

# MANDÍK®

## WHIRLING AIR OUTFLOW OUTLET

### VVM



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

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## II. GENERAL

### 1. Description

- 1.1.** Manually adjustable outlets VVM with vanes for diversion of air stream are terminal, air-handling elements for air distribution enabling an optimal direction of outlet air stream into climatized or ventilated rooms.

Through a turbulent air outlet an intensive mixing with the present air in the room is achieved. Thus the speed and temperature of air are decreased.

The outlets are suitable for up to approximately 30 times higher air exchange and for ceiling height from 2.6 to 4.0 m.

- 1.2.** Outlets are intended for environment protected against weather impacts with the classification of climatic conditions class 3K5, without condensation, frost, ice formation, and without water even from other sources than rain according to EN 60 72133, change A2.

Temperature in the place of installation is permitted to range from - 20°C to + 70°C.

Outlets VVM are suitable for systems without abrasive, chemical and adhesive particles.

- 1.3.** If is not noticed other way, all dimensions and weight are in millimeters and kilograms.

### 2. Design

- 2.1.** The outlets are delivered with square or round front panels.

- 2.2.** The front panels are provided with radial slots with regulation vanes for adjusting required direction of air stream.

- 2.3.** Connection to duct:

- horizontal connection (with round collar to Unibox from the side, according to request, with or without regulating flap)
- vertical connection (with round collar to Unibox from the top, according to request, with or without regulating flap)
- Detailed description of Unibox is mentioned in technical data sheet TPM 139/19

**Fig. 1** VVM with connection box - square front panel



**Fig. 2** VVM with connection box - round front panel



Fig. 3 VVM/C design - Square front panel

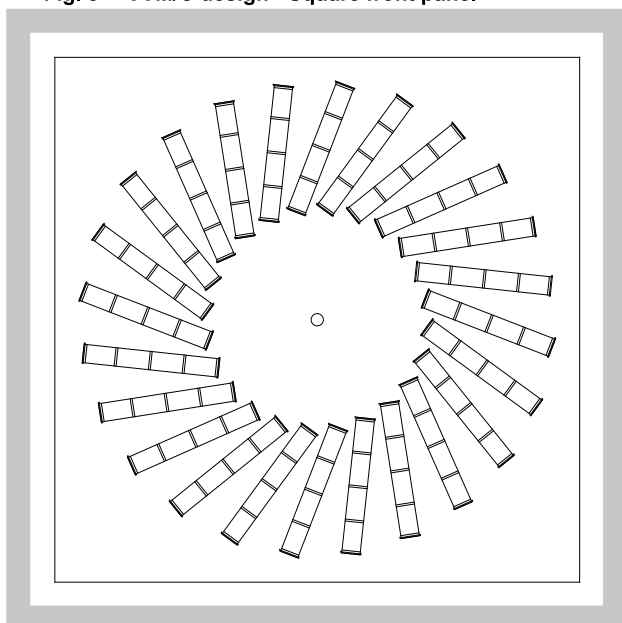
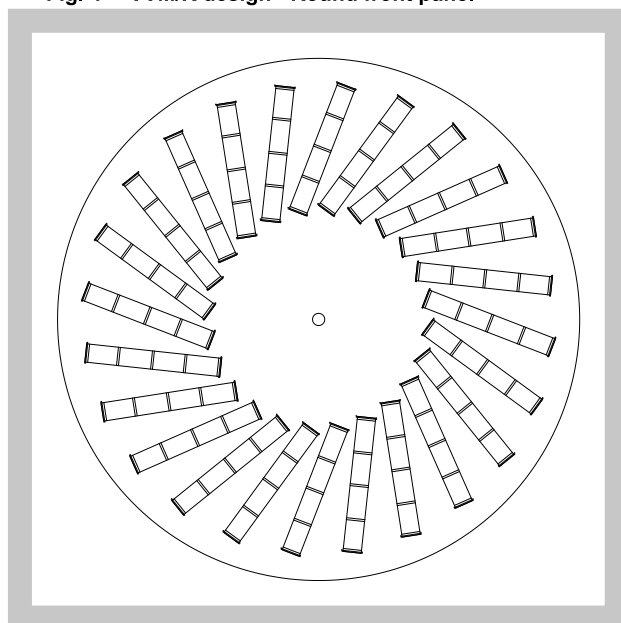
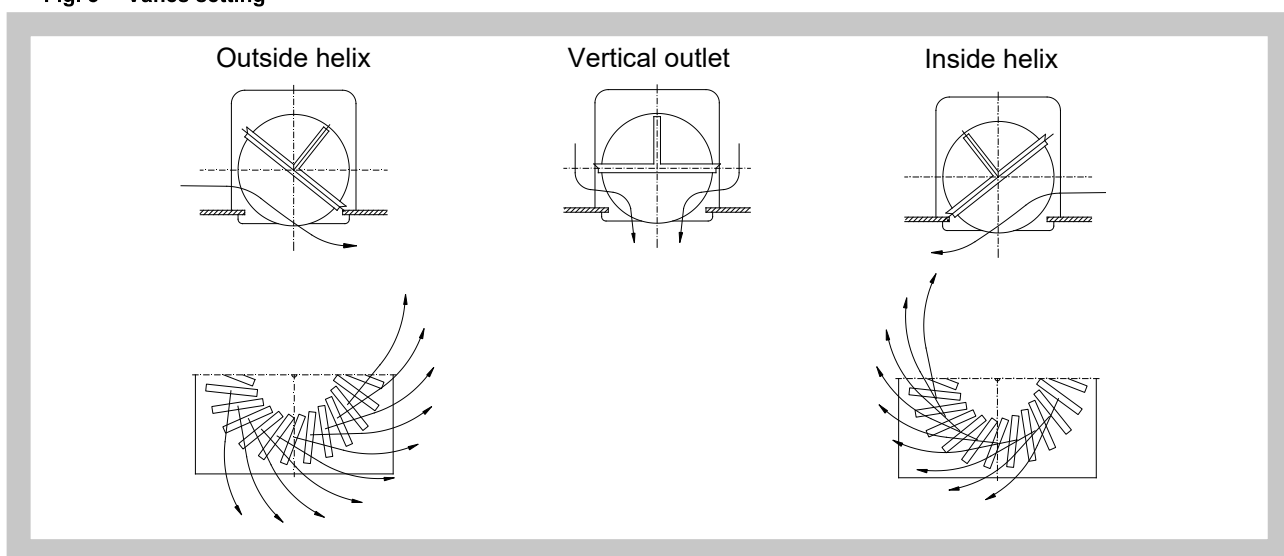


Fig. 4 VVM/K design - Round front panel



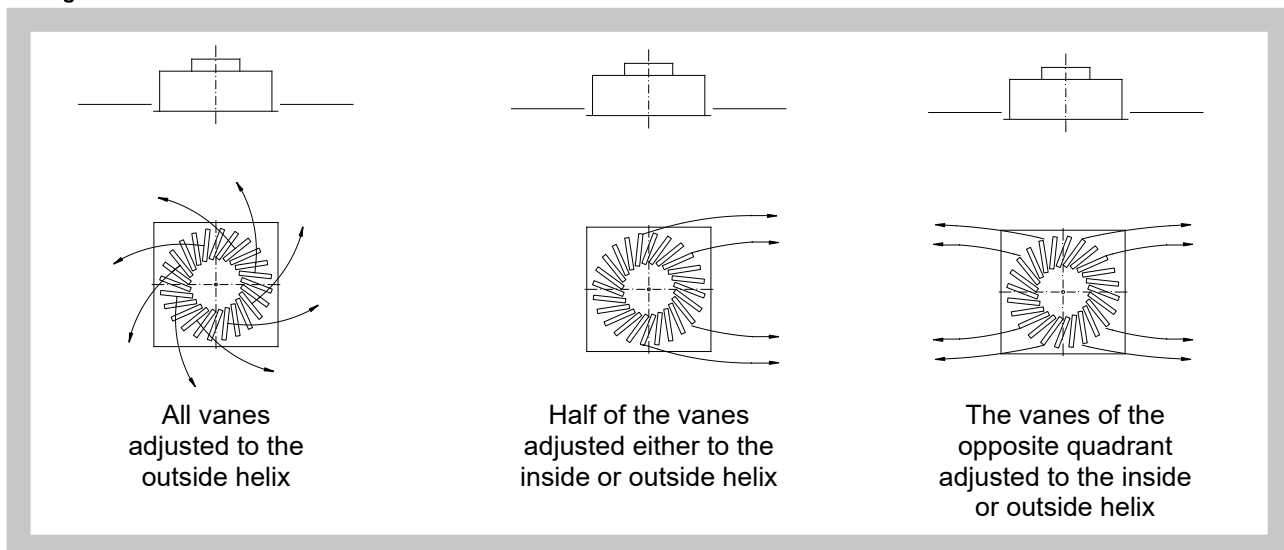
### 3. Vanes setting

Fig. 5 Vanes setting



### 4. Flow directions

Fig. 6



## 5. Dimensions and weights

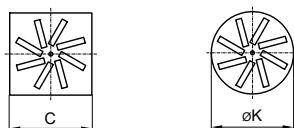
### 5.1. Dimensions

Tab. 5.1.1. Dimensions

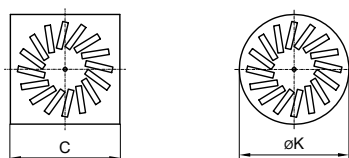
Number of vanes	Size [mm]	C [mm]	øK [mm]	Weight [kg]	Connection box size
8	300	298	300	0,7	300
16	400	398	400	1	400
	500	498	500	2	
	600	598	600	3	
	625	623	625	3	
24	500	498	500	2	500
	600	598	600	3	600
	625	623	625	3	
48	600	598	600	2,5	625
	625	623	625	2,5	
54	625	623	625	2,5	625
72	825	823	825	7	825

Fig. 7

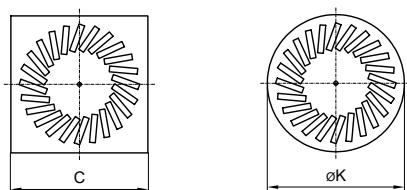
Front panel - 8 vanes, size: 300



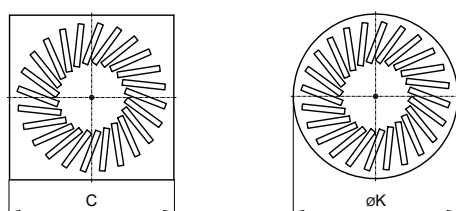
Front panel - 16 vanes, size: 400, 500, 600, 625



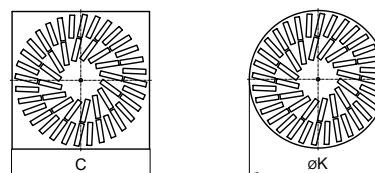
Front panel - 24 vanes, size: 500



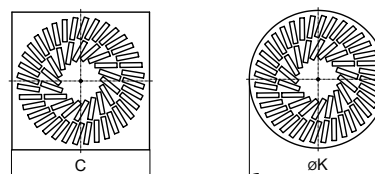
Front panel - 24 vanes, size: 600, 625



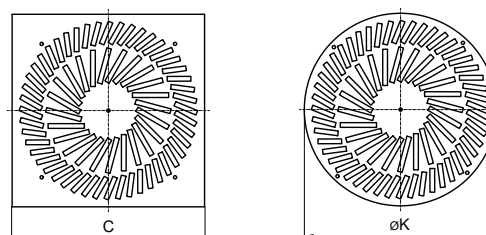
Front panel - 48 vanes, size: 600, 625



Front panel - 54 vanes, size: 625

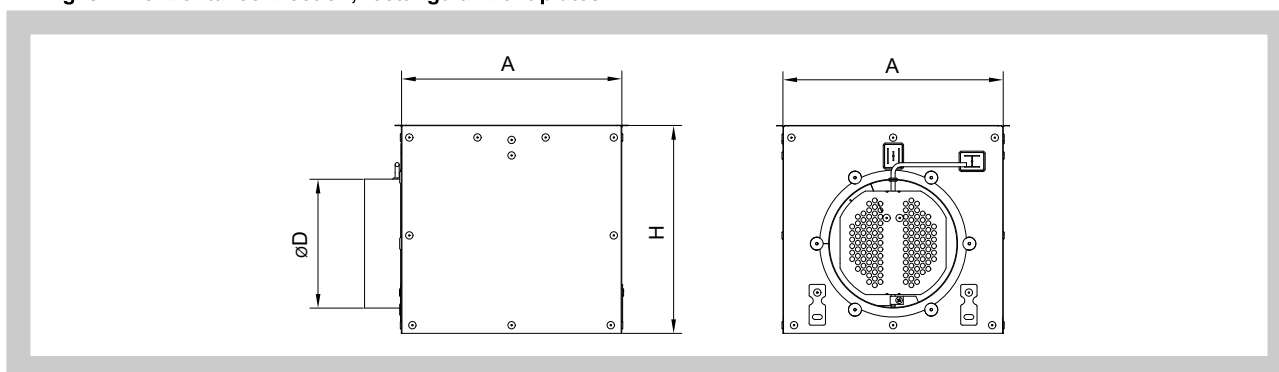


Front panel - 72 vanes, size: 825



## 5.2. Connecting box in design for horizontal connection and rectangular front plates.

Fig. 8 Horizontal connection, rectangular front plates

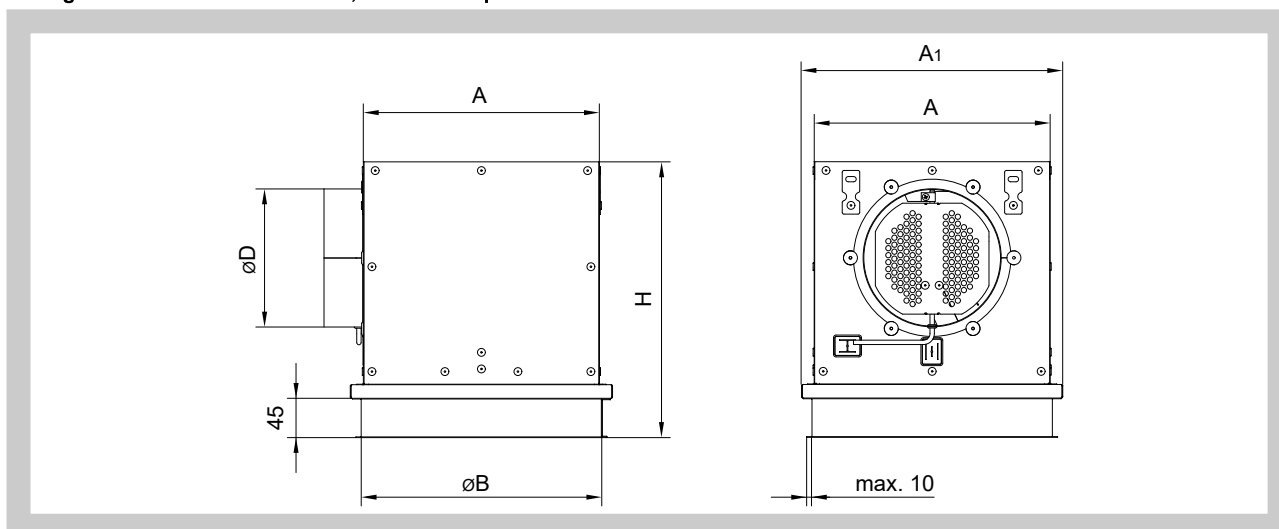


Tab. 5.2.1. Horizontal connection, rectangular front plates – dimensions, weights

Size [mm]	A [mm]	H [mm]	ØD [mm]	Weight [kg]
300	270	255	158	2,3
400	370	295	198	3,5
500	470	295	198	4,8
600	572	345	248	6,7
625	600	345	248	7,1
825	812	395	313	12,1

## 5.3. Connecting box in design for horizontal connection and round front plates.

Fig. 9 Horizontal connection, round front plates

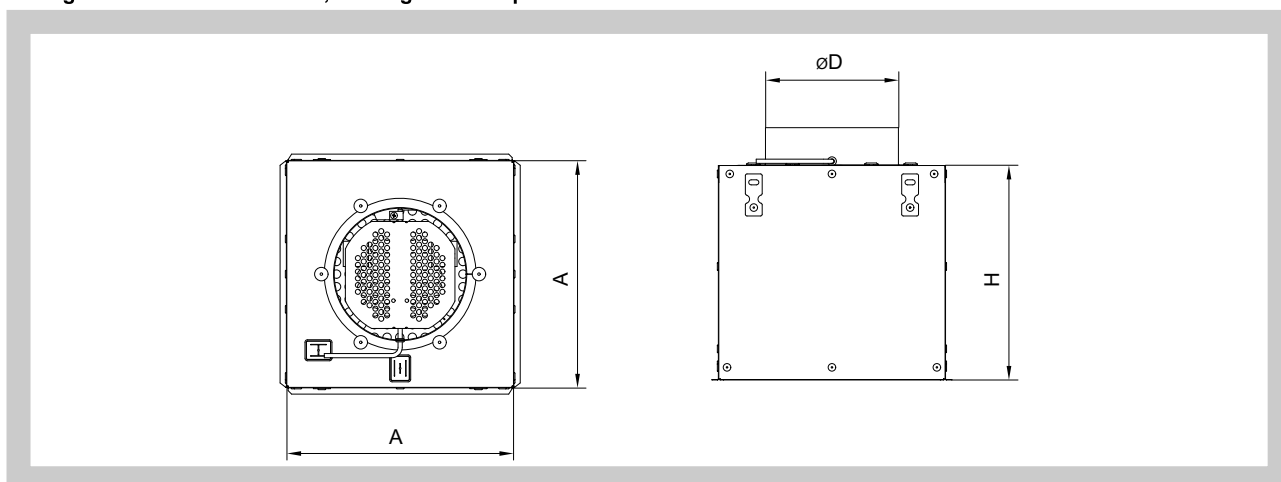


Tab. 5.3.1. Horizontal connection, round front plates – dimensions, weights

Size [mm]	A [mm]	A <sub>1</sub> [mm]	ØB [mm]	H [mm]	ØD [mm]	Weight [kg]
300	270	297	275	290	158	3,1
400	370	390	365	300	198	4,3
500	470	490	465	300	198	5,7
600	572	592	570	350	248	7,8
625	600	620	595	350	248	8,3
825	812	832	790	430	313	13,3

#### 5.4. Connecting box in design for vertical connection and rectangular front plates.

Fig. 10 Vertical connection, rectangular front plates

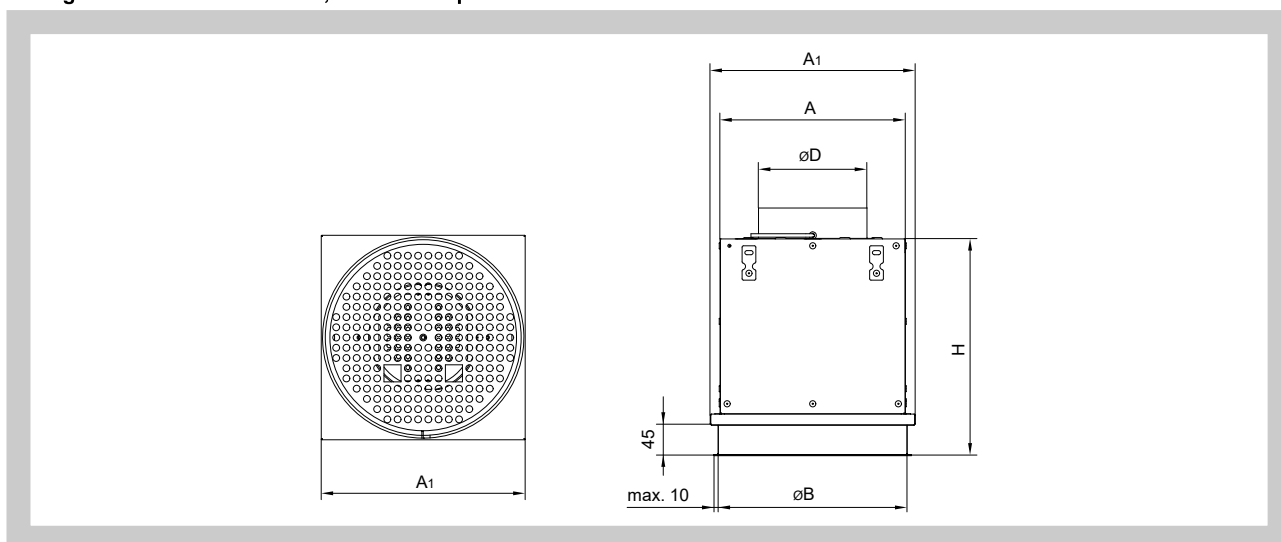


Tab. 5.4.1. Vertical connection, rectangular front plates – dimensions, weights

Size [mm]	A [mm]	H [mm]	ØD [mm]	Weight [kg]
300	270	255	158	2,3
400	370	295	198	3,6
500	470	295	198	4,8
600	572	345	248	6,8
625	600	345	248	7,2
825	812	395	313	12,3

#### 5.5. Connecting box in design for vertical connection and round front plates.

Fig. 11 Vertical connection, round front plates



Tab. 5.5.1. Vertical connection, round front plates – dimensions, weights

Size [mm]	A [mm]	A <sub>1</sub> [mm]	ØB [mm]	H [mm]	ØD [mm]	Weight [kg]
300	270	297	275	290	158	3,1
400	370	390	365	300	198	4,3
500	470	490	465	300	198	5,7
600	572	592	570	350	248	7,8
625	600	620	595	350	248	8,3
825	812	832	790	430	313	13,3

## 6. Installation

- 6.1. All sizes are suitable to be built into the ceiling or for installation out of closed ceilings. The connection boxes are fitted with suspension devices. Several examples of possible installation follow.

Fig. 12 Installation

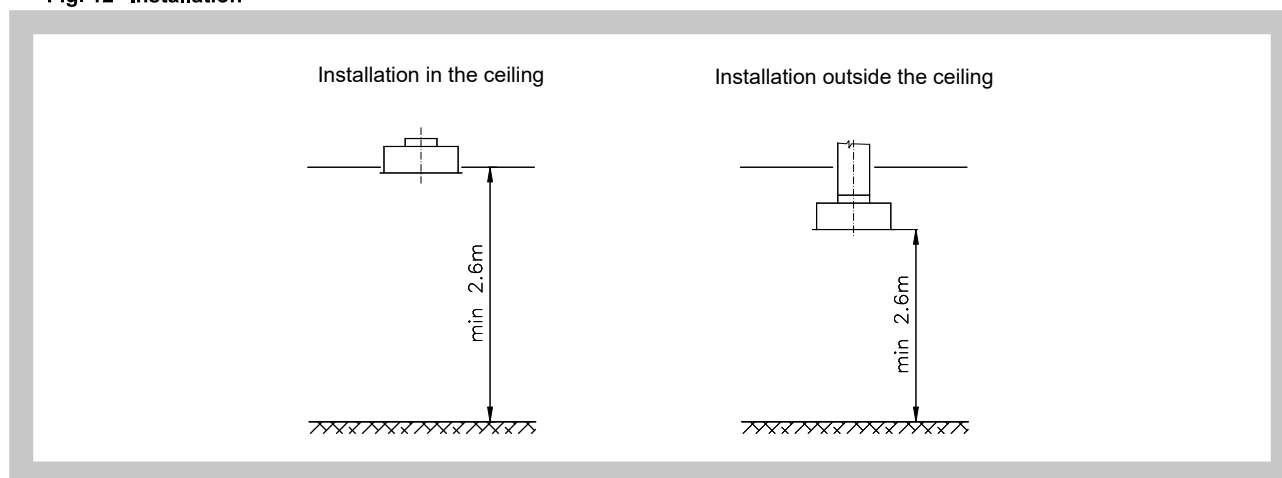
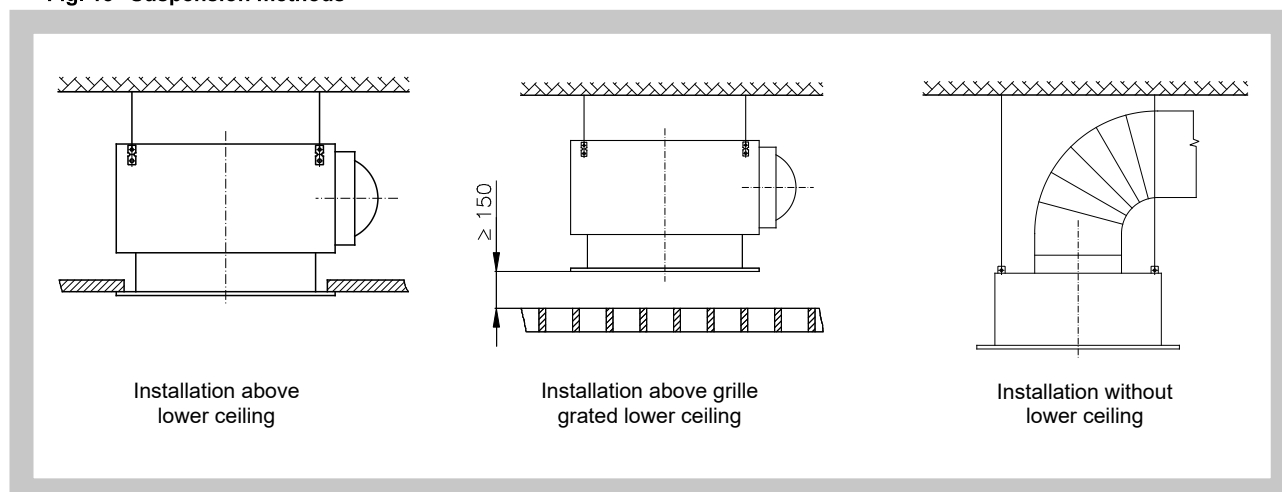


Fig. 13 Suspension methods



## III. TECHNICAL DATA

### 7. Basic parameters

- 7.1. Basic parameters

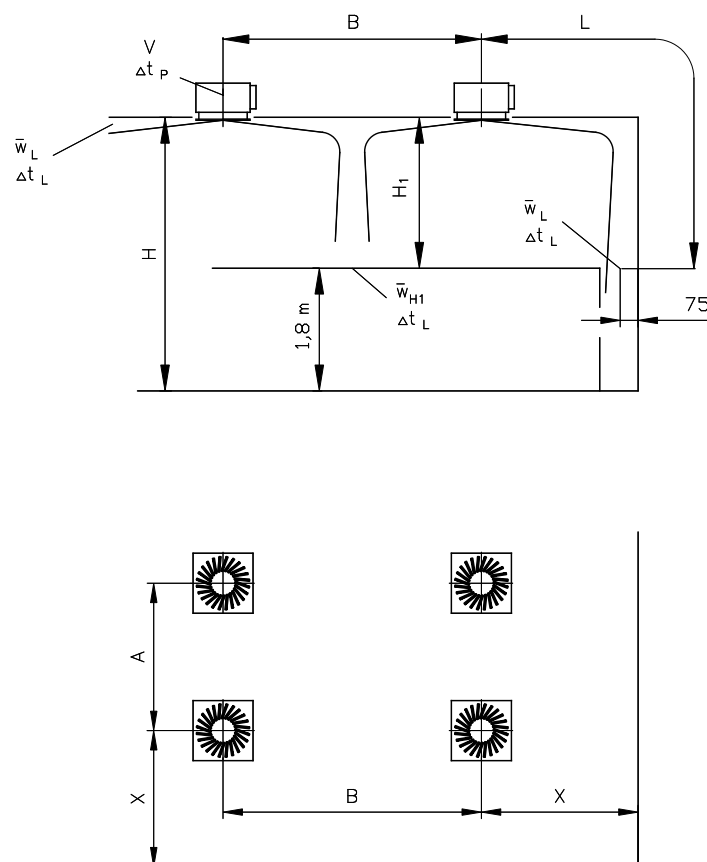
Tab. 7.1.1. Basic parameters

Size	300 8 vanes	400, 500, 600, 625 16 vanes	500 24 vanes	600, 625 24 vanes	600, 625 48 vanes	625 54 vanes	825 72 vanes
$\dot{V}_{\max}$ [m³/h]	180	320	420	660	850	950	1200
$\dot{V}_{\min}$ [m³/h]	55	100	140	200	360	400	560
LW <sub>Amax</sub> [dB(A)]	39	40	39	40	40	43	40
LW <sub>Amin</sub> [dB(A)]	<20	<20	<20	<20	<20	<20	<20
S <sub>ef</sub> [m²]	0,0070	0,0140	0,0210	0,0295	0,0420	0,0473	0,0715



## 8. Calculation and selection of the outlet VVM

**Fig. 14**



V	[m <sup>3</sup> .h <sup>-1</sup> ]	volumetric rate of flow for one outlet
A, B	[m]	distance between two outlets
L	[m]	horizontal + vertical distance (X + H1)
X	[m]	distance from the outlet centre to the wall
H	[m]	ceiling height - from 2.6 to 4.0 m
H <sub>1</sub>	[m]	distance between the ceiling and living zone
$\bar{w}_L$	[m.s <sup>-1</sup> ]	medium velocity of air flow on the wall
$\bar{w}_{H1}$	[m.s <sup>-1</sup> ]	medium velocity of air flow between two outlets in distance H1
w <sub>ef</sub>	[m.s <sup>-1</sup> ]	effective velocity
$\Delta t_p$	[K]	difference between the room air and supplied air temperatures
$\Delta t_L$	[K]	difference between the room and flow temperatures in the distance of: <div style="margin-left: 100px;"> <math>L = A/2 + H_1</math>  or     <math>L = B/2 + H_1</math>  or     <math>L = X + H_1</math> </div>
$\Delta P_c$	[Pa]	total pressure loss for $\rho = 1,2 \text{ kg.m}^{-3}$
L <sub>WA</sub>	[dB(A)]	acoustic performance level
S <sub>ef</sub>	[m <sup>2</sup> ]	effective area

9. Aerodynamic data

9.1. VVM 300 - 8 vanes

Chart 9.1.1. Pressure loss and acoustic performance

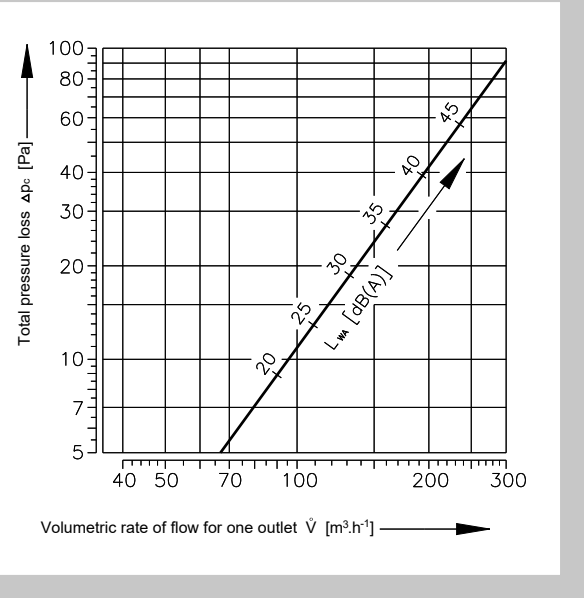


Chart 9.1.2. Air flow velocity and temperature difference

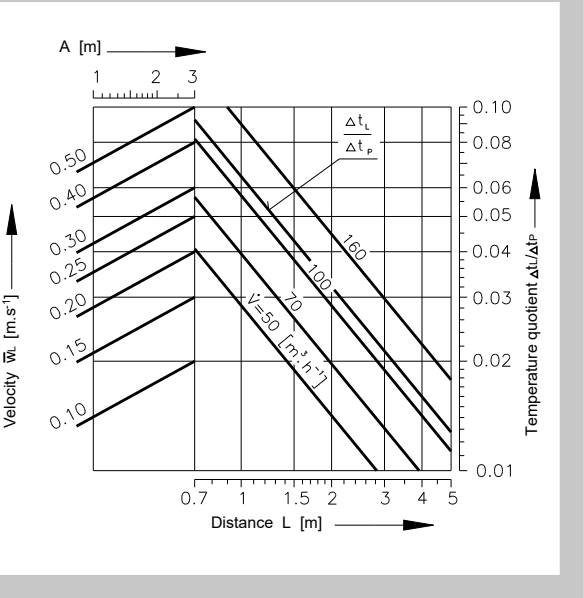


Chart 9.1.3. Alignment of outlets in one or more rows, if B ≥ 4 m

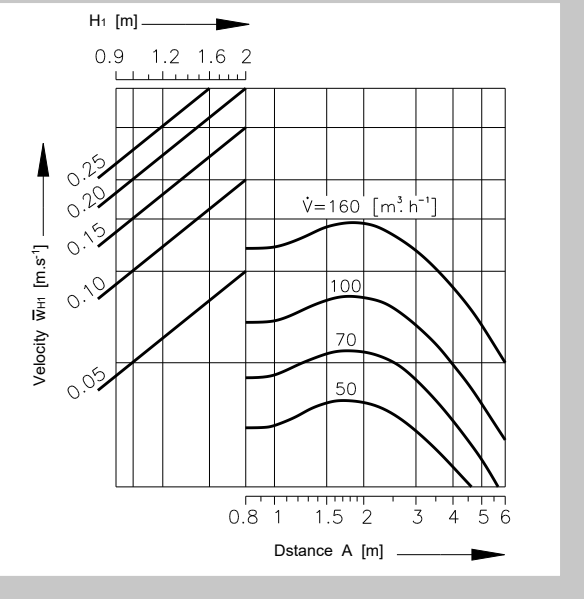
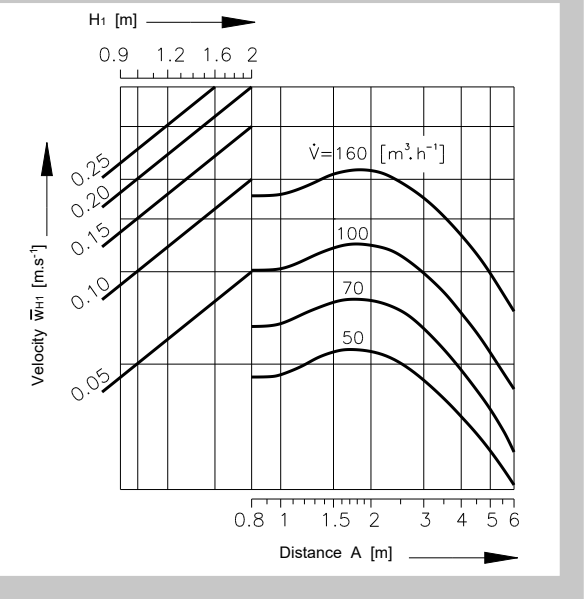


Chart 9.1.4. Alignment of outlets in more rows, if B = 3m



Tab. 9.1.1 Corrective coefficients of pressure losses and acoustic performance according to the flap valve adjustment angle

	Flap valve adjustment angle		
	0°	45°	90°
Δp <sub>c</sub>	x1,0	x1,2	x1,8
L <sub>WA</sub>	-	-	-

9.2. VVM 400, 500, 600, 625 - 16 vanes

Chart 9.2.1. Pressure loss and acoustic performance

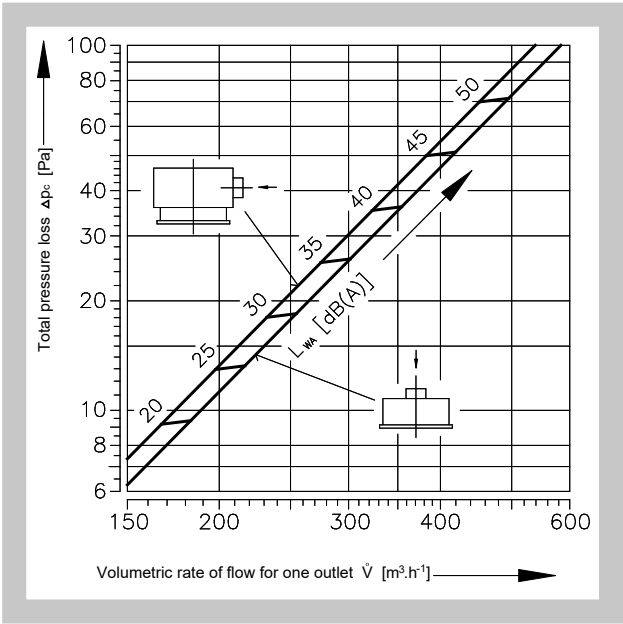


Chart 9.2.2. Air flow velocity and temperature difference

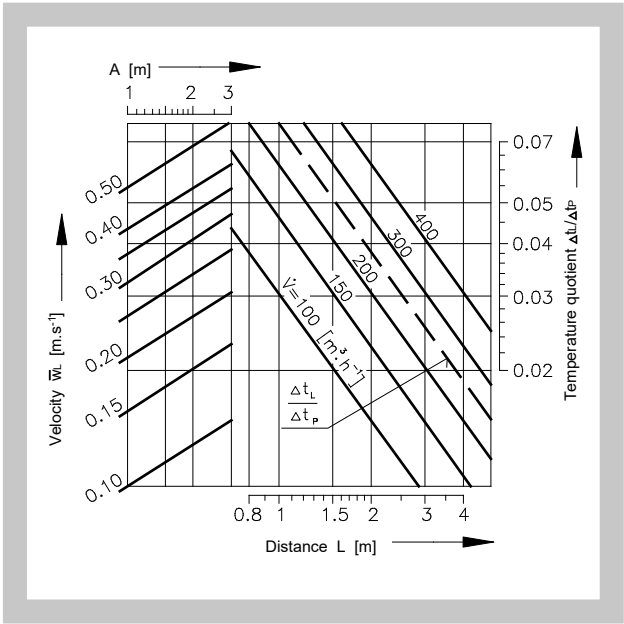


Chart 9.2.3. Alignment of outlets in one or more rows, if B ≥ 4 m

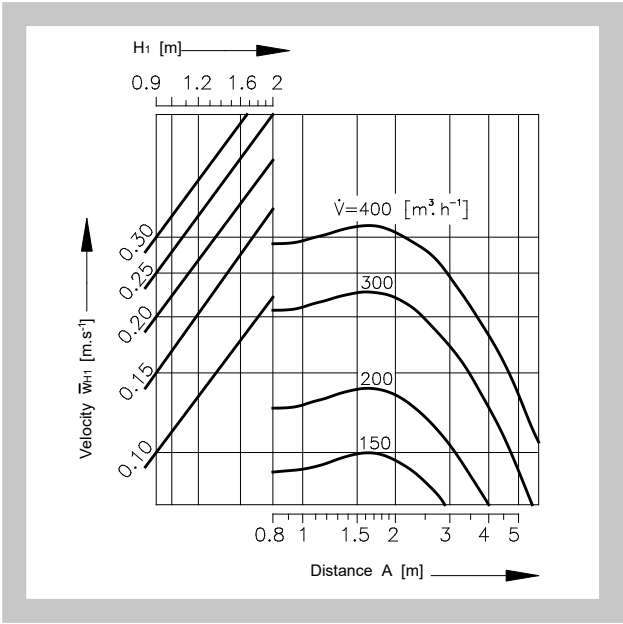
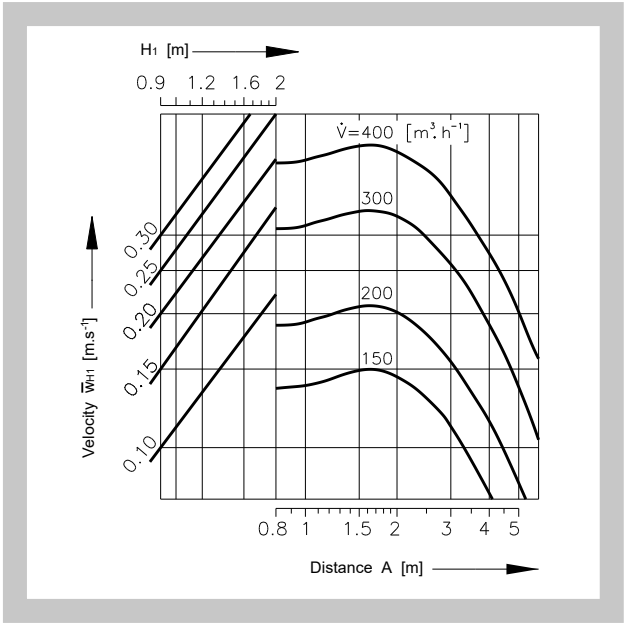


Chart 9.2.4. Alignment of outlets in more rows, if B = 3 m



Tab. 9.2.1. Corrective coefficients of pressure losses and acoustic performance according to the flap valve adjustment angle

	Flap valve adjustment angle		
	0°	45°	90°
Δp <sub>c</sub>	x1,0	x1,1	x2,0
L <sub>WA</sub>	-	+1,0	+2,0

9.3. VVM 500 - 24 vanes

Chart 9.3.1. Pressure loss and acoustic performance

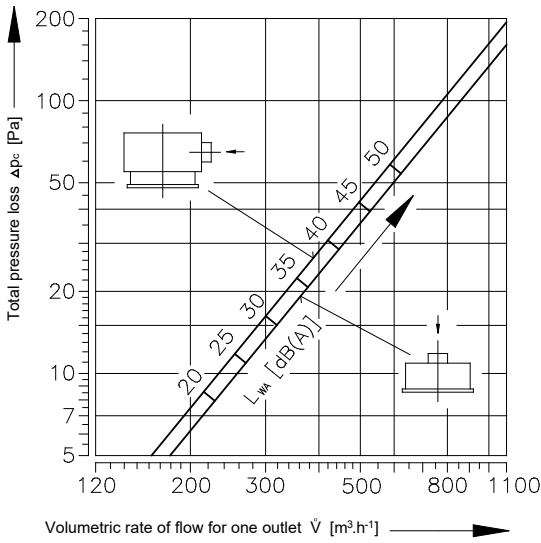


Chart 9.3.2. Air flow velocity and temperature difference

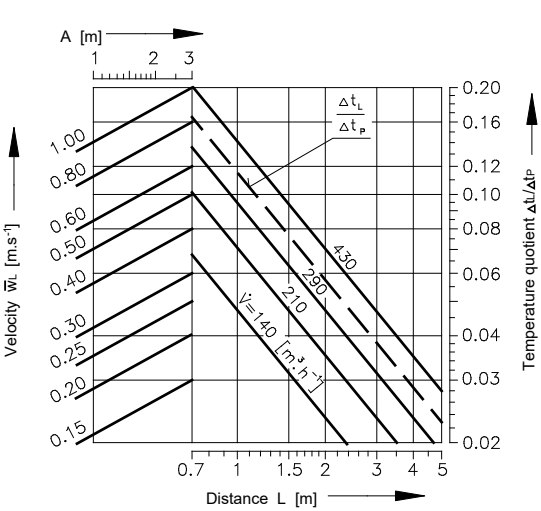


Chart 9.3.3. Alignment of outlets in one or more rows, if B ≥ 4 m

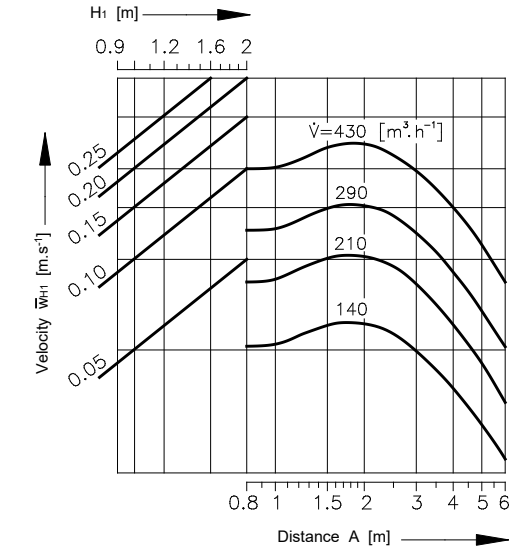
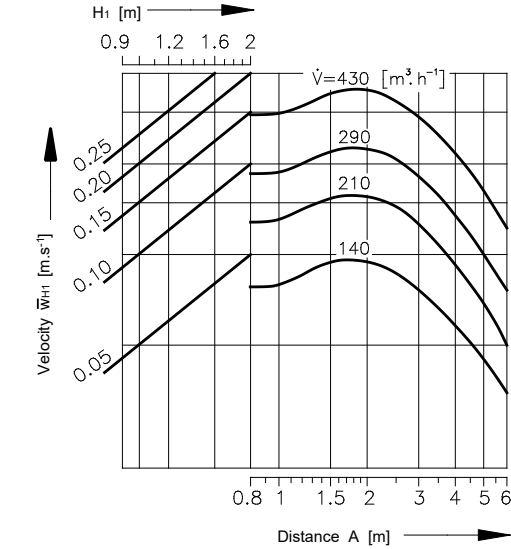


Chart 9.3.4. Alignment of outlets in more rows, if B = 3 m



Tab. 9.3.1. Corrective coefficients of pressure losses and acoustic performance according to the flap valve adjustment angle

	Flap valve adjustment angle		
	0°	45°	90°
Δp <sub>c</sub>	x1,0	x1,4	x2,8
L <sub>WA</sub>	-	+3,0	+6,0

9.4. VVM 600, 625 - 24 vanes

Chart 9.4.1. Pressure loss and acoustic performance

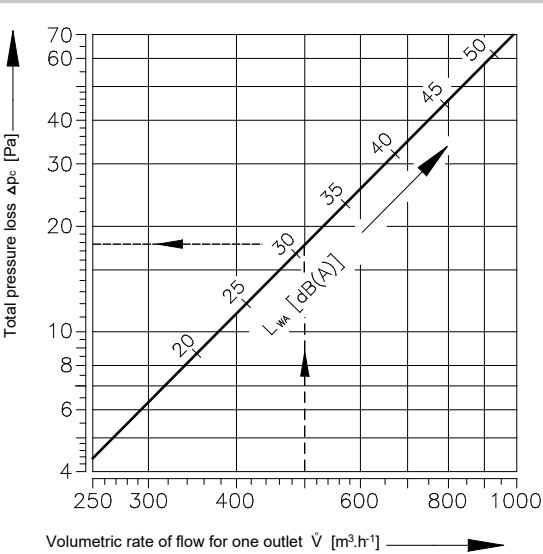


Chart 9.4.2. Air flow velocity and temperature difference

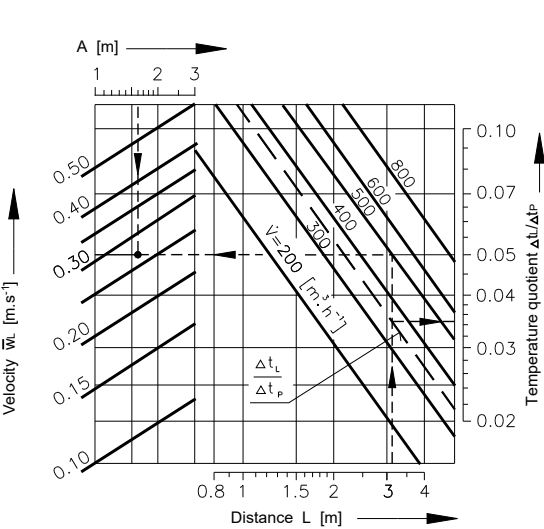


Chart 9.4.3. Alignment of outlets in one or more rows, if B ≥ 4 m

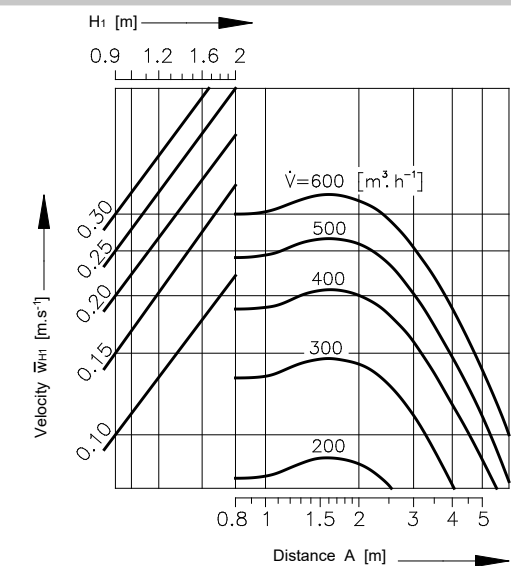
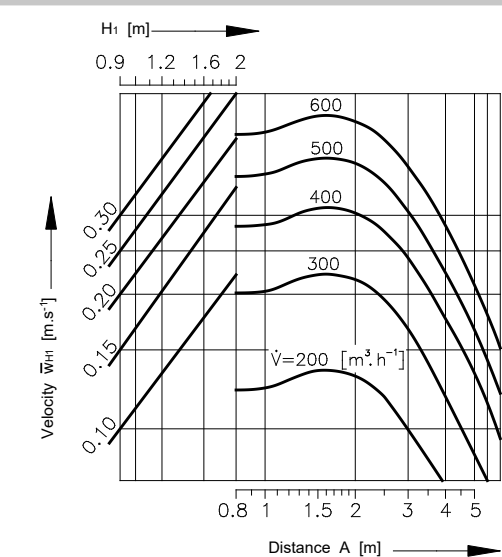


Chart 9.4.4. Alignment of outlets in more rows, if B = 3m



Tab. 9.4.1. Corrective coefficients of pressure losses and acoustic performance according to the flap valve adjustment angle

	Flap valve adjustment angle		
	0°	45°	90°
Δpc	x1,0	x1,3	x2,8
LWA	-	+3,0	+5,0

9.5. VVM 600, 625 - 48 vanes

Chart 9.5.1. Pressure loss and acoustic performance

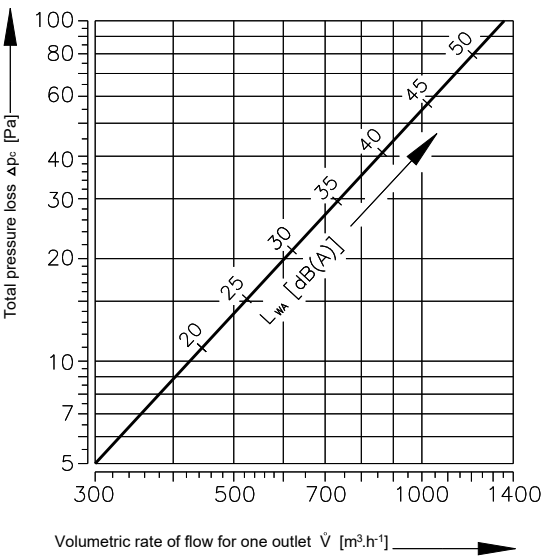


Chart 9.5.2. Air flow velocity and temperature difference

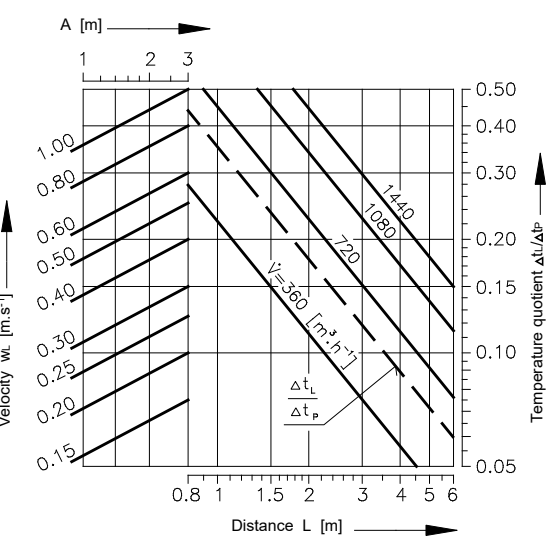


Chart 9.5.3. Alignment of outlets in one or more rows, if B ≥ 4 m

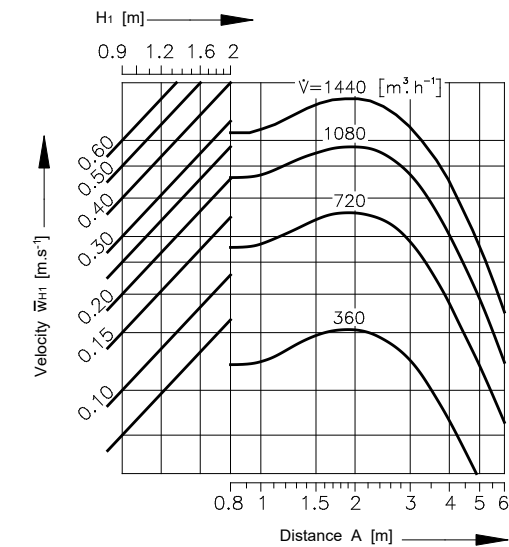
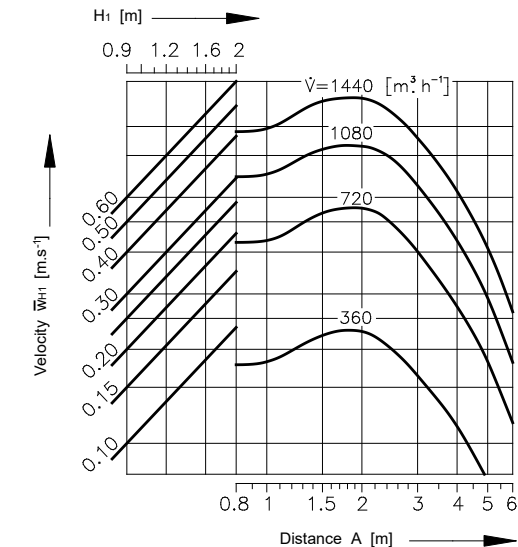


Chart 9.5.4. Alignment of outlets in more rows, if B = 3m



Tab. 9.5.1 Corrective coefficients of pressure losses and acoustic performance according to the flap valve adjustment angle

	Flap valve adjustment angle		
	0°	45°	90°
Δp <sub>c</sub>	x1,0	x1,6	x3,4
L <sub>WA</sub>	-	+4,0	+9,0

9.6. VVM 625 - 54 vanes

Chart 9.6.1. Pressure loss and acoustic performance

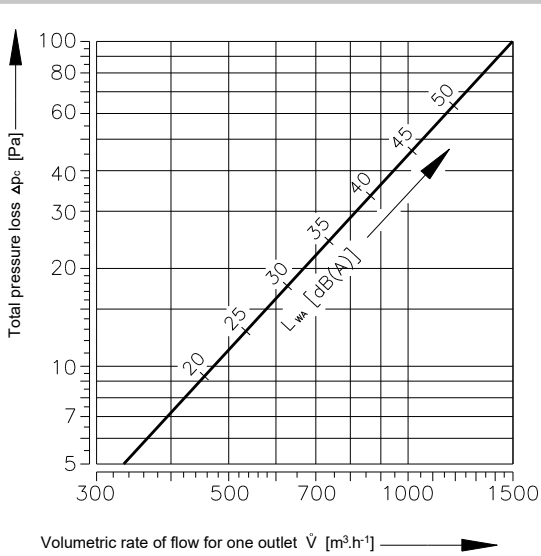


Chart 9.6.2. Air flow velocity and temperature difference

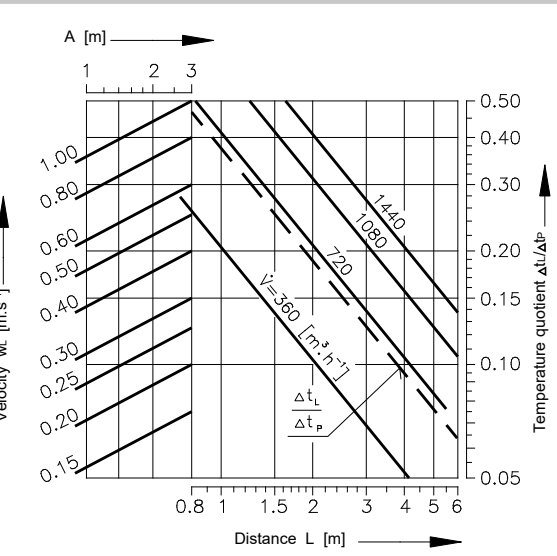


Chart 9.6.3. Alignment of outlets in one or more rows, if B ≥ 4 m

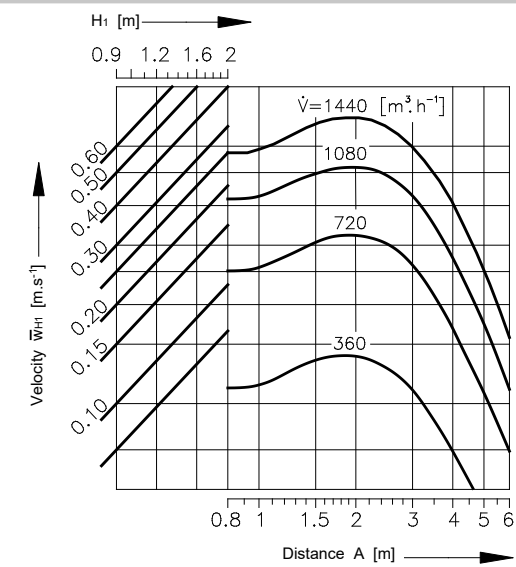
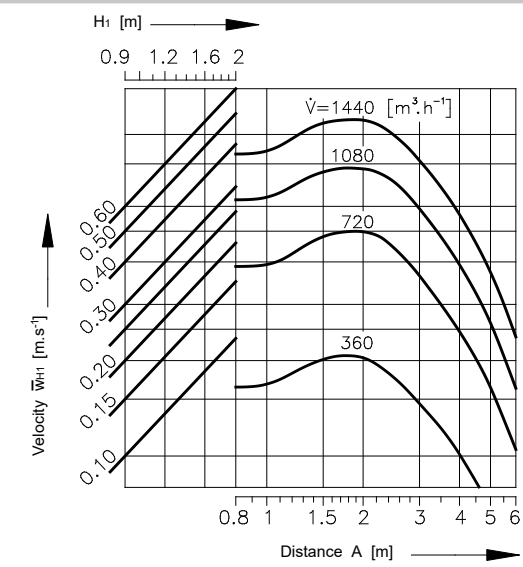


Chart 9.6.4. Alignment of outlets in more rows, if B = 3 m



Tab. 9.6.1 Corrective coefficients of pressure losses and acoustic performance according to the flap valve adjustment angle

	Flap valve adjustment angle		
	0°	45°	90°
Δp <sub>c</sub>	x1,0	x1,6	x3,4
L <sub>WA</sub>	-	+4,0	+9,0

9.7. VVM 825 - 72 vanes

Chart 9.7.1. Pressure loss and acoustic performance

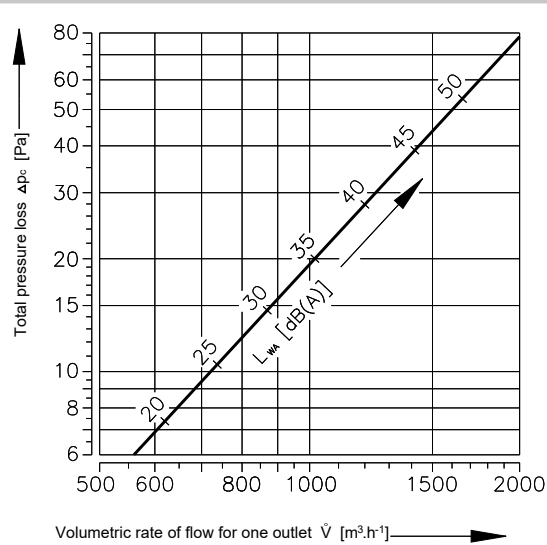


Chart 9.7.2. Air flow velocity and temperature difference

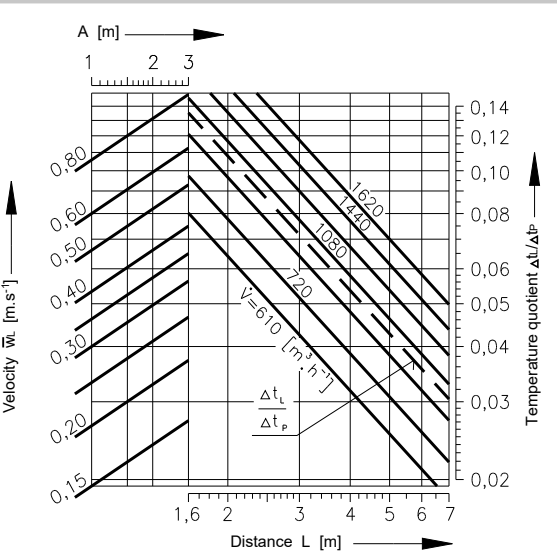


Chart 9.7.3. Alignment of outlets in one or more rows, if B ≥ 4 m

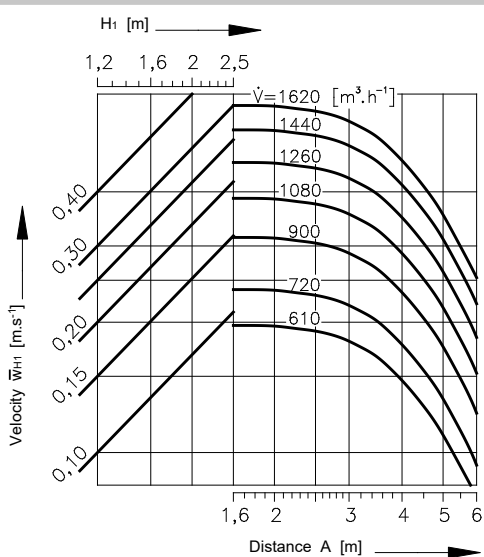
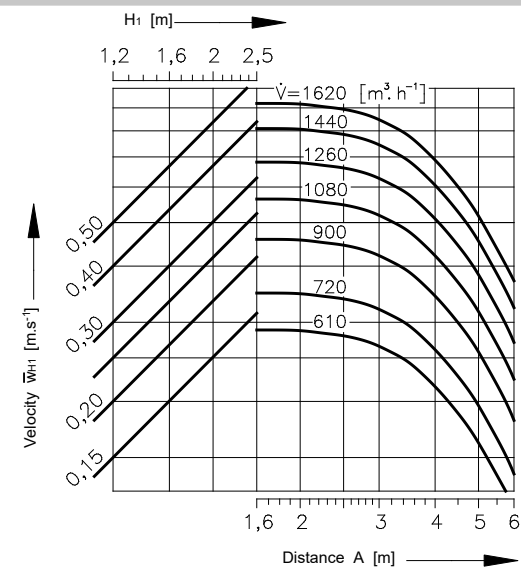


Chart 9.7.4. Alignment of outlets in more rows, if B = 3 m



Tab. 9.7.1. Corrective coefficients of pressure losses and acoustic performance according to the flap valve adjustment angle

	Flap valve adjustment angle		
	0°	45°	90°
Δpc	x1,0	x1,3	x3,3
LWA	-	+2,0	+4,0



Fig. 15 Example

Given data:	Outlet VVM 600 C/V/P/24
	$\dot{V} = 500 \text{ m}^3 \cdot \text{h}^{-1}$
	$\Delta t_p = -8 \text{ K}$
	$H_1 = 1,6 \text{ m}$
	$A = 3 \text{ m}, B = 3 \text{ m}$
	$X = 2,3 \text{ m}$
Diagram 9.4.1. :	$L_{WA} = 31 \text{ dB(A)}$
	$\Delta p_c = 18 \text{ Pa}$
Diagram 9.4.2. :	$L = A/2 + H_1 = 3,1 \text{ m}$ between outlets
	$\Delta t_L / \Delta t_p = 0,049$
	$\Delta t_L = -8 * 0,049 = -0,392 \text{ K}$
	$L = X + H_1 = 3,1 \text{ m}$ on the wall
	$\Delta t_L / \Delta t_p = 0,049$
	$\Delta t_L = -8 * 0,049 = -0,392 \text{ K}$
Diagram 9.4.4. :	$\bar{w}_{H1} = 0,12 \text{ m} \cdot \text{s}^{-1}$ between outlets
Diagram 9.4.2. :	$\bar{w}_L = 0,21 \text{ m} \cdot \text{s}^{-1}$ on the wall

#### IV. ORDERING INFORMATION

##### 10. Ordering key

<b>VVM</b>	<b>600</b>	<b>C/V/P/24/R</b>	<b>TPM 001/96</b>	
				Technical conditions
			R	– with regulating flap
				– without regulating flap
			8,16,24,48,54,72	– number of vanes
			P	– supply
			O	– exhaust
			V	– horizontal connection
			S	– vertical connection
			C	– square front panel
			K	– round front panel
				size
				type

## V. MATERIAL, FINISHING

### 11. Material

- 11.1. Front panels are made of steel sheet. The surface is coated with white baking varnish, shade number RAL 9010.
- 11.2. Vanes for regulation of air flow distribution are supplied in black as a standard. The vanes can be supplied in white, if this requirement is mentioned with the order.
- 11.3. Requirements for other shades of front panels have to be agreed with the manufacturer in advance.
- 11.4. The connection boxes are made of galvanized steel sheet. Other material design of the front plate should be discussed with the manufacturer.

## VI. TRANSPORTATION AND STORAGE

### 12. Logistic terms

- 12.1. 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.
- 12.2. If not otherwise agreed, the handover is considered when the goods is forwarded to the carrier.
- 12.3. 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%.

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