nad KLIMA

MADE IN CANADA

DAL359

swirl diffuser

catalog 1.1.1

$E_z \geq 1.0$

ASHRAE Standard 62.1

KIA automobiles, Sherbrooke, Canada

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Refer to the digital version on **www. nadklima.com**

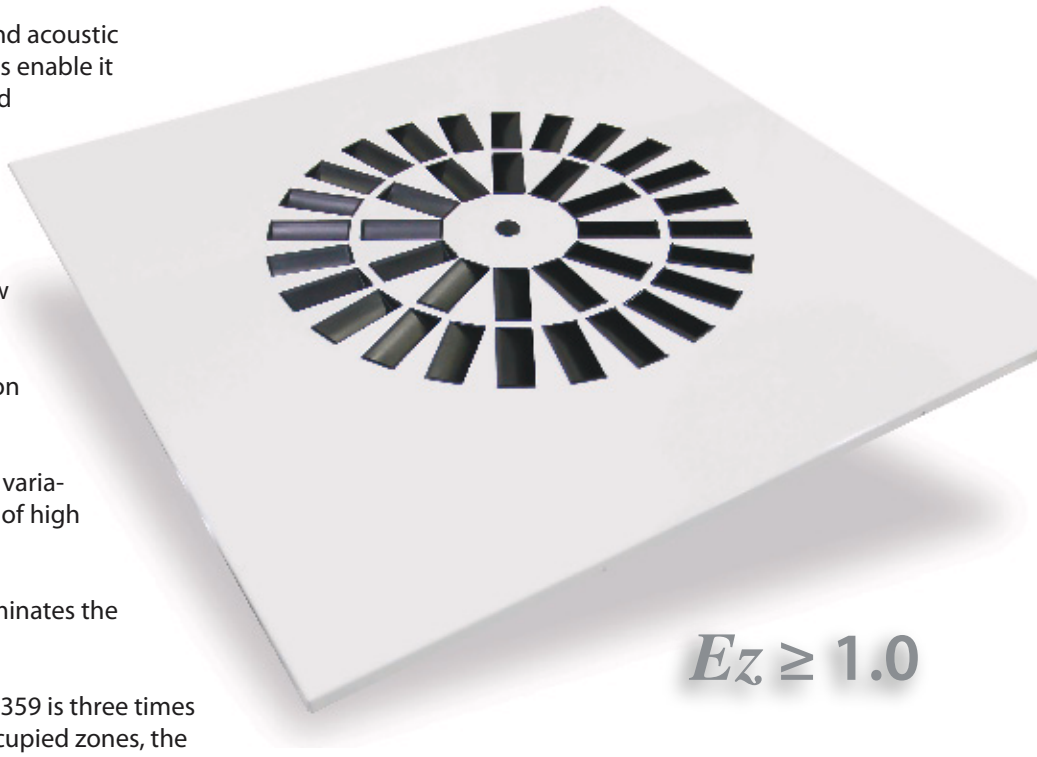
Version 2019

Thibault Automobiles, Sherbrooke, Canada

DAL359

« great aeraulic and acoustic qualities »

The DAL 359 is recognized for its aeraulic and acoustic qualities. The multitude of integrated blades enable it to retain its swirl properties even in elevated conditions. This is the perfect diffuser for important cooling applications.



The DAL 359 is capable of processing high quantities of air while still maintaining a low noise coefficient. Qualities that make it the ideal diffuser for administrative centres, restaurants, conference rooms, multifunction rooms and IT rooms.

Its rugged construction allows it to process variations in air flow while conserving a mixture of high volumes of air.

The surprising efficiency of this diffuser eliminates the need for peripheral heating elements.

The induction factor generated by the DAL 359 is three times superior than a conventional diffuser. In occupied zones, the temperature differential is three times less than a conventional diffuser. This means fewer diffusers are necessary to attain the recognized comfort norms.

The DAL 359 is among the most efficient on the market. The destratification effect it produces generates an optimal comfort level as well as appreciable savings.

A CNRC study has shown that the DAL 359 high induction swirl diffuser reaches a 1.03 (standardized to 1.0) value, reducing fresh air input by 25%.

Areas of application

- Rooms with high ceilings
- Areas with high air movement
- Offices and white rooms
- Administrative centers
- Computer rooms
- Meeting rooms
- Multi-purpose rooms
- Shopping malls
- Constant and variable airflow systems
- Restaurants

Benefits

- Optimal airflow guidance
- Rapid reduction in speeds and temperature difference
- Low acoustic power for large movements of air
- Possibility of changing the air flow
- Possibility of varying the speed of exiting air
- Approximately 3 times more induction than a conventional 4-way diffuser
- Approximately 3 times less temperature variation in occupied area than a traditionnal diffuser
- Possibility of eliminating external heating sources due to the diffuser's heating abilities
- Fewer diffusers required
- Allows a reduction in the total number of units required to circulate a fixed volume of air
- Adaptable to systems requiring constant or variable airflows

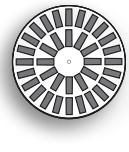
Configuration

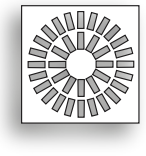
The DAL 359 helicoidal air diffuser is made of steel.
The blades are integrated to the square or round front plate.
Each diffuser is supplied with a plenum, allowing for a uniform and silent airflow. The attachment of the front plate is achieved with a central hidden screw (fixed on a cross).

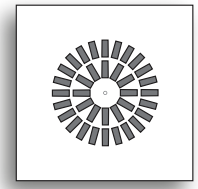
For the nominal dimension 800, four (4) supplementary screws in the corners of the frontal plate ensure proper attachment.

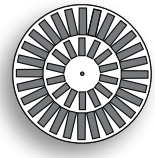
The diffuser is powder coated with a polyester TGIC-free paint, providing a smooth, easy-to-clean, chip and fade resistant finish.

The colours are available from the RAL colour chart.


DAL 359-R-400


DAL 359-Q-400/400


DAL 359-Q-400/603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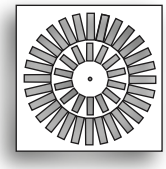
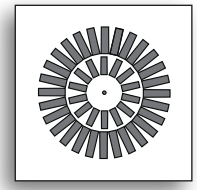
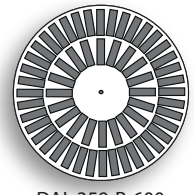
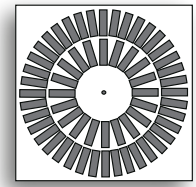
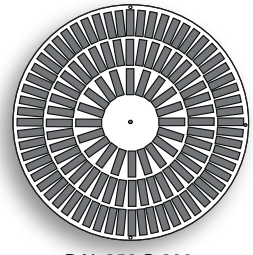
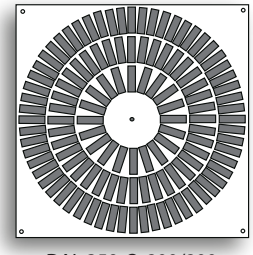

DAL 359-Q-500/502


DAL 359-Q-500/603


DAL 359-R-600


DAL 359-Q-600/603

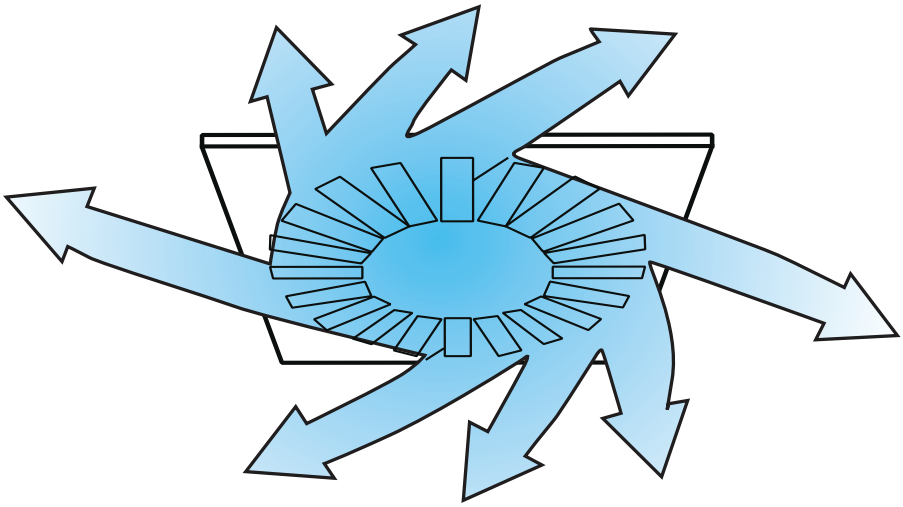

DAL 359-R-800


DAL 359-Q-800/800

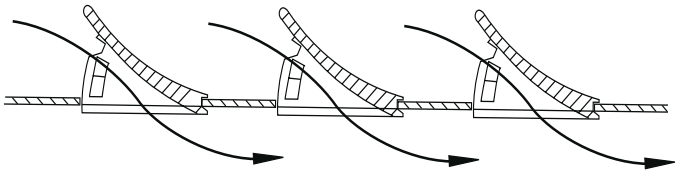
Mode of operation

The DAL 359 optimizes the ventilation system to meet spatial requirements. The large number of blades (aircraft wing shaped) directing the airflow possess ventilation and acoustic qualities. They allow installation even in spaces with high ceilings and high refrigeration needs.

An adaptation to a possible change of airflow is feasible through a modification of the winglet's opening. It is possible to change the flow's pulse, penetration or thickness.

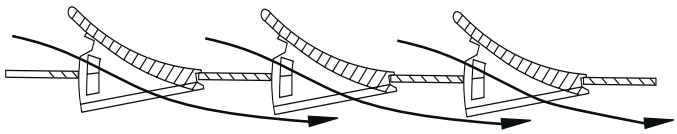


Position 1



The blades produce, at the level of the diffuser's frontal plate, a change in the air flow (from vertical to horizontal) with acoustic and aerodynamic qualities.

Position 2



On position two, the blades can be lowered, reducing exiting airflow by 50%. If the airflow doesn't change, the air jet penetration can be increased.

Range of application and quick selection

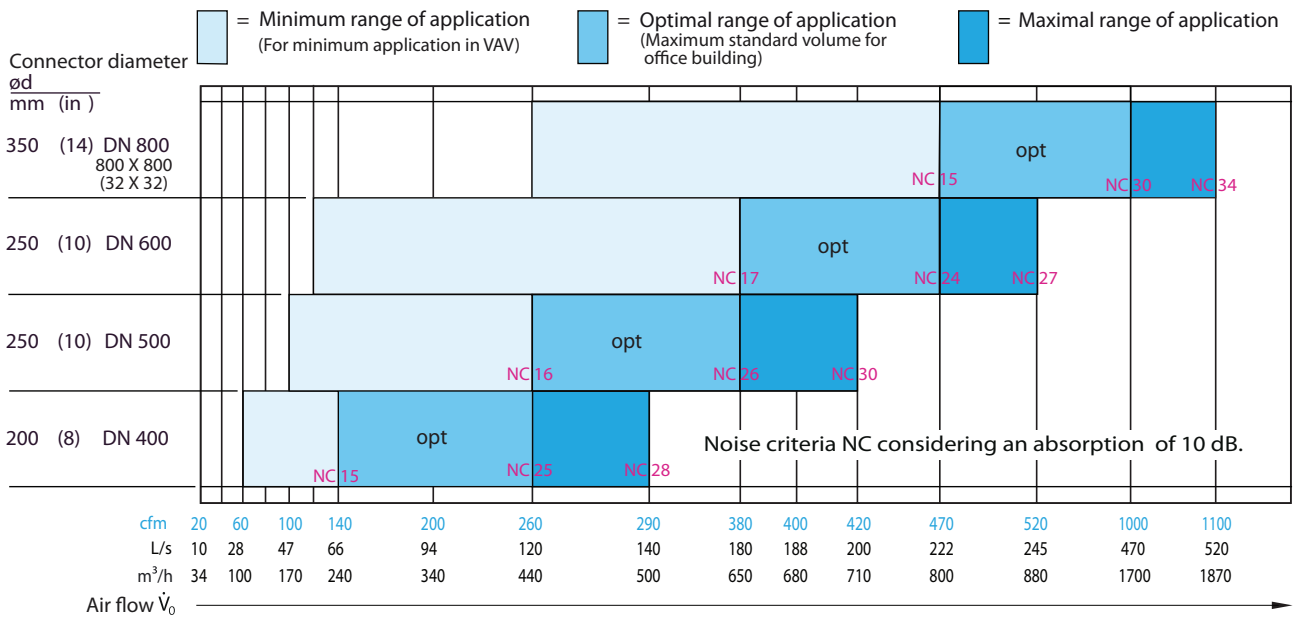
Specifications

Minimum spacing: 3 m (10 ft)(under ceiling)
Speeds in the occupied zone:
> 0.15 m/s (30 ft/m)
at 1.3 m from the floor
Temperature difference ΔT = -10°C

	$\dot{V}_0$ m^3/h	Minimum spacing m	Δp Pa	L_{WA} dB (A)*	Noise criteria NC dB**	x_{crit} m
DN 400	300	5.2	23	30	-	2.2
	360	6.7	34	31	16	2.7
	440	8.6	51	40	25	3.3
DN 500	430	6.4	19	32	16	2.7
	530	8.4	29	37	22	3.3
	650	10.5	42	42	26	4.1
DN 600	550	4.2	17	25	-	1.9
	650	5.5	25	33	17	2.4
	800	7.3	38	39	24	3.0
DN 800	1150	5.4	14	36	22	2.5
	1360	6.8	20	40	25	2.9
	1750	8.8	30	45	30	3.5

Note : * The absorption of the room has not been considered.
** determined by considering an absorption of the room of 10 dB.

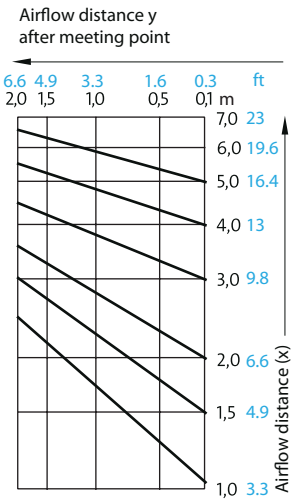
Range of application

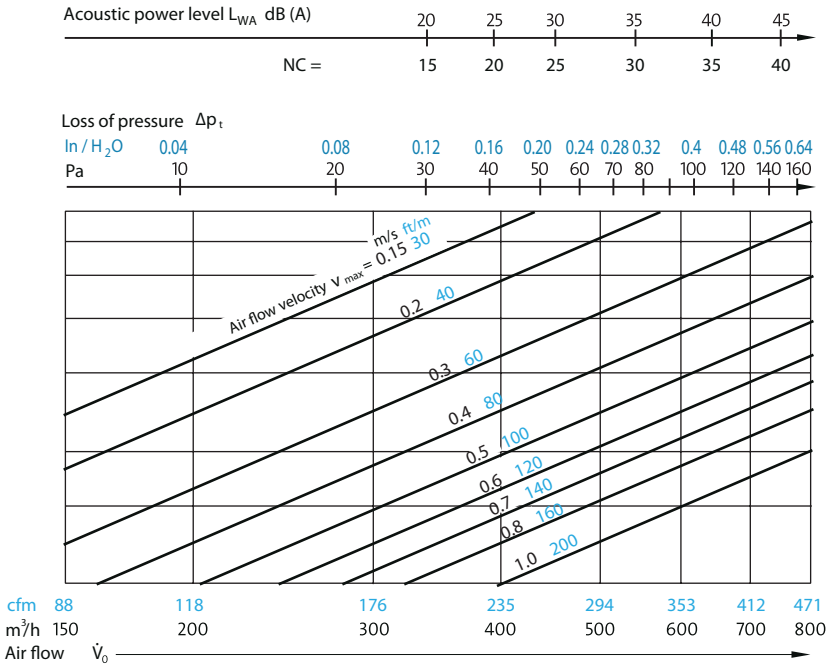


Performance diagrams

DN 400

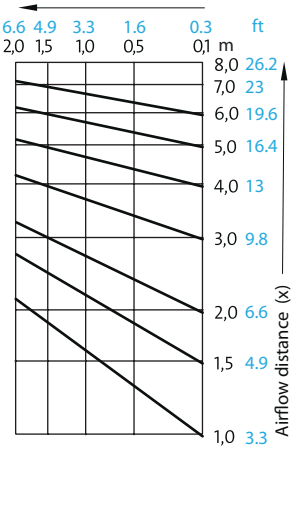
Airflow below ceiling

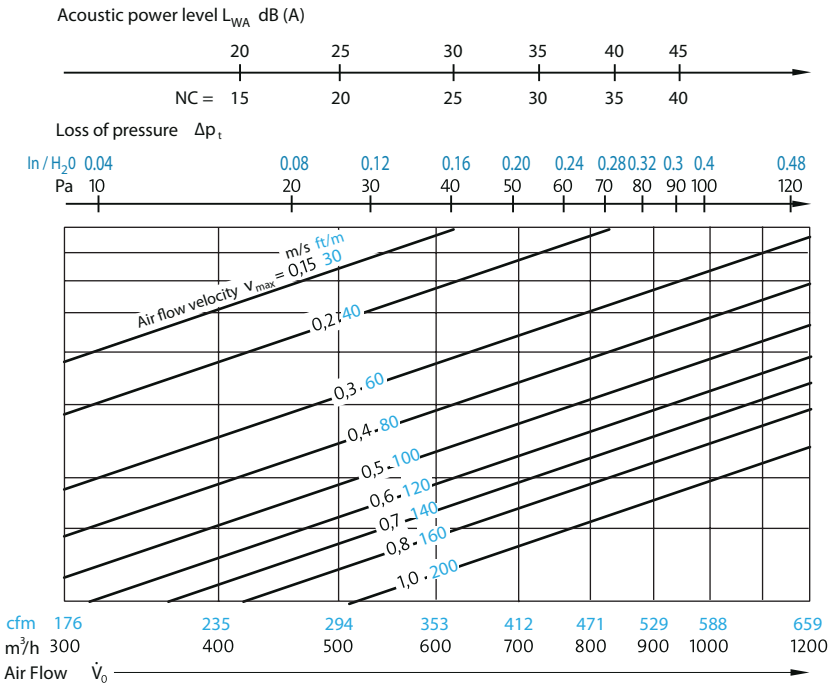




DN 500

Airflow below ceiling





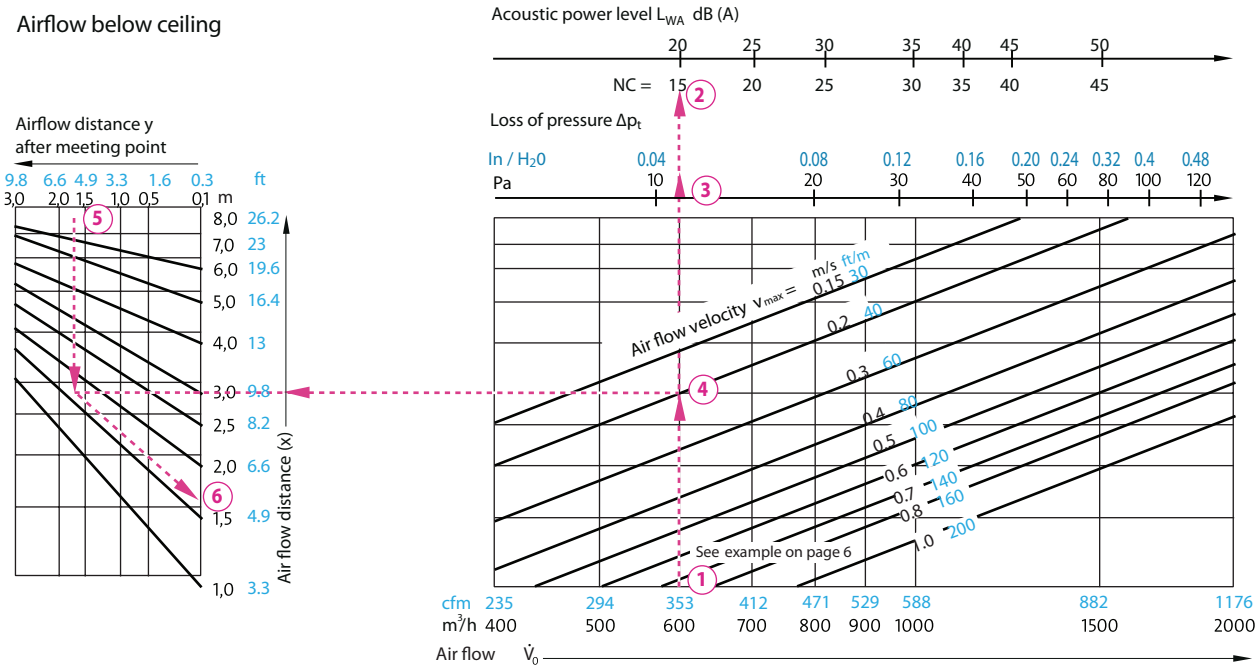
Important:
The noise criteria NC and the acoustic power level L_{WA} are determinated considering a room absorption of 10 dB.

Graph values are based on an isothermal flow.

Performance diagrams

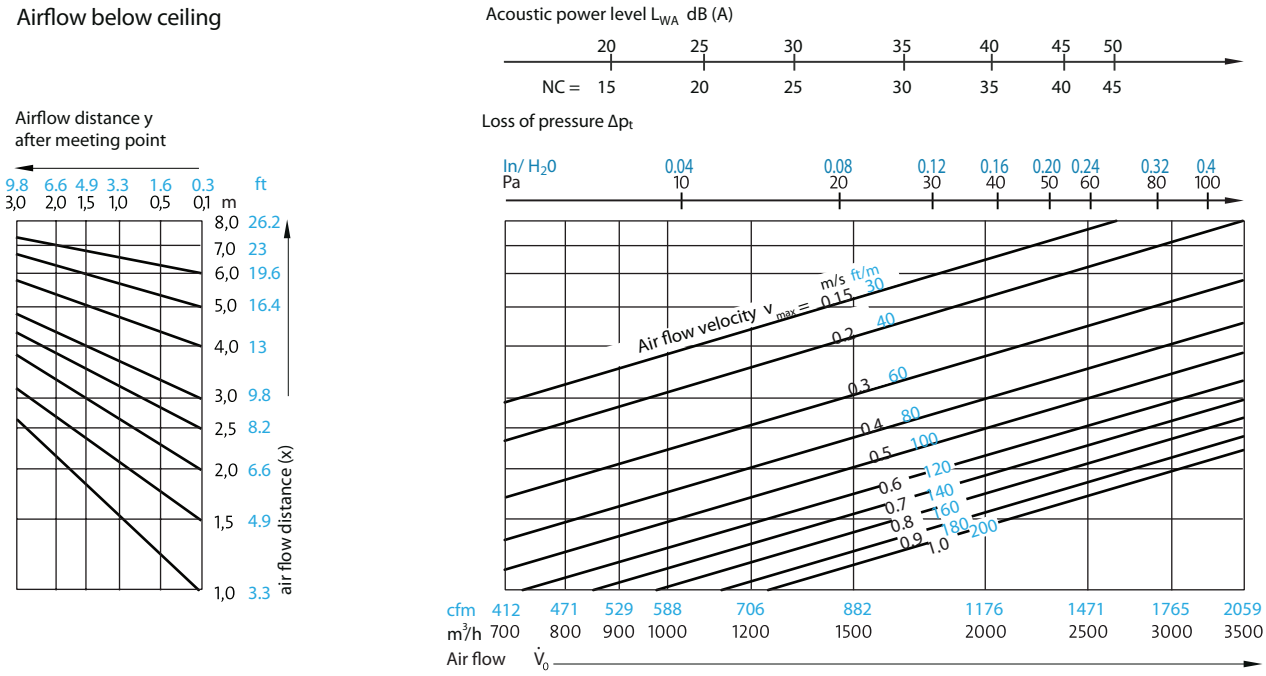
DN 600

Airflow below ceiling



DN 800

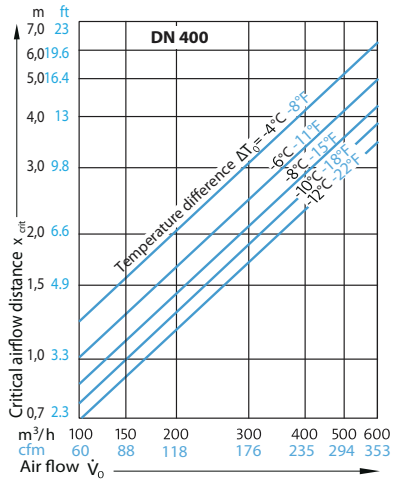
Airflow below ceiling

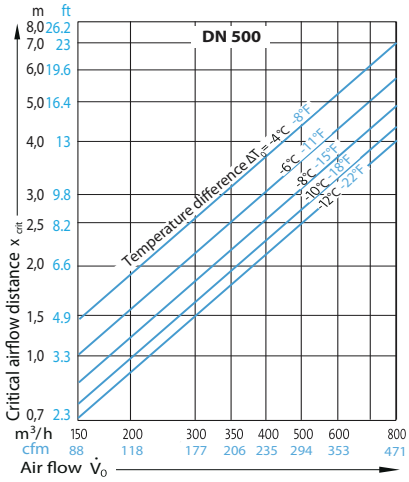


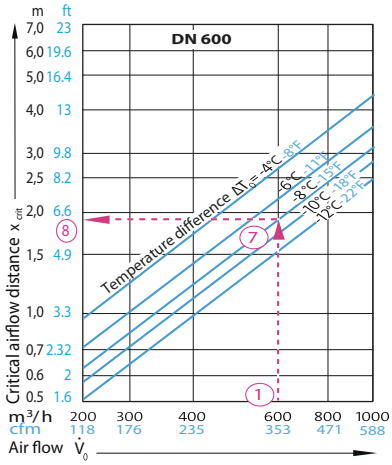
Important:
The noise criteria NC and the acoustic power level L_{WA} are determinated considering a room absorption of 10 dB.

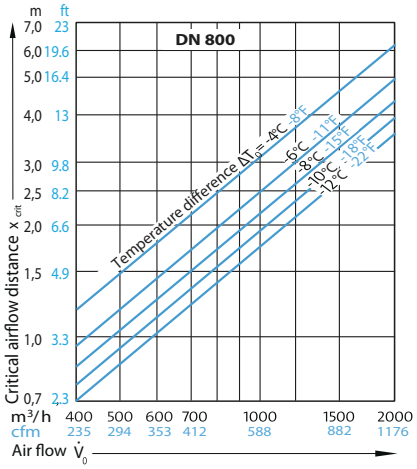
Graph values are based on an isothermal flow.

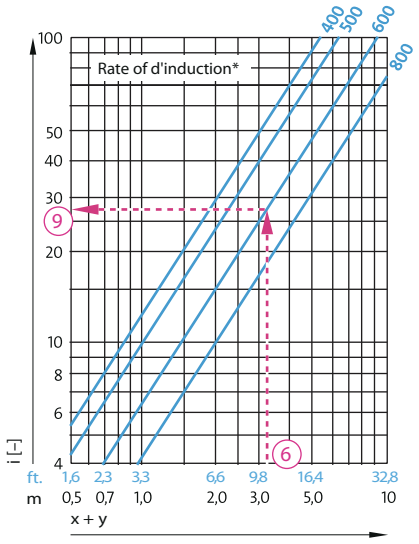
Critical distance in cooling mode and temperature ratio

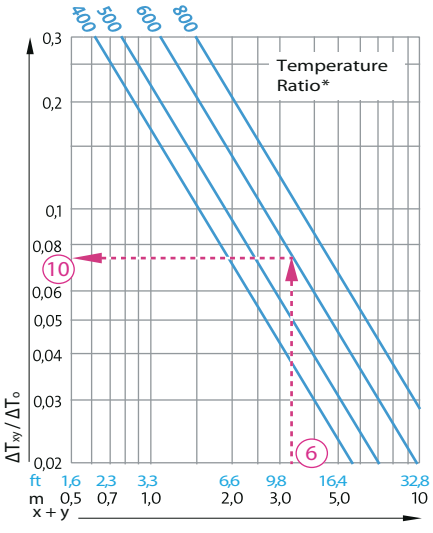












* For dimensions DN 400, 500, 600 and 800

Important

The critical trajectory of the airflow must always be higher than half of the difference between two diffusers.

Specifications

Height of space: H = 3.50 m
Airflow per diffuser: $\dot{V}_0$ = 600 m³/h
Maximum cooling: ΔT_0 = -8°C (7)
Maximum air speed at head height (1.80 m):
V_{max} = 0.2 m/s (4)

Required

1. Nominal dimension of the diffuser
2. Noise criteria NC and acoustic power L_{WA}
3. Loss of pressure Δpt
4. Minimal distance between the diffusers
5. Critical airflow trajectory (detachment of the air jet from the ceiling in cooling mode)
6. Rate of induction
7. Temperature ratio

Solution

1. From the "Range of application" diagram we deduce the nominal dimension of DN 600.

2. 3. 4. From the "Airflow below the ceiling" diagram for the DN 600 diffuser and an airflow of 600 m³/h, (1) we deduce the following values: NC = 15 and L_{WA} = 20 Pa (2) (considering a room absorption of 10 dB)
Total loss of pressure: 12 Pa (3)
A difference between the diffusers of:
Y = H - 1.80 = 3.50 m – 1.80 m = 1.70 m (5)
2 x 1.55 = 3.10 m (6)

5. The "Critical air flow trajectory" diagram gives a critical airflow trajectory of 1.90 m (8) for the DN 600 diffuser, an airflow of 600 m³/h (1) and a temperature difference of - 8°C. (7)

6. The "Rate of induction" diagram gives a critical airflow trajectory of (x+y) = 1.55 m (6) + 1.70 m (5) = 3.25 m and I = 28 (9)

7. From the "Temperature ratio" diagram we deduce a temperature ratio of 0.07 (10) for the same airflow trajectory.

Dimensions and weight

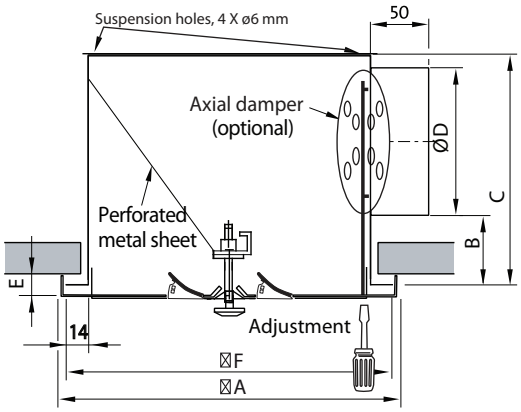
Square plenum

	DN400	DN500	DN600	DN800
Size □A	400	502	603	800
Size B	76	82	67	66
Size C	251	312	347	411
Size ØD	200	250 (ovale)	250	350
Size E	12	12	12	12
Size □F	387	488	584	790
Weight (kg)	4.5	6.6	9.2	15.8
A_{eff} (m^2)	0.0080/0.0134	0.0214	0.0347	0.0508

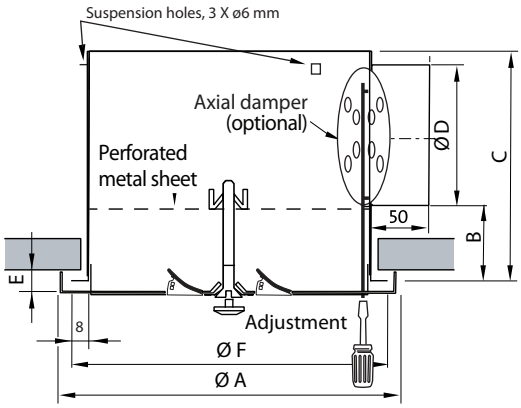
Round plenum

	DN400	DN500	DN600	DN800
Size ØA	400	500	600	800
Size B	76	82	67	66
Size C	251	312	347	411
Size ØD	200	250	250	350
Size E	8	8	8	8
Size Ø F	392	492	592	792
Weight (kg)	3.8	5.8	7.7	12.8
A_{eff} (m^2)	0.0080/0.0134	0.0214	0.0347	0.0508

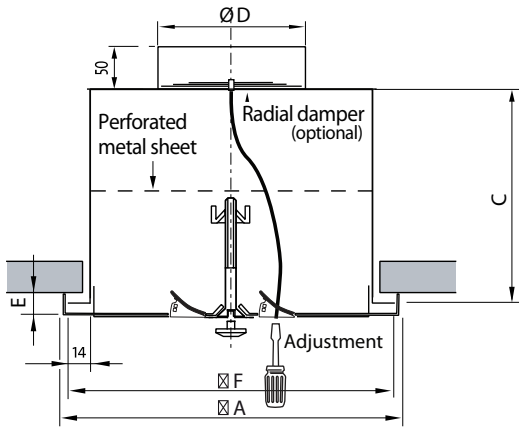
square plenum - side inlet



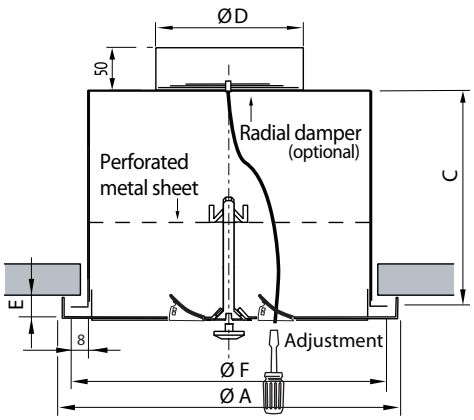
round plenum - side inlet



square plenum - top inlet



round plenum - top inlet



Fireproof damper

Square plenum

	DN 400		DN 500		DN 600
Size □A	400	603	502	603	603
Size C	400	400	450	450	498
Size ØD	200	200	250	250	250
Size □F	396	584	488	584	584
Weight (kg)	10.7	16.6	13.8	16.9	17.4

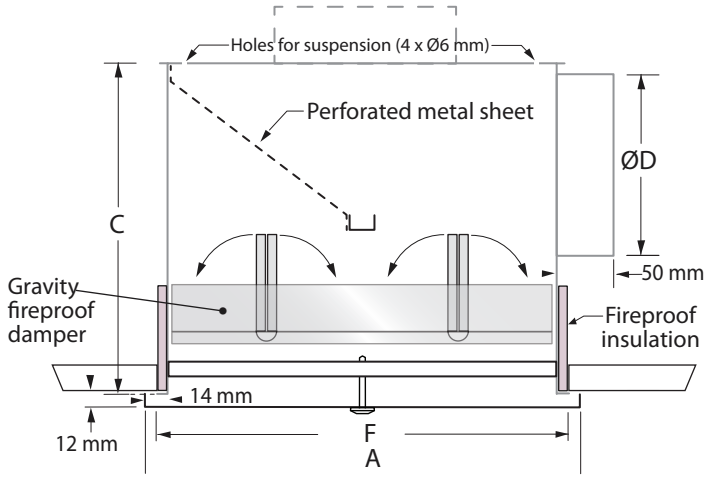
Note : The balancing damper is not available with the fireproof damper.

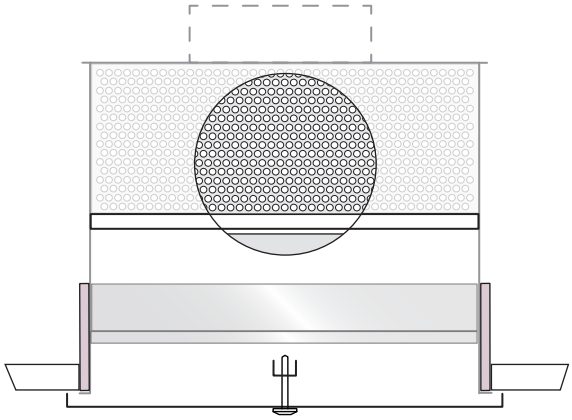
Classified ULC (Underwriters laboratories of Canada), the NAD Klima diffusers with fire resistant dampers have a fire-resistant rating of 3 hours.

The fire-resistant damper is integrated directly to the plenum. This assembly is designed for installation in either a suspended or gypsum ceiling.

LISTED
Air Terminal Unit
R38924
CAN/ULC - S112.2 et CAN/ULC - S101

CEILING AIR DIFFUSER
FIRE RESISTANCE CLASSIFICATION
ANSI/UL 555C et ANSI/UL 263





Specifications

1. Description and physical characteristics

1.1 The high induction swirl airflow diffuser shall be made of 20 ga. galvannealed steel. Blades shall be integrated to the round or square front plate.

1.2 The 90 mm long plastic blades shall enable a horizontal air flow over 180 degrees.

1.3 The diffuser's front plate shall be adapted to fit regular North American suspended ceilings or classic gypsum ceilings.

1.4 The blades shall be adjustable in two positions, to reduce the diffusion area of 50%.

1.5 The diffuser shall be powder coated with a polyester TGIC-free paint, providing a smooth, easy-to-clean, chip and fade resistant finish. The architect or client shall choose a standard colour from the RAL colour chart.

2. Performance

2.1 The performance shall be guaranteed by using performance curves or simulation software for critical areas. These curves shall indicate the pressure drop, acoustic power generated as well as showing a cross-sectional view illustrating the critical airflow path in cooling, isothermal and heating modes.

2.2 **Parameters of guaranteed comfort**

2.2.1 The performance statistics of the diffuser shall reflect a maximum air speed of 0.15 m/s (30 ft/m) in occupied zone at 1.3 m (4 ft) from the floor. The performance guarantee shall be demonstrated in plan view, with circles showing the path of the air stream.

2.2.2 The diffuser shall ensure a maximum variance in temperature of -1°C between the air jet and the area occupied at 4 ft (1.3 m) from the floor. To achieve this, the ratio of temperature differential shall perform at a minimum of $\Delta T_{xy} / \Delta T_0 \leq 0.1$ (for an initial differential of $\Delta T_0 = -10°C$).

2.2.3. In cooling, the diffuser shall guarantee, in variable volume (VAV) a critical distance (X_{crit}) of at least the value is indicated in the following table:

Diffuser inlet (in)	6	8	10	12
Air flow max. (pcm)	80-150	151-280	281-400	401-600
min. (pcm)	20-40	41-90	91-140	141-200
X critical - ft	1'- 7"	1'- 11"	2'- 3"	2'-7"
(m)	0.5	0.6	0.7	0.8

2.3 **Ez ≥ 1.0**

The air diffuser shall meet the ACE air change effectiveness value or the ASHRAE 129 standard ratio of Ez ≥ 1.0. This value shall be measured according to the ASHRAE 129 standard by an independent laboratory.

Note: This Ez ≥ 1.0 value has been applied to this project and will result in a reduction of the unit's heating and cooling capacity.

3. Plenum

3.1 The diffuser shall be delivered with a plenum made and tagged by the diffuser's manufacturer. The plenum is constructed from 24 gauge galvanized steel and includes a perforated stabilizing (equalizing) plate, which regulates the airflow rate. Four suspension points, which adhere to paraseismic standards, are integrated in the plenum. The inlet shall be centered on the side or on the top of the plenum, and its size shall be calibrated to accommodate the airflow rate. The joints of the plenum shall be sealed with a VOC (volatile organic compounds) emission-free caulking.

3.2 The diffuser front plate shall be attached to the plenum with a central screw.

3.3 When required, the plenum shall be supplied with a damper, adjustable through the finished side of the front plate, in order to adjust air volume. This damper shall be available in two options:

3.3.1 **Radial damper**: Key with circular pivoting blades on a flexible metallic cable, which is adjustable through the front plate of the diffuser, allowing for air flow adjustment from 0% to 100%.

3.3.2 **Axial damper**: Perforated swiveling flap rotating from 0 to 90 degrees with a blocking system, allowing for air flow adjustment from 25% to 100%.

4. Balancing

4.1 DAL 359 diffuser balancing shall be performed by a professionally certified technician, trained in ventilation system balancing.

4.2 The technician shall take into consideration the correction factor of air volume using a balometer.

5. Quality required: NAD Klima model DAL 359

Codification

DAL 359	**Product**
Q = Square - R = Round	**Configuration**
400, 500, 600, 800	**Nominal dimension**
400, 502, 603, 800 (603 for 24"X24" T-bar)	**Outer size**
S = Standard swirl flow X = Return (without winglet)	**Airflow**
W = White winglets (RAL 9003) B = Black winglets (RAL 9010) X = Without winglets (return)	**Winglet color**
9003 = White 00SB = Solar black (Standard Black Matte) 00SM = Silver matte (Metallic Grey Standard) ____ = RAL color (write the RAL color number)	**Diffuser color**
S = Plenum with inlet on the side T = Plenum with inlet on the top X = Without plenum	**Plenum**
I = Acoustic insulation A = Closed cell acoustic insulation X = Without insulation	**Acoustic insulation**
F = With fire-proof insulation and fire-proof damper (balancing damper not available) X = Without fire-proof insulation and fire-proof damper	**Fire-proof insulation**
D = With axial damper (standard for inlet on the side) R = With radial damper (for inlet on the top and on the side) * X = Without damper	**Balancing damper**
DAL359 - Q - 400 - 400 - S - W - 9003 - S - X - X - X	**Example**

Notes:
Blue: Standard

* Not available on oval collar

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