Air displacement units SD-3

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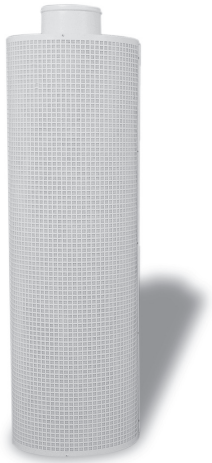
Application

Air displacement units are suitable for both industrial and comfort air conditioning applications. They are suitable for rooms characterised by high heat loads or heavy air pollution. Air displacement units supply air at large flow rates (up to 10.000 m³/h), at low air velocities (in the range from 0.1 to 0.3 m/s). Supplied air forms a so called »fresh air pool« in the occupied zone. Air is lifted in convection currents from heat sources to the ceiling layer, from which it is extracted from the room. In this way, even temperature field is maintained in the room, free of draught. Diffusers can be installed suspended from the ceiling, standing on the floor or hanging immediately above the occupied zone.

SD-3



SD-3: cylindrical

Description

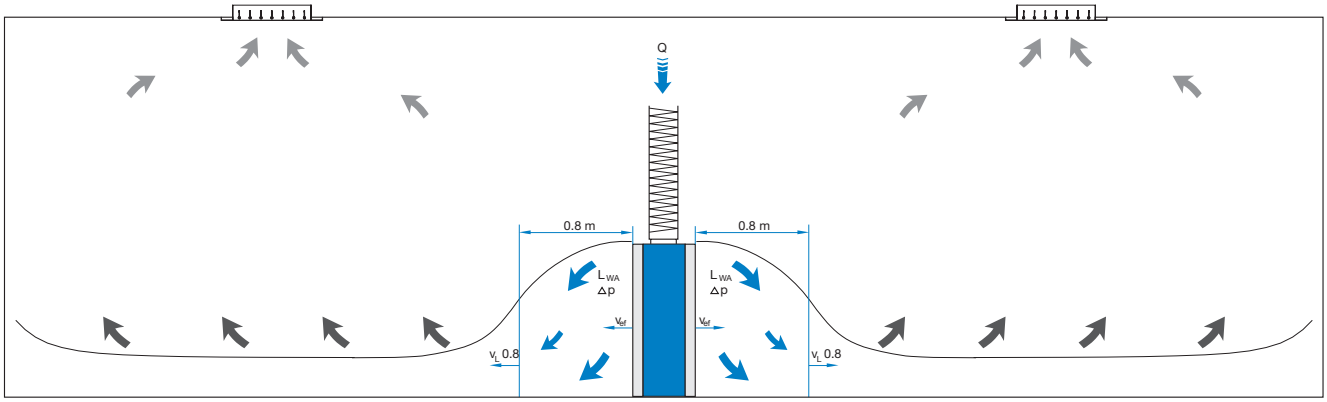
Air displacement units are made of sheet steel and painted in RAL 9010. They can be coloured in any other RAL colour at to the customer's request. They consist of a mantle, a bottom plate and a top plate equipped with an inlet spigot. The standard shape of the spigot is round. At the customer's request, it can be rectangular according to the dimension of the unit.

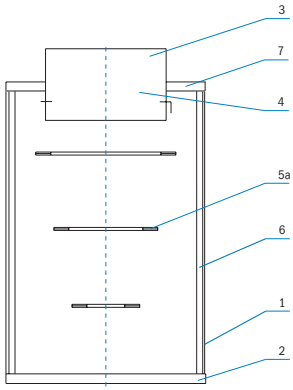
The air displacement unit mantle perfora-tion is designed according to the version. The versions without a filter (F5) have mantle perforation with round openings (ϕ 5.5 x 8 mm, 37 % free area). The versions with a filter (F3 and F6) have square openings (10 x 10 x 2 mm, 69 % free area).

To achieve a uniform distribution of air across the entire displacement surface, versions F3 and F6 are recommended.

Definition of symbols

Q (m³/h)	Air flow rate
v_L (m/s)	Supplied air velocity at the throw distance L=0.8 m
v_{ef}	Effective dishcarge air velocity
Δp_t (Pa)	Pressure drop
L_{WA} (dB(A))	Sound power level

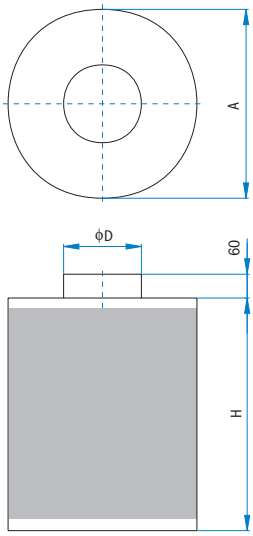




1. Perforated mantle
2. Bottom plate
3. Round inlet spigot
4. Control flap
5a. Dividing rings
6. Filter
7. Top plate

Dimensions

SD-3

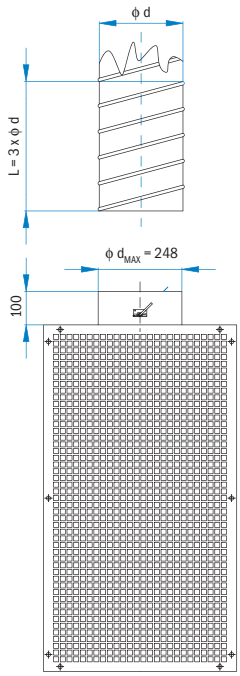


H
750
1000
1250
1500
2000
2500

Size	A	ϕD
400	400	248
600	600	298
800	800	348
1000	1000	398
1500	1500	498
2000	2000	548

Inlet spigot ϕd_{max} = 248 mm

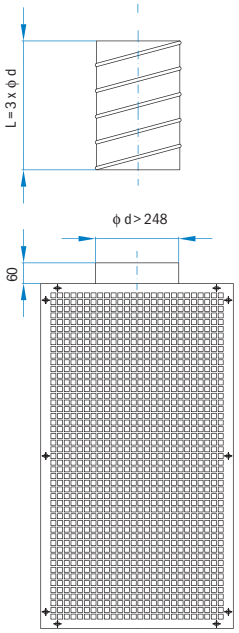
The minimum straight duct length L = 3 x ϕd before the diffuser is sufficient to stabilise the airflow at the diffuser inlet.



ϕd (mm)	Q_{max} (m³/h)
78	80
98	130
123	200
138	260
148	300
158	340
178	440
198	540
223	690
248	850

Example of correct assembly of airflow regulation SD-3

Maximum airflow Q_{max} for the chosen inlet spigot with a size of ϕd has been calculated for the maximum recommended air velocity in the spigot of V = 5 m/s. Optimum air velocity in the spigot is 2 – 3 m/s.



ϕd (mm)	Q_{max} (m³/h)
278	1080
298	1240
313	1370
353	1740
398	2220
448	2810
498	3480
558	4370
628	5540

Ordering key

SD-3 / F3 / Size 400 H=750

1 2 3 4

1 Diffuser type

SD-3	Cylindrical displacement unit

2 Versions

F3	With peripheral filter, perforation with square openings (10x10x2 mm, 69% free area)
F5	With dividing rings without filters, perforation with round openings (5.5 x 8 mm, 37% free area)
F6	With dividing rings and peripheral filter, perforation with square openings (10x10x2 mm, 69% free area)

3 Standard sizes

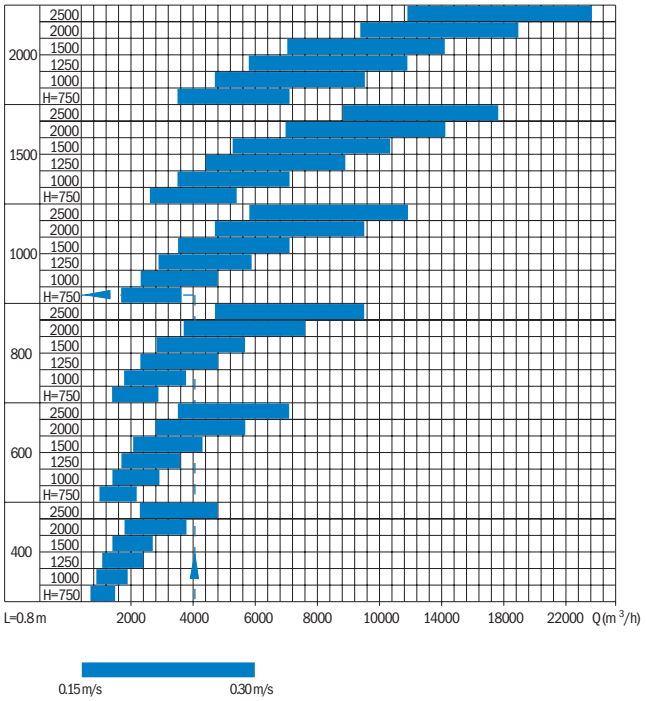
400
600
800
1000
1500
2000

4 Standard heights in mm

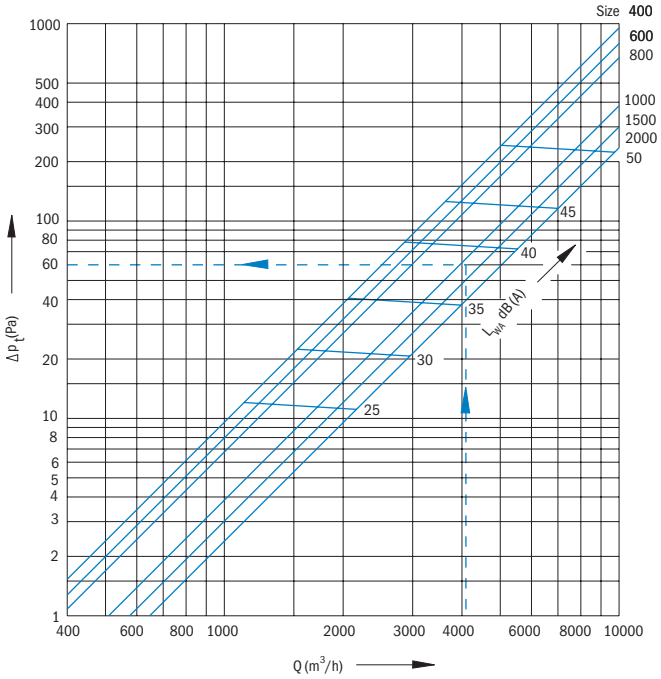
750
1000
1250
1500
2000
2500

Technical data for SD-3

Diagrams to determine the supplied air velocity at the throw distance L=0.8 m:



Pressure drop and noise level diagram:



KF correction factor table

Correction	Size	750	1000	1250	1500	2000	2500
Δp_t for the type F6	**400**	1.11	1.00	0.95	0.93	0.90	0.89
	600	1.14	1.00	0.94	0.90	0.87	0.86
	800	1.18	1.00	0.92	0.88	0.83	0.82
	1000	1.22	1.00	0.90	0.85	0.79	0.77
	1500	1.18	1.00	0.92	0.88	0.84	0.82
	2000	1.17	1.00	**0.92**	0.89	0.85	0.83
Δp_t for the type F5	**400**	0.89	0.88	0.88	0.88	0.87	0.87
	600	0.85	0.84	0.84	0.84	0.83	0.83
	800	0.81	0.80	0.79	0.79	0.79	0.78
	1000	0.77	0.75	0.74	0.74	0.74	0.83
	1500	0.81	0.80	0.79	0.79	0.79	0.78
	2000	0.83	0.81	**0.81**	0.80	0.80	0.73

Definition of symbols

Q (m³/h)	Air flow rate
v_L (m/s)	Supplied air velocity at the throw distance L=0.8 m
Δp_t (Pa)	Pressure drop
L_{WA} (dB(A))	Sound power level

Example calculation

Q = 4000 m³/h

We select size 1000; H = 750

A_{ef} = 1 x π x 0.75 x 0.6944 = 1.64 (m²)

v_{ef} = Q / (A_{ef} x 3600) = 4000 / (1.64 x 3600) = 0.68 m/s

L_{WA} = 37 dB(A)

Pressure drop:

Tip F3

Δp_t = from the diagram x KF (za H = 750) = 60 x 1.05 = 63.0 Pa

Tip F5

Δp_t = from the diagram x KF (za H = 750) = 60 x 0.95 = 57.0 Pa

Free area A_{ef}:

A_{ef} = A x π x H x 0.6944 (m²) A- Size (m)

A_{ef}= A x π x H x 0.37 (m²) for the versions F5 (without filter) and mantle perforation with round openings