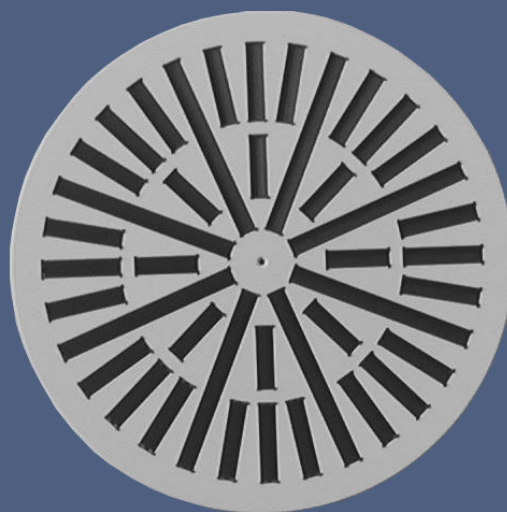


MANDÍK®

WHIRLING AIR OUTFLOW OUTLETS

VVDM



These technical specifications state a row of manufactured sizes and versions of whirling air outflow outlets VVDM 300, 400, 500, 600, 625 und 825 (further only outlets). It is valid for production, designing, ordering, delivery, assembly and operation.

I. CONTENT

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II. GENERAL

1. Description

- 1.1.** The VVDM whirling air outflow outlet with manually adjustable vanes for diversion of airflow is an end HVAC element for air distribution enabling optimum direction of outflow as needed depending on the air-conditioned or ventilated space. The whirling air outflow ensures intensive mixing with the internal air to decrease the velocity and temperature of air substantially (variant A). By other setting of the vanes it is possible to increase the vertical component of the air flow (variant B). Other flow pattern can be achieved by easy resetting of the vanes on the installation site to ensure comfort environment in the room. The outlets are suitable for the room height of approximately 2.6 to 4.0 m, with the difference of up to 12°C between the supplied air temperature and room air temperature.
- 1.2.** Outlets are designed for macroclimatic areas with mild climate according to EN 60 721-3-3.
- 1.3.** Nozzles are suitable for systems without abrasive, chemical and adhesive particles.
- 1.4.** If is not noticed other way, all dimensions and weight are in millimeters and kilograms.
- 1.5.** In this document are used next signs and units.
- 1.6.** Key:

\dot{V}	[m ³ /h]	volumetric air flow
w	[m/s]	air velocity
Δp	[Pa]	pressure loss
Δt	[K]	temperature difference
L_w	[dB]	level of acoustic output
S	[m ²]	area
A, B, C, D, H, K, M	[mm]	dimension
A, B, H, L X	[m]	distance

2. Design

- 2.1.** The outlets are delivered:
- with blades arranged in a circle with square (VVDM C) or round front panel (VVDM K)
 - with blades arranged in a square with square front panel (VVDM M)
- 2.2.** The front panels are equipped by slots with regulation vanes for adjusting required airflow direction.
- 2.3.** The front panels for air exhaust are delivered without the blades and directing band.
- 2.4.** Connection to duct.
- horizontal connection (by round connecting branches via the connection box from side as required with or without the regulating flap)
 - vertical connection (by round connecting branches via the connection box from the top as required with or without the regulating flap)

Fig. 1 Front panels

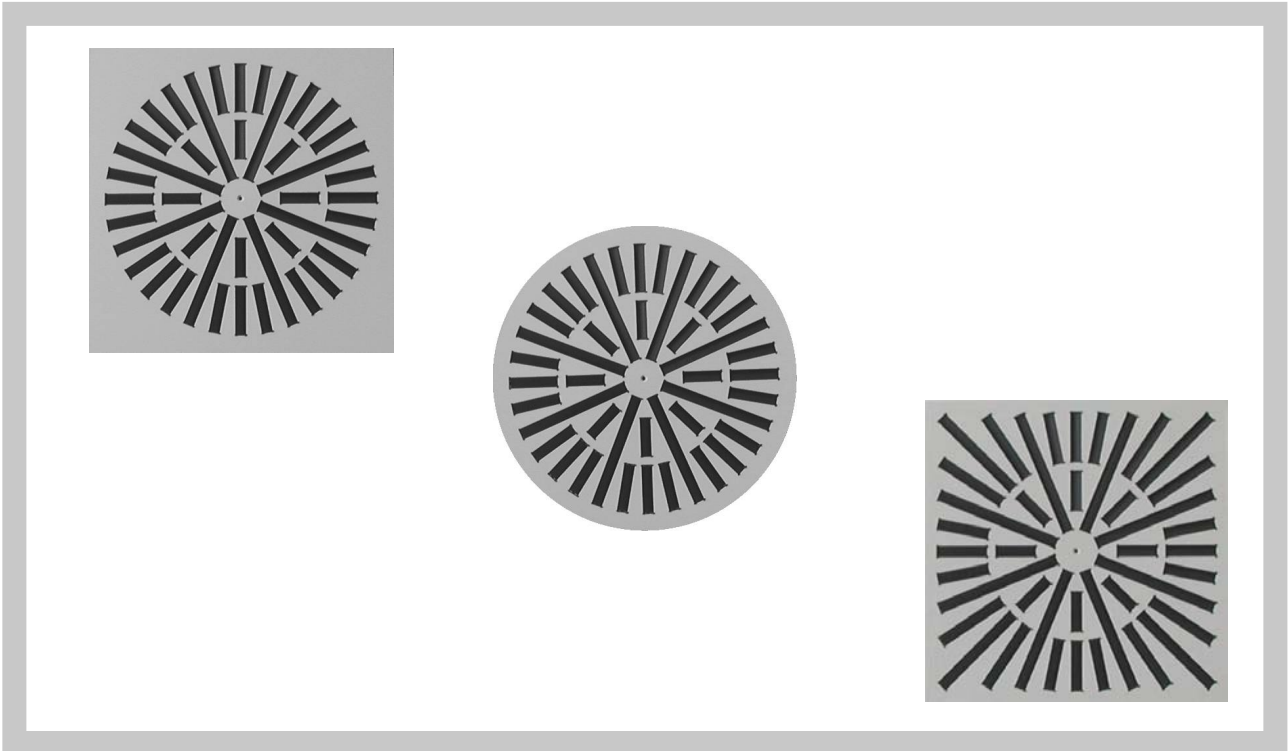


Fig. 2 VVDM C with connection box

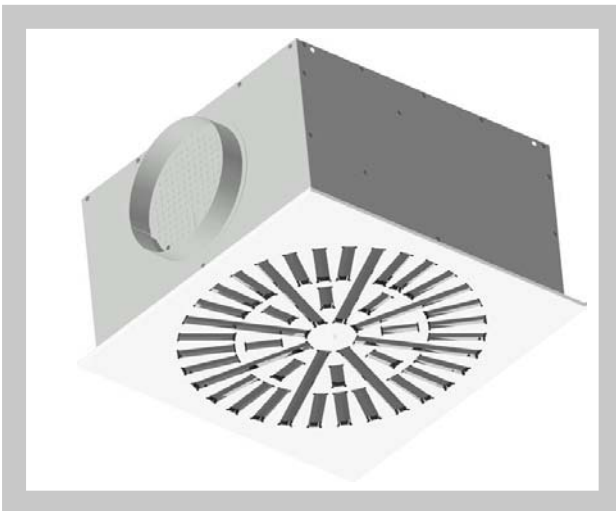


Fig. 3 VVDM K with connection box

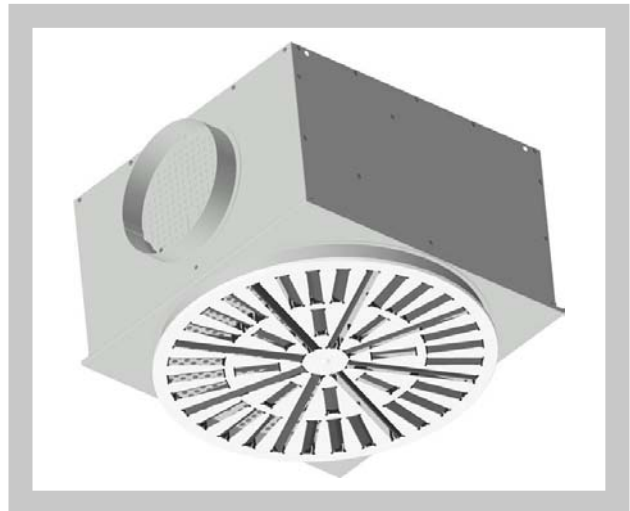
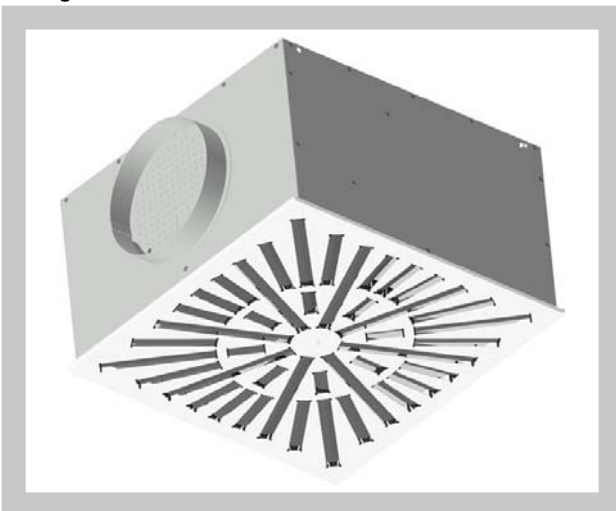


Fig. 4 VVDM M with connection box



3. Front panels - vanes setting

Fig. 5 VVDM C

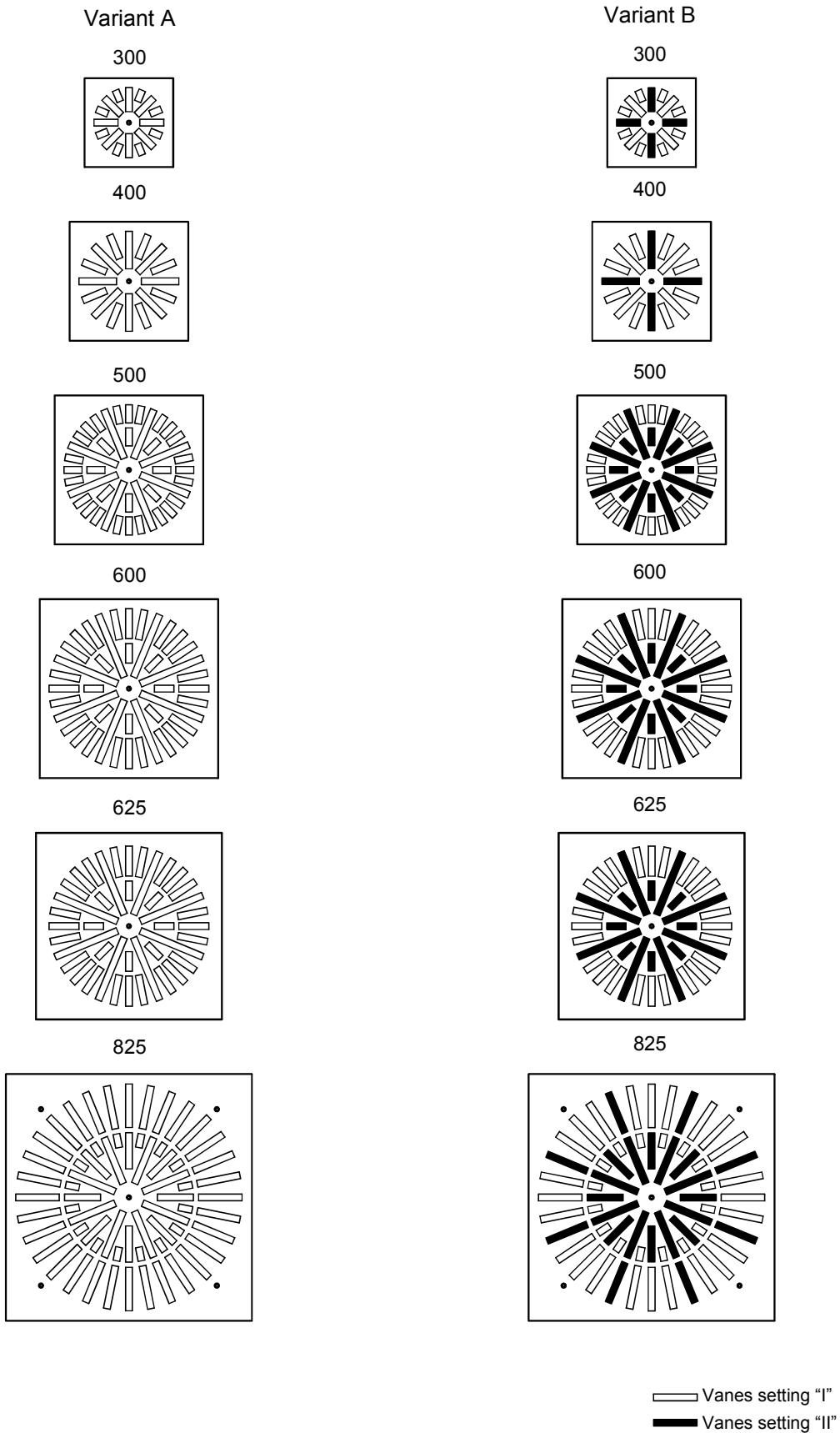
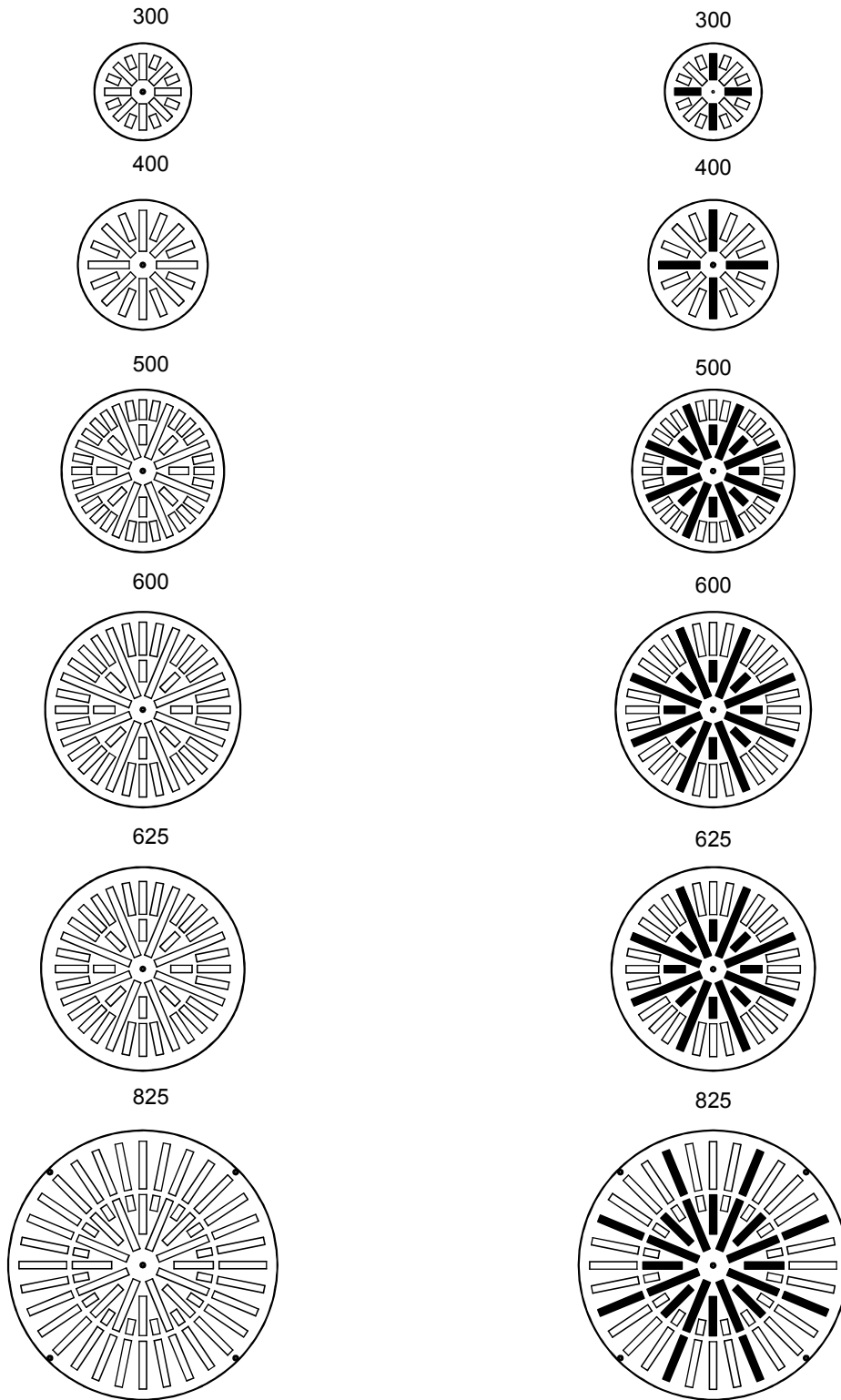


Fig. 6 VVDM K

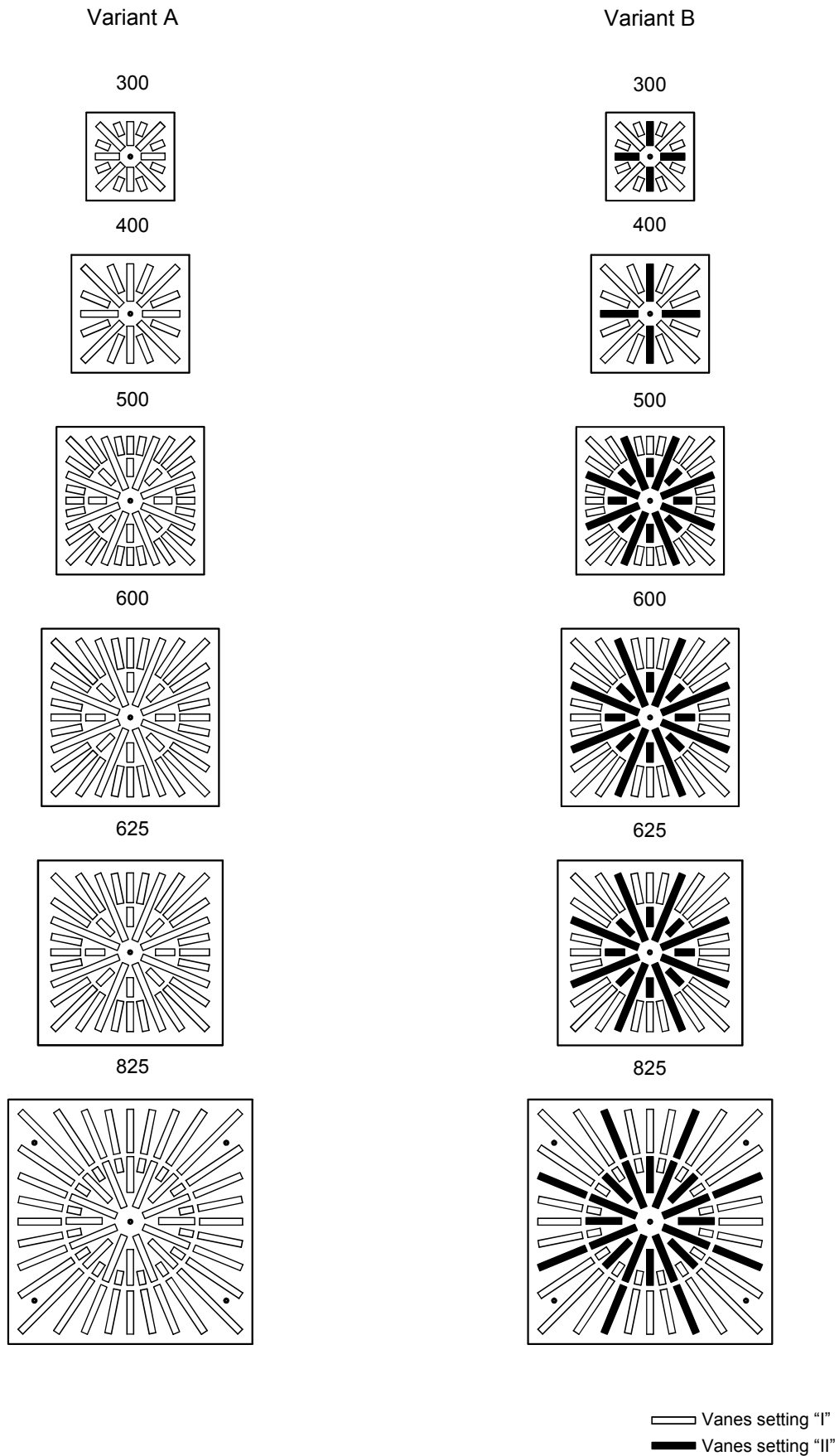
Variant A

Variant B



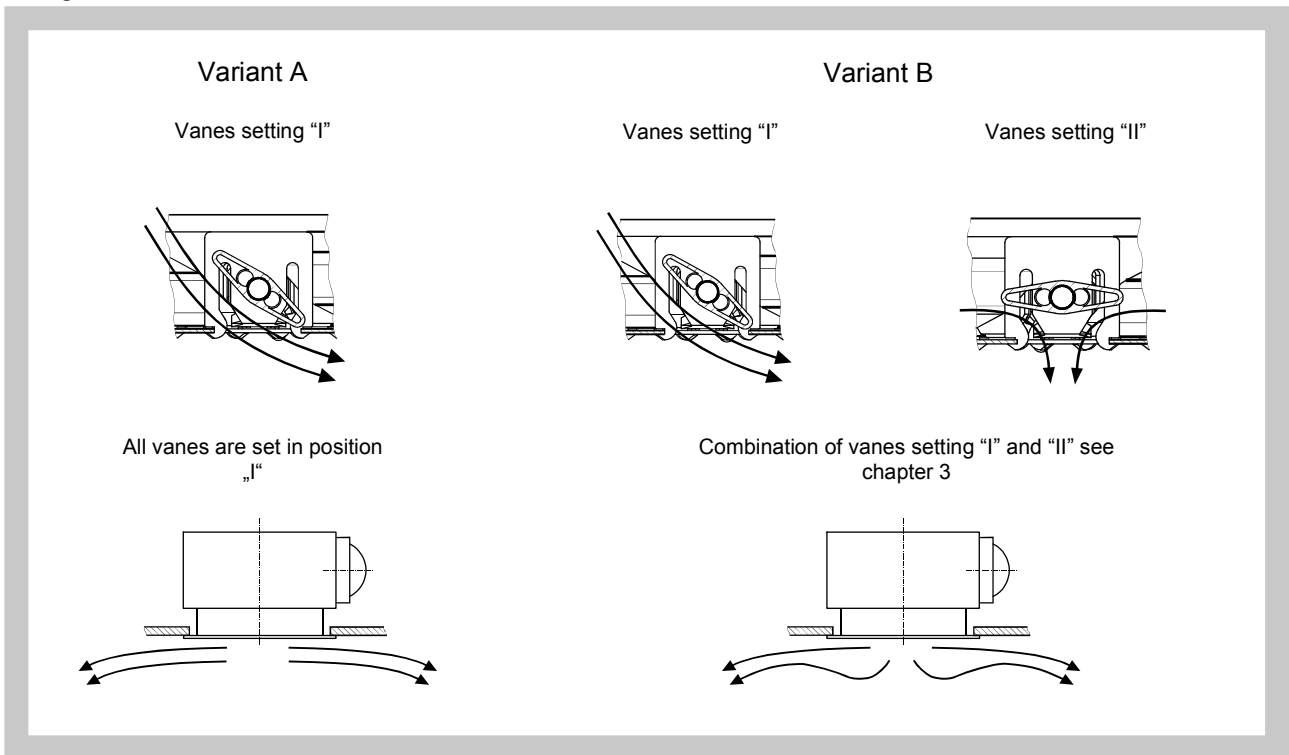
— Vanes setting "I"
 — Vanes setting "II"

Fig. 7 VVDM M



4. Flow directions

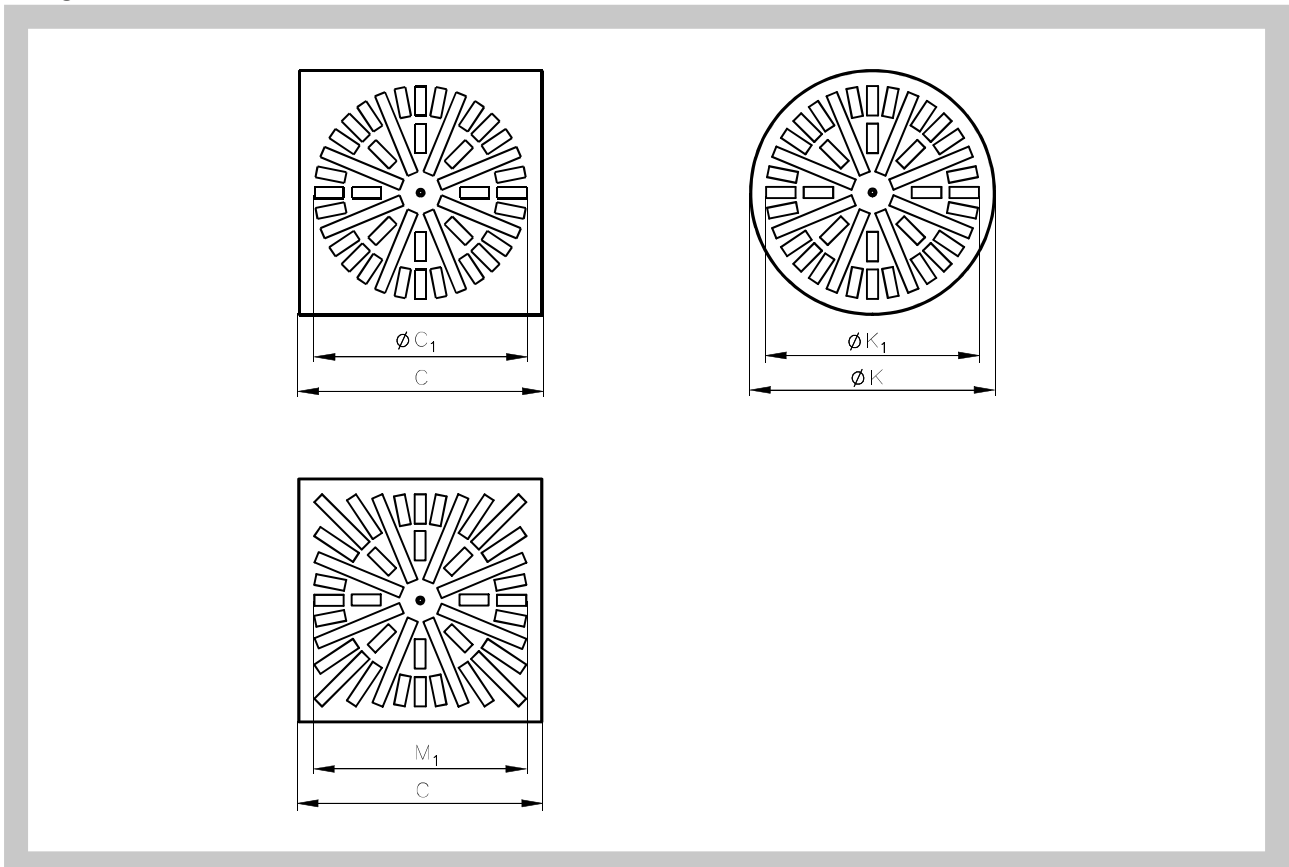
Fig. 8



5. Dimensions and weights

5.1. Front panel dimensions

Fig. 9



Tab. 5.1.1. Dimensions

Size	C	∅ K	C ₁	∅ K ₁	M ₁
300	298	300	233	233	233
400	398	400	333	333	333
500	498	500	433	433	433
600	598	600	533	533	533
625	623	625	533	533	533
825	823	825	755	755	755

5.2. Connection box dimensions

5.2.1. Horizontal connection

Fig. 10 Square front panels (VVDM C, VVDM M)

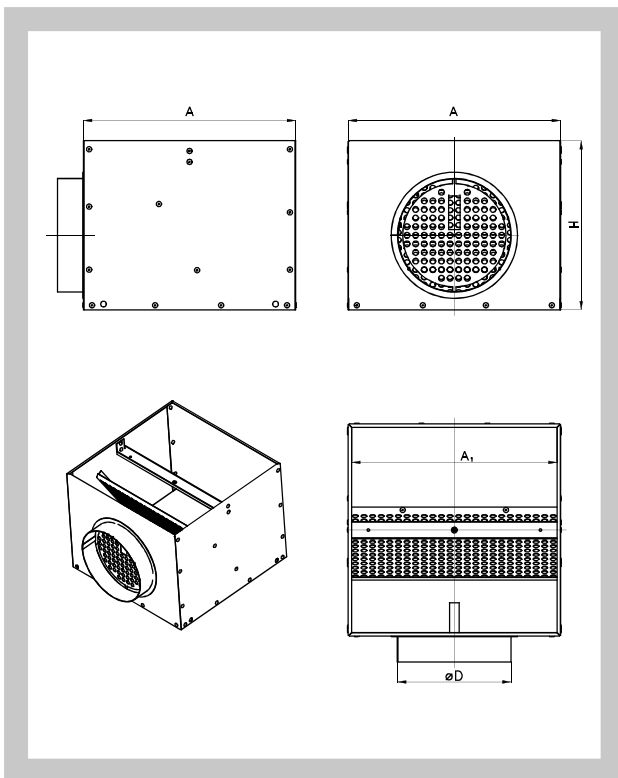
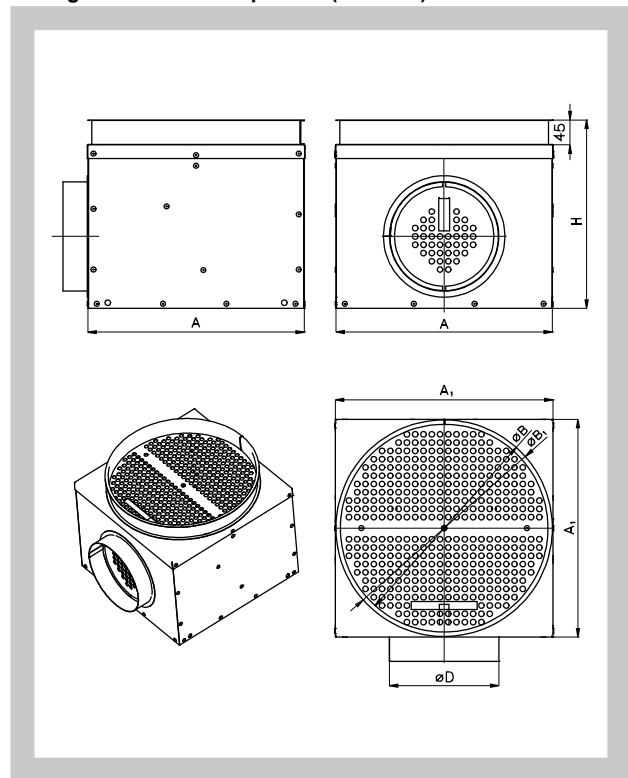


Fig. 11 Round front panels (VVDM K)



Tab. 5.2.1. Dimensions front panels (VVDM C, VVDM M)

Size	A	A ₁	H	∅D
300	270	258	255	158
400	370	358	295	198
500	470	458	295	198
600	572	560	345	248
625	572	560	345	248
825	812	788	395	313

Tab. 5.2.2. Dimensions front panels (VVDM K)

Size	A	A ₁	H	∅D	B	B ₁
300	270	297	300	158	275	287
400	370	390	340	198	365	385
500	470	490	340	198	465	485
600	572	592	390	248	570	590
625	572	592	390	248	570	590
825	812	832	440	313	790	810

5.2.2. Vertical connection

Fig. 12 Square front panels (VVDM C, VVDM M)

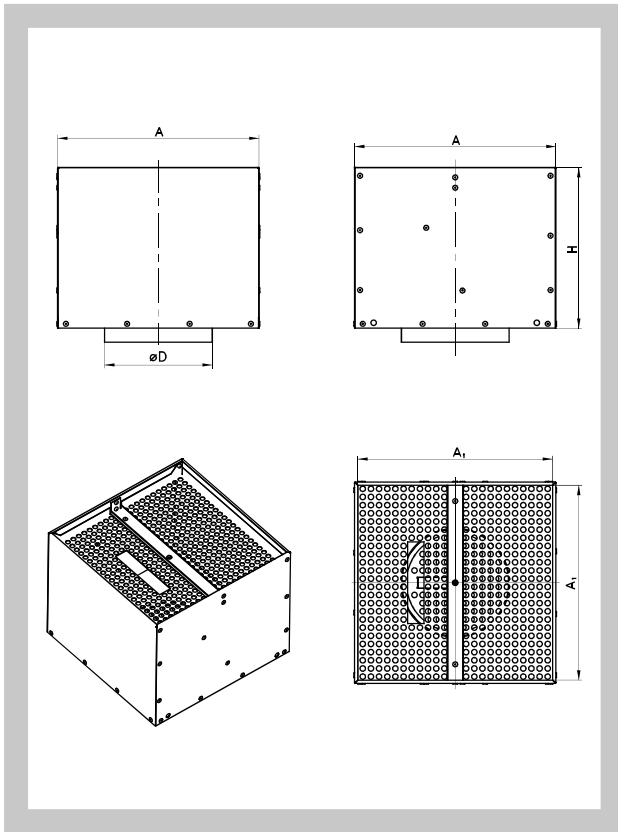
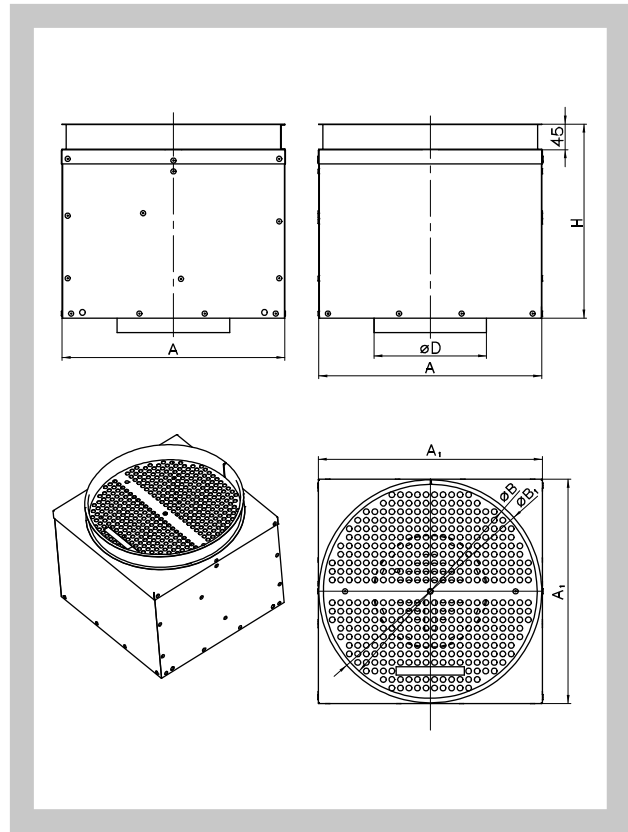


Fig. 13 Round front panels (VVDM K)



Tab. 5.2.3. Dimensions front panels (VVDM C, VVDM M)

Size	A	A ₁	H	ØD
300	270	258	255	158
400	370	358	295	198
500	470	458	295	198
600	572	560	345	248
625	572	560	345	248
825	812	788	395	313

Tab. 5.2.4. Dimensions front panels (VVDM K)

Size	A	A ₁	H	ØD	B	B ₁
300	270	297	300	158	275	287
400	370	390	340	198	365	385
500	470	490	340	198	465	485
600	572	592	390	248	570	590
625	572	592	390	248	570	590
825	812	832	440	313	790	810

5.3. Weights

Tab. 5.3.1. Weights

Size	Square front panels						Round front panels		
	Front panel	Front panel	Horizontal connection		Vertical connection		Front panel	Horizontal connection	Vertical connection
	VVDM C	VVDM M	VVDM C	VVDM M	VVDM C	VVDM M	VVDM K	VVDM K	VVDM K
300,0	0,9	1,0	3,1	3,2	3,2	3,3	0,6	3,4	3,4
400,0	1,5	1,6	5,0	5,1	5,1	5,2	1,0	5,3	5,3
500,0	2,3	2,4	6,9	7,0	7,1	7,2	1,5	7,2	7,2
600,0	3,1	3,2	9,5	9,6	9,9	10,0	2,0	9,9	9,9
625,0	3,3	3,4	9,7	9,8	10,1	10,2	2,2	10,1	10,1
825,0	5,8	6,0	17,1	17,3	18,3	18,5	4,0	17,3	17,3

6. Installation

- 6.1. All sizes are suitable for installation in the ceiling or for installation outside closed ceilings. The connecting boxes are fitted with suspension devices. Several examples of possible suspension follow.

Fig. 14 Installation

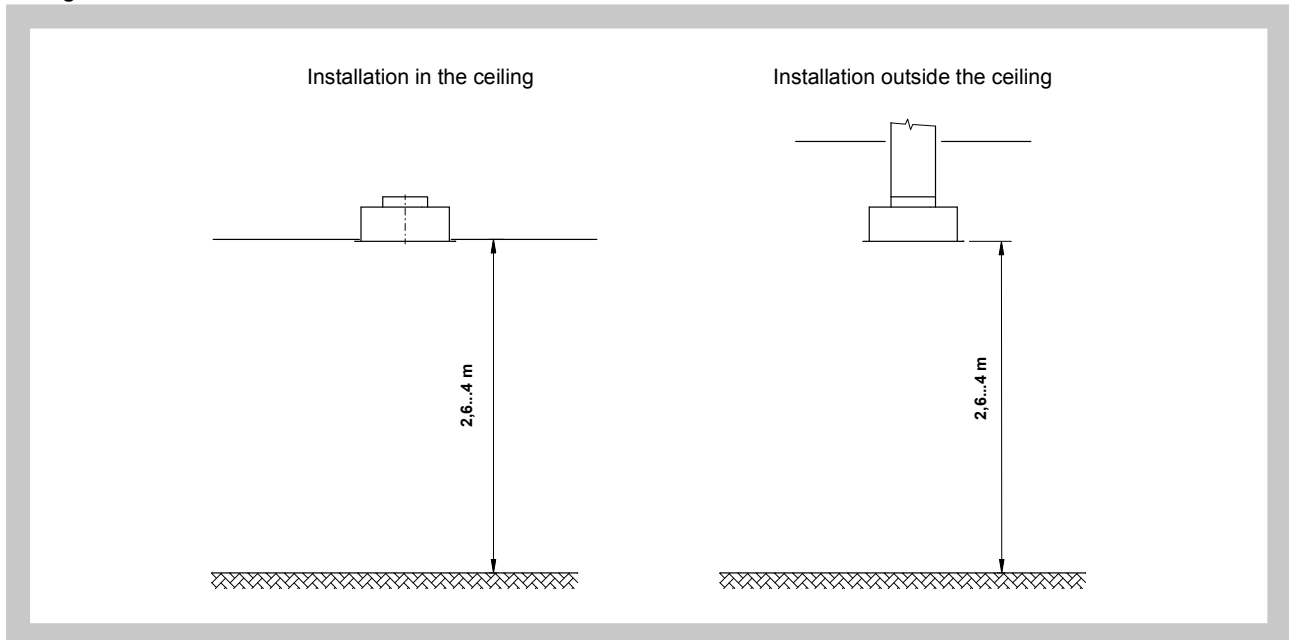
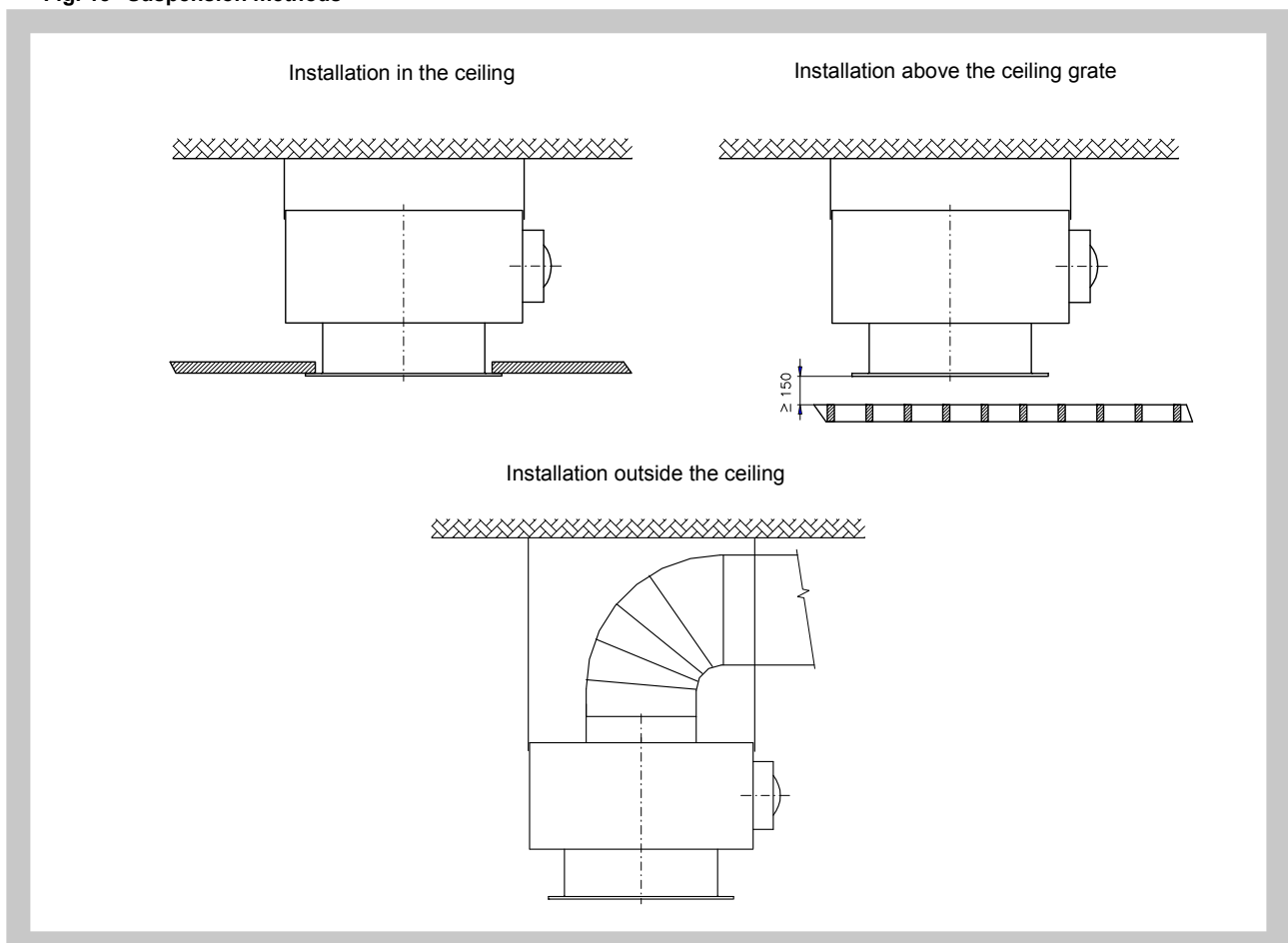


Fig. 15 Suspension methods



III. TECHNICAL DATA

7. Basic parameters

7.1. Basic parameters

Tab. 7.1.1. Basic parameters VVDM C, VVDM K

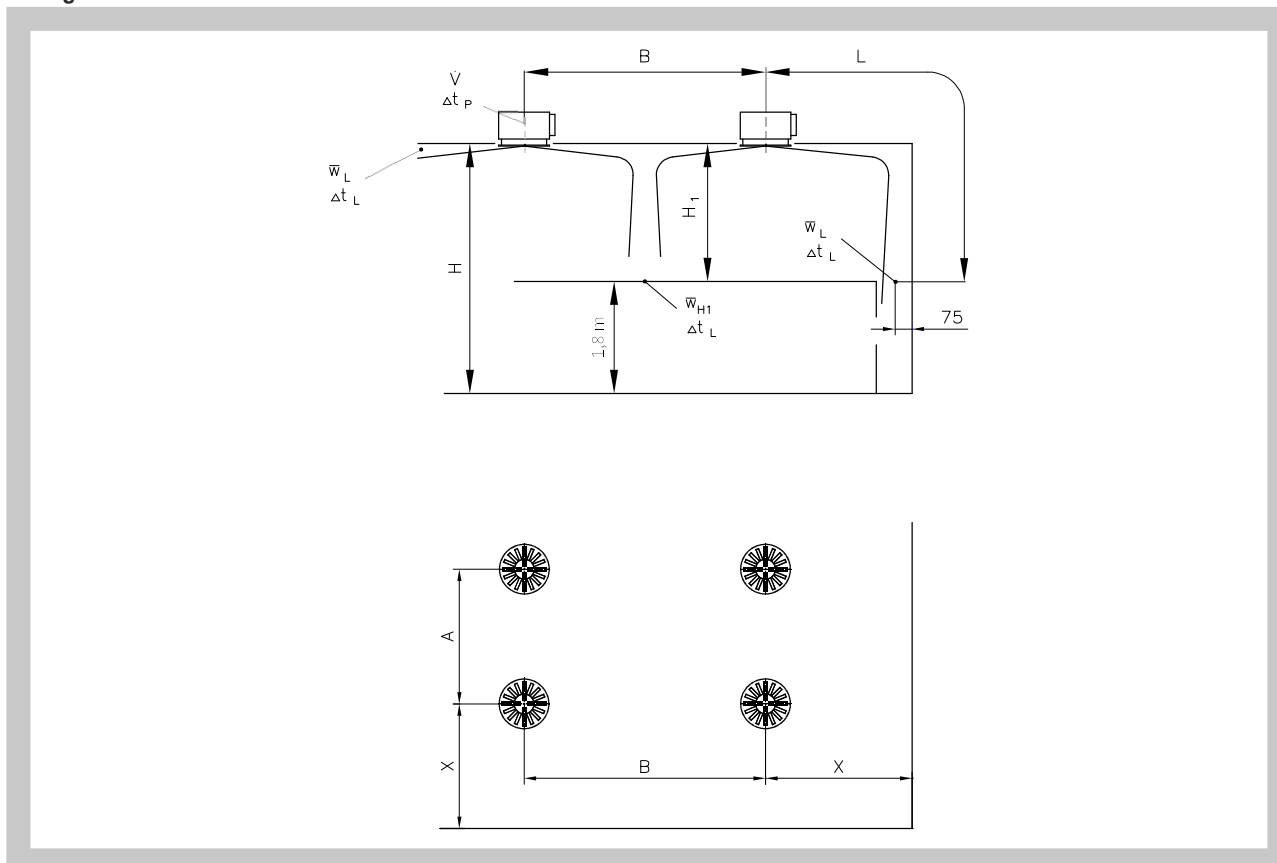
Size	300	400	500	600, 625	825
\dot{V}_{max} [m³/h]	260	350	600	850	1250
\dot{V}_{min} [m³/h]	70	130	250	360	600
$L_{WAm_{max}}$ [dB(A)]	40	42	43	43	42
$L_{WAm_{min}}$ [dB(A)]	<15	<15	<15	<15	<15
S_{ef} [m²]	0,0098536	0,017799	0,03503	0,05085	0,0825352

Tab. 7.1.2. Basic parameters VVDM M

Size	300	400	500	600, 625	825
\dot{V}_{max} [m³/h]	300	370	700	1000	1500
\dot{V}_{min} [m³/h]	85	150	310	440	710
$L_{WAm_{max}}$ [dB(A)]	42	43	41	43	43
$L_{WAm_{min}}$ [dB(A)]	<20	<20	<20	<20	<20
S_{ef} [m²]	0,011978	0,02179	0,04303	0,0613364	0,09831

8. Air flow parameters

Fig. 16

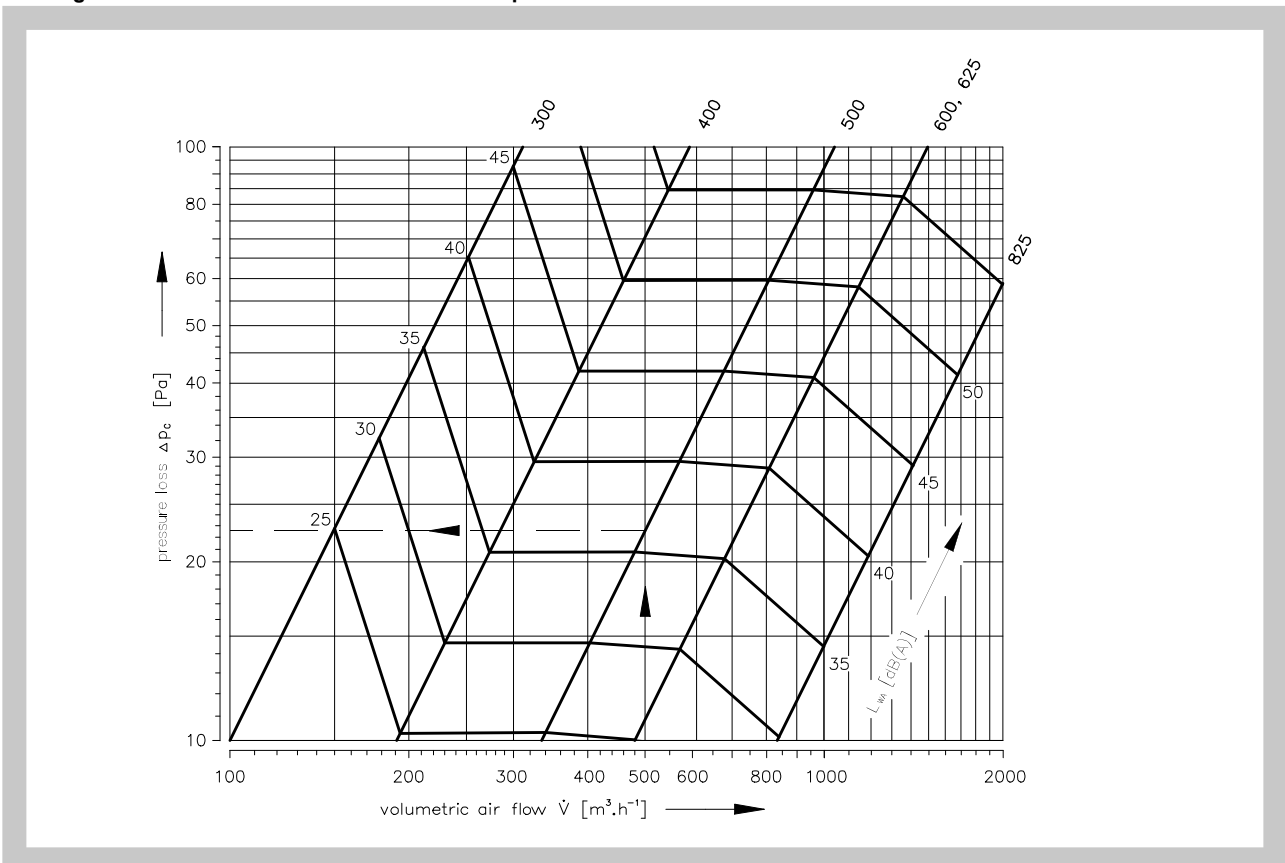


\dot{V}	[m ³ /h]	air volume flow rate for one outlet
A, B	[m]	distance between two outlets
L	[m]	horizontal + vertical distance (X + H ₁)
X	[m]	distance from the outlet centre to the wall
H	[m]	ceiling height - from 2.6 to 4.0 m
H ₁	[m]	distance between the ceiling and the occupied zone
w _L	[m.s ⁻¹]	medium velocity of air stream on the wall
w _{H1}	[m.s ⁻¹]	medium velocity of air stream between two outlets at distance H ₁
w _{ef}	[m.s ⁻¹]	effective velocity
Δt _p	[K]	difference between the supplied air temperature and room air temperature
Δt _L	[K]	difference between the air temperature in the stream axis in length L and the room air temperature in length L = A/2 + H ₁ or L = B/2 + H ₁ or L = X + H ₁
Δp _c	[Pa]	total pressure loss at ρ = 1,2 kg/m ³
L _{WA}	[dB(A)]	level of acoustic output
S _{ef}	[m ²]	effective area

9. Aerodynamic data

9.1. Pressure losses and sound power for VVDM-C, VVDM-K - variants A and B

Diagram 9.1.1. Pressure losses and sound power

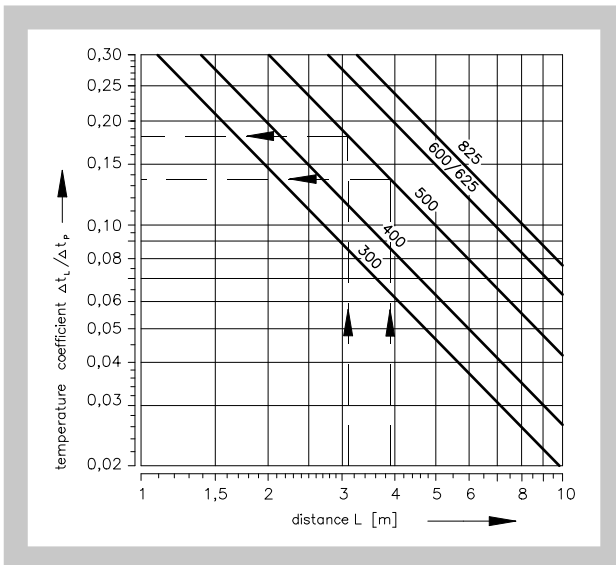


Tab. 9.1.1 Correction coefficients of pressure losses and sound power according to the VVDM C, VVDM K flap setting angle

Size		Flap setting angle		
		0°	45°	90°
300	Δp_c	x1,0	x1,4	x2,1
	L_{WA}	-	-	+1
400	Δp_c	x1,0	x1,2	x1,8
	L_{WA}	-	+1,0	+2,0
500	Δp_c	x1,0	x2,0	x4,5
	L_{WA}	-	+3,0	+8,0
600, 625	Δp_c	x1,0	x1,5	x3,6
	L_{WA}	-	+4,0	+9,0
825	Δp_c	x1,0	x1,4	x3,4
	L_{WA}	-	+1	+3

9.2. Temperature coefficient for VVDM-C, VVDM-K - variant A

Diagram 9.2.1. Temperature coefficient for VVDM-C, VVDM-K - variant A



9.3. Air velocity of VVDM C, VVDM K - Variant A

Diagram 9.3.1. Air velocity of VVDM C, VVDM K 300 - Variant A

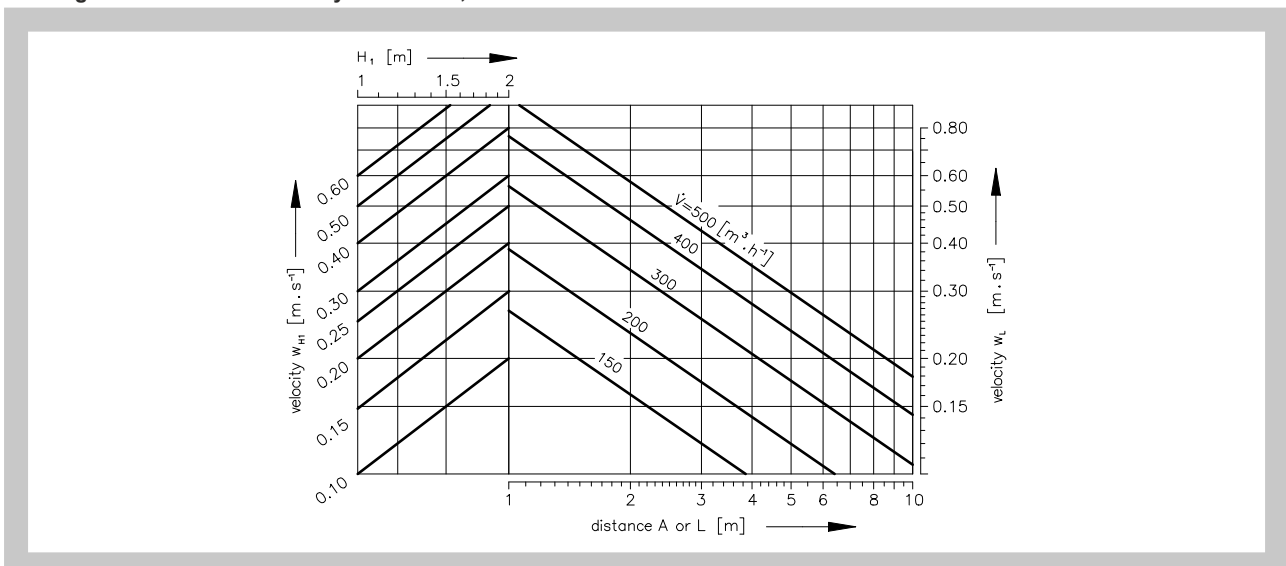


Diagram 9.3.2. Air velocity of VVDM C, VVDM K 400 - Variant A

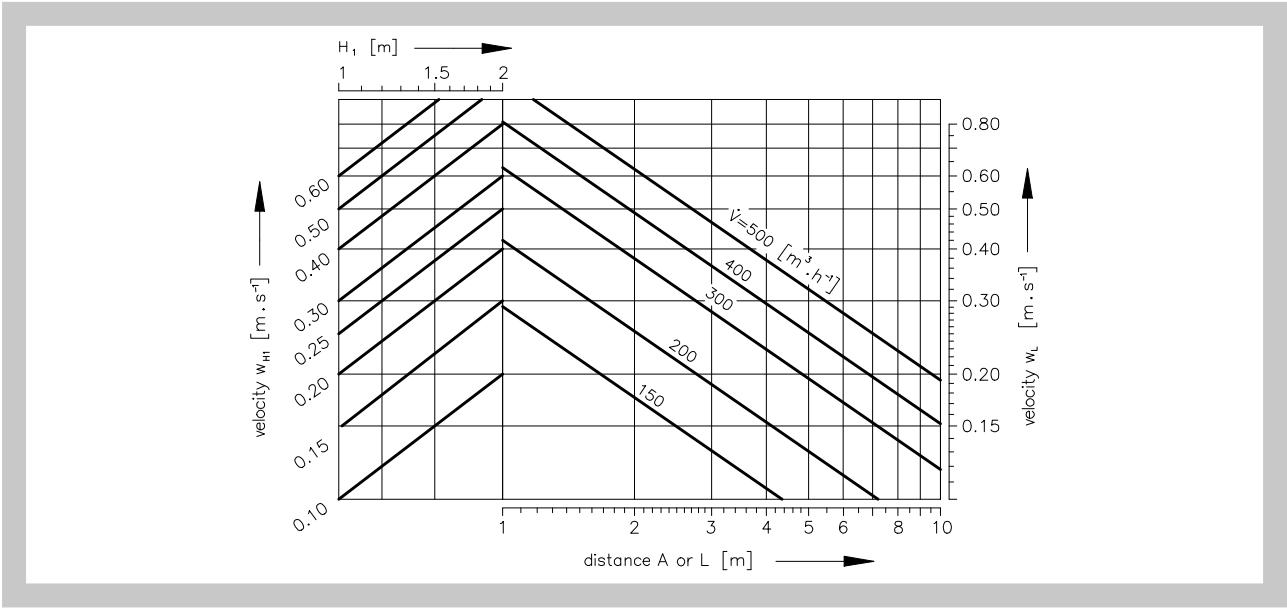


Diagram 9.3.3. Air velocity of VVDM C, VVDM K 500 - Variant A

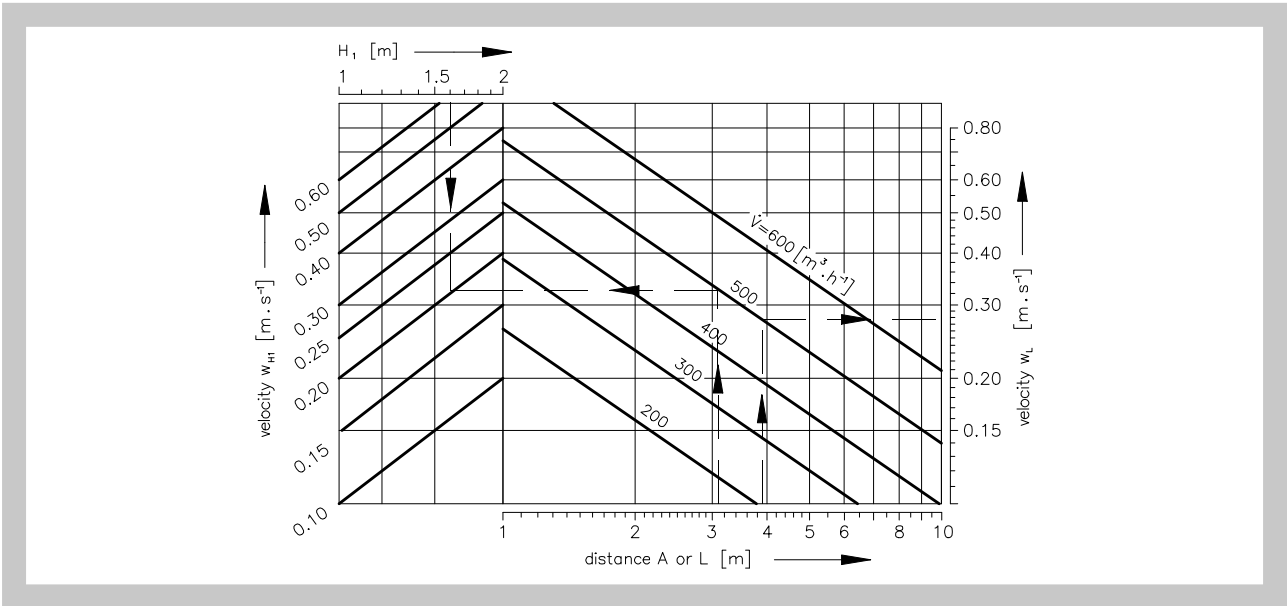


Diagram 9.3.4. Air velocity of VVDM C, VVDM K 600, 625 - Variant A

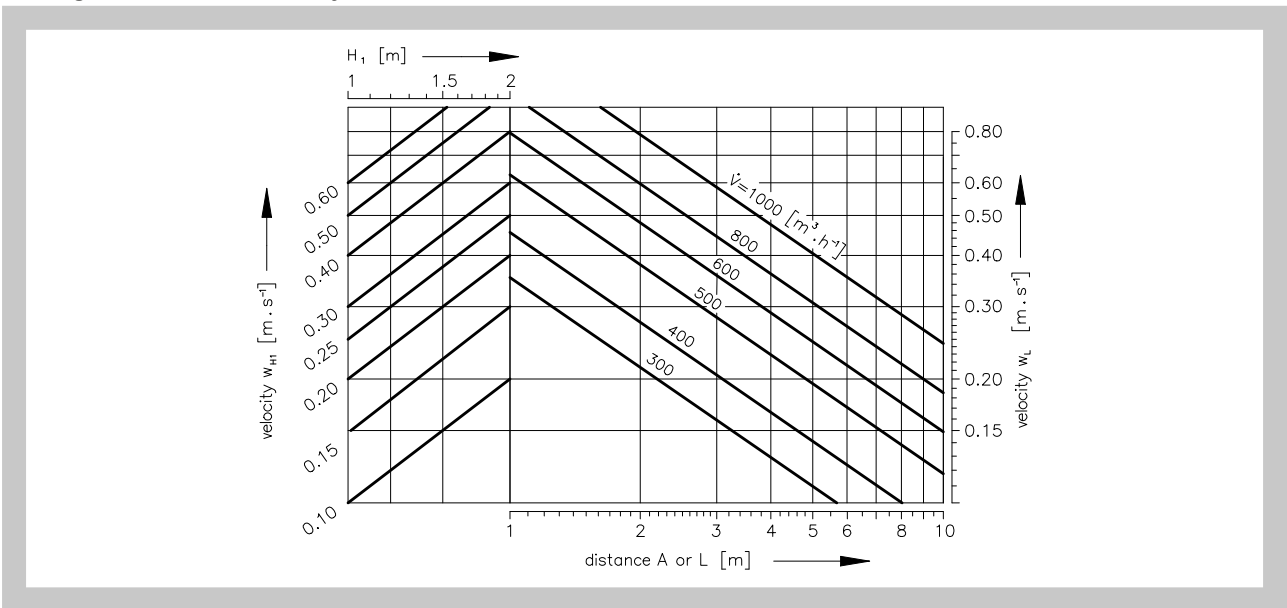
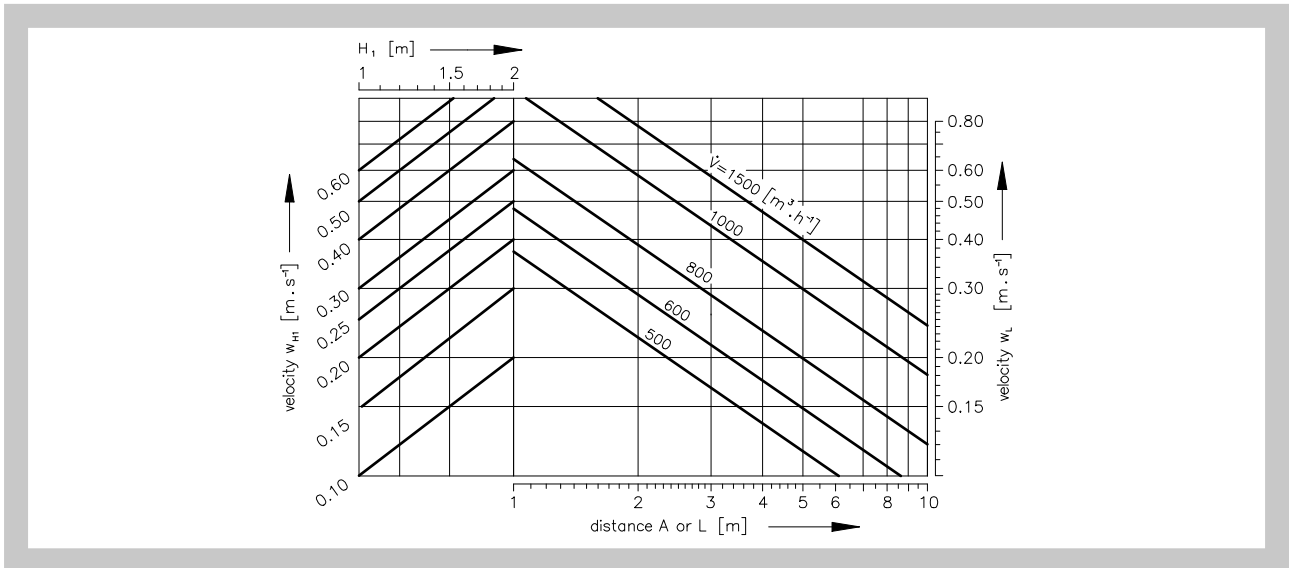
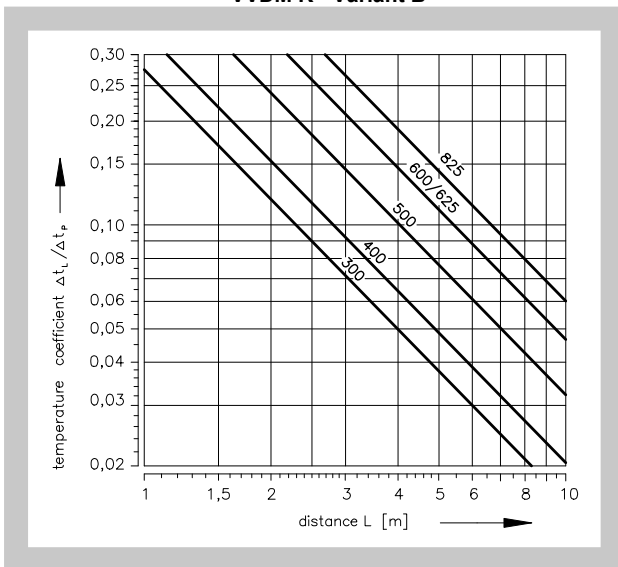


Diagram 9.3.5. Air velocity of VVDM C, VVDM K 825 - Variant A



9.4. Temperature coefficient for VVDM C, VVDM K - Variant B

Diagram 9.4.1. Temperature coefficient for VVDM C, VVDM K - Variant B



9.5. Air velocity of VVDM C, VVDM K - Variant B

Diagram 9.5.1. Air velocity of VVDM C, VVDM K 300 - Variant B

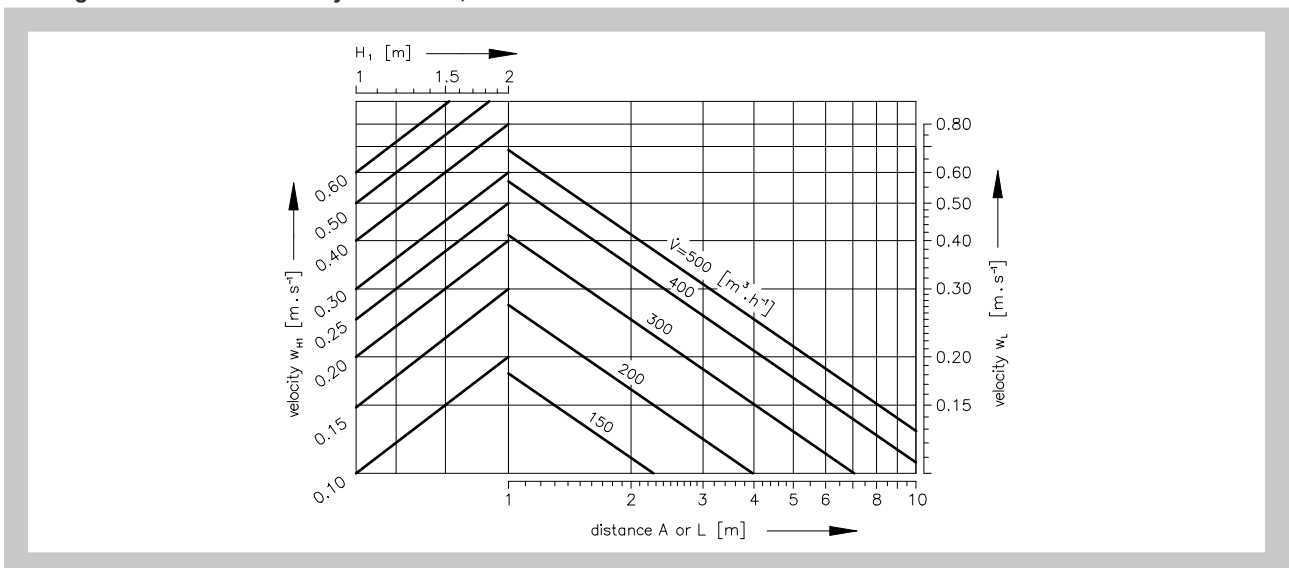


Diagram 9.5.2. Air velocity of VVDM C, VVDM K 400 - Variant B

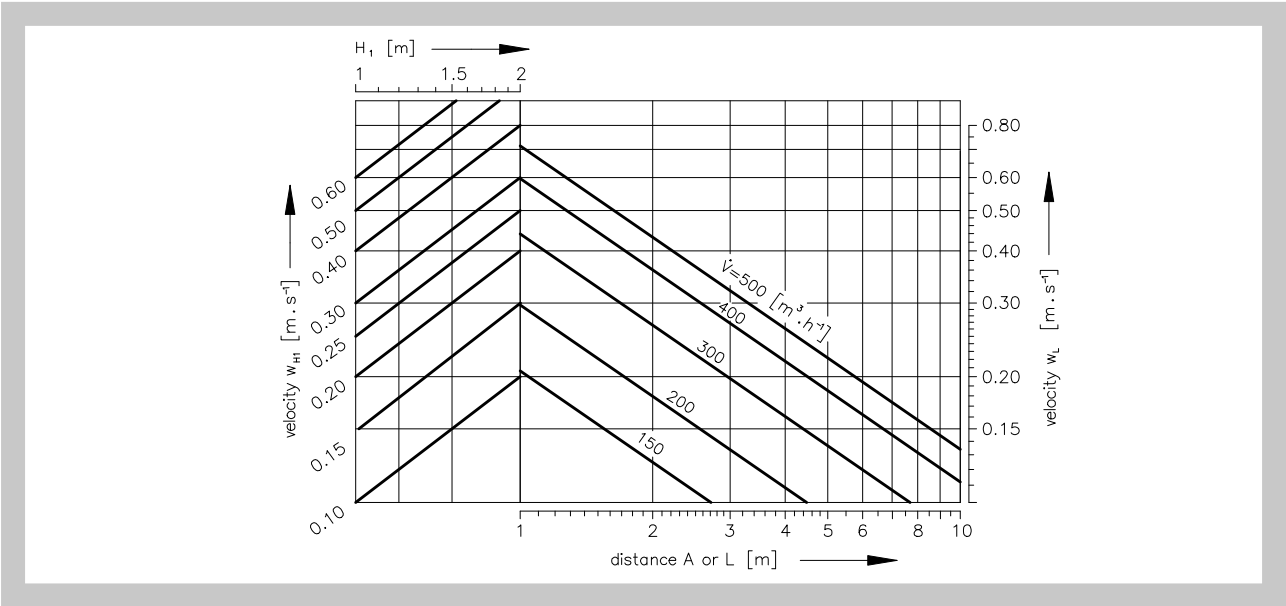


Diagram 9.5.3. Air velocity of VVDM C, VVDM K 500 - Variant B

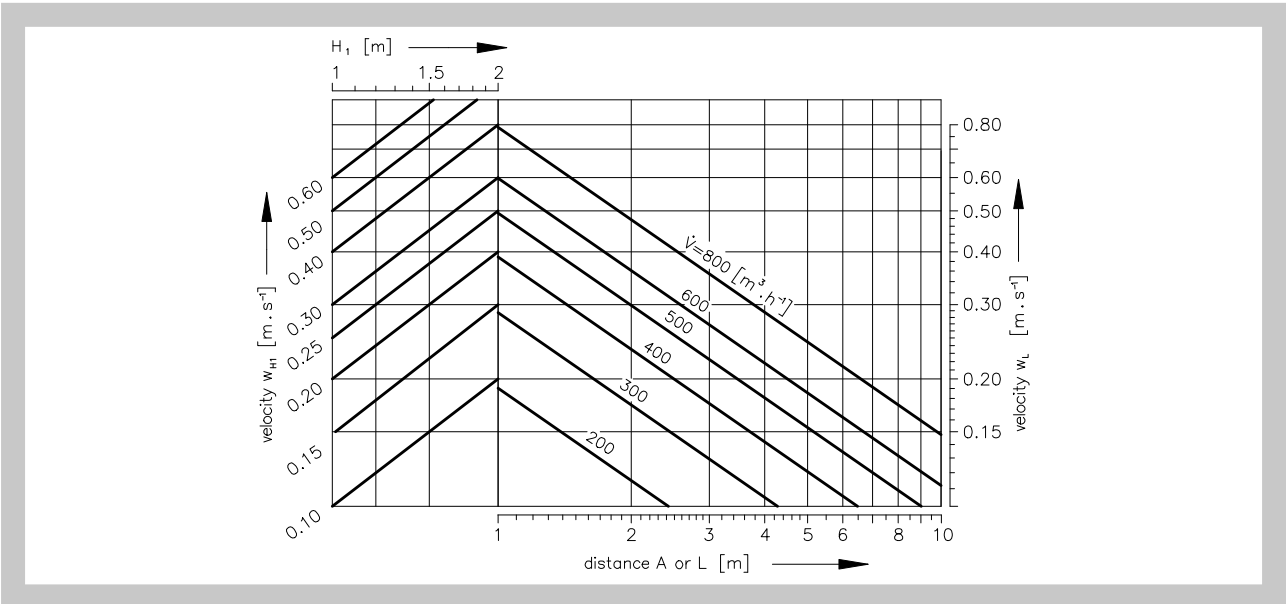


Diagram 9.5.4. Air velocity of VVDM C, VVDM K 600, 625 - Variant B

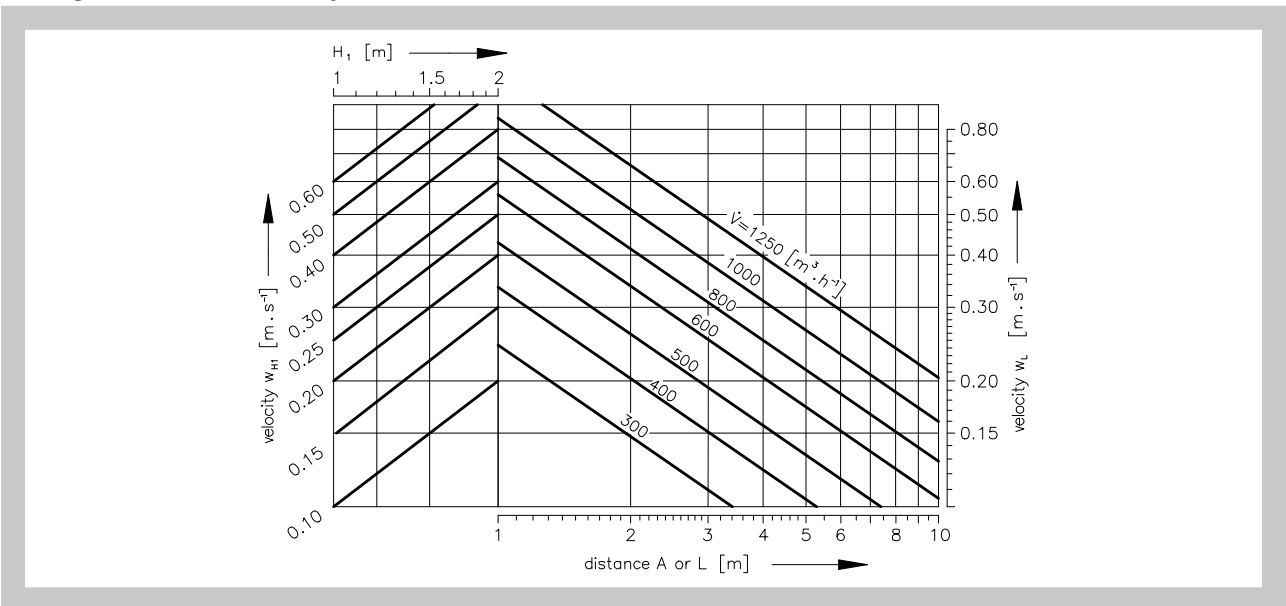
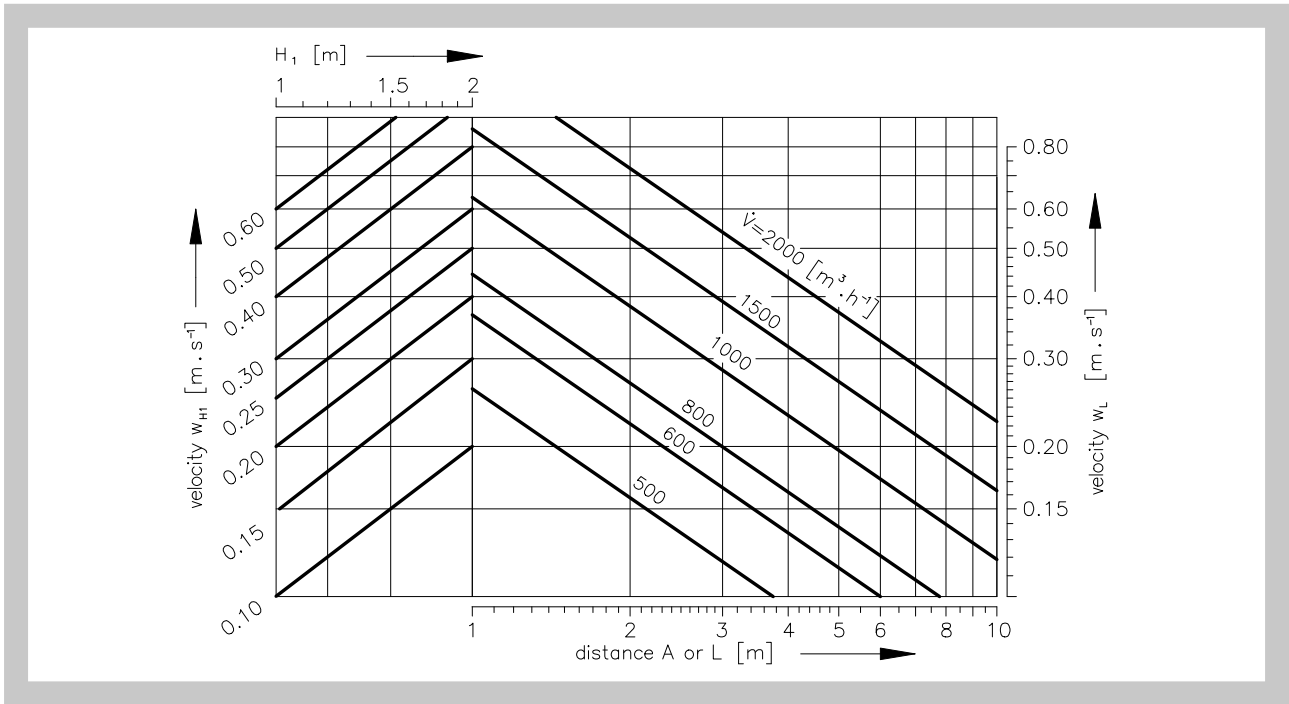
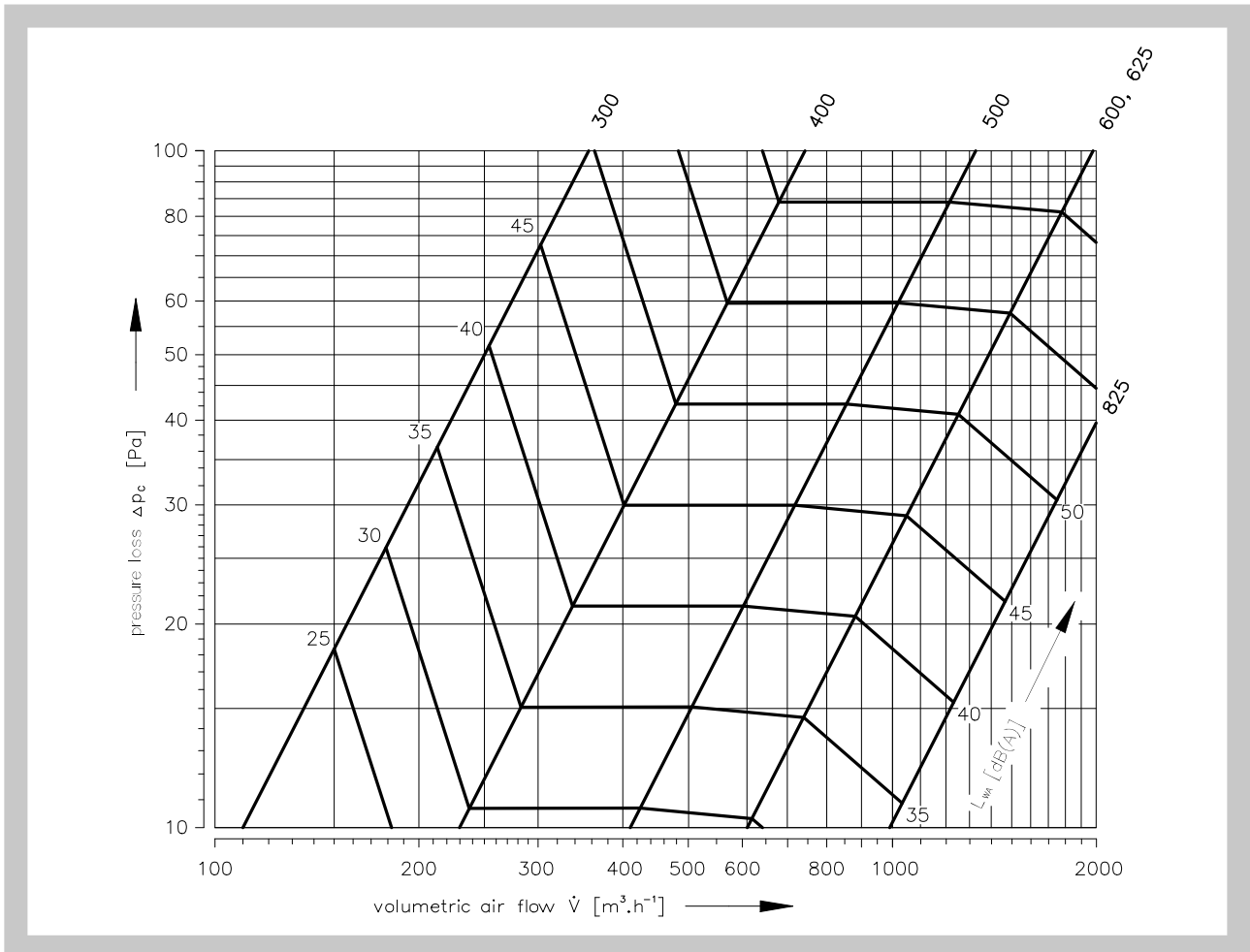


Diagram 9.5.5. Air velocity of VVDM C, VVDM K 825 - Variant B



9.6. Pressure losses and sound power for VVDM M - Variants A and B

Diagram 9.6.1. Pressure losses and sound power

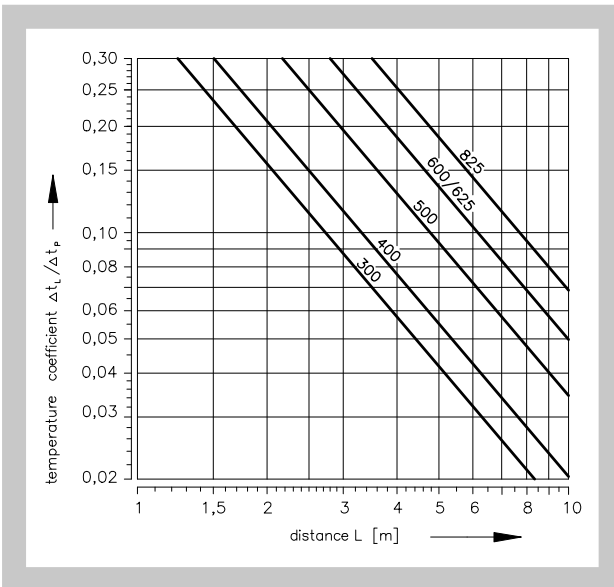


Tab. 9.6.1 Correction coefficients of pressure losses and sound power according to the VVDM M flap setting angle

Size		Flap setting angle		
		0°	45°	90°
300	Δp_c	x1,0	x1,5	x2,4
	L_{WA}	-	-	+1
400	Δp_c	x1,0	x1,3	x2
	L_{WA}	-	+1,0	+2,0
500	Δp_c	x1,0	x2,1	x4,6
	L_{WA}	-	+3,0	+8,0
600, 625	Δp_c	x1,0	x1,5	x4,0
	L_{WA}	-	+4,0	+9,0
825	Δp_c	x1,0	x1,4	x3,5
	L_{WA}	-	+1	+3

9.7. Temperature coefficient for VVDM M - Variant A

Diagram 9.7.1. Temperature coefficient for VVDM M - Variant A



9.8. Air velocity of VVDM M - Variant A

Diagram 9.8.1. Air velocity of VVDM M 300 - Variant A

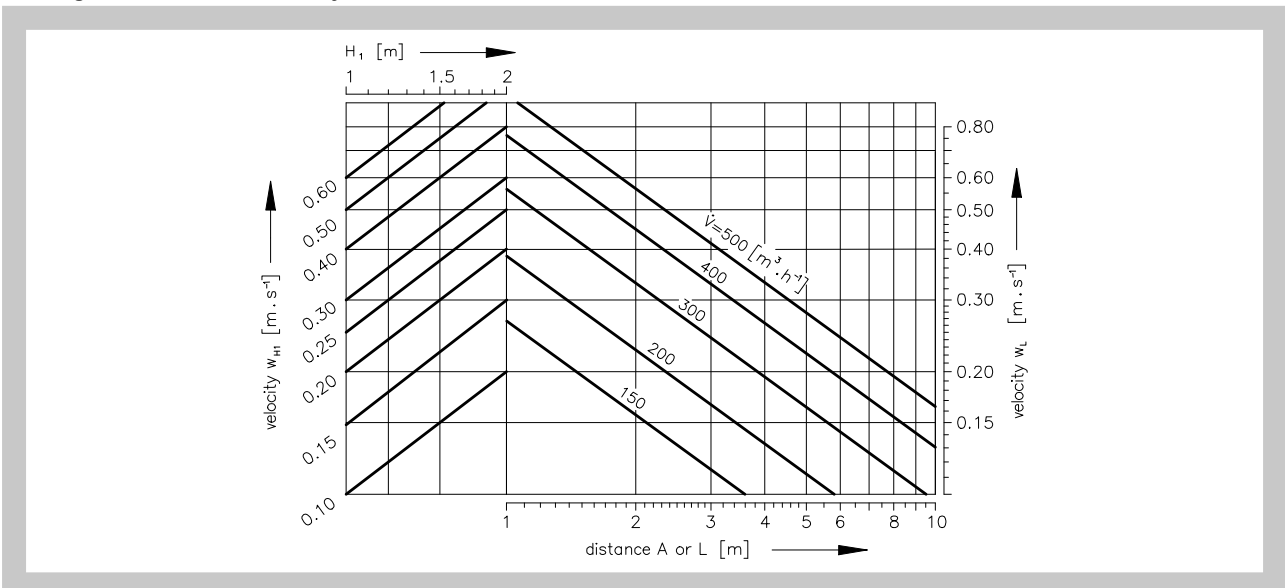


Diagram 9.8.2. Air velocity of VVDM M 400 - Variant A

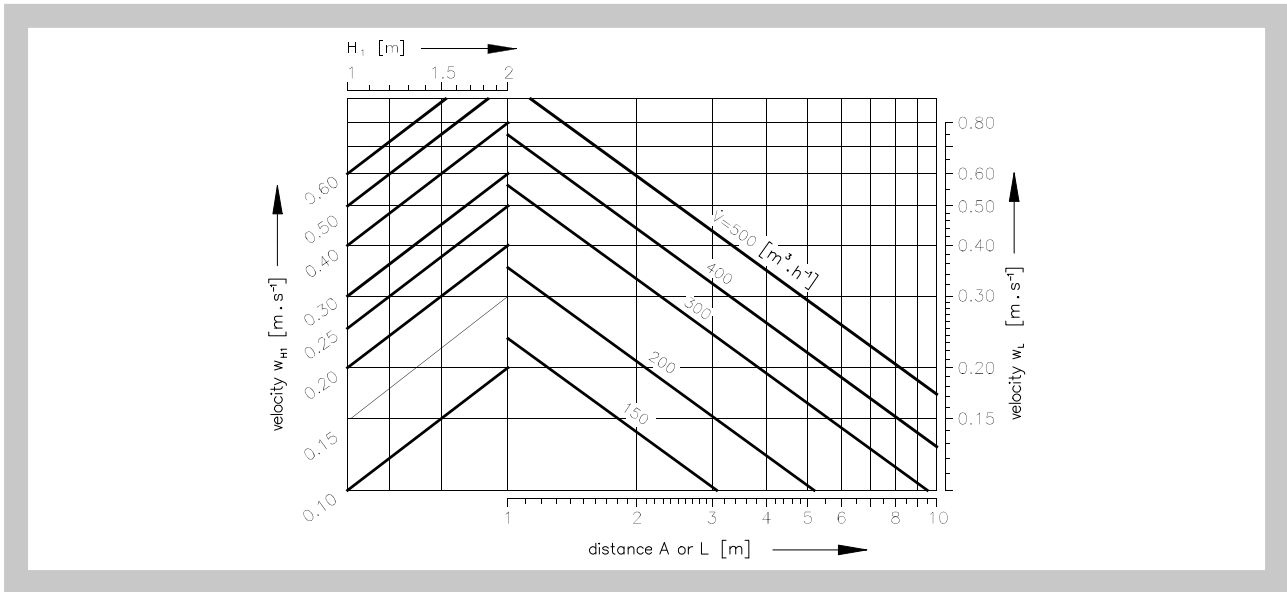


Diagram 9.8.3. Air velocity of VVDM M 500 - Variant A

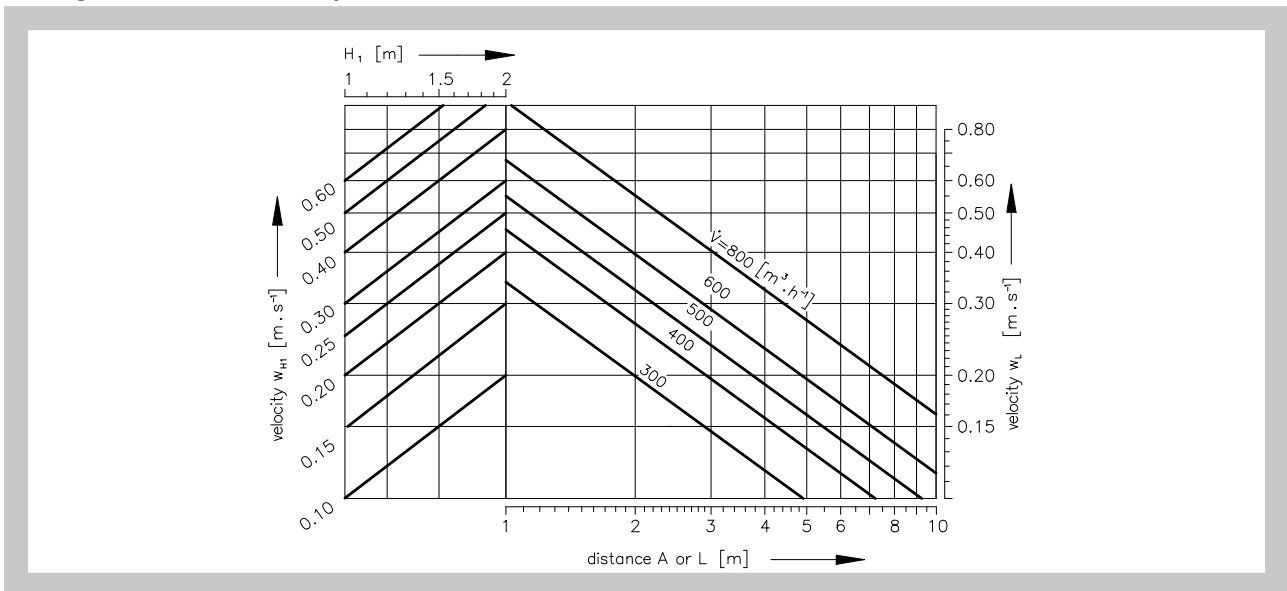


Diagram 9.8.4. Air velocity of VVDM M 600,625 - Variant A

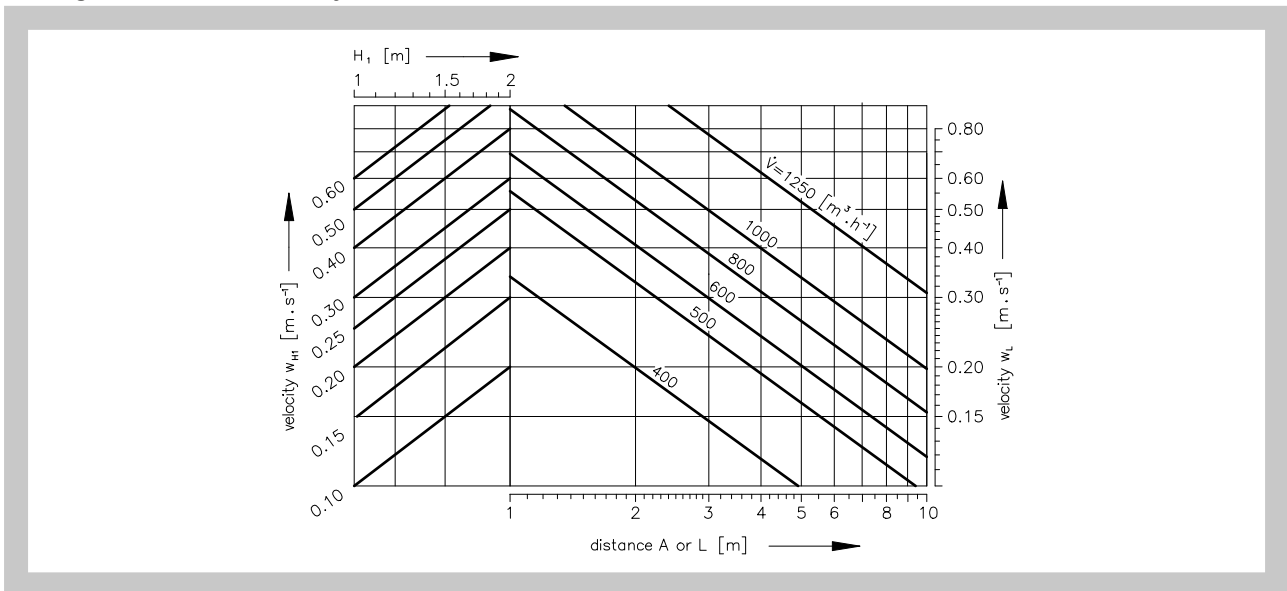
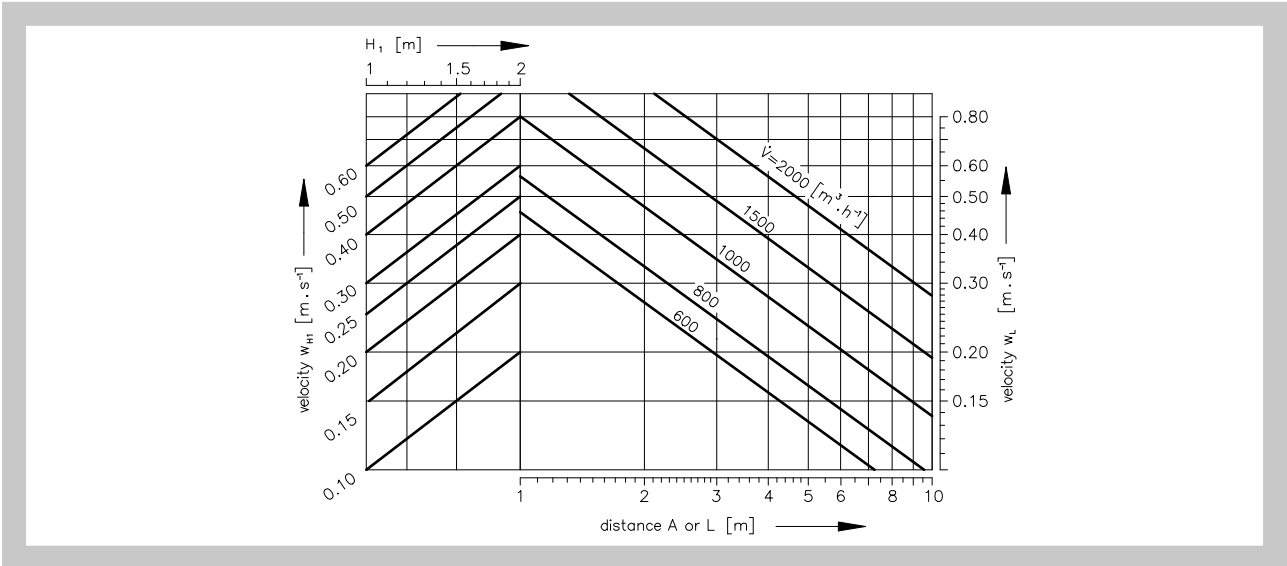
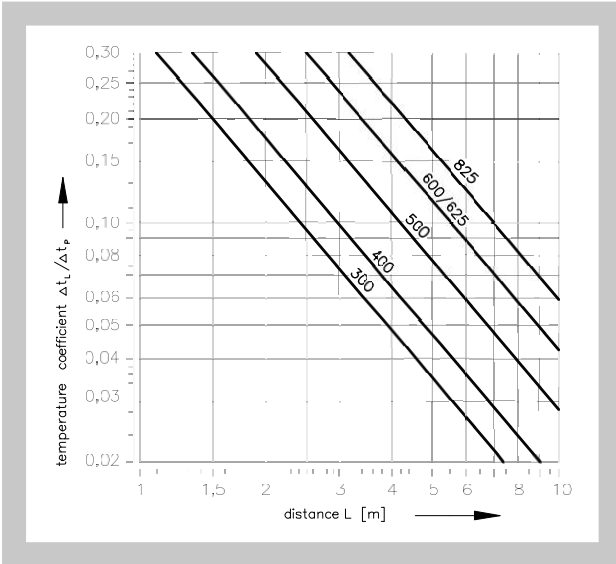


Diagram 9.8.5. Air velocity of VVDM M 825 - Variant A



9.9. Temperature coefficient for VVDM M - Variant B

Diagram 9.9.1. Temperaturquotient für VVDM M - Variant B



9.10. Air velocity of VVDM M - Variant B

Diagram 9.10.1. Air velocity of VVDM M 300 - Variant B

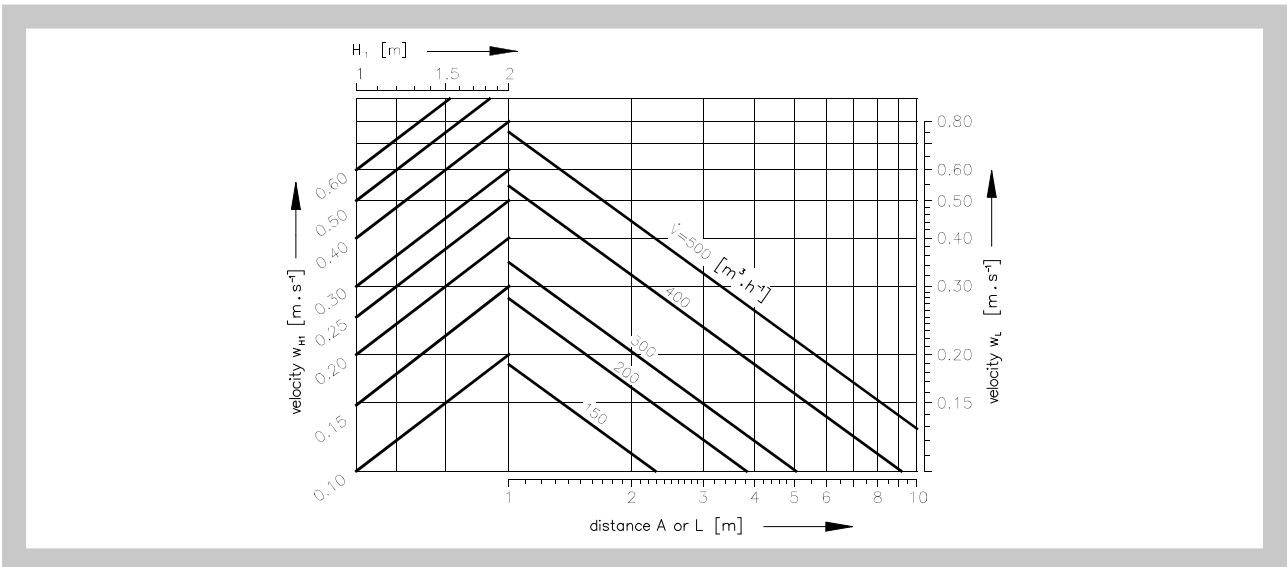


Diagram 9.10.2. Air velocity of VVDM M 400 - Variant B

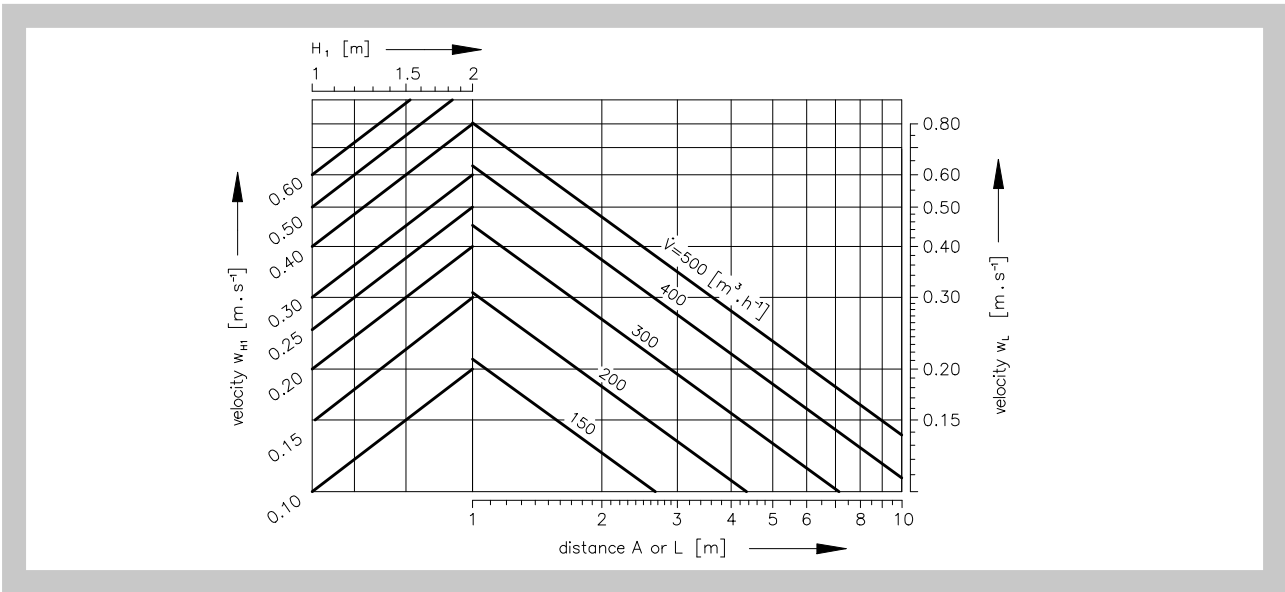


Diagram 9.10.3. Air velocity of VVDM M 500 - Variant B

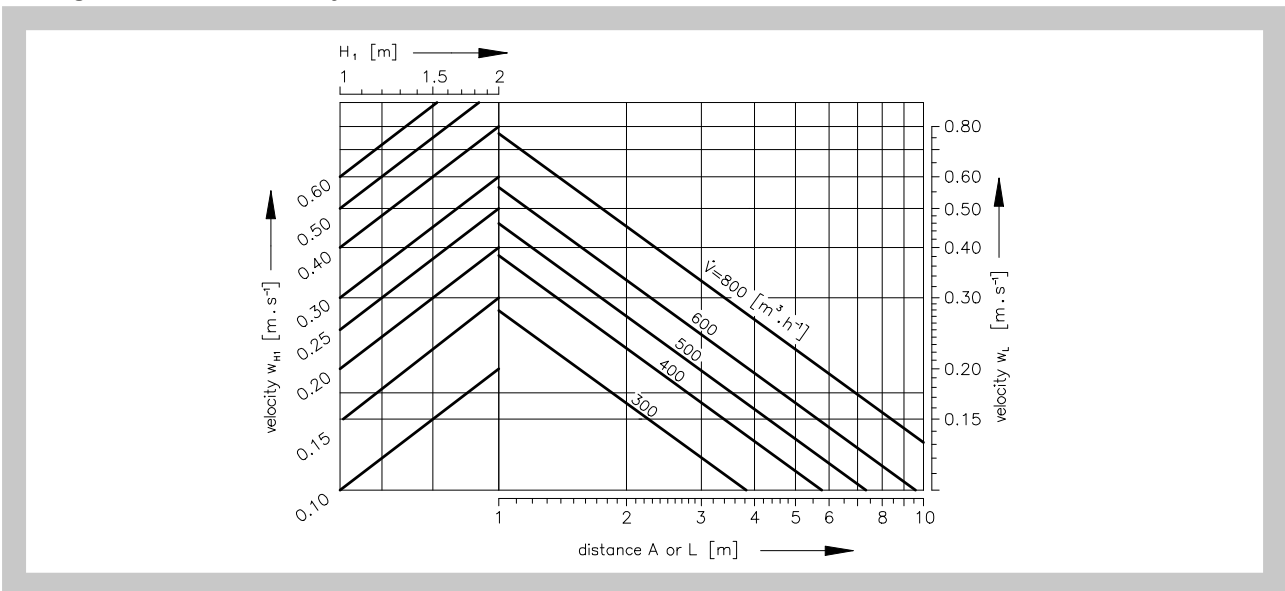


Diagram 9.10.4. Air velocity of VVDM M 600,625 - Variant B

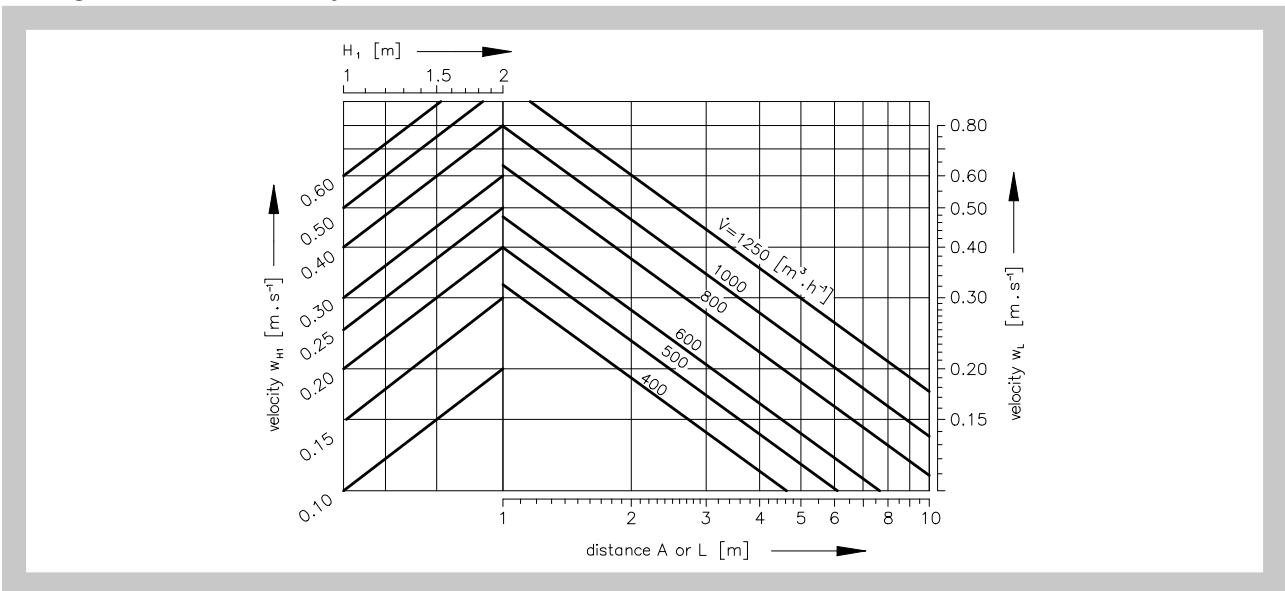


Diagram 9.10.5. Air velocity of VVDM M 825 - Variant B

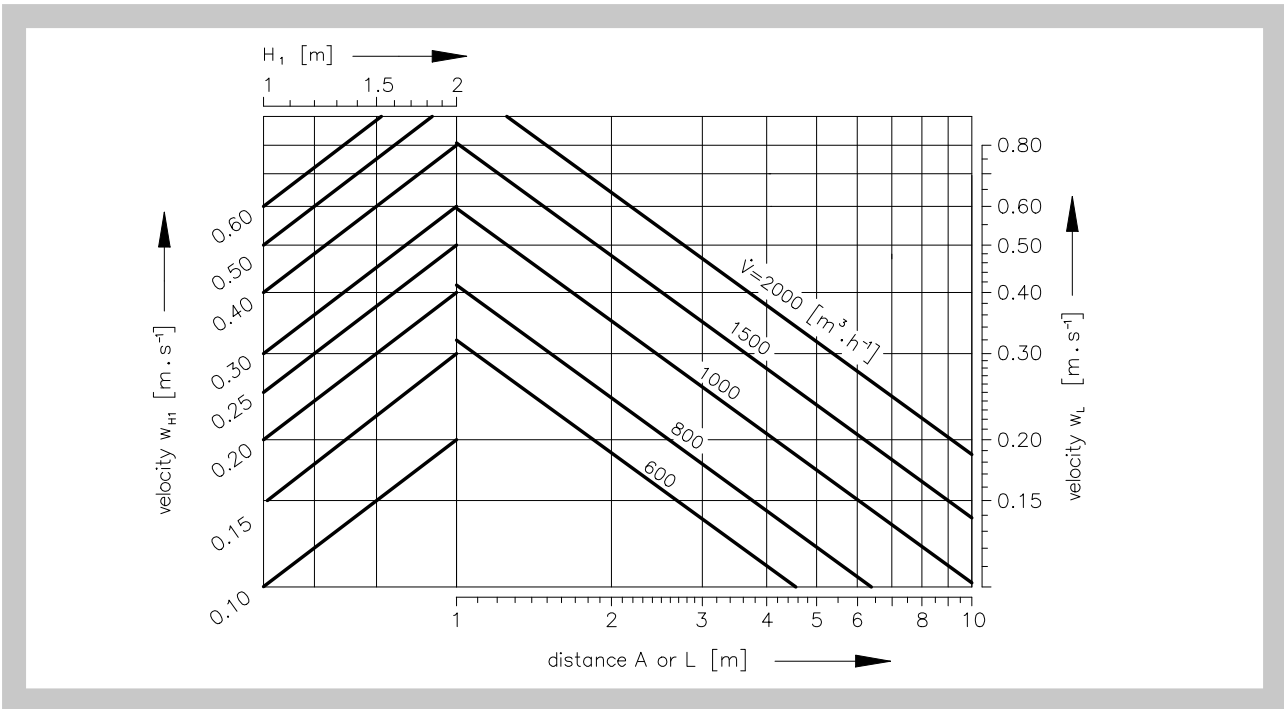


Fig. 17 Example

Given data:

Outlet VVDM - C 500 Variant A

$\dot{V} = 500 \text{ m}^3/\text{h}$

$\Delta t_p = - 8 \text{ K}$

$H_1 = 1,6 \text{ m}$

$A = 3 \text{ m}, B = 3 \text{ m}$

$X = 2,3 \text{ m}$

Diagram 9.1.1. :

$L_{WA} = 36 \text{ dB(A)}$

$\Delta p_c = 23 \text{ Pa}$

Diagram 9.2.1. :

$L = A/2 + H_1 = 3,1 \text{ m}$ between outlets

$\Delta t_L / \Delta t_p = 0,18$

$\Delta t_L = - 8 * 0,18 = - 1,44 \text{ K}$

$L = X + H_1 = 3,9 \text{ m}$ on the wall

$\Delta t_L / \Delta t_p = 0,135$

$\Delta t_L = - 8 * 0,135 = - 1,08 \text{ K}$

Diagram 9.4.4. :

$w_{H1} = 0,2 \text{ m/s}$ between outlets

$w_L = 0,28 \text{ m/s}$ on the wall

IV. MATERIAL, FINISHING

10. Material

- 10.1. Front panels are made of steel sheet. The surface is coated with white baking varnish, shade RAL 9010. The blades for air diversion control are supplied in black. The connecting boxes are made of galvanized steel sheet.
- 10.2. Requirements for other shades of the front panels shall be agreed in advance.

V. TRANSPORTATION AND STORAGE

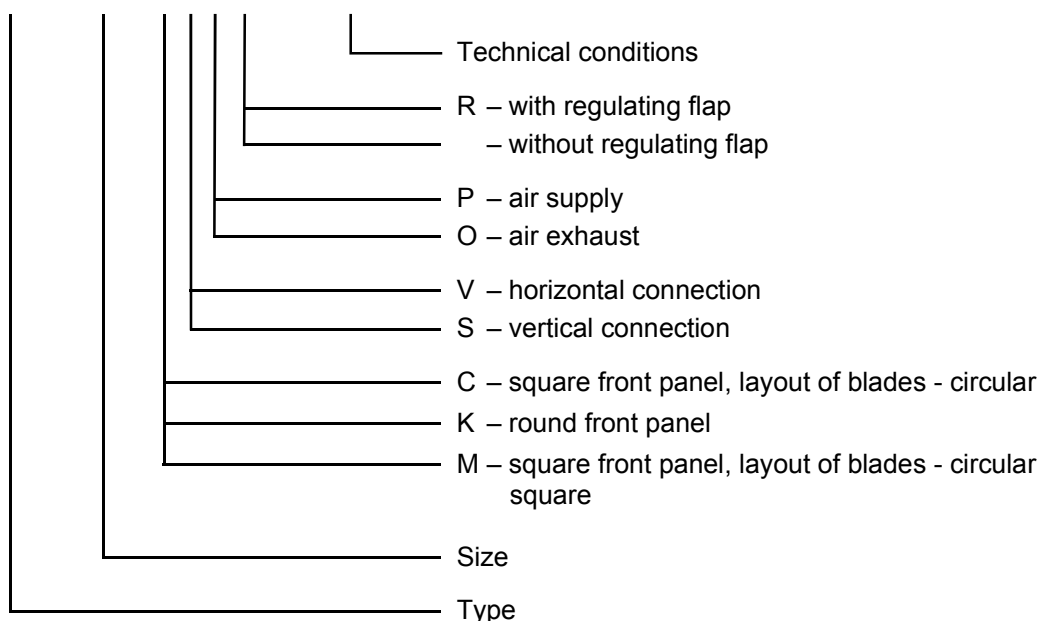
11. Logistic terms

- 11.1. The outlets are delivered in cardboard packaging. They are transported in bulk by common means of transport. If agreed with the customer, the outlets can be delivered on pallets. When handling during transport or storage, the outlets must be protected against mechanical damage and weather effects.
- 11.2. The outlets must be stored in closed rooms, in environment without aggressive vapours, gases and dust. The temperature in the rooms must be maintained from -5 to +40°C and relative humidity max. 80%.

VI. ORDERING INFORMATION

12. Ordering key

Outlet **VVDM** **400** **C/-*/P/R** **TPM 089/12**



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