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.

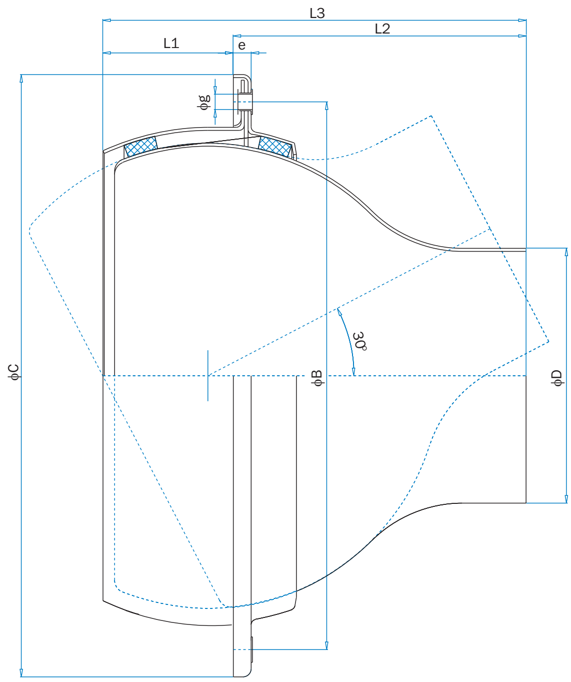
AI
RAL 9010
M
CD

Description

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

- manually within ±30° in all directions or
- with electromotor within ±30° 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.

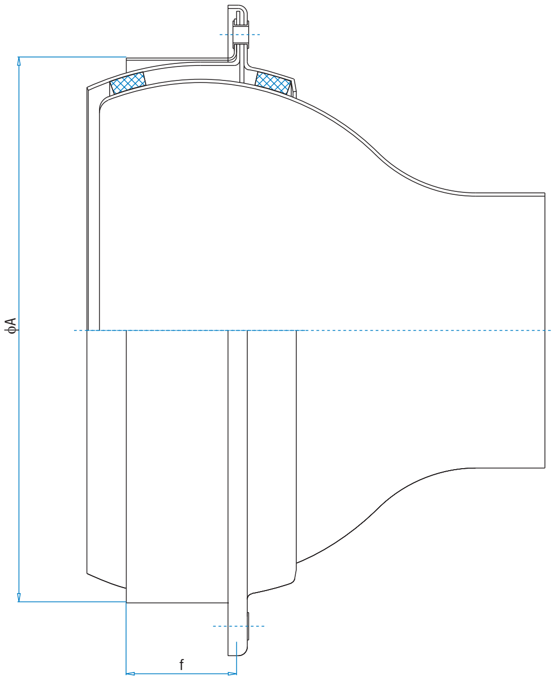


Sizes and dimensions

Size	ΦD	ΦB	Φc	e	L1	L2	L3	Φg	n	A_{ef} (m²)
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/E



Size	ΦA	f
80	158	40
100	198	40
125	248	40
160	313	40
220	398	65

Installation methods

- Mounting on a tube (marking **E**)

Ordering key

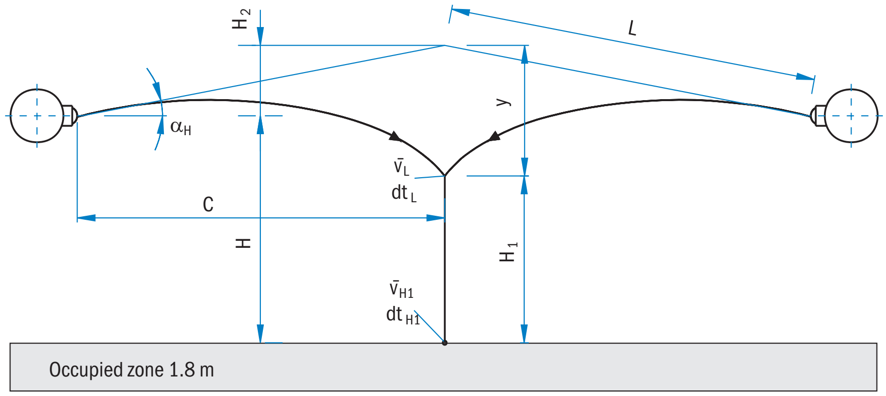
VŠ-4/ --- /R Size 125

Standard sizes 80, 100, 125, 160, 220

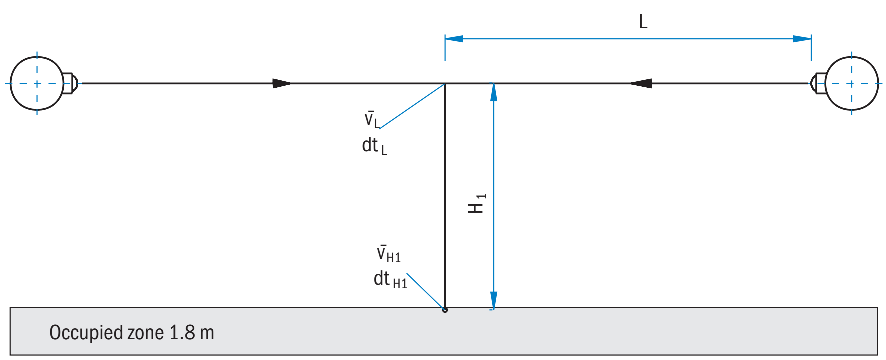
R Manual adjustment

E Mounting on a tube

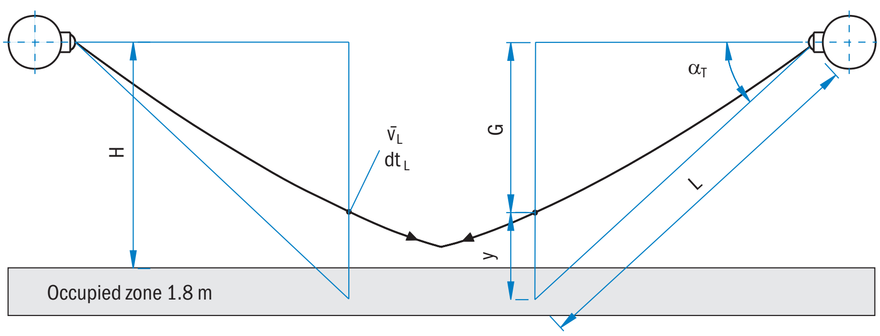
Cooling



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
H_2 (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)
H_1 (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

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

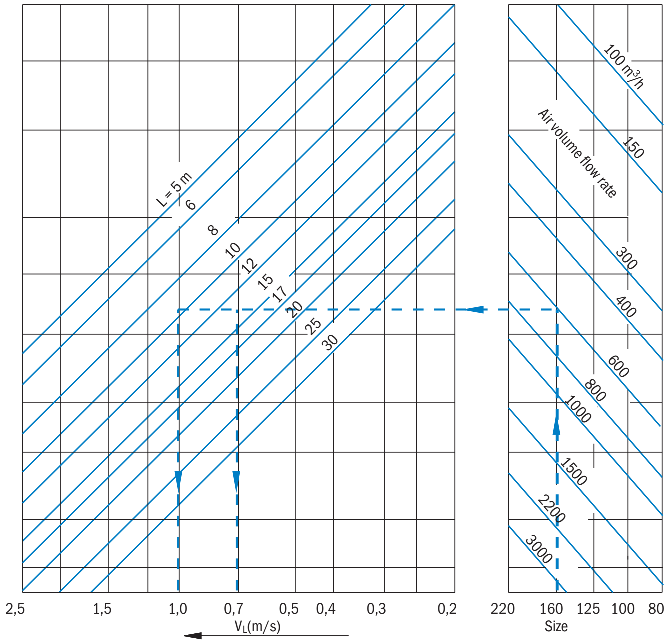


Diagram 2: Air jet deflection

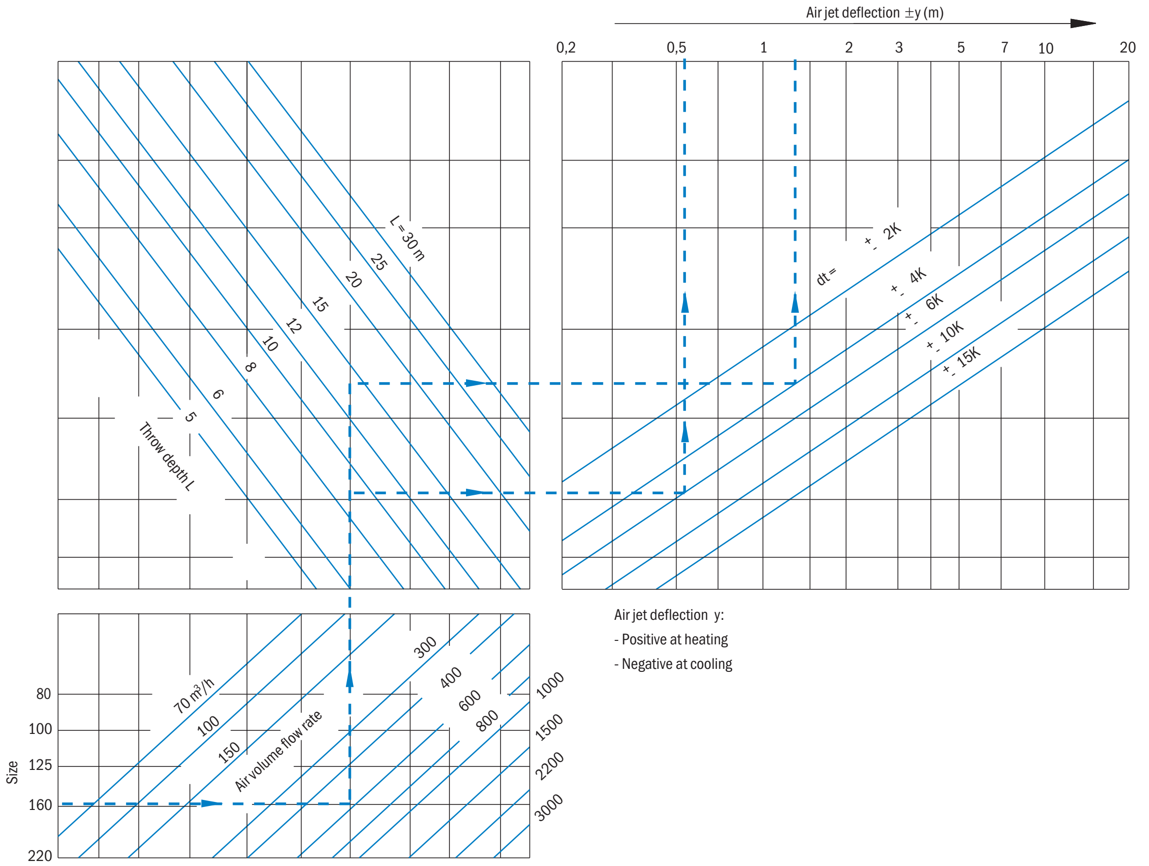


Diagram 3: Velocity at the air jet axis

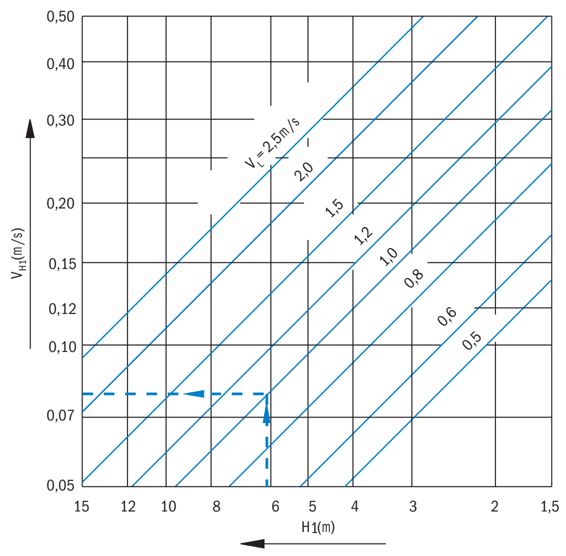


Diagram 6: Maximum warm air throw depth at vertical supply

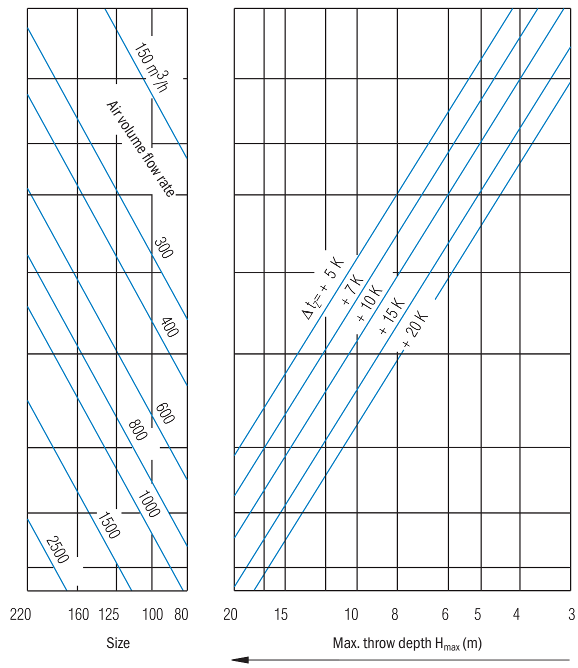


Diagram 4: Temperature quotient

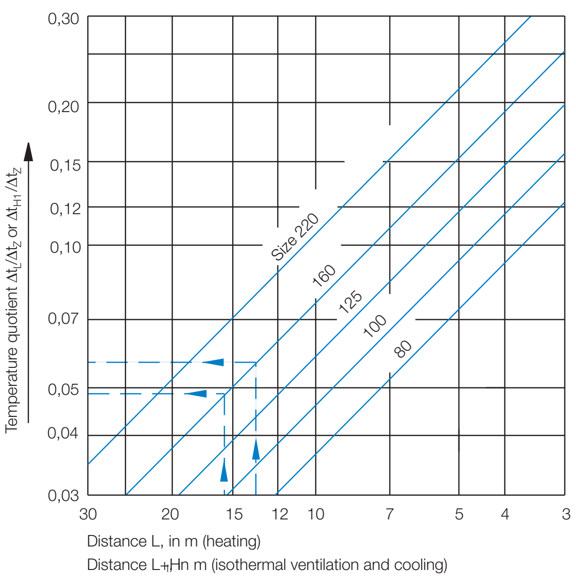
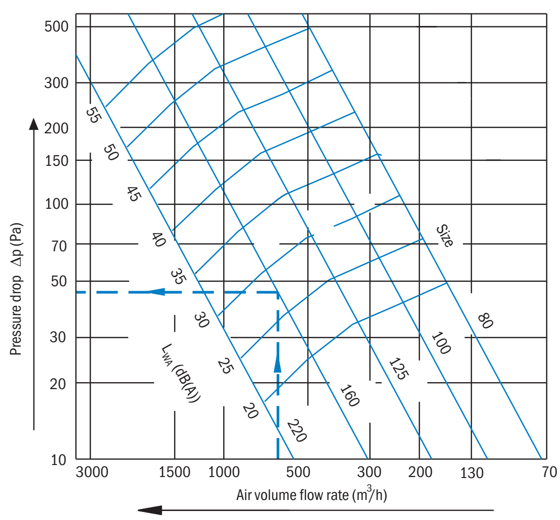


Diagram 5: Pressure drops and sound levels



Calculation example
with regard to different air supply angles

Cooling (α_H)

a) Select air supply angle (α_H):

b) Calculate distance L: $L = \frac{C}{\cos(\alpha_H)}$ (table 1)

c) Calculate height H_2: $H_2 = tg(\alpha_H) \times C$ (table 1)

d) Select velocity v_L from diagram 1

e) Select air jet deflection y from diagram 2

f) Calculate height: H_1: $H_1 = H + H_2 - y$

g) Select velocity v_{H1} from diagram 3.

h) Select temperature quotient from diagram 4 $\frac{\Delta t_{H1}}{\Delta t_Z}$ or $\frac{\Delta t_L}{\Delta t_Z}$:

$$\Delta t_{H1} = \frac{\Delta t_{H1}}{\Delta t_Z} \times \Delta t_Z \qquad \Delta t_L = \frac{\Delta t_L}{\Delta t_Z} \times \Delta t_Z$$

Calculation example
Isothermal ventilation

Apply diagram 1 and 3.

Heating (α_T)

a) Select velocity v_L.

b) Select distance L from diagram 1.

c) Establish air jet deflection y from diagram 2.

d) Calculate air supply angle:

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

e) Select temperature quotient from diagram 4 $\frac{\Delta t_{H1}}{\Delta t_Z}$ or $\frac{\Delta t_L}{\Delta t_Z}$:

$$\Delta t_{H1} = \frac{\Delta t_{H1}}{\Delta t_Z} \times \Delta t_Z \qquad \Delta t_L = \frac{\Delta t_L}{\Delta t_Z} \times \Delta t_Z$$

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 m³/h (per nozzle)

Δt_z = -6K (summer)

Δt_z = +4K (winter)

Selected: nozzle VŠ-4, size 160

Cooling: $(-\alpha_H) = 10°$

a) Distance L:L = c/cos α = 9/0.985 = 9.14 m (table 1)

b) Height H_2: H_2 = tg(α_H) x 9= 0.176x9=1.578 m (table 1)

c) Select velocity v_L from diagram 1: v_L = 1.05 m/s

d) Establish air deflection y from diagram 2: y=-0.6 m

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

f) Select velocity v_{H1} from diagram 3: v_{H1} = 0.08 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 x (-6)= -0.288 K

Heating: (α_t)

a) Select velocity v_L: v_L = 0.71 m/s

b) Establish distance L from diagram 1: L = 13.5 m

c) Establish air deflection y from diagram 2: y = +1.3 m

d) Calculate air supply angle (α_t):
sin(α_t) = G+y/L = 4+1.3/13.5 = 0.3926 $\Rightarrow \alpha_t \approx 23°$

e) Select temperature quotient from diagram 4:

$$\Delta t_L = \frac{\Delta t_L}{\Delta t_Z} \times \Delta t_Z = 0{,}055 \times 4 = 0.22\ K$$

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

L_{WA} = 27 dB(A)

Δp_t = 43 Pa

Table 1

α_H	cos(α_H)	tg(α_H)	α_t	sin(α_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