

Slot Diffuser

- Type VSD15
- with 15 mm wide diffuser face



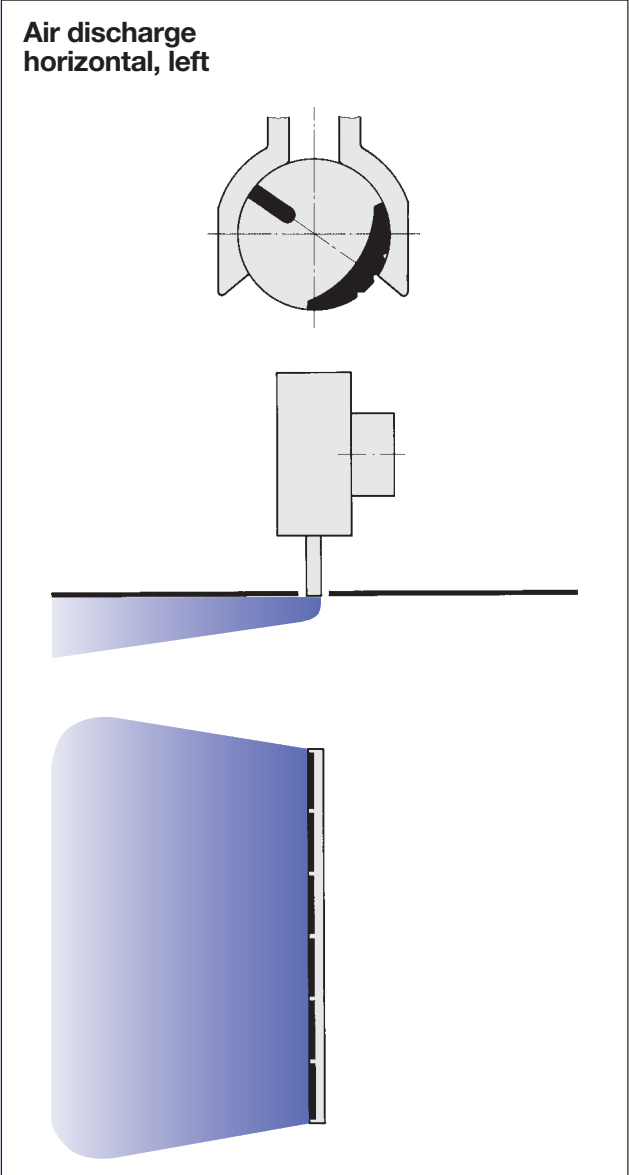
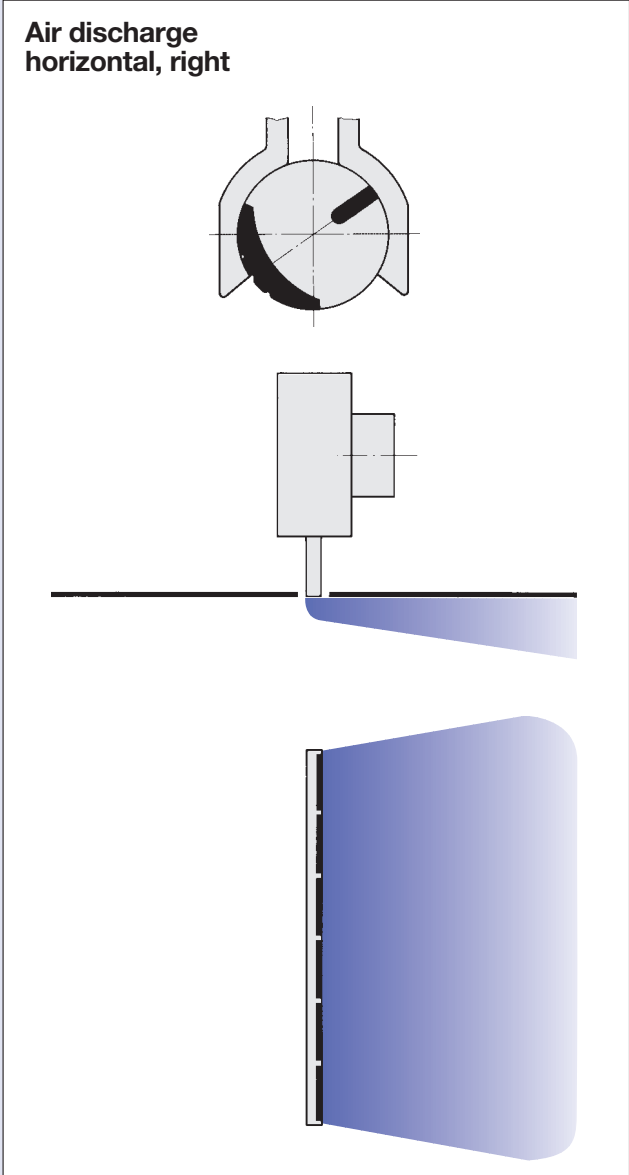
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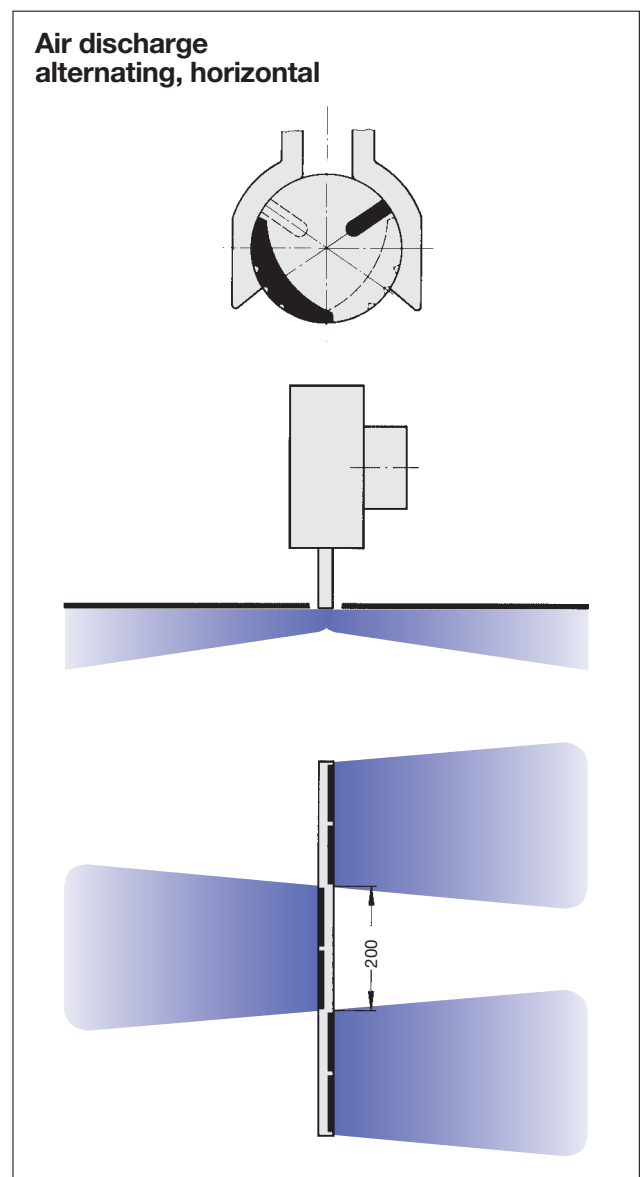
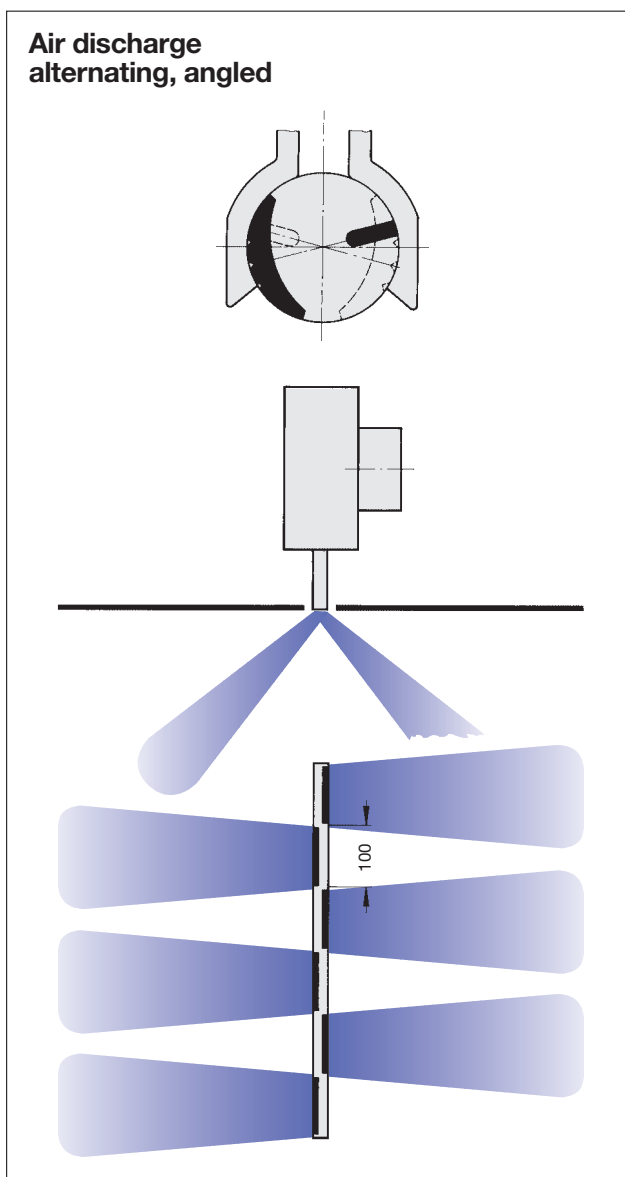
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The type VSD15 slot diffuser is ideal for use where suspended ceiling panels leave narrow gaps just 16 mm wide. As air diffusers should be invisible with this type of ceiling design, the slot diffusers are supplied as standard in black (RAL 9005). An anodised finish is required on VSD15, construction Z0 can be supplied natural anodised to E6-C-0. The type VSD15 can be used in rooms with heights from approx. 2.60 m to 4.00 m. These diffusers are characterised by high induction, which results in rapid decay of supply air velocity and temperature differential.

The recommended volume flow range is 8 to 25 l/s/m with a supply air temperature difference of up to ± 10 K. Because of their stable discharge characteristics, slot diffusers are suitable for use in systems with constant or variable volume air flows.

The direction of air discharge can be adapted to the room conditions required. The air control blades are set as specified on the order. If the discharge direction has to be subsequently changed, this can easily be done by rotating the air control blades on site.



Construction · Dimensions · Materials

Construction

The diffuser is supplied with the rear-mounted plenum box, which, if required, can be fitted with internal acoustic lining. The plenum has circular side entry spigot into which can, if required, be fitted volume control damper which can be adjusted from the diffuser face.

The integral border, Z0, can be supplied for constructions A, F and D versions.

Materials

The diffuser face consists of aluminium extruded section. The visible surfaces of VSD15 are black (RAL 9005), powder coated.

Visible surfaces of VSD15-Z0 natural anodised (E6-C-0).

The plenum box is of galvanised sheet steel.

Lining of mineral wool.

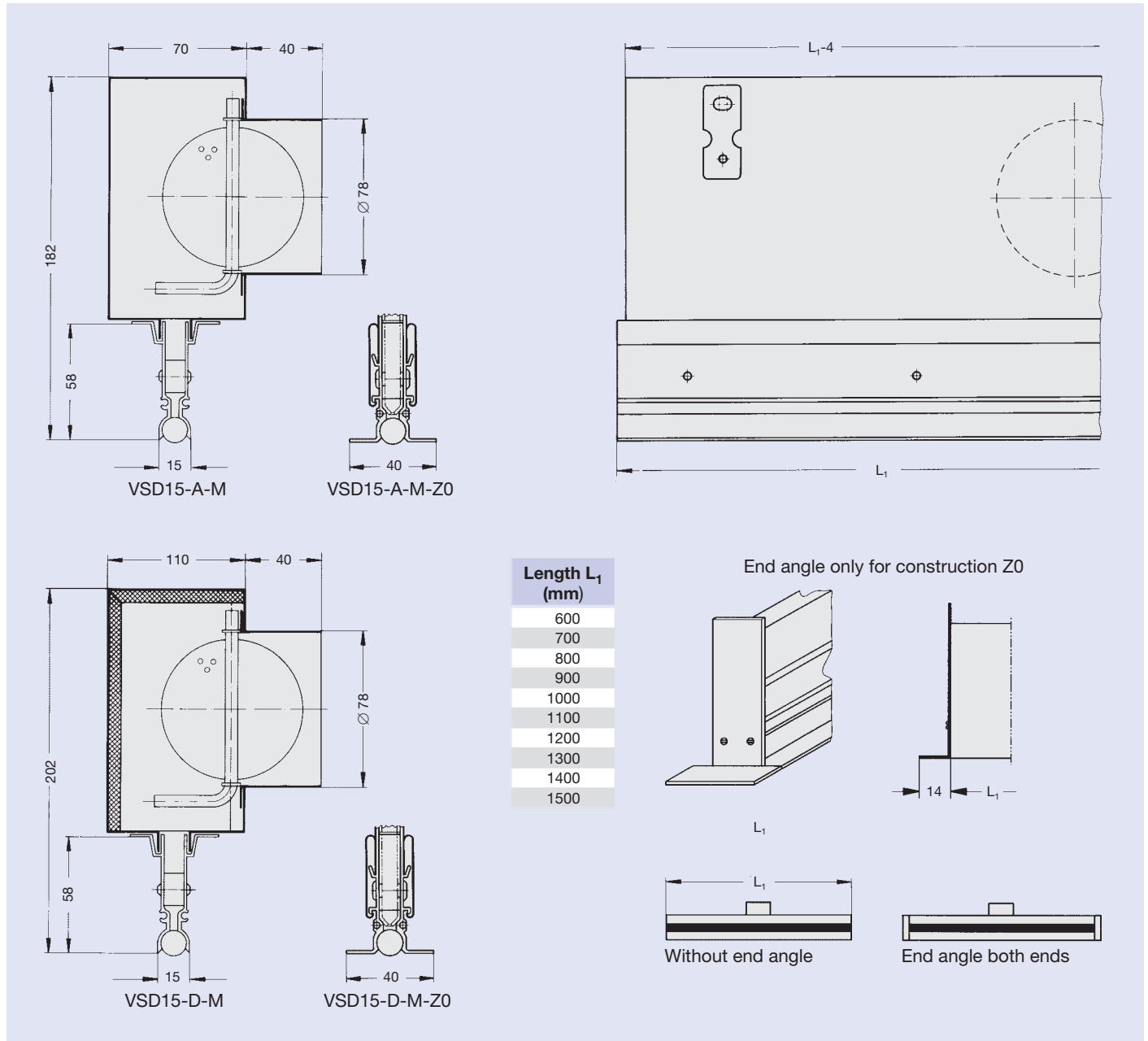


Fig. 1

Slot diffusers of type VSD15 are also suitable for mounting onto the sides of light troffers. The method of fixing and components required must be agreed. All necessary provisions/components will then be supplied by Trox, i.e. inserts, clamping angles etc. Fig. 4 shows an example with clamping angle and threaded insert.

Fig. 2

Standard installation of slot diffusers using 4 suspension brackets fitted to the plenum box.

Fig. 3

When slot diffusers are to be installed in panelled ceilings with external radius $R \geq 10$ mm, they can be mounted up to 7 mm above the ceiling line. If the ceiling panels are rectangular however, the profile edge of the slot diffuser must lie flush with the ceiling line, i.e. the air control blade projects approx. 1 mm.

Fig. 4

When slot diffusers are installed in plaster board ceilings the diffuser can be supplied with integral border Z0 for covering the cut opening.

Fig. 1

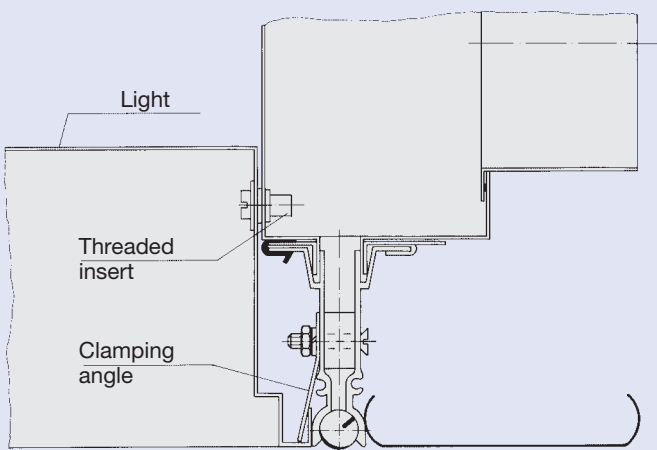


Fig. 3

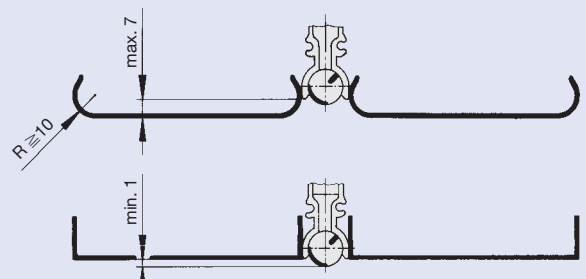


Fig. 4

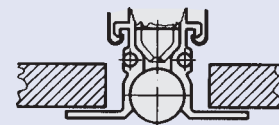
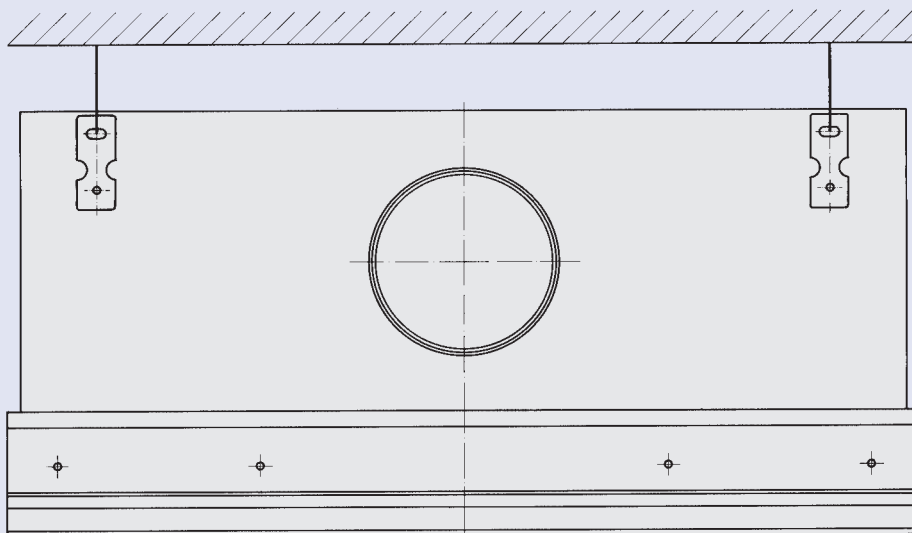


Fig. 2



Installation · Assembly

Fig. 5

When slot diffusers are fitted in a linear format, connecting pins are used to align the front face. The connecting pins (2 per section) are first inserted into one section and then pushed halfway into the other section.

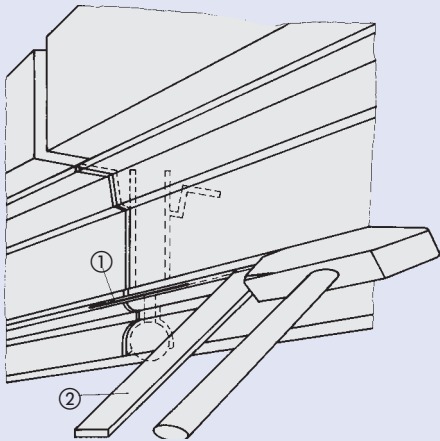
Fig. 6

For an airtight seal on the first and last diffuser in a linear format, an end seal must be fitted. This can be installed in the factory or on site by others. When diffusers are installed as single units, a seal at both ends must be used. The end seal is not available for type Z0.

Fig. 7

The air flow rate can be adjusted from the diffuser face. The air control blade under the spigot should be rotated until the damper can be adjusted by a screwdriver or rod (max. \varnothing 3.5 mm, approx. 100 mm long). The control blade can then be reset.

Fig. 5



- ① Connecting pin
- ② Flat bar max. 1.5 mm thickness

Fig. 7

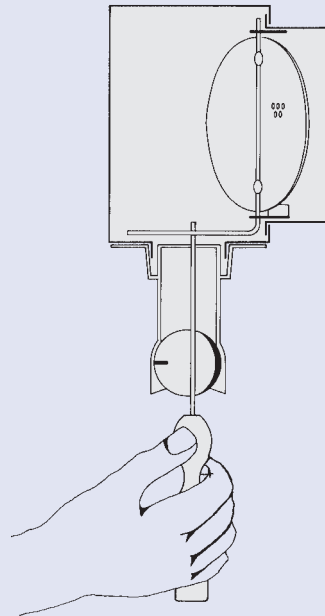
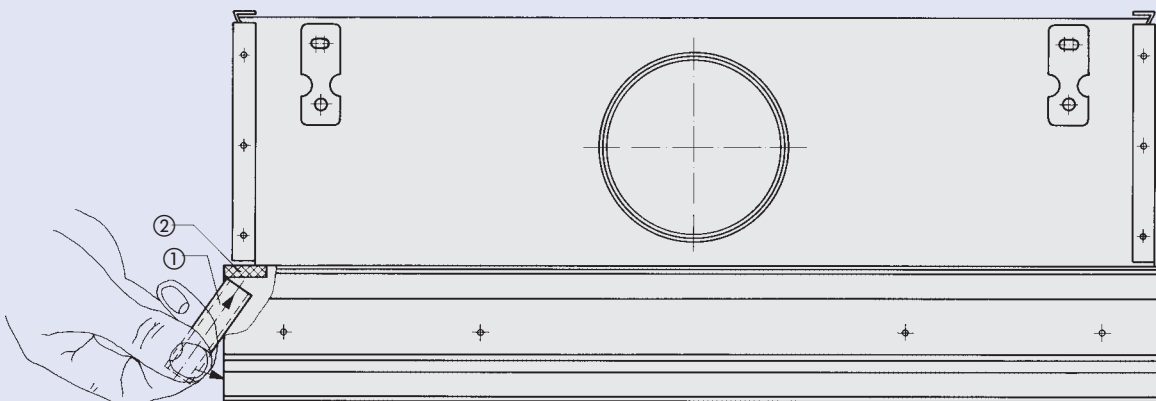


Fig. 6



- ① End seal (tube)
- ② Intermediate seal

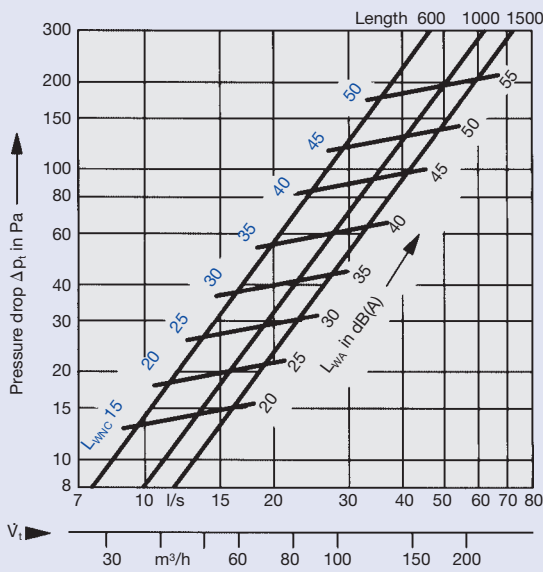
Nomenclature · Acoustic Data · Spectral Data

Nomenclature

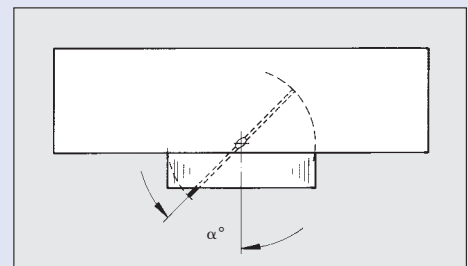
- \dot{V} in l/s · m: Volume flow per unit length
- \dot{V} in m³/h · m: Volume flow per unit length
- \dot{V}_t in l/s: Total volume flow
- \dot{V}_t in m³/h: Total volume flow
- A in m: Spacing between two diffusers
- H₁ in m: Distance between ceiling and occupied zone
- H_{1max} in m: Max. penetration depth when heating
- L in m: Distance from diffuser L = A/2 + H₁
or L = X + H₁
- \bar{v}_{H1} in m/s: Time average air velocity between two diffusers at distance H₁ from the ceiling
- \bar{v}_L in m/s: Time average air velocity at the wall at distance L
- v_{eff} in m/s: Effective jet velocity
- S_{eff} in m: Effective width of slot

- Δt_z in K: Temperature difference between supply air and room air
- Δt_L in K: Difference between core temperature and room temperature at distance L
- Δp_t in Pa: Total pressure drop
- L_{WA} in dB(A): A-weighted sound power level
- L_{WNC}: NC rating of sound power level
- L_{WNR}: L_{WNR} = L_{WNC} + 3
- L_{pA}, L_{pNC}: A-weighting and NC rating of room sound pressure level
- L_{pA} ≈ L_{WA} - 8 dB
- L_{pNC} ≈ L_{WNC} - 8 dB
- ΔL in dB/Oct.: Relative sound power level with respect to L_{WA}
- L_W in dB/Oct.: Octave band sound power level of regenerated noise L_W = L_{WA} + ΔL
- α in °: Damper angle

1 Sound power level and pressure drop (supply air)



Correction to Diagram 1:
Air control damper



Damper angle α	0°	45°	90°
L ₁ = 600	Δp _t x 1.0	x 1.1	x 1.3
L ₁ = 1000	Δp _t x 1.0	x 1.15	x 1.7
L ₁ = 1500	Δp _t x 1.0	x 1.2	x 2.0

Correction to Diagram 1:
Extract air

L ₁	L _{WA}	Δp _t
600	- 10	x 0.20
1000	- 10	x 0.22
1500	- 10	x 0.41

Relative Spectra ΔL for damper angle α = 0°

Length mm	Effective jet velocity v _{eff} m/s	Octave Band Centre Frequency Hz							
		63	125	250	500	1000	2000	4000	8000
600	3	+ 7	+ 4	+ 8	- 7	- 22	- 24	- 32	- 34
1000		+ 12	+ 3	+ 8	- 7	- 22	- 23	- 31	- 34
1500		+ 9	+ 6	+ 7	- 6	- 20	- 24	- 33	- 42
600	5	+ 2	+ 2	+ 7	- 3	- 14	- 16	- 24	- 26
1000		+ 8	+ 1	+ 6	- 3	- 14	- 15	- 24	- 27
1500		+ 5	+ 4	+ 6	- 2	- 12	- 16	- 25	- 34
600	7	- 2	0	+ 5	- 2	- 9	- 12	- 20	- 22
1000		+ 4	- 2	+ 4	- 1	- 10	- 11	- 20	- 23
1500		0	+ 1	+ 4	- 1	- 9	- 13	- 21	- 30
600	8	- 4	- 2	+ 4	- 1	- 8	- 10	- 19	- 21
1000		+ 2	- 3	+ 3	- 1	- 9	- 10	- 19	- 22
1500		- 2	- 1	+ 3	0	- 7	- 11	- 20	- 29

For calculation of v_{eff} see page 8

Aerodynamic Data

Air discharge: horizontal one direction

Example

Data given:

VSD15

Slot length

$$L_1 = 1000 \text{ mm}$$

Total volume flow

$$\dot{V}_t = 15 \text{ l/s}$$

Required: Octave band sound power level for regenerated noise L_w

Octave band centre frequency in Hz	63	125	250	500	1000	2000	4000	8000
L_{WA} in dB(A)	24	24	24	24	24	24	24	24
DL in dB	+10	+2	+7	-5	-18	-19	-28	-31
L_w in dB	34	26	31	19	6	5	-4	-7

Diagram 1: Sound power level and pressure drop

$$L_{WA} = 24 \text{ dB(A)}$$

$$\Delta p_t = 18 \text{ Pa}$$

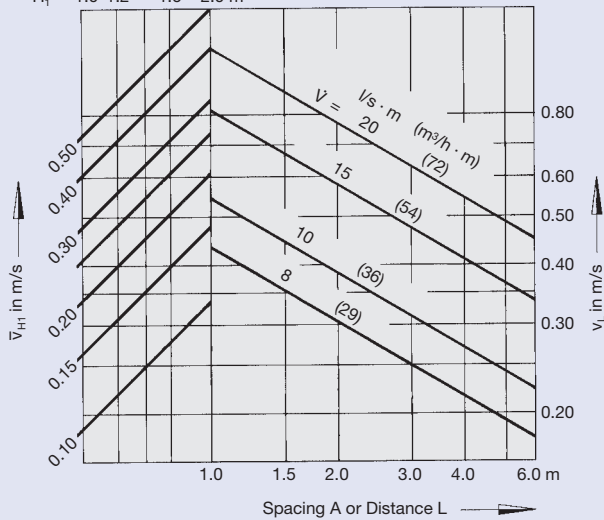
Effective jet velocity v_{eff} :

$$v_{eff} = \frac{\dot{V}_t}{s_{eff} \cdot L_1 \cdot 1000} = \frac{15}{0.004 \cdot 1 \cdot 1000} = 3.75 \text{ m/s}$$

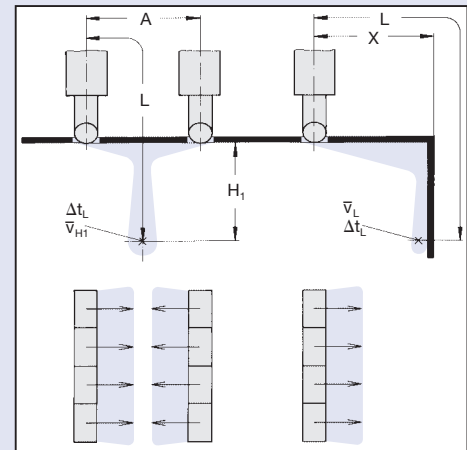
Effective width of slot		
Air discharge	horizontal	angled
s_{eff} in m	0.004	

2 Air velocity between two diffusers and at the wall

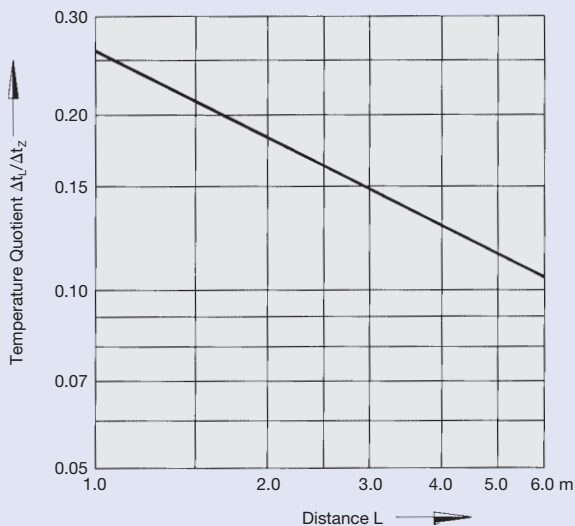
$$H_1 = 1.0 \text{ 1.2 1.6 2.0 m}$$



Diffuser Layout



3 Temperature Quotient



Effective jet velocity

$$\dot{V}_t \text{ in l/s}$$

$$v_{t \text{ eff}} = \frac{\dot{V}_t}{s_{eff} \cdot L_1 \cdot 1000} = [\text{m/s}]$$

$$\dot{V}_t \text{ in m}^3/\text{h}$$

$$v_{t \text{ eff}} = \frac{\dot{V}_t}{s_{eff} \cdot L_1 \cdot 3600} = [\text{m/s}]$$

$$s_{eff} = 0.004 \text{ m}$$

$$L_1 = \text{length of slot diffuser in m}$$

Aerodynamic Data

Air discharge: alternating, horizontal

Example

Data given:

VSD15; air discharge horizontal, alternating

Slot length $L_1 = 1000 \text{ mm}$

Volume flow per unit length $\dot{V} = 15 \text{ l/s} \cdot \text{m}$

Supply air temperature differential horizontal for cooling $\Delta t_z = -10 \text{ K}$

Spacing between diffusers $A = 2.0 \text{ m}$

Distance between ceiling and occupied zone $H_1 = 1.0 \text{ m}$

Distance between diffuser centre line and wall $X = 2.4 \text{ m}$

Diagram 4: Air velocity between the two diffusers

$$\bar{v}_{H1} = 0.12 \text{ m/s}$$

Diagram 5: Temperature quotient

$$L = A/2 + H_1 = 1.0 + 1.0 = 2.0 \text{ m}$$

$$\Delta t_L / \Delta t_z = 0.09$$

$$\Delta t_L = 0.09 \cdot (-10) = -0.9 \text{ K}$$

Diagram 6: Air velocity at the wall

$$L = X + H_1 = 2.4 + 1.0 = 3.4 \text{ m}$$

$$\bar{v}_L = 0.21 \text{ m/s}$$

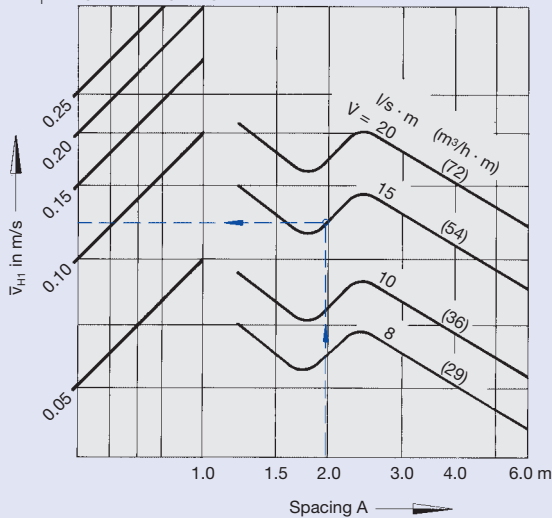
Diagram 1: Sound power level and pressure drop

$$L_{WA} = 24 \text{ dB(A)} \quad (L_{WNC} = 18 \text{ NC})$$

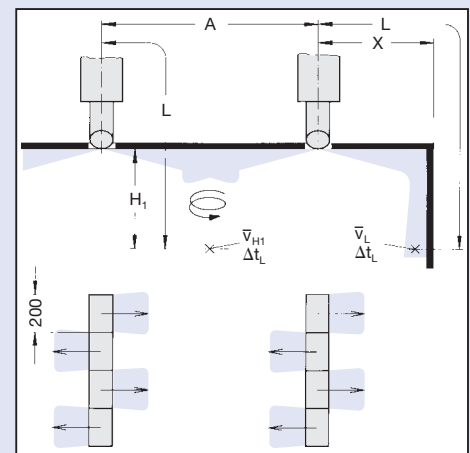
$$\Delta p_t = 18 \text{ Pa}$$

4 Air velocity between two diffusers

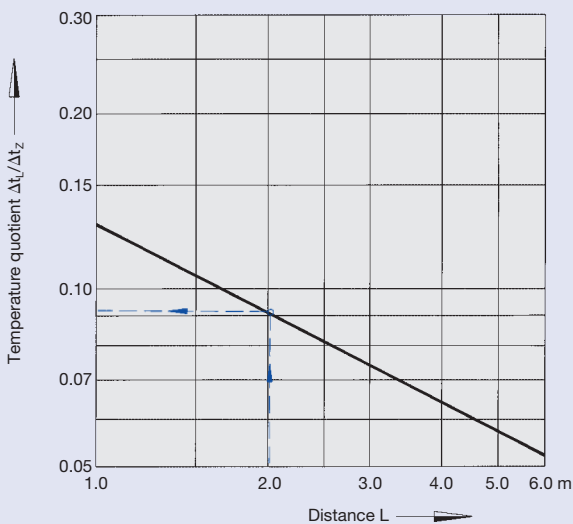
$H_1 = 1.0 \text{ 1.2 1.6 2.0 m}$



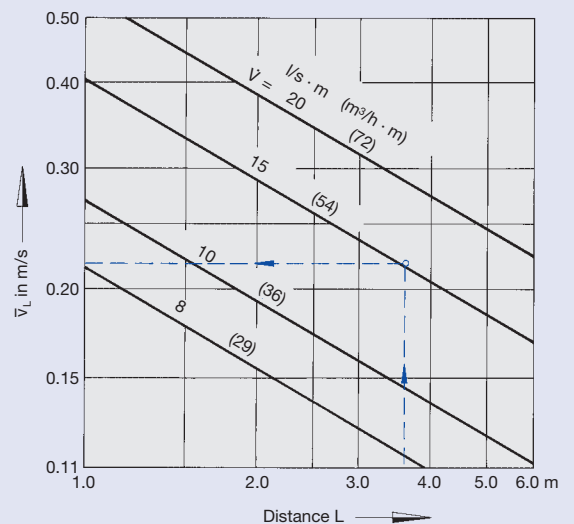
Diffuser Layout



5 Temperature quotient



6 Air velocity at wall



Aerodynamic Data

Air discharge: alternating, angled

Example

Data given:

VSD15; air discharge alternating, angled

Slot length

$$L_1 = 1000 \text{ mm}$$

Volume flow per unit length

$$\dot{V} = 15 \text{ l/s} \cdot \text{m}$$

Supply air temperature differential

$$\Delta t_z = -8 \text{ K} \\ \text{or } +8 \text{ K}$$

Spacing between diffusers

$$A = 2.4 \text{ m}$$

Distance between ceiling

$$H_1 = 1.2 \text{ m}$$

and occupied zone

Diagram 7:

Air velocity between the two diffusers

$$\bar{v}_{H1} = 0.19 \text{ m/s}$$

Diagram 8:

Temperature quotient for cooling

$$\Delta t_{H1}/\Delta t_z = 0.042$$

$$\Delta t_{H1} = 0.042 \cdot (-8) = -0.336 \text{ K}$$

for heating $\Delta t_z = +8 \text{ K}$

Diagram 9:

Maximal penetration depth when heating

$$H_{1\max} \approx 1.3 \text{ m}$$

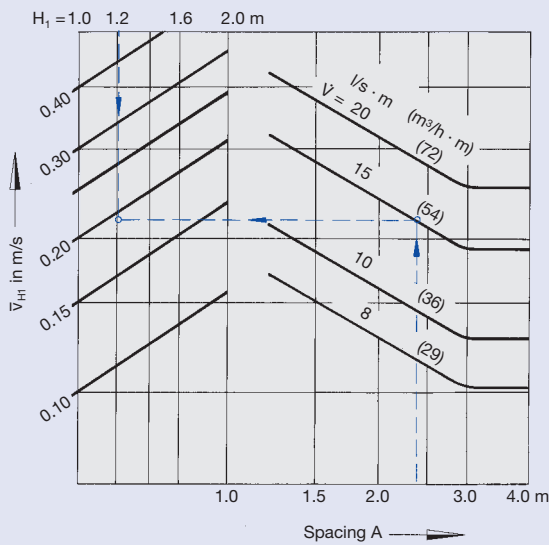
Diagram 1:

Sound power level and pressure drop

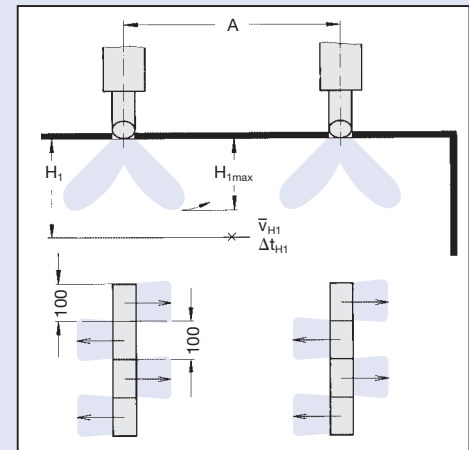
$$L_{WA} = 24 \text{ dB(A)} \quad (L_{WNC} = 18 \text{ NC})$$

$$\Delta p_t = 18 \text{ Pa}$$

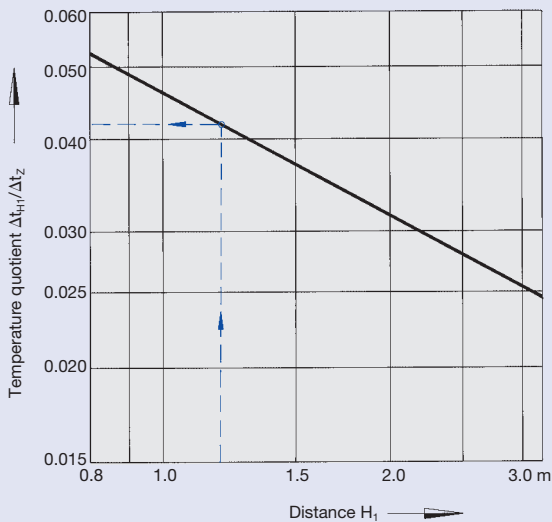
7 Air velocity



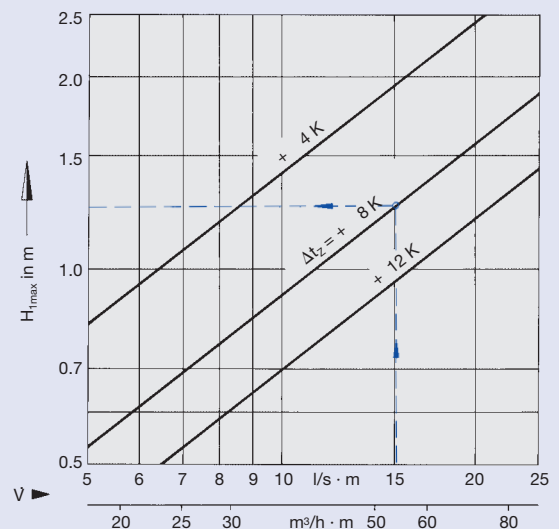
Diffuser Layout



8 Temperature quotient when cooling



9 Max. penetration depth when heating



Specification Text

Adjustable slot diffusers with face width of 15 mm, suitable for installation in between ceiling panels. Consists of diffuser face with air control blades to provide adjustable discharge direction. Blades are factory set but are adjustable on site by others. Available with integral border type Z0. Complete with a rear mounted plenum box fitted with circular side entry spigot and four suspension brackets. Optionally, with 20 mm thick internal lining with glass fibre scrim covering and/or volume control damper adjustable from diffuser face.

Materials:

VSD15 diffuser face of extruded aluminium section, visible surface powder coated black (RAL 9005).

VSD15 Z0 diffuser face of extruded aluminium section, visible surface natural anodised to E6-C-0. Air control blades in ABS (flame retardant), self extinguishing – tested to UL for lack of molten droplets. Black as standard, white if required (similar to RAL 9010). Rear plenum box of galvanised sheet steel, mineral wool lining, the lip seal is of rubber.

Order Code

Need not be completed for standard products

VSD15 - A - M - Z0 - L / 900 / A9 / 0 / P1 / RAL 9016 / WS

Plenum box	A	<table border="1"> <tr><td>600</td></tr> <tr><td>700</td></tr> <tr><td>800</td></tr> <tr><td>900</td></tr> <tr><td>1000</td></tr> <tr><td>1100</td></tr> <tr><td>1200</td></tr> <tr><td>1300</td></tr> <tr><td>1400</td></tr> <tr><td>1500</td></tr> <tr><td>L₁ (mm)</td></tr> </table>	600	700	800	900	1000	1100	1200	1300	1400	1500	L ₁ (mm)	<table border="0"> <tr><td>0</td><td>Standard finish</td></tr> <tr><td></td><td>VSD15 black RAL 9005</td></tr> <tr><td></td><td>VSD15-Z0 E6-C-0</td></tr> <tr><td>P1</td><td>Powder-coated</td></tr> <tr><td></td><td>to RAL 9006 (GE 30%)²⁾</td></tr> <tr><td></td><td>other colours</td></tr> <tr><td></td><td>to RAL ... (GE 70%)²⁾</td></tr> </table>	0	Standard finish		VSD15 black RAL 9005		VSD15-Z0 E6-C-0	P1	Powder-coated		to RAL 9006 (GE 30%) ²⁾		other colours		to RAL ... (GE 70%) ²⁾	<table border="0"> <tr><td>HL</td><td>Horizontal left</td></tr> <tr><td>HR</td><td>Horizontal right</td></tr> <tr><td>WH</td><td>Alternating horizontal</td></tr> <tr><td></td><td>(standard construction)</td></tr> <tr><td>WS</td><td>Alternating angled</td></tr> </table>	HL	Horizontal left	HR	Horizontal right	WH	Alternating horizontal		(standard construction)	WS	Alternating angled
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	(standard construction)																																						
WS	Alternating angled																																						
Plenum box with lining	D																																						
Face section	F																																						
Volume control damper M ¹⁾																																							
Integral border Z0																																							
Spigot with lip seal L ¹⁾	L																																						
		0 Not used																																					

¹⁾ Only for construction with spigot
²⁾ GE = gloss level

0 Without end seals
A9 End seal both ends (VSD15)
CA End angle both ends (VSD15-Z0)

Note!
Black air control blades standard.
If required state "Air control blades white" (similar RAL 9010).

Order code for end seals – pairs supplied loose – please order separately –	
End angle	VSD15-Z0-EW
End seals	VSD15-ED

Order Example
Make: TROX
Type: VSD15 - A - M / 900 / A9 / 0 / P1 / RAL 9016 / WS
Air control blades white

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