

**2/S14**  
v 2.4 (en)



# ADJUSTABLE SWIRL DIFFUSER

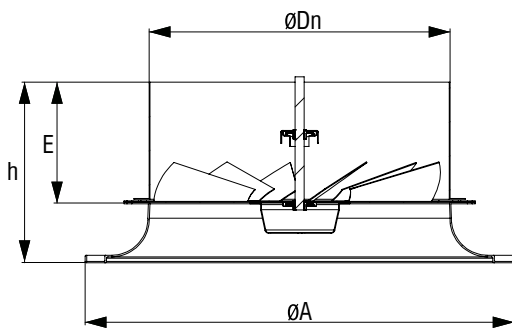
## DKZ

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## Definition of symbols:

|                              |                                                      |                   |                                                                                |
|------------------------------|------------------------------------------------------|-------------------|--------------------------------------------------------------------------------|
| $V$ [m <sup>3</sup> /h]      | - Airflow rate                                       | $v_{Lmax}$ [m/s]  | - Maximal air velocity at distance $L$ (m) from diffuser                       |
| $V_n$ [m <sup>3</sup> /h]    | - Nominal airflow rate                               | $v_h$ [m/s]       | - Average air velocity between two diffusers at distance $h$ (m) from diffuser |
| $V_{uk}$ [m <sup>3</sup> /h] | - Total airflow rate                                 | $\Delta p$ [Pa]   | - Total pressure drop                                                          |
| $h$ [m]                      | - Distance between ceiling and occupied zone         | $t_p$ [°C]        | - Room temperature                                                             |
| $H$ [m]                      | - Room height                                        | $t_z$ [°C]        | - Supply air temperature                                                       |
| $A, B$ [m]                   | - Distance between diffusers                         | $t_m$ [°C]        | - Air-stream core temperature                                                  |
| $x$ [m]                      | - Distance between diffuser and wall                 | $\Delta t_z$ [°C] | - $(t_z - t_p)$                                                                |
| $y$ [m]                      | - Vertical jet throw                                 | $\Delta t_L$ [°C] | - $(t_m - t_p)$                                                                |
| $L$ [m]                      | - Throw distance ( $x+h$ )                           | $i$               | - Induction $V_{uk}/V$                                                         |
| $A_{ef}$ [m <sup>2</sup> ]   | - Effective outlet area                              | $L_{WA}$ [dB(A)]  | - Sound power level                                                            |
| $v_{ef}$ [m/s]               | - Effective air discharge velocity                   |                   |                                                                                |
| $v_L$ [m/s]                  | - Average air velocity at distance $h$ from diffuser |                   |                                                                                |



## DKZ

- Ceiling diffuser for room heights from 4 to 10m.
- Made out of steel sheet, standard RAL 9010
- Adjustable discharge direction

## Options

- RAL...
- Plenum box
- Motor drive

- Vertical discharge (warm jet)



- Discharge at an angle (isothermal jet)



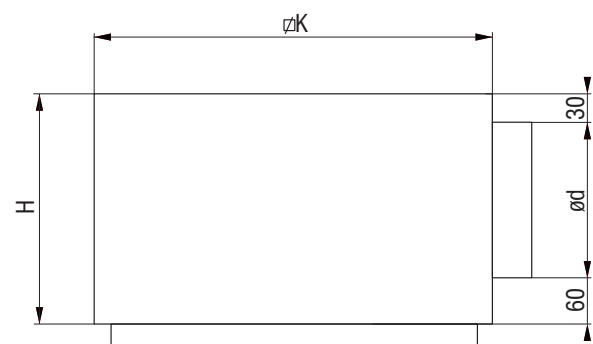
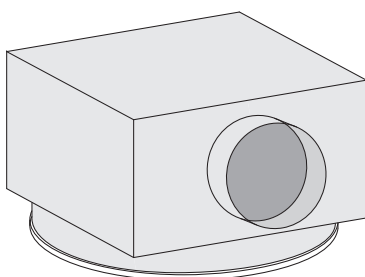
- Horizontal discharge (cold jet)



Table 1: Diffuser dimensions

| DKZ | $V_{min}$           | $V_{max}$           | $\varnothing A$ | $\varnothing D_n$ | E    | h    | $\varnothing K$ | H    | $\varnothing d$ |
|-----|---------------------|---------------------|-----------------|-------------------|------|------|-----------------|------|-----------------|
|     | [m <sup>3</sup> /h] | [m <sup>3</sup> /h] | [mm]            | [mm]              | [mm] | [mm] | [mm]            | [mm] | [mm]            |
| 315 | 300                 | 1200                | 464             | 313               | 143  | 205  | 384             | 340  | 248             |
| 400 | 600                 | 2200                | 567             | 398               | 158  | 238  | 484             | 405  | 313             |
| 630 | 1000                | 4300                | 871             | 628               | 258  | 383  | 790             | 490  | 398             |
| 800 | 1400                | 5200                | 1077            | 798               | 408  | 568  | 950             | 590  | 498             |

## Plenum box for round diffuser UPK2



## ADJUSTABLE SWIRL DIFFUSER

Ordering key:

Adjustable industrial swirl diffuser **DKZ - 630 - M230 - OZ - A - H - ød - Z**

Size

**M230** - motor drive 230V

**M24** - motor drive 24V

**R** - manual drive

**OZ** - two positions

**K** - continuous

**A** - supply air

**B** - exhaust air

**H** - horizontal connection

Connection diameter

Insulation

## SELECTION DIAGRAMS

Diagram 1.0 - Effective discharge velocity

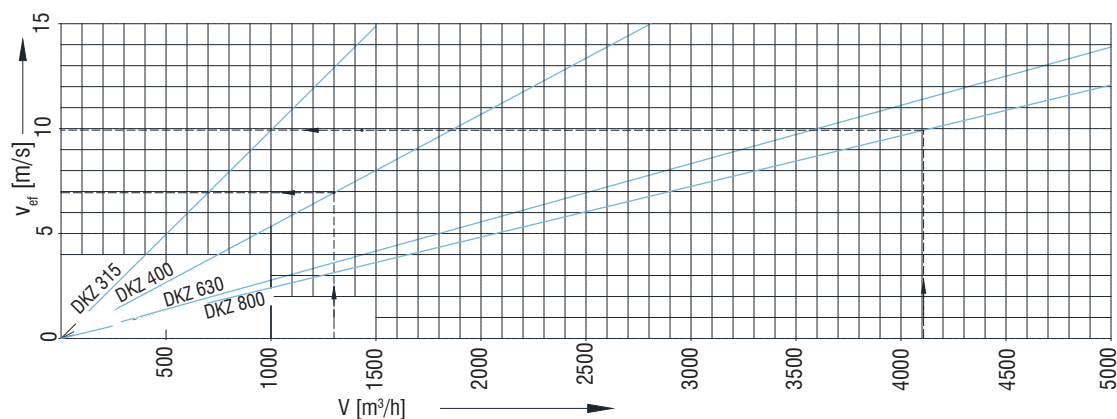


Table 3: Sound power levels

| $v_{ef} = 8 \text{ m/s}$      | $\Delta L$ | $L_{WA}$ | $L_{WA} = L_{WA} + \Delta L$ |
|-------------------------------|------------|----------|------------------------------|
| Average octave frequency (Hz) |            |          |                              |
| 63                            | 4          | 53       | 57                           |
| 125                           | 1          | 53       | 54                           |
| 250                           | 0          | 53       | 53                           |
| 500                           | -2         | 53       | 51                           |
| 1000                          | -5         | 53       | 48                           |
| 2000                          | -9         | 53       | 44                           |
| 4000                          | -14        | 53       | 39                           |
| 8000                          | -23        | 53       | 30                           |

Table 4: Effective outlet area

| DKZ | $A_{ef}$ [m²] | $v_{ef}$ [m/s]                                                            |
|-----|---------------|---------------------------------------------------------------------------|
| 315 | 0,028         | $v_{ef} = \frac{\dot{V} \text{ (m³/h)}}{A_{ef} \text{ (m²)} \times 3600}$ |
| 400 | 0,052         |                                                                           |
| 600 | 0,100         |                                                                           |
| 800 | 0,115         |                                                                           |

Example 1:

GIVEN

Model DKZ V 400 with plenum

$V = 1300 \text{ (m³/h)}$

SOLUTION

**Diagram 1.0**

$v_{ef} = 6,95 \text{ (m/s)} \approx 7 \text{ (m/s)}$

**Diagram 1.2**

$\Delta p = 51 \text{ (Pa)}$

$L_{WA} = 53 \text{ (dB(A))}$

$L_W = L_{WA} + \Delta L \text{ Table 3}$

Table 5: Relative sound power levels  $\Delta L$  for DKZ 315

| DKZ 315                       | DKZ     | DKZ-H | DKZ     | DKZ-H | DKZ     | DKZ-H | DKZ      | DKZ-H |
|-------------------------------|---------|-------|---------|-------|---------|-------|----------|-------|
| $v_{ef} \text{ (m/s)}$        | 3 (m/s) |       | 5 (m/s) |       | 8 (m/s) |       | 12 (m/s) |       |
| Average octave frequency (Hz) |         |       |         |       |         |       |          |       |
| 63                            | 10      | 10    | 7       | 8     | 5       | 6     | 1        | 3     |
| 125                           | 2       | 6     | 1       | 5     | 0       | 3     | -1       | 1     |
| 250                           | 2       | 2     | 1       | 1     | 0       | -1    | -2       | -3    |
| 500                           | -1      | -1    | -2      | -1    | -3      | -2    | -5       | -4    |
| 1000                          | -5      | -6    | -4      | -5    | -5      | -5    | -6       | -5    |
| 2000                          | -18     | -18   | -14     | -13   | -9      | -9    | -7       | -7    |
| 4000                          | -28     | -28   | -20     | -21   | -15     | -14   | -8       | -10   |
| 8000                          | -37     | -30   | -30     | -25   | -21     | -23   | -17      | -18   |

**Table 6: Relative sound power levels  $\Delta L$  for DKZ 400**

| DKZ 315                       |      | DKZ     | DKZ-H | DKZ     | DKZ-H | DKZ     | DKZ-H | DKZ      | DKZ-H |
|-------------------------------|------|---------|-------|---------|-------|---------|-------|----------|-------|
| $v_{ef}$ (m/s)                |      | 3 (m/s) |       | 5 (m/s) |       | 8 (m/s) |       | 12 (m/s) |       |
| Average octave frequency (Hz) | 63   | 6       | 7     | 4       | 5     | 1       | 2     | -1       | -1    |
|                               | 125  | 4       | 7     | 4       | 5     | 3       | 3     | 2        | 0     |
|                               | 250  | 2       | 0     | 1       | -1    | 0       | -3    | -1       | -5    |
|                               | 500  | -1      | -1    | -1      | -2    | -2      | -3    | -3       | -5    |
|                               | 1000 | -5      | -5    | -5      | -4    | -4      | -4    | -5       | -5    |
|                               | 2000 | -21     | -15   | -16     | -11   | -11     | -8    | -8       | -6    |
|                               | 4000 | -36     | -26   | -28     | -19   | -21     | -13   | -15      | -9    |
|                               | 8000 | -44     | -30   | -36     | -25   | -29     | -21   | -23      | -19   |

**Table 7: Relative sound power levels  $\Delta L$  for DKZ 600**

| DKZ 315                       |      | DKZ     | DKZ-H | DKZ     | DKZ-H | DKZ     | DKZ-H | DKZ      | DKZ-H |
|-------------------------------|------|---------|-------|---------|-------|---------|-------|----------|-------|
| $v_{ef}$ (m/s)                |      | 3 (m/s) |       | 5 (m/s) |       | 8 (m/s) |       | 12 (m/s) |       |
| Average octave frequency (Hz) | 63   | 7       | 9     | 5       | 7     | 3       | 4     | 0        | 1     |
|                               | 125  | 3       | 6     | 3       | 5     | 2       | 3     | 2        | 0     |
|                               | 250  | 2       | 1     | 1       | 0     | 0       | -2    | -1       | -4    |
|                               | 500  | -1      | -1    | -1      | -1    | -2      | -3    | -3       | -5    |
|                               | 1000 | -5      | -6    | -4      | -5    | -4      | -4    | -5       | -5    |
|                               | 2000 | -20     | -16   | -15     | -12   | -11     | -9    | -8       | -7    |
|                               | 4000 | -33     | -27   | -25     | -20   | -18     | -14   | -12      | -10   |
|                               | 8000 | -41     | -30   | -33     | -25   | -26     | -21   | -20      | -19   |

**Table 8: Relative sound power levels  $\Delta L$  for DKZ 800**

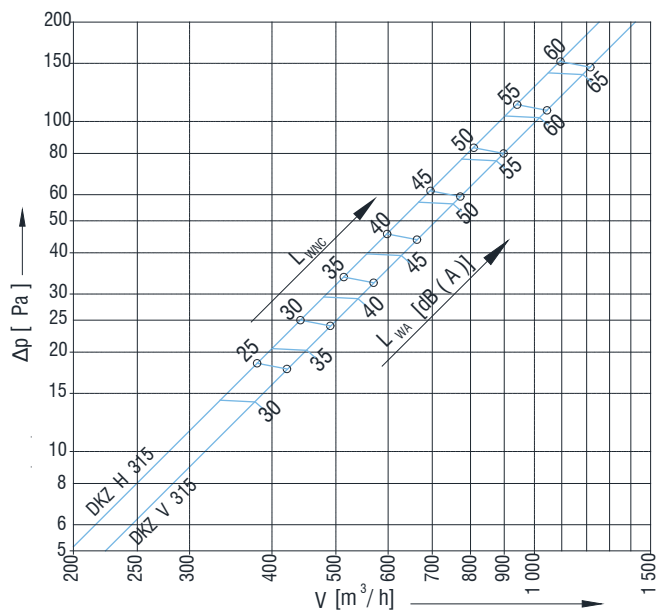
| DKZ 315                       |      | DKZ     | DKZ-H | DKZ     | DKZ-H | DKZ     | DKZ-H | DKZ      | DKZ-H |
|-------------------------------|------|---------|-------|---------|-------|---------|-------|----------|-------|
| $v_{ef}$ (m/s)                |      | 3 (m/s) |       | 5 (m/s) |       | 8 (m/s) |       | 12 (m/s) |       |
| Average octave frequency (Hz) | 63   | 7       | 4     | 5       | 12    | 3       | 9     | 0        | 6     |
|                               | 125  | 3       | 6     | 3       | 4     | 2       | 3     | 1        | 1     |
|                               | 250  | 2       | 3     | 1       | 2     | 0       | 1     | -1       | 0     |
|                               | 500  | -1      | -1    | -1      | -1    | -2      | -2    | -3       | -3    |
|                               | 1000 | -5      | -7    | -5      | -6    | -4      | -5    | -5       | -5    |
|                               | 2000 | -20     | -20   | -15     | -15   | -11     | -11   | -8       | -8    |
|                               | 4000 | -33     | -31   | -25     | -23   | -18     | -17   | -13      | -12   |
|                               | 8000 | -42     | -31   | -35     | -27   | -26     | -21   | -22      | -17   |



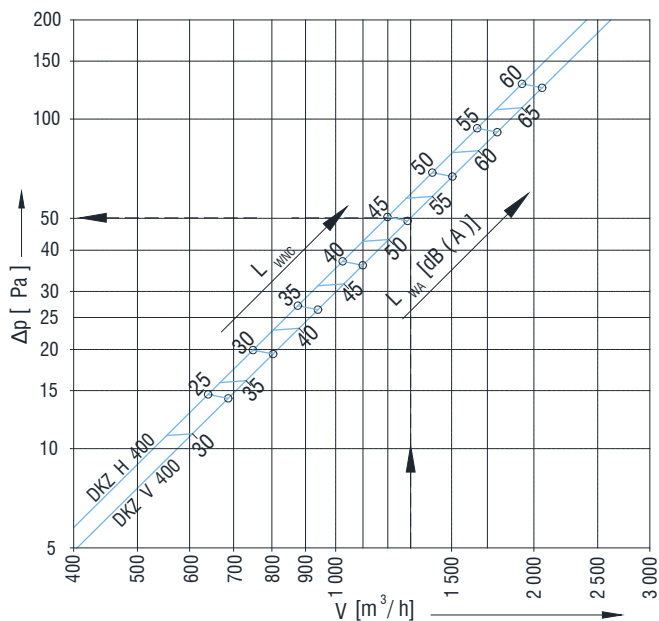
For determining total sound power levels in a room, number of diffusers and absorption properties should be considered.

## ADJUSTABLE SWIRL DIFFUSER

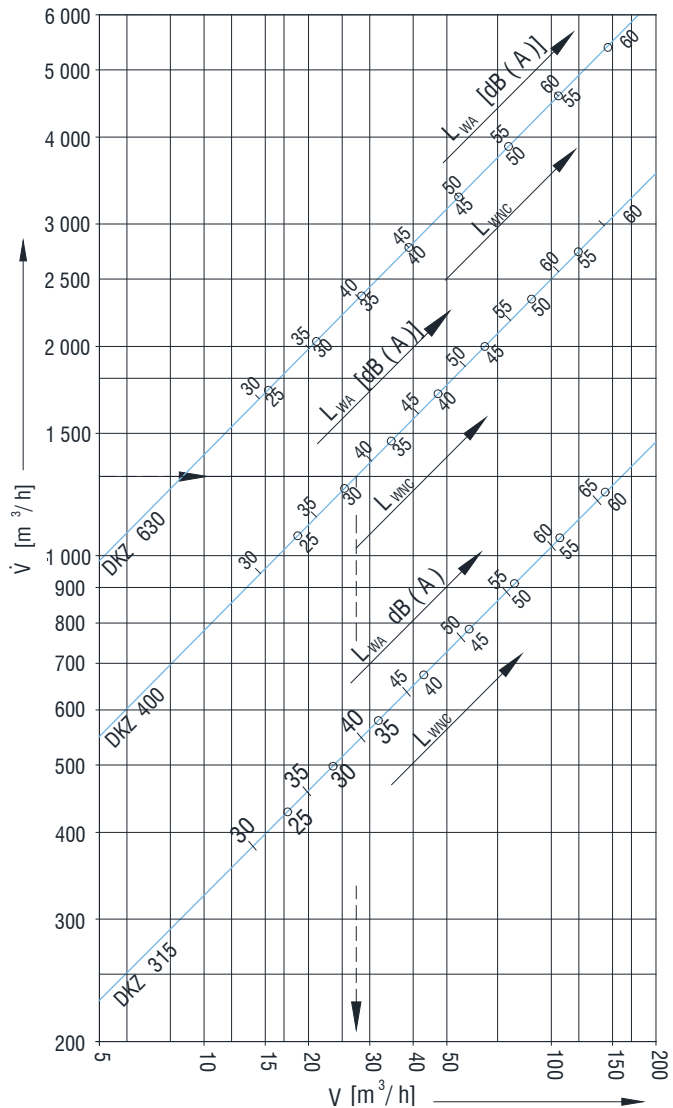
1.1 Total pressure drop and sound power level for DKZ 315 - with plenum box



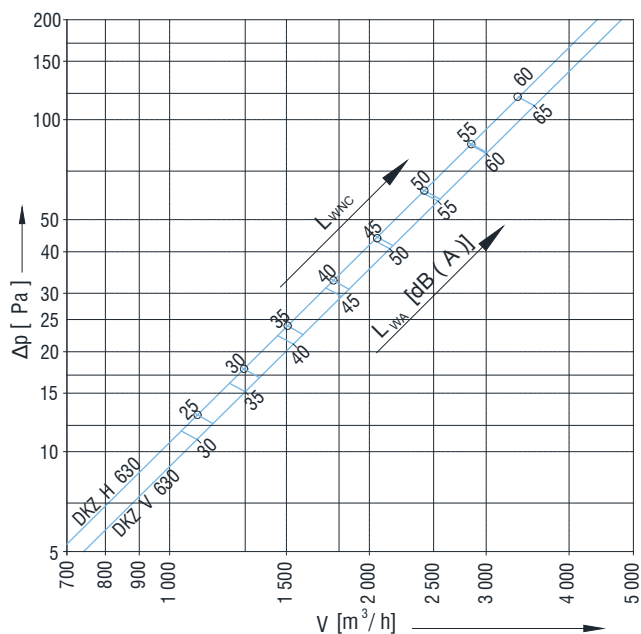
1.2 Total pressure drop and sound power level for DKZ 400 - with plenum box



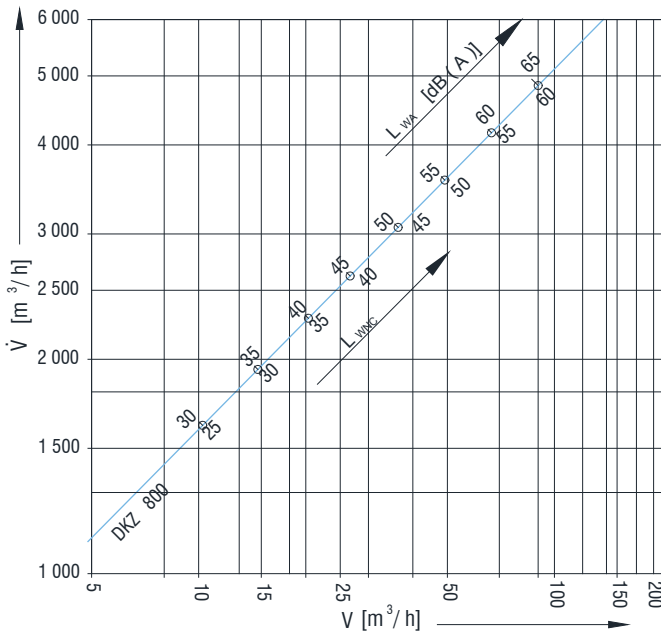
1.4 Total pressure drop and sound power level for DKZ 630 - with plenum box



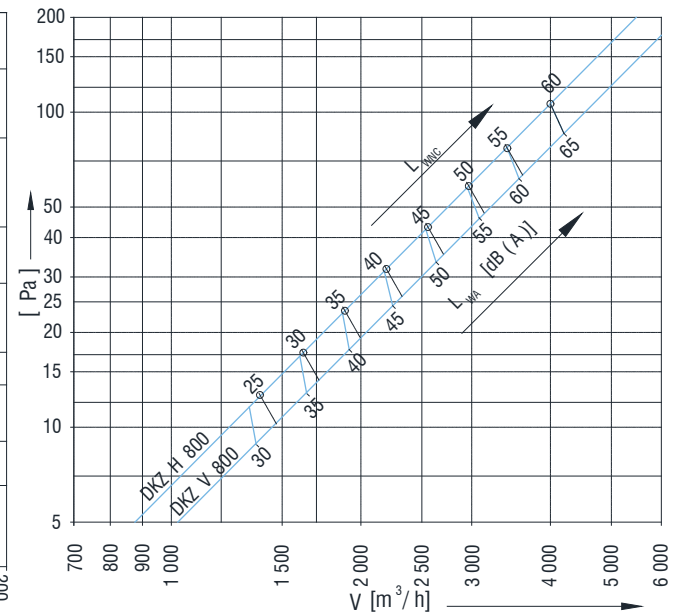
1.3 Total pressure drop and sound power level for DKZ 315, 400, 630 - without plenum box



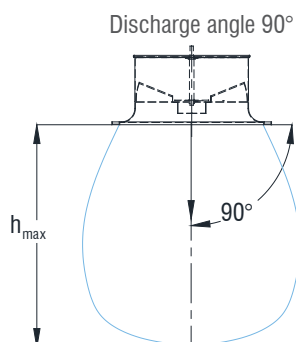
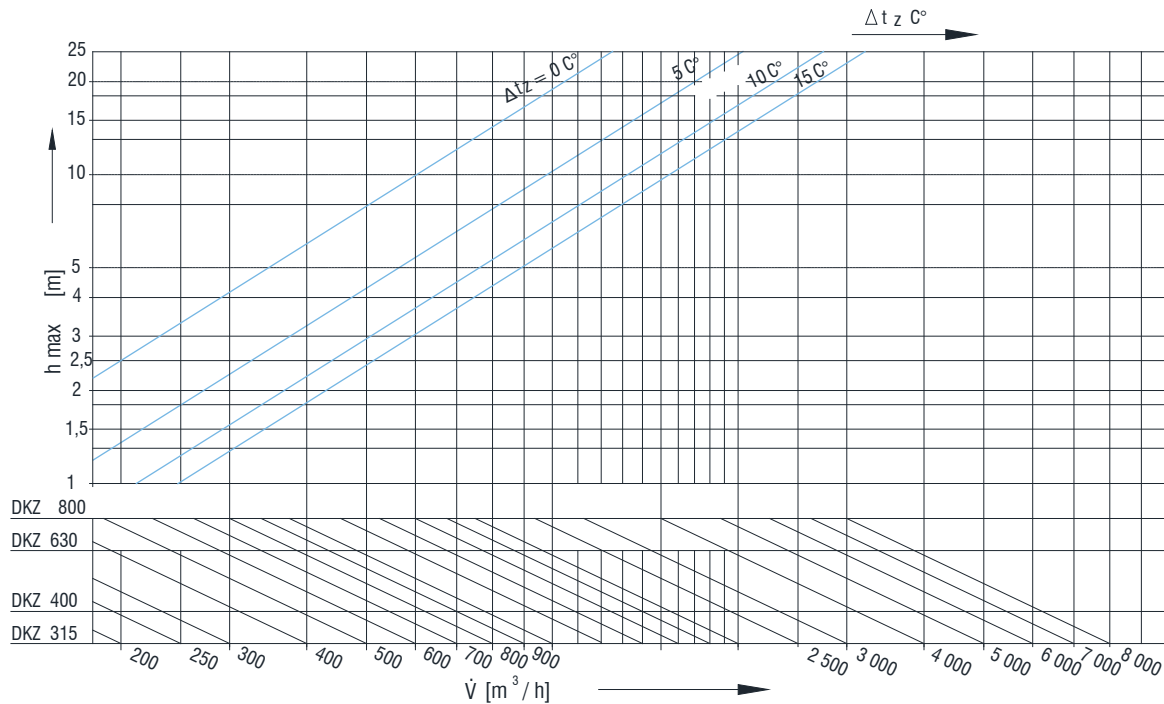
1.5 Total pressure drop and sound power level for DKZ 800 - with plenum box



1.6 Total pressure drop and sound power level for DKZ 800 - without plenum box

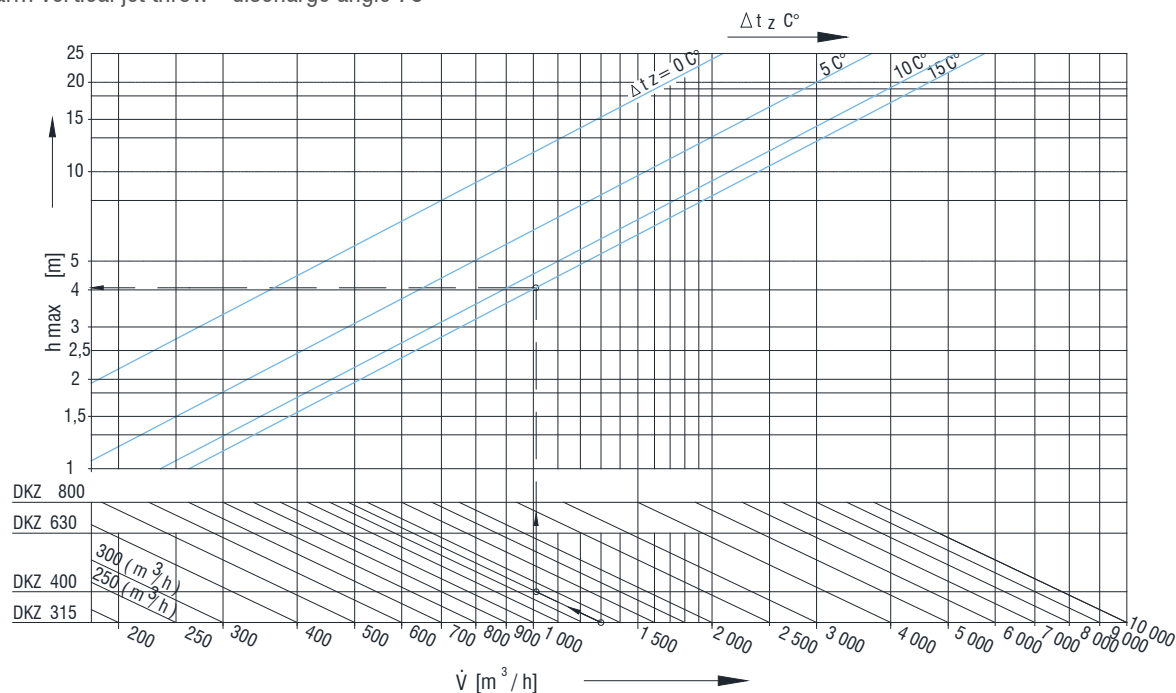


1.7 Warm vertical jet throw - discharge angle 90°

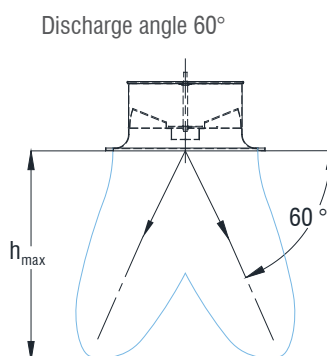
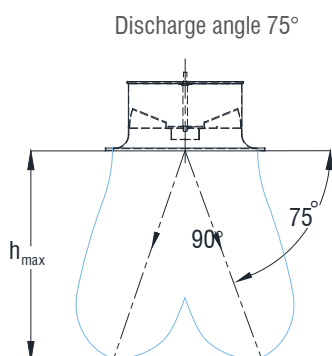
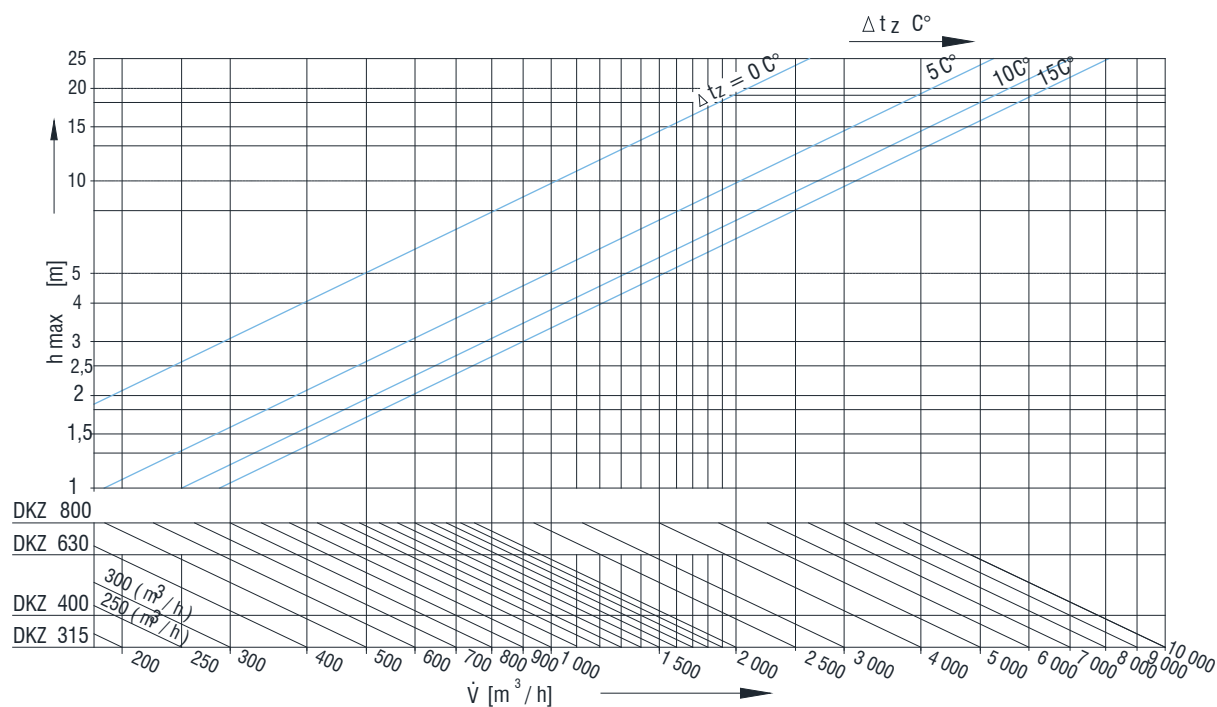


# ADJUSTABLE SWIRL DIFFUSER

## 1.8 Warm vertical jet throw - discharge angle 75°



## 1.9 Warm vertical jet throw - discharge angle 60°



### Example 2:

#### GIVEN

Model: DKZ 400

$V = 1400 \text{ m}^3/\text{h}$

Discharge angle 60°

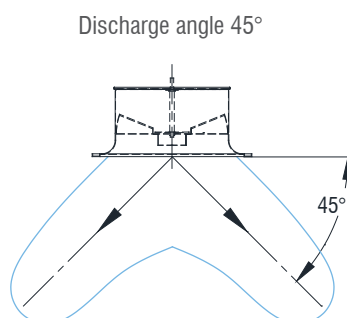
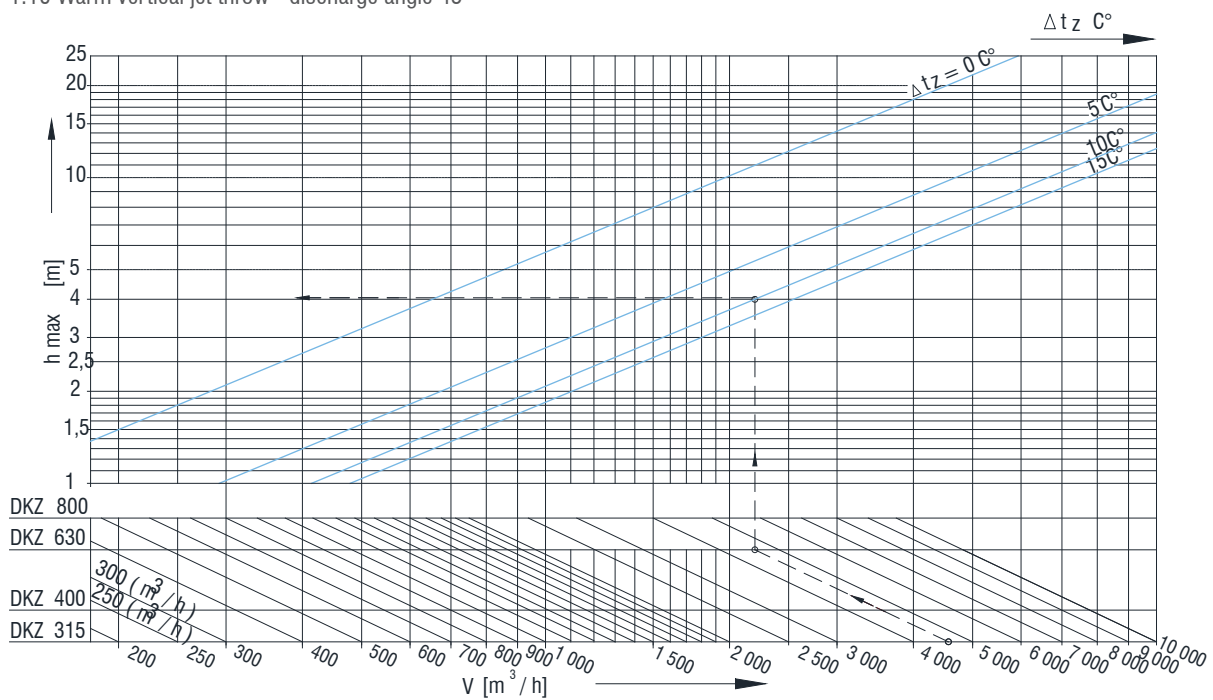
$\Delta t_z = +15^\circ\text{C}$

#### SOLUTION

Diagram 1.6

$h_{max} = 3,8 \text{ m}$

1.10 Warm vertical jet throw - discharge angle 45°



Example 3:  
GIVEN  
Model: DKZ 630  
 $V = 4600 \text{ m}^3/\text{h}$   
Discharge angle 45°  
 $\Delta t_z = +10 \text{ }^\circ C$

SOLUTION  
**Diagram 1.7**  
 $h_{max} = 4,0 \text{ m}$

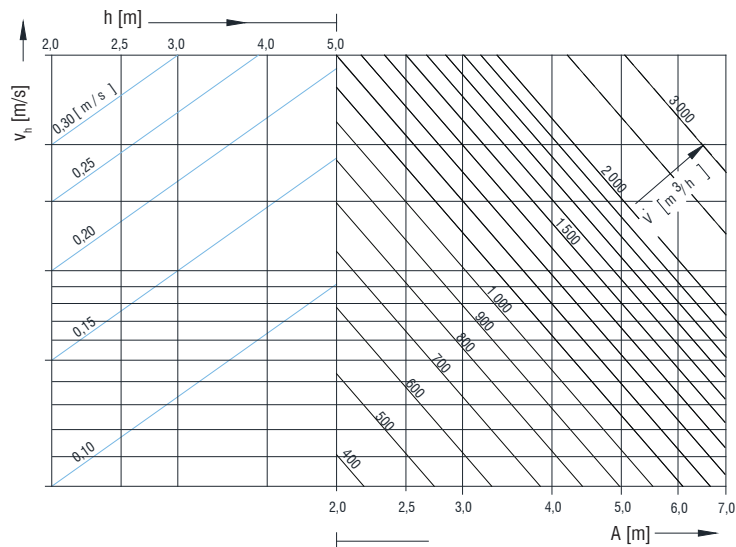
## ADJUSTABLE SWIRL DIFFUSER

Average velocity  $v_h$  diagrams at distance  $B \geq 5$  m

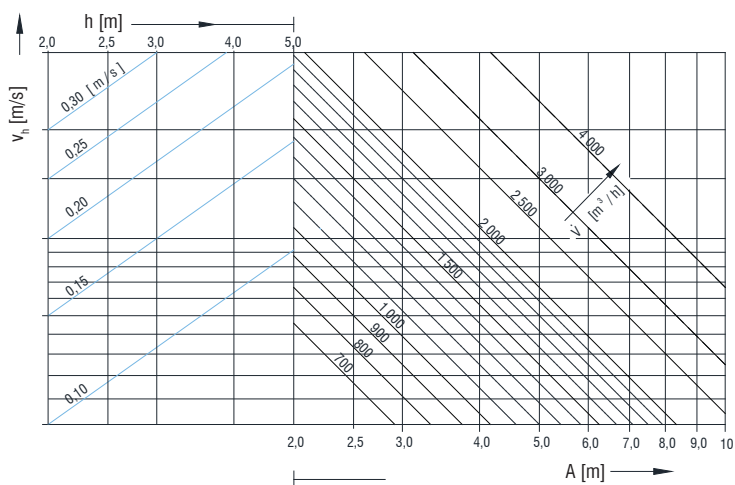
Valid for:

- horizontal cold throw discharge
- free-hanging diffuser installation
- $\Delta t_z = 0$  do  $-10$  °C

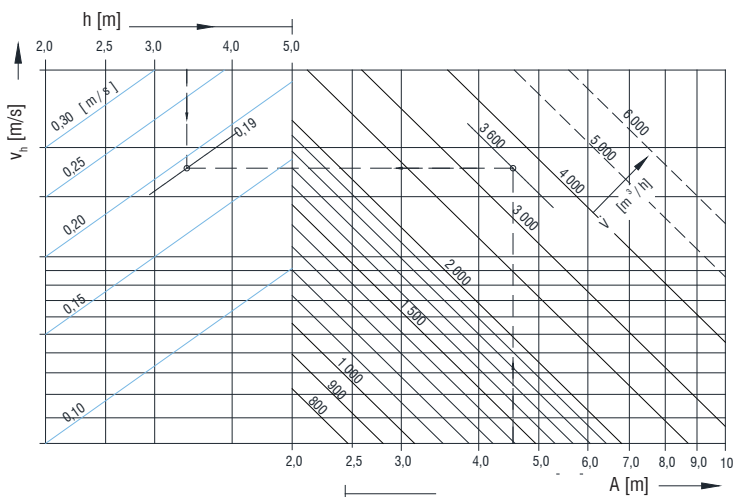
1.11 Average velocity  $v_h$  at  $B \geq 5$  m for DKZ 315



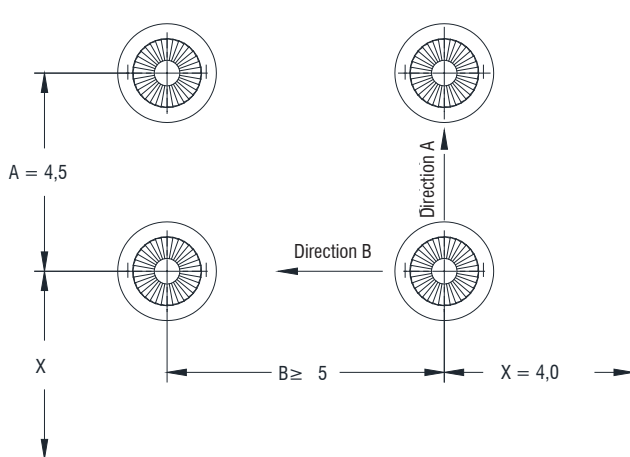
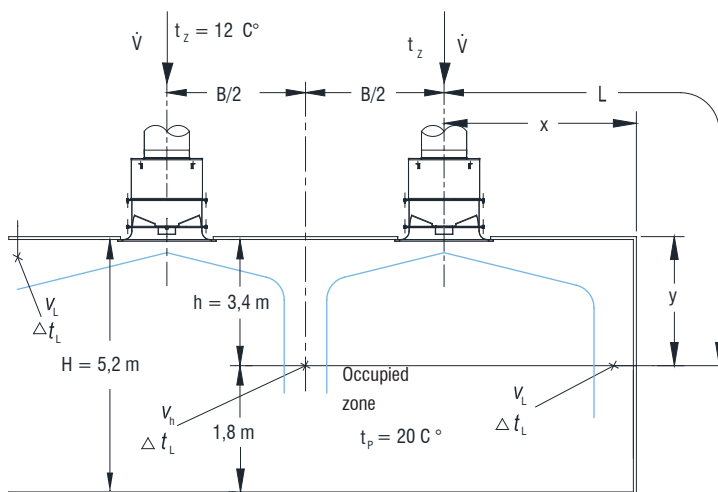
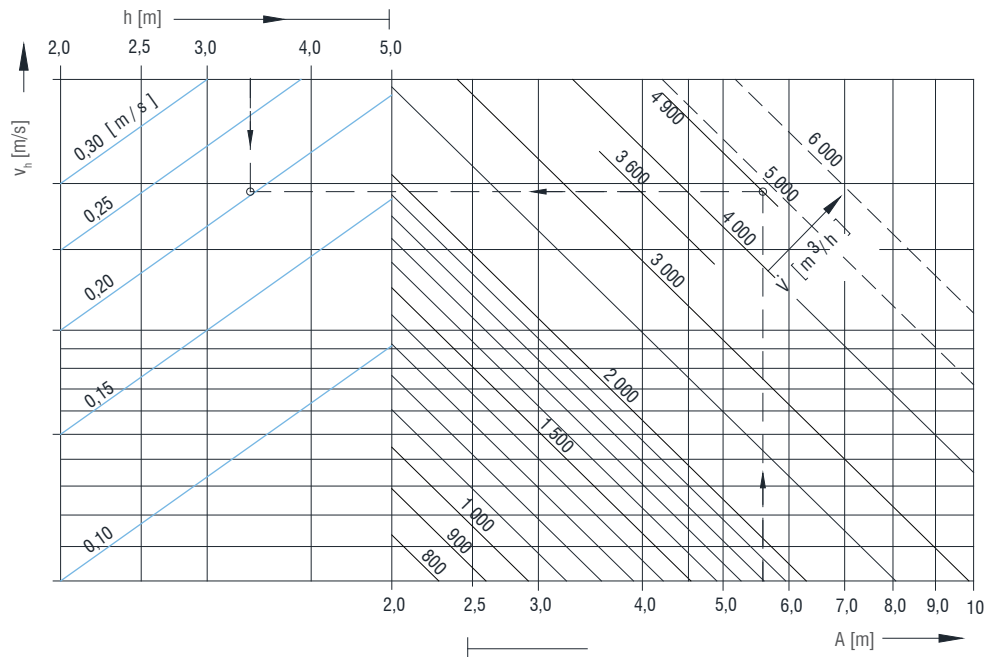
1.12 Average velocity  $v_h$  at  $B \geq 5$  m for DKZ 400



1.13 Average velocity  $v_h$  at  $B \geq 5$  m for DKZ 630



### 1.14 Average velocity $v_h$ at $B \geq 5$ m for DKZ 800



#### Example 4:

**GIVEN**  
Model: DKZ 630

$A = 4,5$  m       $t_z = 12^\circ\text{C}$   
 $B \geq 5$  m       $t_p = 20^\circ\text{C}$   
 $V = 3600$  m³/h       $x = 4,0$  m  
 $h = 3,4$  m       $L = 7,4$  m  
 $\Delta t_z = -8^\circ\text{C}$

Installation in suspended ceiling

#### SOLUTION

##### Diagram 1.10

$v_h = 0,19$  m/s

Ceiling influence on horizontal discharge

$v_h \times 1,4 = 0,26$  m/s

##### Diagram 2.1

$v_L = 0,37$  (m/s)

Ceiling influence on horizontal discharge

$v_L \times 1,4 = 0,52$  m/s

$$\frac{\Delta t_L}{\Delta t_z} = 0,06 \times 1,4 = 0,084$$

$t_L = 19,33^\circ\text{C}$

$i = 11,9$

## ADJUSTABLE SWIRL DIFFUSER

Average velocity  $v_L$  diagrams

2.0 Average velocity  $v_L$  and temperature ratio for DKZ 315

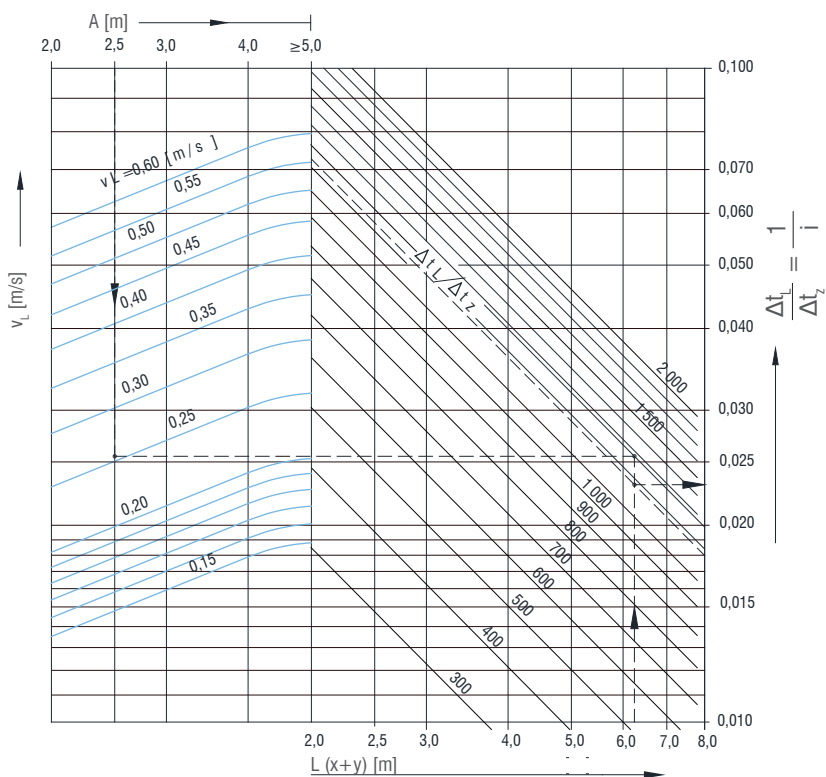
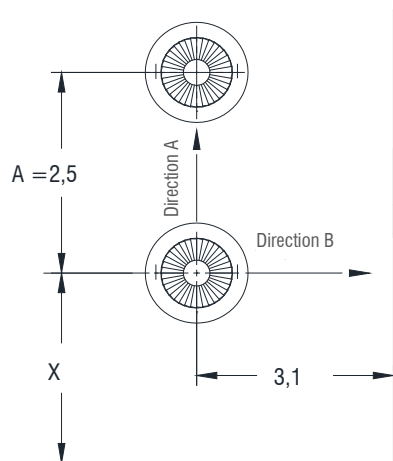
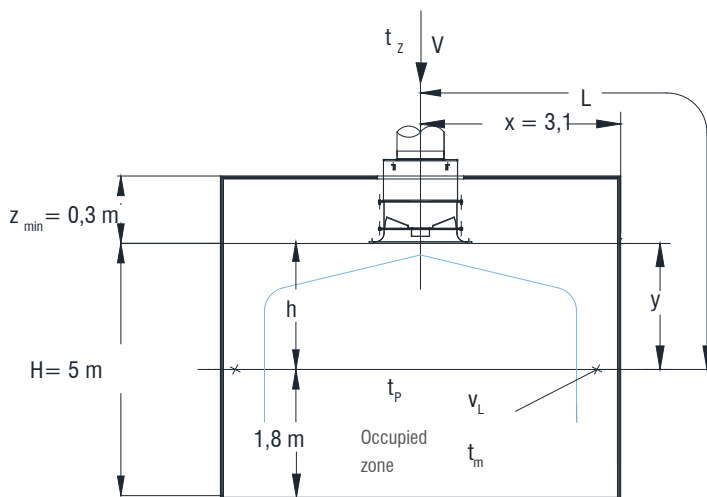


Diagram data valid for:

- cold horizontal air discharge
- free-hanging diffuser installation
- $\Delta t_z = 0$  do  $-10^\circ\text{C}$



When installing diffuser at suspended ceiling level,  $v_L$ ;  $v_h$ ;  $\frac{\Delta t_L}{\Delta t_z}$  should be multiplied by a factor of 1,4



Example 5:

GIVEN

Size: DKZ 315

$t_p = 20^\circ\text{C}$

$V = 1300 \text{ m}^3/\text{h}$

$H = 5 \text{ m}$

$A = 2,5 \text{ m}$

$x = 3,1 \text{ m}$

$h = 3,2 \text{ m}$

$L = 6,3 \text{ m}$

$z_{\min} = 0,3 \text{ m}$

SOLUTION

**Diagram 2.2**

$v_L = 0,25 \text{ m/s}$

$\frac{\Delta t_L}{\Delta t_z} = 0,0235$

$i = 42,55$

$t_L = 19,88^\circ\text{C}$

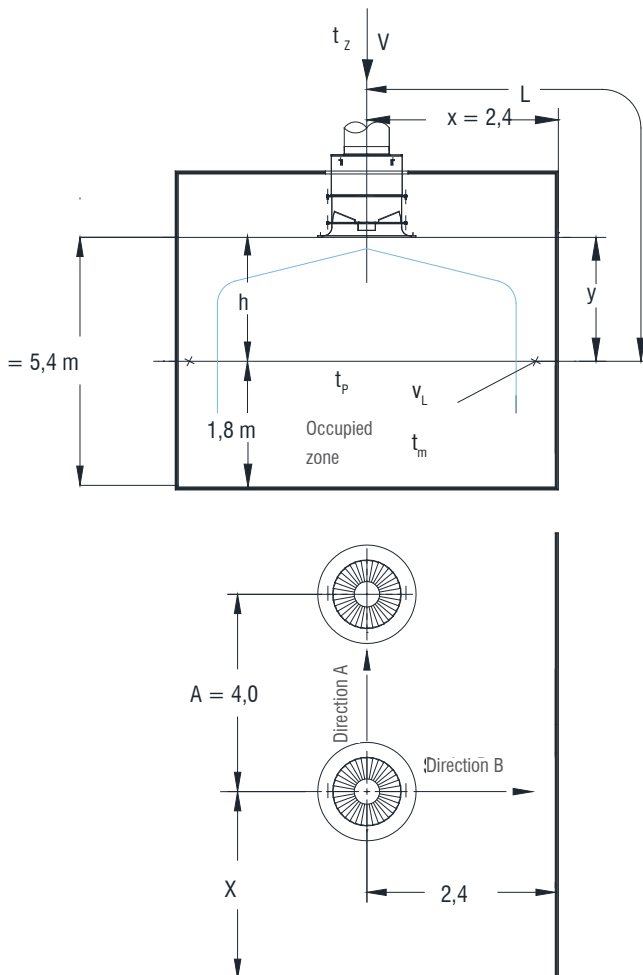
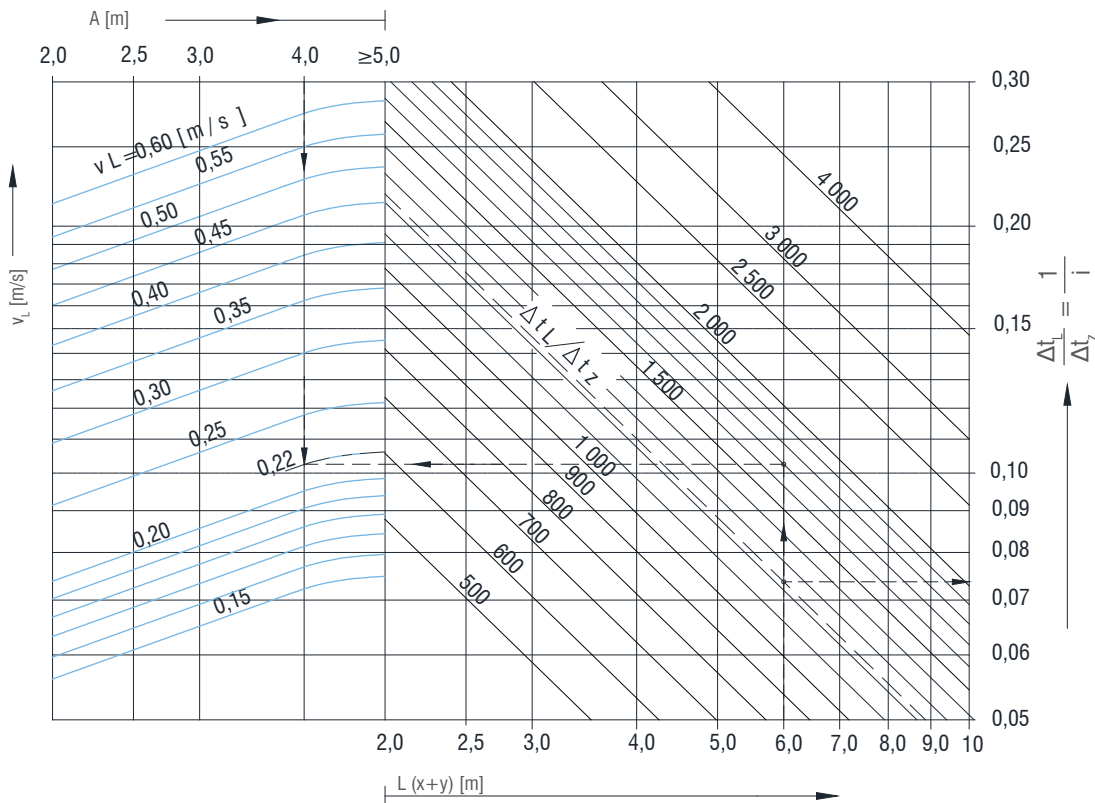
$t_z = 15^\circ\text{C}$

$H = h + 1,8$

$L = x + h$

Free-hanging installation

## 2.2 Average velocity $v_L$ and temperature ratio for DKZ 400



Example 6:  
GIVEN  
Size: DKZ 400  
 $V = 1700 \text{ m}^3/\text{h}$   
 $H = 5,4 \text{ m}$   
 $A = 4,0 \text{ m}$   
 $x = 2,4 \text{ m}$   
 $h = 3,6 \text{ m}$   
 $L = 6,0 \text{ m}$

SOLUTION  
**Diagram 2.1**

$v_L = 0,22 \text{ m/s}$

$$\frac{\Delta t_L}{\Delta t_z} = 0,074$$

$$t_p = 20 \text{ }^\circ\text{C}$$

$$t_z = 12 \text{ }^\circ\text{C}$$

$$\Delta t_z = 12 - 20 = -8 \text{ }^\circ\text{C}$$

$$H = h + 1,8$$

$$L = x + h$$

Ceiling influence:

$$z < 0,3 \text{ m}$$

Ceiling influence:

$$v_L \times 1,4 = 0,31 \text{ m/s}$$

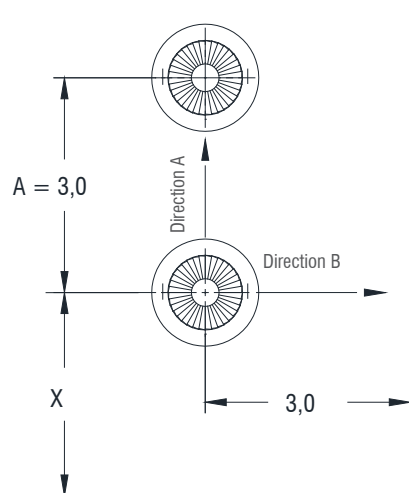
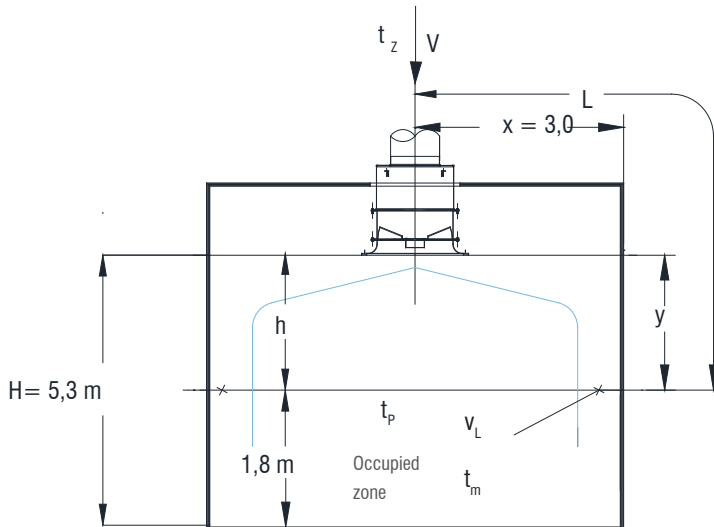
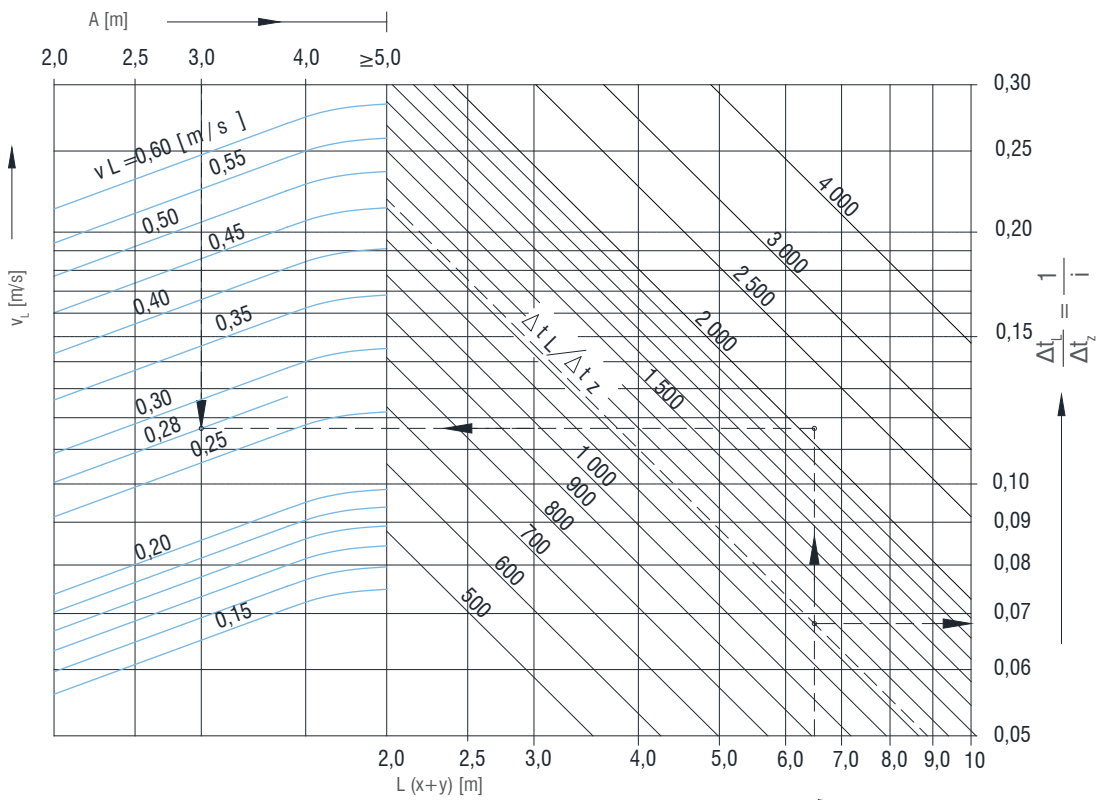
$$\frac{\Delta t_L}{\Delta t_z} \times 1,4 = 0,1036$$

$$i = 9,65$$

$$t_L = 19,17 \text{ }^\circ\text{C}$$

## ADJUSTABLE SWIRL DIFFUSER

### 2.3 Average velocity $v_L$ and temperature ratio for DKZ 630



Example 7:  
GIVEN  
Size: DKZ 630

$V = 2100 \text{ m}^3/\text{h}$   
 $H = 5.3 \text{ m}$   
 $A = 3.0 \text{ m}$   
 $x = 3.0 \text{ m}$   
 $h = 3.5 \text{ m}$   
 $L = 6.5 \text{ m}$

$t_p = 20^\circ\text{C}$   
 $t_z = 14^\circ\text{C}$   
 $H = h + 1.8$   
 $L = x + h$

SOLUTION

**Diagram 2.2**

$v_L = 0.28 \text{ m/s}$

$\frac{\Delta t_L}{\Delta t_z} = 0.068$

Ceiling influence:

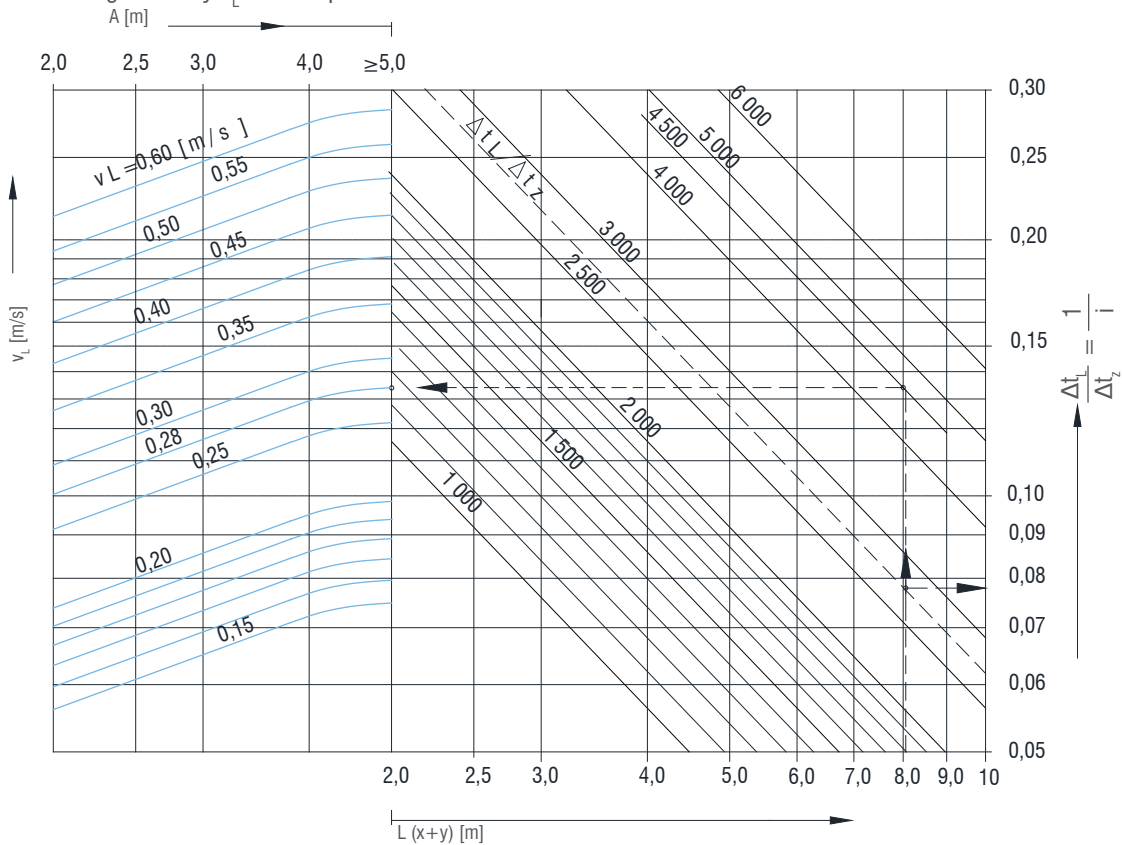
$v_L \times 1.4 = 0.39 \text{ m/s}$

$\frac{\Delta t_L}{\Delta t_z} \times 1.4 = 0.0952$

$i = 10.5$

$t_L = 19.43^\circ\text{C}$

## 2.4 Average velocity $v_L$ and temperature ratio for DKZ 800



### Example 8:

#### GIVEN

Size: DKZ 800  
 $V = 4500 \text{ m}^3/\text{h}$   
 $H = 6,0 \text{ m}$   
 $A = 5,0 \text{ m}$   
 $x = 3,8 \text{ m}$   
 $h = 4,2 \text{ m}$   
 $L = 8,0 \text{ m}$

$t_p = 20 \text{ }^\circ\text{C}$   
 $t_z = 14 \text{ }^\circ\text{C}$   
 $H = h + 1,8$   
 $L = x + h$   
 $\Delta t_z = -6^\circ\text{C}$

#### SOLUTION

##### Diagram 2.3

$v_L = 0,28 \text{ m/s}$

$\frac{\Delta t_L}{\Delta t_z} = 0,078$

Ceiling influence:

$v_L \times 1,4 = 0,39 \text{ (m/s)}$

$\frac{\Delta t_L}{\Delta t_z} \times 1,4 = 0,1092$

$i = 9,16$

$t_L = 19,3 \text{ (}^\circ\text{C)}$