Slot Diffuser

Type VSD50

with 50 mm wide diffuser face
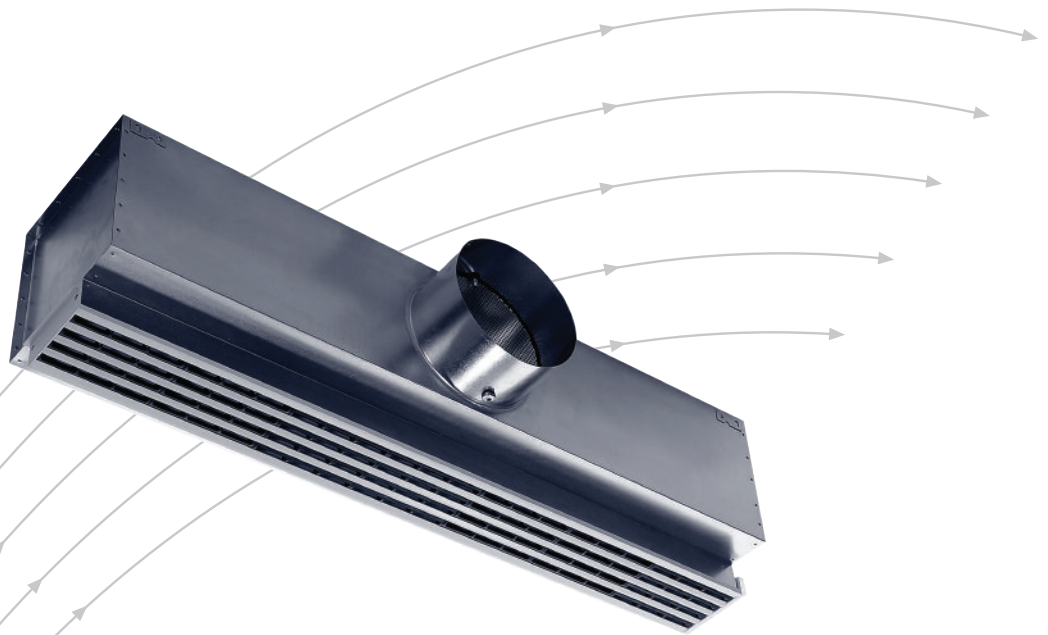
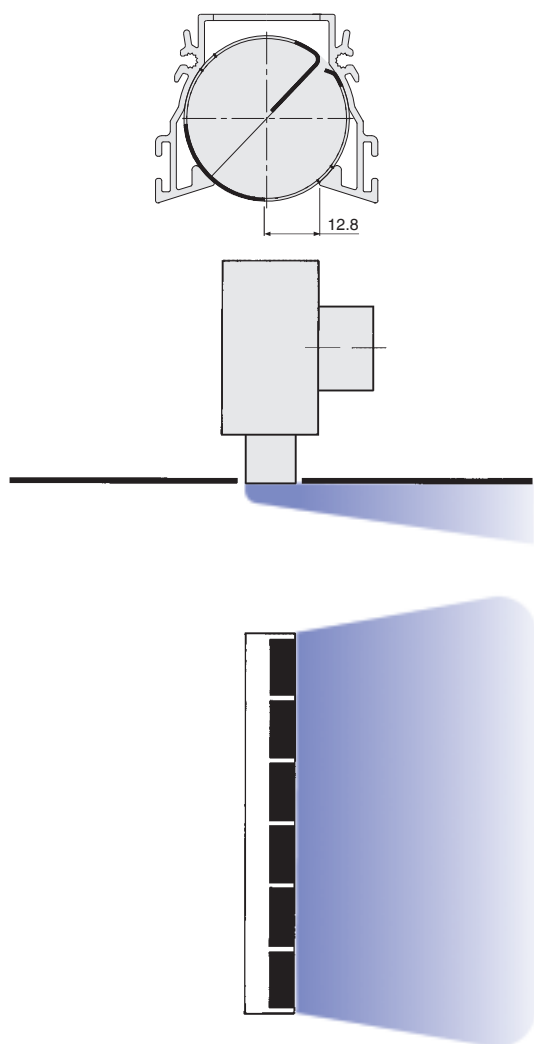**TROX**® **TECHNIK**

Contents · Air Diffuser Discharge

**Air Discharge
Horizontal Right**

**Air Discharge
Horizontal Left**

12.8

12.8
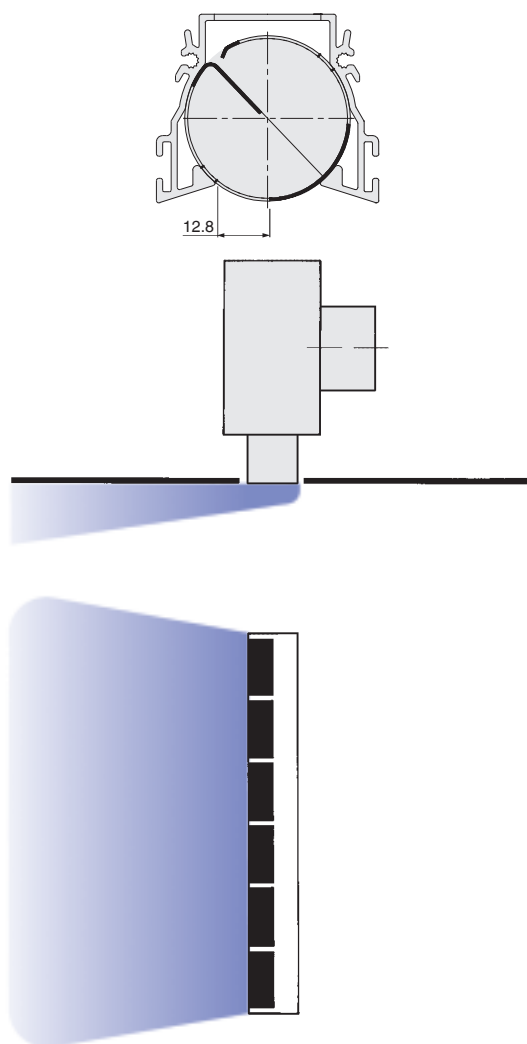
The type VSD50 slot diffuser is available with 1-2 slots. The diffuser face is a one piece extrusion, so there are no visible joints. The Type VSD50 can be used in rooms with heights from approx. 2.6 m to 4.0 m. The low overall height means that the slot diffusers are particularly suitable for use in restricted ceiling voids and in suspended ceiling systems. They are characterised by high induction which results in a rapid decrease in supply air temperature differential and jet velocity.

The recommended supply air temperature differential range is $\pm 10\,$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 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.

**Air Discharge
Alternating Angled**
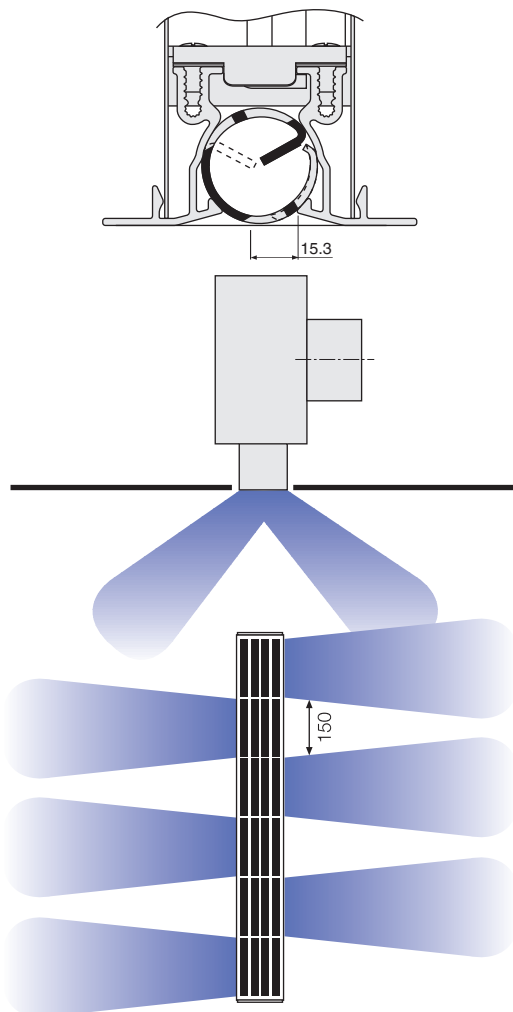
**Air Discharge
Alternating Horizontal**
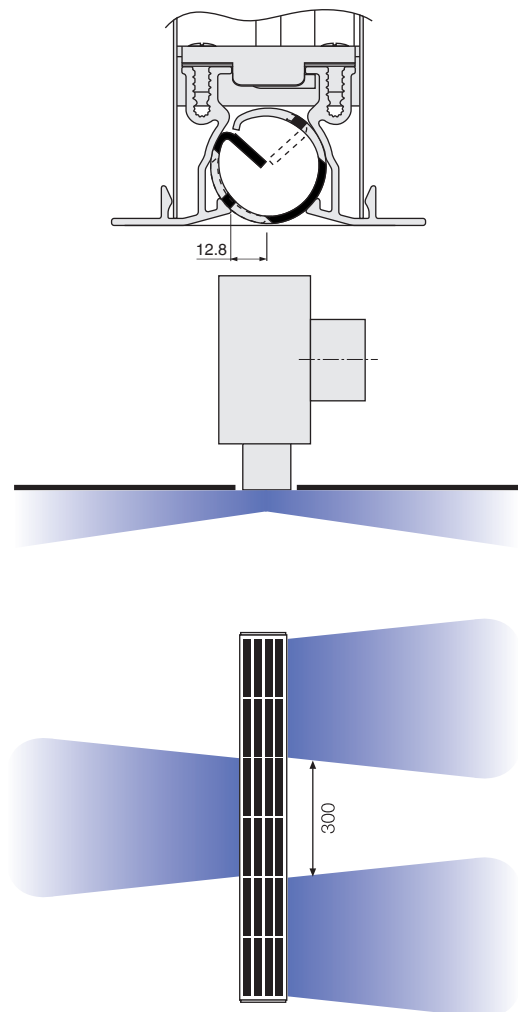
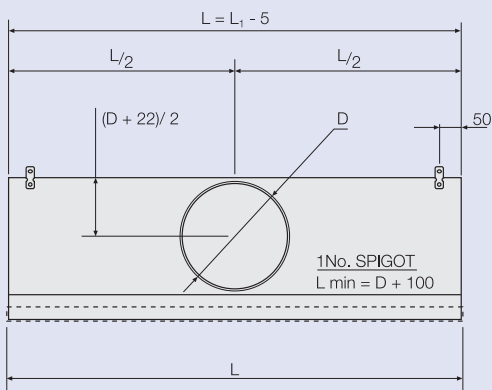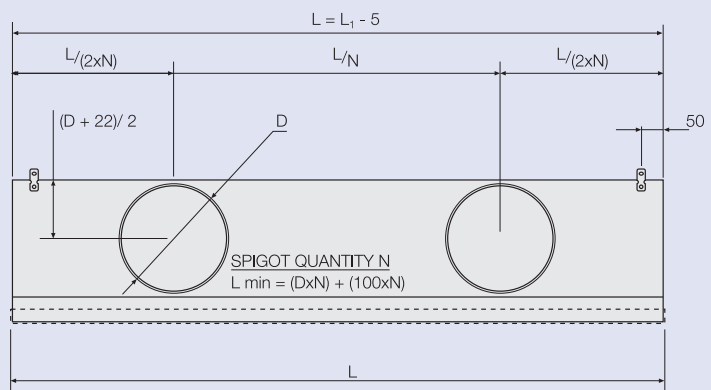| Slots	Ø D	AKV-VSD50 plenum details		AKV-VSD50 extended height plenum details	
		W	B	W	B
1	98, 123,148,	138	52.0	102	52.0
2	158, 198, 248,	176	94.0	144	94.0
3	298, 313, 348	238	136	186	136
4		310	178	228	178

AKV-VSD50

$L = L_1 - 5$

$L/2$ $L/2$

$(D + 22)/2$ D   50

1No. SPIGOT
$L min = D + 100$

L

Plenum Length L - 300mm to 1500mm
(150mm increments)

AKV-VSD50

$L = L_1 - 5$

$L/(2 \times N)$ L/N $L/(2 \times N)$

$(D + 22)/2$ D   50

SPIGOT QUANTITY N
$L min = (D \times N) + (100 \times N)$

L

Plenum Length L - 1650mm, 1800mm (2 Spigots)

AKV-VSD....M/

W   ØD98 - 158 = 75
ØD198 - 398 = 100

$VSD50 = D + 81$
$D + 22$
ØD
B

AKV-VSD....D12-O/

W   37

$VSD50 = D + 81$
$D + 22$
ØD
B

Extended Height Plenum

W   37

Assembled Height Y
$D + A + 22$
ØD
A

Assembled Height Y = VSD50 (D+A+81)
Extension A = 125, 150, 200
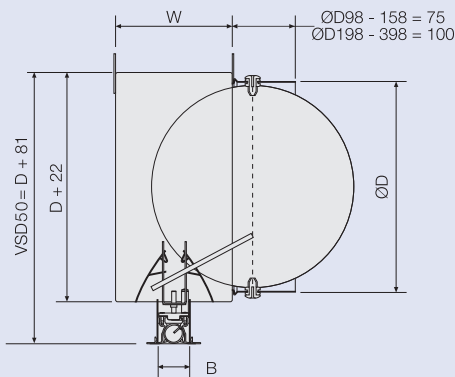
Plenum to slot fixing detail
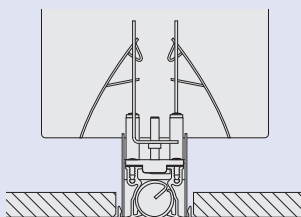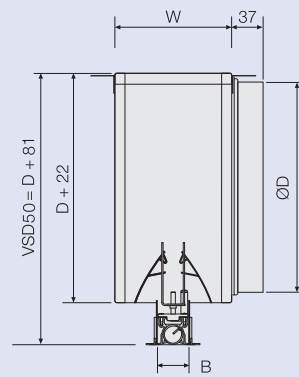
Slot installed in board detail

NOTE: Suitable support battens (by others) should be used at each spring clip location to distribute the weight of the diffuser and to prevent penetration of the substrate.
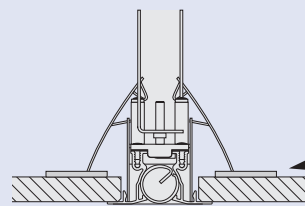
Minimum Board Thickness
VSD50 = 20.0mm

Slot Width Dimensions VSD50

Slots	'P'		
	FL	NF	PL
1	79.5	59.5	-
2	121.5	101.5	-
3	163.5	143.5	299
4	205.5	185.5	299
O/A Height	47*	47*	47*

*Overall height excludes 'FK' fixing kit

Tolerance Length 'L$_1$' +/- 1
Width 'P' +/- 1

VSD50 slot diffusers are supplied separate from the plenum box which is fitted to the rear of the diffuser on site by others. Lined plenums are available as an option. The supply air is connected via the circular side entry spigot which is optionally available with a volume control damper. The face sections are available without flanges type NF or with integral edge flanges type FL, or with flange profiles types PL or TZ to suit various ceiling requirements. Matching end caps are available for the diffuser faces, in the form of end angles or end plates. The alignment pins used at the joints are also included in the scope of supply, to enable the alignment and interconnection of individual L$_1$ sections. Mitre corners pieces are for aesthetic reasons not fitted with air control blades.

NF = No Flange. The flangeless VSD slot diffuser is suited to installing in apertures in ceiling tiles where the slot diffuser face can sit flush with the tile. It is combined with the L02 end angle for levelling.
FL = Flanged. The flanged VSD can be used to lay on a ceiling T bar or be pulled up and cover an opening in the ceiling.
PL = Plank Ceiling. VSD50 3 & 4 slot diffusers with extended flanges to replace a 300mm plank ceiling tile. It is combined with the PL02 end angle for levelling.

Ceiling Integration/Sections

NF
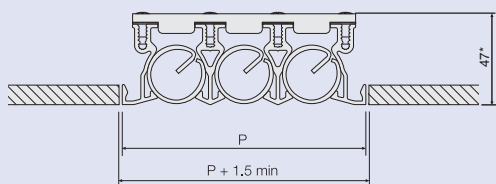
Type 'P' end cap
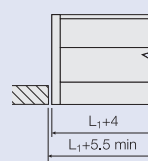
Type 'L' end cap

FL
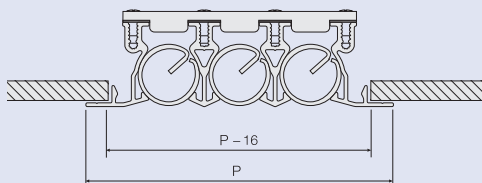
Type 'A' end cap
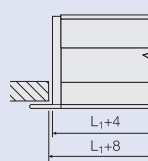
PL
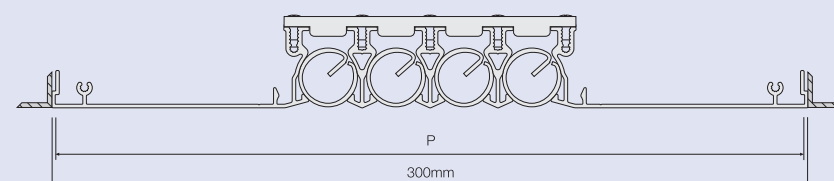
Type 'PL' end cap
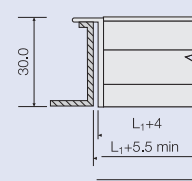
NOTE: 'PL' diffuser type only available as finite section L$_1$ = 300 min / 1800 max
Must be specified with PL02 (end cap at each end of diffuser).

End Caps

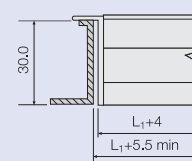| End Cap	Description	Border		
		NF	FL	PL
PO1	'P' type fitted on one end only	✔		
PO2	'P' type fitted on both ends	✔		
AO1	'A' type fitted on one end only		✔	
AO2	'A' type fitted on both ends		✔	
LO2	'L' type fitted on both ends	✔		
PLO2	'PL' type fitted on both ends			✔

End Caps

Type P
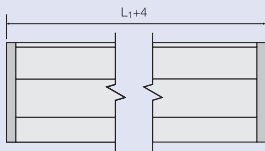
Type A
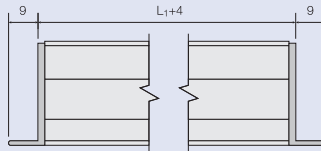
Type L
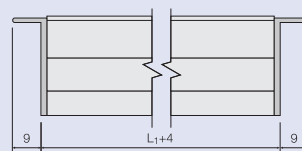
Type PL
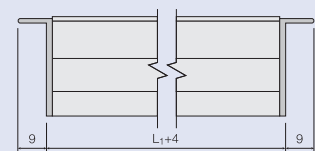
Without end caps ('0')
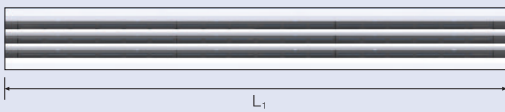
End caps on one end ('XX01')

End caps on both ends ('XX02')

Faceted Ends

Non Standard
E = 300 minimum
Angle = 34° to 89° in 1 degree increments

Tolerance +/- 1°

Facet Angle 34° to 89°
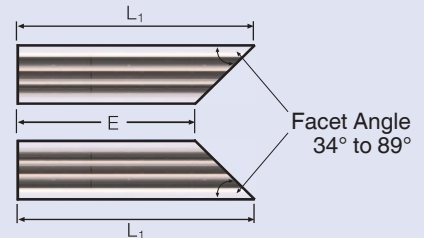
Front face

Mitred Corners

Standard
E = 200 : Angle = 90° or 135°

Non Standard
E = 200 : Angle = 68° to 179° in 1 degree increments

Tolerance +/- 1°
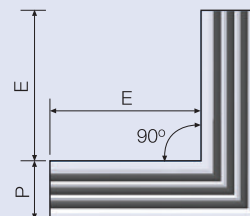
Figure 1
Standard method of installing slot diffuser assemblies is to use the four suspension points on the plenum box. Suitable support rods/wires and fixing accessories by others on site.

Figure 2
If there are linear runs of slot diffusers, the alignment pins supplied can be used to keep the face of the diffuser aligned. The alignment pins (2 per slot) are initially fitted on one side and then inserted approx. halfway into the other section.

Figure 3
Installation spring clip is supplied with 8 pre-set notch positions to suit variable ceiling types. The required notch should be selected on each spring clip prior to installation within the ceiling. NOTE - When used in conjunction with type AKV plenums, notch position 1 should be used.

Figure 4
In order to fit the diffuser to the plenum box, the air control blades below the fixing points must be adjusted so that the screw can be reached with a screw driver. Push the diffuser into the neck of the plenum compressing the spring clips. Once inside the plenum the spring clips will spring out preventing the diffuser from coming out.
Then turn the screw so the diffuser pulls up tight into the plenum.

Figure 5
The airflow rate can be adjusted from the front face of the diffuser. To do this, the air control blade below the spigot must be adjusted until the damper can be moved using a screwdriver or round bar (max. dia. 3.5mm, length depending on the neck extension).

Figure 1
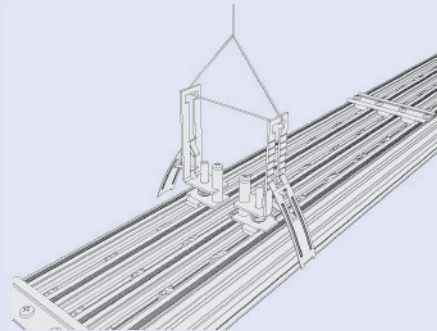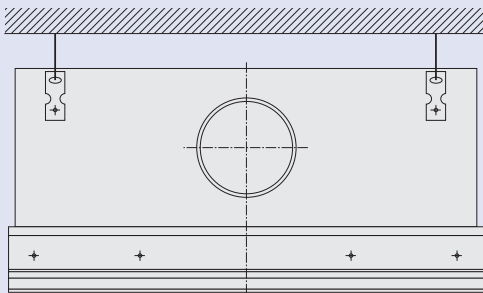
For diffusers without plenums the use of a safety wire by others attached to the slab provides an extra level of safety.

Figure 2

Figure 3
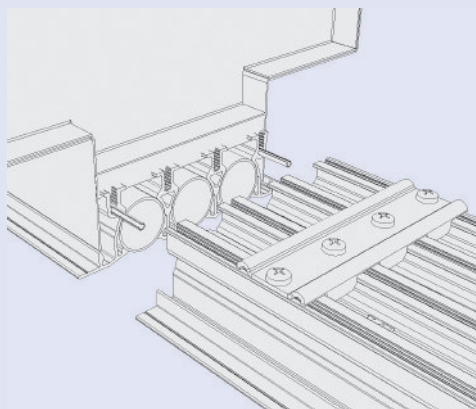
Position 1
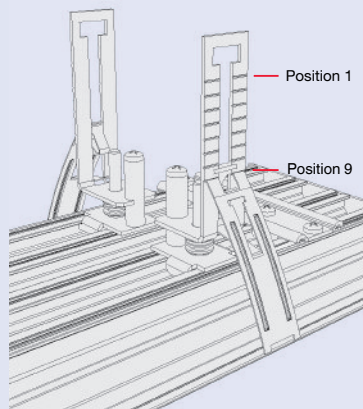
Position 9

Notch Positions		
Notch Position	Min board thickness mm	Max board thickness mm
1	60	67
2	55	62
3	50	57
4	45	52
5	40	47
6	35	42
7	30	37
8	25	32
9	20	27

Figure 4
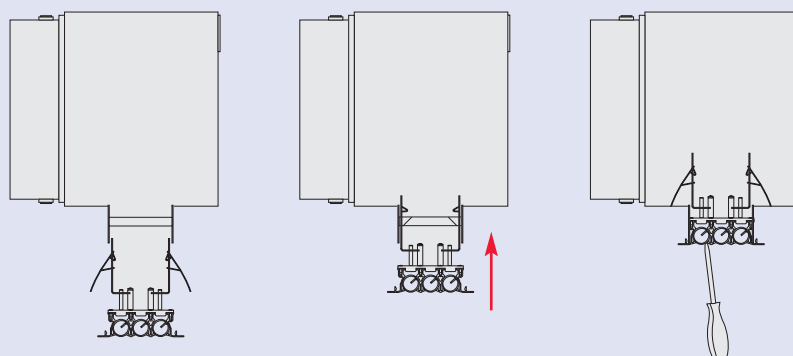
Figure 5
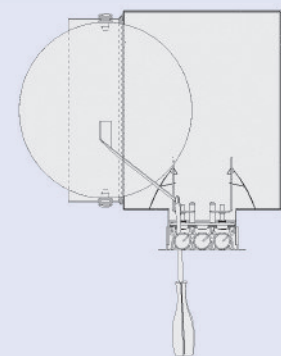
Nomenclature

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

H_1 in m: Spacing 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

$\bar{v}_L$ in m/s: Time average air velocity at wall at distance L

v_{eff} in m/s: Effective jet velocity

Δt_Z in K: Temperature difference between supply air and room air

Δt_L in K: Difference between room temperature and core temperature at distance L

Δt_{H1} in K: Difference between core temperature and room temperature at distance H_1

Δp_t in Pa: Total pressure drop

L_{WA} in dB(A): A-weighted sound power level

$L_{W\,NC}$: NC rating of sound power level

$L_{W\,NR}$: $L_{W\,NR} = L_{W\,NC} + 2$

L_{pA}, L_{pNC} : A weighting and NC rating respectively of room sound pressure level
$L_{pA} \approx L_{WA} - 8$ dB
$L_{pNC} \approx L_{W\,NC} - 8$ 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 flow generated noise $L_W = L_{WA} + \Delta L$

Effective Jet Velocity

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

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

L_1 = Length of slot diffuser in m

$\dot{V}_t$ in m³/h

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

Effective slot width		
Air discharge	Horizontal	Angled
s_{eff} in m	0.0092	0.0061

Example

Data given:

VSD50-1; Air discharge alternating angled

Slot length	L_1 =	1500 mm
Total volume flow	$\dot{V}_t$ =	45 l/s
Spigot diameter	D =	158 mm

Required: Sound power level of flow generated noise L_W

Diagram 2: Sound power level and pressure drop

$\Delta p_t = 10$ Pa · 1.5 = 15 Pa

$L_{WA} = 25$ dB(A) + 5 = 33 dB(A)

Effective jet velocity v_{eff}:

$$v_{eff} = \frac{\dot{V}_t}{s_{eff} \cdot L_1 \cdot 1000} = \frac{45}{0.0061 \cdot 1.5 \cdot 1000} = 4.9 \text{ m/s}$$

Octave band centre frequency in Hz	63	125	250	500	1000	2000	4000	8000
L_{WA} in dB	33	33	33	33	33	33	33	33
L in dB	0	2	7	− 4	− 11	− 18	− 29	− 36
L_W in dB	33	35	40	29	22	15	4	− 3

Relative Spectra ∆L 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
VSD50-1	600	2	12	7	7	− 6	− 26	− 44	− 46	− 50
	1050		10	3	8	− 10	− 26	− 38	− 43	− 47
	1500		9	3	8	− 7	− 23	− 37	− 42	− 48
	600	3	8	7	7	− 4	− 20	− 34	− 35	− 38
	1050		5	3	8	− 7	− 20	− 29	− 33	− 38
	1500		6	3	7	− 5	− 17	− 28	− 33	− 43
	600	5	1	6	6	− 3	− 13	− 22	− 28	− 32
	1050		− 1	3	7	− 5	− 12	− 19	− 28	− 34
	1500		0	2	7	− 4	− 11	− 18	− 29	− 36
	600	7	− 4	5	5	− 2	− 9	− 14	− 26	− 29
	1050		− 6	2	6	− 4	− 8	− 14	− 30	− 36
	1500		− 4	0	5	− 3	− 8	− 13	− 30	− 33
VSD50-2	600	2	12	7	7	− 6	− 25	− 42	− 44	− 47
	1050		10	3	8	− 9	− 25	− 37	− 42	− 47
	1500		10	4	7	− 6	− 21	− 34	− 40	− 47
	600	3	8	7	7	− 4	− 19	− 32	− 34	− 38
	1050		5	4	8	− 7	− 18	− 28	− 32	− 37
	1500		6	3	7	− 5	− 16	− 26	− 31	− 40
	600	5	1	6	6	− 3	− 12	− 20	− 27	− 33
	1050		− 2	3	7	− 4	− 11	− 18	− 29	− 34
	1500		0	2	6	− 3	− 10	− 16	− 28	− 35
	600	7	− 4	5	5	− 2	− 8	− 13	− 25	− 29
	1050		− 7	2	5	− 4	− 7	− 13	− 30	− 34
	1500		− 4	0	5	− 3	− 7	− 11	− 30	− 33

Acoustic Data

Correction to diagram 1: Damper setting

D = 123 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L₁ = 600	Δp_t	x 1	x 1.2	x 1.8	x 1.7	x 1.8	x 2.6
	L_{WA}	–	+ 1.0	–	+ 7.0	+ 6.0	–
	L_{WNC}	–	+ 1.0	–	+ 8.0	+ 6.0	–
L₁ = 1050	Δp_t	x 1	x 1.4	x 3.1	x 1.6	x 1.9	x 3.6
	L_{WA}	–	+ 1.0	–	+ 5.0	+ 5.0	–
	L_{WNC}	–	+ 1.0	–	+ 6.0	+ 6.0	–
L₁ = 1500	Δp_t	x 1	x 1.5	x 4.1	x 1.4	x 1.8	x 4.3
	L_{WA}	–	+ 1.0	–	+ 4.0	+ 3.0	–
	L_{WNC}	–	+ 1.0	–	+ 5.0	+ 4.0	–

Correction to diagram 3: Damper setting

D = 158 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L₁ = 600	Δp_t	x 1	x 1.3	x 2.0	x 1.7	x 2.0	x 2.5
	L_{WA}	–	+ 1.0	–	+ 7.0	+ 7.0	–
	L_{WNC}	–	+ 1.0	–	+ 8.0	+ 8.0	–
L₁ = 1050	Δp_t	x 1	x 1.4	x 3.2	x 1.5	x 1.8	x 3.8
	L_{WA}	–	+ 1.0	–	+ 4.0	+ 4.0	–
	L_{WNC}	–	+ 1.0	–	+ 5.0	+ 5.0	–
L₁ = 1500	Δp_t	x 1	x 1.6	x 4.4	x 1.4	x 1.9	x 4.7
	L_{WA}	–	+ 1.0	–	+ 3.0	+ 3.0	–
	L_{WNC}	–	+ 1.0	–	+ 4.0	+ 4.0	–

Correction to diagram 2: Damper setting

D = 158 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L₁ = 600	Δp_t	x 1	x 1.1	x 1.4	x 1.6	x 1.7	x 1.9
	L_{WA}	–	–	–	+ 6.0	+ 6.0	–
	L_{WNC}	–	–	–	+ 5.0	+ 5.0	–
L₁ = 1050	Δp_t	x 1	x 1.3	x 2.1	x 1.7	x 1.8	x 2.5
	L_{WA}	–	+ 1.0	–	+ 6.0	+ 5.0	–
	L_{WNC}	–	–	–	+ 6.0	+ 6.0	–
L₁ = 1500	Δp_t	x 1	x 1.3	x 2.8	x 1.5	x 1.8	x 3.2
	L_{WA}	–	+ 1.0	–	+ 5.0	+ 4.0	–
	L_{WNC}	–	+ 1.0	–	+ 5.0	+ 4.0	–

Correction to diagram 4: Damper setting

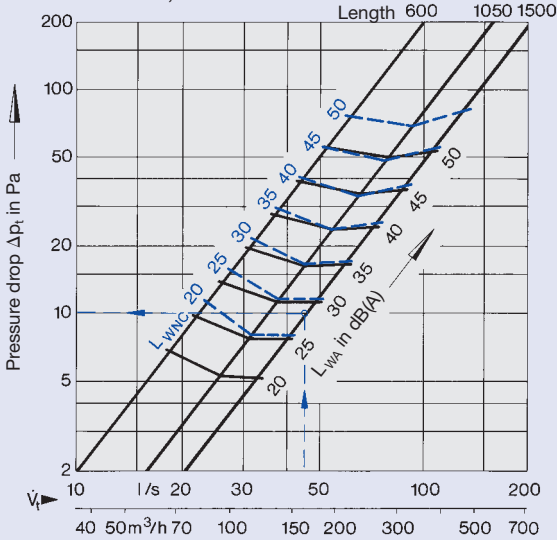| D = 198 mm		Air discharge horizontal			Air discharge angled		
Damper angle		0°	45°	90°	0°	45°	90°
L₁ = 600	Δp_t	x 1	x 1.2	x 1.8	x 1.8	x 1.9	x 2.4
	L_{WA}	–	+ 1.0	–	+ 6.0	+ 7.0	–
	L_{WNC}	–	–	–	+ 7.0	+ 8.0	–
L₁ = 1050	Δp_t	x 1	x 1.3	x 2.8	x 1.6	x 1.8	x 3.4
	L_{WA}	–	+ 1.0	–	+ 5.0	+ 5.0	–
	L_{WNC}	–	+ 1.0	–	+ 6.0	+ 6.0	–
L₁ = 1500	Δp_t	x 1	x 1.4	x 3.6	x 1.5	x 1.8	x 4.2
	L_{WA}	–	+ 2.0	–	+ 5.0	+ 4.0	–
	L_{WNC}	–	+ 2.0	–	+ 6.0	+ 5.0	–

1 Sound power level and pressure drop
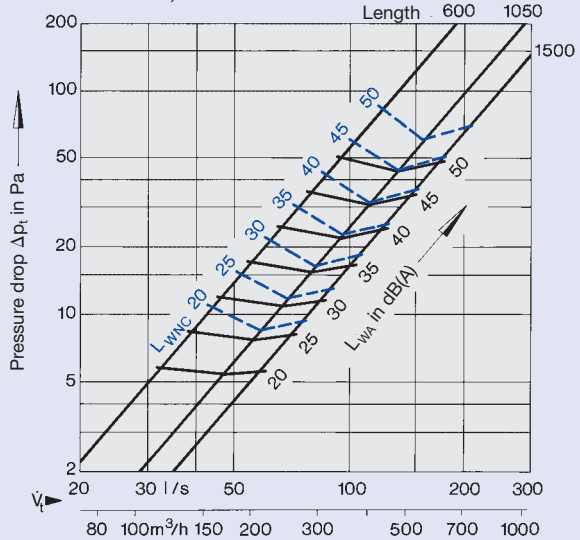VSD50-1; D = 123 mm
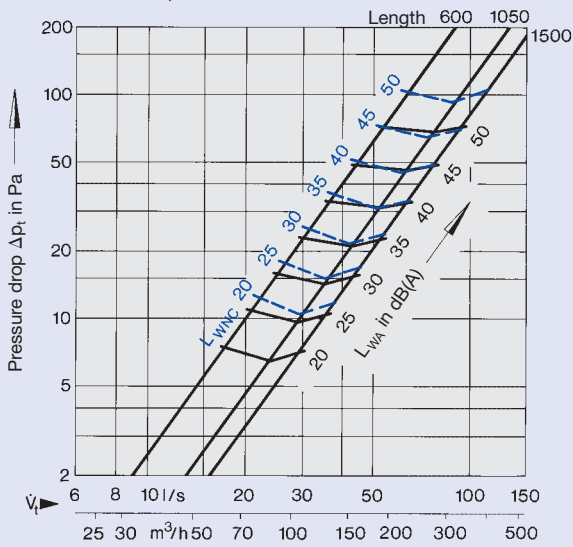
3 Sound power level and pressure drop
VSD50-2; D = 158 mm
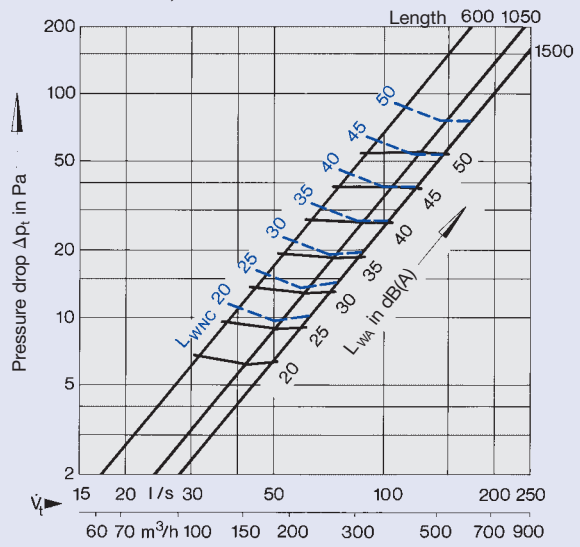
2 Sound power level and pressure drop
VSD50-1; D = 158 mm

4 Sound power level and pressure drop
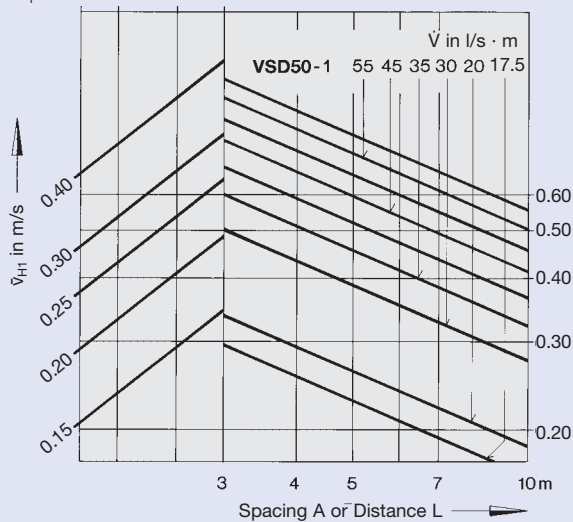VSD50-2; D = 198 mm

5 Air velocity between two diffusers and at wall

$H_1 =$ 1.0   1.2   1.6   2.0 m

$\dot{V}$ in l/s · m

VSD50 - 1   55 45 35 30 20 17.5

$\bar{v}_{H1}$ in m/s

0.40

0.30

0.25

0.20

0.15

0.60
0.50
0.40
0.30
0.20

3   4   5   7   10 m

Spacing A or Distance L ➤

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

Diffuser Layout

6 Air velocity between two diffusers and at wall

$H_1 =$ 1.0   1.2   1.6   2.0 m

$\dot{V}$ in l/s · m

VSD50 - 2   75 60 50 40

$\bar{v}_{H1}$ in m/s

0.40

0.30

0.25

0.20

0.15

$\bar{v}_L$ in m/s

0.60
0.50
0.40
0.30
0.20

3   4   5   7   10 m

Spacing A or Distance L ➤
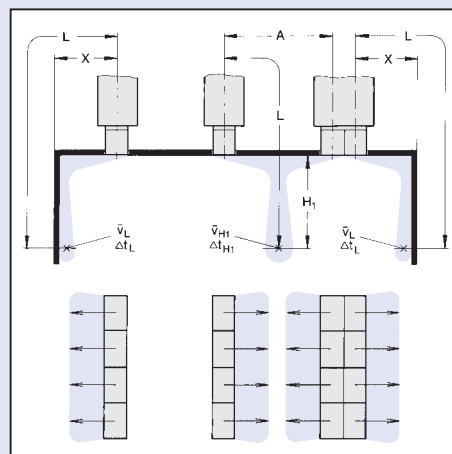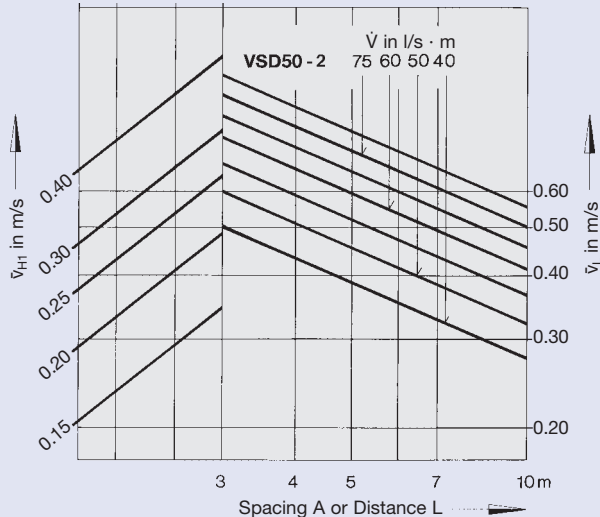
7 Temperature quotient

Temperature quotient $\Delta t_L / \Delta t_Z$

0.30

0.20

0.15

0.10

0.08

0.06

VSD50 - 2

~ 1

2   3   4   5   7   10 m

Distance L ➤

11

Example

Data given:
VSD50-1; air discharge: alternating horizontal

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

Supply air temperature differential
horizontal, cooling $\Delta t_z = -10$ K

Spacing between diffusers	A =	1.8 m

Distance between ceiling
and occupied zone $H_1 =$ 1.2 m

Distance between diffuser
centre line and wall $X =$ 2.4 m

Diagram 8: Air velocity between two diffusers

$\bar{v}_{H1}$ = 0.11 m/s

Diagram 9: Air velocity at the wall
$L = X + H_1 = 2.4 + 1.2 = 3.6$ m
$\bar{v}_L$ = 0.23 m/s

Diagram 10: Temperature quotient
$L = A/2 + H_1 = 0.9 + 1.2 = 2.1$ m
$\Delta t_L/\Delta t_Z$ = 0.082
Δt_L = 0.082 x (– 10) K
Δt_L = – 0.82 K
At $L = X + H_1 = 3.6$ m; $\Delta t_L/\Delta t_Z = 0.062$;
Δt_L ≈ – 0.6 K

8   Air velocity between two diffusers

$H_1 =$ 1.0 1.2   1.6 2.0 m

Diffuser Layout

$\dot{V}$ [m³/h] =
$\dot{V}$ [l/s] x 3.6
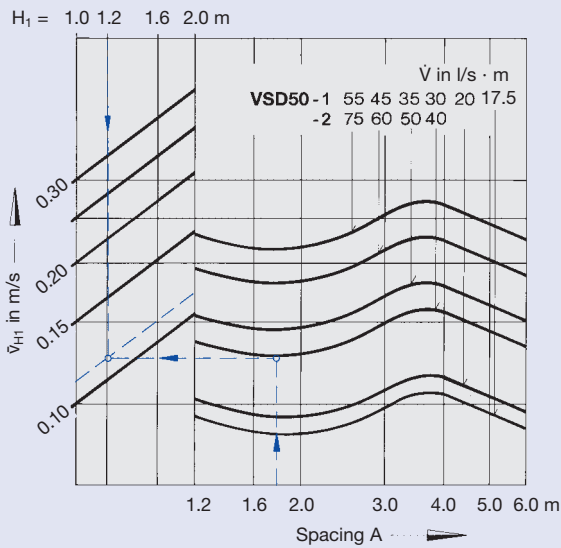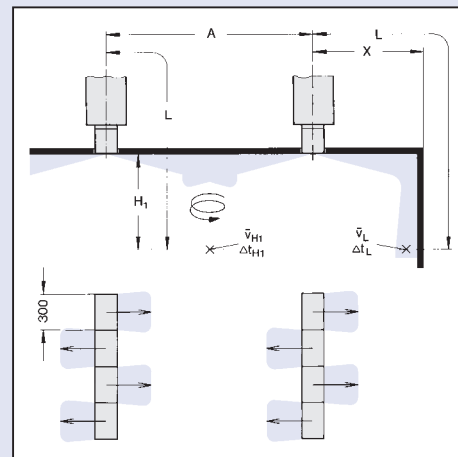
9   Air velocity at the wall
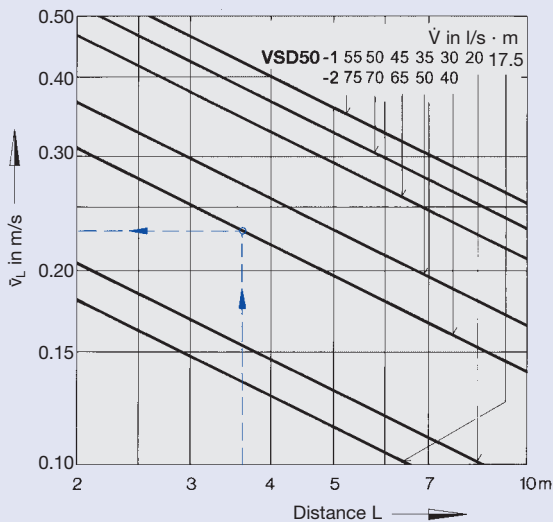
10   Temperature quotient
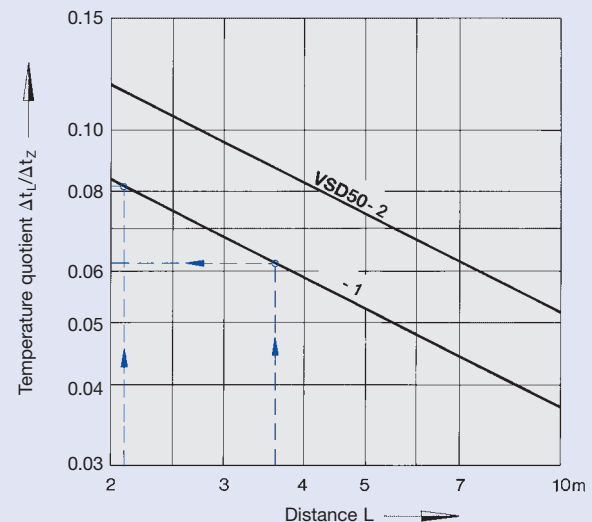
Example

Data given:

VSD50-1; air discharge: alternating angled

Volume flow per unit length	$\dot{V}$ =	30 l/s · m
Supply air temperature differential	Δt_Z =	− 8 K
	approx.	+ 8 K
Spacing between diffusers	A =	2.4 m
Distance between ceiling and occupied zone	H_1 =	1.0 m

Diagram 11: Air velocity

$\overline{v}_{H1}$ = 0.22 m/s

Diagram 12: Temperature quotient cooling

$\Delta t_{H1}/\Delta t_Z$ = 0.057
Δt_{H1} = 0.057 x (− 8 K) ≈ − 0.5 K
For heating Δt_Z = + 8 K

Diagram 13: Maximum penetration depth for heating

H_{1max} ≈ 1.2 m

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11 Air velocity

Diffuser Layout
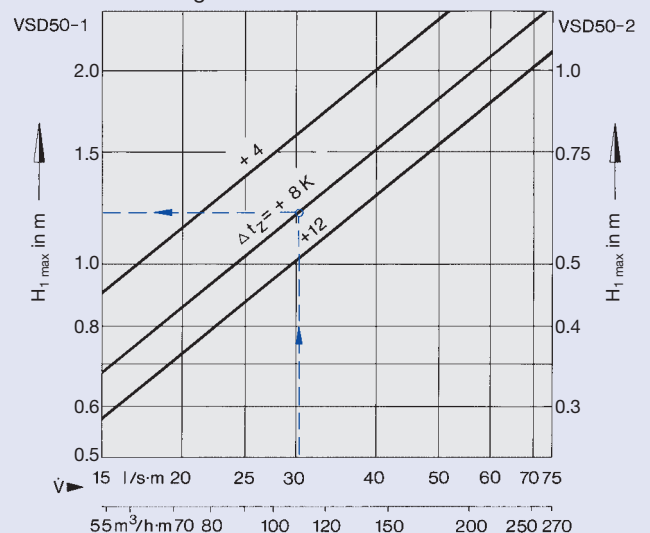

$\dot{V}$ [m³/h] = $\dot{V}$ [l/s] x 3.6

12 Temperature quotient – Cooling

13 Maximum penetration depth for heating

Order Details

Specification

Adjustable slot diffuser with aesthetically designed face section, suitable for installation in suspended ceiling systems, comprising the diffuser face in 1 to 4-slot configuration, optionally without edge flange NF or with integral edge flange FL. 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.
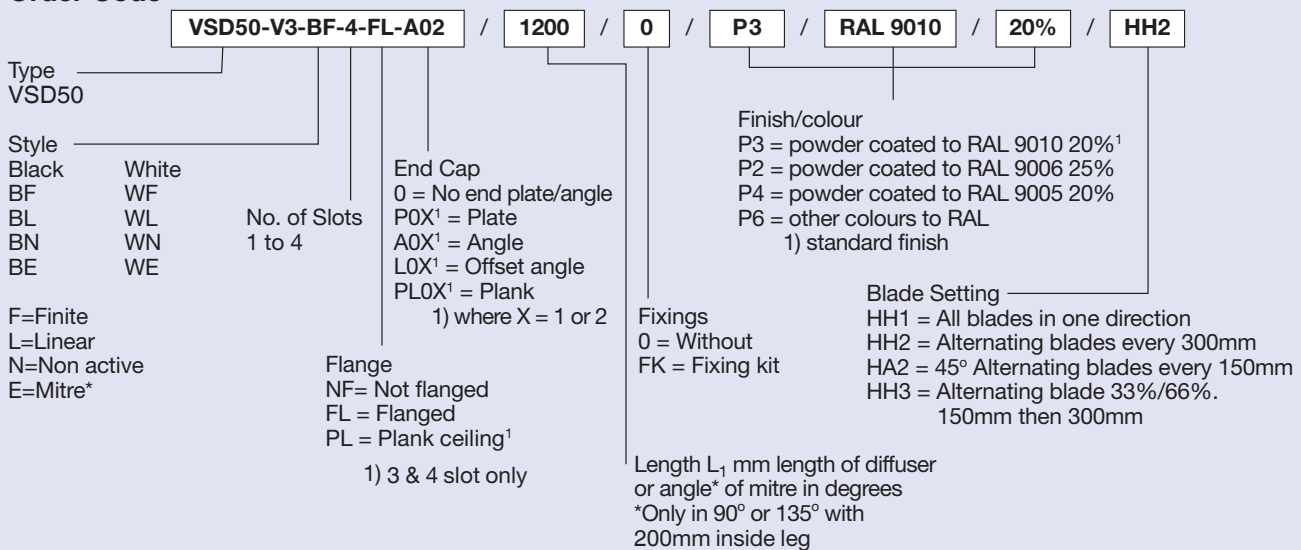The plenum box is optionally available with an inner lining of 12 mm in thickness, with circular side entry spigot and four suspension points for suspension of the complete

assembly from the ceiling slab, optionally with volume control damper which is adjustable on the face of the diffuser.
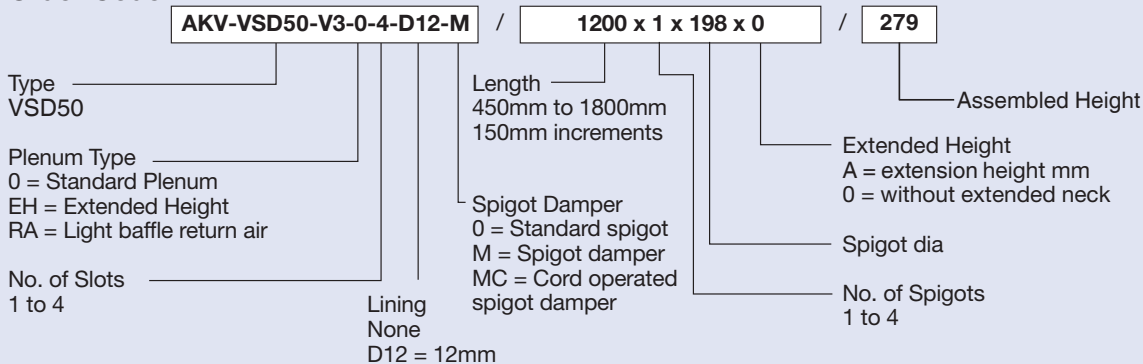
Materials:
Diffuser face and end caps consist of extruded aluminium sections powder coated in RAL colours. The air control blades are produced in black plastic (polystyrene) as standard, similar to RAL 9005, or on request in white (similar to RAL9010). Plenum boxes are from formed pre galvanised sheet steel, optional spigot damper is pre galvanised perforated sheet steel. Plenum boxes can be internally lined with 12mm black faced foam with a class O rating.

Order Code

| VSD50-V3-BF-4-FL-A02 | / | 1200 | / | 0 | / | P3 | / | RAL 9010 | / | 20% | / | HH2 |

Type
VSD50

Style

Black	White	
BF	WF	
BL	WL	No. of Slots
BN	WN	1 to 4
BE	WE	

F=Finite
L=Linear
N=Non active
E=Mitre*

End Cap
0 = No end plate/angle
P0X[1] = Plate
A0X[1] = Angle
L0X[1] = Offset angle
PL0X[1] = Plank
    1) where X = 1 or 2

Flange
NF= Not flanged
FL = Flanged
PL = Plank ceiling[1]

    1) 3 & 4 slot only

Fixings
0 = Without
FK = Fixing kit

Length L_1 mm length of diffuser or angle* of mitre in degrees
*Only in 90° or 135° with 200mm inside leg

Finish/colour
P3 = powder coated to RAL 9010 20%[1]
P2 = powder coated to RAL 9006 25%
P4 = powder coated to RAL 9005 20%
P6 = other colours to RAL
    1) standard finish

Blade Setting
HH1 = All blades in one direction
HH2 = Alternating blades every 300mm
HA2 = 45° Alternating blades every 150mm
HH3 = Alternating blade 33%/66%.
    150mm then 300mm

Order Code

| AKV-VSD50-V3-0-4-D12-M | / | 1200 x 1 x 198 x 0 | / | 279 |

Type
VSD50

Plenum Type
0 = Standard Plenum
EH = Extended Height
RA = Light baffle return air

No. of Slots
1 to 4

Lining
None
D12 = 12mm

Length
450mm to 1800mm
150mm increments

Spigot Damper
0 = Standard spigot
M = Spigot damper
MC = Cord operated spigot damper

No. of Spigots
1 to 4

Spigot dia

Extended Height
A = extension height mm
0 = without extended neck

Assembled Height

Order Example

Make: TROX
Diffuser Type: VSD50-V3-BF-4-FL-P02/1200/0/P3/RAL9010/20%/HH2
Plenum Type: AKV-VSD50-V3-0-4-D12-M/1200x1x198x0/0