

# MANDÍK<sup>®</sup>

## WHIRLING AIR OUTFLOW OUTLET WITH FIXED BLADES

### VVPM



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

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## II. GENERAL

### 1. Description

- 1.1. Whirling air outflow outlet with fixed blades are end HVAC elements of air handling or air conditioning systems.  
The whirling air outflow ensures intensive mixing with the internal air to decrease the velocity and temperature.  
The outlets are suitable for the room height of approximately 2.6 to 4.0 m, with the air exchanges up to 30 times per hour.
- 1.2. Outlets are designed for macroclimatic areas with mild climate according to EN 60 721-3-3.
- 1.3. Temperature in the place of installation is permitted to range from - 20°C to + 70°C.
- 1.4. Outlets are suitable for systems without abrasive, chemical and adhesive particles.
- 1.5. 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. Front panels are equipped by fixed blades arranged in a circle.  
For air inlet is plenum box equipped by air disperse element. For air outlet it is not necessary.  
Front panels are installed in plenum boxes by using of central screw.
- 2.2. Design according to connection to ductwork:
  - horizontal connection (with round collars and UNIBOX from site according to request with or without regulating flap)
  - vertical connection (with round collars and 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 Design VVPM/C - square front panel

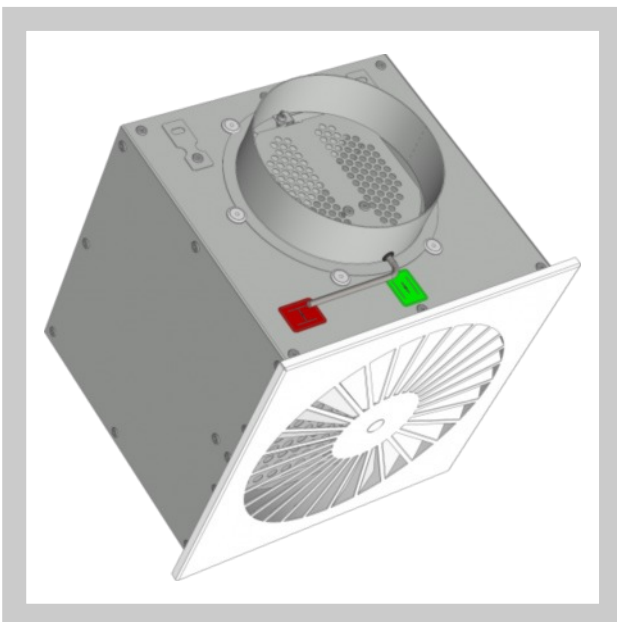
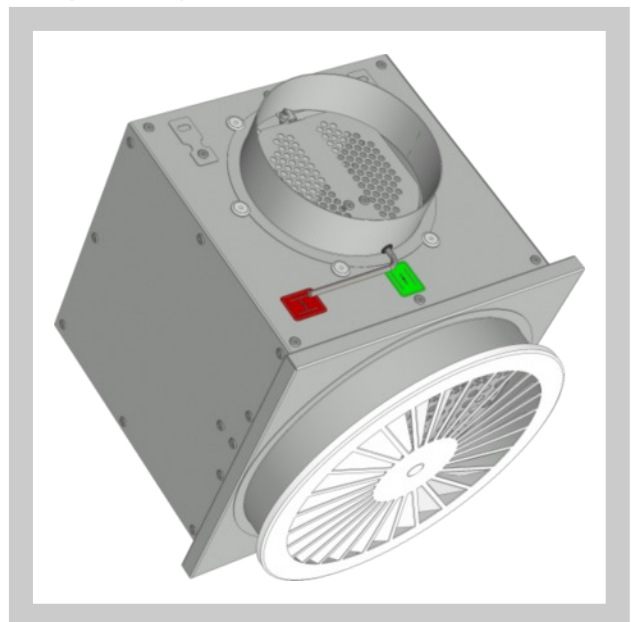


Fig. 2 Design VVPM/K - round front panel



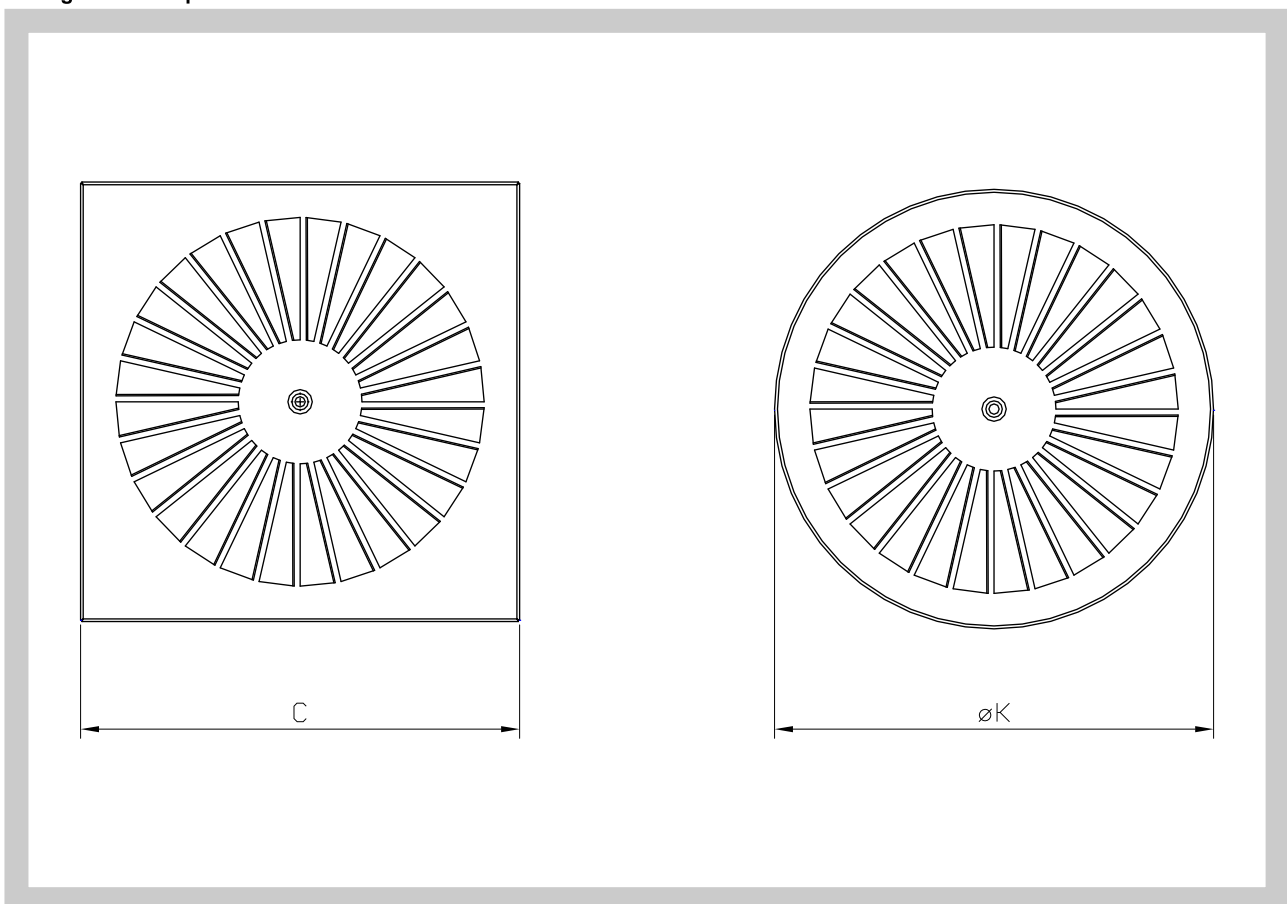
**3. Dimensions and weights**

**3.1. Dimensions and weights of front plates**

**Tab. 3.1.1. Dimensions and weights of front plates**

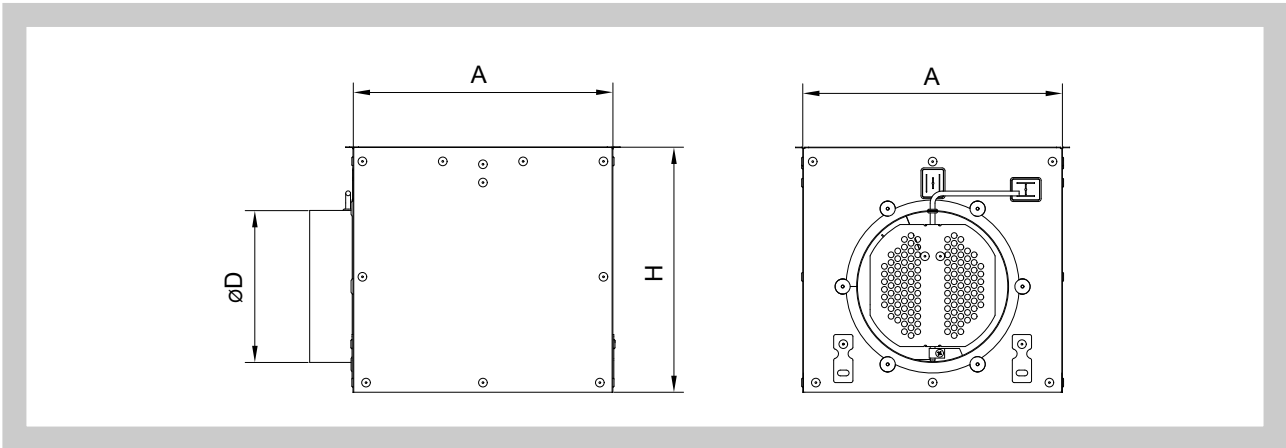
<b>Size [mm]</b>	<b>C [mm]</b>	<b>øK</b>	<b>Weights [kg]</b>
300	298	298	0,8
400	398	398	1,4
500	498	498	2,1
600	598	598	3,0
625	623	623	3,3

**Fig. 3 Front panels**



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

Fig. 4 Horizontal connection, rectangular front plates

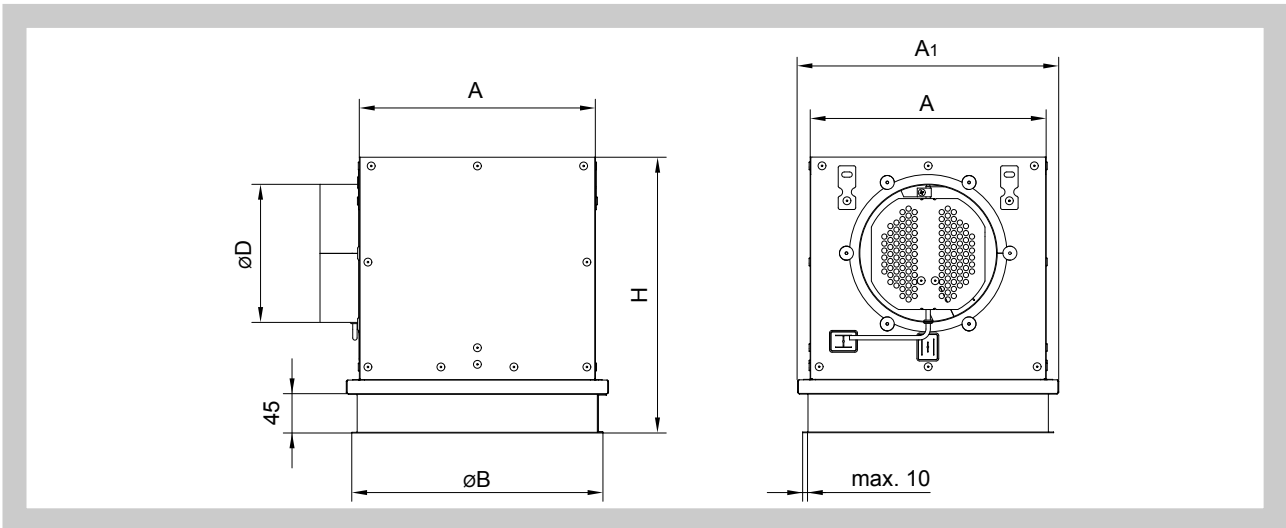


Tab. 3.2.1. Horizontal connection, rectangular front plates – dimensions, weights

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

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

Fig. 5 Horizontal connection, round front plates

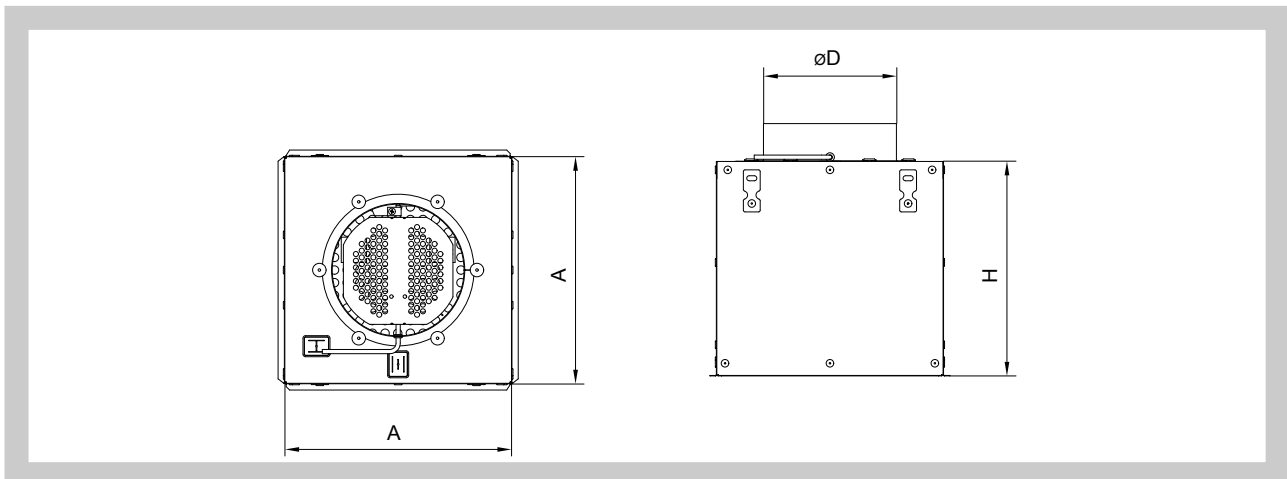


Tab. 3.3.1. Horizontal connection, round front plates – dimensions, weights

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

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

Fig. 6 Vertical connection, rectangular front plates

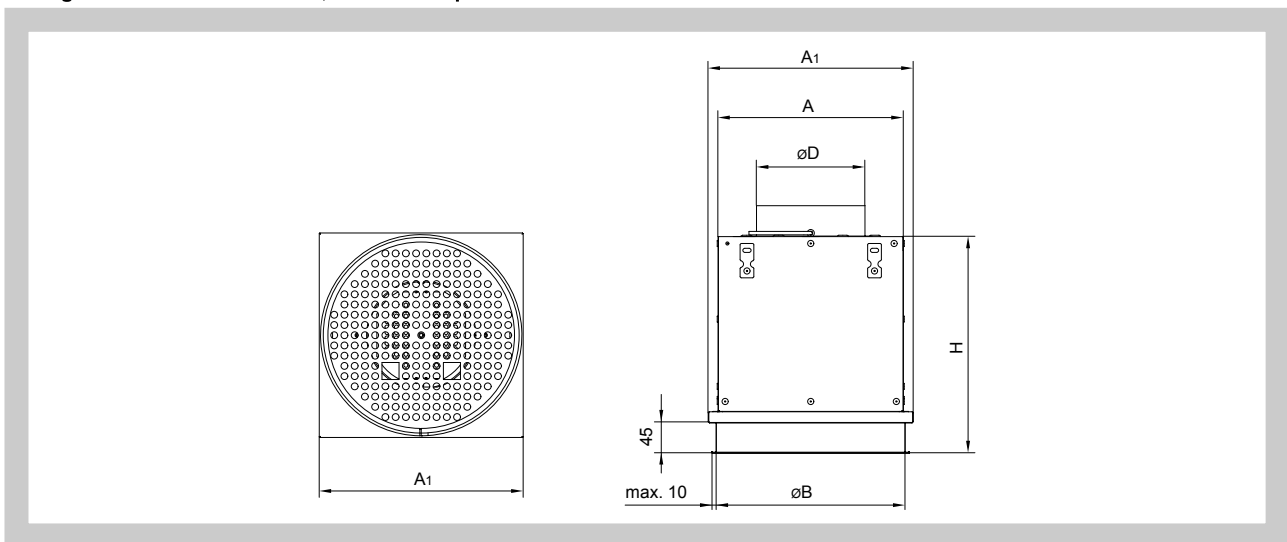


Tab. 3.4.1. Vertical connection, rectangular front plates – dimensions, weights

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

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

Fig. 7 Vertical connection, round front plates



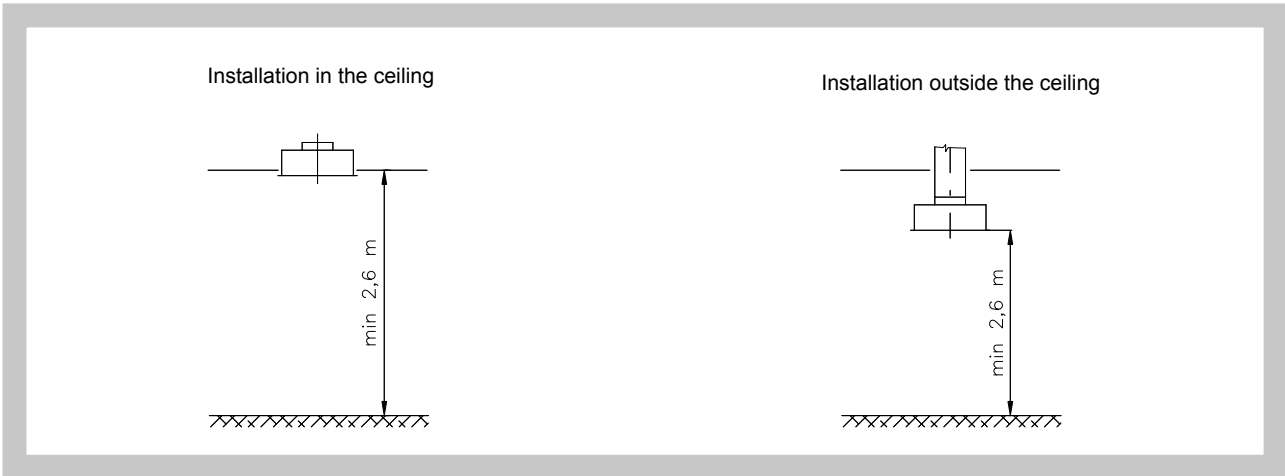
Tab. 3.5.1. Vertical connection, round front plates – dimensions, weights

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

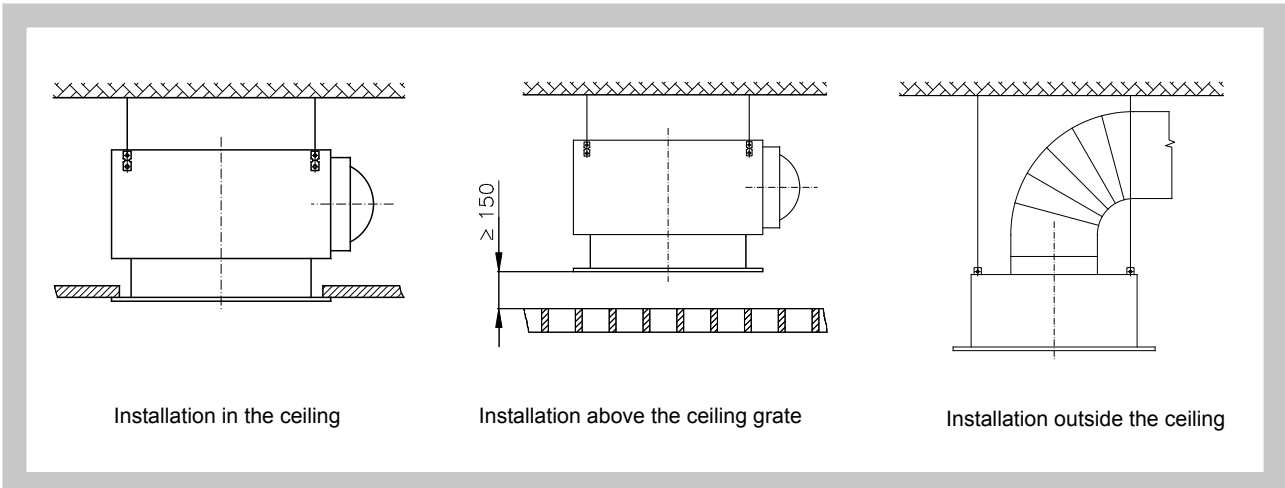
**4. Installation**

4.1. 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. 8 Installation**



**Fig. 9 Suspension methods**



**III. TECHNICAL DATA**

**5. Basic parameters**

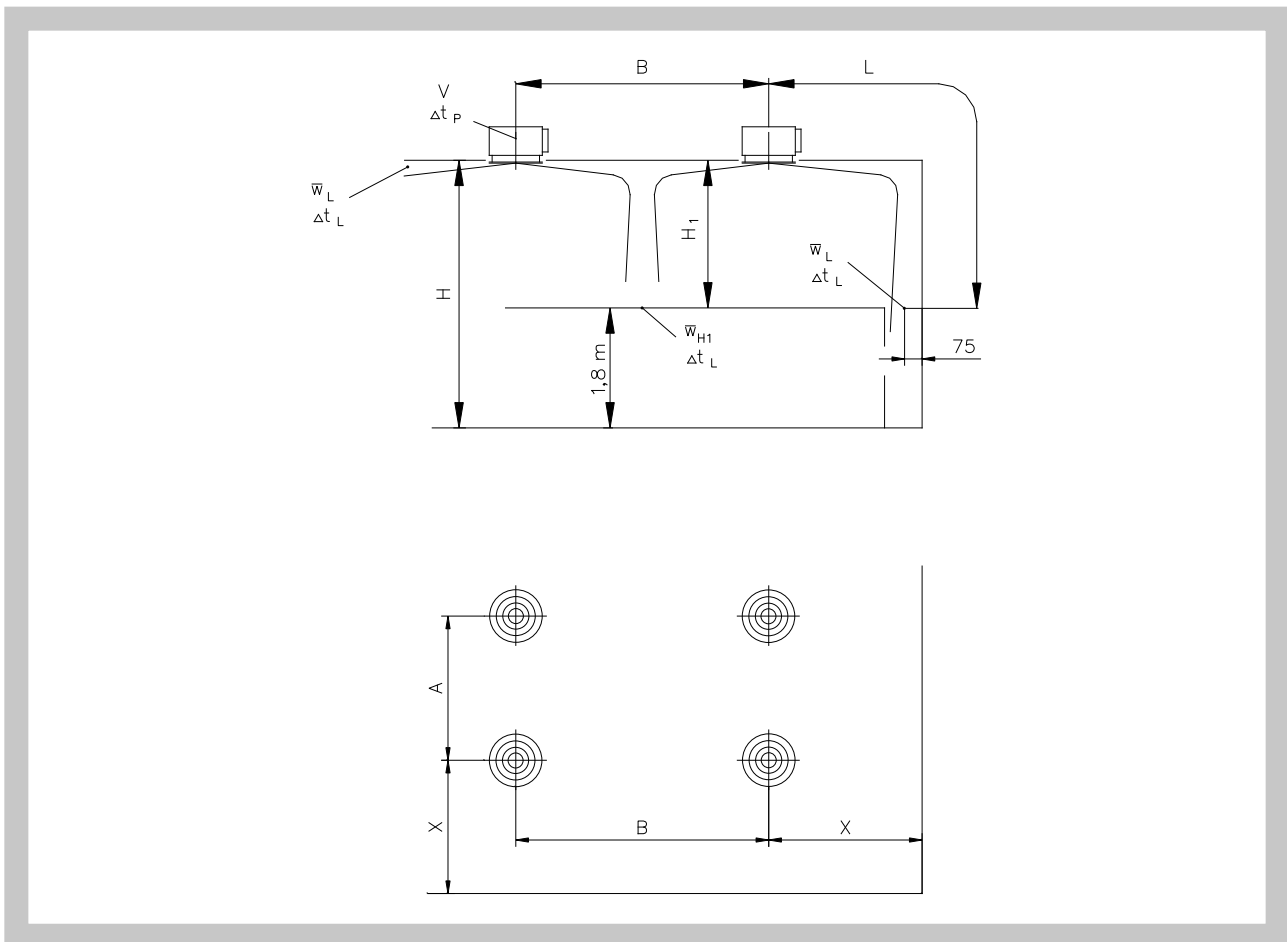
5.1. Basic parameters

**Tab. 5.1.1. Basic parameters**

Size	300		400		500		600, 625	
	horizontal	vertical	horizontal	vertical	horizontal	vertical	horizontal	vertical
$\dot{V}_{max}$ [m <sup>3</sup> .h <sup>-1</sup> ]	200		350		480		600	
$\dot{V}_{min}$ [m <sup>3</sup> .h <sup>-1</sup> ]	120		180		280		330	
L <sub>WAmax</sub> [dB(A)]	40	39	38	42	40	43	41	41
L <sub>W Amin</sub> [dB(A)]	24	25	18	24	25	28	24	24
S <sub>ef</sub> [m <sup>2</sup> ]	0,0128		0,0245		0,0374		0,0450	

6. Air flow parameters

Fig. 10



$\dot{V}$	[m <sup>3</sup> /h]	air volume flow rate for one outlet
A, B	[m]	distance between two outlets
L	[m]	horizontal + vertical distance (X + H <sub>1</sub> )
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 the occupied zone
w <sub>L</sub>	[m·s <sup>-1</sup> ]	medium velocity of air stream on the wall
w <sub>H1</sub>	[m·s <sup>-1</sup> ]	medium velocity of air stream between two outlets at distance H <sub>1</sub>
w <sub>ef</sub>	[m·s <sup>-1</sup> ]	effective velocity
Δt <sub>p</sub>	[K]	difference between the supplied air temperature and room air temperature
Δt <sub>L</sub>	[K]	difference between the air temperature in the stream axis in length L and the room air temperature in length L = A/2 + H <sub>1</sub> or L = B/2 + H <sub>1</sub> or L = X + H <sub>1</sub>
Δp <sub>c</sub>	[Pa]	total pressure loss at ρ = 1,2 kg/m <sup>3</sup>
L <sub>WA</sub>	[dB(A)]	level of acoustic output
S <sub>ef</sub>	[m <sup>2</sup> ]	effective area



7. Aerodynamic data

7.1. Pressure losses and sound power

Diagram 7.1.1. VVPM - horizontal connection - INLET

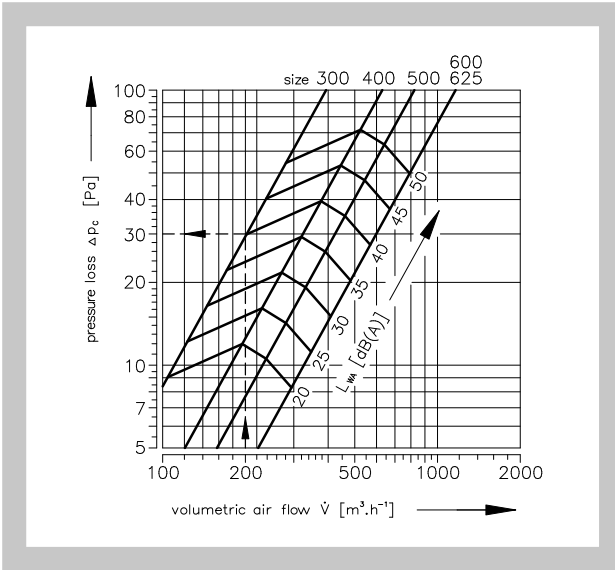


Diagram 7.1.2. VVPM - horizontal connection - OUTLET

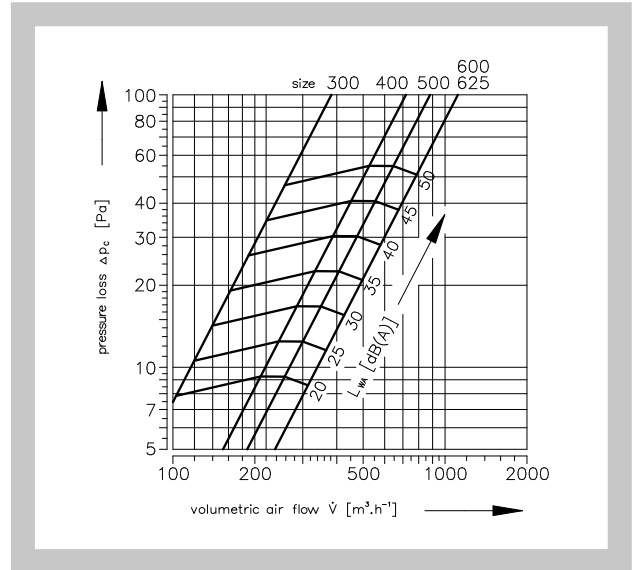


Diagram 7.1.3. VVPM - vertical connection - INLET

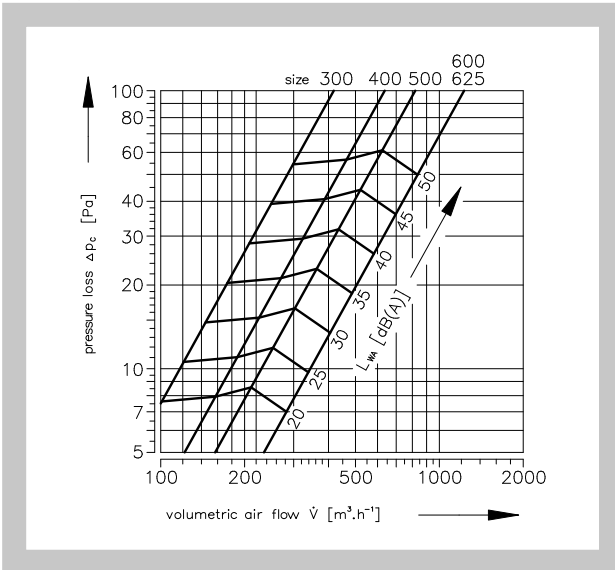
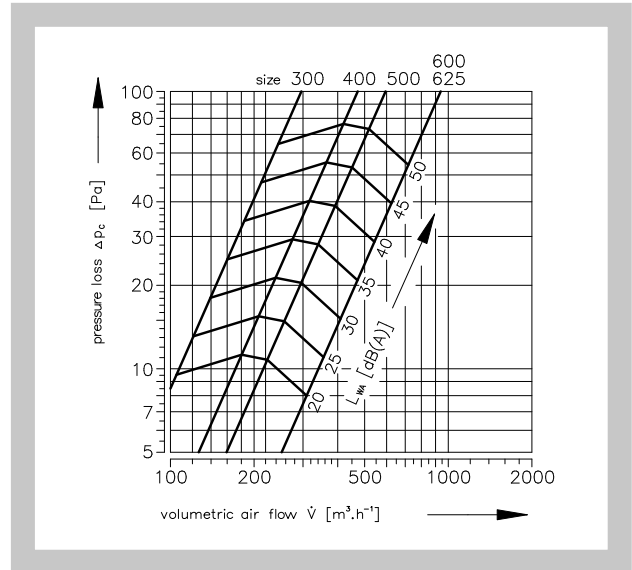


Diagram 7.1.4. VVPM - vertical connection - OUTLET



7.2. Correction coefficients of pressure losses and sound power according to the flap setting angle.

Tab. 7.2.1. Correction coefficients related to diagram 7.1.1.

Size	Flap setting angle			
	0°	45°	90°	
300	Δpc	x1,0	x1,3	x2,7
	LWA	-	+0	+2
400	Δpc	x1,0	x1,5	x2,2
	LWA	-	+1	+3
500	Δpc	x1,0	x1,6	x3,1
	LWA	-	+1	+8
600	Δpc	x1,0	x1,5	x2,9
	LWA	-	+1	+4

Tab. 7.2.2. Correction coefficients related to diagram 7.1.3.

Size	Flap setting angle			
	0°	45°	90°	
300	Δpc	x1,0	x1,3	x2,7
	LWA	-	+0	+2
400	Δpc	x1,0	x1,5	x2,2
	LWA	-	+1	+3
500	Δpc	x1,0	x1,6	x3,1
	LWA	-	+1	+8
600	Δpc	x1,0	x1,5	x2,9
	LWA	-	+1	+4

7.3. Effective velocity and temperature coefficient

Diagram 7.3.1. Effective velocity

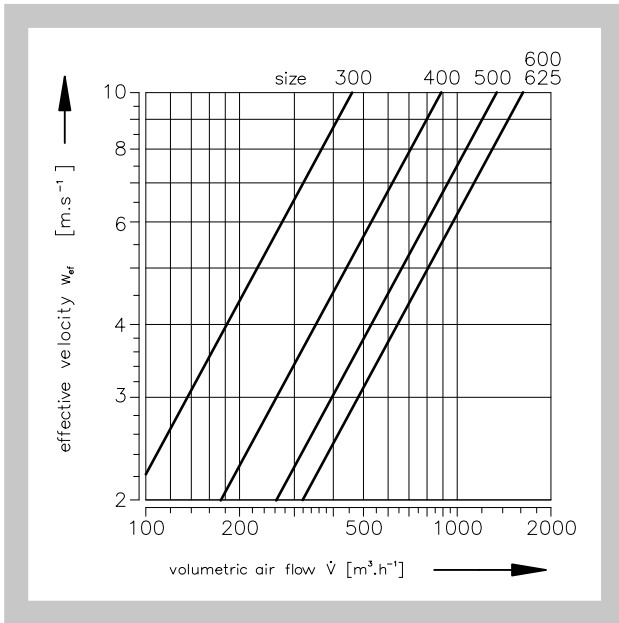


Diagram 7.3.2. Temperature coefficient

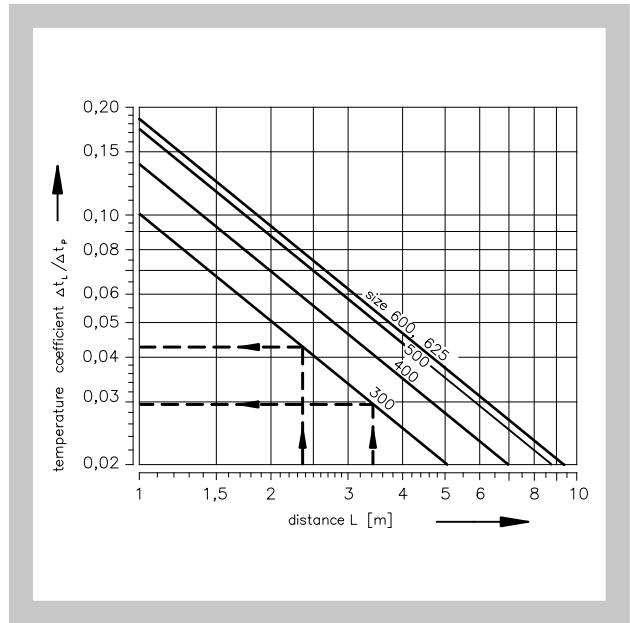
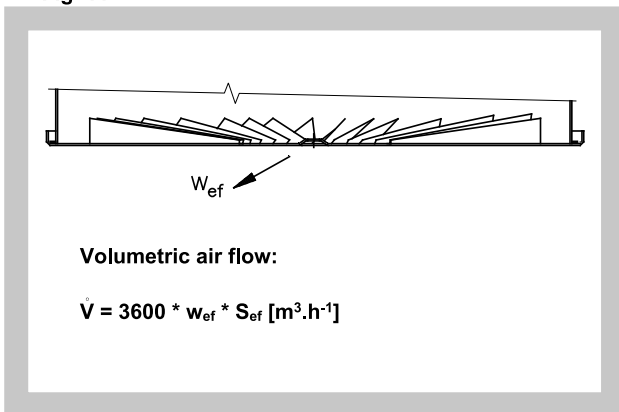
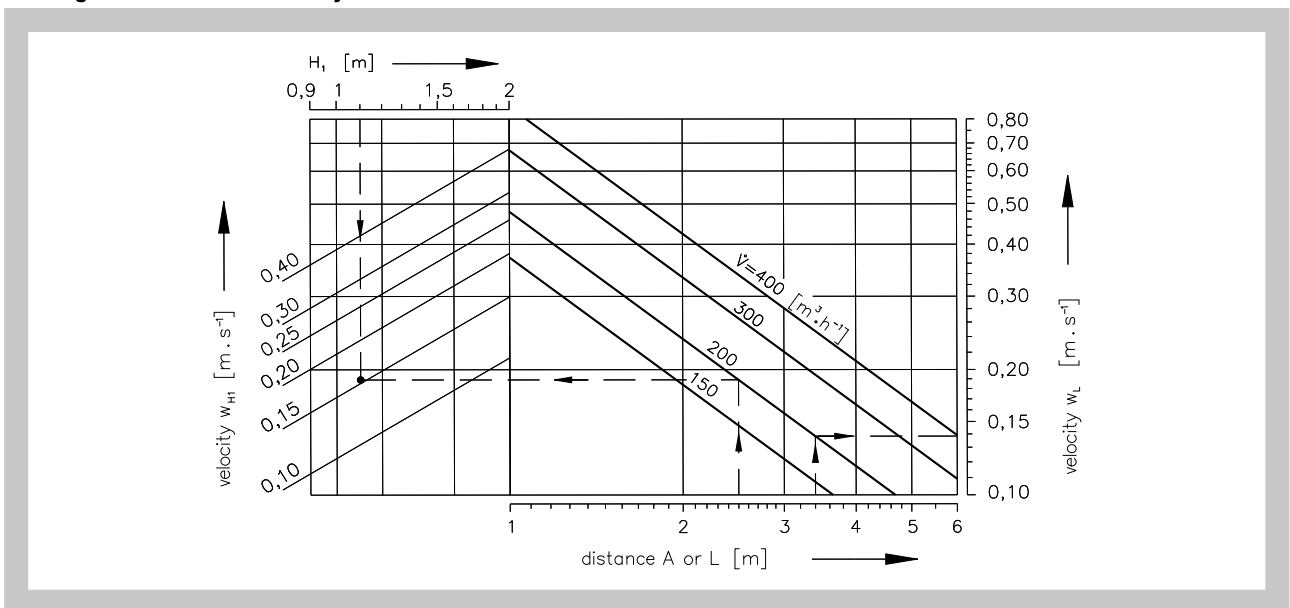


Fig. 11

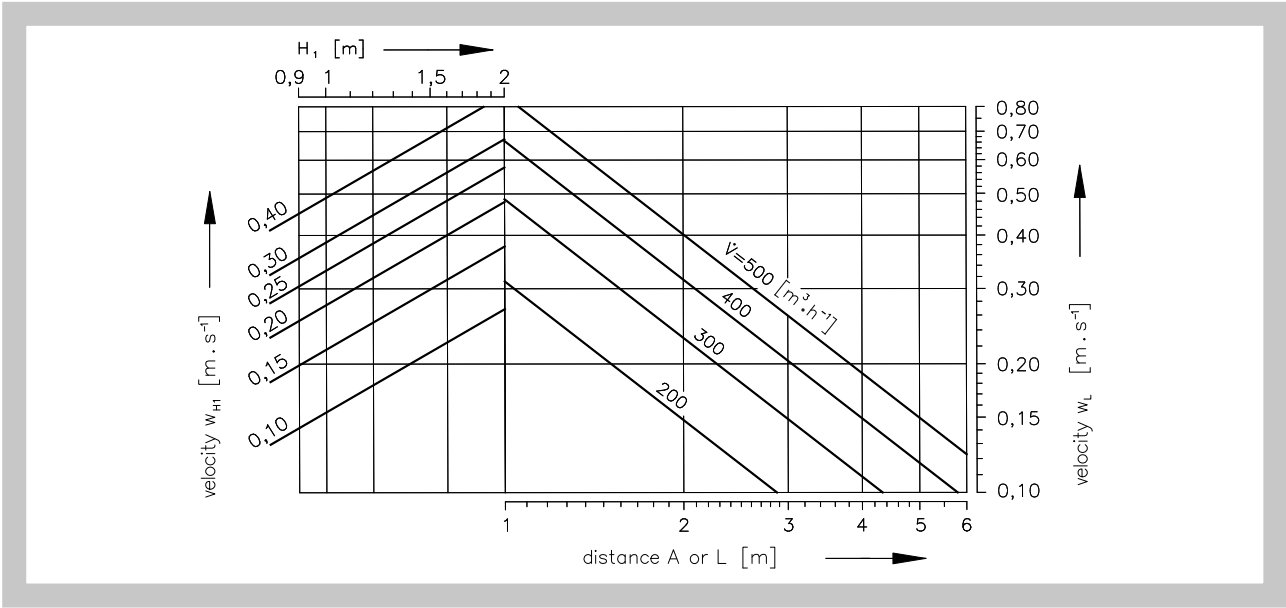


7.4. Air velocity

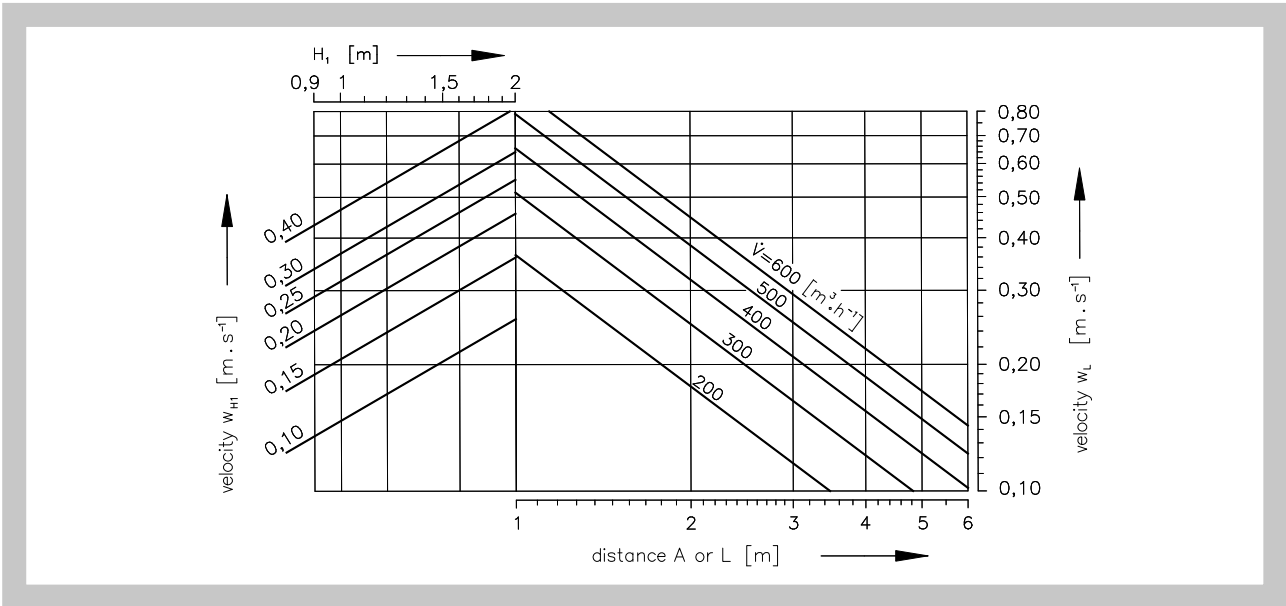
Diagram 7.4.1. Air velocity - size 300



**Diagram 7.4.2. Air velocity - size 400**



**Diagram 7.4.3. Air velocity - size 500**



**Diagram 7.4.4. Air velocity - size 600, 625**

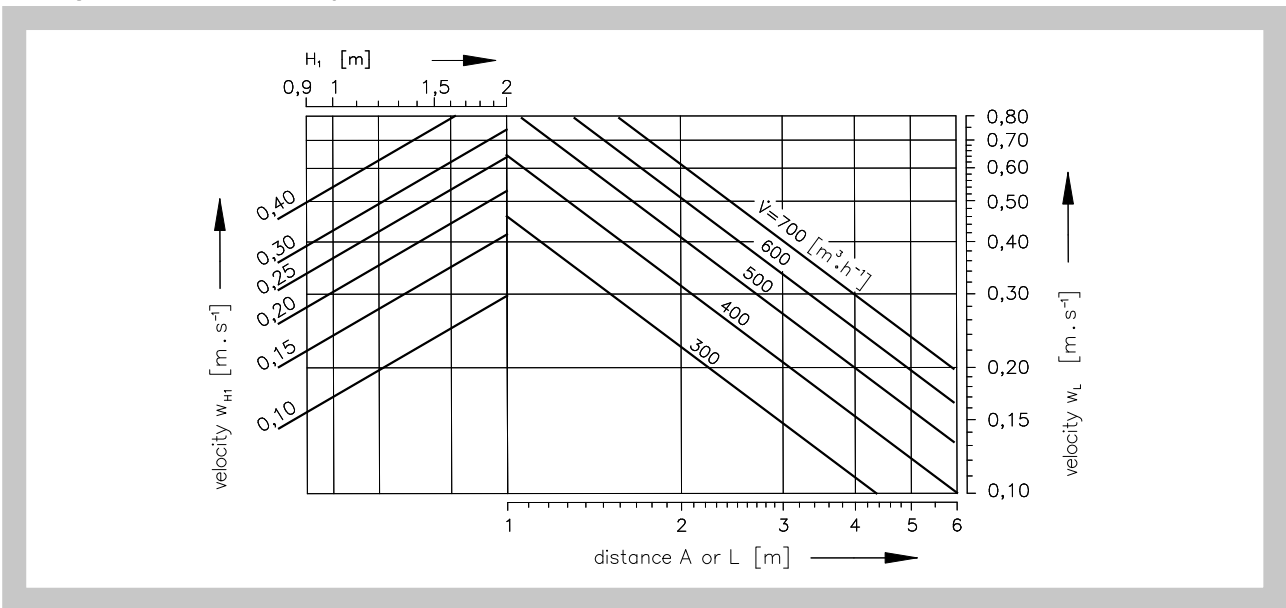


Fig. 12 Example

Given data:	Outlet VVPM 300 C/V/P/R	
	$\dot{V} = 200 \text{ m}^3 \cdot \text{h}^{-1}$	
	$\Delta t_p = - 8 \text{ K}$	
	$H_1 = 1,1 \text{ m}$	
	$A = 2,5 \text{ m}$	
	$X = 2,3 \text{ m}$	
Diagram 7.1.1. :	$L_{WA} = 40 \text{ dB(A)}$	
	$\Delta p_c = 30 \text{ Pa}$	
Diagram 7.3.2. :	$L = A/2 + H_1 = 2,35 \text{ m}$	between outlets
	$\Delta t_L / \Delta t_p = 0,042$	
	$\Delta t_L = - 8 * 0,042 = - 0,34 \text{ K}$	
	$L = X + H_1 = 3,4 \text{ m}$	on the wall
	$\Delta t_L / \Delta t_p = 0,029$	
	$\Delta t_L = - 8 * 0,029 = - 0,23 \text{ K}$	
Diagram 7.4.1. :	$\bar{w}_{H1} = 0,15 \text{ m} \cdot \text{s}^{-1}$	between outlets
	$\bar{w}_L = 0,14 \text{ m} \cdot \text{s}^{-1}$	on the wall

#### IV. MATERIAL, FINISHING

##### 8. Material

- 8.1. Front panels are made of steel sheet. The surface is coated with white baking varnish, shade RAL 9010. The plenum boxes are made of galvanized steel sheet. Other material design of the front plate should be discussed with the manufacturer.
- 8.2. Requirements for other shades of the front panels shall be agreed in advance.

#### V. TRANSPORTATION AND STORAGE

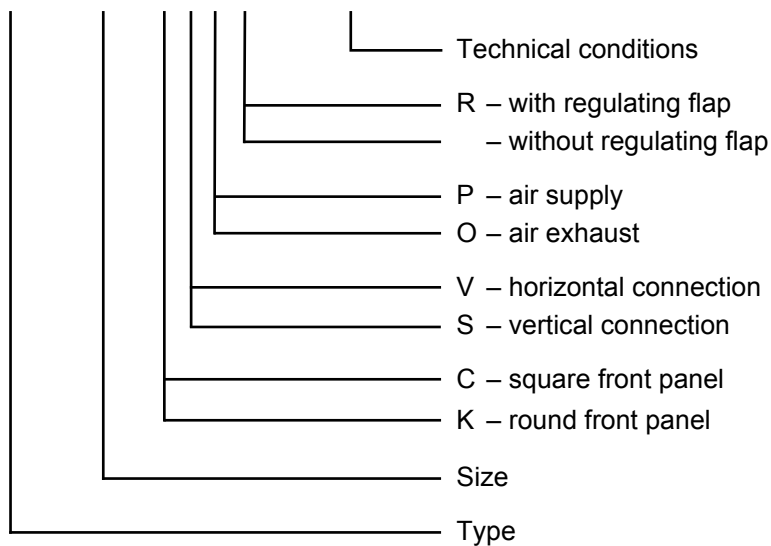
##### 9. Logistic terms

- 9.1. 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.
- 9.2. 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**

**10. Ordering key**

Outlet **VVPM** **600** **C/V/P/R** **TPM 007/99**



MANDÍK, a.s.  
Dobříšská 550  
26724 Hostomice  
Czech Republic  
Tel.: +420 311 706 706  
E-Mail: [mandik@mandik.cz](mailto:mandik@mandik.cz)  
[www.mandik.com](http://www.mandik.com)

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