cases considerably. Almost all RAL colours can be used in powder coating with $\epsilon = 0.9$; normal aluminium surfaces, however, have values of $0.1 \leq \epsilon \leq 0.2$. With aluminium or special surfaces, therefore, it is advisable to contact the cooling ceiling expert at an early stage.

All cooling elements from KRANTZ KOMPONENTEN are available in all kinds of **dimensions**, different **shapes**, with cutouts for all sorts of fittings (lighting, air outlets, sprinklers ...), frames and customized, functional fastening options. See our product information brochure for more details. This is available on request.



Chilled sails offer multifarious, and exclusive, design options combined with high functionality, optimum prefabrication and short installation times. With our SKS family, you can design the bar geometry as you wish. **Chilled beams** are also an option in the search for economical solutions. They can be very effective but you must bear the following in mind:

- Chilled beams only have a very low radiation quota. For the most part (90 – 95 %), they operate through convection.
- Their specific cooling capacity layout (W/m^2 visible surface) is usually considerably larger than for cooling ceilings ($= 400 \text{ W/m}^2$). This inevitably results in less comfortable conditions in the occupied zone.
- Chilled beams with built-in air supply, similar to induction units, can cause draughts and unpleasant noise.

Advantages of using a cooling ceiling system

Room ventilation is separate from room cooling. This reduces the supply air volume flow rate to the minimum outside air flow. At the same time, heat transmission via water requires far smaller mass flows and transport cross-sections than with air.

- The lower supply air volume flow rates can be discharged draught-free and noiselessly into the room.
- Smaller numbers and sizes of air outlets are required.
- The storey heights, the cross-section of rising shafts as well as the height and ground area of central stations can be reduced. This saves on building volume or makes additional utility space available.
- Altogether, this contributes to simpler technical installations and lower investment and operating costs.
- It is combinable with any air distribution system.

Use can be made of the building's natural retention capacity.

- The active cooling ceiling area or the maximum room temperature or operating time of the cooling ceiling can therefore be reduced.

The control engineering, also that of the HVAC plant for minimum outside air flow, can be simplified.

Thanks to their smaller space requirements, cooling ceilings are particularly suitable for building refurbishment.

They allow for a very flexible floor plan partitioning, retrofitting and also a possible post-installation increase in capacity.

Depending on the user, it is possible to determine the energy consumption of selected areas.

Heat removal via radiation and convection corresponds largely to natural conditions and is therefore felt to be particularly comfortable.

The thermal comfort produced by cooling ceilings has been proved to be very high. Dissatisfaction is far less than with conventional 'air-only air-conditioning systems'.

Due to the radiation quota of the active cooling ceiling area the room temperature feels 'cooler' than at the same indoor air temperature without a cooling ceiling. A higher air temperature may also be acceptable under certain conditions.

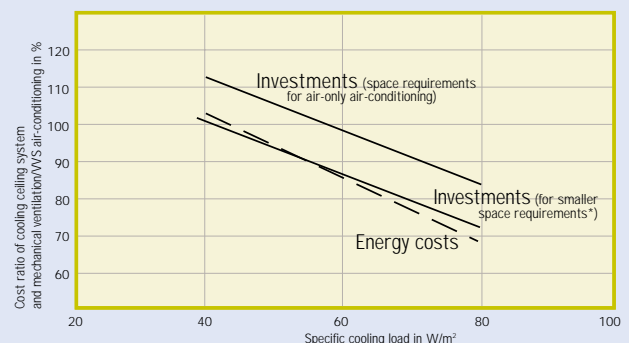
Cooling ceiling systems from KRANTZ-KOMPONENTEN

- meet all kinds of cooling capacity and design requirements
- comprise as basic elements all types of serpentine piping made of quality-controlled copper piping (from one pipe piece), different kinds of heat conducting profiles made of aluminium and are manufactured in firms certified to DIN ISO 9001
- contain no combustible components
- can be fully recycled
- are constructed for proper function and in compliance with construction regulations – so they are safe and easy to install

Even at flow temperatures raised to 18 °C, the SKS-5 high-power cooling elements can still provide a cooling capacity of over 100 W/m² (up to 110 W/m² at $\Delta t = 7$ K). This considerably reduces condensation risk.

The SKS-4 high-power cooling elements are also suitable for very high cooling loads, as occur in television studios, technical rooms or in the industrial sector. Planning and installation of this type is largely independent of a suspended false ceiling.

Model cost ratio of cooling ceiling system / VVS air-conditioning system



* Space requirements for central station, shafts and suspended ceiling

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