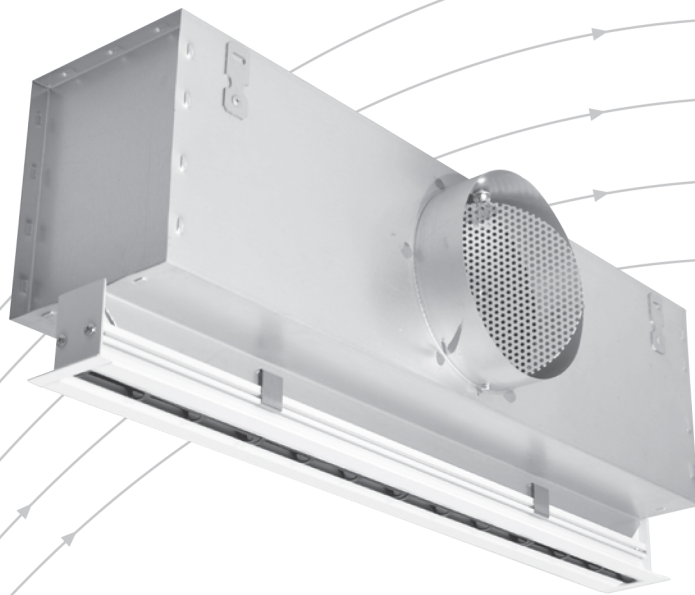


Slot diffuser

- Type VSD35
- with flanged or flangeless supply outlets



TROX[®] TECHNIK

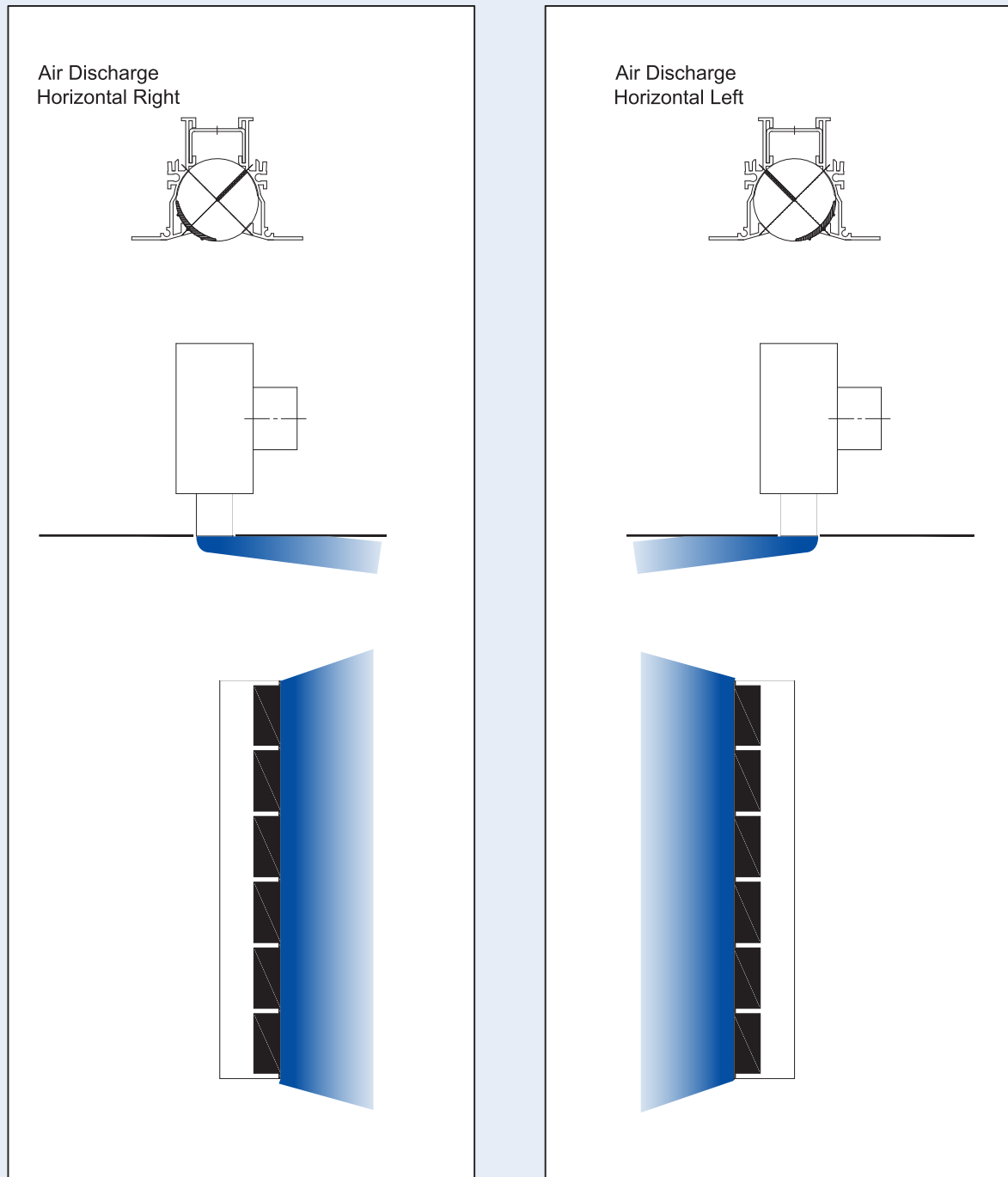
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Contents · Air Diffuser Discharge

Air diffuser discharge	2	Spectral Data	9
Description	3	Acoustic Data	10
Construction · Dimensions	4	Aerodynamic Data	12
Installation Details	7	Order Details	16
Nomenclature	8		

Figure 1



Description · Air Discharge

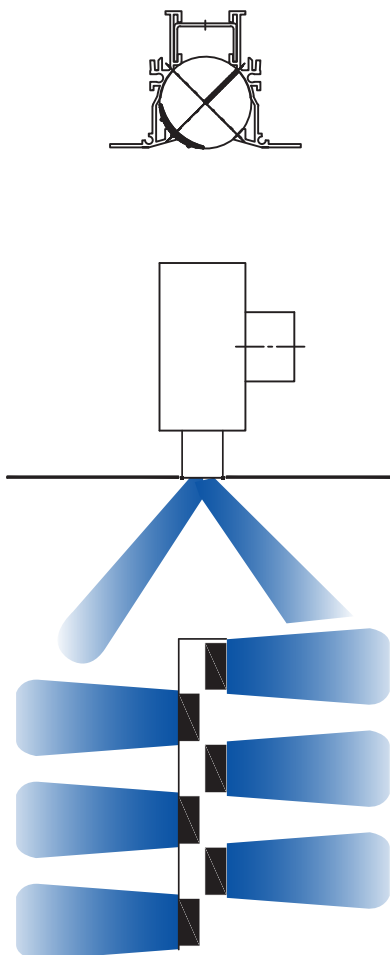
- The VSD35 type slot diffuser is available with 1-4 slots. The diffuser face is a one piece extrusion so there are no visible joints. The type VSD35 can be used in rooms with ceiling heights from approx. 2.6 m to 4.0 m. The low overall height means that the slot diffusers are particularly suitable for use in restricted ceiling voids and in suspended ceiling systems. They are characterised by high induction which results in a rapid decay in supply air temperature differential and air discharge velocity.

The recommended supply air temperature differential range is ± 10 K. Because of their stable discharge characteristics the slot diffusers are suitable for use in systems with constant and variable volume flows.

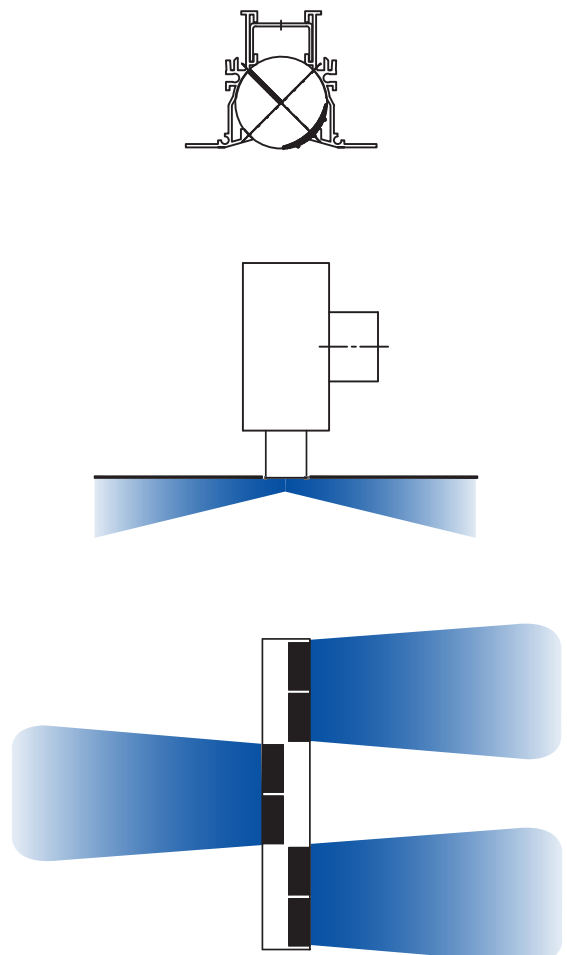
The direction of the air discharge can be adapted to the required room conditions. The air control blades are set at the factory to the customer's requirements as stated on the order. If the discharge directions have to be subsequently changed, this can easily be done on site by rotating the air control blades.

Figure 2

Air Discharge Alternating Angled



Air Discharge Alternating Horizontal



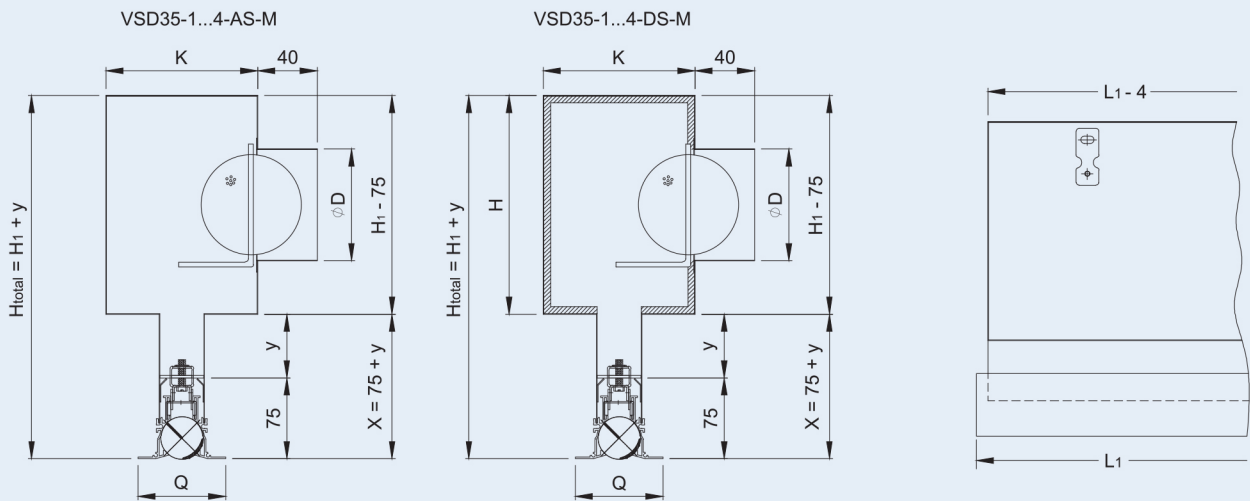
Construction · Dimensions

VSD 35						
No. of slots "n"	Q	P	K	H ₁	H ₂	φD
1	62	35	138	247	223	98 123
2	93	66	176	277	253	123 148
3	123	96	214	295	271	148
4	154	127	254	327	303	148 198

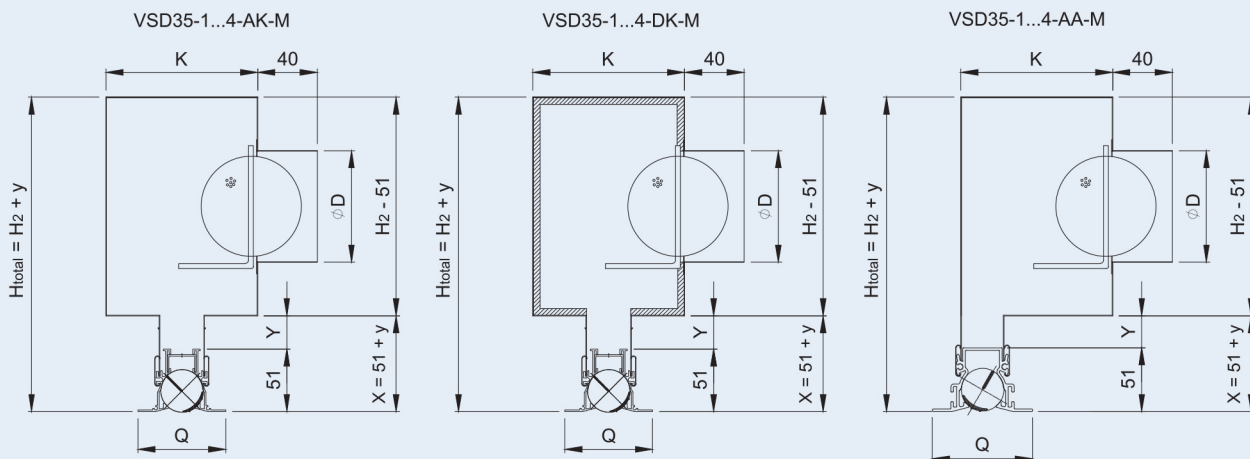
If y=0 (standard); other possible values for y = 30, 55, 80 and 104mm; maximum neck length x= 180mm.

Figure 3

With removable face (Refer to Figure 8 for operational details)



Without removable face



Construction · Dimensions

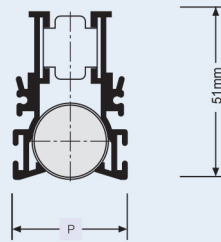
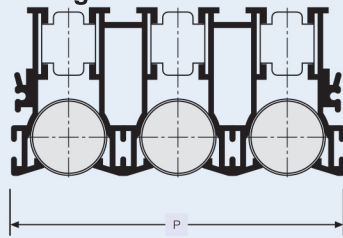
Number of Spigots and Spigot Diameter				
L ₁	VSD35			
	...-1	...-2	...-3	...-4
600				
750				
900	1 x 98	1 x 123		1 x 148
1050	1 x 123	1 x 148	1 x 148	1 x 198
1200				
1350				
1500				
1200	2 x 98	2 x 123	2 x 148	2 x 148
1350	2 x 123	2 x 148	2 x 148	2 x 198
1500				

Variants AK, DK and AA of the diffuser face are supplied with a plenum box fitted to the rear, while variant DK is provided with internal lining. On variants AS and DS, the face sections with flange Z0 can be connected on site to the mounted plenum boxes. The supply air is connected via the circular side entry spigot, with or without sealing lip, which is optionally available with a volume control damper which can be adjusted on the face of the diffuser. The face sections is available with integral edge flange Z0. Matching end caps are available for the diffuser faces, in the form of end angles or end plates. The fish plates on the joints are also included in the scope of supply, to enable the alignment and interconnection of individual L₁ sections.

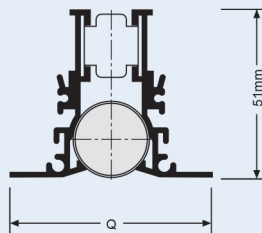
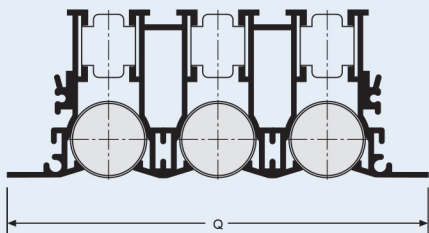
Figure 4

Sections

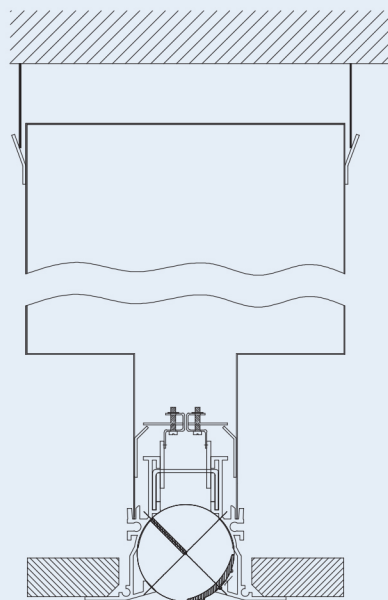
Z4 Flangless Slot



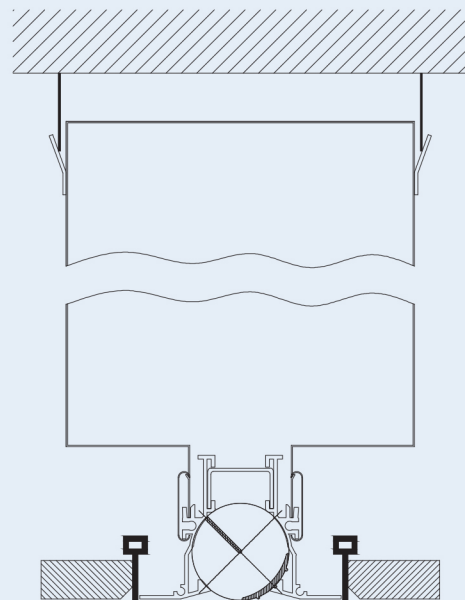
Z0 Flanged Slot



Installation



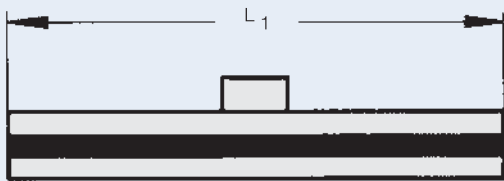
Installation in tiled ceilings



Installation in "T" bar ceilings

Figure 5

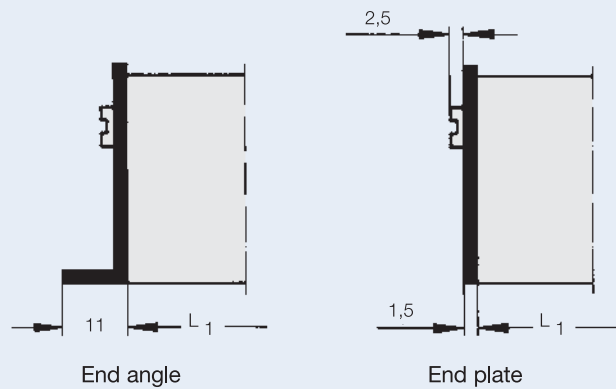
End caps



Without end cap



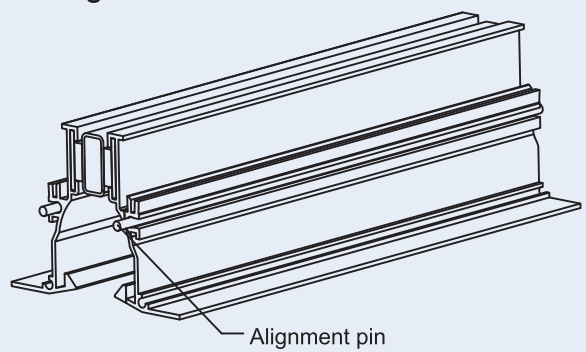
End cap on both ends



End angle

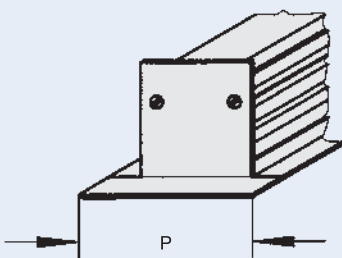
End plate

Alignment



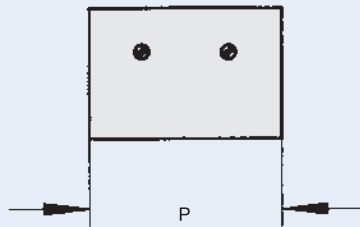
Alignment pin

End angles

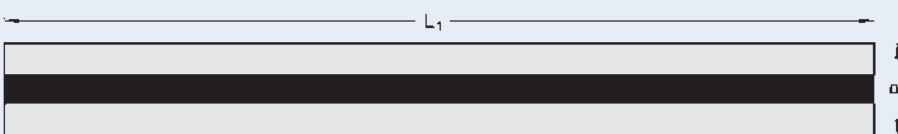


P

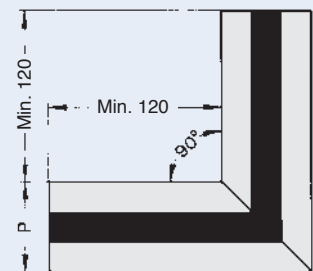
End plates



P



Front face "F"



90° mitre

Figure 6

Standard method of installation for slot diffusers via suspension on four suspension points provided on the plenum box. Suitable installation and fixing materials to be provided on site.

Figure 7

In order to retrofit the diffuser face to the plenum box (AS, DS), the concealed fixing brackets which are supplied with the diffuser must be slid onto the face section. The tongue of the concealed fixing bracket must be positioned length-ways to the face section.

Slide face section with concealed fixing bracket into the neck of the plenum box. Turn the screwdriver until the tongue is in a crosswise position, then turn the screwdriver further to tighten the cheese-head screw. Please check that this screw is tight! Dismantling is carried out by reversing the procedure.

Figure 8

The volume control damper can be adjusted from the front face of the diffuser. To this end, adjust the air control blade below the spigot until the butterfly damper can be adjusted using a screwdriver or rod (max. diameter 3.5 mm, length up to approx. 230 mm, depending on neck extension).

Figure 9

When the slot diffusers are installed in linear configuration, the face sections are aligned by inserting the supplied alignment pins and/or fish plates. The alignment pins and fish plates (2 per section) are first fitted on one side and then slid approximately half way into the other face section (see also page 6).

Figure 6

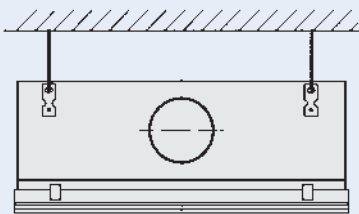


Figure 8

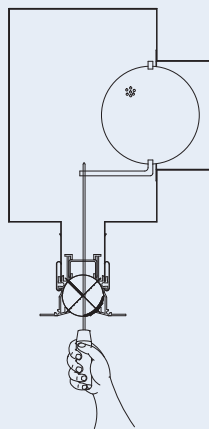


Figure 9

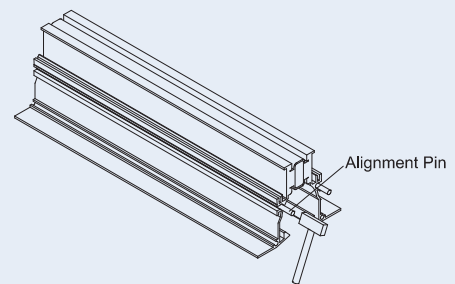
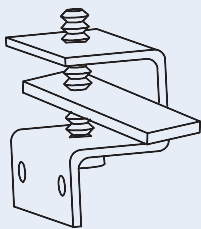
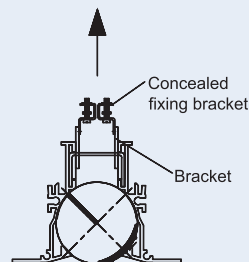
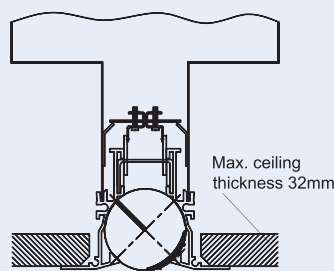
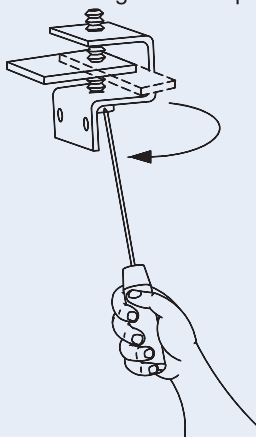


Figure 7

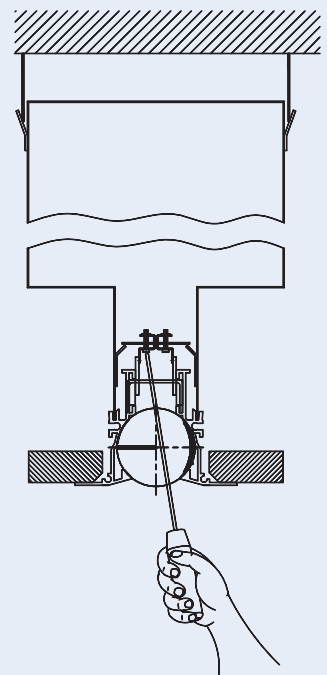
Concealed fixing in open position



Concealed fixing in locked position



Concealed fixing brackets are supplied with the diffuser



Nomenclature

Nomenclature

\dot{V}	in l/s · m:	Volume flow per unit length
\dot{V}	in m ³ /h · m:	Volume flow per unit length
\dot{V}_t	in l/s:	Total volume flow
\dot{V}_t	in m ³ /h:	Total volume flow
A	in m:	Spacing between two diffusers
H ₁	in m:	Distance between ceiling and occupied zone
H _{1 max}	in m:	Maximum penetration depth when heating
L	in m:	Distance from diffuser L = A/2 + H ₁ or L = X + H ₁
\bar{v}_{H1}	in m/s:	Time average air velocity between two diffusers at distance H ₁ from ceiling
\bar{v}_L	in m/s:	Time average air velocity at wall at distance L
v _{eff}	in m/s:	Effective jet velocity
Δ t _Z	in K:	Temperature difference between room air and supply air
Δ t _L	in K:	Difference between room temperature and core temperature at distance L
Δ t _{H1}	in K:	Difference between room temperature and core temperature at distance H ₁
Δ p _t	in Pa:	Total pressure drop
L _{WA}	in dB(A):	A-weighted sound power level
L _{W NC}	:	NC rating of sound power spectrum
L _{W NR}	:	L _{W NR} = L _{W NC} + 2
L _{pA} , L _{pNC}	:	A weighting and NC rating respectively of room sound pressure level L _{pA} ≈ L _{WA} - 8 dB L _{pNC} ≈ L _{W NC} - 8 dB
Δ L	in dB/oct.:	Relative level with respect to L _{WA}
L _W	in dB/oct.:	Octave band sound power level of regenerated noise L _W = L _{WA} + Δ L

Effective Jet Velocity

\dot{V}_t in l/s	\dot{V}_t in m ³ /h
$v_{\text{eff}} = \frac{\dot{V}_t}{s_{\text{eff}} \cdot L_1 \cdot 1000}$ [m/s]	$v_{\text{eff}} = \frac{\dot{V}_t}{s_{\text{eff}} \cdot L_1 \cdot 3600}$ [m/s]
L ₁ = Length of slot diffuser in m	

Effective Slot Width

Air discharge	Horizontal	Angled
s _{eff} in m	0.0062	0.0049

Example

Data given:

VSD35-1; Air discharge alternating, angled

Slot length

$$L_1 = 1050 \text{ mm}$$

Total volume flow

$$\dot{V}_t = 25 \text{ l/s}$$

Spigot diameter

$$D = 98 \text{ mm}$$

Required: Sound power level of regenerated noise L_w

Octave band centre frequency in Hz	63	125	250	500	1000	2000	4000	8000
L_{WA} in dB (A)	29	29	29	29	29	29	29	29
ΔL in dB	3	1	7	-3	-15	-23	-31	-38
L_w in dB	32	30	36	26	14	6	-2	-9

Diagram 1:

Sound power and pressure drop

$$\Delta p_t = 17 \text{ Pa} \cdot 1.4 \approx 24 \text{ Pa}$$

$$L_{WA} = 29 \text{ dB(A)}$$

Effective jet velocity v_{eff} :

$$v_{eff} = \frac{\dot{V}_t}{S_{eff} \cdot L_1 \cdot 1000} = \frac{25}{0.0049 \cdot 1.05 \cdot 1000} = 4.9 \text{ m/s}$$

Relative Spectra ΔL for Damper Angle 0°

Type	Length mm	Effective jet velocity v_{eff} m/s	Octave band centre frequency in Hz							
			63	125	250	500	1000	2000	4000	8000
VSD35-1	600 1050 1500	2	13	6	6	-6	-28	-42	-45	-50
			17	2	7	-10	-30	-43	-46	-52
			16	8	6	-8	-26	-36	-47	-53
	600 1050 1500	3	9	5	6	-4	-21	-32	-35	-40
			11	2	7	-6	-22	-34	-42	-48
			11	6	7	-5	-20	-29	-38	-46
	600 1050 1500	5	3	2	6	-1	-14	-21	-28	-34
			3	1	7	-3	-15	-23	-31	-38
			3	2	6	-2	-13	-20	-30	-40
	600 1050 1500	7	-2	0	4	0	-10	-14	-27	-31
			-3	0	6	-2	-10	-16	-29	-34
			-3	-1	5	-1	-9	-16	-33	-36
VSD35-2	600 1050 1500	2	14	9	5	-5	-24	-33	-37	-42
			20	7	6	-9	-20	-27	-35	-45
			5	8	7	-5	-18	-26	-37	-47
	600 1050 1500	3	9	7	6	-3	-18	-26	-30	-36
			14	6	7	-5	-15	-23	-34	-43
			1	5	7	-3	-14	-22	-36	-43
	600 1050 1500	5	0	3	6	-1	-11	-19	-27	-33
			6	3	6	-3	-12	-19	-30	-38
			-5	1	6	-2	-10	-17	-32	-40
	600 1050 1500	7	-6	-1	5	-1	-8	-15	-29	-30
			-1	0	6	-2	-10	-17	-35	-38
			-10	-2	5	-1	-8	-15	-36	-38
VSD35-3	600 1050 1500	2	10	5	6	-3	-24	-39	-44	-51
			9	6	7	-7	-16	-28	-38	-48
			11	2	7	-5	-17	-26	-36	-48
	600 1050 1500	3	5	4	6	-2	-18	-28	-35	-42
			3	4	7	-5	-13	-23	-36	-45
			5	1	7	-4	-13	-21	-35	-45
	600 1050 1500	5	-2	1	6	-2	-10	-17	-28	-36
			-6	0	7	-3	-11	-17	-29	-39
			-3	0	6	-3	-9	-15	-33	-42
	600 1050 1500	7	-8	-2	4	-2	-6	-10	-30	-34
			-12	-3	6	-2	-9	-14	-32	-36
			-8	-2	5	-3	-7	-12	-36	-40
VSD35-4	600 1050 1500	2	9	6	7	-5	-18	-29	-34	-45
			13	5	7	-7	-18	-28	-38	-50
			4	3	7	-5	-13	-21	-36	-45
	600 1050 1500	3	5	5	7	-4	-13	-22	-29	-40
			5	3	7	-5	-13	-21	-32	-44
			1	2	7	-4	-10	-18	-26	-38
	600 1050 1500	5	-2	2	6	-4	-7	-15	-28	-36
			-6	-1	6	-4	-7	-15	-28	-38
			-4	1	6	-3	-7	-14	-26	-35
	600 1050 1500	7	-7	-1	4	-4	-5	-11	-31	-35
			-14	-4	3	-4	-4	-11	-30	-33
			-8	-1	5	-3	-6	-12	-27	-32

Acoustic Data

Correction to diagram 1: Damper setting

D = 98 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L ₁ = 600	Δp _t	x 1	x 1.3	x 2.0	x 1.7	x 1.9	x 2.6
L ₁ = 1050	Δp _t	x 1	x 1.3	x 2.6	x 1.4	x 1.7	x 3.0
L ₁ = 1500	Δp _t	x 1	x 1.5	x 3.5	x 1.2	x 1.6	x 3.8
	L _{WA}	-	+3	+5	-	+3	+5
	L _{WNC}	-	+3	+5	-	+4	+6

Correction to diagram 3: Damper setting

D = 123 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L ₁ = 600	Δp _t	x 1	x 1.3	x 2.4	x 1.7	x 2.0	x 3.4
L ₁ = 1050	Δp _t	x 1	x 1.6	x 3.8	x 1.3	x 1.9	x 4.7
L ₁ = 1500	Δp _t	x 1	x 1.5	x 4.3	x 1.2	x 1.8	x 4.4
	L _{WA}	-	+3	+5	-	+4	+7
	L _{WNC}	-	+4	+6	+1	+5	+8

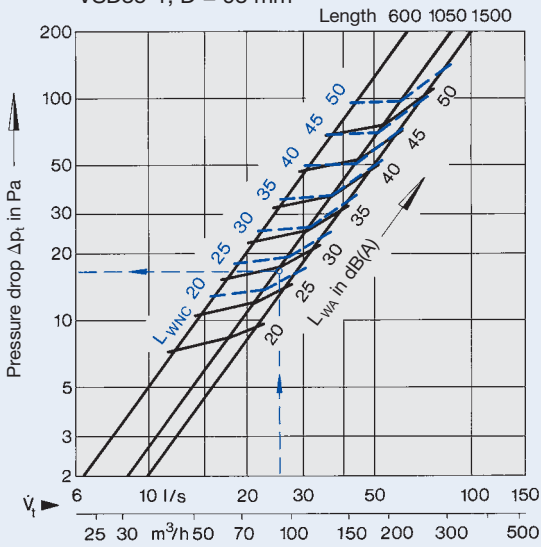
Correction to diagram 2: Damper setting

D = 123 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L ₁ = 600	Δp _t	x 1	x 1.1	x 1.6	x 1.8	x 1.9	x 2.3
L ₁ = 1050	Δp _t	x 1	x 1.2	x 2.2	x 1.6	x 1.8	x 2.8
L ₁ = 1500	Δp _t	x 1	x 1.3	x 2.3	x 1.4	x 1.7	x 3.2
	L _{WA}	-	+3	+5	-	+4	+5
	L _{WNC}	-	+4	+6	+1	+5	+6

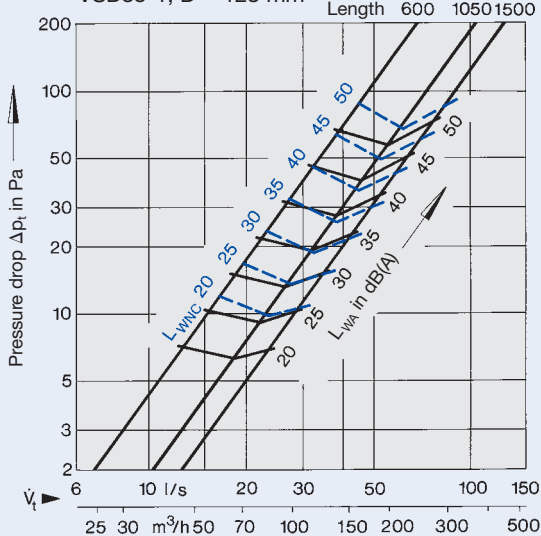
Correction to diagram 4: Damper setting

D = 148 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L ₁ = 600	Δp _t	x 1	x 1.3	x 2.4	x 1.5	x 1.8	x 3.4
L ₁ = 1050	Δp _t	x 1	x 1.5	x 4.0	x 1.5	x 1.9	x 5.1
L ₁ = 1500	Δp _t	x 1	x 1.7	x 4.9	x 1.3	x 2.0	x 6.6
	L _{WA}	-	+4	+7	-	+5	+8
	L _{WNC}	-	+4	+6	+1	+5	+8

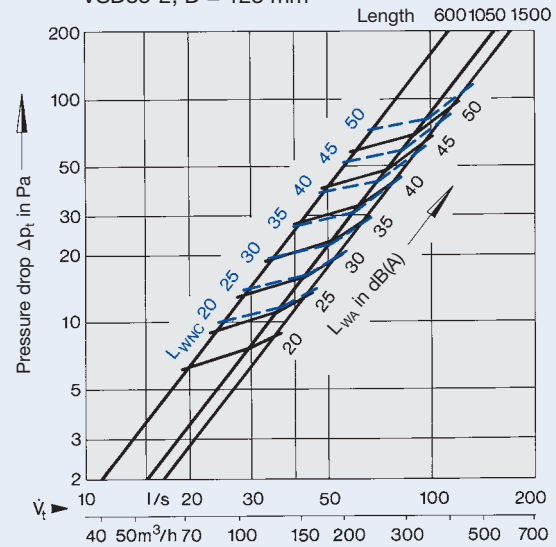
1 Sound power level and pressure drop VSD35-1; D = 98 mm



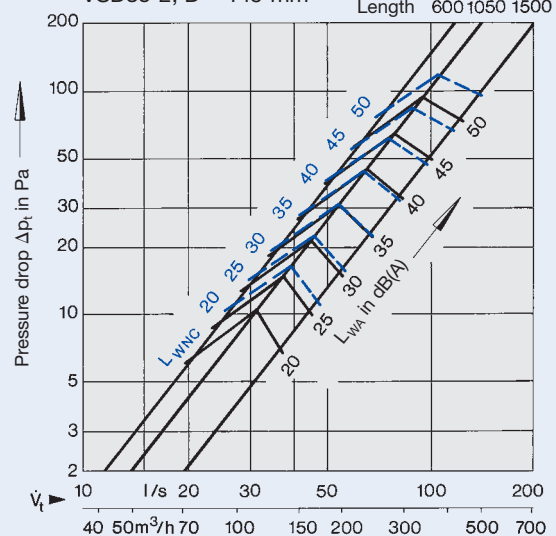
2 Sound power level and pressure drop VSD35-1; D = 123 mm



3 Sound power level and pressure drop VSD35-2; D = 123 mm



4 Sound power level and pressure drop VSD35-2; D = 148 mm



Correction to diagram 5: Damper setting

D = 148 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L ₁ = 600	Δp _t	x 1	x 1.4	x 3.3	x 1.6	x 1.9	x 4.3
L ₁ = 1050	Δp _t	x 1	x 1.7	x 4.9	x 1.3	x 2.0	x 6.1
L ₁ = 1500	Δp _t	x 1	x 1.7	x 4.4	x 1.2	x 1.8	x 6.2
	L _{WA}	-	+ 4	+ 6	+ 1	+ 5	+ 7
	L _{WNC}	-	+ 4	+ 6	+ 1	+ 6	+ 8

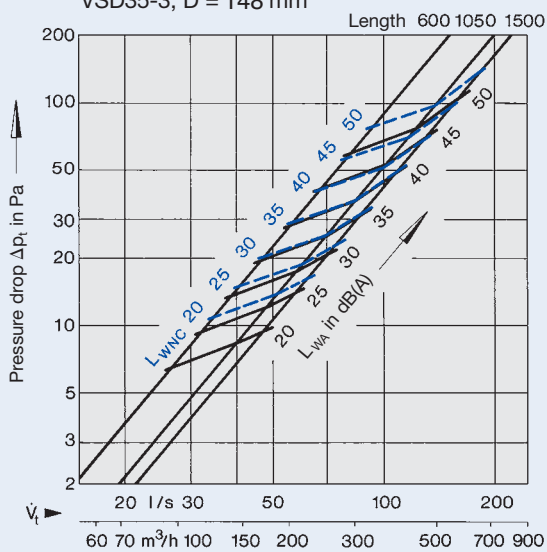
Correction to diagram 6: Damper setting

D = 148 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L ₁ = 600	Δp _t	x 1	x 1.2	x 2.4	x 1.5	x 1.7	x 4.4
L ₁ = 1050	Δp _t	x 1	x 1.9	x 4.0	x 1.2	x 1.8	x 6.7
L ₁ = 1500	Δp _t	x 1	x 1.7	x 4.2	x 1.2	x 2.3	x 7.2
	L _{WA}	-	+ 4	+ 6	+ 1	+ 5	+ 7
	L _{WNC}	-	+ 4	+ 6	+ 1	+ 6	+ 7

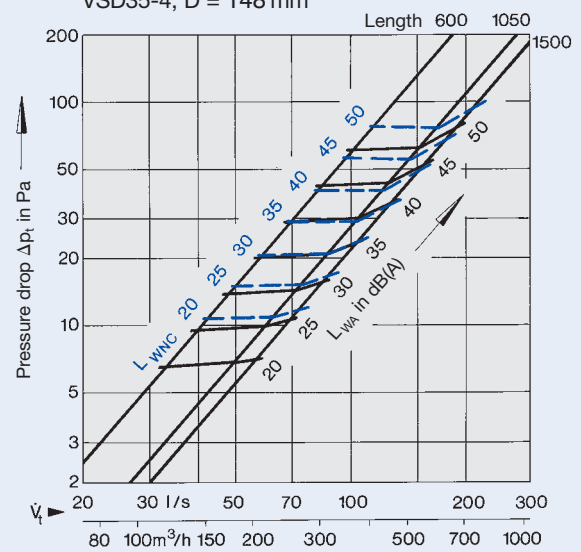
Correction to diagram 7: Damper setting

D = 198 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L ₁ = 600	Δp _t	x 1	x 1.1	x 2.0	x 1.5	x 1.8	x 3.3
L ₁ = 1050	Δp _t	x 1	x 1.4	x 3.2	x 1.2	x 1.7	x 4.7
L ₁ = 1500	Δp _t	x 1	x 1.7	x 4.1	x 1.2	x 2.1	x 6.0
	L _{WA}	-	+ 3	+ 5	+ 1	+ 5	+ 6
	L _{WNC}	-	+ 3	+ 5	+ 1	+ 6	+ 7

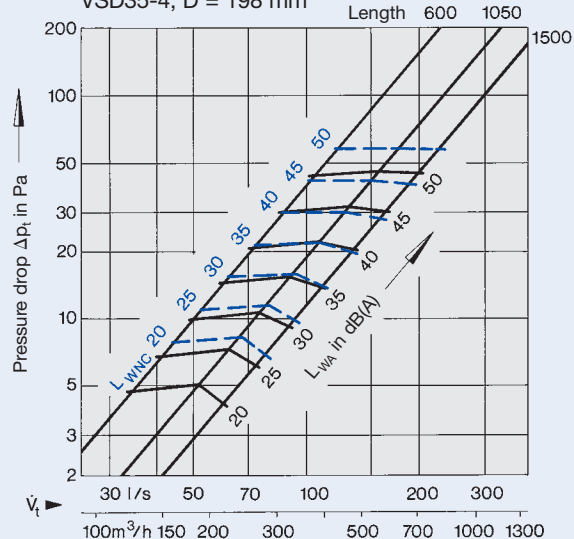
5 Sound power level and pressure drop
VSD35-3; D = 148 mm



6 Sound power level and pressure drop
VSD35-4; D = 148 mm



7 Sound power level and pressure drop
VSD35-4; D = 198 mm

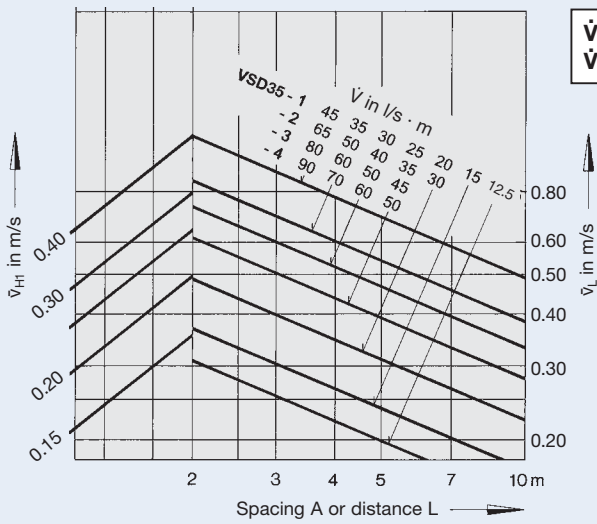


Aerodynamic Data

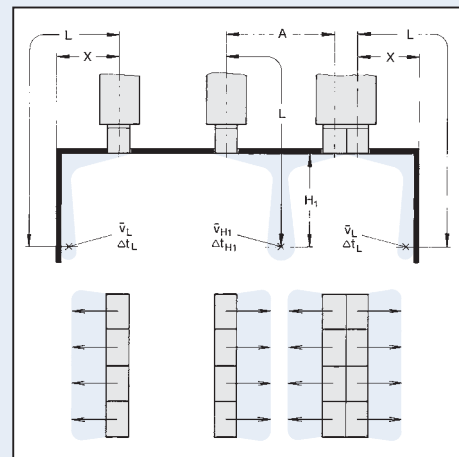
Air discharge: Horizontal, one or two directions

9 Air velocity between two diffusers and at the wall

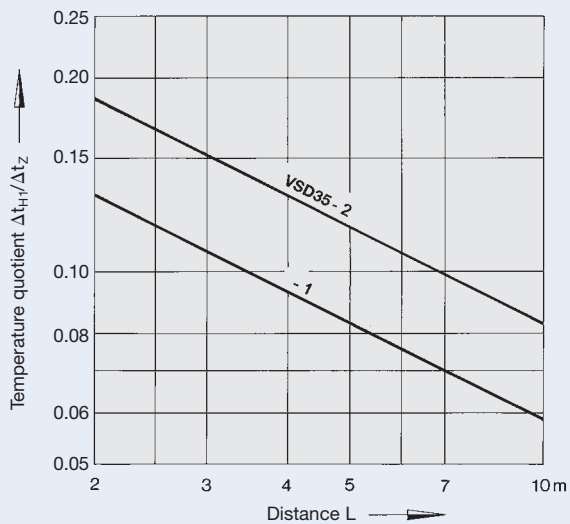
$H_1 = 1.0\ 1.2\ 1.6\ 2.0\ \text{m}$



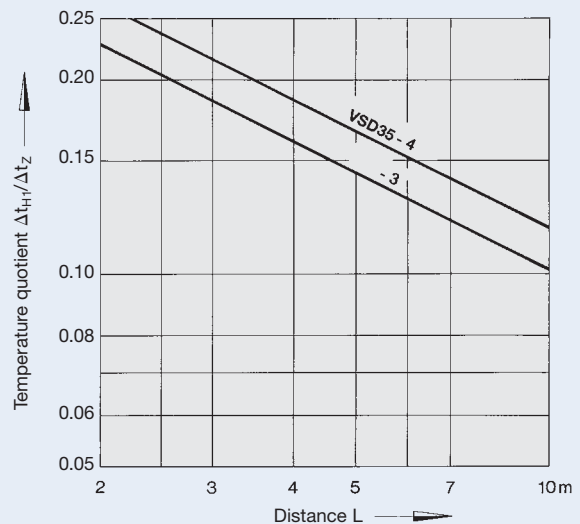
Diffuser Layout



10 Temperature quotient



11 Temperature quotient



Aerodynamic Data

Air discharge: Alternating horizontal

Example

Data given:
VSD35-1; air discharge: alternating horizontal

Volume flow per unit length $\dot{V} = 30 \text{ l/s} \cdot \text{m}$

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

Spacing between diffusers $A = 1.8 \text{ m}$

Distance between ceiling
and occupied zone $H_1 = 1.2 \text{ m}$

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

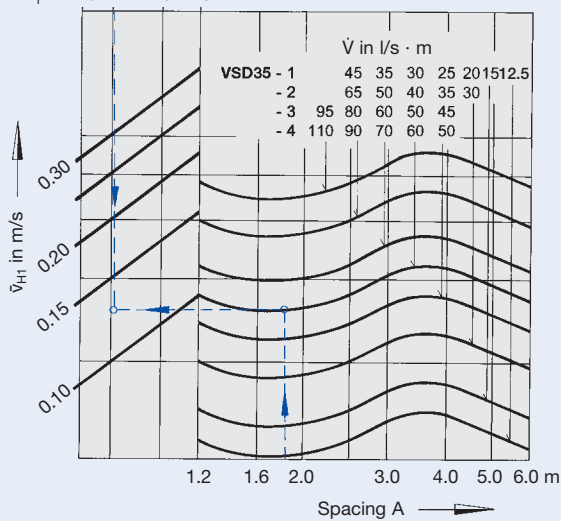
Diagram 12: Air velocity between two diffusers
 $\bar{v}_{H1} = 0.13 \text{ m/s}$

Diagram 13: Air velocity at the wall
 $L = X + H_1 = 2.4 + 1.2 = 3.6 \text{ m}$
 $\bar{v}_L = 0.27 \text{ m/s}$

Diagram 14: Temperature quotient
 $L = A/2 + H_1 = 0.9 + 1.2 = 2.1 \text{ m}$
 $\Delta t_L / \Delta t_z = 0.064$
 $\Delta t_L = 0.064 \times (-10) \text{ K}$
 $\Delta t_L = -0.64 \text{ K}$
For $L = X + H_1 = 3.6 \text{ m}$; $\Delta t_L / \Delta t_z = 0.049$;
 $\Delta t_L \approx -0.5 \text{ K}$

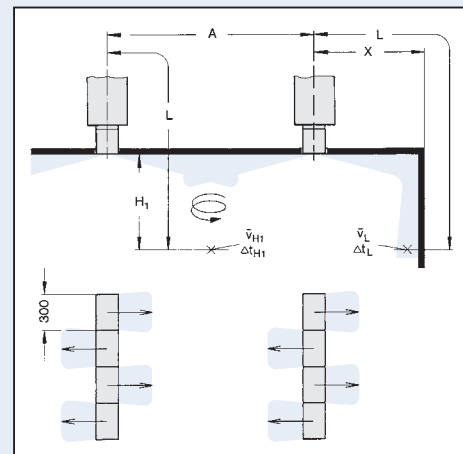
12 Air velocity between two diffusers

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

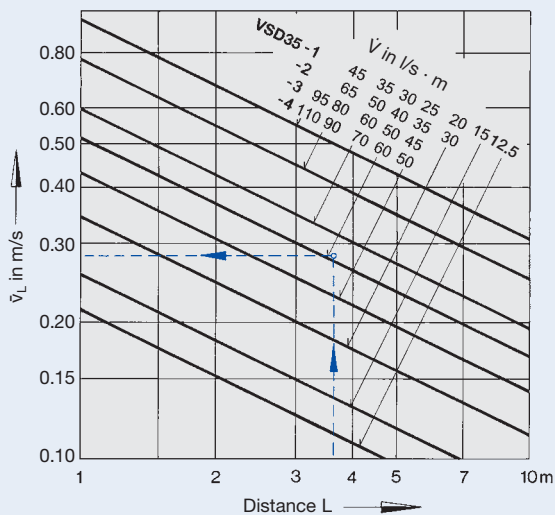


Diffuser Layout

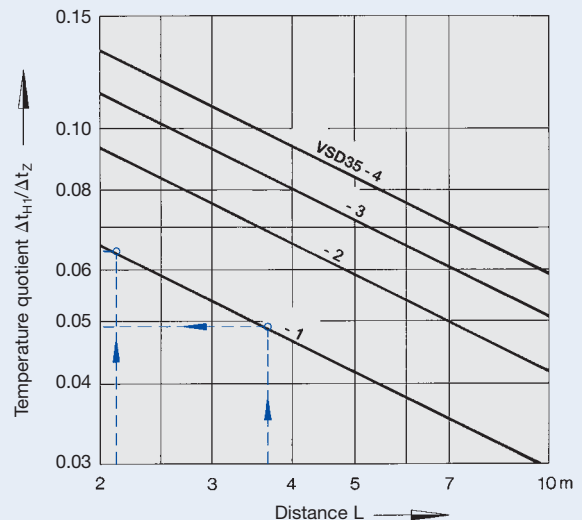
$\dot{V} [\text{m}^3/\text{h}] =$
 $\dot{V} [\text{l/s}] \times 3.6$



13 Air velocity at the wall



14 Temperature quotient



Aerodynamic Data

Air discharge: Alternating angled

Example

Data given:

VSD35-1; air discharge alternating angled

Volume flow per unit length $\dot{V} = 25 \text{ l/s} \cdot \text{m}$

Supply air temperature differential $\Delta t_z = -8 \text{ K}$
approx. $+8 \text{ K}$

Spacing between diffusers $A = 2.4 \text{ m}$

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

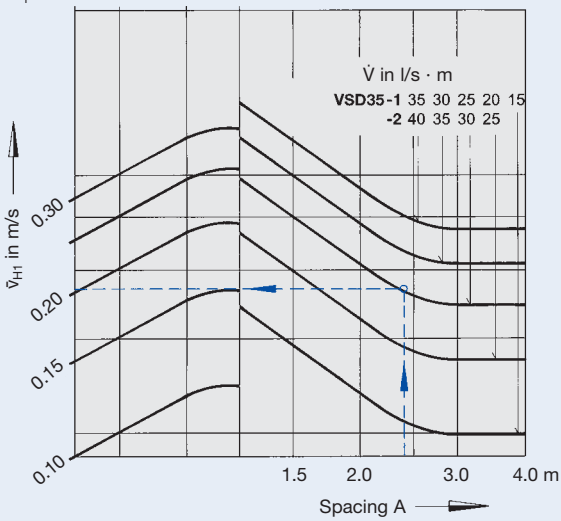
Diagram 15: Air velocity between two diffusers
 $\bar{v}_{H1} = 0.20 \text{ m/s}$

Diagram 17: Temperature quotient, cooling
 $\Delta t_{H1}/\Delta t_z = 0.051$
 $\Delta t_{H1} = -0.051 \times (-8 \text{ K}) \approx -0.4 \text{ K}$
For heating $\Delta t_z = +8 \text{ K}$

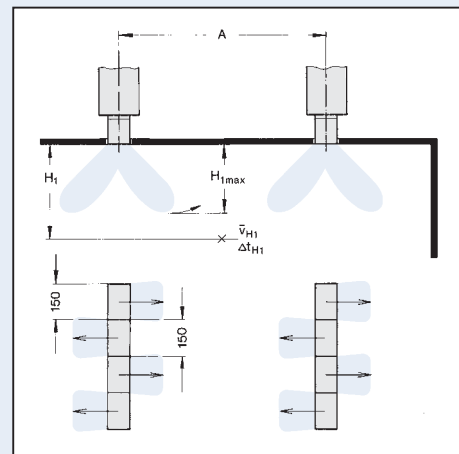
Diagram 19: Maximum penetration depth for heating
 $H_{1\text{max}} \approx 1.5 \text{ m}$

15 Air velocity between two diffusers

$H_1 = 1.0 \text{ m}$

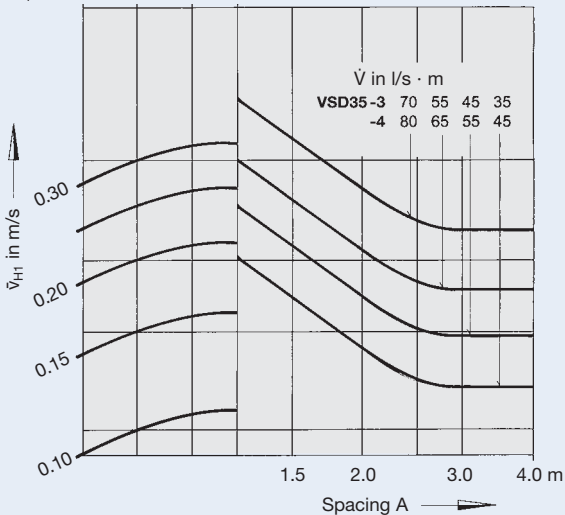


Diffuser Layout

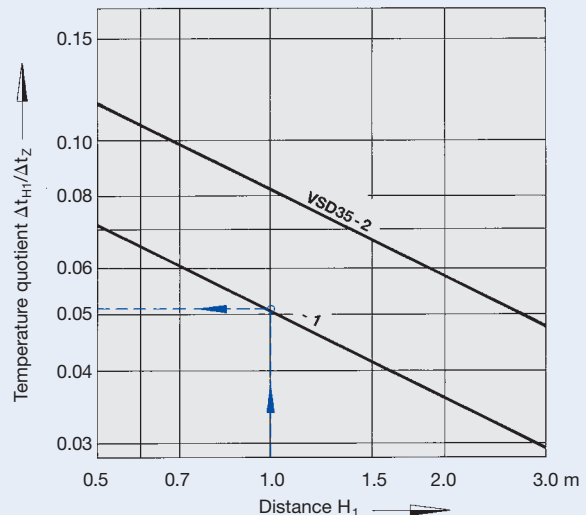


16 Air velocity between two diffusers

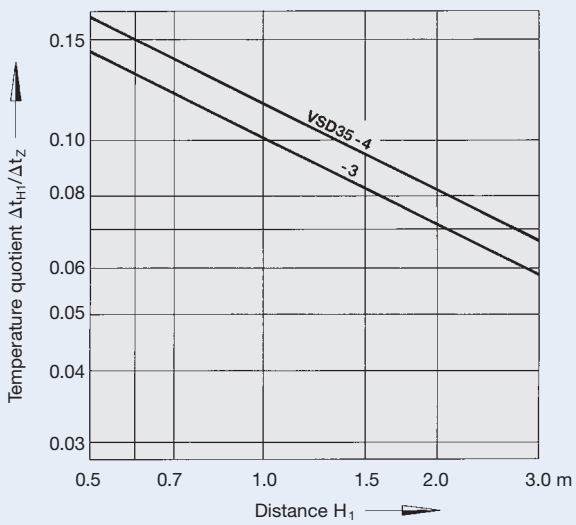
$H_1 = 1.6 \text{ m}$



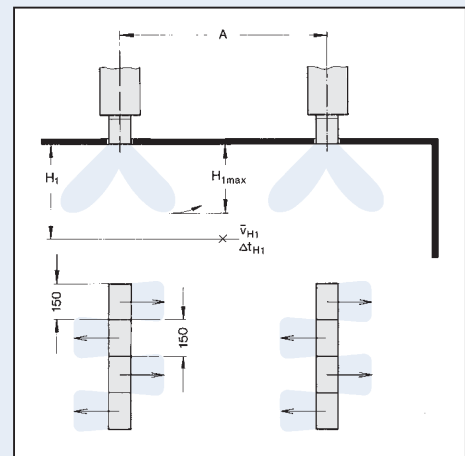
17 Temperature quotient



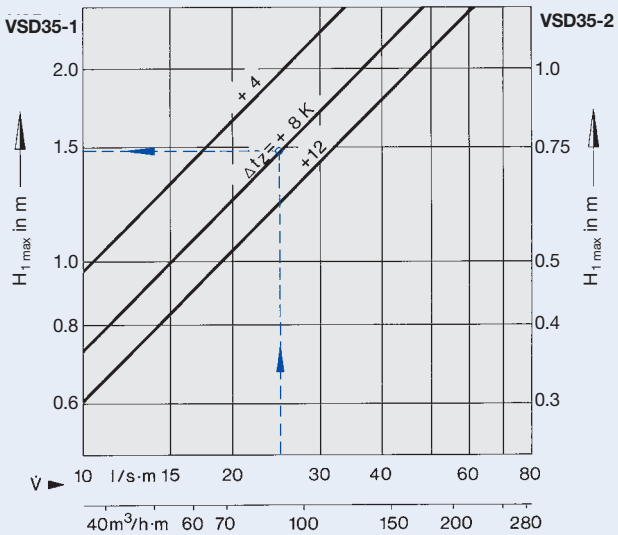
18 Temperature quotient cooling



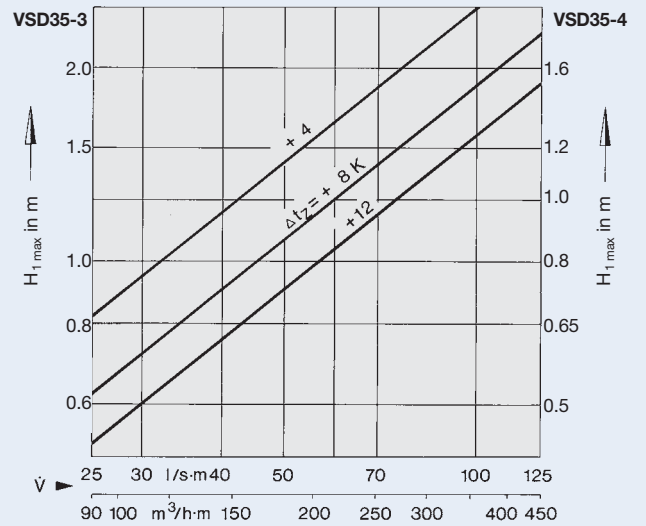
Diffuser Layout



19 Maximum penetration depth, heating



20 Maximum penetration depth, heating



Order Details

Specification

Adjustable slot diffuser with aesthetically designed face sections, suitable for installation in suspended ceiling systems, comprising the diffuser face in 1- to 4-slot configuration, with integral edge flange (Z0). End caps either as end plates or end angles, with incorporated air control blades, which are set at the factory but can be adjusted by the user at any time to enable adaptation to the prevailing conditions. The slot diffuser has a variable neck length and the diffuser face can optionally be fitted to the plenum box on site.

Plenum box is optionally available with internal insulation, circular side entry spigot, volume control damper and four hanging brackets to suspend the plenum box from

the floor slab above. The damper can be easily adjusted from the face of the diffuser.

Materials:

Diffuser face and end caps consist of extruded aluminium section, powder coated matt white in RAL 9010 for standard supply. The air control blades are produced in black plastic (polystyrene) as standard, similar to RAL 9005. The plenum box is made from pre-galvanised sheet steel and internal insulation can be either 6 mm rubber foam or 25 mm fibre glass with a protective glass woven cloth to prevent fibre erosion.

Order Code

State variable y dimension³⁾

VSD35-1-AK-M-Z0-I1 / **900 x 98 x y** / **0** / **P1** / **RAL 9016** / **WS**

No. of slots "n" }

Plenum box

- Clip fix AK
- Clip fix with internal lining DK
- Concealed slot fixture AS
- Concealed slot fixture with internal lining DS
- Offset 90° mitre AA
- Face section E
- Face section F

Volume control damper M¹⁾

Flanged -Z0 }

Flangeless -Z4 }

Internal Lining :

6mm Rubber foam insulation -I1 }
25mm Fibre glass insulation -I2 }

600
750
900
1050
1200
1350
1500
1650²⁾
1800
1950

L₁ (mm)

98	1
123	1 + 2
148	2 + 3
148	3 + 4
198	4

∅ D (mm) **n**

HL Horizontal left
HR Horizontal right
WH Alternating horizontal (standard)
WS Alternating angled } *

* see pages 2 and 3

State colour

{ 0 Standard finish RAL 9010 matt white
P1 Powder-coated to Other RAL colours.

Note
Air control blades as standard are made of black plastic (similar to RAL 9005), on request white plastic (similar to RAL 9010). Please state in the supplementary text.

{ 0 With end cap
1 No end cap

1) For variants with plenum box only
2) 2 spigots if L₁ ≥ 1650 mm!
3) y = 0 or 30, 55, 80, 105, 129 mm for AK, DK and AA
y = 0 or 30, 55, 80, 104 mm for AS and DS

Order Example

Make: TROX
Type: VSD35-1-AK-M-Z0/900x98/0/P1/RAL9016/WS
Suppl. text: Air control blades white, similar to RAL 9010