

06



Supply air nozzles

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Supply air nozzles are designed to supply air into rooms in applications requiring large throw distances and low noise levels. They are suitable for supplying either cold or warm air. They are made of anodised sheet aluminium. On request, they can be powder painted in any of the RAL scale colours. Air supply nozzles are supplied either as single components or assembled into blocks, which considerably increase throw distance.

VENTILATING GRILLES,
VENTILATING VALVES

CIRCULAR DIFFUSERS,
SQUARE DIFFUSERS

SWIRL DIFFUSERS,
VARIABLE SWIRL
DIFFUSERS

SLOT DIFFUSERS,
ROUND DUCT DIFFUSERS

AIR DISPLACEMENT
UNITS

SUPPLY AIR NOZZLES

EXTERNAL ELEMENTS

AIR FLOW
CONTROL UNITS

SOUND ATTENUATORS,
SOUND ATTENUATING
LOUVRES

Overview

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Supply air nozzles are designed to supply air into rooms in applications requiring large throw distances and low noise levels. They are suitable for supplying either cold or warm air. They are made of anodised sheet aluminium. On request, they can be powder painted in any of the RAL scale colours. Air supply nozzles are supplied either as single components or assembled into blocks, which considerably increase throw distance.

Supply air nozzles VŠ-1

VŠ-1 supply air nozzles are of a fixed construction. They are supplied either as single components or assembled into blocks.

Supply air nozzles VŠ-4

VŠ-4 supply air nozzles are adjustable. The air jet direction can be adjusted either manually or by means of a motor drive, within a $\pm 30^\circ$ range.

Supply air nozzles VŠ-5

VŠ-5 supply air nozzles can be adjusted in the same way as VŠ-4. Supply air nozzle is integrated into the housing and does not protrude into the room.

Supply air nozzles VŠ-1



VŠ-1

Supply air nozzles VŠ-4



VŠ-4

Supply air nozzles VŠ-5

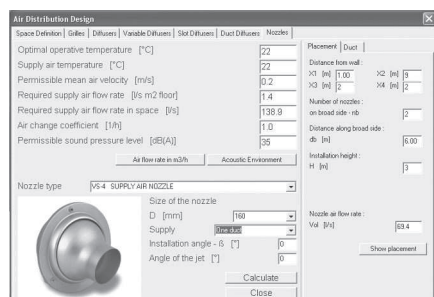


VŠ-5

Software: KLIMA ADE 5.4

The air supply nozzle calculation and selection software package comprises:

- throw velocity calculation models, developed based on measurements,
- heating and cooling condition models,
- calculation of technical specifications of air supply on one wall or on opposite walls,
- calculation of throw velocities for all VŠ-4 and VŠ-5 sizes.












Software: KLIMA ADE 5.4

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Legend of symbols

- | | | |
|--|---|---|
| Al Element is made of aluminium profiles, aluminium sheet or aluminium casting. |  Element is intended to be built in the wall. |  Element is suitable for the supply of cool air (cooling). |
| St Element is made of steel sheet. |  Element is intended to be built in the ceiling or in the wall. | M Element allows regulation by electric motor (Belimo electric motors). |
|  Element is powder painted in standard RAL 9010 colour. Other desired colour is to be specified in the order. |  Element for air conditioning of rooms with floor to ceiling heights room up to 4 m. | F Element is intended for air filtration. The filter of class ... is built in. |
|  Shady symbol means possibility of optional material, surface protection, motor version, ... |  Element for air conditioning of rooms with floor to ceiling heights from 6 to 15 m. | CD The possibility of the automatic selection and calculation of the technical characteristics of grilles and difusers in regard to the given conditions with the assistance of the Klima ADE program. |
|  Element is intended to be built in the floor. |  Element is suitable for the supply of warm air (heating). | INOX The element is made of stainless sheet steel AISI 304. |

Supply air nozzle VŠ-4

Application

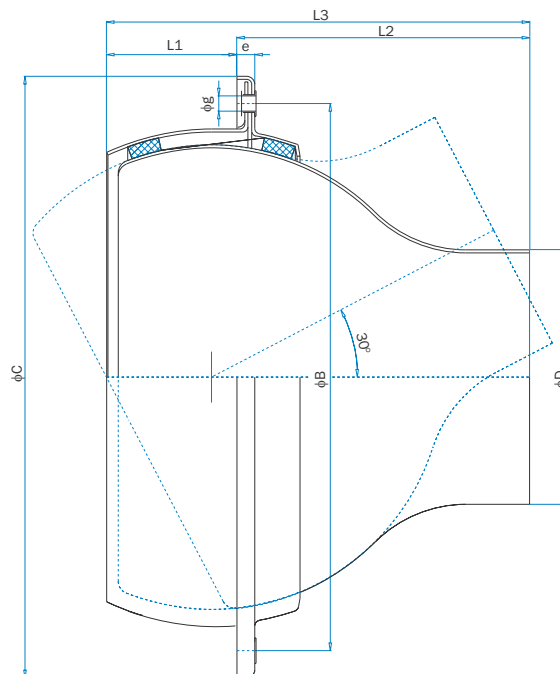
VŠ-4 supply air nozzles are suitable for supplying either cold or warm air into rooms in applications requiring large throw distances and low noise levels. By arranging several nozzles in a block, the throw distance can be increased accordingly. Several installation methods are applicable.

Description

Supply air nozzles VŠ-4 are adjustable. The air jet injection can be adjusted either:

- manually within $\pm 30^\circ$ in all directions or
- with electromotor within $\pm 30^\circ$ in vertical or horizontal direction.

Adjusting depends on temperature oscillation. VŠ-4 supply air nozzles are made of anodised sheet aluminium. On customer's request, they can be powder painted in any of the RAL scale colours.

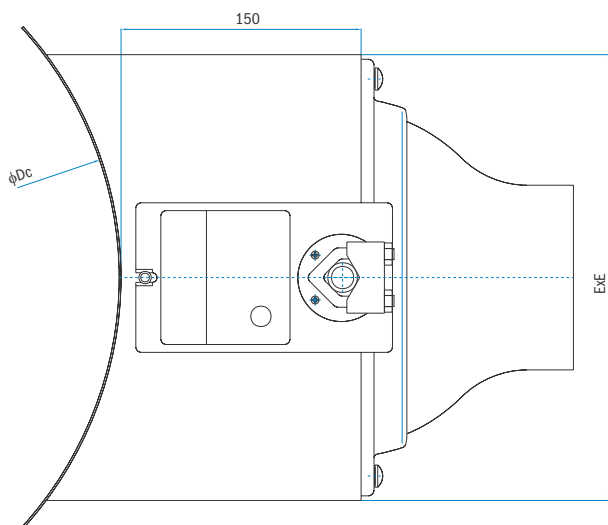


Sizes and dimensions

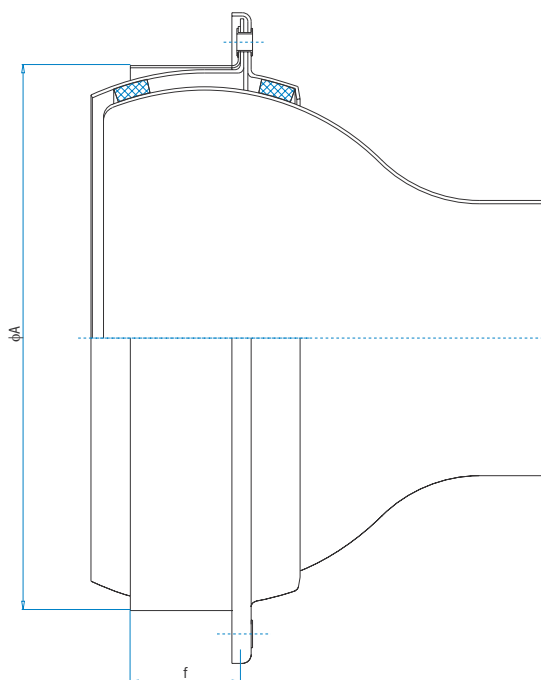
Size	ϕD	ϕB	ϕc	e	L1	L2	L3	ϕg	n	A _{ef} (m ²)
80	80	175	196.5	7	43	96	139	6.5	3	0.004778
100	100	215	236.5	7	51	115	166	6.5	3	0.007543
125	125	265	286.5	7	52	142	194	6.5	3	0.011882
160	160	340	361.5	9	75	180	255	6.5	4	0.019607
220	220	425	446.5	9	95	219	314	6.5	4	0.037325

n - number of fixing boreholes

VŠ-4/D/B



VŠ-4/E



Installation methods

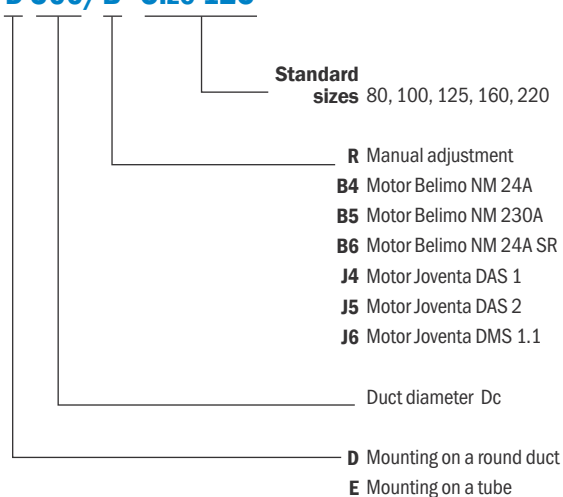
- Mounting on a circular duct (marking **D**)
- Mounting on a tube (marking **E**)

Size	ExE	ΦDc _{min}	ΦA	f
80	200	200	158	40
100	240	250	198	40
125	290	300	248	40
160	365	380	313	40
220	450	500	398	65

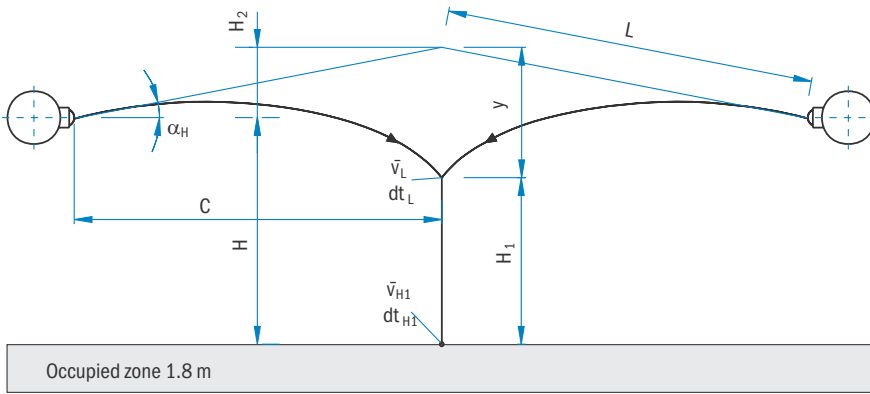
When ordering, please specify ΦDc.

Ordering key

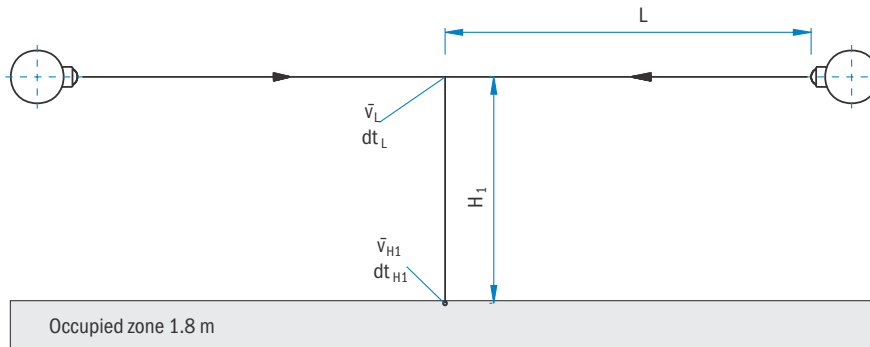
VŠ-4/D 300/B Size 125



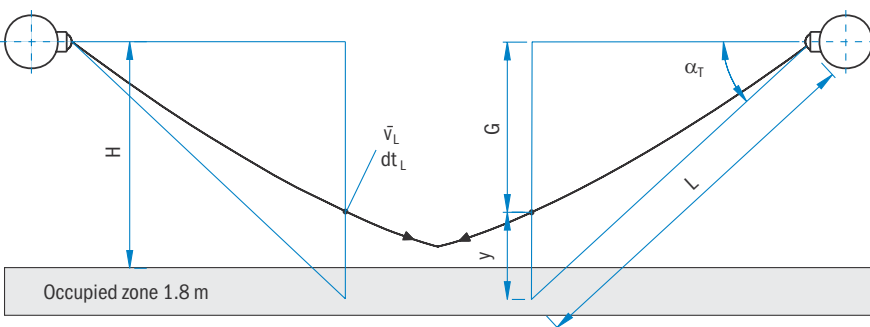
Cooling



Isothermal ventilation



Heating



Definition of symbols

L (m)	Throw distance in isothermal condition
α_H (°)	Set angle in cooling mode
α_T (°)	Set angle in heating mode
C (m)	Horizontal distance between the nozzle and the two air jets collision point
H (m)	Height of the nozzle above the occupied zone
H₂ (m)	Virtual vertical distance between the nozzle and the two air jets collision point at isothermal air supply
H_{max} (m)	Max. depth of air throw (only at vertical supply)
H₁ (m)	Vertical distance between the occupied zone and the two air jets collision point
Y (m)	Air jet deflection as a function of blow temperature difference
G (m)	vertical distance between the air jet deflection point and the nozzle
v_{H1} (m/s)	Average air velocity in the occupied zone H ₁
v_L (m/s)	Average air velocity at the two air jets collision point L
dt_z (K)	Temperature difference between the supply air and the room air
dt_L (K)	Temperature difference between the supply air at the distance L and the room air
dt_{H1} (K)	Temperature difference between the supply air at the entry in the occupied zone and the room air
dp_t (Pa)	Total air pressure drop
L_{WA} (dB(A))	Sound power level

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Diagram 1: Velocity in the air jet core and throw depth

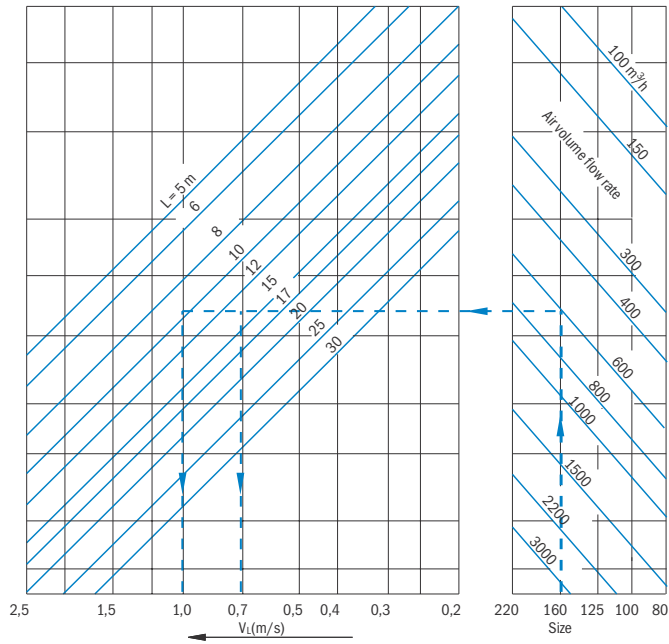


Diagram 2: Air jet deflection

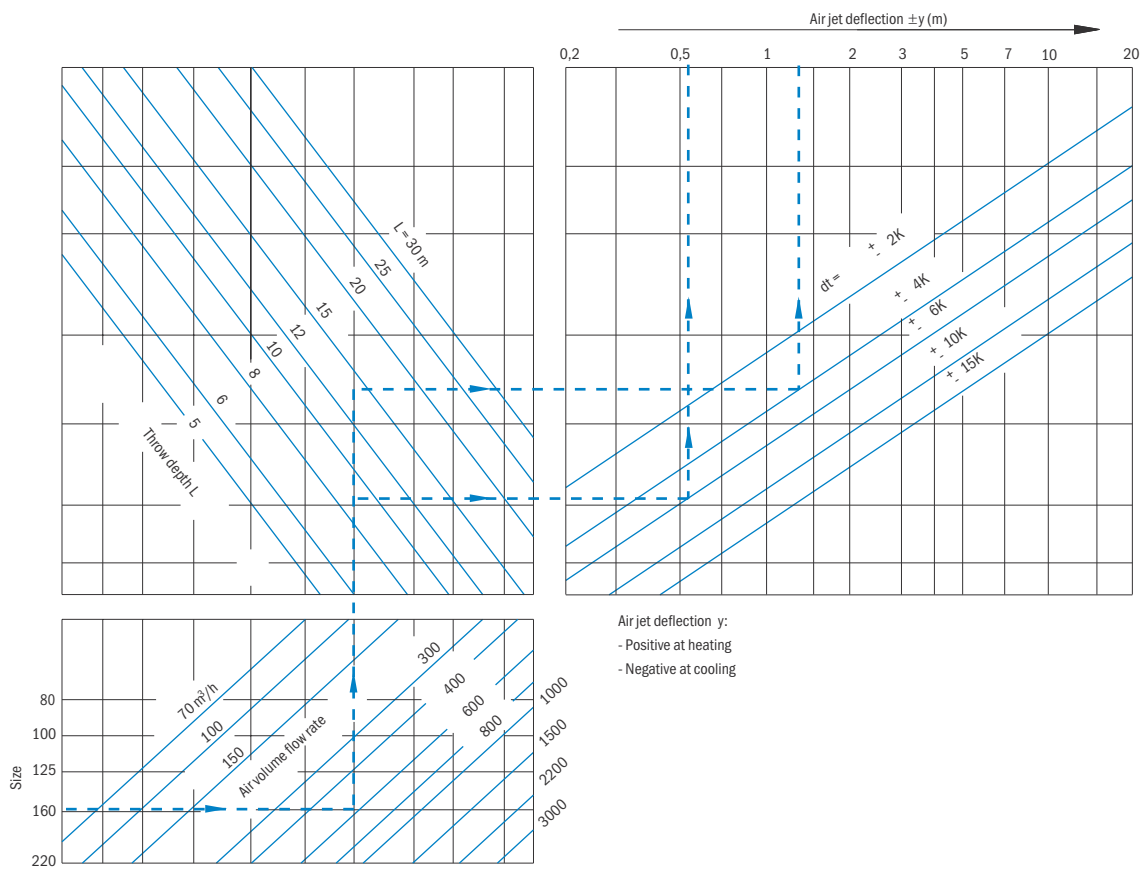


Diagram 3: Velocity at the air jet axis

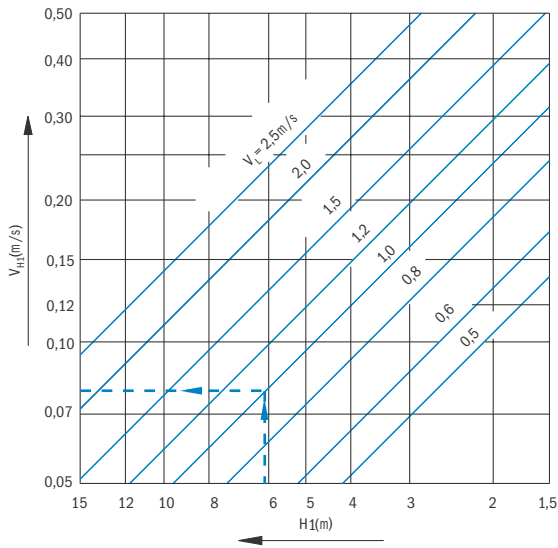


Diagram 4: Temperature quotient

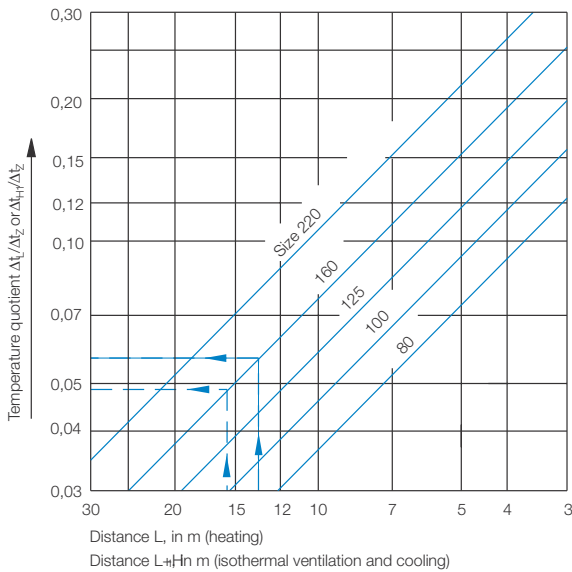


Diagram 5: Pressure drops and sound levels

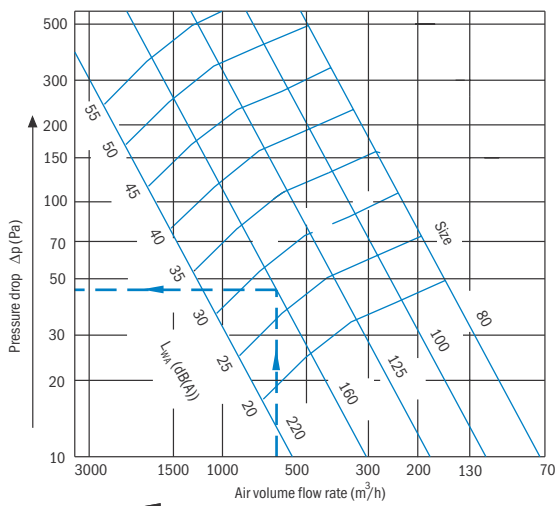
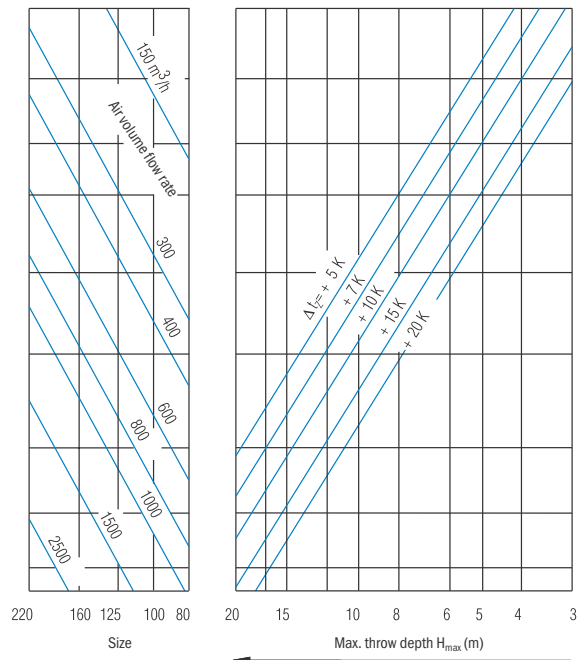


Diagram 6: Maximum warm air throw depth at vertical supply



Calculation example
with regard to different air supply angles

Cooling (α_H)

- Select air supply angle (α_H):
- Calculate distance L: $L = \frac{C}{\cos(\alpha_H)}$ (table 1)
- Calculate height H₂: H₂ = tg(α_H) x C (table 1)
- Select velocity v_L from diagram 1
- Select air jet deflection y from diagram 2
- Calculate height: H₁: H₁ = H + H₂ - y
- Select velocity v_{H1} from diagram 3.
- Select temperature quotient from diagram 4 $\frac{\Delta t_{H1}}{\Delta t_z}$ or $\frac{\Delta t_L}{\Delta t_z}$:

$$\Delta t_{H1} = \frac{\Delta t_{H1}}{\Delta t_z} \times \Delta t_z \quad \Delta t_L = \frac{\Delta t_L}{\Delta t_z} \times \Delta t_z$$

Calculation example
Isothermal ventilation

Apply diagram 1 and 3.

Heating (α_T)

- Select velocity v_L.
- Select distance L from diagram 1.
- Establish air jet deflection y from diagram 2.
- Calculate air supply angle:

$$\sin(\alpha_T) = \frac{G+y}{L} \quad \text{table (1)}$$

- Select temperature quotient from diagram 4 $\frac{\Delta t_{H1}}{\Delta t_z}$ or $\frac{\Delta t_L}{\Delta t_z}$:

$$\Delta t_{H1} = \frac{\Delta t_{H1}}{\Delta t_z} \times \Delta t_z \quad \Delta t_L = \frac{\Delta t_L}{\Delta t_z} \times \Delta t_z$$

Note:

In the case of the distance between nozzles smaller than 0,14 x C, velocity v_L and Δt_L are increased by a factor of ≈ 1,5

Example

Two nozzles are installed at a distance of 18 m one from another and 7 m above the floor.

Air flow rate:

$V = 600 \text{ m}^3/\text{h}$ (per nozzle)

$\Delta t_z = -6\text{K}$ (summer)

$\Delta t_z = +4\text{K}$ (winter)

Selected: nozzle VS-4, size 160

Cooling: ($-\alpha_H$) = 10°

a) Distance L: $L = c / \cos \alpha = 9 / 0.985 = 9.14 \text{ m}$ (table 1)

b) Height H_2 : $H_2 = \text{tg}(\alpha_H) \times 9 = 0.176 \times 9 = 1.578 \text{ m}$ (table 1)

c) Select velocity v_L from diagram 1: $v_L = 1.05 \text{ m/s}$

d) Establish air deflection y from diagram 2: $y = -0.6 \text{ m}$

e) Calculate height H_1 : $H_1 = H + H_2 - y$ $H_1 = 5.2 + 1.587 - 0.6 = 6.187 \text{ m}$

f) Select velocity v_{H1} from diagram 3: $v_{H1} = 0.08 \text{ m/s}$

g) Select temperature quotient from diagram 4 $\Delta t_{H1} / \Delta t_z$:

$$\Delta t_{H1} = \Delta t_{H1} / \Delta t_z \times \Delta t_z = 0.048 \times (-6) = -0.288 \text{ K}$$

Heating: (t)

a) Select velocity v_L : $v_L = 0.71 \text{ m/s}$

b) Establish distance L from diagram 1: $L = 13.5 \text{ m}$

c) Establish air deflection y from diagram 2: $y = +1.3 \text{ m}$

d) Calculate air supply angle (α_t):

$$\sin(\alpha_t) = G + y/L = 4 + 1.3/13.5 = 0.3926 \Rightarrow \alpha_t \approx 23^\circ$$

e) Select temperature quotient from diagram 4:

$$\Delta t_t = \frac{\Delta t_t}{\Delta t_z} \times \Delta t_z = 0.055 \times 4 = 0.22 \text{ K}$$

f) From diagram 5, sound power level L_{WA} at the source can be established:

$L_{WA} = 27 \text{ dB(A)}$

$\Delta p_t = 43 \text{ Pa}$

Table 1

α_H	$\cos(\alpha_H)$	$\text{tg}(\alpha_H)$	α_t	$\sin(\alpha_t)$
0	1	0	0	0
5	0.996	0.0875	5	0.087
10	0.985	0.176	10	0.174
15	0.966	0.268	15	0.260
20	0.940	0.364	20	0.342
25	0.906	0.466	25	0.423
30	0.866	0.577	30	0.500