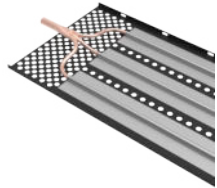


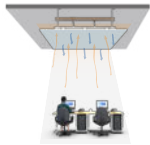
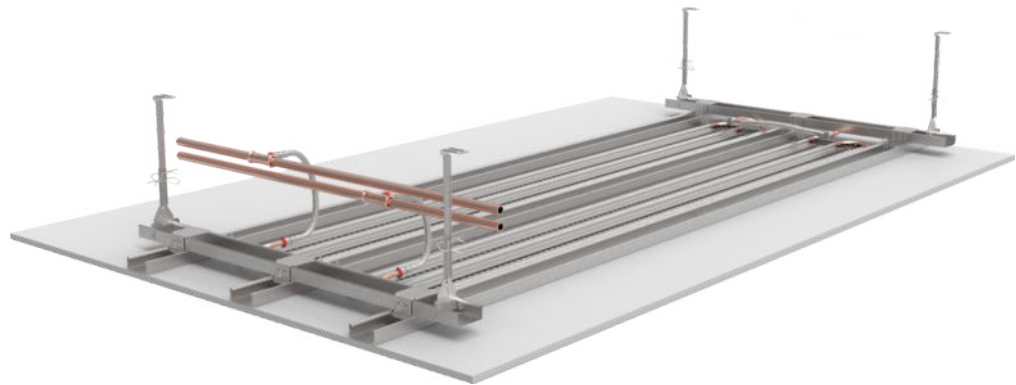
WK-D-GK Meander



WK-D-GK straight pipe

Ceiling cooling elements

WK-D-GK

Principle of operation –
WK-D-GK

Ceiling cooling element for easy combination with commercially available plasterboard ceilings

Ceiling cooling element for concealed installation in suspended, primarily closed plasterboard ceilings to dissipate internal thermal loads

- Can be used in conjunction with all commercially available plasterboard ceilings and acoustic variants
- Quick and easy installation of the ceiling cooling elements thanks to special suspension elements
- Secure contact with the plasterboard ceiling thanks to full-surface support
- Comfortable room cooling that provides thermal comfort for users
- Savings in operating costs by dissipating thermal loads via the medium water. This allows supply air volume flows to be reduced to the hygienically required minimum
- Can be combined with geothermal energy as a cost-effective and sustainable energy source
- Simple handling. The on-site connection is usually made to a cooling water network with a water flow temperature of $\geq 16\text{ °C}$



Flexible connecting hoses

Optional equipment and accessories

- Flexible connecting hoses type FS
- Integration of required ceiling cut-outs possible by adapting the cooling elements
- Combination with various control systems

| | | | |
|---------------------|---|----------------------|----|
| General information | 2 | Order code | 10 |
| Function | 4 | Dimensions | 11 |
| Technical data | 7 | Installation details | 13 |
| Quick sizing | 7 | Explanation | 15 |
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General information

Application

- WK-D-GK chilled ceiling elements are primarily suitable for combination with seamless, smooth plasterboard ceilings and perforated acoustic ceilings
- For room heights from 2.60 m, preferably up to 4.0 m room height
- Utilisation of the energy advantages of water as a cooling/heating medium due to its high specific thermal capacity
- Dissipation of specific thermal loads through radiation exchange and convection (cooling case), increased comfort
- Particularly comfortable room temperature, especially when cooling, thanks to uniform temperature distribution
- Energy savings in cooling and heat generation due to low water temperatures
- Savings in transport energy or air transport by reducing the air volume flow to the minimum fresh air rate

Special characteristics

- Simple, invisible integration possible in combination with all commercially available plasterboard ceilings
 - This makes the system ideal for both new buildings and retrofitting
- The special suspension technology on the support profiles ensures very simple installation with simultaneous performance assurance on site
- Joints and connections of the cooling elements can be tested for leaks on the water side by means of a pressure test before the plasterboard panels are installed
- The chilled ceiling elements enable an ideal connection and a flat construction on site thanks to different meander and connection variants
- Performance depending on the plasterboard ceiling panel used
- Positive influence on the water-side pressure loss by selecting the straight pipe design (H), especially with longer ceiling cooling elements
- Cut-outs for integration possible, for example of fixtures
- Lateral raised edges prevent the cooling elements from sliding under the support profiles (installation safety)
- Thanks to the simple and customised installation, the chilled ceiling elements are particularly suitable for small and medium-sized projects as well as individual rooms if a cooling water network is available on site

Nominal sizes

- L: 600 mm - 5000 mm
- Intermediate lengths possible in 50 mm increments
- B: 263 mm and 430 mm
 - 263 mm for acoustic ceilings, perforated ceilings, perforated carrier plate, for support profiles with a pitch of 333 mm
 - 430 mm for closed ceiling surface, smooth carrier plate, for support profiles with a pitch of 500 mm
- H: Dimension to top edge of tube
 - Meander 50 mm
 - Straight pipe 25 mm

Construction

Meander variant

- H: straight pipe
- G: even number of meanders
- UL: uneven number of meanders, left
- UR: uneven number of meanders, right

Connection

- 180: Water connection 180°
- 90: Water connection 90°
- No entry: straight pipe

Parts and characteristics

- Carrier plate made of aluminium (AlMg3)
 - Ensures full-surface heat transfer
 - Smooth support plate for closed ceiling panels
 - Perforated carrier plate for acoustic effectiveness in combination with perforated ceiling tiles
 - Simple installation by hooking into on-site ceiling profiles
- Mounting bracket (steel)
 - For on-site suspension from the support profiles and pressure testing in the installed state
 - Ensures that the ceiling cooling element is held in place when the plasterboard is mounted
- Copper tube meander (Cu)
 - D-tube design for increased performance
 - Pipe connections calibrated with support sleeves, ideal for flexible connection hoses
- Straight pipe (Cu)
 - Round tube construction
 - Optimised distribution element
 - Larger water circuits possible due to lower pressure losses

Material and surfaces

- Surface: untreated
 - Underside similar to RAL9005
- Carrier plate made of aluminium (AlMg3)
- Heat conducting rails made of aluminium (AlMg3)
- Pipe meander made of copper (Cu)
- Straight pipe made of copper (Cu)
- Mounting bracket (steel)

Construction features

- One-piece chilled ceiling element consists of large-format aluminium carrier plate
- Copper tube meander attached as D-tube with heat conducting rails, using patented WLT® technology
- Copper meander as D-tube, to increase performance
- Installation clamp for easy installation and pressure testing before ceiling work is completed
- Connections of the copper pipe meander possible in various arrangements to ensure an ideal connection on site
- Carrier plate with or without perforation



Standards and guidelines

- Cooling capacity according to DIN 14240
- Heating capacity data based on DIN EN 14037, Part 5
- DIN EN 12449: Copper and copper alloys - Seamless round pipes for general purposes

Maintenance

- Low-maintenance as construction and materials are not subject to wear

Useful additions

- Flexible connection hoses Type FS
- Various control combinations with air-water system control or X-AIRCONTROL possible, e.g. valves, valve actuators, dew point sensors, window contacts, etc.

Function

General information:

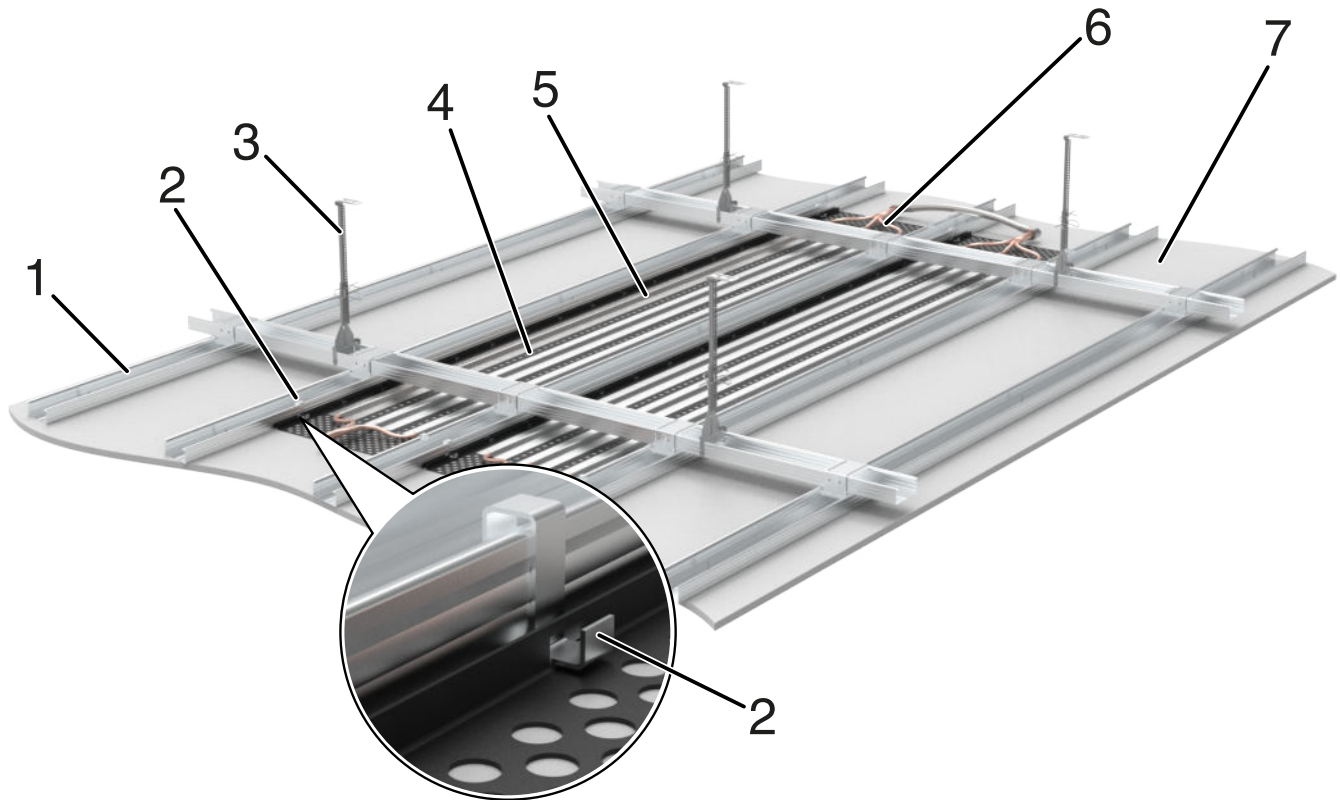
Chilled ceilings and chilled ceiling elements (sails) absorb heat from the room air and transfer it to the transport medium, water. Chilled ceilings are usually full-surface suspended ceilings that work according to the radiation principle. Chilled ceiling sails, for example, consist of cooling panels in an open construction with gaps.

Radiant chilled ceiling:

Radiant cooling ceilings are passive cooling systems that absorb heat from the room on their surfaces and transfer it to the transport medium water for dissipation from the room. Heat is transferred by radiation and convection, the proportions of which differ depending on the design of the cooling ceiling system (radiant chilled ceiling or convective chilled ceiling). The radiant cooling ceiling variant usually involves closed ceiling surfaces with a radiant component of up to approx. 60 %. The remainder is generated by free convection.

The cooling elements of type WK-D-GK can be used in closed plasterboard ceilings and perforated acoustic ceilings in all standard designs for room temperature control. Heat is transferred between the surfaces with different temperatures from the warm to the colder bodies. The room air is cooled on the ceiling surfaces equipped with ceiling cooling elements and flows into the occupied zone at a reduced temperature and low velocity. Type WK-D-GK ceiling cooling elements are installed on the back of the plasterboard between the support profiles. Depending on the element sizes, the ceiling cooling elements are grouped into individual water circuits, which are responsible for removing thermal loads. The so-called level of occupancy is defined according to the proportion of ceiling areas equipped with cooling elements. Due to installations such as light fittings, air diffusers and the support structure of the ceiling itself, a 100% level of occupancy is not possible.

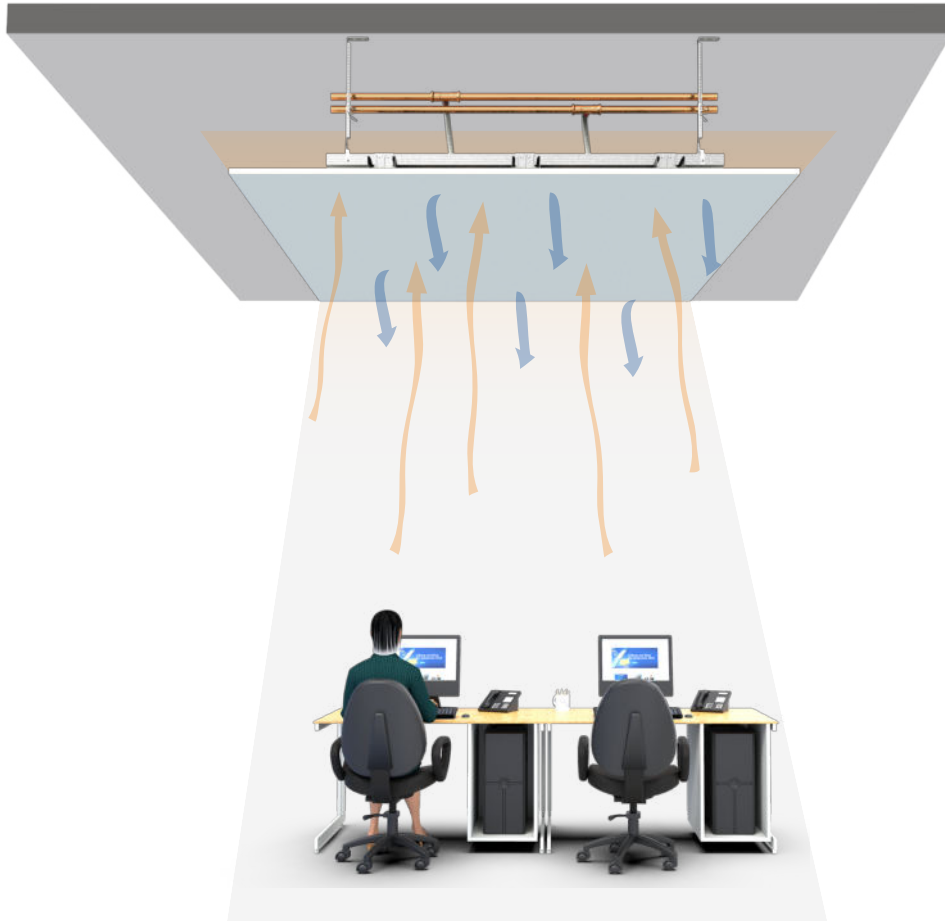
Schematic illustration of WK-D-GK (straight pipe)



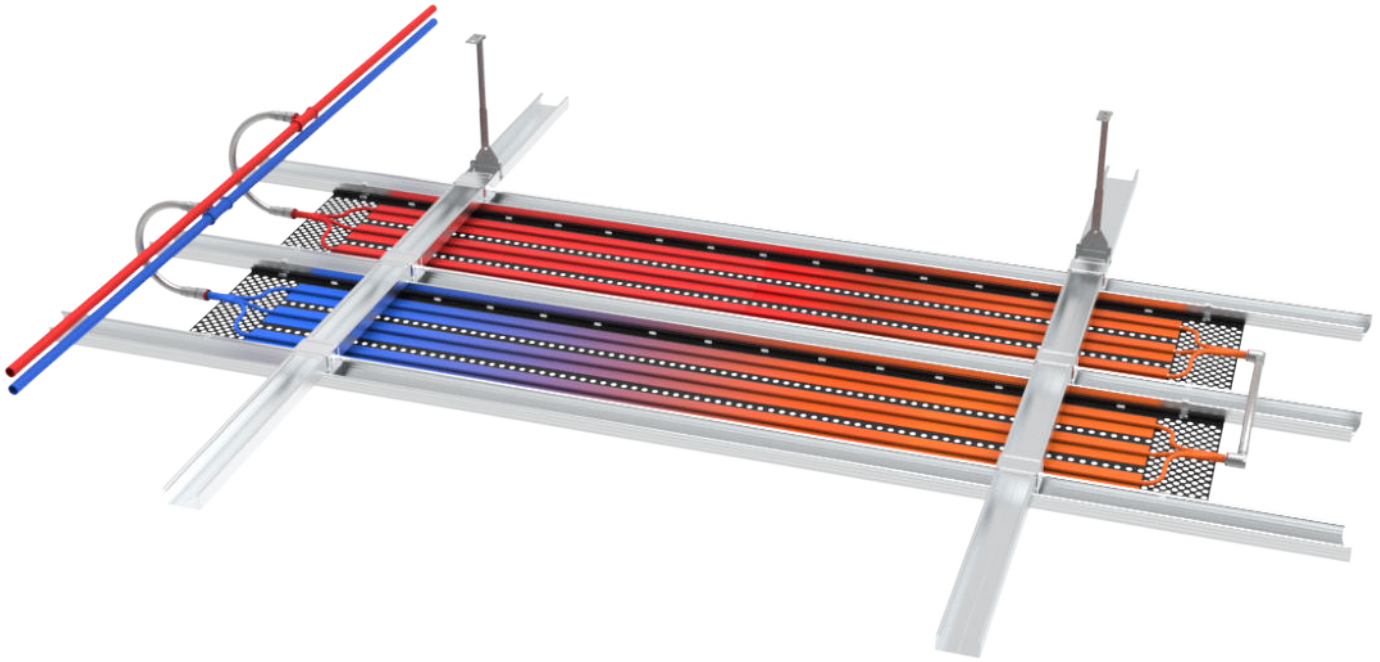
- 1 Support profile / base profile*
- 2 Mounting bracket
- 3 Vernier hanger ceiling construction*
- 4 Carrier plate
- 5 Heat conducting rail
- 6 Copper tube, straight pipe (or meander)
- 7 Plasterboard ceiling*

* on site/by others

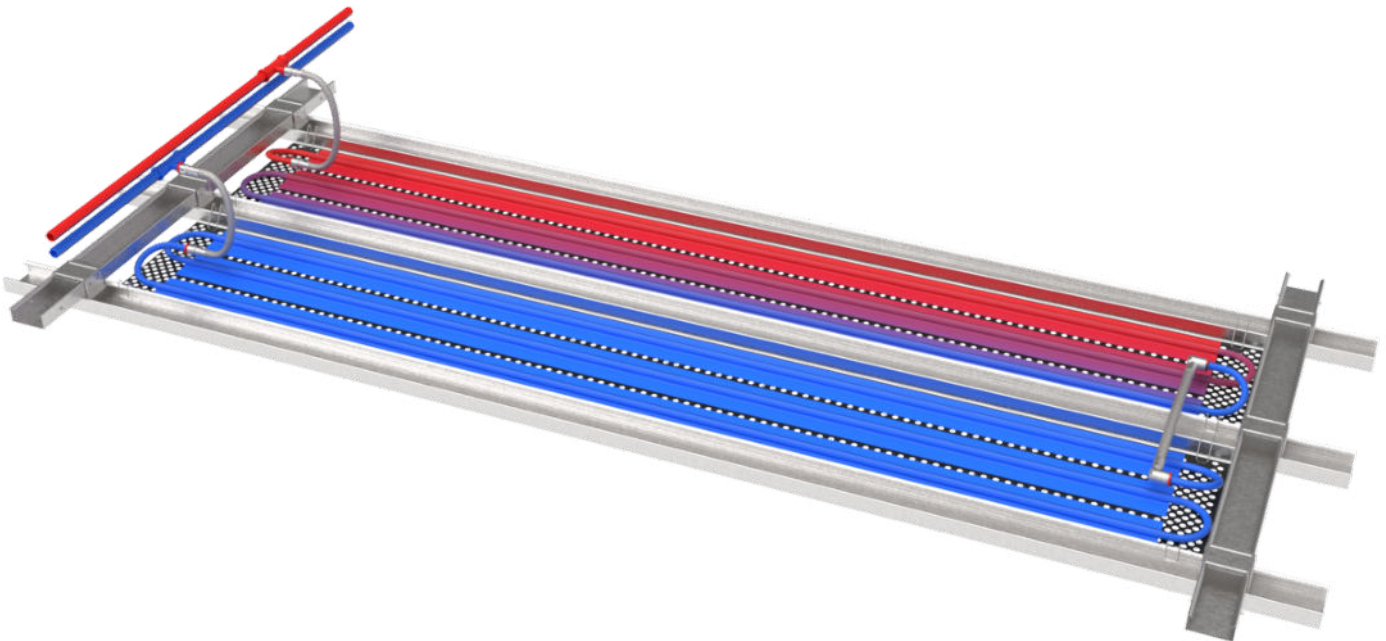
Principle of operation – WK-D-GK



Principle of operation – WK-D-GK

WK-D-GK Cooling temperature curve (straight pipe version)

Straight pipe version (H) with two interconnected cooling elements

WK-D-GK Cooling temperature curve (meander version)

Meander design with two interconnected cooling elements

Technical data

| | |
|---|----------------------------------|
| Length | 600 – 5000 mm |
| Height depending on connection, 90°, 180° or straight pipe | 25 – 50 mm |
| Width | 263, 430 mm |
| Standard cooling capacity depends on the plasterboard ceiling plate construction DIN EN 14240 (Δt 8 K) | from 50 to 70 W/m ² |
| Cooling capacity depends on the plasterboard ceiling plate construction (Δt 10 K) | from 64 to 89 W/m ² |
| Heating capacity depends on the plasterboard ceiling plate construction (Δt 15 K) | from 70 to 96 W/m ² |
| Heating capacity depends on the plasterboard ceiling plate construction (Δt 30 K) | from 147 to 204 W/m ² |
| maximum operating pressure, water side | 6 bar |
| maximum operating temperature, water side | 50 °C |

Cooling/heating capacities depending on Δt of the meander or straight pipe variant as well as the plasterboard ceiling variant.

For the heating function, surface temperatures > 35 °C should not be selected for reasons of comfort.

Maximum operating pressure and maximum operating temperature apply when flexible hoses are used.

When using chilled ceilings for heating, only the radiation proportion can be considered.

When sizing chilled ceiling systems, the use of standard cooling capacities ($\phi_{w,c,a}$) in accordance with DIN EN 14240 is NOT recommended due to the comparability of the results. The specific cooling capacity based on the usable ceiling tile area ($\phi_{w,c,p}$), which refers to the active area of a cooling ceiling system, should be used for the calculation.

This is the only way to easily determine the achievable cooling capacity based on the possible ceiling occupancy level and to compare it to the cooling capacity per m² of floor space that is required for the design.

Quick sizing

Cooling

| | |
|---|-------------|
| Water flow temperature t_{wV} | 16 °C |
| Water return temperature t_{wR} | 18 °C |
| Medium water temperature Δt_{wm} | 17 °C |
| Room temperature for $\Delta t = 8$ K (DIN EN 14240) $t_R = t_{ON}$ | 25 °C |
| Room temperature for different cooling capacities $t_R = t_{ON}$ | variable C |
| Temperature difference room to water Δt_{wm-R} | see above K |

Heating

| | |
|--|-------|
| Water flow temperature t_{wV} | 42 °C |
| Water return temperature t_{wR} | 32 °C |
| Medium water temperature Δt_{wm} | 37 °C |
| Room temperature $t_R = t_{ON}$ | 22 °C |
| | 15 K |



Temperature difference room to water Δt_{Wm-R}

Specification text

This specification text describes the general properties of the product.

Specification text

Ceiling cooling elements for simple combination with on-site plasterboard ceiling panels in all standard designs. The ceiling cooling elements consist of either a copper pipe meander or a straight copper pipe, which are connected on the carrier plate by special heat conducting rails. In order to achieve the highest quality of heat conduction, this connection is made using patented WLT® technology. Depending on the plasterboard ceiling, the carrier plate is designed as a plain or perforated acoustic ceiling. The width of the ceiling cooling element is adapted to the gaps between the support profiles and its length can be configured in 50 mm increments from 600 to 5000 mm. The ceiling cooling elements are suspended between the support profiles of the ceiling support structure, using mounting clips on the long sides. The carrier plates are designed with raised edges on the long sides so that the installation safety between the support profiles is ensured during the installation of the plasterboard panels. The pipe ends of the ceiling cooling elements are arranged to suit the design in order to realise low installation heights. Connections to each other and to the main pipework are preferably made using flexible hoses. Depending on the maximum desired pressure losses and the ceiling structure, several ceiling cooling elements can be interconnected to form a cooling circuit.

Special characteristics

- Simple, invisible integration possible in combination with all commercially available plasterboard ceilings
 - This makes the system ideal for both new buildings and retrofitting
- The special suspension technology on the support profiles ensures very simple installation with simultaneous performance assurance on site
- Joints and connections of the cooling elements can be tested for leaks on the water side by means of a pressure test before the plasterboard panels are installed
- The chilled ceiling elements enable an ideal connection and a flat construction on site thanks to different meander and connection variants
- Performance depending on the plasterboard ceiling panel used
- Positive influence on the water-side pressure loss by selecting the straight pipe design (H), especially with longer ceiling cooling elements
- Cut-outs for integration possible, for example of fixtures
- Lateral raised edges prevent the cooling elements from sliding under the support profiles (installation safety)
- Thanks to the simple and customised installation, the chilled ceiling elements are particularly suitable for small and

medium-sized projects as well as individual rooms if a cooling water network is available on site

Material and surfaces

- Surface: untreated
 - Underside similar to RAL9005
- Carrier plate made of aluminium (AlMg3)
- Heat conducting rails made of aluminium (AlMg3)
- Pipe meander made of copper (Cu)
- Straight pipe made of copper (Cu)
- Mounting bracket (steel)

Construction

Meander variant

- H: straight pipe
- G: even number of meanders
- UL: uneven number of meanders, left
- UR: uneven number of meanders, right

Connection

- 180: Water connection 180°
- 90: Water connection 90°
- No entry: straight pipe

Technical data

- Length: 600 mm - 5000 mm (dimension of the cooling element)
 - Intermediate sizes in increments of 50 mm possible
- Width: 263 mm and 430 mm (dimension of the cooling element)
- Height: 25 - 50 mm depending on the connection type
- Capacities, depending on the plasterboard ceiling design
 - Cooling capacity DIN EN 14240 (Δt 8 K): up to 70 W/m²
 - Cooling capacity (Δt 10 K): up to 89 W/m²
 - Heating capacity (Δt 15 K): up to 96 W/m²
 - Heating capacity (Δt 30 K): up to 204 W/m²
- Maximum operating pressure, water side: 20 bar (limitation in combination with flexible hoses, 6 bar)
- Maximum operating temperature, water side: 75 °C (with flexible hoses approx. 50 °C)



Order code

WK-D-GK – UL – 180 / 2000 × 263

| | | | | |
|---|---|---|---|---|
| | | | | |
| 1 | 2 | 3 | 4 | 5 |

1 Type

WK-D-GK Cooling panel

No entry: straight tube (only with variant H)

90 Water connection 90° (not with variant H)**180** Water connection 180° (not with variant H)**2 Meander variant****H** Straight pipe**G** even number of meanders (only with width 263)**UL** uneven number of meanders, left**UR** uneven number of meanders, right**4 Cooling panel length [mm]****600 – 5000**

Cooling elements can be adjusted in 50 mm increments.

3 Connection**5 Cooling panel width [mm]****263** (for acoustic ceiling made of plasterboard)**430** (for plain plasterboard ceiling)**Order example: WK-D-GK-UL-180/2000×263**

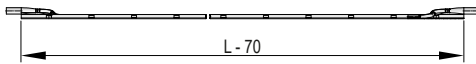
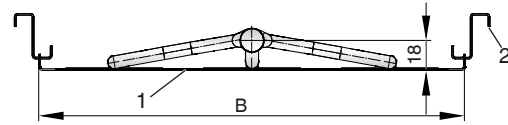
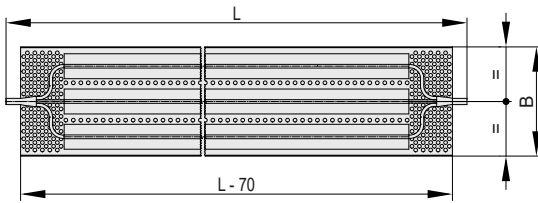
| | |
|----------------------------------|---|
| Type | WK-D-GK - Cooling panel |
| Meander variant | uneven number of meanders, left |
| Connection | Water connection 180° |
| Cooling panel length [mm] | 2000 |
| Cooling panel width [mm] | 263 (for acoustic ceiling made of plasterboard) |

Order example: WK-D-GK-H/4000×430

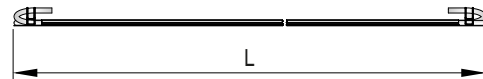
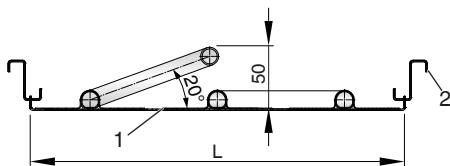
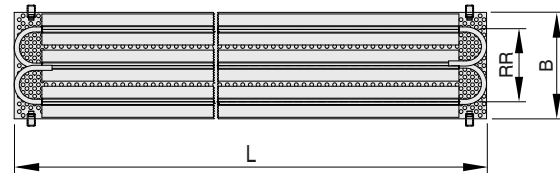
| | |
|----------------------------------|--------------------------------------|
| Type | WK-D-GK - Cooling panel |
| Meander variant | Straight pipe |
| Connection | straight pipe |
| Cooling panel length [mm] | 4000 |
| Cooling panel width [mm] | 430 (for plain plasterboard ceiling) |

Dimensions

WK-D-GK - straight pipe

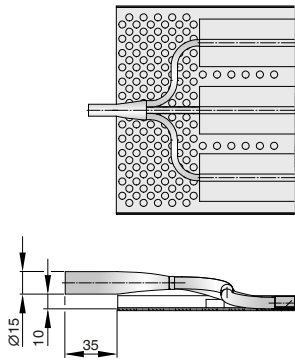


WK-D-GK - Meander

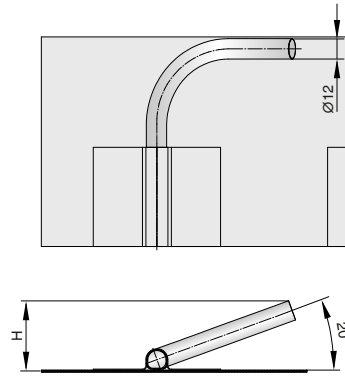


- 1 underside carrier plate black
- 2 mounting clamp (supplied loose / fitted on site)

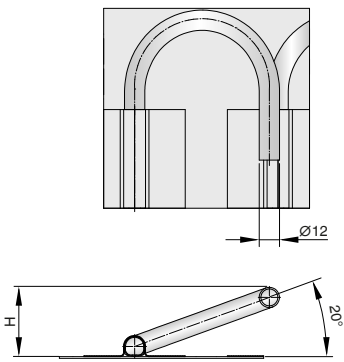
Water connection straight pipe



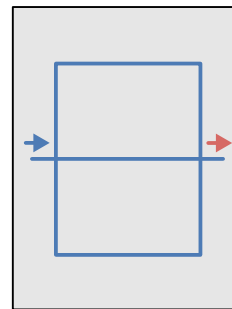
90: Water connection 90°



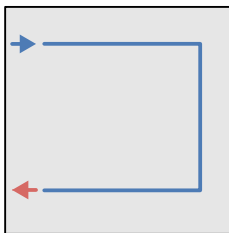
180: Water connection 180°



H: straight pipe

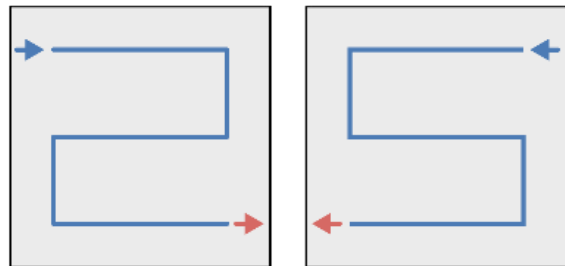


G: straight meander division, for width 263



UL: odd number of meanders, left

UR: odd number of meanders, right



Weight

approx. 4 to 5 kg / m² Ceiling area (pitch support profile 316 mm)

Installation details

WK-D-GK Installation example



On-site support structure



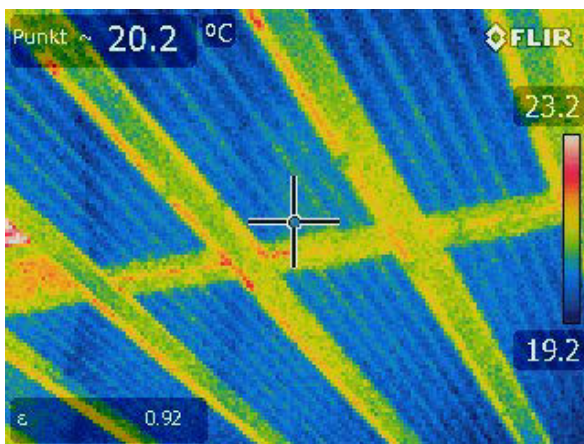
WK-D-GK suspended in on-site support structure



WK-D-GK with started plasterboard ceiling



WK-D-GK Thermography



Installation and commissioning

- Any work associated with the installation of cooling panels, hydraulic connections and commissioning must be carried out by specialist personnel
- When selecting the water-side connection, ensure that oxygen is prevented from entering the water system, as this can lead to corrosion.



- Compliance with the fill and make-up water quality in accordance with VDI 2035 Sheet 1 must be taken into account.
- For details on installation and commissioning, please refer to our installation instructions

Explanation

| | |
|--|--|
| L_N [mm] Nominal length (length of a cooling panel, variable, in mm increments) | $t_{r,c}/t_{r,h}$ [°C] Intake temperature in the ceiling area |
| B_N [mm] Nominal width (multiples of 200 mm) | $\Delta t = t_{r,c} - t_{w,m,c}$ [K] Temperature difference between room temperature and mean water temperature |
| B [mm] Width ($B = B_N - 30$ mm) | $\Delta p_{w,c}$ [Pa] Pressure loss in a cooling water circuit (several elements can be combined here) |
| H [mm] Cooling panel height | $\Delta p_{w,h}$ [Pa] Pressure loss in a heating water circuit (several elements can be combined here) |
| B [mm] Meander division | |
| $q_{v,w,c}$ [l/h] Water flow rate – cooling | $\phi_{w,c,a}$ [W/m ²] Specific cooling capacity in relation to the active area |
| $q_{v,w,h}$ [l/h] Water flow rate – heating | $\phi_{w,c,p}$ [W/m ²] Specific cooling capacity in relation to the panel area |
| $\Phi_{w,c}$ [W] Total cooling capacity in relation to the active area | $\phi_{w,c,i}$ [W/m ²] Specific cooling capacity in relation to the installation area |
| $t_{w,s,c}$ [°C] Water flow temperature | $\phi_{w,c,t}$ [W/m ²] Specific cooling capacity in relation to the room area |
| $t_{w,r,c}$ [°C] Water return temperature | A_t [m ²] Test room area |
| $t_{w,m,c}$ [°C] Mean water temperature ($t_{w,m,c} = t_{w,s,c} + t_{w,r,c} / 2$) | A_i [m ²] Installation area |
| $t_{r,c}$ [°C] Room temperature – cooling | A_p [m ²] Panel area |
| $t_{r,h}$ [°C] Room temperature – heating | A_a [m ²] Active area |