Slot Diffuser

Type VSD50

with 50 mm wide diffuser face

TROX® TECHNIK

Contents · Air Diffuser Discharge

Figure 1

Air Discharge
Horizontal Right
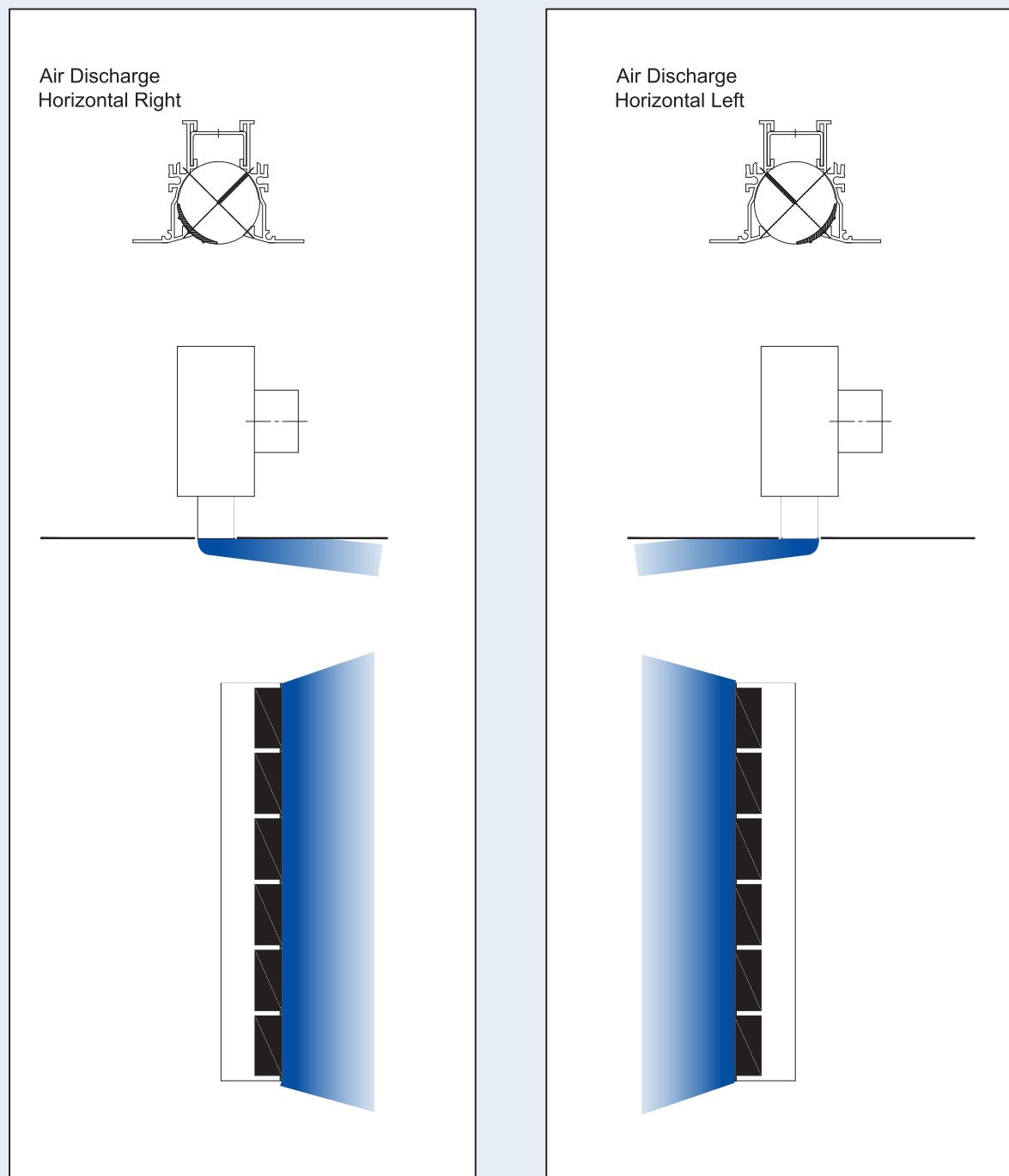
Air Discharge
Horizontal Left

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 ± 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.

Figure 2

Air Discharge Alternating Angled
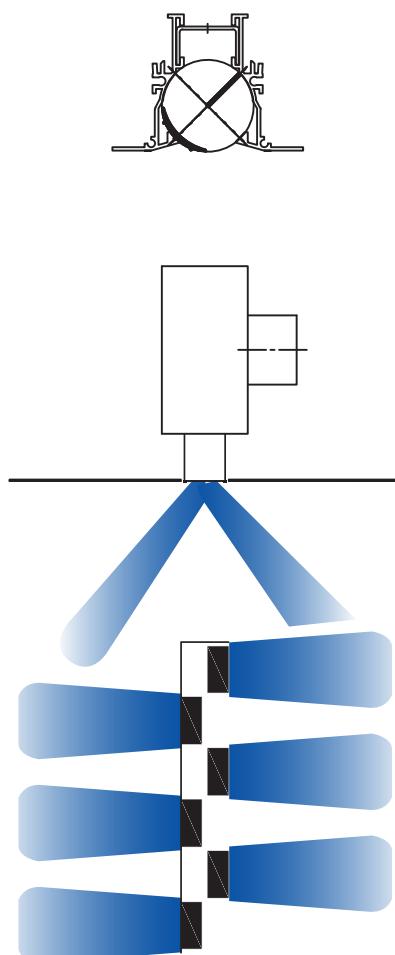
Air Discharge Alternating Horizontal
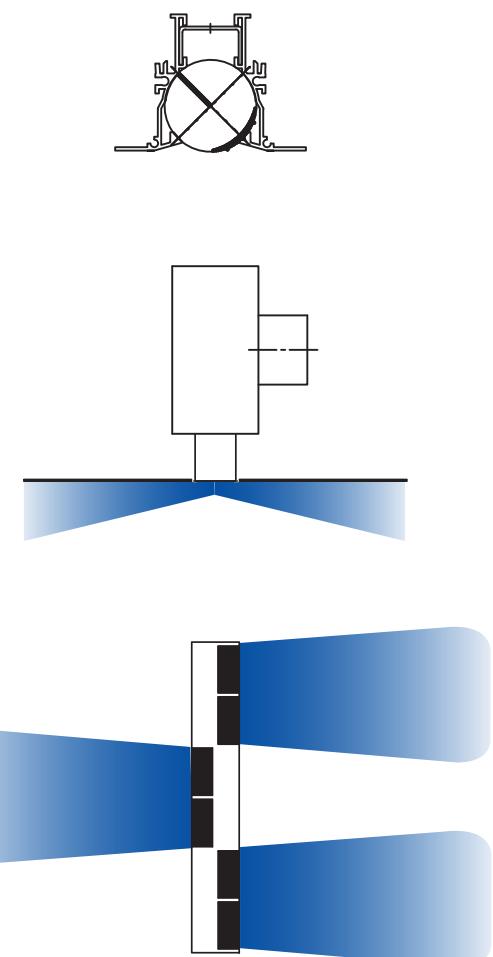
VSD50-...-AS; VSD50-...-DS with concealed bracket fixing					
No. of slots "n"	P	K	H_1	H_2	$\varnothing$ D
1	77	138	286	262	123 148
2	123	176	326	302	148 198

1) if y = 0 (Standard):
   other possible values for y = 20....100mm;
   maximum neck length X = 180 mm

Figure 3

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

VSD50-1...4-AS-M　　　　　　VSD30-1...4-DS-M
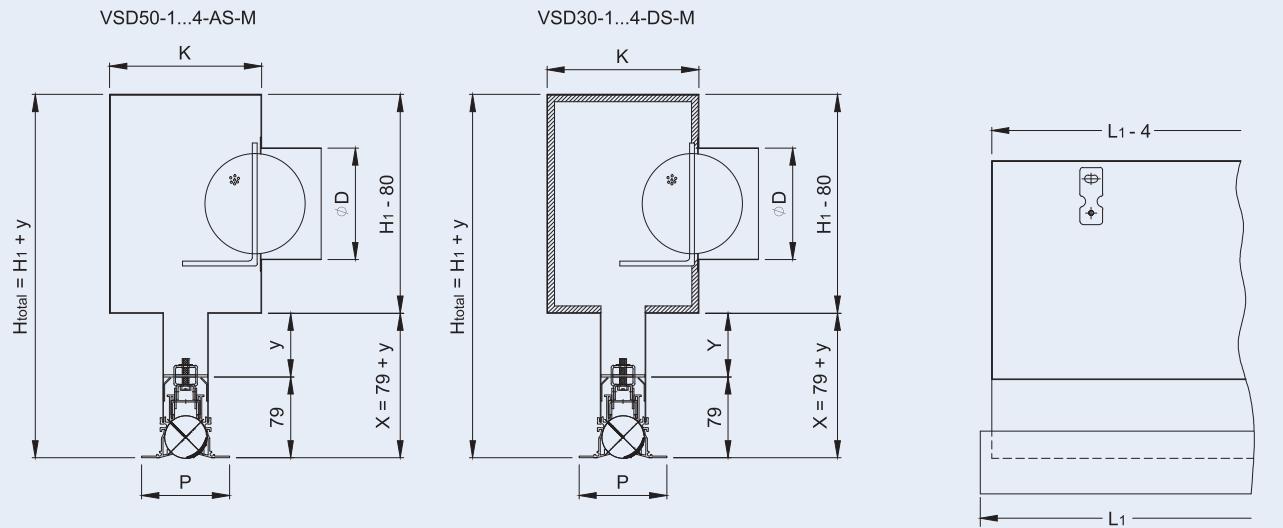
Without removable face

VSD50-1...4-AK-M　　　　　VSD50-1...4-DK-M　　　　　VSD50-1...4-AA-M
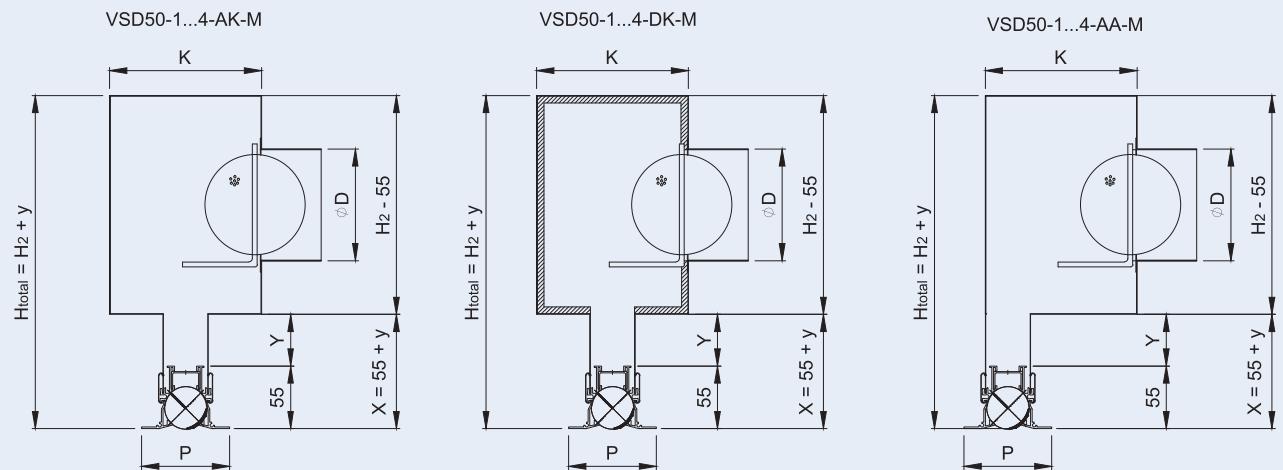
| Number of spigots and spigot diameter		
L₁	**VSD50**	
	...-1	**...-2**
600		
750		
900	1 x 123	1 x 148
1050	1 x 148	1 x 198
1200		
1350		
1500		
1650	2 x 123	2 x 148
1800	2 x 148	2 x 198
1950		

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 to the mounted plenum boxes on site. The supply air is connected via the circular side entry spigot, 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 L_1 sections.

**Figure 4**

Sections
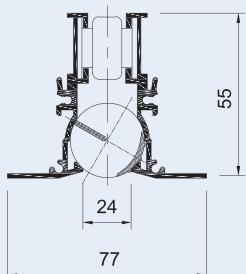
VSD50-1 with Z0
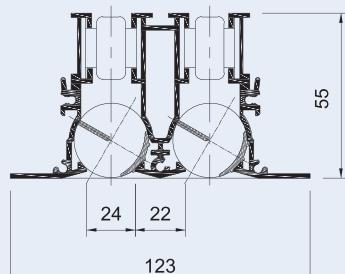
VSD50-2 with Z0

Installation
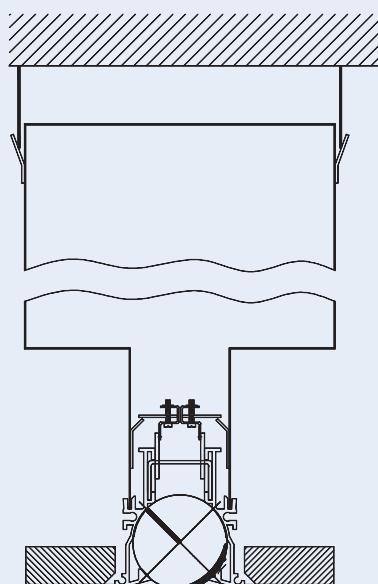
Installation in tiled ceilings
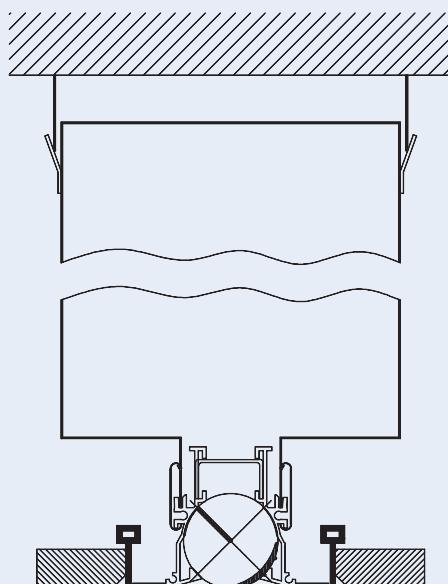

Installation in "T" bar ceilings

Figure 5

End caps

L 1
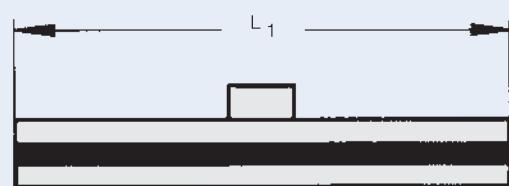
Without end cap
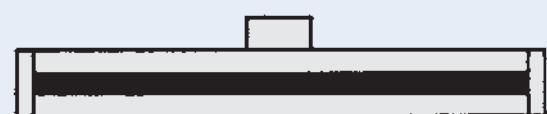
End cap on both ends

2,5

11 · L 1

End angle

1,5 · L 1
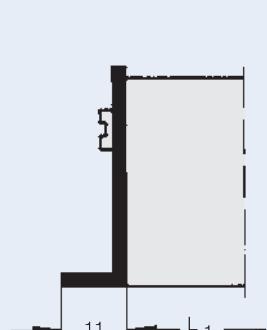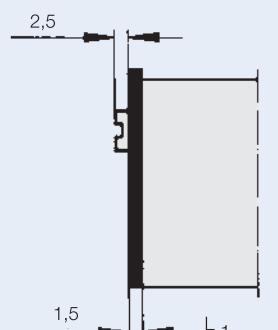
End plate

Alignment

End angles

End plates

P

P

Alignment pin

L 1

Front face "F"

P

Min. 120

Min. 120

IP

90°
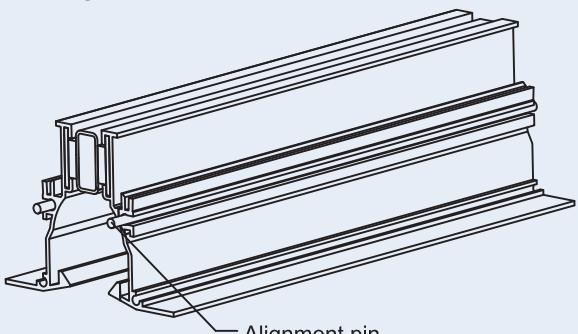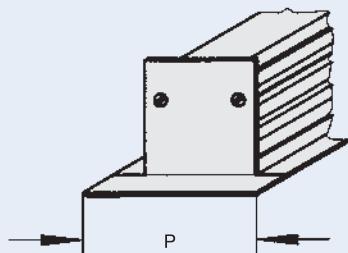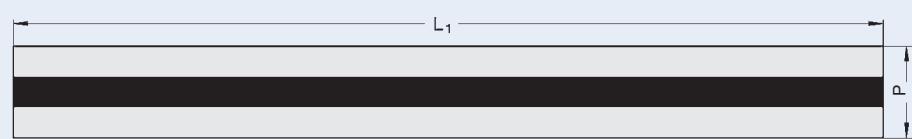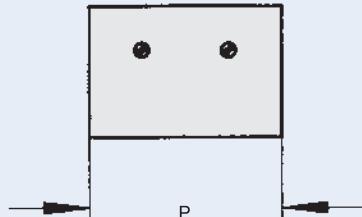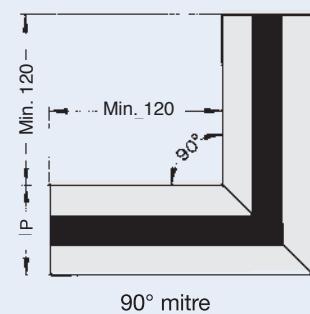
90° mitre

Installation Details

Figure 6

Standard method of installation for slot diffusers by 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

Alignment Pin
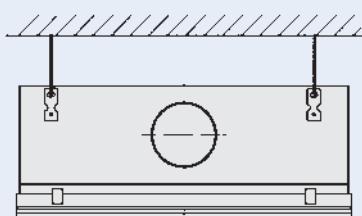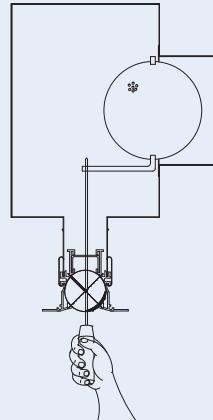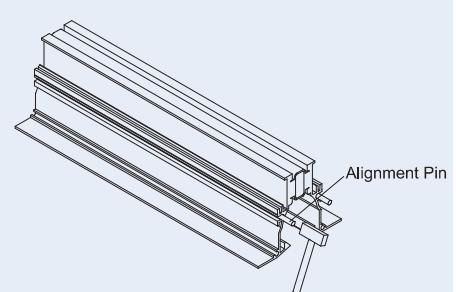
Figure 7

Concealed fixing in open position
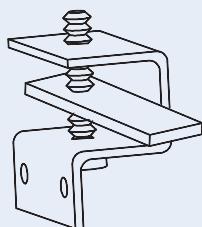
Concealed fixing in locked position

Max. ceiling thickness 32mm

Concealed fixing bracket

Bracket

Concealed fixing brackets are supplied with the diffuser
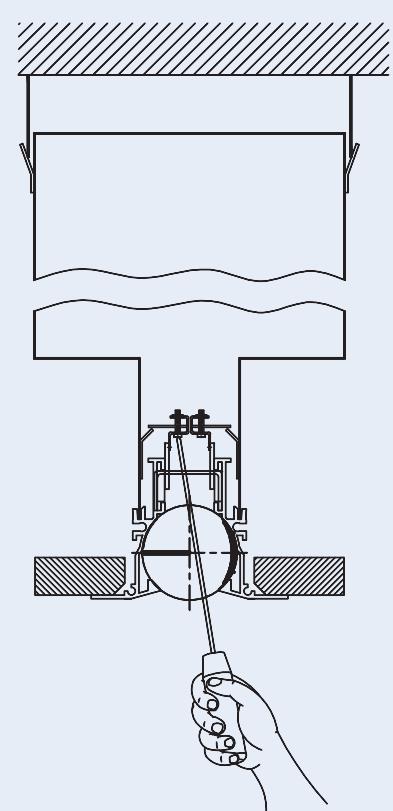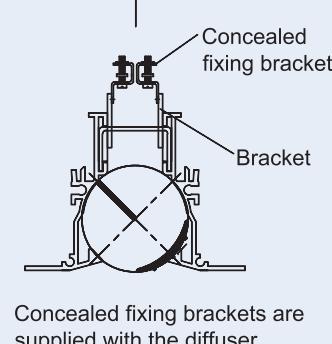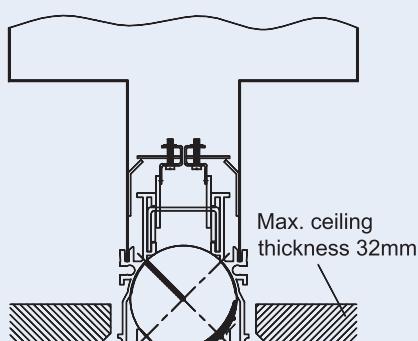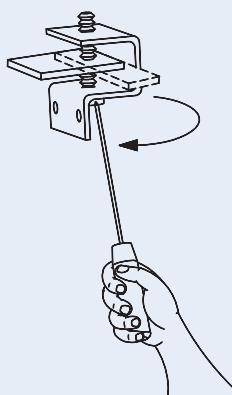
Nomenclature

|		
$\dot{V}$	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

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

$\dot{V}_t$ in m³/h

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

L_1 = Length of slot diffuser in m

Effective slot width		
Air discharge	Horizontal	Angled
s_{eff} in m	0.0092	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	$D = 148$ 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

Correction to diagram 1: 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 1.2	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	–
L$_1$ = 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	–
L$_1$ = 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 2: 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 1.1	x 1.4	x 1.6	x 1.7	x 1.9
	L$_{WA}$	–	–	–	+ 6.0	+ 6.0	–
	L$_{WNC}$	–	–	–	+ 5.0	+ 5.0	–
L$_1$ = 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	–
L$_1$ = 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 3: 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 2.0	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	–
L$_1$ = 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	–
L$_1$ = 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 4: 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 1.2	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	–
L$_1$ = 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	–
L$_1$ = 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
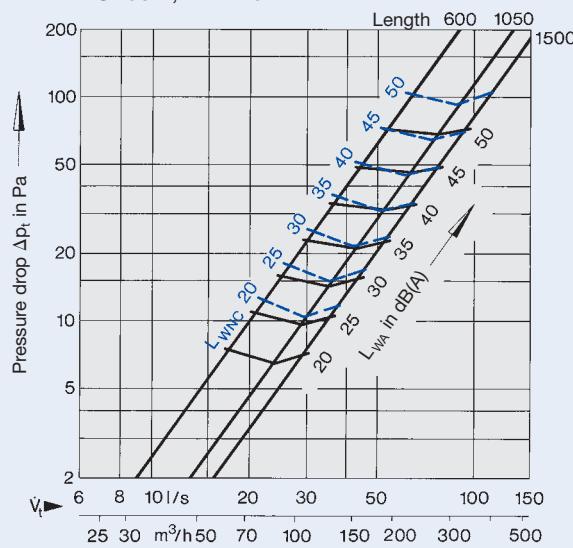
2 Sound power level and pressure drop
VSD50-1; D = 148 mm
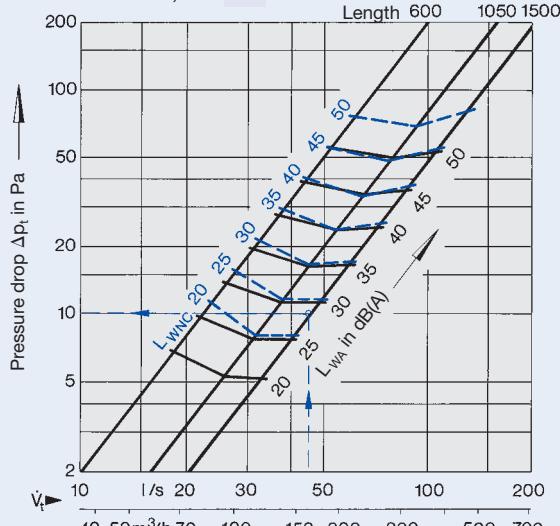
3 Sound power level and pressure drop
VSD50-2; D = 148 mm

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
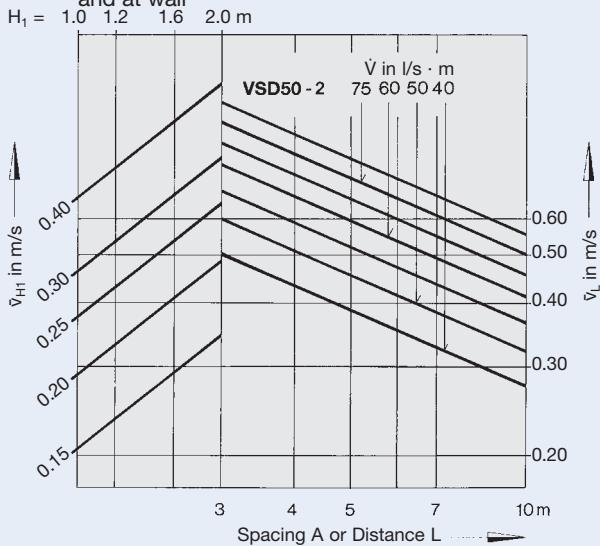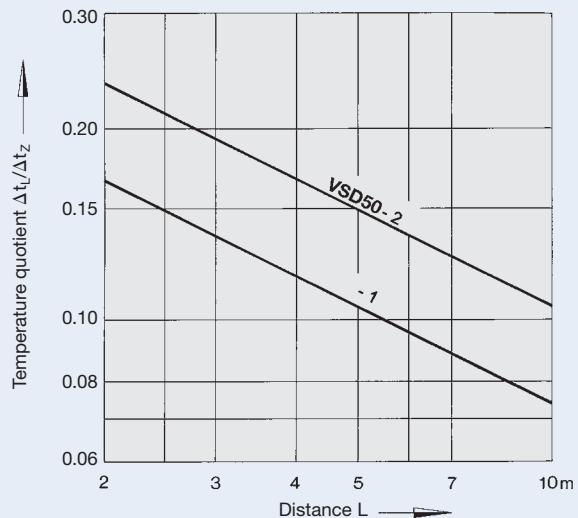
Aerodynamic Data
Air Discharge: Alternating Horizontal

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	Δt_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

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

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

$\dot{V}$ in l/s · m
VSD50 -1 55 45 35 30 20 17.5
-2 75 60 50 40

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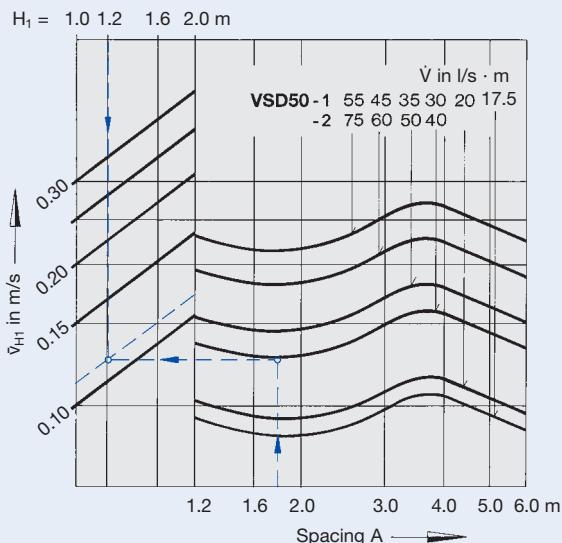
Diffuser Layout

9 Air velocity at the wall

$\dot{V}$ in l/s · m
VSD50 -1 55 50 45 35 30 20 17.5
-2 75 70 65 50 40

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	$\Delta t_Z = - 8$ 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$) \approx - 0.5$ K
For heating $\Delta t_Z = + 8$ K

Diagram 13:   Maximum penetration depth for heating

$H_{1max} \approx 1.2$ m

**11**   Air velocity

$H_1 = 1.0$ 1.2 1.6 2.0 m

$\dot{V}$ in l/s · m

| VSD50 -1 | 55 45 35 30 20 15 |
| -2 | 75 65 50 40 |

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

0.40
0.30
0.25
0.20
0.15

1.5   2.0   3.0   4.0 m

Spacing A

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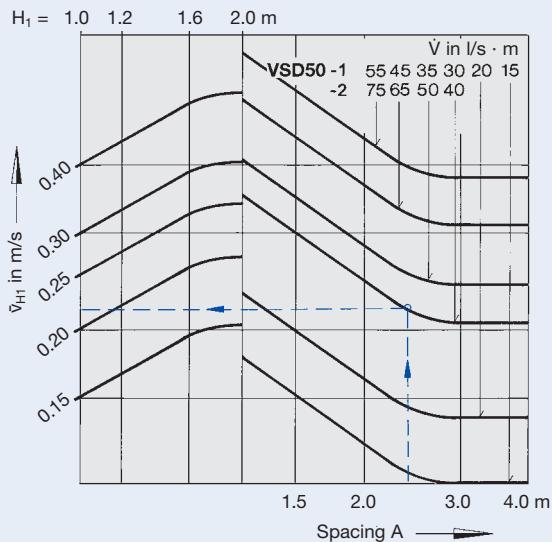
Diffuser Layout

12   Temperature quotient – Cooling

Temperature quotient $\Delta t_L/\Delta t_Z$

0.10
0.08
0.06
0.05
0.04
0.03
0.02

VSD50-2
-1

0.8   1.0   1.5   2.0   3.0   4.0 m

Distance H_1

13   Maximum penetration depth for heating

VSD50-1   VSD50-2

$H_{1 max}$ in m

2.0   1.0
1.5   0.75
1.0   0.5
0.8   0.4
0.6   0.3
0.5

$+4$
$\Delta t_Z = + 8$ K
$+12$

$H_{1 max}$ in m

$\dot{V}$ 15 l/s·m 20   25   30   40   50   60   70 75

55 m³/h·m 70 80   100   120   150   200   250 270
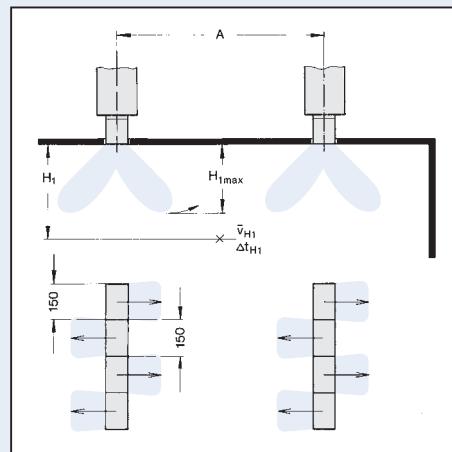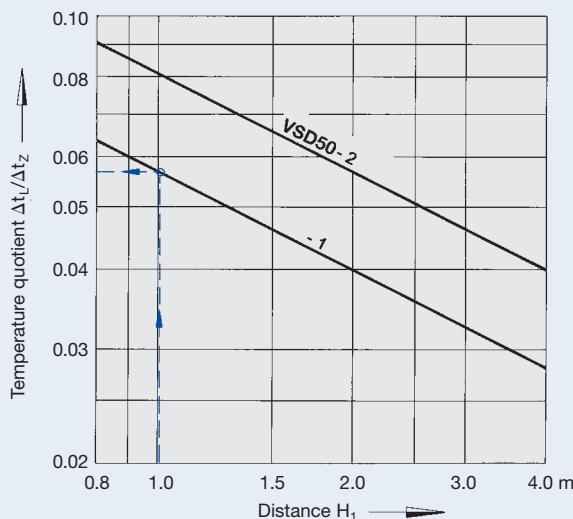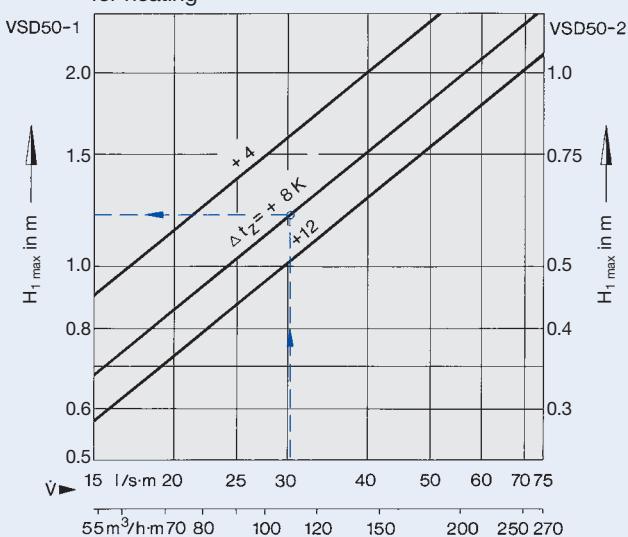
Order Details

Specification Text

Adjustable slot diffusers with aesthetically designed face sections, suitable for installation in suspended ceiling systems, comprising the diffuser face in 1- or 2-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 adaption 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 dimension [3]

| VSD50-1-AK-M-Z0-I1 | / | 900 x 123 x y | / | 0 | / | P1 | / | RAL 9016 | / | WS |

* No. of slots "n" $\begin{matrix}1\\2\end{matrix}$ }
Refer to note below

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

Volume control damper M [1]

Integral border -Z0

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

| 600 |
| 750 |
| 900 |
| 1050 |
| 1200 |
| 1350 |
| 1500 |
| 1650 [2] |
| 1800 |
| 1950 |
| **L₁ (mm)** |

L_1 (mm)

$\varnothing$ D(mm)	n
123	1
148	1 + 2
198	2

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 $\geqq$ 1650 mm!
3) y = 0 or 25, 50, 75, 100 mm for AS, DS
     y = 0 or 25, 50, 75, 100, 125 mm for AK, DK and AA

* NOTE
VSD 50 can be supplied with either 3 0r 4 slots as non-standard construction if required. contact TROX Malaysia Sdn. Bhd. for technical information.

Order Example

Make :   TROX
Type: VSD50-1-AK-M-Z0/900x98/0/P1/RAL9016/WS
Suppl. text: Air control blades white, similar to RAL 9010