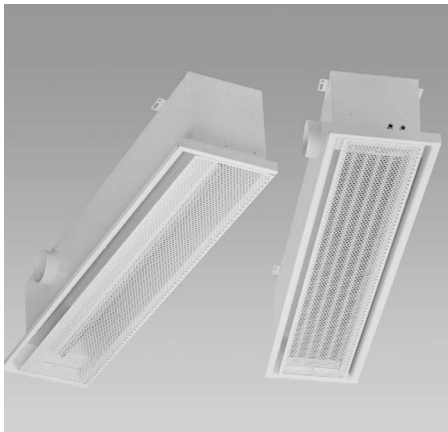


## Cooling and heating systems

**4.3.1** Active chilled beam DK-LIG/Z

**4.3.3** Active chilled beam DK-LIG/E



## Preliminary remarks

Along with large-surface cooling ceilings, KRANTZ KOMPONENTEN provides passive and active chilled beams for indoor air cooling. While the passive DK-F type operates without supply air (primary air) simply as a recirculating air cooler using gravity, the DK-L has an additional ventilation function through primary air connection. This way the requisite outdoor air flow rate for the occupants can be supplied to the room. KRANTZ KOMPONENTEN supplies the following types of active chilled beam

- One-sided discharge, best for placement along the facade or wall, type DK-LIG/E.
  - Two-sided discharge for placement at a distance to the wall or in the centre of the room, type DK-LIG/Z.
- Both types can also be used for heating.

## Construction design

The main components of the DK-LIG active chilled beams are the top-closed housing 1 with air connection spigot 1a, the built-in heat exchanger 2 with terminals 2a for 2-pipe or 4-pipe systems, the nozzle disk 3 with the primary air jet nozzles 3a and the perforated screen 4.

In the DK-LIG/Z 2-sided discharge type the screen 4 is positioned symmetrically between the ventilation shafts 5. In the 1-sided discharge type DK-LIG/E, the screen can be placed symmetrically or asymmetrically (see Figure 2). The screen is also available with different visual perforation; information on request.

As required, the connection spigot 1a can be placed lengthwise at the housing on the left (view from heat exchanger connection side) or endwise. Type DK-LIG/Z is available with a connection spigot on the right. The standard width of the endwise ceiling connection bracket 1b is 15 mm. The connection brackets can be provided with other dimensions as needed for length adjustment to the ceiling system; information on request.

## Mode of operation

The primary air is discharged at high momentum through the nozzles 3a and induces indoor air (secondary air) in the process, which reflows through the heat exchanger from below. Primary and secondary air are mixed intensively and discharged into the room as supply air via the ventilation shafts 5.

The DK-LIG can be built flush into suspended ceilings or placed downstanding below the concrete ceiling. In flush installation the supply air glides along the ceiling

and flows horizontally and evenly at low velocity into the room.

In downstanding installation, this effect is obtained with narrow lateral wings 6.

Because the secondary air flows from below into the DK-LIG chilled beam, there is no need for the usual re-flow apertures in the ceiling. This simplifies project planning at the early stage of a project since there is no need for consultation with the architect on this. The heat exchanger is also easily accessible from below, after removal of the screen 4.

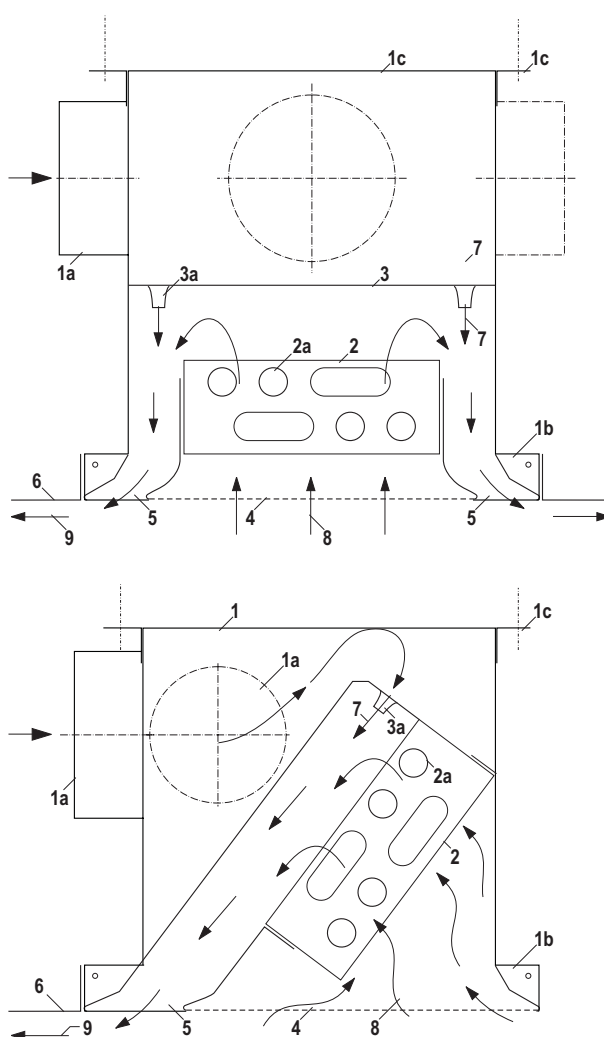


Figure 1: Construction and function of the DK-LIG active chilled beam,  
 above: 2-sided discharge, symmetrical screen  
 below: 1-sided discharge, asymmetrical screen

Key:

1 Housing	2a Terminals	5 Ventilation shaft
1a Connection spigot	3 Nozzle disk	6 Wing
1b Connection bracket	3a Primary air jet nozzles	7 Primary air
1c L-fastener	4 Perforated screen	8 Secondary air
2 Heat exchanger		9 Supply air

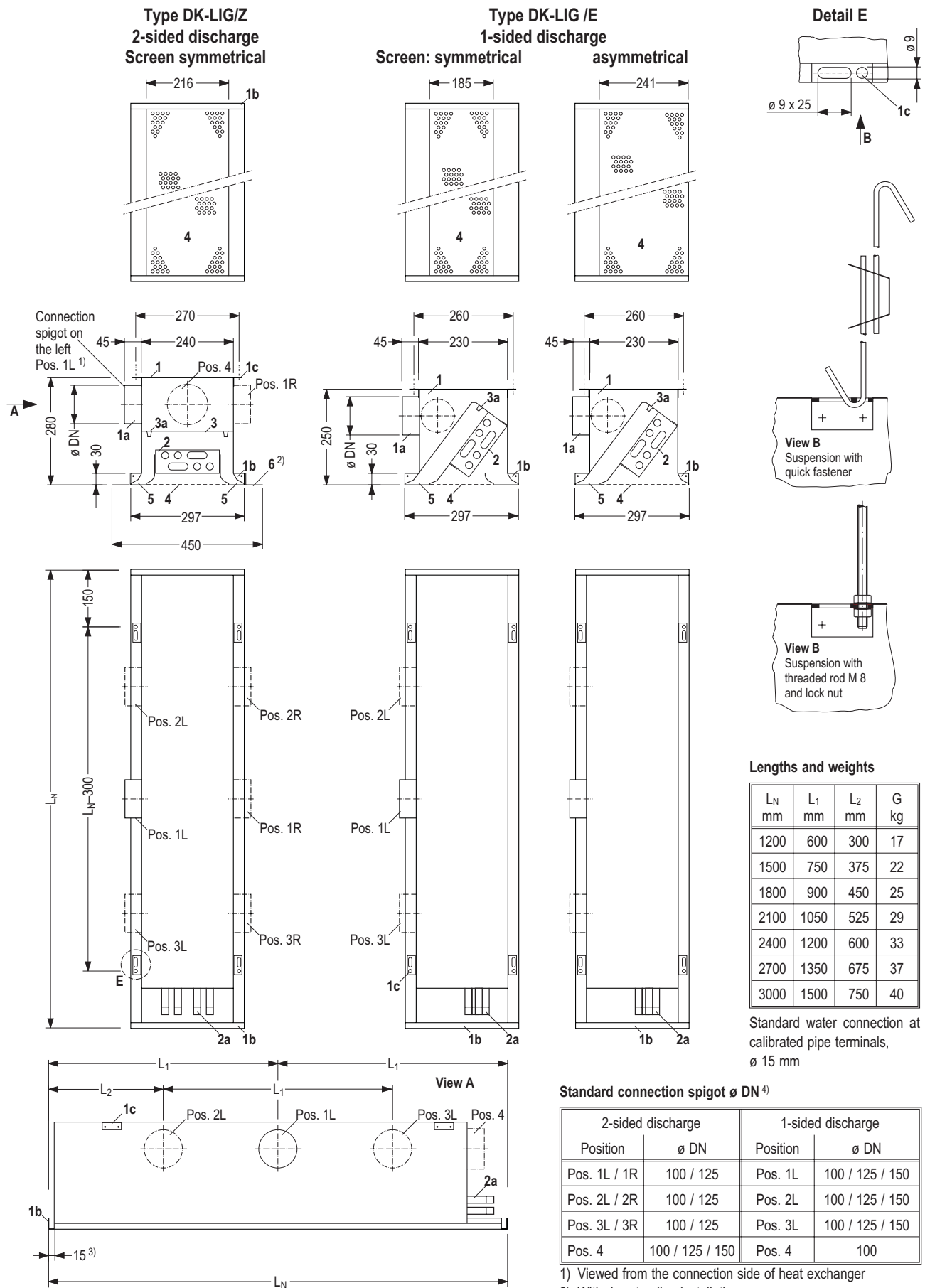


Figure 2: DK-LIG active chilled beam, dimensions

1) Viewed from the connection side of heat exchanger  
 2) With dowstanding installation  
 3) Other widths possible on request  
 4) Smaller  $\varnothing$  DN and several connection spigots possible

## Planning specifications

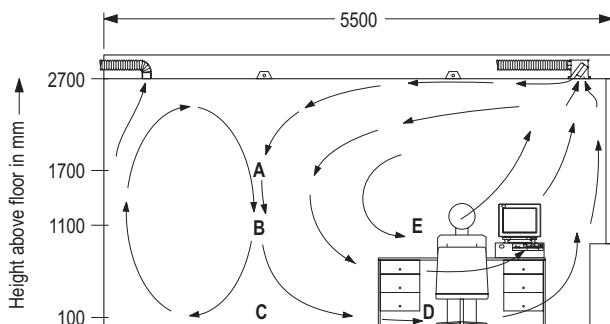
### DK-LIG/E chilled beam with 1-sided discharge

The chilled beam with 1-sided discharge was generally developed for parallel, close placement along the facade (Figure 3). The advantage of this layout is that the ascending warm convection air at the window pane or wall in summer can flow directly into the heat exchanger. The temperature of the convection air is higher than that of the indoor air due to the influence of the warm outer facade. As a result, the difference between mean water temperature and the inflowing air increases and with it the cooling capacity.

Figure 3 shows a representative example of indoor air velocities at various critical points correlated with primary air flow and total cooling capacity.

Despite the high cooling capacity, the indoor air velocities in the workplace zone near the facade (D and E) are low. Slightly higher velocities depending on the thermal load do not arise until the supply air detaches from the ceiling (zone A). Nevertheless, even here at a cooling capacity of up to approx. 360 W/m and a primary air flow of 11 l/(s·m) [40 m<sup>3</sup>/(h·m)] the indoor air velocities are relatively low, 0.2 m/s. In this example (continuous chilled beam strip along the facade in a room about 5 m deep), the specifications are as follows:

- Specific cooling capacity = 72 W/m<sup>2</sup> floor area
- Specific primary air flow = 2.2 l/(s·m<sup>2</sup>) [8 m<sup>3</sup>/(h·m<sup>2</sup>)]



Zone	Primary air flow rate in l/(s·m) [m <sup>3</sup> /(h·m)]				
	25 [90]	19.5 [70]	14 [50]	11 [40]	8 [30]
	Total cooling capacity in W/m (air $\Delta\vartheta_{Z,R} = -8$ K and water $\Delta\vartheta_{R,WK} = -10$ K)				
	620	530	420	360	300
A	0.26	0.24	0.22	0.20	0.20
B	0.21	0.19	0.17	0.16	0.15
C	0.36	0.29	0.19	0.16	0.16
D	0.15	0.11	0.13	0.12	0.11
E	0.13	0.11	0.10	0.08	0.07

Figure 3: Chilled beam with 1-sided discharge, indoor air velocities in m/s in occupied zone, example

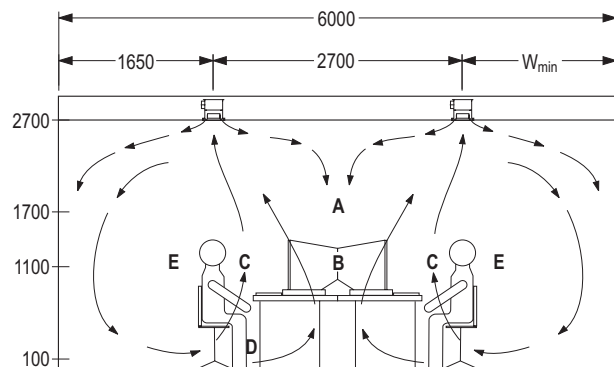
**Note:** We recommend in-ceiling or hanging lighting at least 20 cm from the ceiling. Lighting built onto the ceiling is not suitable because it deflects the air jet from the ceiling resulting in an early descent of supply air and thus higher air velocities.

### DK-LIG/Z chilled beam with 2-sided discharge

The chilled beam with 2-sided discharge is frequently positioned at rightangles to the facade, in the centre of the facade axis. Sometimes placement parallel to the facade is required, e.g. as a continuous strip or in the form of single devices spaced in a row.

Maximum indoor air velocities depend on the spacing between the chilled beams, their distance from the wall and on the primary air flow rate. Figure 4 shows some velocities at different points in the room. For example, at a primary air flow rate of 11 l/(s·m) [40 m<sup>3</sup>/(h·m)] maximum indoor air velocities of 0.14 – 0.18 m/s occur. Total cooling capacity amounts here to 360 W/m.

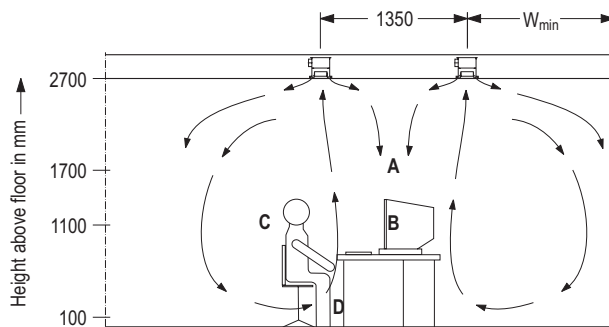
To obtain low indoor air velocities (for office applications) with a spacing of only 1350 mm (Figure 5), a primary air flow rate of about 8 l/(s·m) [30 m<sup>3</sup>/(h·m)] should be selected.



W <sub>min</sub> in mm	Primary air flow rate in l/(s·m) [m <sup>3</sup> /(h·m)]				
	25 [90]	19.5 [70]	14 [50]	11 [40]	8 [30]
	1600	1300	1000	800	600
Zone	Total cooling capacity in W/m (air $\Delta\vartheta_{Z,R} = -8$ K and water $\Delta\vartheta_{R,WK} = -10$ K)				
	620	530	420	360	300
A	0.34	0.31	0.28	0.18	0.16
B	0.29	0.27	0.25	0.16	0.14
C	0.20	0.17	0.15	0.14	0.13
D	0.22	0.20	0.18	0.14	0.13
E	0.22	0.18	0.16	0.14	0.12

Figure 4: Chilled beam with 2-sided discharge, indoor air velocities in m/s in occupied zone with broader spacing, example

For other spacings, an interpolation between 1350 and 2700 mm can be made.



W <sub>min</sub> in mm	Primary air flow rate in l/(s·m) [m <sup>3</sup> /(h·m)]			
	19.5 [70]	14 [50]	11 [40]	8 [30]
1300	1000	800	600	
Zone	Total cooling capacity in W/m (air Δ <i>θ</i> <sub>Z,R</sub> = -8 K and water Δ <i>θ</i> <sub>R,WK</sub> = -10 K)			
	530	420	360	300
A	0.32	0.28	0.24	0.22
B	0.29	0.26	0.23	0.20
C	0.20	0.18	0.18	0.18
D	0.25	0.22	0.20	0.18

Figure 5: Chilled beam with 2-sided discharge, indoor air velocities in m/s in occupied zone with **narrow** spacing, example

### In general:

The vertical temperature gradient in all cases is ≤ 1 K/m.

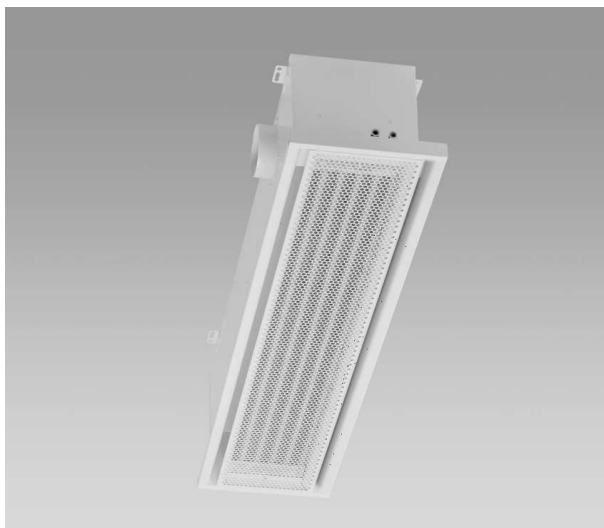


Figure 6: Active DK-LIG/Z chilled beam with 2-sided discharge, symmetrical screen positioning

### Layout

The cooling capacity of the chilled beam is made up of the water-side and air-side cooling capacity. The water-side cooling capacity can be determined with Graphs 1 to 3 and the air-side cooling capacity with Graph 7.

$$\dot{Q}_{\text{total}} = \dot{Q}_K + \dot{Q}_{PK} = \dot{Q}_{BK} \cdot k_0 \cdot k_1 + \dot{Q}_{PK} \text{ in W}$$

The water-side heating capacity is determined with Graphs 4 to 6. Supplementary heating with primary air is possible, but is in most cases unnecessary due to the high water-side heating capacity. In this case, the primary air discharge is isothermal.

$$\dot{Q}_{\text{total}} = \dot{Q}_H + \dot{Q}_{PH} = \dot{Q}_{BH} \cdot k_0 \cdot k_2 + \dot{Q}_{PH}^{1)} \text{ in W}$$

The water flow rate and water-side pressure loss can be determined with Graphs 8 to 10.

Charts and tables 11 to 14 are used to determine air-side pressure loss and sound power level.

The layout of the chilled beams is geared to the diameter of the primary air jet nozzles. The nozzle diameter specification depends on the primary air flow rate; see Table 1.

Table 1: Recommended nozzle diameter related to primary air flow rate

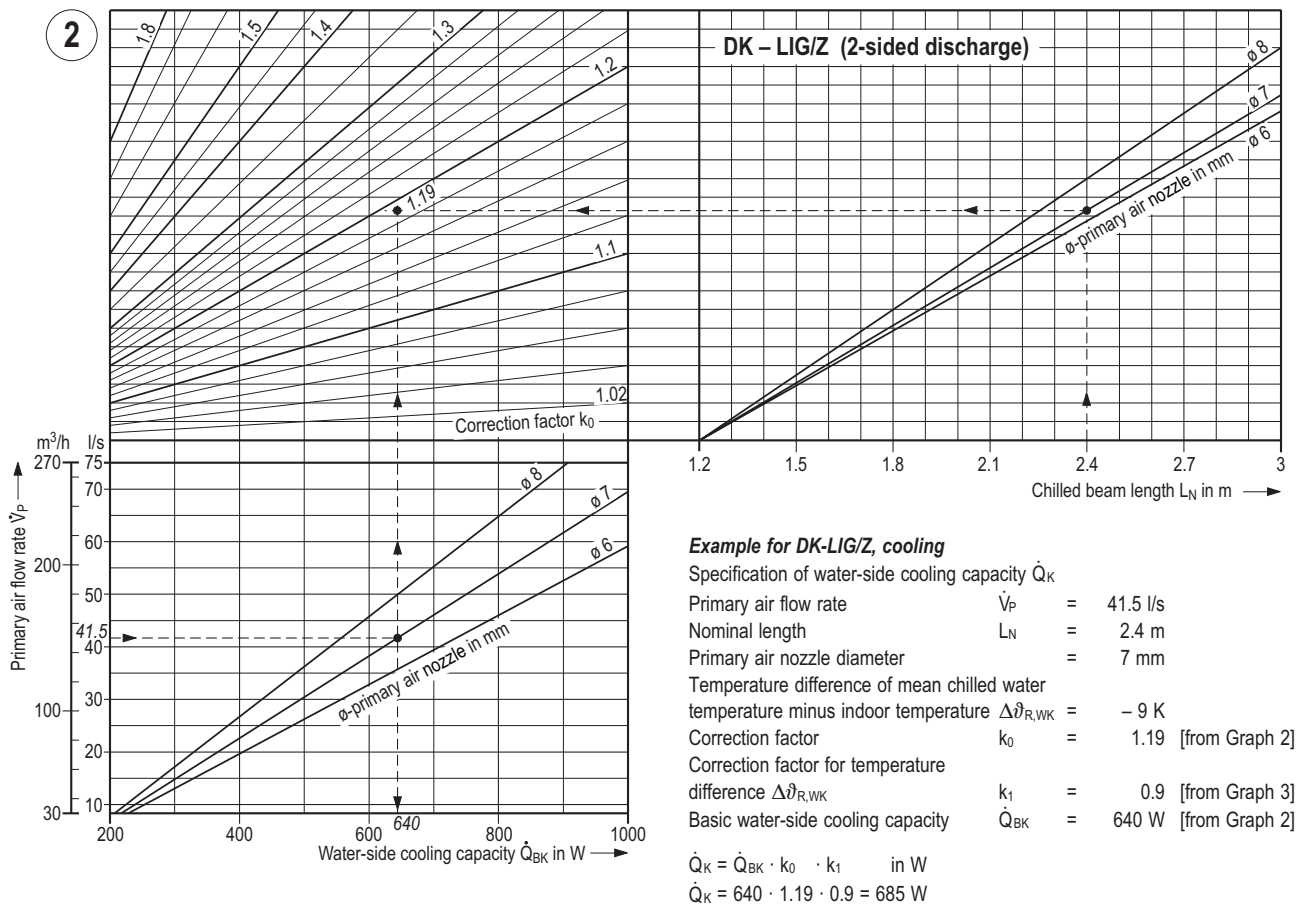
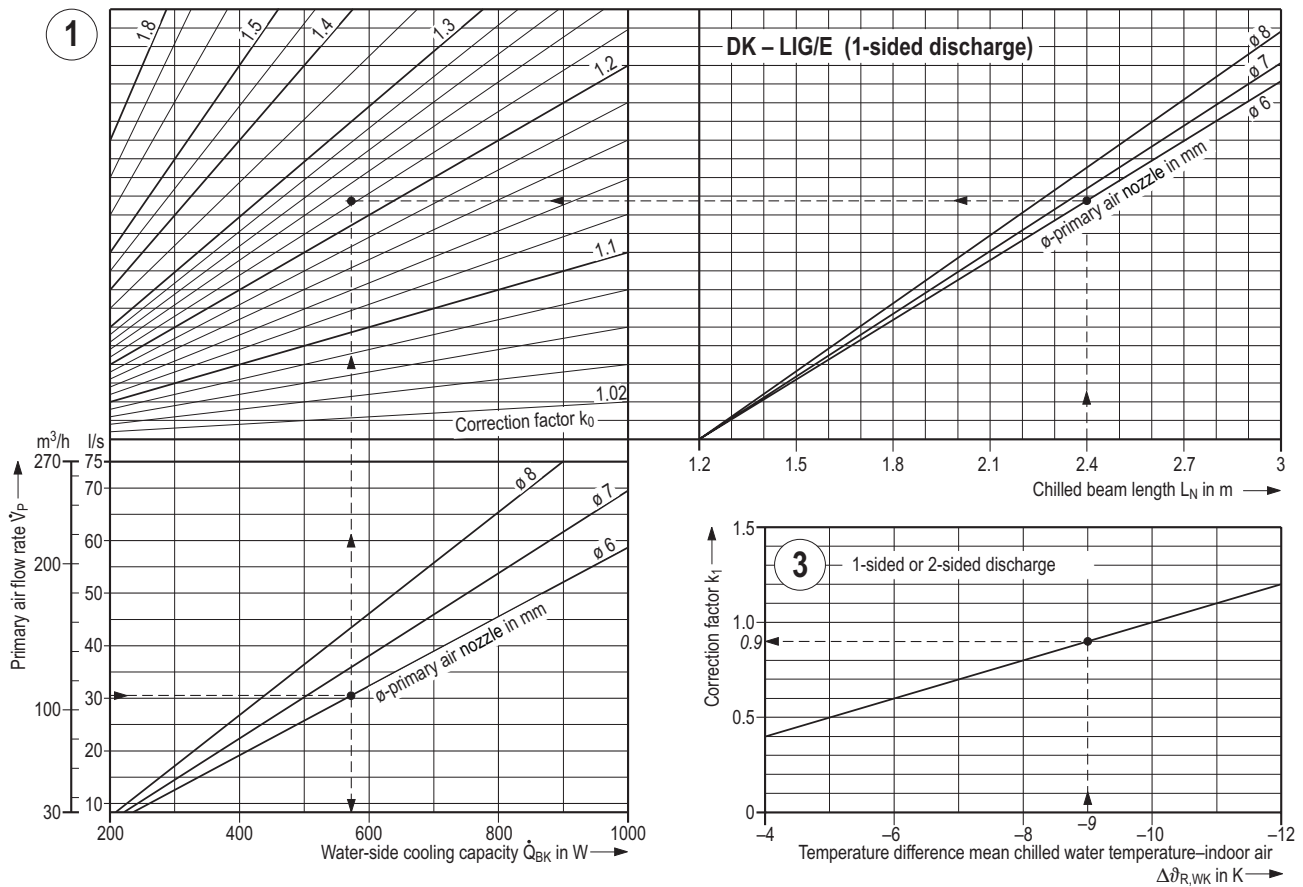
Air flow rate in l/(s·m) [m <sup>3</sup> /(h·m)] <sup>2)</sup>	Nozzle ø in mm
8 to 15 [30 to 55]	6
11 to 19.5 [40 to 70]	7
16.5 to 25 [60 to 90]	8

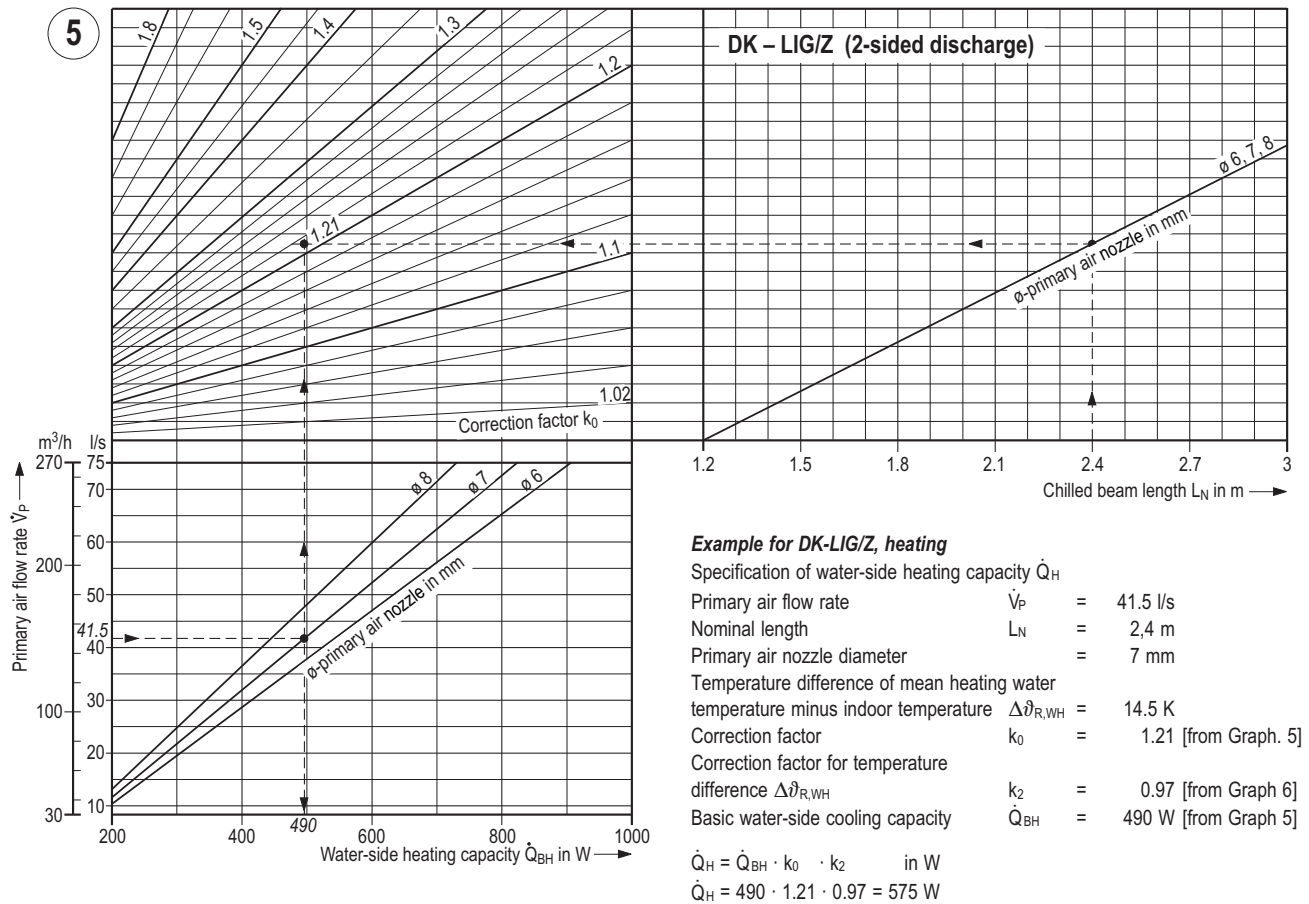
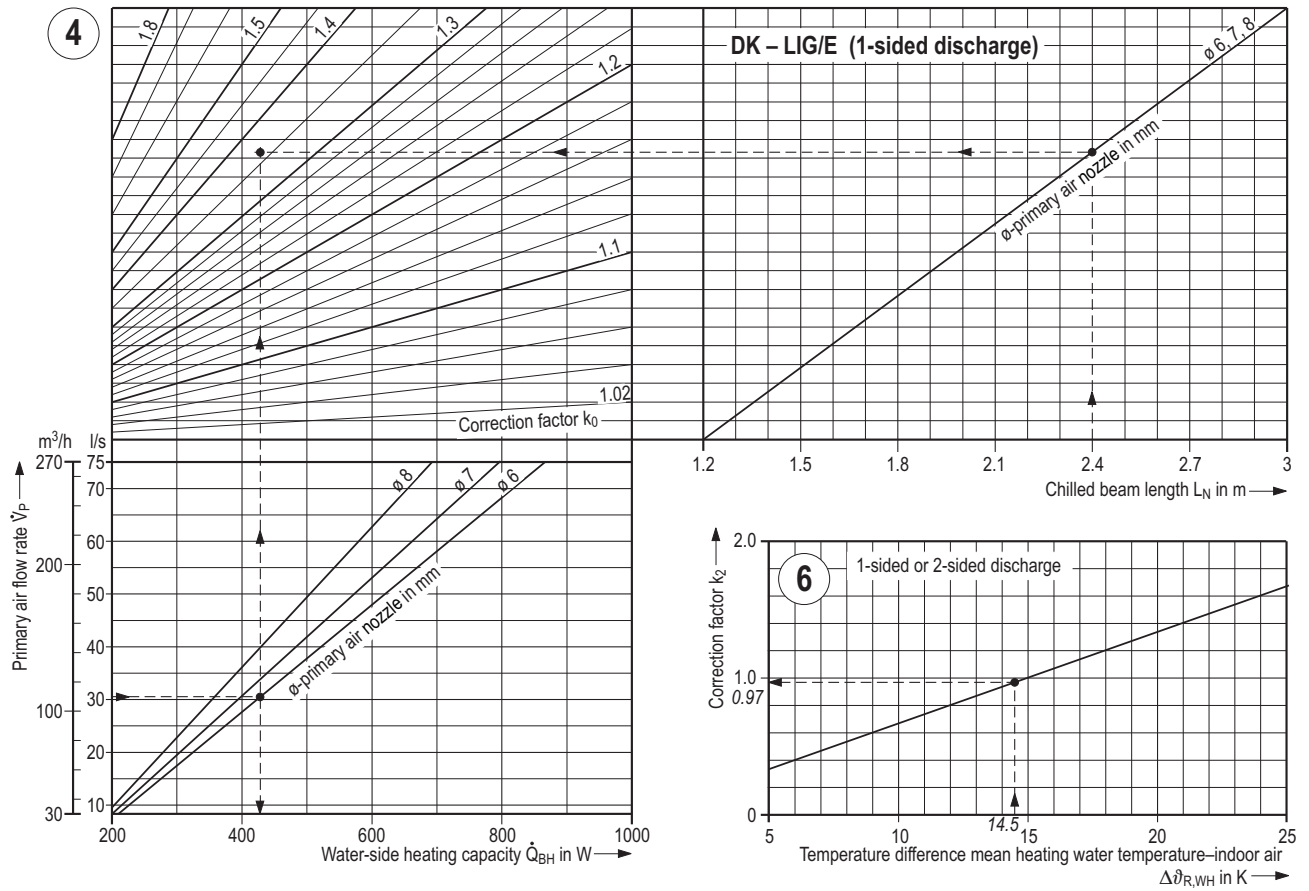
### Key to graphs on pages 6 to 10

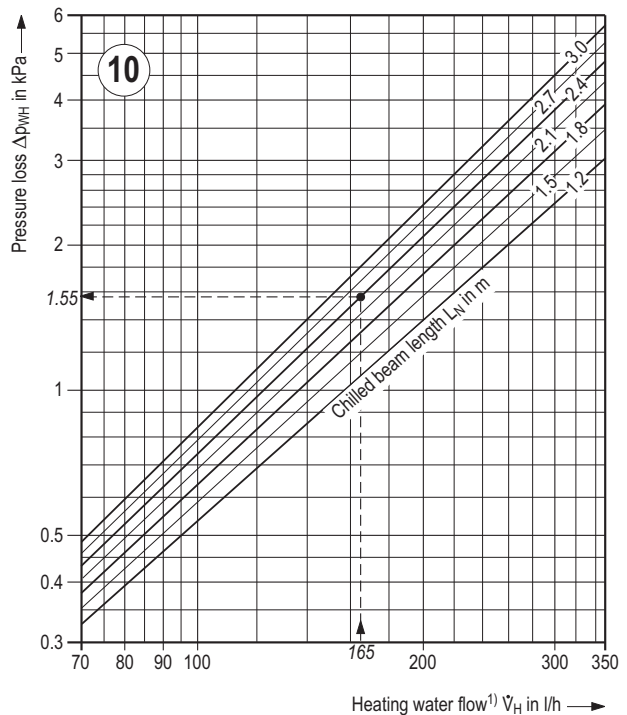
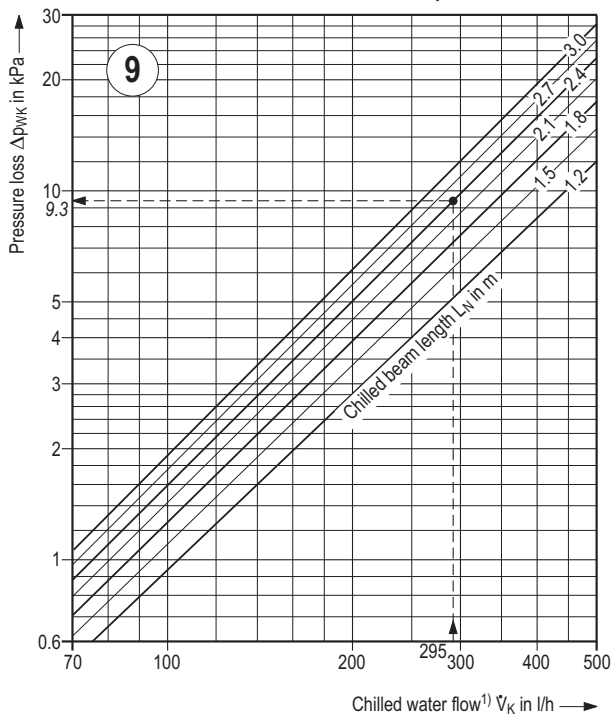
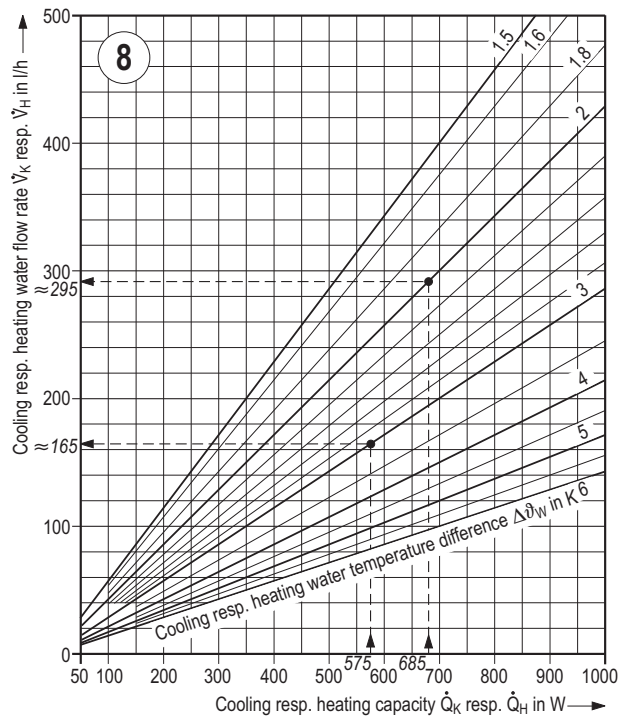
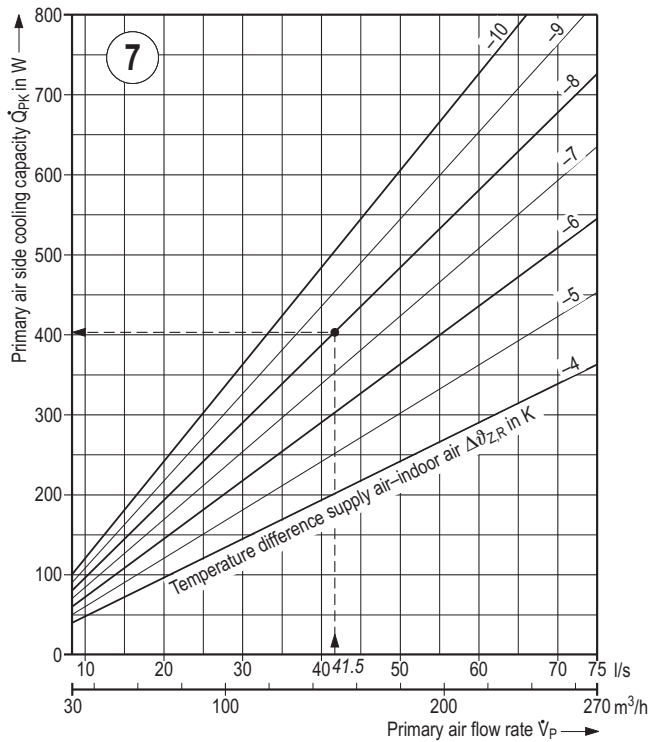
- $\dot{Q}_K$  = Water-side cooling capacity in W for nominal length L<sub>N</sub>...
- $\dot{Q}_{BK}$  = Water-side basic cooling capacity in W
- $\dot{Q}_H$  = Water-side heating capacity in W related to nominal length L<sub>N</sub>...
- $\dot{Q}_{BH}$  = Water-side basic heating capacity in W
- $\dot{V}_P$  = Primary air flow rate in l/s [m<sup>3</sup>/h]
- L<sub>N</sub> = Nominal length of chilled beam in m
- Δ*θ*<sub>R,WK</sub> = Temperature difference of mean chilled water temperature minus indoor temperature in K
- Δ*θ*<sub>R,WH</sub> = Temperature difference of mean heating water temperature minus indoor temperature in K
- Δ*θ*<sub>Z,R</sub> = Temperature difference of supply air–indoor air in K
- Δ*θ*<sub>W</sub> = Chilled water temperature difference in K
- Δ*p*<sub>WK</sub> = Chilled-water-side pressure loss in kPa
- Δ*p*<sub>WH</sub> = Heating-water-side pressure loss in kPa
- $\dot{V}_K$  = Chilled water flow rate in l/h
- $\dot{V}_H$  = Heating water flow rate in l/h
- $\dot{Q}_{PK}$  = Primary-air-side cooling capacity in W
- L<sub>W0</sub> = Basic sound power level in dB(A)
- L<sub>WA</sub> = Sound power level in dB(A)
- Δ*p*<sub>t</sub> = Air-side pressure loss in Pa
- k<sub>0</sub> = Correction factor for various beam lengths
- k<sub>1</sub> = Correction factor for temperature difference Δ*θ*<sub>R,WK</sub>
- k<sub>2</sub> = Correction factor for temperature difference Δ*θ*<sub>R,WH</sub>
- k<sub>3</sub>, k<sub>4</sub>, k<sub>7</sub> = Correction factor for sound power level L<sub>WA</sub>
- k<sub>5</sub>, k<sub>6</sub> = Correction factor for pressure loss Δ*p*<sub>t</sub>
- C<sub>0</sub>, C<sub>1</sub> = Total correction factors for pressure loss Δ*p*<sub>t</sub>

1) In the isothermal case,  $\dot{Q}_{PH} = 0$

2) Related to chilled beam length L<sub>N</sub>







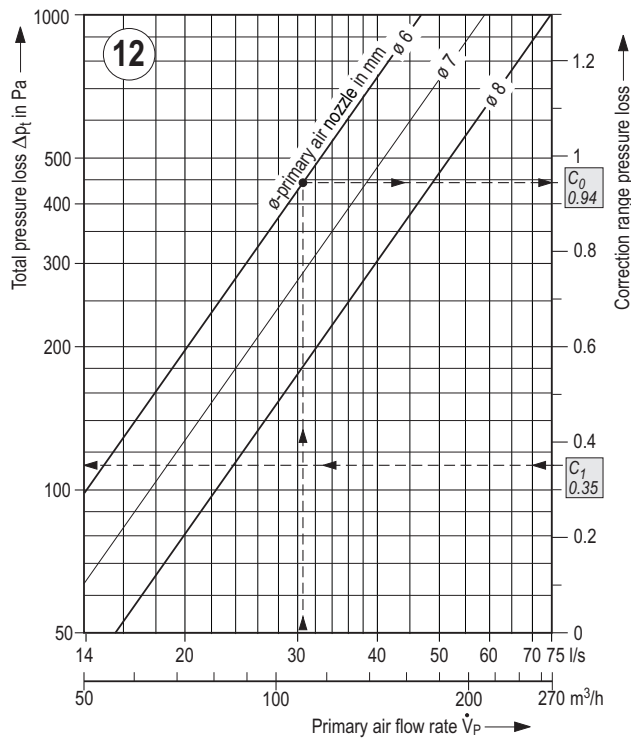
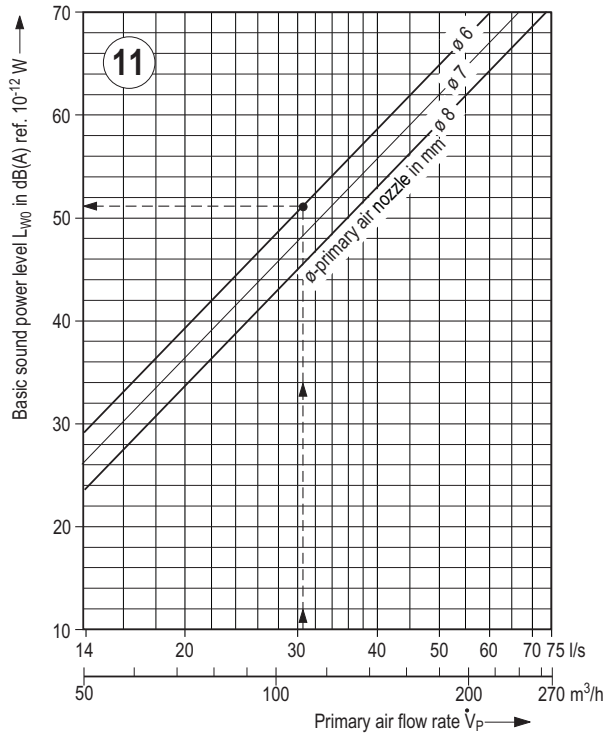
### Example DK-LIG/Z, cooling

Specification of water-side pressure loss DK-LIG/Z,  $L_N = 2.4 \text{ m}$   
 Water-side cooling capacity of chilled beam  
 for nominal length  $L_N = 2.4 \text{ m}$      $\dot{Q}_K = 685 \text{ W}$  [Example Page 6]  
 Nominal length     $L_N = 2.4 \text{ m}$   
 Chilled water flow rate     $\dot{V}_K = 295 \text{ l/h}$  [from Graph 8]  
 Pressure loss     $\Delta p_{WK} = 9.3 \text{ kPa}$  [from Graph 9]

### Example DK-LIG/Z, heating

Specification of water-side pressure loss DK-LIG/Z,  $L_N = 2.4 \text{ m}$   
 Water-side heating capacity of chilled beam  
 for nominal length  $L_N = 2.4 \text{ m}$      $\dot{Q}_H = 575 \text{ W}$  [Example Page 7]  
 Nominal length     $L_N = 2.4 \text{ m}$   
 Heating water flow rate     $\dot{V}_H = 165 \text{ l/h}$  [from Graph 8]  
 Pressure loss     $\Delta p_{WH} = 1.55 \text{ kPa}$  [from Graph 10]

1) Recommended minimum chilled or heating water flow rate = 90 l/h



### Example DK-LIG/E

Specification of sound power level  $L_{WA}$  and pressure loss  $\Delta p_t$

Primary air flow rate	$\dot{V}_P$	=	30.5 l/s
Nominal length	$L_N$	=	2.4 m
Primary air nozzle diameter		=	6 mm
Connection spigot		=	DN 125
Number of spigots		=	1 unit
Position of spigots <sup>1)</sup>		=	1 L

Sound power level  $L_{WA}$ :

Basic sound power level	$L_{W0}$	=	51 dB(A) ref. $10^{-12}W$	[from Graph 11]
Correction factor	$k_3$	=	-4 dB(A)	[from Table 11a]
Correction factor	$k_4$	=	-12 dB(A)	[from Table 11b]

$$L_{WA} = L_{W0} + k_3 + k_4 + k_7 \text{ in dB(A) ref. } 10^{-12}W$$

$$L_{WA} = 51 - 4 - 12 = 35 \text{ dB(A) ref. } 10^{-12}W \text{ } ^2)$$

Spigot correction factor $k_3$ for sound power level in dB(A) ref. $10^{-12}W$ (11a)			
Connection spigot DN	Primary air jet nozzles		
	$\varnothing 6$	$\varnothing 7$	$\varnothing 8$
1 x 100	0	0	0
2 x 100	-6	-8	-10
1 x 125	-4	-5	-6
2 x 125	-19	-20	-22
1 x 150	-8	-10	-13

Length correction factor $k_4$ for sound power level in dB(A) ref. $10^{-12}W$ (11b)			
Nominal length $L_N$	Primary air jet nozzles		
	$\varnothing 6$	$\varnothing 7$	$\varnothing 8$
1.2	0	0	0
1.5	-3	-2	-1
1.8	-6	-4	-2
2.1	-9	-6	-3
2.4	-12	-8	-4
2.7	-15	-10	-5
3.0	-15	-12	-6

Spigot position correction factor $k_7$ for sound power level with endwise connection spigot (11c)	
Primary air jet nozzles	$L_{WA}$ in dB(A) ref. $10^{-12}W$
$\varnothing 6$	-3
$\varnothing 7$	-3
$\varnothing 8$	-2

Spigot correction factor $k_5$ for pressure loss (12a)			
Connection spigot DN	Primary air jet nozzles		
	$\varnothing 6$	$\varnothing 7$	$\varnothing 8$
2 x 125	-0.04	-0.04	-0.04

For other connection spigots- $\varnothing$  is  $k_5 = 0$

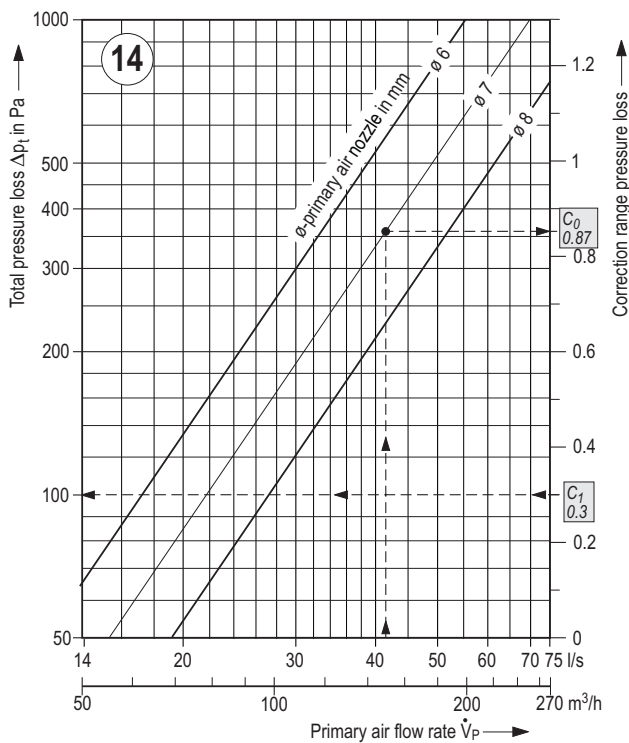
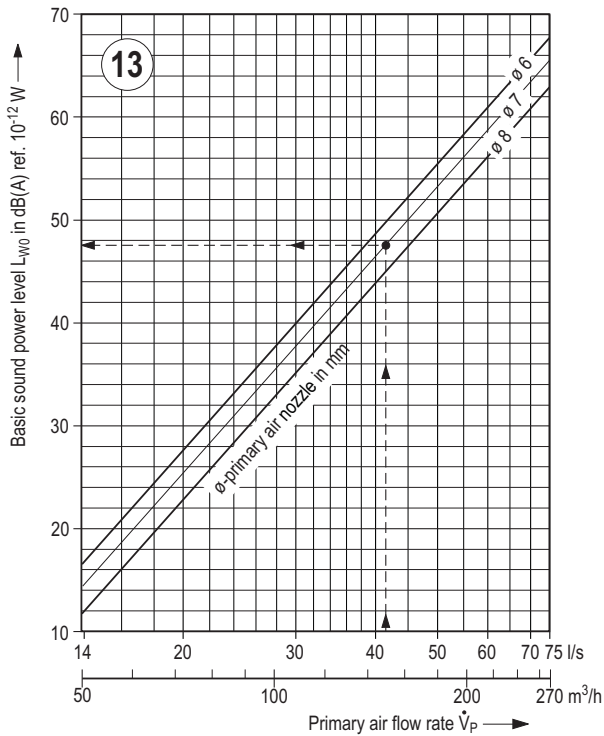
Length correction factor $k_6$ for pressure loss (12b)			
Nominal length $L_N$	Primary air jet nozzles		
	$\varnothing 6$	$\varnothing 7$	$\varnothing 8$
1.2	0	0	0
1.5	-0.23	-0.23	-0.24
1.8	-0.36	-0.37	-0.37
2.1	-0.48	-0.48	-0.49
2.4	-0.59	-0.59	-0.60
2.7	-0.69	-0.70	-0.71
3.0	-0.79	-0.80	-0.81

Pressure loss  $\Delta p_t$ :

Total correction factor	$C_0$	=	0.94	[from Graph 12]
Correction factor	$k_5$	=	0	[from Table 12a]
Correction factor	$k_6$	=	-0.59	[from Table 12b]
Total correction factor	$C_1$	=	$C_0 + k_5 + k_6$	
	$C_1$	=	$0.94 - 0 - 0.59 = 0.35$	
Total pressure loss	$\Delta p_t$	=	115 Pa	[from Graph 12]

1) See table on Page 3

2) Correction factor  $k_7$  is not required for this example as the connection spigots are lateral.



### Example DK-LIG/Z

Specification of sound power level  $L_{WA}$  and pressure loss  $\Delta p_t$

Primary air flow rate  $\dot{V}_P = 41.5$  l/s  
 Nominal length  $L_N = 2.4$  m  
 Primary air nozzle diameter = 7 mm  
 Connection spigot = DN 125  
 Number of spigots = 1 unit  
 Position of spigots <sup>1)</sup> = 1 L

Sound power level  $L_{WA}$ :

Basic sound power level  $L_{W0} = 48$  dB(A) ref.  $10^{-12}W$  [from Graph 13]  
 Correction factor  $k_3 = -4$  dB(A) [from Table 13a]  
 Correction factor  $k_4 = -8$  dB(A) [from Table 13b]

$L_{WA} = L_{W0} + k_3 + k_4 + k_7$  in dB(A) ref.  $10^{-12}W$

$L_{WA} = 48 - 4 - 8 = 36$  dB(A) ref.  $10^{-12}W$  <sup>2)</sup>

Spigot correction factor $k_3$ for sound power level in dB(A) ref. $10^{-12}W$ (13a)			
Connection spigot DN	Primary air jet nozzles		
	$\varnothing 6$	$\varnothing 7$	$\varnothing 8$
1 x 100	0	0	0
2 x 100	-3	-7	-11
1 x 125	-2	-4	-6
2 x 125	-9	-16	-23
1 x 150	-4	-9	-14

Length correction factor $k_4$ for sound power level in dB(A) ref. $10^{-12}W$ (13b)			
Nominal length $L_N$	Primary air jet nozzles		
	$\varnothing 6$	$\varnothing 7$	$\varnothing 8$
1.2	0	0	0
1.5	-3	-2	-1
1.8	-6	-4	-2
2.1	-9	-6	-3
2.4	-12	-8	-4
2.7	-15	-10	-5
3.0	-18	-12	-6

Spigot position correction factor $k_7$ for sound power level with endwise connection spigot (13c)	
Primary air jet nozzles	$L_{WA}$ in dB(A) ref. $10^{-12}W$
$\varnothing 6$	-3
$\varnothing 7$	-3
$\varnothing 8$	-2

Spigot correction factor $k_5$ for pressure loss (14a)			
Connection spigot DN	Primary air jet nozzles		
	$\varnothing 6$	$\varnothing 7$	$\varnothing 8$
1 x 100	0	0	0
2 x 100	-0.02	-0.02	-0.02
1 x 125	-0.01	-0.01	-0.01
2 x 125	-0.1	-0.1	-0.1
1 x 150	-0.04	-0.04	-0.04

Length correction factor $k_6$ for pressure loss (14b)			
Nominal length $L_N$	Primary air jet nozzles		
	$\varnothing 6$	$\varnothing 7$	$\varnothing 8$
1.2	0	0	0
1.5	-0.22	-0.23	-0.23
1.8	-0.34	-0.35	-0.36
2.1	-0.44	-0.46	-0.47
2.4	-0.54	-0.56	-0.58
2.7	-0.64	-0.66	-0.68
3.0	-0.72	-0.75	-0.79

Pressure loss  $\Delta p_t$ :

Total correction factor  $C_0 = 0.87$  [from Graph 14]

Correction factor  $k_5 = -0.01$  [from Table 14a]

Correction factor  $k_6 = -0.56$  [from Table 14b]

Total correction factor  $C_1 = C_0 + k_5 + k_6$

$C_1 = 0.87 - 0.01 - 0.56 = 0.3$

Total pressure loss  $\Delta p_t = 100$  Pa [from Graph 14]

1) See table on Page 3

2) Correction factor  $k_7$  is not required for this example as the connection spigots are lateral.

## Layout example: Active chilled beam, cooling and heating

### Prespecified:

1	Office room with 2x facade axis of 1.25 m		
2	Room width	=	2.5 m [from 1]
3	Room depth	=	5.5 m
4	Room height	=	2.7 m
5	Floor area	=	13.75 m <sup>2</sup> [2 · 3]
6	Cubic capacity	=	37.12 m <sup>3</sup> [5 · 4]
7	Indoor air exchange	=	4 h <sup>-1</sup>
8	Primary air flow rate	$\dot{V}_P$	≈ 41.5 l/s [6 · 7 : 3.6]
9	Total cooling capacity	$\dot{Q}_{K \text{ total}}$	= 960 W
10	Total heating capacity	$\dot{Q}_{H \text{ total}}$	= 550 W
11	Chilled water flow temperature	$\vartheta_{KV}$	= 16°C
12	Chilled water return temperature	$\vartheta_{KR}$	= 18°C
13	Indoor temperature in summer	$\vartheta_{RS}$	= 26°C
14	Primary air temperature in summer	$\vartheta_{PS}$	= 18°C
15	Heating water flow temperature	$\vartheta_{HV}$	= 38°C
16	Heating water return temperature	$\vartheta_{HR}$	= 35°C
17	Indoor temperature in winter	$\vartheta_{RW}$	= 22°C
18	Primary air temperature in winter	$\vartheta_{PW}$	= 22°C [isothermal]

### Summer:

19	Temperature difference of mean chilled water temperature minus indoor temperature	$\Delta\vartheta_{R,WK}$	= -9 K [from (11 + 12) · 0.5 - 13]
20	Temperature difference supply air–indoor air	$\Delta\vartheta_{Z,R}$	= 8 K [13 - 14]
21	Chilled water temperature difference	$\Delta\vartheta_W$	= 2 K [12 - 11]

### Winter:

22	Temperature difference of mean heating water temperature minus indoor temperature	$\Delta\vartheta_{R,WH}$	= 14.5 K [from (15 + 16) · 0.5 - 17]
23	Temperature difference supply air–indoor air	$\Delta\vartheta_{Z,R}$	= 0 K [Primary air temperature = isothermal]
24	Heating water temperature difference	$\Delta\vartheta_W$	= 3 K [15 - 16]

### Selected

25	2-sided discharge		
26	Four-pipe system		
27	Nominal length	$L_N$	= 2.4 m
28	Type DK-LIG/Z - 4 - 2.4		
29	Specific primary air flow rate	$\dot{V}_P$	= 17.3 l/(s·m) [8 : 27]
30	Primary air nozzle diameter		= 7 mm [from Table 1, Page 5]

### Calculation of total cooling capacity

31	$\dot{Q}_{K \text{ total}} = \dot{Q}_K + \dot{Q}_{PK}$		
32	$\dot{Q}_K =$	685 W	[Example Page 6]
33	$\dot{Q}_{PK} =$	405 W	[from Graph 7]
34	$\dot{Q}_{K \text{ total}} =$	1090 W	[from 31] 1090 W > 960 W [34 > 9] Requisite cooling capacity attained!

### Calculation of total heating capacity

35	$\dot{Q}_{H \text{ total}} = \dot{Q}_H + \dot{Q}_{PH}$		
36	$\dot{Q}_H =$	575 W	[Example Page 7]
37	$\dot{Q}_{PH} =$	0 W	[Primary air = isothermal]
38	$\dot{Q}_{H \text{ total}} =$	575 W	[from 35] 575 W > 550 W [38 > 10] Requisite heating capacity attained!

### Calculation of water-side pressure loss

39	$\dot{V}_K =$	295 l/h	[from Graph 8]
40	$\Delta p_{WK} =$	9.3 kPa	[from Graph 9]
41	$\dot{V}_H =$	165 l/h	[from Graph 8]
42	$\Delta p_{WH} =$	1.55 kPa	[from Graph 10]

### Calculation of sound power level and pressure loss

43	$L_{WA} =$	36 dB(A) ref. 10 <sup>-12</sup> W	[Example Page 10]
44	$\Delta p_t =$	100 Pa	[Example Page 10]

## Preventing temperature drop below dew point

The dew point temperature of the indoor air must always be lower than the surface temperature of the flow pipe. This is a reliable way of preventing condensation. To enhance reliability, we recommend using dew point detectors. These are fitted at the coldest or most suitable place on the chilled water flow pipe. These signal the start of local condensation at an early stage and trigger an increase in water flow temperature or a chilled water supply shutoff, for example.

If chilled beams operate in combination with a central air handling system a sufficient dehumidification is usually ensured by the cooling coil, so that dew point temperature stays below the recommended flow temperature of 16°C.

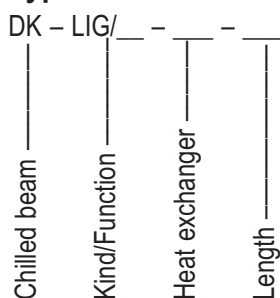
If the building has openable windows, care must be taken to ensure that the dew point temperature of the outside air can remain above 16°C under suitable weather conditions.

For more details please read our publication DS 4076 "Description of cooling ceiling systems", Register 1.2.

## Features

- Active chilled beam with primary air connection for supplying the requisite outdoor air flow rate for the occupants
- With 1-sided and 2-sided discharge
- For placement parallel and/or at rightangles to facade
- Compact unit with high capacity for cooling and heating – cooling capacity to 620 W/m, – heating capacity to 315 W/m
- Horizontal discharge direction for low indoor air velocities in occupied zone
- Suitable for ceiling installation or downstanding
- With housing closed at side and top
- Primary air connection lengthwise or endwise possible
- Also for use in closed ceilings thanks to built-in reflow surfaces for secondary air intake
- Heat exchanger easily accessible from room for cleaning
- Hygiene tested to VDI 6022, Sheet 1 and 3, VDI 3803, DIN 1946, Part 2 and 4
- Many visual design options with an assortment of screens
- Suitable for low stories in new buildings and for refurbishments thanks to low height

### Type code



### Kind/Function

LIG = Active chilled beam with ventilation function and induction device in closed housing

ES = 1-sided discharge, symmetrical screen

EA = 1-sided discharge, asymmetrical screen

Z = 2-sided discharge, symmetrical screen

### Heat exchanger

2 = Two-pipe system

4 = Four-pipe system

### Length

1.2, 1.5, 1.8, 2.1, 2.4, 2.7, 3.0 [m]

### Example:

Active chilled beam with ventilation function and induction device with closed housing, 1-sided discharge, symmetrical screen, heat exchanger for four-pipe system, length 1.8 m

**DK - LIG/ES - 4 - 1.8**

### Tender text

..... Unit

Active chilled beam for cooling and heating indoor air with simultaneous fresh air supply through centrally conditioned primary air,

1-sided discharge,

2-sided discharge,

particularly suitable for installation in closed false ceilings instead of a standard ceiling tile, comprising:

rectangular housing with primary air spigot,

primary air jet nozzles in a row above a built-in supply air shaft for horizontal discharge direction,

perforated screen at housing underside for indoor air reflow (secondary air),

built-in air-water heat exchanger with horizontally placed copper piping and mounted aluminum bars,

1) Higher operating pressure on request

L-fastener at the housing top side for fastening to ceiling.

### Technical Data

Specific water-side cooling capacity: ..... W/m (related to nominal length)

Chilled water flow temperature: ..... °C

Chilled water return temperature: ..... °C

Chilled water flow rate: ..... l/h

Water-side pressure loss: ..... Pa

Max. operating pressure: Standard 6 bar<sup>1)</sup>

Water quality: Mains water

Indoor air temperature: ..... °C

Primary air temperature: ..... °C

Primary air flow rate: ..... l/s (m<sup>3</sup>/h)

Air-side cooling capacity: ..... W

Sound power level: ..... dB(A) ref-10<sup>-12</sup>W

Pressure loss: ..... Pa

### Dimensions/Type

Installation type:  flush with ceiling (standard)

downstanding (with lateral wings)

Nominal length: ..... mm

Nominal width: 297 mm

Nominal height: 250 mm (1-sided discharge)

280 mm (2-sided discharge)

Heat exchanger:  two-pipe system (standard)

four-pipe system (optional)

Water connection:  plug-in connection, ø 15 mm

pipe terminal for soldering or pressing, ø 15 mm

Connection spigot-ø: DN .....; ..... units

Position of connection spigots  left, Pos. ....

right, Pos. ....

endwise, Pos. 4

### Screen for:

sided discharge, symmetrical

1-sided discharge,  symmetrical,

asymmetrical

Perforation: Standard RV 8/9,6

Optional ..... (Ao ≥ 63% required)

Material: Galvanized steel powder-coated or wet-primed

Colour: to RAL 9010 (Standard)

to RAL .....

Make: KRANTZ KOMPONENTEN

Type: DK - LIG/ - - -

Subject to technical alterations!