

How to select the right diffuser?

Introduction

Diffusers are the interface between the HVAC ductwork and the occupied space.

A diffuser's primary purpose is to introduce conditioned air into the room without creating uncomfortable drafts or excessive noise. That's why selecting the right diffuser is very important for any consultant and contractor.

The secondary role of diffuser is to suit any kind of room for a perfect indoor integration. Aldes diffusers have been designed to serve this purpose.



Procedure for selection of a diffuser

1st step: to collect all the necessary information to select the right diffuser

- 1) **Acceptable noise level** (NC / NR / RC)
- 2) Detail of the **airflow**
 - Overall
 - Through each diffuser/grille
- 3) **Use**
 - Supply
 - Exhaust
- 4) **Dimensions of the room** (L x W)
- 5) **Height of ceiling** (H)
 - Less than 3m
 - Between 3m and 5m
 - More than 5m
- 6) Select the right product based on the height of ceiling, mixing rate, mixing dimension:
 - **Grilles** (*adjustable/fixed blades, linear fixed bars*)
 - (4-10 vol/h; 1D mixing)
 - **Ceiling Diffusers** (*4-ways, slot, round*)
 - (6-20 vol/h; 2D mixing)
 - **Swirl Diffusers** (*adjustable blades, fixed*)
 - (6-25 vol/h; 1D mixing)

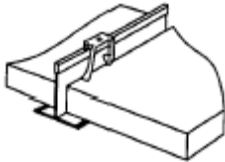
Design Guidelines for HVAC-Related Background Sound in Rooms (Ref. ASHRAE Handbook)

Room Types	RC(N); QAI ≤ 5dB Criterion a,b
Residences, Apartments, Condominiums	25 – 35
Hotels/Motels	
Individual rooms or suites	25 – 35
Meeting/banquet rooms	25 – 35
Corridors, lobbies	35 – 45
Service/support areas	35 – 45
Office Buildings	
Executive and private offices	25 – 35
Conference rooms	25 – 35
Teleconference rooms	25 (max)
Open-plan offices	30 – 40
Corridors and lobbies	40 – 45
Hospitals and Clinics	
Private rooms	25 – 35
Wards	30 – 40
Operating rooms	25 – 35
Corridors and public areas	30 – 40
Performing Arts Spaces	
Drama theaters	25 (max)
Concert and recital halls c	
Music teaching studios	25 (max)
Music practice rooms	30 – 35 (max)
Laboratories (with fume hoods)	
Testing/research, minimal speech communication	45 – 55
Research, extensive telephone use, speech communication	40 – 50
Group teaching	35 – 45
Churches, Mosques, Synagogues	
General assembly	25 – 35
With critical music programsc	

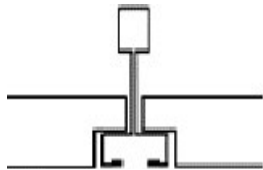
7) Way of **installation**

- Wall
- Ceiling: type and dimension

→ Standard T profile



→ Fine line profile



8) Define the **aesthetic** that would suit the best the room:

Square diffusers replacing ceiling tiles, slot diffusers as per the layout of interior, RAL color to match with ceiling etc.

9) Identifying the **system**

- Ventilation
- Air conditioning: AHU, FCU, ...

10) **Type** of **airflow**

- Constant
- Variable (how many possible speeds on the unit)

11) **Fixing way** and the **plenum**

- Screws, clamps, clips, rivets...
- Position of the connections (side or top)
- Thermal (5 sides) or acoustic (2 sides) insulation

Terminal velocity (V_T) criteria:

- Terminal velocity is the velocity at the end of the air-jet throw.

$\frac{V_T}{(m/s)}$	<u>Results</u>	<u>Requested buildings</u>
$V_T = 0.25$	Top comfort	Hotels, hospitals...
$V_T = 0.37$	Comfortable	Offices, Open spaces, Meeting rooms, retail stores
$V_T = 0.50$	Quite Comfortable	Retail stores, malls
$V_T = 0.625$	Not good comfort for sitting people	Sport buildings,...
$V_T = 0.75$	Not comfortable (flying papers)	Halls, industrial buildings, corridors...

2nd step: to choose the right diffuser according to required performance

There are three useful options available in Aldes ME (General Catalogue) for the selection of right diffuser i.e **Selection Guide**, **Product Page** and **Selection Table**.

Selection Guide					
Applications	Range	Model	System options of the diffuser	Final use	
Wall-mounted air supply	Small fixed metal grilles Air circulation levels 1 - 4	BM 300 Page 266	++ +	-	
	Adjustable core grilles Air circulation levels 1 - 4	SN 140 Page 265	++ +	-	
	Single / double deflection grilles Air circulation levels 4 - 10	AC 101 D Page 265	++ +	+	
	Fixed linear bar grilles Air circulation levels 4 - 10	AC 140 Page 263	++ +	++ +	
	Floor-mounted fixed linear bar grilles Air circulation levels 4 - 10	AG 430 Page 267	++ +	+	
	Fixed linear bar grilles (LH HQ) Air circulation levels 4 - 10	AC 440 Page 263	+	++ +	
	Fixed air transfer blades grilles	AC 181 Page 266	++ +	++ +	
	Ceiling-mounted air supply	Small fixed metal grilles Air circulation levels 1 - 6	BM 300 Page 266	++ +	-
		Fixed circular diffusers for ceiling fans Air circulation levels 4 - 10	SC 832 TP Page 243	++ +	-
		Adjustable circular diffusers for ceiling fans Air circulation levels 4 - 20	AF 842 Page 247	++ +	++ +
Fixed square diffusers for ceiling fans Air circulation levels 4 - 20		SF 704 TP Page 242	++ +	++ +	
Combined multi-slots square diffusers for ceiling fans (air supply and return) Air circulation levels 4 - 20		ALD 810 K COMBINED Page 232	++ +	++ +	
Adjustable square diffusers - perforated sheet - for ceiling fans Air circulation levels 4 - 20		SC 360 R Page 249	+	++ +	
Swift square diffusers for ceiling fans Air circulation levels 4 - 20	SF 766 Page 238	+	++ +		

218 air&people General Catalogue 2011

Ceiling Diffusers

Square, removable core diffusers

Advantages:

- Hydraulic design
- L, L1 or L2 easy diffusion
- High velocity flow
- The filter is removable to avoid dust accumulation

APPLICATION:

- Fixed horizontal air supply diffusion
- Simple hanging installation (AF 704 - L1 or L2) and air-conditioning (AF 704 - L)
- Ceiling mounted

DESCRIPTION:

- External frame and core in anodized aluminium
- Removable core using a system of clips for access to the blades
- AF 704 - L1: 200° free adjustment
- AF 704 with spray painted case finish - RAL 9005
- Connection to circular ducts

ACCESSORIES:

- Change of 700 in aluminium. Counter rotating blades. Available in the form of level of the diffuser. Mounted on the diffuser using the clips supplied.
- AF 704 connecting panel (AF 704 connecting panels in aluminium or in steel construction)
- AF 704 connecting panel in galvanneal steel. Available in different sizes.

OPTIONS:

- White Rango screen, 50mm in the AF 704 range only.
- Optional frame, 50mm in the AF 704 range only.
- All above type in stainless steel (optional) with opposite blade design.
- All above type in stainless steel (optional) with opposite blade design. AF 704 S.

ADDITIONAL RANGE:

- The frame versions. Rectangular versions.
- Request from us regarding with the file, colour chart, grilles, control etc.
- Designed for suspended ceilings.
- See Selection Table on page 243.

RANGE:

Connections	1-way diffuser AF 704 Code	2-way diffuser AF 702 Code	4-way diffuser AF 703 Code	6-way diffuser AF 704 L, L1, L2 Code	8-way diffuser AF 705 Code
100 x 100	100 x 100	100 x 100	100 x 100	100 x 100	100 x 100
150 x 150	150 x 150	150 x 150	150 x 150	150 x 150	150 x 150
200 x 200	200 x 200	200 x 200	200 x 200	200 x 200	200 x 200
250 x 250	250 x 250	250 x 250	250 x 250	250 x 250	250 x 250
300 x 300	300 x 300	300 x 300	300 x 300	300 x 300	300 x 300
400 x 400	400 x 400	400 x 400	400 x 400	400 x 400	400 x 400
500 x 500	500 x 500	500 x 500	500 x 500	500 x 500	500 x 500

General Catalogue 2011 air&people 243

Selection Tables

AF 842 - AT 842 Series

Air supply with ceiling effect

AF 842	AT 842	AF 842	AT 842	AF 842	AT 842	AF 842	AT 842	AF 842	AT 842	AF 842	AT 842	AF 842	AT 842	AF 842	AT 842
100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850
0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90
0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90

The values in this table are the maximum in the given table accounts.

Contributions for other terminal velocities:

10	15	20	25	30	35	40	45	50
0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55

Speed = 0.20 m/s

Series AF 704 - AN 704 TP - SF 704 TP

Air supply in 4 directions with ceiling effect

AF 704	AN 704 TP	SF 704 TP	AF 704	AN 704 TP	SF 704 TP	AF 704	AN 704 TP	SF 704 TP	AF 704	AN 704 TP	SF 704 TP	AF 704	AN 704 TP	SF 704 TP	AF 704	AN 704 TP	SF 704 TP
100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00
0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.00

The values in this table are the maximum in the given table accounts.

Contributions for other terminal velocities:

10	15	20	25	30	35	40	45	50
0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55

Speed = 0.20 m/s

Series SC 360 R - SC 310 R

Air supply in 4 directions with ceiling effect

SC 360 R	SC 310 R	SC 360 R	SC 310 R	SC 360 R	SC 310 R	SC 360 R	SC 310 R	SC 360 R	SC 310 R	SC 360 R	SC 310 R	SC 360 R	SC 310 R	SC 360 R	SC 310 R
100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850
0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90
0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90

The values in this table are the maximum in the given table accounts.

Contributions for other terminal velocities:

10	15	20	25	30	35	40	45	50
0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55

Speed = 0.20 m/s

286 air&people General Catalogue 2011

Practical example: RESTAURANT

Necessary information have been collected:

- Dimensions of the room:
 - o length : 9m
 - o width : 6m
 - o height under the ceiling : 3m
- Ventilation: 40 persons = 1200 m³/h
- Multi-directional square ceiling diffuser

- Air mixing level : $1200 / (9 \times 6 \times 3) = 7.4$ vol/h with AHU
- Terminal velocity (Vt) = 0.37 m/s
- Acceptable sound power level (Lp) = NR35 < Lp < NR40

→ Selection guide recommends

Square diffuser
AF 704





Series AF 704 - AN 704 TP - SF 704 TP

Air supply in 4 directions with ceiling effect

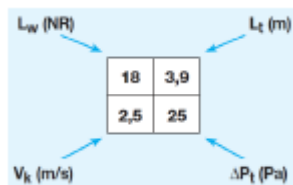
Ak (m²)	L x H (mm)	qv (m³/hr)												Lw	Lt									
		100	150	200	250	300	400	500	600	800	1000	1200	1500											
0.011	150 x 150	20 2.8	0.7 4.6	29 4.2	1.0 10	34 5.6	1.4 19												Lw	Lt				
0.023	225 x 225			17 2.1	0.8 2.6	23 2.8	1.0 4.6	28 3.5	1.2 7.2	32 4.2	1.5 10	37 5.6	2.0 19						Vk	Pa				
0.038	300 x 300						1.8 1.9	0.9 2.2	22 2.3	1.1 3.2	28 3.1	1.5 5.7	32 3.9	1.8 9.0	36 4.6	2.3 13								
0.057	375 x 375										21 1.9	1.2 2.4	25 2.5	1.5 3.7	29 2.9	1.8 5.3	35 3.9	2.4 9.4	40 5.0	3.0 15				
0.087	472 x 472													23 2.1	1.5 2.5	29 2.8	2.0 4.5	33 3.4	2.4 5.9	37 4.2	3.0 10	42 5.1	3.7 15	
0.106	525 x 525																24 2.0	1.7 2.4	28 2.5	2.1 3.8	32 3.1	2.6 5.5	37 3.8	3.2 8.6
0.137	600 x 600	Lw Vk	Lt Pa														20 1.5	1.5 1	24 2	1.8 2.4	28 2.5	2.2 3.8	32 3	2.7 5.4

The values Lw (NR) do not take the attenuation in the premises into account.

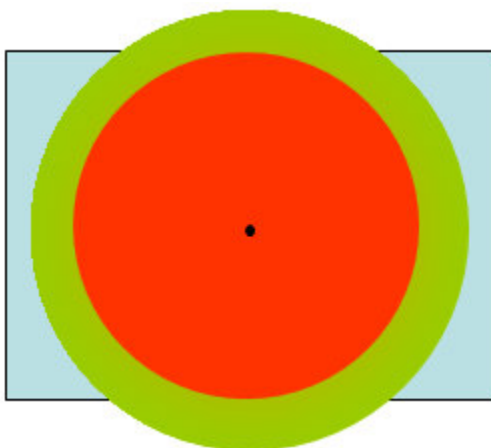
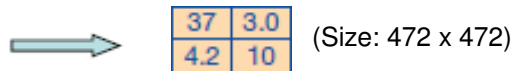
Speed = 0.5 m/s.

Corrections for other terminal velocities

Vt (m/s)	0.25	0.37	0.5	0.63	0.75
Lt	x 2	x 1.33	x 1	x 0.8	x 0.67



→ **One diffuser: Q = 1200 m³/h**



Size: 472 x 472

Lw: NR 37

Lt (0.5 m/s) = 3 m

Lt (0.37m/s) = 3x1.33 = 3.99 m

Analysis: Throw @ terminal velocity of 0.37 m/s is not enough to cover the total length of room while it is more than width of room. → **Not accepted!**

→ **Two diffusers: Q = 600 m³/h per diffuser**

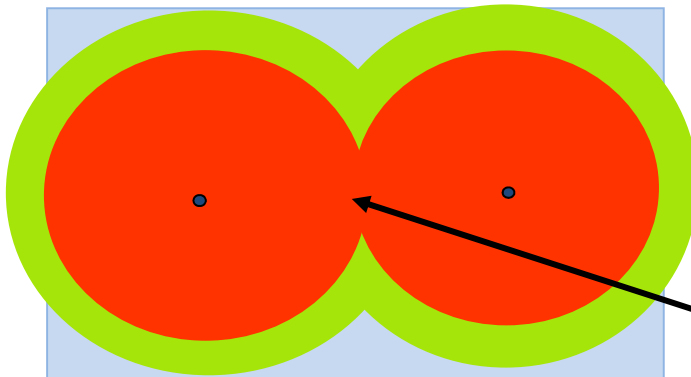


36	2.3
4.6	13

a) Size: 300 x 300

29	1.8
2.9	5.3

b) Size: 375 x 375

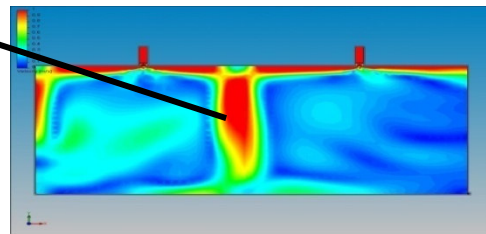


a) Size: 300 x 300

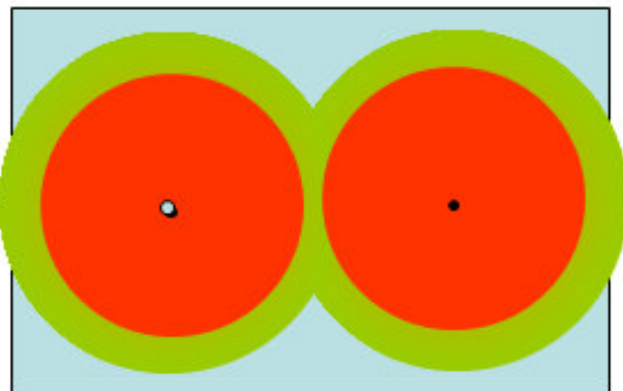
Lw = NR 36

Lt (0.5 m/s) = 2.3 m

Lt (0.37m/s) = 2.3 x 1.33 = 3 m



Analysis: Crossing of air-jets with a velocity of 4.6m/s will create uncomfortable draught.
→ **Not accepted!**



b) Size: 375 x 375

Lw = NR 29

Lt (0.5 m/s) = 1.8 m

Lt (0.37m/s) = 1.8 x 1.33 = 2.4 m

Analysis: No crossing of air-jets, noise level under acceptable limit, throw of air jet covering the occupied zone well → **Accepted!**

Aldes technical support to clients: CFD Analysis

CFD → Computational Fluid Dynamics

- Made by Floworks in Solidworks CAO software
- Technical support to our partners in well designing their projects
- Prove efficiency of the design and the performances of various Aldes diffusers / grilles.

How you can get CFD analysis for your prestigious project?

Three easy steps:

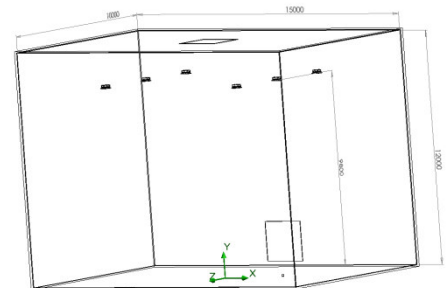
1. Provide Aldes ME team the information about the diffusers/grilles type & quantities, airflow details, engineering drawing with area highlighted for CFD analysis.
2. Aldes ME representative will then fill the CFD analysis form with all related information required and will submit the same along with the engineering drawings to Aldes France for CFD analysis.
3. Aldes France performs the CFD analysis and submit the visual data showing the performance of the system.

The form includes fields for: Project reference, Client Name, G&B global amount, Execution (yes/no), Aldes subsidiary, Numerical simulation, ALDES contact, Date, Diffuser (type, quantity, position), Reference, Size/diameter, Number of supply/exhaust diffusers, Air flow (supply/exhaust rates, temperature), Room configuration (height, geometry, furniture, indoor temperature), and a list of checkboxes for simulation options like velocity, temperature, and floor radiation.

Example:

1°) Rooms with high ceiling height: H = 12 m

	Airflow (m³/h)	T supply (°C)	T indoor (°C)	Supply diffuser	Exhaust diffuser
Summer	627	13,5	24	AR 883 D315 – 30°	-



AR 883
Adjustable Blades
Swirl Diffuser

