SCHAKO
KLIMA-LUFT

Ceiling Cooling System

Alpety

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Ceiling Cooling System Alpety

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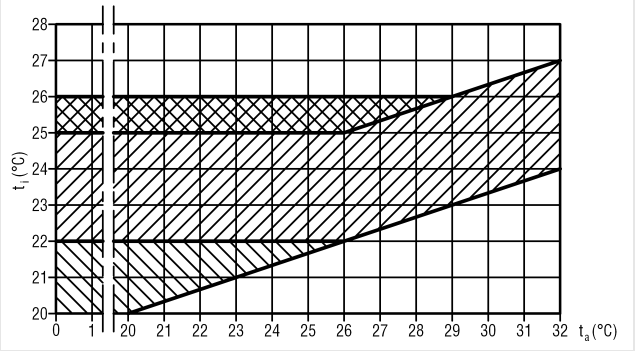
Description

Knowledge of the direct correlation between human productivity and ambient conditions, for example room temperature and air humidity, leads to an increased use of technology for cooling, humidifying or dehumidifying.

According to DIN 1946 Part 2, at high outside temperatures in summer and short appearances of high thermal loads, an increase in the operative room temperature is allowed. Often the cooling load of rooms is not determined by outside but inside thermal loads. If these loads appear for short periods only, the operative room temperature is allowed to increase as long as it stays under the outside temperature of 29° C to 26° C.
With certain air-conditioning systems, operative room temperatures of 20 to 22° C are allowed.
According to the workplace guidelines, the max. room temperature should not exceed 26°C.



(°C) = Room inside temperature
(°C) = Outside temperature

Short-term admissible operative room temperature caused by thermal inside load

Range of recommended operative room temperature.

Admissible operative room temperature for certain air-conditioning systems (Ex.: displacement ventilation)

Cooling ceilings are water-bound radiation systems whose **advantages include silent cooling, the low energy transport costs and the high degree of satisfaction by having absolutely draught-free cooling, an even temperature distribution in the room and cool surface temperatures.** However, it must be taken into account that cooling ceiling systems must be supported by additional mechanical ventilation and in part by air-conditioning.
Cooling ceilings emit their cooling power to rooms by convection and radiation. The ambient air in the ceiling area cools down, and falls to the occupied area, due to its higher density. In contrast, the ambient air heated by heat sources located in the room will rise. This **gives rise to forced air circulation with very low flow velocities.** Furthermore, the cooling ceiling emits its cooling power to the surrounding surfaces in the area by radiation. As soon as the radiation reaches one of the surrounding surfaces, the radiant energy is absorbed by the surrounding surface, regardless of the room air temperature. This radiation is pleasant to people and leads to the ambient temperature being felt cooler than it actually is. This means that the surrounding surfaces are cooled by approx. 5 - 6°C by radiation from the cooling ceiling. Depending on the relation of the active cooling surface to the overall surface of the room (including floor, walls, windows, furniture, etc.) the temperature will be felt 1 – 2 degrees cooler than it actually is.
This effect has the advantage that the room must not be cooled as much, which again brings an energy saving with it.
Since the cooling power no longer has to be introduced into the room via fresh air when using cooling ceilings, the air volume can be reduced to the amount necessary for fresh air supply. Draughts and noise volumes from ventilation installations are greatly reduced. This increases the feeling of well-being of the people in that room.

The inside thermal loads are removed by using the Alpety ceiling cooling elements. This makes use of the energetic advantages provided by the medium water during the load removal.
In conjunction with the customer's own metal or acoustic ceiling plates, the cooling ceiling elements can be integrated in the room as a cooling ceiling awning or in combination with suspended ceiling systems. With a closed radiation cooling ceiling, the inside load is discharged as radiation to about 55% and as convection to about 45%.
Aluminium profiles are attached to the rear of the cooling ceiling elements into which the water-carrying copper pipes are pressed in the form of meandering pipes. A contact-ensuring mounting of the copper pipes and the ceiling elements is guaranteed and ensures an optimum transfer of the cooling power.
An exactly designed support system allows a quick and time-saving assembly. The desired maximum pressure loss of the water circuit affects the number of cooling ceiling elements to be included in the water circuit. The copper pipes have a diameter of 15 x 0.7 mm. The copper pipes are calibrated and therefore allow an absolutely tight mounting of the fittings. The fittings from SCHAKO can be mounted with the need for tools. The fittings have been attached to the pipes ex works and are provided with plugs, in order to prevent dirt from entering the pipes. During assembly, the plugs must be removed. As a standard feature, the water connections have been designed horizontally, but can be designed vertically upon customer request (at an extra charge). The individual cooling ceiling elements are usually joined to one another by flexible tubes with stainless steel jacket (on-site). Quick-acting couplings allow the connections to be established in a simple and thus cost-saving way (on-site).
Rigid piping by soft soldering is also possible (on-site).

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The overall system is checked for tightness on-site. The maximum test pressure is 10 bar. This check is carried out by the pressure-drop method.
As with all cooling ceilings, the cold water supply temperature must be selected such that it will not drop below the dew point.

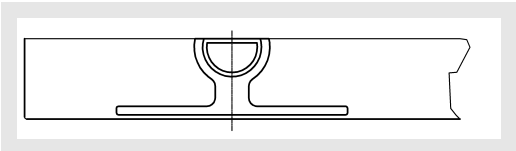
A combination with twist or slot diffusers as well as lights is possible.

Attention:
The Alpety cooling ceiling elements must be designed and installed in such a way that a condensate-free operation is guaranteed.

Upon request, the ceiling panels to be activated can be provided. If ceiling panels are provided for activation, they must comply with the specifications of the Technical Association of Industrial Metal Ceiling Manufacturers (TAIM).

Structure

The cooling ceiling elements consist of a front cover made of sheet steel or aluminium painted to RAL 9010 (white) with backfitted extruded aluminium profiles and meander-shaped pressed-in copper pipe. The combination of materials of high conductivity guarantees an excellent transmission of the high cooling power.



Perforation and acoustics
The front covers can be supplied with or without perforation. The standard perforation can be seen in the table below. The whole top surface can be furnished with an acoustic fleece. To achieve the requested room sound absorption, mineral fiber mats welded into PE film can be inserted over the cooling ceiling elements.

Perforation

	Standard perforation	Free cross-section
Alpety-SKS	2,5	16%

Other perforations and free cross-sections upon request

Surface
The visible surface areas are powder-coated to RAL colour 9010 (white). Other RAL coulours are available at an extra charge.

Assembly and water connections
The cooling ceiling elements are supplied in single parts. All single elements are assembled to a cooling ceiling on site. The type of suspension depends on the chosen ceiling system. The water connections can be made using flexible, diffusion sealed pipes which are protected by a stainless steel jacket.
The connection between the individual modules is established by means of flexible connections. If foldable elements are required, this must be stated in the order, in order to ensure that longer connections are attached ex works.
Upon special request, the assembly can be done by SCHAKO.

Construction

Ceiling panel
- made of galvanised sheet steel, powder-coated to RAL 9010 (white) (Alpety-SKS-...-S only)
- made of aluminium, powder-coated in RAL 9010 (white) (Alpety-SKS-...-A only)

Cooling ducts
- made of extruded aluminium profiles, height 24 mm (Alpety-SKS only)
- For steel ceiling plates: width 50, 75 or 100 mm
- for aluminium ceiling panel: widths 100, 125 and 150 mm

Copper coils
- Cu pipe ø15 x 0.7mm, meander-shaped pressed into cooling ducts, ends calibrated and polished ex works (Alpety-SKS only)

Cooling blades
- made of extruded aluminium profiles, powder-coated to RAL 9010 (white). Includes pressed-in cooper pipe ø15 x 0.7mm, ends calibrated and polished ex works (Alpety-FKL, -HKL)

Pole braces
- made of galvanised sheet steel, powder-coated (Alpety-FKL, -HKL only)

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Model

Alpety-SKS-R - Rectangular shaped ceiling panel

Alpety-SKS-Q - Square ceiling panels

Alpety-SKS-...-A - Aluminium sheet ceiling panels, powder-coated to RAL 9010 (white)

Alpety-SKS-...-S - Galvanised sheet steel ceiling panels, powder-coated to RAL 9010 (white)

Alpety-SKS-...-...-O - without perforation and without acoustic fleece

Alpety-SKS-...-...-P - with standard perforation of Ø 2.5 mm and 16% free cross-section and with black acoustic fleece, thermally glued all over (white fleece on request)

Alpety-FKL
- Blade cooling ceiling:
- made of extruded aluminium profiles for a flattened ceiling appearance, powder-coated to RAL 9010.(white).
- Mounting pole brace at the cooling sail for suspension from on-site suspension systems
- The cooling ducts of a cooling sail are connected to one another via copper pipes.
- The pipe ends ø15mm (water supply and return) are calibrated and prepard for on-site connection by means of plug-in fittings

Alpety-HKL
- Blade cooling ceiling:
- made of extruded aluminium profiles for an arch-shaped ceiling appearance, powder-coated to RAL 9010 (white).
- Mounting pole brace at the cooling sail for suspension from on-site suspension systems
- The cooling ducts of a cooling sail are connected to one another via copper pipes.
- The pipe ends ø15mm (water supply and return) are calibrated and prepard for on-site connection by means of plug-in fittings

Accessories

(available at an extra charge)

- Threaded rods (ø 6 mm)
- Flexible hoses, diffusion-resistant to DIN 4726 nominal width 13 mm with stainless steel braid temperature-resistant from - 40° C to + 80° C test pressure 30 bar, working pressure 10 bar, length from 200 mm to 2000 mm
  - with two-sided plug-in fitting 90° bend
  - with one-sided 90° bend plug-in fitting at the cooling sail and straight plug-in fitting to connect to on-site ductwork.
  - with one-sided 90° bend plug-in fitting at the cooling sail and ½" flat seal spigot nut to connect to on-site ductwork.
  - with one-sided 90° bend plug-in fitting at the cooling sail and ¾" flat seal spigot nut to connect to on-site ductwork.
- Mounting system for cooling sails FKL/HKL for downward swinging cooling sails

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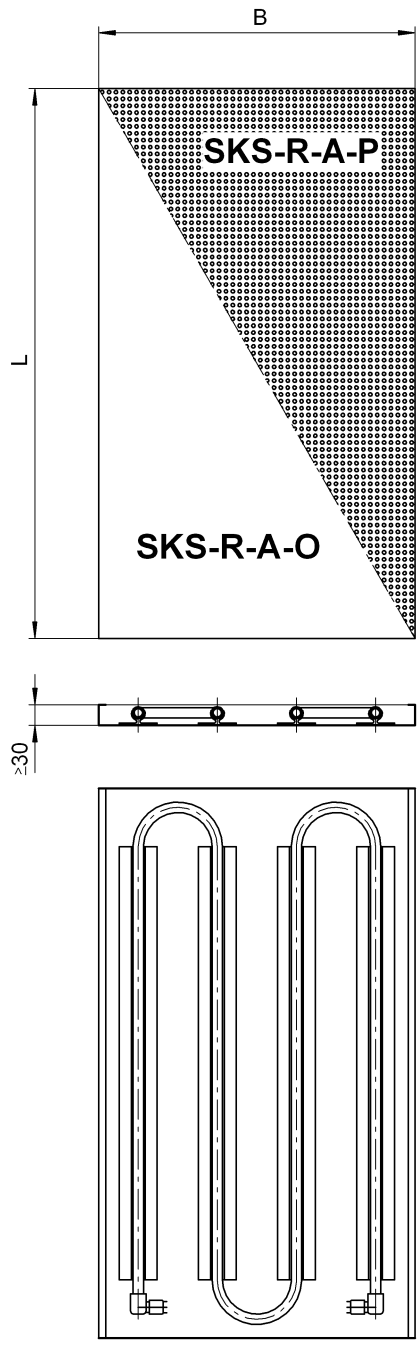
Models and dimensions

Dimensions

Alpety-SKS



Alpety-SKS-R:

Rectangular shaped ceiling panel
L= from 800 to 2500 mm
W= from 200 to 800 mm
(in intervals of 100 mm)
Other dimensions on request

Alpety-SKS-Q:

Square ceiling panels
Length x Width
600x600
625x625
700x700
800x800
900x900
Other dimensions on request

The panel thickness and bevel depend on the selected ceiling system.

Output

Cooling power to DIN 4715: up to 90 W/m²
The cooling power of the cooling ceiling elements depends on the type of air supply as well as the covered %, i.e., percentage of the activated surface area, relative to the overall surface area of the ceiling.

Weight 7 - 11 kg/m² including water (depending on model)
Normally the interface for each water circuit is the ball valve at the start of the air conditioned zone.

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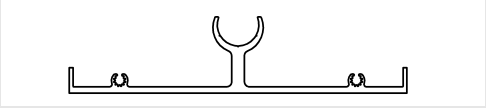
Cooling ceiling blade types
Adjusted to the requirements of the architect or client

Alpety-FKL 134

Blade width 134 mm / pipe distance 150 mm

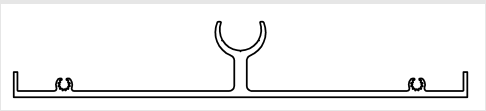


Determination of the cooling capacity to DIN 14 240

	Output data at an active ceiling surface area of												
Δt_m (K)	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
5	63	62	62	61	60	59	58	57	55	54	53	52	50
6	78	77	76	75	74	72	71	70	68	67	65	64	62
7	93	92	90	89	88	86	85	83	81	79	78	76	74
8	109	107	106	104	103	101	99	97	95	93	91	89	86
9	125	123	121	119	118	116	114	111	109	106	104	102	99
10	140	138	136	134	132	130	127	125	122	119	117	114	111
11	155	153	151	149	147	144	142	139	135	133	130	127	123
12	171	169	167	164	162	159	156	153	149	146	143	140	136

Alpety-FKL 180

Blade width 180 mm / pipe distance 200 mm



Determination of the cooling capacity to DIN 14 240

	Output data at an active ceiling surface area of												
Δt_m (K)	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
5	63	62	62	61	60	59	58	57	55	54	53	52	50
6	75	75	74	73	71	70	69	67	66	65	63	62	60
7	90	89	88	87	85	84	82	81	79	78	76	74	71
8	103	102	101	100	98	97	95	93	91	89	87	85	82
9	119	118	117	115	113	111	109	107	105	103	100	98	95
10	133	132	130	128	126	124	122	119	117	115	112	109	106
11	147	146	144	142	140	138	135	132	129	127	124	121	117
12	162	161	159	156	154	151	148	145	142	140	136	133	129

$$\Delta t_m = t_R - [(t_{VL} + t_{RL}) \times 0,5]$$

Δt_m	(K)	=	Average temperature difference
t_R	(°C)	=	Room temperature
t_{VL}	(°C)	=	Water supply temperature
t_{RL}	(°C)	=	Water return temperature

When combined with a ventilation system with turbulent supply air pattern (air change rate of at least 2), the performance data from the performance tables are increased by up to 10 %.

When combined with a laminar supply air pattern (air change rate of at least 2), the performance data from the performance tables are increased by up to 5%.

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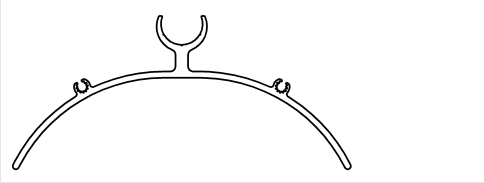
Alpety-HKL 134

Blade width 134 mm / pipe distance 150 mm

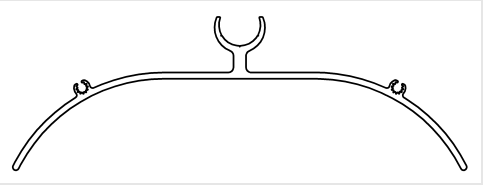


Determination of the cooling capacity to DIN 14 240

	Output data at an active ceiling surface area of												
Δt_m (K)	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
5	71	70	69	67	67	65	64	63	62	60	59	58	56
6	88	87	86	84	83	81	80	78	77	75	73	72	70
7	105	104	102	100	99	97	96	94	92	90	88	86	83
8	122	121	119	117	115	113	111	109	107	105	102	100	97
9	139	138	136	133	131	129	127	124	122	119	117	114	111
10	157	155	153	150	148	145	143	140	137	134	131	128	125
11	174	171	169	166	164	161	158	155	152	149	145	142	138
12	191	188	186	182	180	177	174	170	167	163	160	156	152

Alpety-HKL 180

Blade width 180 mm / pipe distance 200 mm



Determination of the cooling capacity to DIN 14 240

	Output data at an active ceiling surface area of												
Δt_m (K)	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
5	68	68	67	66	65	64	63	61	60	59	57	56	55
6	83	83	82	80	79	78	76	75	73	72	70	68	66
7	100	100	99	97	95	94	92	90	89	87	84	82	80
8	118	117	116	114	112	110	108	106	104	101	99	96	94
9	134	133	131	129	127	125	122	120	118	115	112	109	107
10	150	149	147	145	142	140	137	135	132	129	126	122	120
11	164	163	162	159	156	153	151	148	145	142	138	134	131
12	181	180	178	175	172	169	166	163	160	157	152	148	145

$$\Delta t_m = t_R - [(t_{VL} + t_{RL}) \times 0,5]$$

Δt_m	(K)	=	Average temperature difference
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When combined with a ventilation system with turbulent supply air pattern (air change rate of at least 2), the performance data from the performance tables are increased by up to 10 %.

When combined with a laminar supply air pattern (air change rate of at least 2), the performance data from the performance tables are increased by up to 5%.

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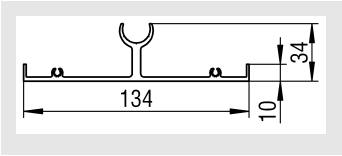
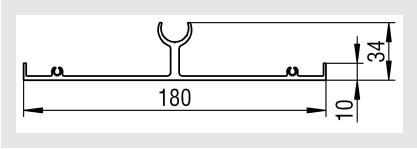
Blade dimensions

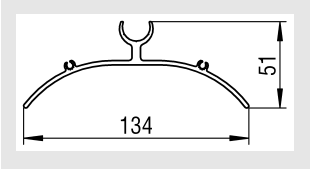
FKL 134



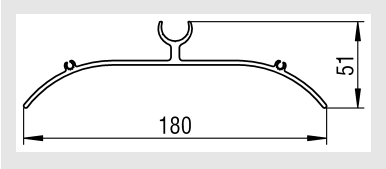
FKL 180



HKL 134



HKL 180



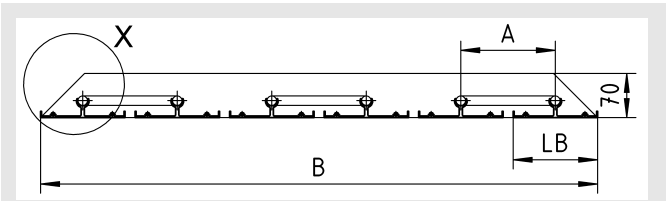
Cooling sails Alpety FKL / HKL

Alpety FKL/HKL are joined to give two- to six-blade cooling sails having a maximum length of 2500 mm.

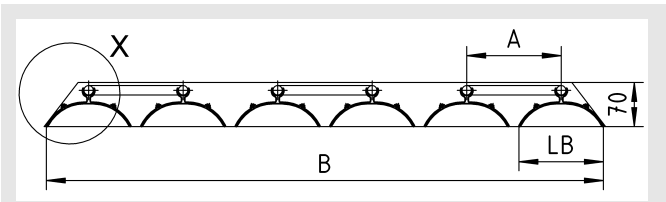
Note:

The cooling sails are connected to one another with flexible hoses. Make sure that the hoses are connected without kinks.

Alpety-FKL



Alpety-HKL

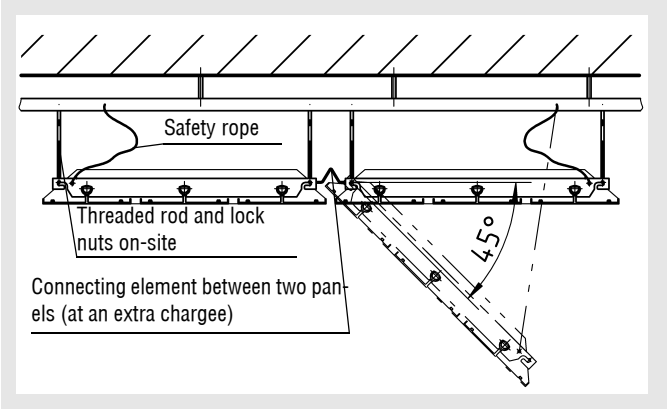


Available sizes for Alpety FKL / HKL

Type	Blade width LB	Duct spacing A	Width 2 blades	3 blades	4 blades	5 blades	6 blades
FKL	134	150	284	434	584	734	884
	180	200	380	580	780	980	1180
HKL	134	150	284	434	584	734	884
	180	200	380	580	780	980	1180

Suspended ceiling fixture:

Detail X



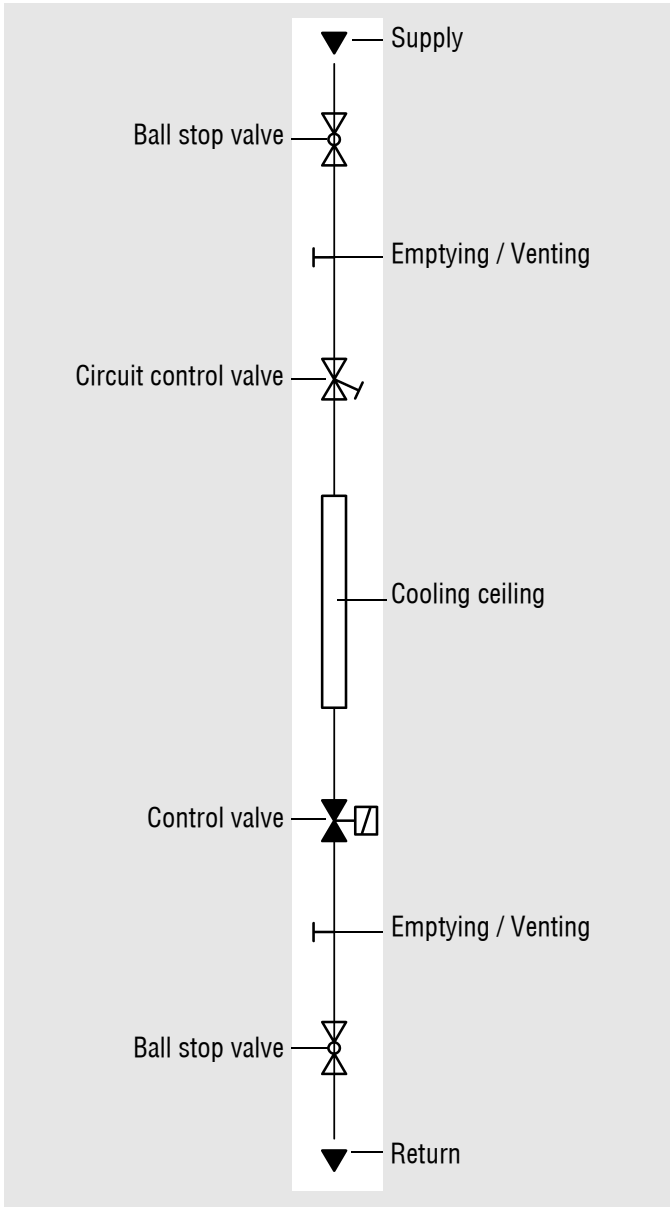
Ceiling Cooling System Alpety

Technical Data

Control of cooling ceilings

The output of cooling ceilings is usually controlled by varying the water flow of the cooling ceiling. A stop valve having a thermal or motorised actuator, which varies the amount of flow as a function of ambient temperature, is suitable for this.

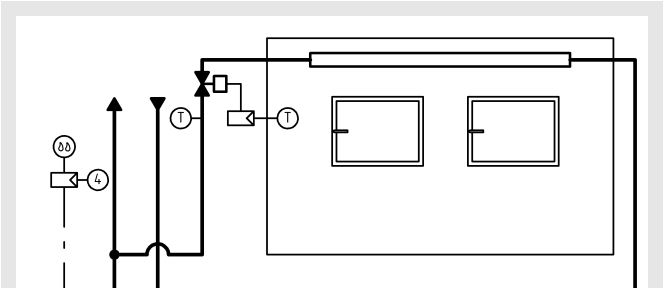
Hydraulic connection scheme of the cooling ceiling



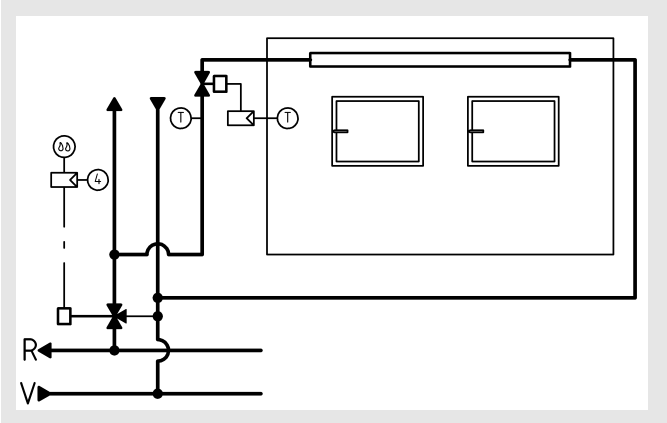
Legend:
Basic connection diagram of the cooling ceiling to the cold water network. The ball stop valves are the separation point of the control circuit and provide an option for shutting off the main supply line. For each control circuit, we recommend one circuit control valve for adjusting the desired nominal water flow quantity and a venting and emptying device.

Dew point control
A condensation of the cooling ceiling will take place when the surface temperature of the cooling ceiling falls below the dew point temperature of the room.

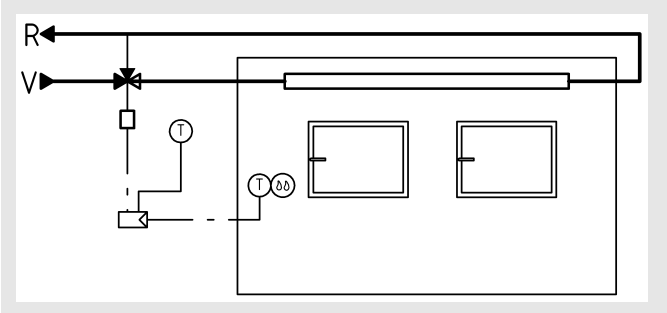
Single-room dew point control - passive
The dew point sensor contains a sensor element whose electric reistance depends on the humidity. This change in resistance is converted into an ON/OFF signal, which will stop the water flow of the cooling ceiling via a room controller.



Central dew point control - passive
The supply temperature for the cooling ceilings is controlled centrally as a function of the dew point temperature of the outgoing air or of a reference point.



Dew point control per single room - active
The single-room dew point temperature is determined, and the supply temperature is controlled individually, with the supply temperature being higher than the dew point temperature.
The cooling water flow is not interrupted.



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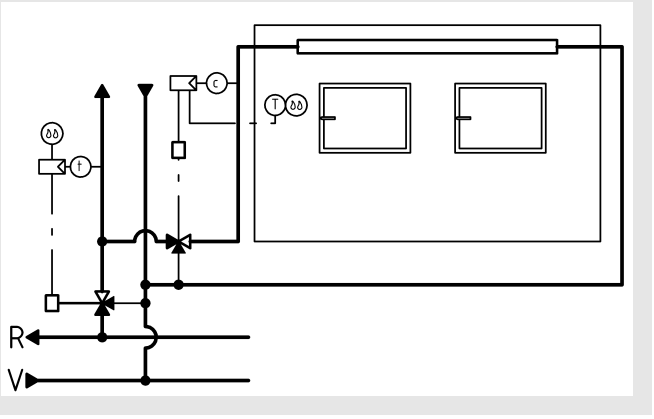
Central temperature control including dew point control per single room - active

The supply temperature for the cooling ceiling is controlled centrally as a function of the dew point temperature of the return air or of a reference room. The room cooling is not interrupted.



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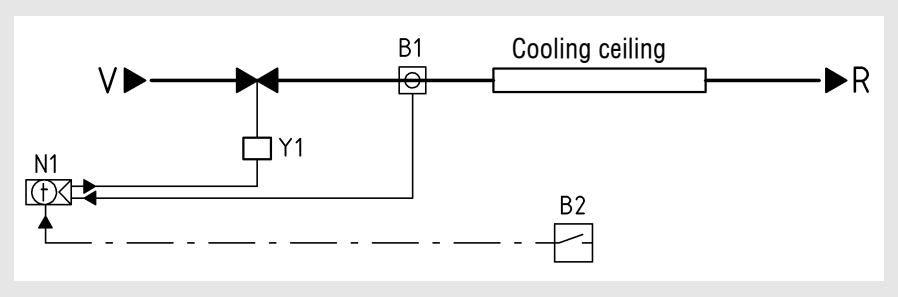
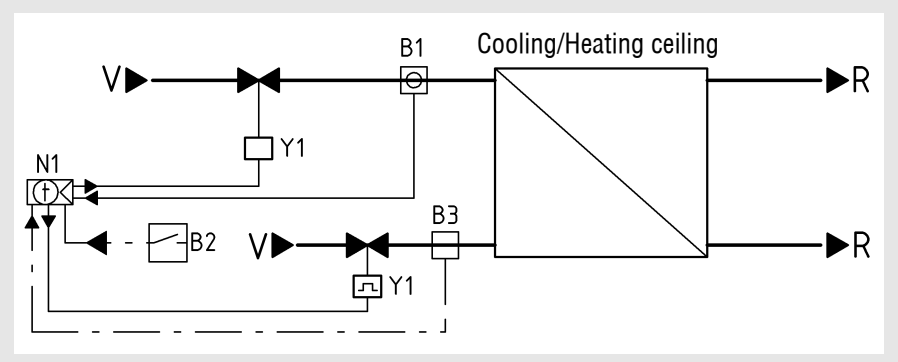
Control examples

Standard solution for single rooms

Cooling ceiling



Cooling/Heating ceiling



Selection of units:

Pos.	Type	Designation / Function
N1	RCU 10 RCU 10.1 RCU 20	Temperature control including room sensor and setpoint value adjustment
Y1	VVP 469... STA 219	Stop valve equipped with thermal actuator
B1	QXA 2000 AQX 2000	Dew point sensor
B2 B3	 RYT 182	Window and/or clock contact Changeover thermostat

Function:
Passive dew point control by connecting a dew point sensor type QXA 2000, AQX 2000.

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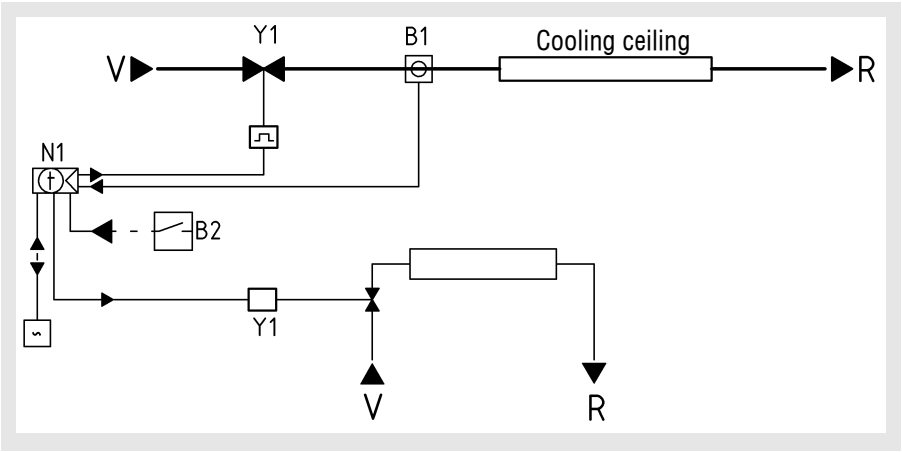
Bus-capable single-room control

Konnex EIB or LON
Cooling / Heating (in sequences), cooling ceiling with radiator heating



Selection of units: KONNEX - EIB

Pos.	Type	Designation / Function
N1	RXB 10.1 / CC-01	Temperature control by room sensor and setpoint value adjustment by operating mode key
Y1	VVP 469... STA 219	Stop valve equipped with thermal actuator
B1	QXA 2000	Dew point sensor
B2		Window and/or clock contact

Function

- Passive dew point control by means of dew point sensor QXA 2000
- Communication-capable controller
- Comfort, Standby, Energy Cutoff temperature level

Ceiling Cooling System Alpety

Further data

Questionnaire for planning cooling or heating ceilings

Project / Place: _____

Type of ventilation system

___ without ventilation
___ Turbulent ventilation via swirl or slot diffusers
___ Displacement ventilation via floor or displacement ventilation outlets
___ Intended air change / h

Function of the ceiling

___ Cooling only
___ Heating only
___ Cooling and heating

Type of suspended ceiling:

___ Aluminium sheet
___ Aluminium profile
___ Sheet steel
___ Smooth plaster
___ Perforated plaster
___ .....

Fittings built into the double ceiling

___ piece Ventilation outlets
___ piece Lights, spots
___ piece Loudspeaker
___ piece Sprinkler or nozzles
___ piece Fire detector
___ piece .....

Type of use

___ Office
___ Conference room
___ Hotel
___ Industrial firm
___ Conference center
___ Shopping center
___ Computer center
___ .....

Comfort requirements:

___ % Persons sitting
___ % Persons standing
___ % Persons at work standing

Specifications (relative to the floor surface area):

with cooling W/m²:
with heating W/m²:

Sound absorption requirements:

at	Hz	125	250	500	1K	2K	4K
	α	___	___	___	___	___	___

Specifications:

___ m² Floor surface area per person
___ w internal load per m² (persons, lighting, EDP, etc.)
___ w external load per m² (radiation and heat transfer)

Room division:

___ Large room
___ Single rooms with fixed partition walls
___ Single rooms with adjustable partition walls

Room dimensions:

___ cm Room height from bare floor to bare ceiling
___ cm Double ceiling height
___ cm Double floor height
___ cm Window width for facade modulation
___ cm Room depth

Type of partition walls

"Fixed" version

___ cm from bare floor to bare ceiling
___ cm from bare floor to double ceiling
___ cm from double floor to bare ceiling
___ cm from double floor to double ceiling

"Dismountable" version

___ cm from bare floor to bare ceiling
___ cm from bare floor to double ceiling
___ cm from double floor to bare ceiling
___ cm from double floor to double ceiling

Material of the water circuit from transformer:

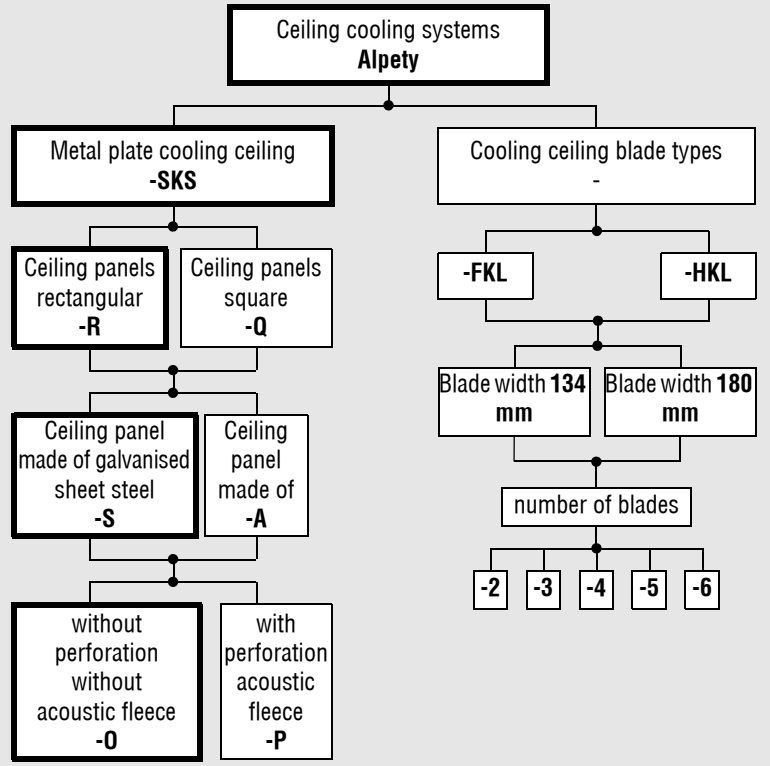
___ Black steel pipe
___ Inox pipe
___ Plastic pipe
___ Copper pipe

Remarks:

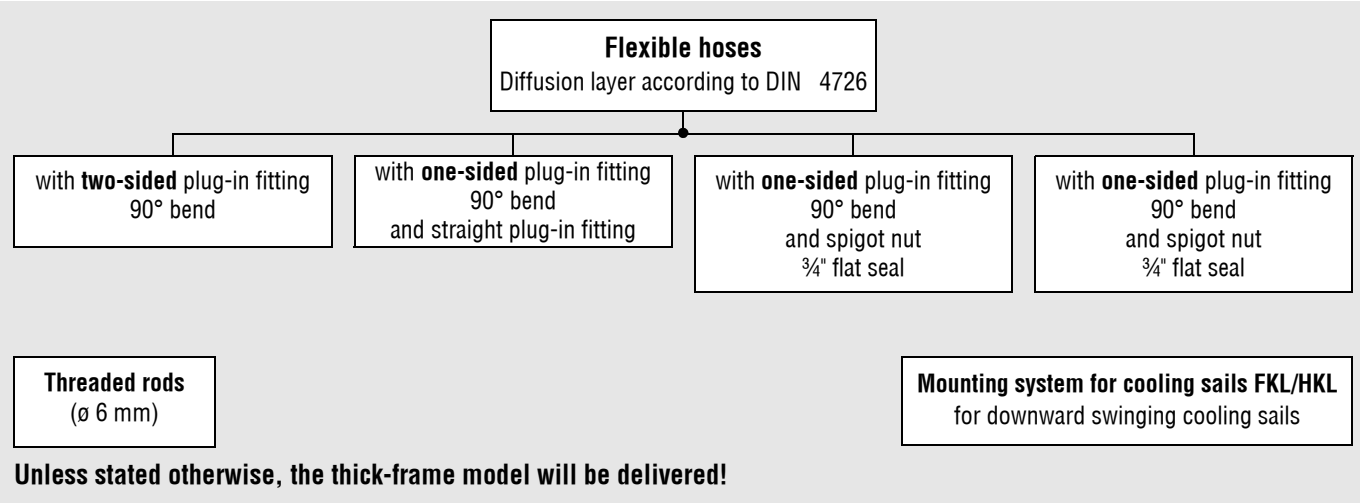
.....
.....
.....
.....

Ceiling Cooling System Alpety

Order details



Accessories
(available at an extra charge)



Unless stated otherwise, the thick-frame model will be delivered!

Ceiling Cooling System Alpety

Specification texts

The cooling ceiling element of the Alpety-SKS type is suitable for installation as ceiling sail or large-sized cooling ceiling or for combination with suspended ceiling systems.
The cooling ceiling elements consist of the ceiling panel made of galvanised sheet steel or aluminium powder-coated to RAL 9010 (white) provided with large-sized glued, optimised aluminium heat-conducting rails with pressed-in copper pipe. As standard, the pipe ends are designed horizontally and can be connected to one another using either flexible hoses (by means of quick-acting couplings) or rigid copper pipes, as desired.
The mounting of the suspended ceiling to the concrete bare ceiling is done on-site using suitable mounting material via Z bracket profiles and threaded rods.
The understructure is effected by means of on-site transverse bracket profiles.
Product: SCHAKO type **Alpety-SKS**

- Rectangular shaped ceiling panel.(-R)
- Square ceiling panels (-Q)
- Aluminium sheet ceiling panels, powder-coated to RAL 9010 (white) (-A)
- Galvanised sheet steel ceiling panels, powder-coated to RAL 9010 (white) (-S)
- Ceiling panel without perforation and without acoustic fleece (-O)
- Ceiling panel with standard perforation of Ø 2.5 mm and 16% free cross-section (FQ) and with black acoustic fleece, glued to the ceiling over the entire surface (white fleece on request) (-P).

The blade cooling ceilings of the Alpety-FKL, HKL types are suitable for installation as ceiling sail or large-sized cooling ceiling or for combination with suspended ceiling systems.
The cooling ceiling blades are made of extruded aluminium profiles, powder-coated to RAL 9010 (white) with pressed-in copper pipe. As a standard feature, the pipe ends are designed horizontally and can be connected to one another using either flexible hoses (by means of quick-acting couplings) or rigid copper pipes, as desired.
The mounting of the suspended ceiling to the concrete bare ceiling is done on-site using suitable mounting material via pole braces made of extruded aluminium profiles and threaded rods.
Product: SCHAKO type **Alpety-FKL, HKL**

Blade width either 134 or 180 mm for duct spacing of 150 or 200 mm

Accessories:

- Threaded rods (ø 6 mm)
- Flexible hoses, diffusion-resistant to DIN 4726 nominal width 13 mm with stainless steel braid temperature-resistant from -40° C to +80° C test pressure 30 bar, working pressure 10 bar, length from 200 mm to 2000 mm
  - with two-sided plug-in fitting 90° bend
  - with one-sided 90° bend plug-in fitting at the cooling sail and straight plug-in fitting to connect to on-site ductwork.
  - with one-sided 90° bend plug-in fitting at the cooling sail and ½" flat seal spigot nut to connect to on-site ductwork.
  - with one-sided 90° bend plug-in fitting at the cooling sail and ¾" flat seal spigot nut to connect to on-site ductwork.
- Mounting system for cooling sails FKL/HKL for downward swinging cooling sails