Supply air nozzles
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

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 ±30° 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.

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
Content

<table>
<thead>
<tr>
<th>SUPPLY AIR NOZZLES</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply air nozzles VS-1</td>
<td>256</td>
</tr>
<tr>
<td>Supply air nozzles VS-4</td>
<td>263</td>
</tr>
<tr>
<td>Supply air nozzles VS-5</td>
<td>269</td>
</tr>
</tbody>
</table>

**Legend of symbols**

- **AI**: Element is made of aluminium profiles, aluminium sheet or aluminium casting.
- **St**: Element is made of steel sheet.
- **RAL 9010**: Element is powder painted in standard RAL 9010 colour. Other desired colour is to be specified in the order.
- **Shady symbol**: Shady symbol means possibility of optional material, surface protection, motor version, ...
- **Floor**: Element is intended to be built in the floor.
- **Wall**: Element is intended to be built in the wall.
- **Ceiling or in the wall**: Element is intended to be built in the ceiling or in the wall.
- **Cool air**: Element is suitable for the supply of cool air (cooling).
- **Motor**: Element allows regulation by electric motor (Belimo electric motors).
- **F**: Element is intended for air filtration. The filter of class ... is built in.
- **CD**: The possibility of the automatic selection and calculation of the technical characteristics of grilles and diffusers in regard to the given conditions with the assistance of the Klima ADE program.
- **Inox**: The element is made of stainless steel AISI 304.
Supply air nozzles

Supply air nozzles VŠ-1

Application
VŠ-1 supply air nozzles are designed to supply air into rooms in applications requiring large throw distances and low noise levels. By arranging nozzles in blocks, the throw distance is considerably increased. In terms of materials and shape, blocks of air nozzles can be designed according to to fit well into room decoration.

Description
VŠ-1 supply air nozzles are of a fixed construction. They are made of anodised sheet aluminium. On request, they can be powder painted in any of the RAL scale colours.

Sizes and dimensions
VŠ-1 supply air nozzles are available in six sizes: from 20 to 250.

Installation methods
Size 20 and 50 VŠ-1 supply air nozzles are installed by gluing, while size 100, 140, 160 and 250 air supply nozzles are installed by means of rivets or 3.5 mm self-tapping screws. VŠ-1 supply air nozzles are supplied without mounting holes.

<table>
<thead>
<tr>
<th>Size</th>
<th>φd</th>
<th>φD1</th>
<th>φD2</th>
<th>b</th>
<th>φC</th>
<th>Ar (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>20</td>
<td>40</td>
<td>52</td>
<td>60</td>
<td>46</td>
<td>0.00025</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>100</td>
<td>116</td>
<td>100</td>
<td>108</td>
<td>0.00181</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
<td>200</td>
<td>220</td>
<td>160</td>
<td>210</td>
<td>0.00785</td>
</tr>
<tr>
<td>140</td>
<td>140</td>
<td>250</td>
<td>290</td>
<td>250</td>
<td>270</td>
<td>0.01496</td>
</tr>
<tr>
<td>160</td>
<td>160</td>
<td>250</td>
<td>290</td>
<td>250</td>
<td>270</td>
<td>0.01960</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>400</td>
<td>440</td>
<td>350</td>
<td>420</td>
<td>0.04830</td>
</tr>
</tbody>
</table>

Ordering example
Supply air nozzle type: VŠ-1
Size: 100
Pcs: 25
**Technical data of single supply air nozzles VŠ-1**

Supply air nozzle is considered as a single unit when the distance between two adjacent nozzles is \( A \geq 10d \).

The most significant data in respect of an air supply nozzle characterization is the turbulence number \( m \).

**Throw distance of single supply air nozzle:**

\[
L = \frac{d}{m} \cdot \frac{d}{10d} \cdot \left( \frac{v_0}{v_L} - 0.63 \right) \quad \text{(m)}
\]

**Method of determining induction:**

\[
i = 2 \frac{m}{d}
\]

<table>
<thead>
<tr>
<th>Size (mm)</th>
<th>( m )</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.180</td>
</tr>
<tr>
<td>50</td>
<td>0.155</td>
</tr>
<tr>
<td>100</td>
<td>0.150</td>
</tr>
<tr>
<td>140</td>
<td>0.145</td>
</tr>
<tr>
<td>160</td>
<td>0.145</td>
</tr>
<tr>
<td>250</td>
<td>0.150</td>
</tr>
</tbody>
</table>

**Definition of symbols**

- \( v_0 \) (m/s): Discharge air velocity (velocity in the air jet core)
- \( Q_s \) (m³/s): Air flow rate per single nozzle
- \( A_{ef} \) (m²): Effective nozzle cross-section area
- \( v_L \) (m/s): Desired velocity at the throw distance \( L \)
- \( L \) (m): Desired throw distance
- \( m \): Supply air nozzle turbulence number
- \( \Delta t_L \) (°C): Maximum difference between the jet core temperature and the room temperature
- \( \Delta t_Z \) (°C): Temperature difference between supply air and room air
- \( i \): Induction, i.e. the ratio between the total air jet flow rate and supply air flow rate
- \( A \) (m): Distance between nozzles
- \( g \) (m/s²): Acceleration of gravity
- \( d \) (m): Nozzle diameter
- \( T_p \) (°K): Room air absolute temperature

---

The technical data and characteristics of single supply air nozzles VŠ-1 are provided, including the method of determining the turbulence number, throw distance formula, and a table listing various sizes and corresponding turbulence numbers. The symbols used are defined, ensuring a clear understanding of the technical specifications and calculations involved.
Calculation of the throw distance as a function of the temperature quotient:
In non-isothermal conditions (temperature difference between the supply air and room air) the air jet rise or drop \(y\) and temperature quotient shall be considered:

\[
\frac{\Delta L}{\Delta t_z} = 3 \times \frac{d}{m \times L \times \Delta t_l \times \Delta t_z} (\text{m})
\]

\[y = 0.33d \times m \times Ar \left(\frac{L}{d}\right) (\text{m})\]

where \(Ar\) = Arhchimean number

\[
Ar = \frac{d \times \Delta t_z \times g}{v_o \times T_p}
\]

Temperature quotient:

\[
\frac{\Delta L}{\Delta t_z} = \frac{3}{4} \times \frac{d}{m \times L \times \Delta t_l \times \Delta t_z} (\text{m})
\]

\[
\Delta t_l = \frac{3}{4} \times \frac{d}{m \times L \times \Delta t_z} (\text{C})
\]

Sound power level diagram
Definition of symbols

- \( Q_0 \) (m³/s): supply air flow rate
- \( n \): Number of nozzles in a block
- \( Q_{cel} \) (m³/s): Air flow rate at the throw distance
- \( v_2 \) (m/s): Air jet velocity at the throw distance
- \( b \) (m): Air jet width at \( x_2 \)
- \( h \) (m): Air jet height at \( x_2 \)
- \( L \) (m): Throw distance of the combined air jet
- \( L_{cel} \) (m): Total throw distance
- \( Q_{cel} \) (m³/s): Air flow rate at the throw distance

Isothermal conditions - rectangular array nozzle block

The indicated calculation method is applicable in isothermal conditions and for rectangular blocks of nozzle where \( b \times h \leq 12 \). In a case of non-isothermal conditions, the air jet rise or drop due to the temperature difference has to be calculated.

Arrangement of supply air nozzles in blocks

When large throw distance or greater air flow rate is required, supply nozzles are installed arranged in blocks.

Calculation method applicable to isothermal conditions and a rectangular array nozzle blocks \( b \times h \leq 12 \)

1. Distance from the outlet to the joint air jet:
   \[
   x_2 = 9.5 \times \left( A \cdot \frac{d}{2} \right) \text{ (m)}
   \]

2. Increase of air flow rate due to induction:
   \[
   Q_2 = \frac{2 \times x_2}{x_0} \times Q_0 \left( \frac{\text{m}^3}{\text{s}} \right)
   \]

3. Widening of air jet up to the distance \( x_2 \):
   \[
   b = b' + 0.2x_2 \text{ (m)}
   \]
   \[
   h = h' + 0.2x_2 \text{ (m)}
   \]
   \[
   F_2 = b \times h \text{ (m²)}
   \]

4. Air jet velocity at \( x_2 \):
   \[
   v_2 = \frac{Q_2}{F_2} \text{ (m/s)}
   \]

5. Air jet velocity at the throw distance \( L \):
   \[
   v_L = \frac{v_2 \times d \times \sqrt{h}}{m \times L} \text{ (m/s)}
   \]

6. Throw distance:
   \[
   L = \frac{v_2 \times d \times \sqrt{h}}{m \times v_L} \text{ (m)}
   \]

7. Total throw distance:
   \[
   L_{cel} = L + X_2 \text{ (m)}
   \]

8. Air supply nozzle block induction is calculated as follows:
   \[
   i = \frac{Q_{cel}}{Q_0} \quad Q_{cel} = 2Q_2 \frac{v_2 \times d \times \sqrt{h}}{m \times v_L}
   \]
**Supply air nozzles**

**Isothermal conditions - square or circular array nozzle block**
In the cases of nozzle blocks not installed in a rectangular array, the adjustments indicated on the left shall be applied.

**Non-isothermal conditions**
In non-isothermal conditions, the air jet rise or drop is calculated according to formulas indicated on the left.

**Calculation method applicable to isothermal conditions and a square or circular array nozzle blocks:**

1. Square arrangement of supply air nozzles:
   - \( b = h = a \)
   - \( F_2 = a^2 \)

2. Circular arrangement of supply air nozzles:
   - \( b = h = d \)
   - \( F_2 = \pi \times d^2 / 4 \)
   - \( m = 0.20 \)

**Calculation method applicable in non-isothermal conditions:**

1. Rectangular arrangement of supply air nozzles:
   - \( y = 0.4 \times h \times \sqrt{m} \times Ar \times \left( \frac{L}{m} \right)^3 \)

2. Circular arrangement of supply air nozzles:
   - \( y = 0.33 \times m \times Ar \times \left( \frac{L}{m} \right)^3 \) (M)

**Archimedeans number (Ar)**

- for rectangular supply air nozzle block: \( Ar = \frac{g \times h \times \Delta t_2}{v^2 \times T_0} \)
- for circular supply air nozzle block: \( Ar = \frac{d \times \Delta t_2 \times g}{v^2 \times T_1} \)

The indicated calculation method provides an approximate result. In cases of sophisticated architectural demands, the designer is invited to consult our factory team for detailed design information. A model test can be carried out on request.
Supply air nozzles

Pressure drop diagrams

Pressure drop

\[ p_s = 1.05 \frac{\rho}{2} V_0^2 \] (Pa)

\( \rho \) – air density (kg/m\(^3\))

Definition of symbols

- **\( g \) (m/s)\)** Acceleration of gravity
- **\( d \) (m)** Circular air jet diameter at \( x_2 \)
- **\( h \) (m)** Rectangular air jet height at \( x_2 \)
- **\( \Delta \)t (ºC)** Temperature difference between supply air and room air
- **\( T_r \) (ºK)** Absolute room air temperature
- **\( m \)** Turbulence number (m=0.25 for rectangular block and m=0.20 for circular block)
- **\( L \) (m)** Throw distance

Supplies air nozzles

- 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 REGULATION UNITS
- SOUND ATTENUATORS, SOUND ATTENUATING LOUVRES
Supply air nozzles

**Calculation example**

Required air flow rate into the hall: 15 000 m³/h.
Room temperature: 
\[ t_p = 20 \, ^\circ C \]
Supply air temperature: 
\[ t_s = 26 \, ^\circ C \]
Air velocity in occupied zone: 
\[ v_L = 0.5 \, m/s \]

**Solution:**

52 pcs individually installed air supply nozzles VS-1 of size 100 are required. Air flow rate per each air supply nozzle is calculated as follows:

\[ Q_s = \frac{15000}{52} = 292 \, m^3/h = 0.08011 \, m^3/s \]

1. **Supply air velocity:**

\[ V_0 = \frac{Q_s}{A_0} = \frac{0.08011}{0.00785} = 10.2 \, m/s \]

2. **Throw distance:**

\[ L = 0.1 + \frac{0.1 \times 0.128 \times (10.2 - 0.5 - 0.63)}{0.15} = 16 \, m \]

3. **Archimedeans number:**

\[ A_r = \frac{(0.1) \times (-6) \times (9.81)}{(10.2)^2 \times 293} = \frac{-5.885}{3.047} \times 10^{-4} = -1.931 \times 10^{-4} \]

4. **Air jet rise:**

\[ y = 0.33 \times 0.1 \times 0.15 \times (-1.931 \times 10^{-4}) \times \frac{16}{0.1} = -3.9 \, m \]

5. **Temperature quotient:**

\[ \frac{\Delta t_L}{\Delta t_0} = \frac{0.1}{0.15 \times 16} = 0.031 \]

6. **Pressure drop:**

\[ p_d = 1.05 \times \frac{1.15}{2} \times (10.2)^2 = 62.7 \, Pa \]

7. **Self-noise level:**

Determined from the diagram at
\[ v_0 = 10.2 \, m/s \]
\[ L_{win} = 25 \, dB (A) \]
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 ±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**

<table>
<thead>
<tr>
<th>Size</th>
<th>ØD</th>
<th>ØB</th>
<th>Øc</th>
<th>e</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>Øg</th>
<th>n</th>
<th>Aef (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>80</td>
<td>175</td>
<td>196.5</td>
<td>7</td>
<td>43</td>
<td>96</td>
<td>139</td>
<td>6.5</td>
<td>3</td>
<td>0.004778</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
<td>215</td>
<td>236.5</td>
<td>7</td>
<td>51</td>
<td>115</td>
<td>166</td>
<td>6.5</td>
<td>3</td>
<td>0.007543</td>
</tr>
<tr>
<td>125</td>
<td>125</td>
<td>265</td>
<td>286.5</td>
<td>7</td>
<td>52</td>
<td>142</td>
<td>194</td>
<td>6.5</td>
<td>3</td>
<td>0.011882</td>
</tr>
<tr>
<td>160</td>
<td>160</td>
<td>340</td>
<td>361.5</td>
<td>9</td>
<td>75</td>
<td>180</td>
<td>255</td>
<td>6.5</td>
<td>4</td>
<td>0.019607</td>
</tr>
<tr>
<td>220</td>
<td>220</td>
<td>425</td>
<td>446.5</td>
<td>9</td>
<td>95</td>
<td>219</td>
<td>314</td>
<td>6.5</td>
<td>4</td>
<td>0.037325</td>
</tr>
</tbody>
</table>

n - number of fixing boreholes
Supply air nozzles

Installation methods
• Mounting on a circular duct (marking D)
• Mounting on a tube (marking E)

<table>
<thead>
<tr>
<th>Size</th>
<th>ExE</th>
<th>ΦDc,min</th>
<th>ΦA</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>200</td>
<td>200</td>
<td>158</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>240</td>
<td>250</td>
<td>198</td>
<td>40</td>
</tr>
<tr>
<td>125</td>
<td>290</td>
<td>300</td>
<td>248</td>
<td>40</td>
</tr>
<tr>
<td>160</td>
<td>365</td>
<td>380</td>
<td>313</td>
<td>40</td>
</tr>
<tr>
<td>220</td>
<td>450</td>
<td>500</td>
<td>398</td>
<td>65</td>
</tr>
</tbody>
</table>

When ordering, please specify ΦDc.

Ordering key
VŠ-4/D 300/B Size 125

- Standard sizes 80, 100, 125, 160, 220
- R Manual adjustment
- B4 Motor Belimo NM 24A
- B5 Motor Belimo NM 230A
- B6 Motor Belimo NM 24A SR
- J4 Motor Joventa DAS 1
- J5 Motor Joventa DAS 2
- J6 Motor Joventa DMS 1.1
- D Mounting on a round duct
- E Mounting on a tube
### Definition of symbols

- \( L (m) \): Throw distance in isothermal condition
- \( \alpha_H (°) \): Set angle in cooling mode
- \( \alpha_T (°) \): 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
- \( H_{\text{max}} (m) \): 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
- \( v_H (m/s) \): Average air velocity in the occupied zone \( H_1 \)
- \( v_L (m/s) \): Average air velocity at the two air jets collision point \( L \)
- \( \Delta t_L (K) \): Temperature difference between the supply air at the distance \( L \) and the room air
- \( \Delta t_{H1} (K) \): Temperature difference between the supply air at the entry in the occupied zone and the room air
- \( \Delta p_L (Pa) \): Total air pressure drop
- \( L_{\text{WA}} (dB(A)) \): Sound power level

---

### Supply air nozzles

- Supply air nozzles
- 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 REGULATION UNITS
- SOUND ATTENUATORS, SOUND ATTENUATING LOUVRES
Diagram 1: Velocity in the air jet core and throw depth

Diagram 2: Air jet deflection

Air jet deflection y:
- Positive at heating
- Negative at cooling
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 ($\kappa_{Hi}$)

a) Select air supply angle ($\kappa_{Hi}$):
b) Calculate distance $L$: $L = \frac{C}{\cos(\kappa_{Hi})}$ (table 1)
c) Calculate height $H_2$: $H_2 = \tan(\kappa_{Hi}) \times C$ (table 1)
d) Select velocity $v_i$ from diagram 1
e) Select air jet deflection $y$ from diagram 2
f) Calculate height: $H_2 = H + H_2 - y$
g) Select velocity $v_{i1}$ from diagram 3.
h) Select temperature quotient from diagram 4

$$\Delta t_{Hi} = \frac{\Delta t_{Hi}}{\Delta t_1} \text{ or } \frac{\Delta t_L}{\Delta t_2}$$

$$L = C \cos(\alpha_H)$$

Apply diagram 1 and 3.

Heating ($\kappa_T$)

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:

$$\sin(\kappa_T) = \frac{G+y}{L} \text{ table (1)}$$
e) Select temperature quotient from diagram 4

$$\Delta t_{Hi} = \frac{\Delta t_{Hi}}{\Delta t_1} \text{ or } \frac{\Delta t_L}{\Delta t_2}$$

Note:
In the case of the distance between nozzles smaller than $0,14 \times C$, velocity $v_i$ and $\Delta t_L$ 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 $VŠ-4$, size 160

Cooling: $(-\alpha_t) = 10^\circ$

a) Distance $L: L = c/\cos \alpha = 9/0.985 = 9.14 \text{ m}$ (table 1)
b) Height $H_2: H_2 = \tan(\alpha_t) \times 9 = 0.176 \times 9 = 1.578 \text{ m}$ (table 1)
c) Select velocity $v_c$ from diagram 1: $v_c = 1.05 \text{ m/s}$
d) Establish air deflection $y$ from diagram 2: $y = 0.6 \text{ m}$
e) Calculate height $H_1$: $H_1 = H + H_2 - y = 5.2 + 1.587 - 0.6 = 6.187 \text{ m}$
f) Select velocity $v_{H1}$ from diagram 3: $v_{H1} = 0.08 \text{ m/s}$
g) Select temperature quotient from diagram 4: $\Delta t_{H1} = \Delta t_{H1} / \Delta t_z x \Delta t_z = 0.048 x (-6) = -0.288 \text{K}$

Heating: $(\alpha_t)$

a) Select velocity $v_t$: $v_t = 0.71 \text{ m/s}$
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 ($\alpha_t$):
\[
\sin(\alpha_t) = \frac{y}{L} = \frac{4.1.3}{13.5} = 0.3926 \Rightarrow \alpha_t = 23^\circ
\]
e) Select temperature quotient from diagram 4:
\[
\Delta t = \frac{\Delta t_1}{\Delta t_2} x \Delta t_2 = 0.055 \times 4 = 0.22 \text{ K}
\]
f) From diagram 5, sound power level $L_{WA}$ at the source can be established:
\[
L_{WA} = 27 \text{dB(A)}
\]
\[
\Delta p_b = 43 \text{ Pa}
\]

<table>
<thead>
<tr>
<th>$\alpha_t$</th>
<th>$\cos(\alpha_t)$</th>
<th>$\tan(\alpha_t)$</th>
<th>$\alpha_t$</th>
<th>$\sin(\alpha_t)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0.996</td>
<td>0.0875</td>
<td>5</td>
<td>0.087</td>
</tr>
<tr>
<td>10</td>
<td>0.985</td>
<td>0.176</td>
<td>10</td>
<td>0.174</td>
</tr>
<tr>
<td>15</td>
<td>0.966</td>
<td>0.268</td>
<td>15</td>
<td>0.260</td>
</tr>
<tr>
<td>20</td>
<td>0.940</td>
<td>0.364</td>
<td>20</td>
<td>0.342</td>
</tr>
<tr>
<td>25</td>
<td>0.906</td>
<td>0.466</td>
<td>25</td>
<td>0.423</td>
</tr>
<tr>
<td>30</td>
<td>0.866</td>
<td>0.577</td>
<td>30</td>
<td>0.500</td>
</tr>
</tbody>
</table>
Supply air nozzle VŠ-5

Application
Air supply nozzles VŠ-5 are applied in the supply of cold or warm air in rooms where long throw distances and low noise operation are required. By combining individual nozzles into a block, the throw distance is increased proportionally. There is a choice of several mounting methods.

Description
Supply nozzles VŠ-5 are adjustable. The air jet can be adjusted:

- manually, in all directions, within a ±30° range
- by means of an electric motor or thermostat element, in horizontal and vertical direction, within a ±30° range.

The nozzle setting depends on the supplied air temperature.

The supply nozzle is integrated in a housing, thus even with the largest size, 400, it does not project into the room by more than 45 mm (see dimension L2 as a function of the setting angle 0°).

Supply nozzles VŠ-5 are made of galvanised eloxal treated aluminium sheet. On customer’s request, nozzles can be powder painted in any of the RAL scale colours.

Sizes and dimensions
L2* ... corresponds to the setting angle 0°

<table>
<thead>
<tr>
<th>Size</th>
<th>Do</th>
<th>Dz</th>
<th>D4</th>
<th>L1</th>
<th>L2*</th>
<th>Aef (m²)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>98</td>
<td>146</td>
<td>40</td>
<td>87</td>
<td>-5</td>
<td>0.0013</td>
<td>0.20</td>
</tr>
<tr>
<td>125</td>
<td>123</td>
<td>171</td>
<td>64</td>
<td>91</td>
<td>-1</td>
<td>0.0032</td>
<td>0.27</td>
</tr>
<tr>
<td>160</td>
<td>158</td>
<td>206</td>
<td>82</td>
<td>98</td>
<td>11</td>
<td>0.0053</td>
<td>0.30</td>
</tr>
<tr>
<td>200</td>
<td>198</td>
<td>252</td>
<td>108</td>
<td>108</td>
<td>19</td>
<td>0.0092</td>
<td>0.55</td>
</tr>
<tr>
<td>250</td>
<td>248</td>
<td>312</td>
<td>136</td>
<td>121</td>
<td>19</td>
<td>0.0145</td>
<td>0.77</td>
</tr>
<tr>
<td>315</td>
<td>313</td>
<td>377</td>
<td>174</td>
<td>145</td>
<td>35</td>
<td>0.0238</td>
<td>1.12</td>
</tr>
<tr>
<td>400</td>
<td>398</td>
<td>472</td>
<td>230</td>
<td>171</td>
<td>45</td>
<td>0.0415</td>
<td>1.64</td>
</tr>
</tbody>
</table>
Mounting methods:

- **Standalone nozzle (V)**
  A nozzle without extensions is mounted by means of three bolts from its face. The mounting opening dimension is $\Phi Do + 10\text{mm}$.

- **Mounting with extensions (designations D,K,E)**
  Visible nozzle mounting by means of an extension. The nozzle is supplied with the extension already installed. The installation technician mounts the extension to a round or rectangular duct by means of rivets or self-tapping screws. On customer’s request, the extension can be powder painted in any of the RAL scale colours. The duct diameter $\Phi Dc$ shall be specified in the order.

  The extension is mounted separately. A standard dimension duct is attached to the extension connector.

- **Mounting to a round duct (D)**

- **Mounting to a rectangular duct (K)**

- **Mounting with a connector to a duct (E)**
• **Mounting of a nozzle on the extension**
The nozzle is fixed into the extension on the side face, thus there are no bolts on its face side.

<table>
<thead>
<tr>
<th>Size</th>
<th>ΦDo</th>
<th>ΦDz</th>
<th>ΦDa</th>
<th>ΦDa+20</th>
<th>L3</th>
<th>ΦDc min</th>
<th>Ip</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>98</td>
<td>146</td>
<td>118</td>
<td>138</td>
<td>90</td>
<td>125</td>
<td>63</td>
</tr>
<tr>
<td>125</td>
<td>123</td>
<td>171</td>
<td>143</td>
<td>163</td>
<td>95</td>
<td>150</td>
<td>63</td>
</tr>
<tr>
<td>160</td>
<td>158</td>
<td>206</td>
<td>178</td>
<td>198</td>
<td>100</td>
<td>180</td>
<td>63</td>
</tr>
<tr>
<td>200</td>
<td>198</td>
<td>252</td>
<td>224</td>
<td>244</td>
<td>110</td>
<td>224</td>
<td>83</td>
</tr>
<tr>
<td>250</td>
<td>248</td>
<td>312</td>
<td>284</td>
<td>304</td>
<td>120</td>
<td>315</td>
<td>78</td>
</tr>
<tr>
<td>315</td>
<td>313</td>
<td>377</td>
<td>349</td>
<td>369</td>
<td>150</td>
<td>355</td>
<td>78</td>
</tr>
<tr>
<td>400</td>
<td>398</td>
<td>472</td>
<td>444</td>
<td>464</td>
<td>170</td>
<td>450</td>
<td>73</td>
</tr>
</tbody>
</table>

Adjustment methods:
• **Manual adjustment in all directions, within a ±30° (R)**

• **Electric motor adjustment, for stand-alone mounting**
  - B4 motor Belimo NM 24A
  - B5 motor Belimo NM 230A
  - B6 motor Belimo NM 24A SR
  - J4 motor Joventa DAS 1
  - J5 motor Joventa DAS 2
  - J6 motor Joventa DMS 1.1

Variants D, K and E available.
With all the variants, the L3 dimension equals 250 mm.
Adjustment methods:
• Electric motor adjustment, internal drive
  B1 LH motor Belimo LH 24A 100
  B2 LH motor Belimo LH 230A 100
  B3 LH motor Belimo LH 24A SR
  B4 LH motor Belimo LH 24A MP100

Variants D, K and E available.
With all the variants, the L3 dimension equals 550 mm. Variant is available in following sizes: 160, 200, 250, 315 and 400.

• Termostatic regulation
  Available designs: D, K or E.
  The dimension L3 is 300 mm and is the same for all sizes. The designs are compatible with the sizes 200, 250, 315 and 400.

Advantages:
• Automatic regulation using a thermostatic head
• Requires no motor or installation required for motor power supply and control

Ordering key
VŠ-5/D/R/C0 Size 160

- Standard sizes 100, 125, 160, 200, 250, 315, 400
- C0 Eloxal treated, in the original Al colour (C0)
- RAL Standard RAL 9010 (30% gloss)
  (on customer’s request, any RAL scale colour)
- R Manual adjustment
  B4 Motor Belimo NM 24A standalone mounting
  B5 Motor Belimo NM 230A standalone mounting
  B6 Motor Belimo NM 24A SR standalone mounting
  J4 Motor Joventa DAS 1 standalone mounting
  J5 Motor Joventa DAS 2 standalone mounting
  J6 Motor Joventa DMS 1.1 standalone mounting
  B1 LH Motor Belimo LH 24A 100
  B2 LH Motor Belimo LH 230A 100
  B3 LH Motor Belimo LH 24A SR
  B4 LH Motor Belimo LH 24A MP100
  TR Termostatic regulation*
- V Nozzle without extension - mounting with three bolts
- D Mounting to a round duct (specify ФDc in the order)
- K Mounting to a rectangular duct
- E Mounting with a connector to a duct

* Variant is available in following sizes: 200, 250, 315 and 400.