nad KLIMA

MADE IN CANADA

DAL358

Swirl diffuser

catalog 1.1.1

$E_z \geq 1.1$

ASHRAE Standard 62.1

Concordia University, Montréal, Canada

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The information contained in this catologue is subject to change.
Refer to the digital version on **www. nadklima.com**

Version 2019

CIMA + , ingénieurs, Sherbrooke, Canada

Presentation and benefits

The high induction air diffusion technology of Nad Klima is recognized across Canada as a significant advance.

The comfort generated by the reduction of input of fresh air will contribute in reducing absenteeism rate and also eliminate discomfort complaints

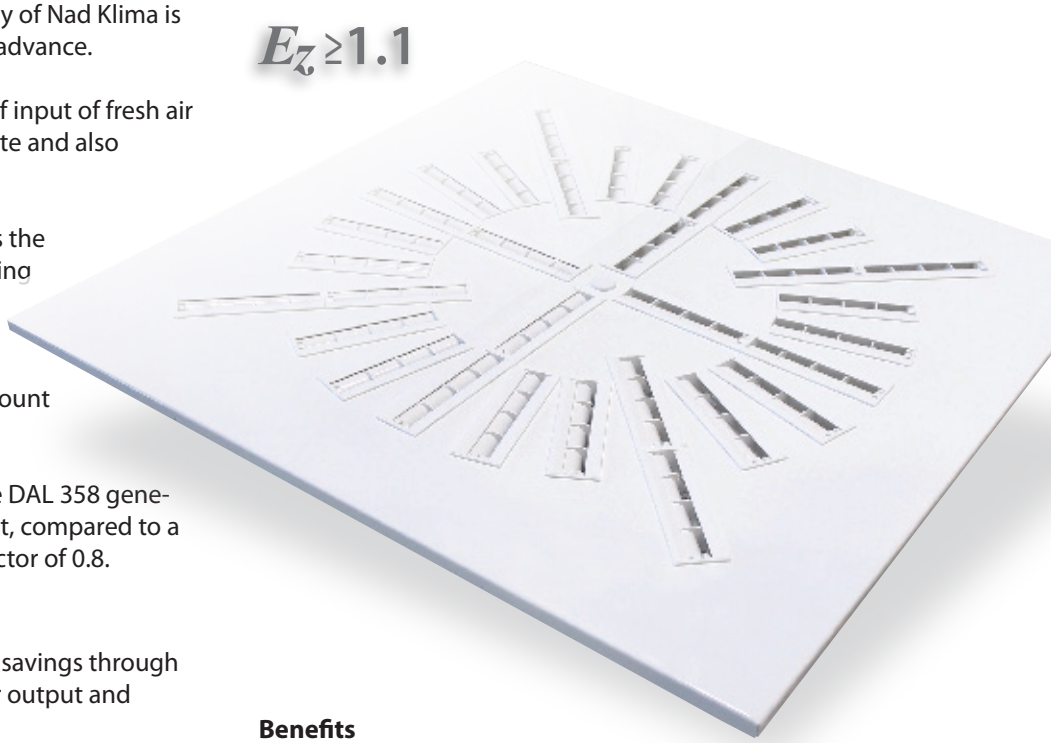
The revolutionary DAL 358 stands alone as the reference in air distribution. Tested according to the ASHRAE 129 norm (Measuring Air-Change Effectiveness) by the CNRC, the DAL 358 can reach a factor of Ez ≥ 1.1 of air diffusion efficiency, reducing the amount of fresh air required.

Beyond the optimal interior air quality, the DAL 358 generates 27 % savings regarding fresh air input, compared to a conventional cone diffuser, which has a factor of 0.8.

(ref. List of symbols and basic concepts, page 5)

This efficiency translates into heating cost savings through homogenization of the air, reduction of air output and energy consumption of ventilation units.

The DAL 358 also contributes in reducing the costs of construction by eliminating peripheral heating.



Application areas

- Offices with partitioned workspaces
- Clean rooms
- Call centres
- Closed offices
- Computer (server) rooms
- Conference rooms
- Multi-purpose rooms
- Systems with constant or variable airflow rates
- Entrance halls (vertical air streams)
- Restaurants

Benefits

- Rapid reduction of flow speed and temperature variations caused by high induction
- Low acoustic power for high airflow rates
- Stable helical airflow and a variety of air streams available in 1,2 or 3 directions
- Eccentric rollers allowing for 180° airflow adjustment
- Possibility of adjusting airflows, even after installation
- Possibility of reducing total airflow rate as much as 25% in VAV
- 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 for a reduction in the total number of units required to circulate a fixed volume of air
- Adaptable to systems requiring constant or variable airflows

Configurations

The DAL 358 swirl diffuser is made of steel. The receptacle and eccentric rollers are integrated to the front plate (square or round).

Each diffuser is supplied with a stabilising chamber, allowing for a uniform and silent airflow.

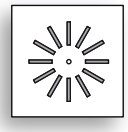
The eccentric rollers allow for a variety of airstream configurations, even after the unit has been installed.

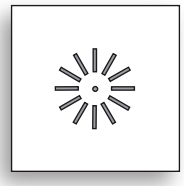
Both the square and circular front plates have slots for the eccentric rollers arranged in a star pattern.

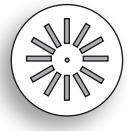
The diffuser is mounted on a plenum. The front plate is secured by a hidden center screw.

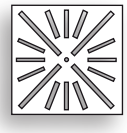
For the diffuser DN 800, 4 additional screws in the corners of the plate secure the frontal plate.

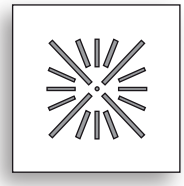
The diffuser will be powder coated with a polyester TGIC-free paint, providing a smooth, easy-to-clean, chip and fade resistant finish. The colours are available from the RAL colour chart.


DAL 358-Q-300/400

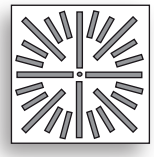

DAL 358-Q-300/603

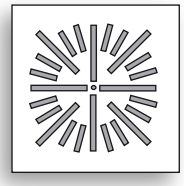

DAL 358-R-300

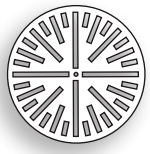

DAL 358-Q-400/400

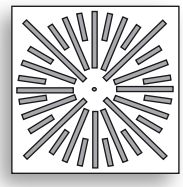

DAL 358-Q-400/603

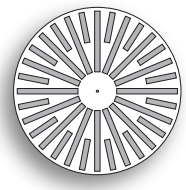

DAL 358-R-400

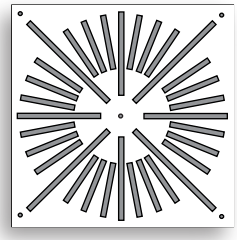

DAL 358-Q-500/502

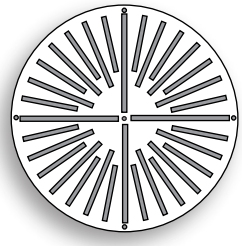

DAL 358-Q-500/603


DAL 358-R-500


DAL 358-Q-600/603


DAL 358-R-600


DAL 358-Q-800/800


DAL 358-R-800

Mode of operation

The 100 mm long eccentric rollers can be rotated 360 degrees. In standard position (21), the eccentric rollers establish, through the profile of the slots, a streamline through which carried along. At the outlet of the roller, a low pressure is created, generating a high rate of induction.

Airflow behaviour

The DAL 358 frontal plate has slots arranged in a characteristic star pattern. Turning the rollers individually can produce a multitude of airstream patterns. In this manner, obstacles to efficient air flow can be avoided (lightning fixtures, overhanging ceiling, architectural columns, etc.). When installing in high ceilings (>5 m), a portion of the rollers in the centre of the diffuser must be directed to produce a vertical blast (see figure 1). Use of the DAL 358 does not require a closed ceiling installation in order to produce a stable horizontal airflow.

Despite the variety of airflow directions, all stream options have approximately the same acoustic power and pressure drop due to the specific design of the eccentric rollers.

Controlling the direction of airflow

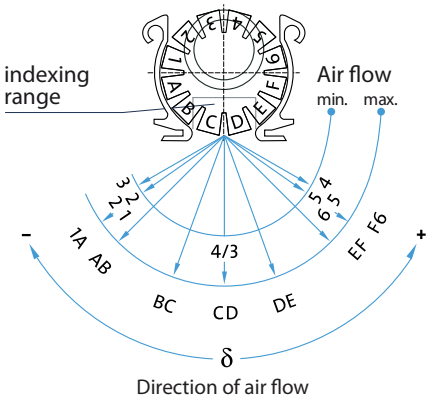
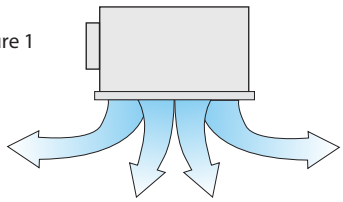
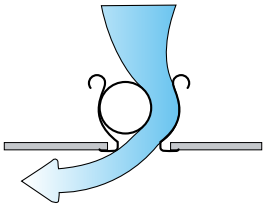


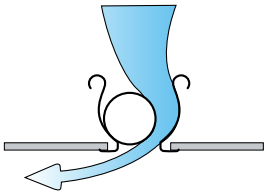
Figure 1



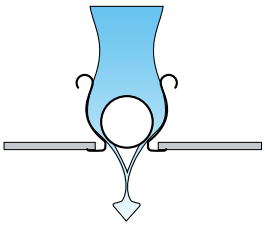
Roller position 1A



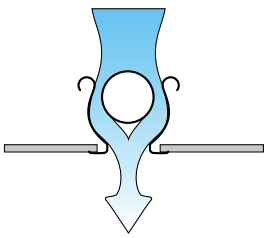
Roller position 21



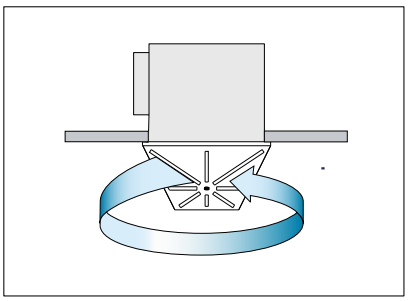
Roller position 43



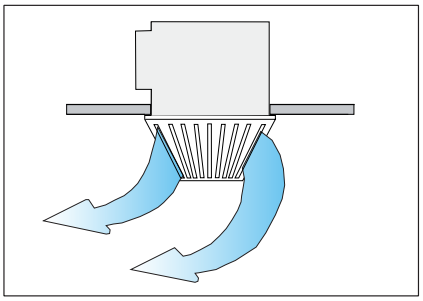
Roller position CD



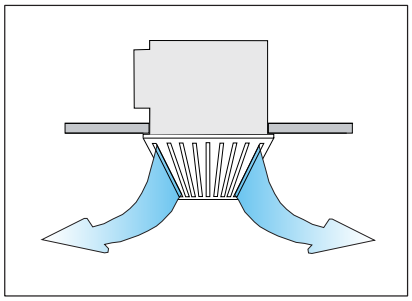
Helical (swirl) air stream
When positioning all rollers on 21, a rotating air stream is produced below the ceiling in a helical stream, creating a strong induction current (Standard setting).



One-sided air stream
This one-sided airflow is obtained by positioning all of the rollers in position 21.



Two-sided air stream
This two-sided airflow is obtained by positioning half the rollers in position 21 and the other half in position 65.

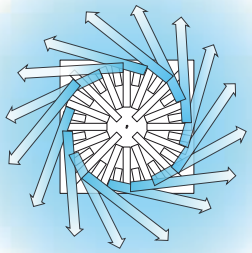


Air flow and air direction

V_{max} = V_{max} simulation x f	ΔP_t = ΔP_t simulation x f	L_{WA} (dB) = L_{WA} (dB) simulation x f

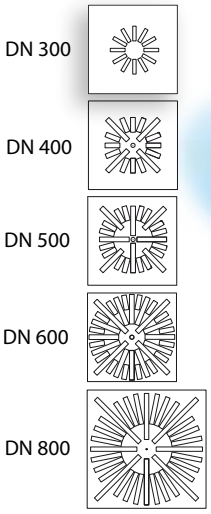
DN 600 360° swirl airflow

ST = Standard swirl airflow (21)
HL = Flow rise (>5 m)
(exterior 21 and center CD)
VF = Vertical airflow (CD)



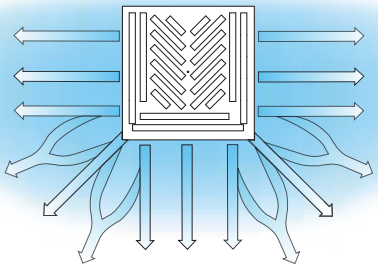
Correction factor: f

V_{MAX}	1.0
ΔP_t	1.0
L_{WA} (dB)	1.0



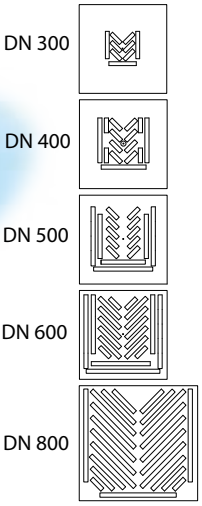
DN 600 3 directions covering 180°

3W = Airflow 180° (wall) (21- 34)



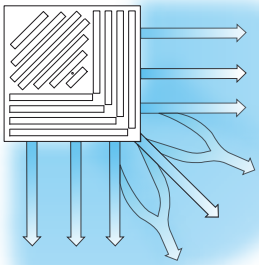
Correction factor: f

V_{MAX}	1.3
ΔP_t	1.0
L_{WA} (dB)	1.0



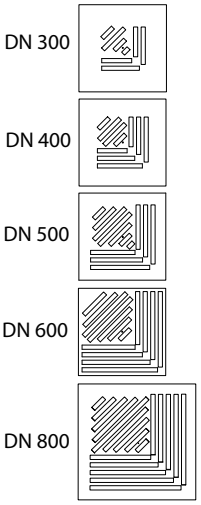
DN 600 2 airflow direction at 90°

2C = Airflow 90° (corner) (21)



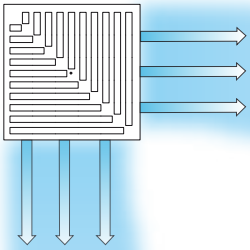
Correction factor: f

V_{MAX}	1.4
ΔP_t	1.0
L_{WA} (dB)	1.0



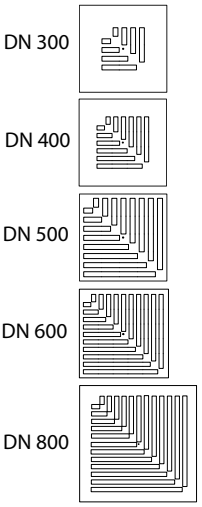
DN 600 2 directions in the corner

2L = Airflow in two directions in an L shape
(2 streams) (21)



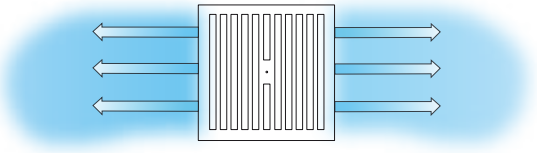
Correction factor: f

V_{MAX}	1.7
ΔP_t	1.0
L_{WA} (dB)	1.0



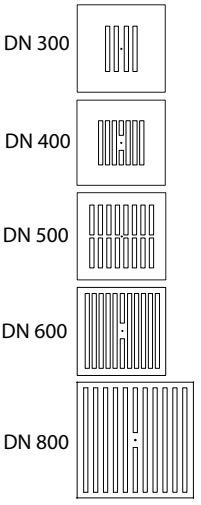
DN 600 2 opposing directions

2W = Airflow on two opposing directions (21- 56)



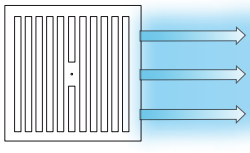
Correction factor: f

V_{MAX}	1.7
ΔP_t	1.0
L_{WA} (dB)	1.0



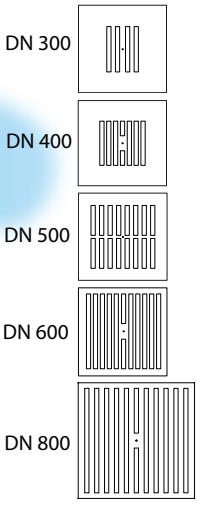
DN 600 1 direction

1W = Airflow on one side (21)



Correction factor: f

V_{MAX}	2.0
ΔP_t	1.0
L_{WA} (dB)	1.0



Range of applications and quick selection

Height of the room	Air flow by surface m³/h/m²	Air flow by surface cfm/sq.ft	Nominale size DN	Quantity of diffusers	Airflow per diffuser m³/h	Airflow per diffuser cfm	Min. distance diffusers (2x) (m)	Min. distance wall (m)	Critical X (m)	Pressure drop ΔP (Pa)	Acoustic Power level L_W(dBA)*	Noise criteria NC (dB)**
2.44 / 2.75 m (8/9 ft) (1)	9	0.5	DN 400	4	228	134	1.6	0.9	1.4	25	36	15
	15	0.8	DN 500	4	366	215	2.8	1.5	1.4	25	36	18
	24 (2)	1.3	DN 600 (3)	4	660	350	5.5 (6)	2.8 (7)	1.9	30	42	23
	30	1.6	DN 600	6	500	295	3.6	1.9	1.4	18	33	17
3.05 / 3.7 m (10/12 ft)	9	0.5	DN 400	4	228	134	0.4	0.3	1.4	25	36	15
	15	0.8	DN 500	4	366	215	1.5	0.9	1.4	25	36	18
	27	1.5	DN 600	4	685	403	4.6	2.4	1.9	32	43	29
	37	2	DN 600	6	609	358	3.7	1.9	1.7	26	39	24
4.0 / 4.3 m (13/14 ft)	9	0.5	DN 500	2	457	269	0.8	0.6	1.7	36	42	23
	15	0.8	DN 500	4	366	215	0.3	0.2	1.4	25	36	18
	27	1.5	DN 600	4	685	403	2.5	1.5	1.9	32	43	29
	37	2	DN 800	4	914	537	3.7	2.0	1.8	28	44	31

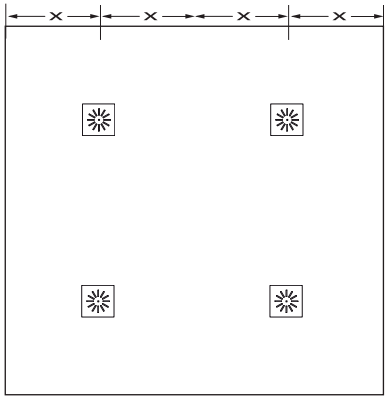
*The absorption of the room is not considered.
** determined by considering a room absorption of 10 dB.

Column for any room from that height at the same volume of air per diffuser (isothermal values)
Column in reference to the example

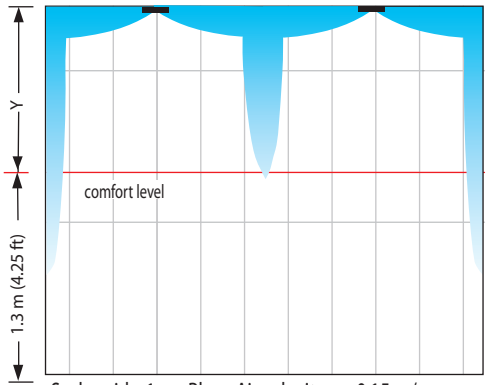
Specifications:
- Room: L x W x H = 10 m x 10 m x 2.44 m (33 ft x 33 ft x 8 ft)
- Total air flow in the room: 1400 cfm (4)
- Initial temperature difference: ΔT = -10° C
- Air velocity: 0.15 m/s (30 ft/m) 1.3 m (4.25 ft) from the floor
- VAV: 25%

Using the data on ceiling height (1) and airflow rate by surface (m² or sq. ft), (2) choose the nominal size (DN) of the DAL 358. (3)
Divide the total airflow rate of the room (4) by the ideal value (5) of the air flow rate for the selected size. Adjust the quantity of diffusers to achieve symmetry in the room while respecting the maximum airflow rate in the optimal setting range. Watch for minimal distance between diffusers (6) and walls. (7)

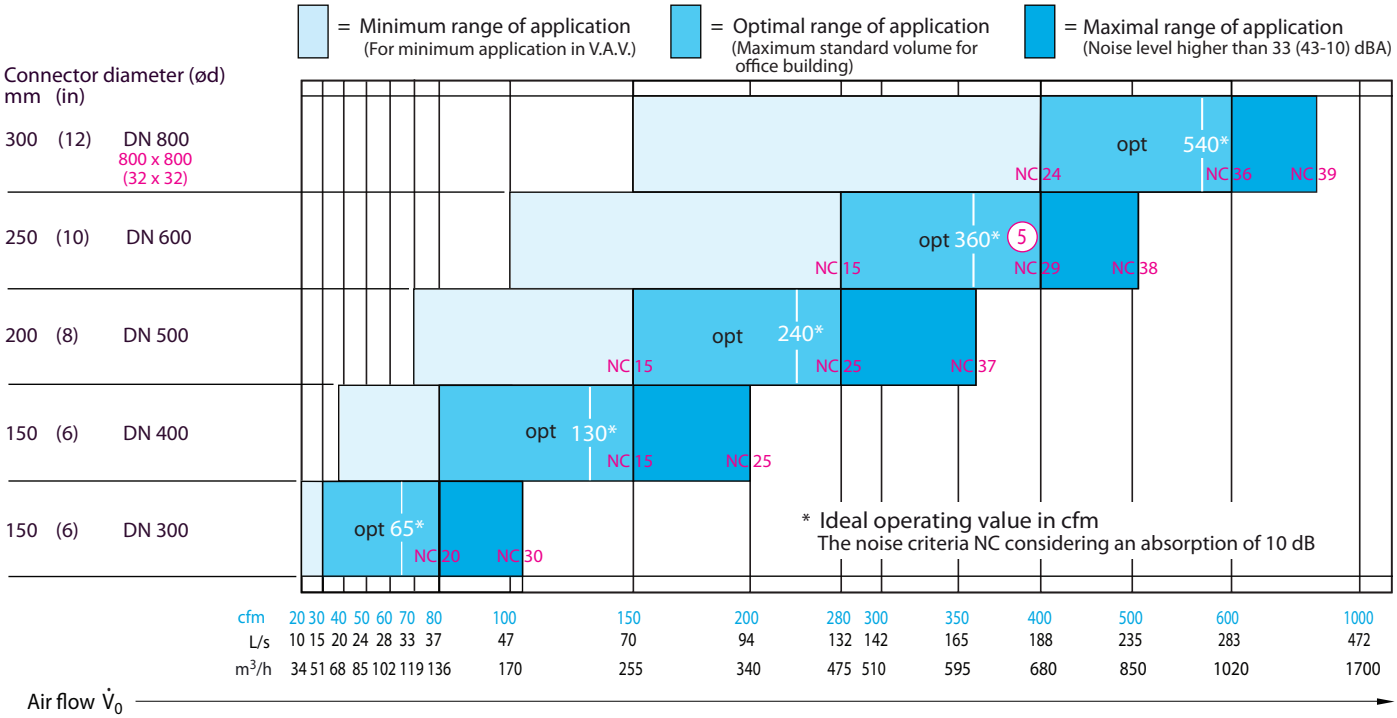
Location of the diffusers



Air flow pattern - DN 600



Scale grid : 1 m Blue: Air velocity >= 0.15 m/s



The distance (radius) in a view plan, to validate a maximum air speed of 0.15 m/s (30 fpm) at 1.3 m above the ground : X L - (y=h-1.3) V 0.15

The design of ventilation systems must be adapted to the needs of the occupants. Comfort parameters must be ensured, principally air speed in the occupied zone and operative temperature (average of air temperature and surfaces surrounding the occupant).

ASHRAE 55-2013, CSA Z 204-94 and several performance customers specifications (SQI, hospitals, etc.) recommend temperatures below 22.5° C (72.5° F) and to avoid exceeding air velocity of 0.15 m/s (30 fpm), to prevent the sensation of cold generated by the air stream.

In several cases, the air flow is felt at the height of 1.3 meters to over 0.15 m/s (30 fpm) for sitting (sedentary) person. German manufacturers of air diffusers also recommended a maximum air 0.15 m /sec (30 fpm) for a seated person, and 0.2 m/s (40 fpm) at the height of 1.8 meters for a standing person.

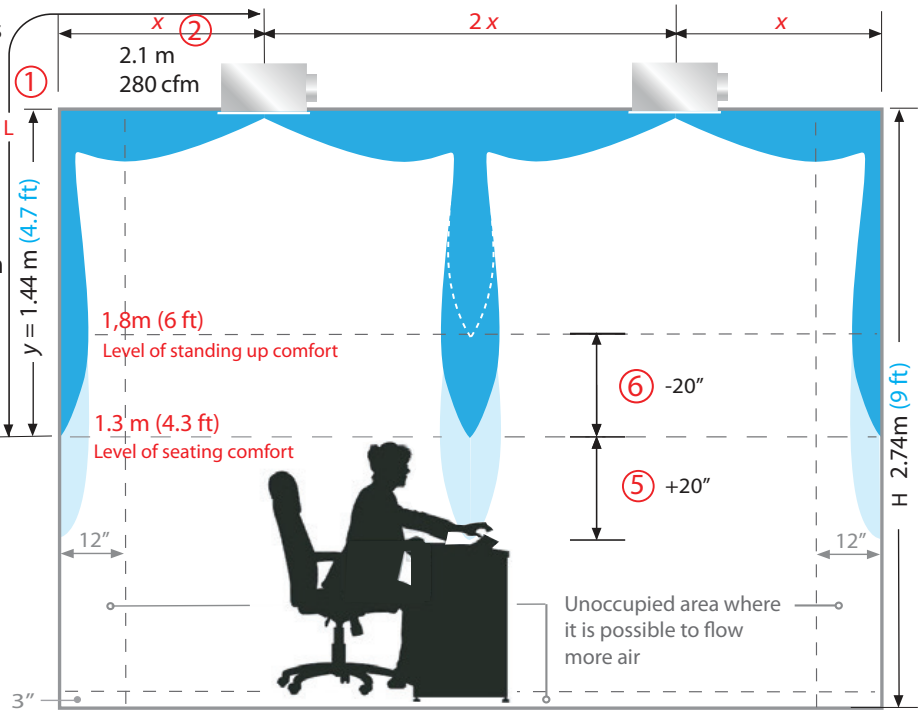
To meet comfort parameters, we base our design on a height of 1.3 meters above the ground. This will prevent the occupants seated to feel a sensation of cold caused by the air stream.

Criteria for heating only by ceiling (diffuser)

In the case of heating operation only by diffuser, it is important to respect the following criteria:

1. Select the units of ventilation in order to differenciate between the peripheral and central zones.
2. Position the diffuser in such a manner so the circle indicating the 30 fpm area overlaps the exterior wall by 2-3 feet (0.6 to 0.9 m).
3. Limit initial temperature difference to ± 27 ° F (15 ° C) or 37 ° C.
4. Set heating mode (VAV box) to the specified maximum flow.

See the "Complete guide of heating only by the diffuser" available on our web site : www.nadklima.com/en/products/swirl-diffusers/dal-358



Illustrated plan view of the circles demonstrating the trajectory of the air jet

To see the trajectory of the air jet from the diffuser to the sitting position, corresponding to a maximum speed of 30 fpm (0.15 m/s), just draw a circle depending on the value of the air flow provided in the tables below.

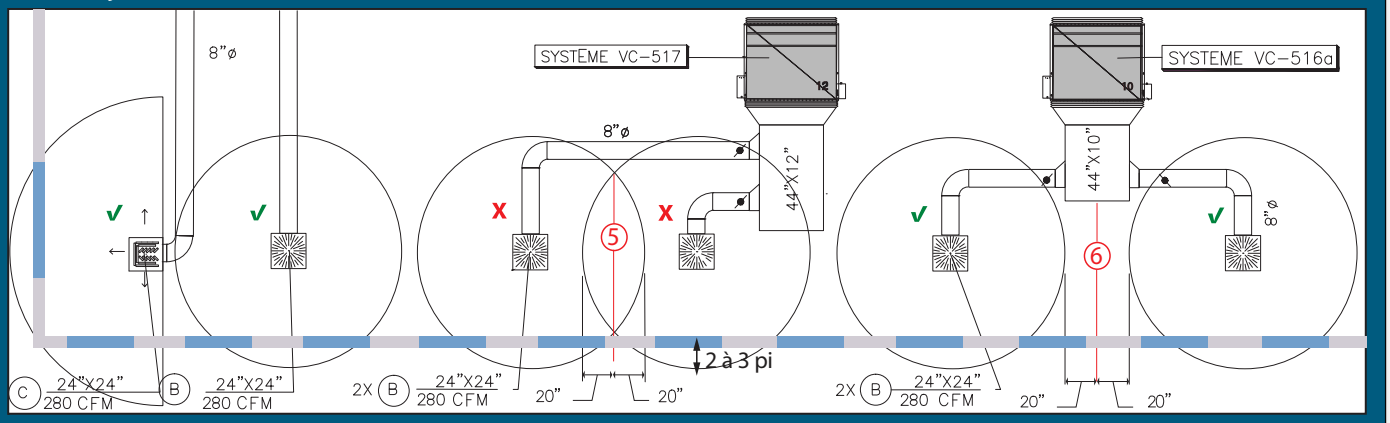


Illustration of circles and example of an application

Example of application:

- Application: Office
- Room height: 2.74 m (9')
- Diffuser Airflow: 280 fpm
- Operative Temperature: 22.5°C (72.5°F)
- Height of comfort level: 1.3 m (± 4 ')
- Comfort level air Velocity: 0.15 m/s (30 fpm)

From the ceiling height ① and the diffuser air flow ② data, select the nominal size of the DAL 358 diffuser (according to the quick selection table) ③ and choose the recommended distance between two diffusers in order to respect the parameters of comfort seat height at 1.3 meters. For this example, the radius circle to be drawing on the plane is 2.1 meters (81") ④. In the event where two jets are intersecting (which increases the jet length), the length in the crossing region represents the exceeding length of the comfort zone at 1.3 meters above the ground ⑤. That means that the speed is greater than 0.15 m/s (30 fpm) and could therefore create an air stream.

The half-distance between two circles indicates the distance reached by the jet at 0.15 m/s (30 fpm) above the occupied zone ⑥.

This distance (radius) in a view plan determined by the following equation:

$$X_{L-(y=h-1.3)}\ V\ 0.15$$

With:

L: $L = x+y$: The length of the jet to reach the air velocity at 0.15 m/s (30 fpm) provided by the manufacturers.

y: Height between the ceiling and the head of a seated person.

h: Height of the room

V 0.15: Air speed at 0.15 m/s (30 fpm).

DN 300

L/S	CFM	8'		9'		10'	
		m	in	m	in	m	in
14	30	0,4	16	0,2	8	0,1	4
19	40	0,5	18	0,3	10	0,1	4
24	50	0,5	20	0,3	12	0,1	4
28	60	0,6	22	0,4	14	0,2	6
33	70	0,6	24	0,4	16	0,2	6
38	80	0,7	26	0,5	18	0,2	6
42	90	0,7	28	0,5	20	0,2	8

DN 400

L/S	CFM	8'		9'		10'	
		m	in	m	in	m	in
38	80	0,1	4	0,10	4	0,10	4
42	90	0,3	10	0,10	4	0,10	4
47	100	0,4	16	0,10	4	0,10	4
52	110	0,7	26	0,25	10	0,10	4
57	120	0,7	28	0,40	16	0,10	4
61	130	0,9	33	0,55	22	0,25	10
66	140	1,0	39	0,70	28	0,40	16
71	150	1,2	45	0,85	33	0,55	22
75	160	1,3	51	1,00	39	0,70	28

DN 500 ③

L/S	CFM	8'		① 9'		10'	
		m	in	m	in	m	in
71	150	0,8	30	0,5	18	0,2	6
75	160	0,9	33	0,6	22	0,3	12
80	170	1,0	39	0,7	28	0,4	16
85	180	1,1	43	0,8	31	0,5	20
90	190	1,3	49	1,0	39	0,7	26
94	200	1,4	53	1,1	41	0,8	31
99	210	1,5	59	1,2	47	0,9	35
104	220	1,6	63	1,3	51	1,0	39
108	230	1,8	69	1,4	55	1,2	45
113	240	1,9	73	1,6	61	1,3	49
118	250	2,0	77	1,7	65	1,4	53
123	260	2,1	83	1,8	71	1,5	59
127	270	2,2	87	1,9	75	1,7	65
② 132	280	2,4	93	2,1 ④	81	1,8	69
137	290	2,5	96	2,2	85	1,9	75

DN 600

L/S	CFM	8'		9'		10'	
		m	in	m	in	m	in
132	280	1,8	71	1,5	59	1,2	47
137	290	1,9	75	1,6	63	1,3	51
142	300	2,0	79	1,7	67	1,4	55
146	310	2,1	83	1,8	71	1,5	59
151	320	2,2	87	1,9	75	1,6	63
156	330	2,3	91	2,0	79	1,7	67
160	340	2,4	94	2,1	83	1,8	71
165	350	2,5	98	2,2	87	1,9	75
170	360	2,6	102	2,3	91	2,0	79
175	370	2,7	106	2,4	94	2,1	83
179	380	2,8	110	2,5	98	2,2	87
184	390	2,9	114	2,6	102	2,3	91
189	400	3,0	118	2,7	106	2,4	94
193	410	3,1	122	2,8	110	2,5	98
198	420	3,2	126	2,9	114	2,6	102

DN 800

L/S	CFM	8'		9'		10'	
		m	in	m	in	m	in
189	400	2,5	96	2,1	83	1,9	73
196	415	2,6	100	2,3	89	2,0	79
203	430	2,7	106	2,4	94	2,1	83
210	445	2,9	112	2,5	98	2,3	89
217	460	3,0	116	2,7	104	2,4	94
224	475	3,1	122	2,8	110	2,5	98
231	490	3,2	126	2,9	114	2,7	104
238	505	3,4	132	3,1	120	2,8	110
245	520	3,5	138	3,2	126	2,9	114
252	535	3,6	142	3,3	130	3,1	120
259	550	3,8	148	3,5	136	3,2	124
267	565	3,9	154	3,6	142	3,3	130
274	580	4,0	157	3,7	146	3,4	134
281	595	4,2	163	3,9	152	3,6	140
288	610	4,3	167	4,0	156	3,7	146

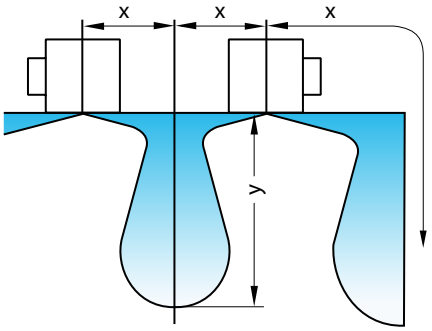
To draw circles of these tables and draw the form of the diffuser on AutoCad, an application is available on our website:
www.nadklima.com/en/products/swirl-diffusers/dal-358

Performance diagrams

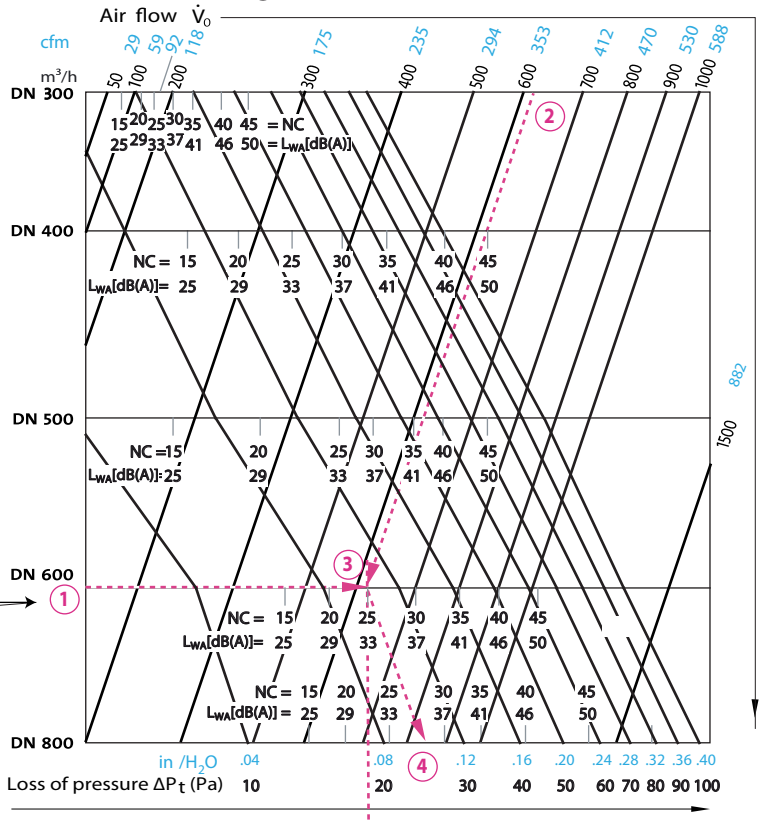
Important :

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

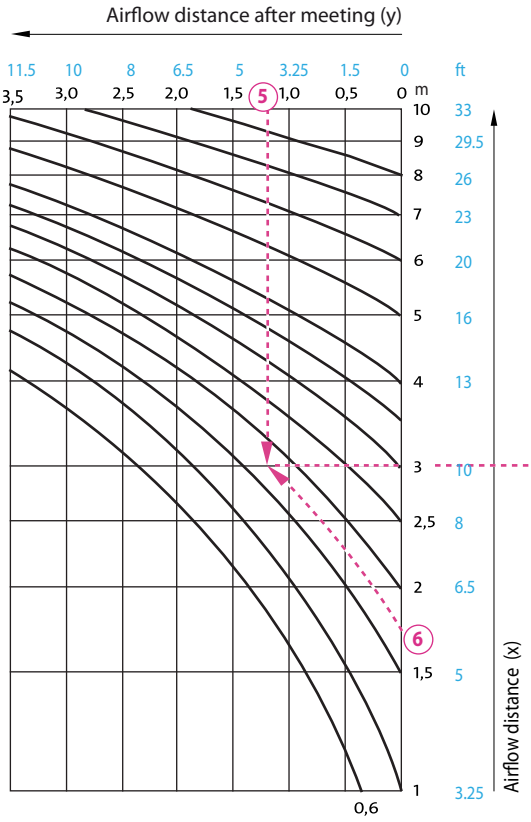
The values are based on an isothermal flow.

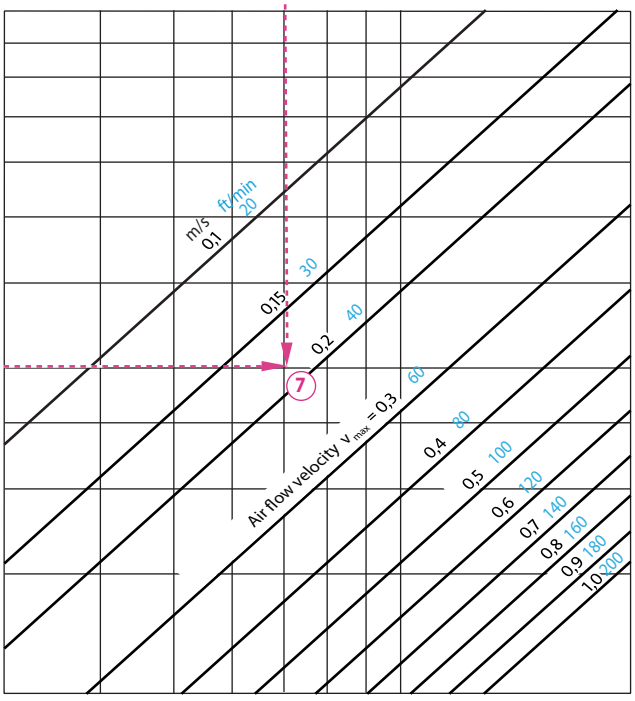


Flow sub-ceiling

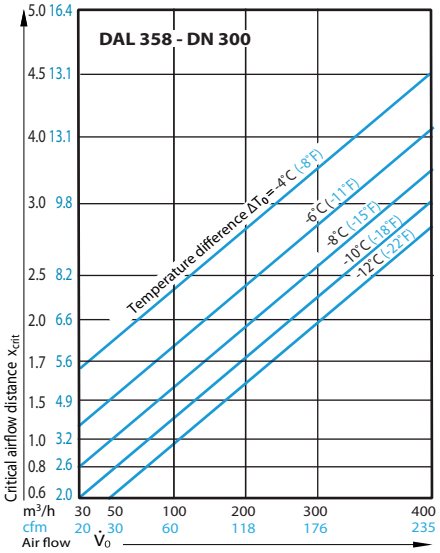


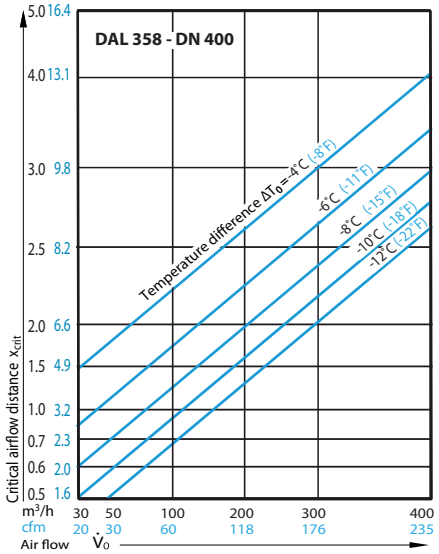
See example on page 5

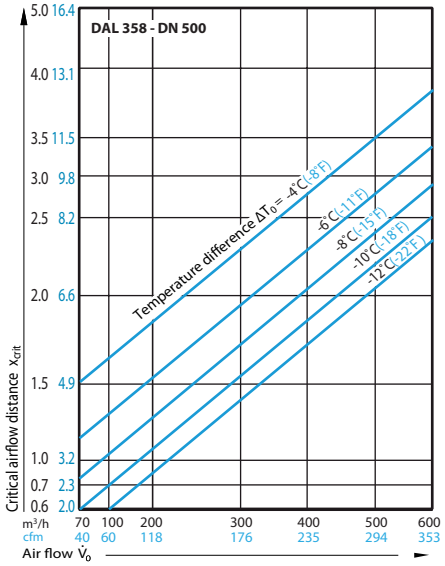


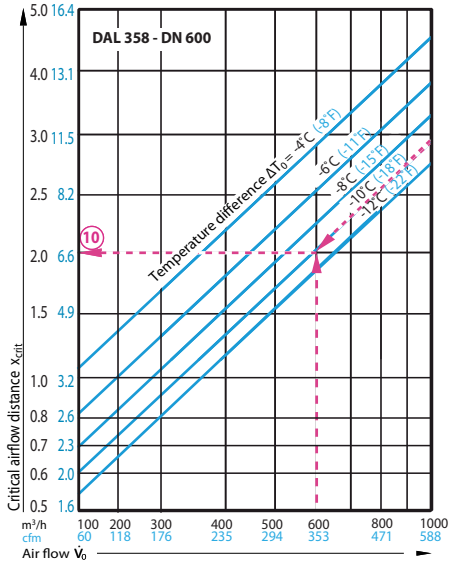


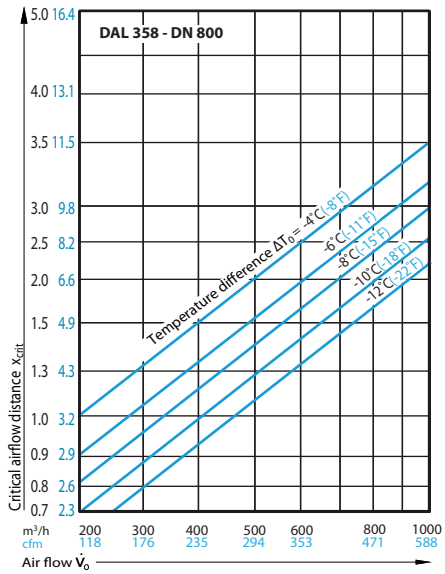
Critical distance of airflow in cooling and temperature ratio

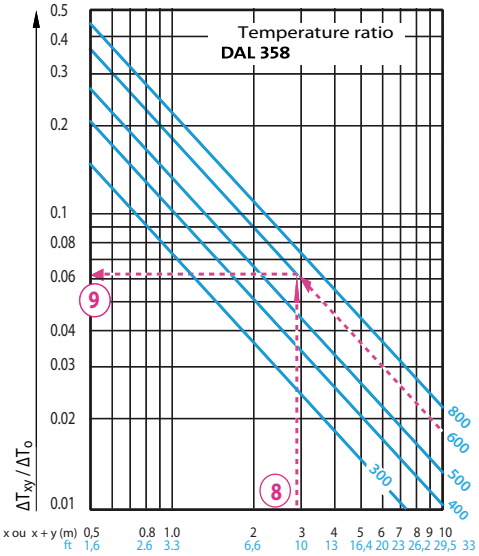












Specifications :

Spade height: H = 3.00 m
Airflow rate by diffuser: V_0 = 600 m³/h
Maximum cooling: ΔT_0 = -10° C
Distance between diffusers: 2x1.7 = 3.4 m

Required:

1. Nominal size of diffuser
2. NC value and acoustic power L_{WA}
3. Pressure drop Δpt
4. Maximum air velocity at nominal head height (1.8 m)
5. Maximum temperature variation of ambient air at nominal head height
6. Critical path of airflow (stream detaching itself from ceiling when cooling)

Solution:

1. From the "Range of Applications" diagram we find the nominal size of DN 600 (1)

2. & 3. From the "Airflow from Ceiling" diagram with the DN 600 diffuser and an airflow rate of 600 m³/h (2) we find the following values: Noise criteria NC = 25 and the acoustic power level L_{WA} = 33dB(A) (3)
Total pressure drop 25 Pa (4)

4. At nominal head height y = H - 1.80 = (3.00 m - 1.80 m = 1.20 m) (5) and a horizontal airflow path of x-1.7 m (6) we observe a maximum air velocity of 0.18 m/s (7)

5. For an airflow distance of (x+y) = 1.70 m + 1.20 m = 2.90 m (8) and a DN 600, we observe a temperature ratio of 0.062°C. (9)
The maximum temperature variation reached between room air and air flow at head height is 0.062 x 10°C = -0.62°C.

6. From the "Critical Distance of Airflow" diagram and an airflow rate of 600 m³/h with an initial temperature variation of Δ T_0 = -10° C we come to a critical distance of airflow X_{crit} = 2 m. (10)

TVA, Montréal, Canada

Université Laval, Québec, Canada

Dimensions and weight

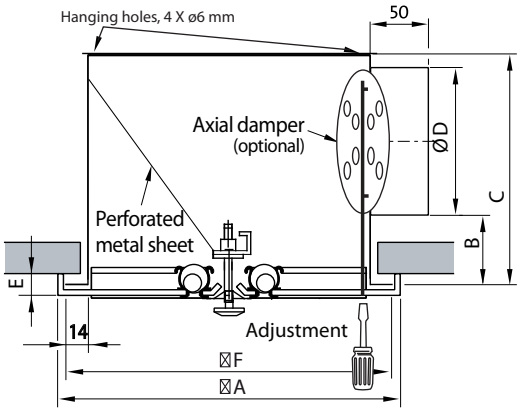
Dimensions / weight **Square plenum**

	DN 300/400	DN 500	DN 600	DN 800
Size A	400	502	603	800
Size B	76	82	68	66
Size C	251	312	347	411
Size ØD	150	200	250	300
Size E	12	12	12	12
Cote F	387	488	584	790
Weight (kg)	4.5/4.7	7.4	11	17.1
A_{eff} (m^2)	0.0080/0.0134	0.0214	0.0347	0.0508

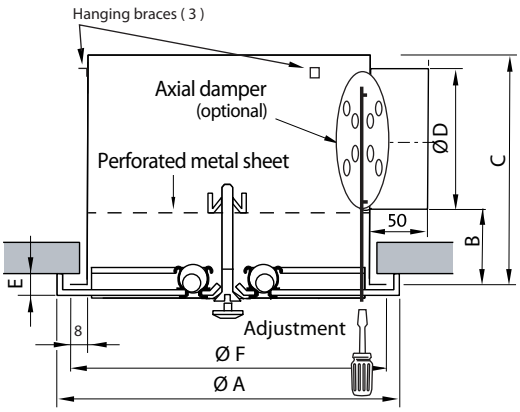
Dimensions / weight **Round plenum**

	DN 300/400	DN 500	DN 600	DN 800
Size ØA	400	500	600	800
Size B	76	82	67	66
Size C	252	312	347	411
Size ØD	150	200	250	300
Size E	8	8	8	8
Size Ø F	392	492	592	792
Weight (kg)	3.8/4.3	6.5	8.5	14.3
A_{eff} (m^2)	0.0080/0.0134	0.0214	0.0347	0.0508

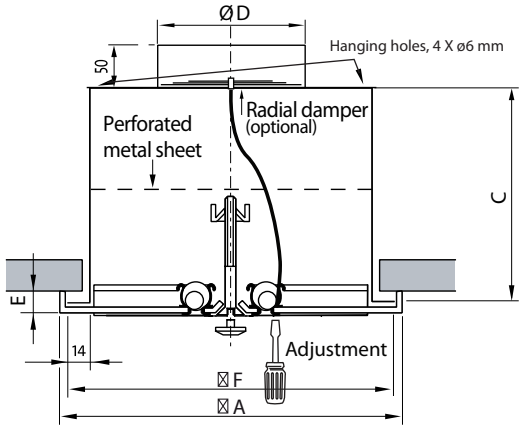
square plenum - side inlet



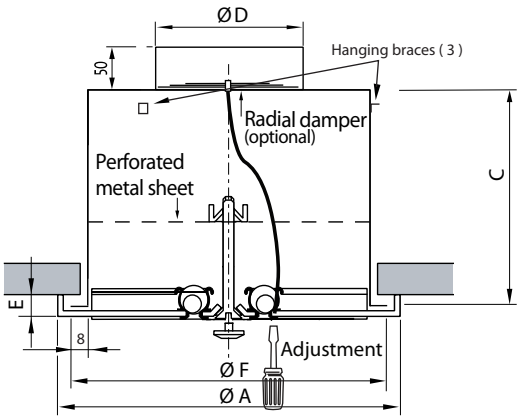
round plenum - side inlet



square plenum - top inlet



round plenum - top inlet



Fireproof damper

Square plenum

	DN 300		DN 400		DN 500		DN 600
Size □A	603	400	603	400	603	502	603
Size C	400	400	400	400	450	450	498
Size ØD	150	150	150	150	200	200	250
Size □F	584	396	584	396	584	488	584
Weight (kg)	16.7	10.7	16.8	10.9	17.7	14.6	19.2

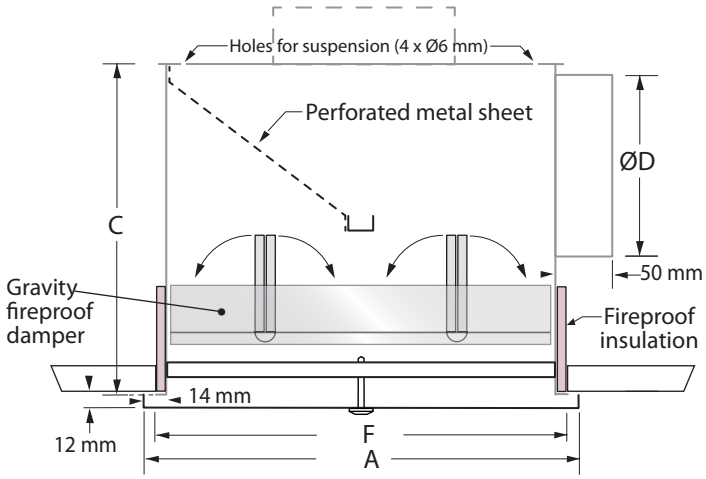
Note : The balancing damper is not available with the fireproof damper.

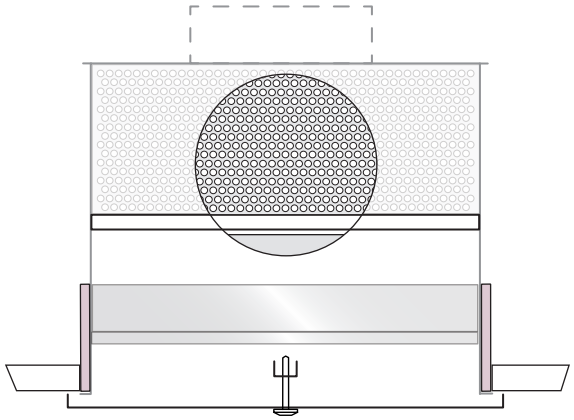
Classified ULC (Underwriters laboratories of Canada), the NAD Klima diffusers with fire resistant dampers have a fire-resistant rating of 3 hours.

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





Airflow correction factor to read an Alnor (model 9407) balometer

To ensure adequate balancing of DAL 358 type diffusers, it is recommended to use the airflow rate correction factors, which are equivalent to the resistance generated by the balometer.

These correction factors are appropriate for a ventilation system comprising of at least 3 diffusers after a VAV unit or box. For less than 3 diffusers with an automatic airflow rate setting, correction factors are lower than stated.

As indicated in the ALNOR manual, Appendix B - " Capture Hood Flow Resistance ", the instrument's manufacturer recommends taking a reading at the ventilation duct and comparing it with one taken under the diffuser, with or without the balometer, in order to determine the correction factor.

To avoid having to perform this procedure, we have provided the correction factors needed for all DAL 358 diffuser models.

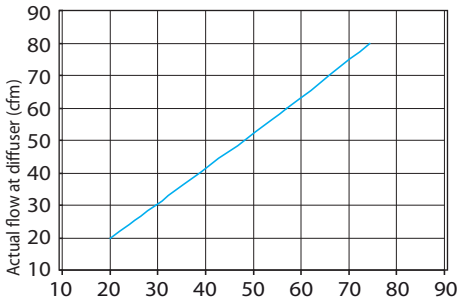
Warning!

An electronic balometer is able to generate own correction factors. For these models of balometers, when used with a helical effect diffuser such as the DRS, a stabilizing cross must be installed within. Without the cross, it is possible to obtain a reading up to 40% higher than the actual rate.

Confirm with the user's guide balometer.

DAL 358 - DN 300

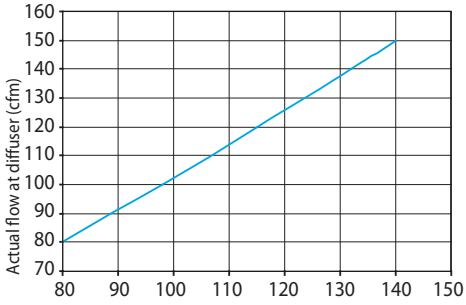
Adjustment : Helical - adjustment 21



Balometer (cfm)	20	29	57	70	74
Factor	1.00	1.01	1.05	1.06	1.07
Actual flow (cfm)	20	30	60	75	80

DAL 358 - DN 400

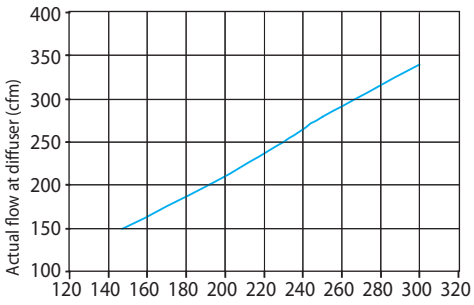
Adjustment : Helical - adjustment 21



Balometer (cfm)	80	98	115	132	140
Factor	1.00	1.02	1.04	1.06	1.07
Actual flow (cfm)	80	100	120	140	150

DAL 358 - DN 500

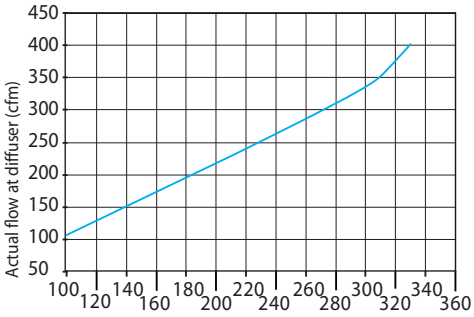
Adjustment : Helical - adjustment 21



Balometer (cfm)	147	192	230	250	300
Factor	1.02	1.04	1.08	1.12	1.13
Actual flow (cfm)	150	200	250	280	340

DAL 358 - DN 600

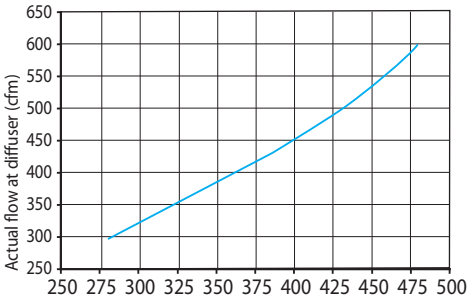
Adjustment : Helical - adjustment 21



Balometer (cfm)	94	185	270	310	330
Factor	1.06	1.08	1.11	1.16	1.21
Actual flow (cfm)	100	200	300	350	400

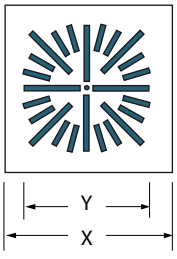
DAL 358 - DN 800

Adjustment : Helical - adjustment 21



Balometer (cfm)	360	392	415	446	480
Factor	1.11	1.14	1.20	1.23	1.25
Actual flow (cfm)	400	450	500	550	600

Identification Chart



DN	X (mm)	Y(mm)
300	603	355
400	603	355
500	603	455
600	603	552
800	803	755

Restaurant Auguste, Sherbrooke, Canada

CIMA+, ingénieurs, Sherbrooke, Canada

Specifications

1. Description and physical characteristics

1.1 The high induction swirl airflow diffuser shall be made of 20 ga. mat finished steel. The round or square front plate shall have integrated eccentric adjustable rollers.

1.2 The 100 mm long eccentric rollers shall have an alphanumeric identification, which will allow adjustment of the air flow pattern 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 diffuser plate shall be available for air flows of 1, 2 or 3 directional configurations as well as corner or "L" shapes.

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 shall indicate the pressure drop, acoustic power it 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 must ensure a maximum temperature difference 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 at $\Delta T_0 = -10^{\circ}C$).

2.2.3 In cooling mode, the diffuser shall guarantee, in variable volume (VAV), a critical distance (X_{crit}) of at least that which 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 ≥ 1.1**

The air diffuser shall meet the ACE air change effectiveness value or the ASHRAE 129 standard ratio of Ez ≥ 1.1 This value shall be measured according to the ASHRAE 129 standard by an independent laboratory.

Note : This Ez ≥ 1.1 value has been applied to this project and will result in a reduction of heating and cooling capacities of the units.

3. Plenum

3.1 The diffuser shall be delivered with a plenum made and tagged by the diffuser's manufacturer. The plenum shall be constructed from 24-gauge galvanized steel and include 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 caulking, which is free of VOC (volatile organic compounds) emissions.

3.2 The diffuser front plate shall be attached to the plenum by 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 the volume of air. This damper shall be available in two options:

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

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

4. Balancing

4.1 Balancing of DAL 358 diffusers shall be performed by a professionally certified technician, trained in ventilation system balancing.

4.2 The technician shall take into consideration the correction factor for balometer usage when regulating air volume.

5. Quality required: NAD Klima model DAL 358

Codification

DAL 358																			**Product**
	Q = Square R = Round																		**Configuration**
		300, 400, 500, 600, 800																	**Nominal dimension**
			400, 502, 603, 800 (603 for 24" x 24" T-bar)																**Outer size**
				ST = Standard helical airflow (21) HL = Flow rise (>5 m) (exterior 21 and center CD) VF = Vertical airflow (CD) 1W = Airflow on one direction (21) 2W = Airflow in two opposing directions (21 - 65) 2L = Airflow in two directions in an L shape (21) 2C = 90° airflow (corner) (21) 3W = 180° airflow (wall) (21 - 65) XX = Without roller (return)												**Air flow**
					W = White roller and receptacle (RAL 9003) C = Cream roller and receptacle (RAL 9010) B = Black roller and receptacle X = Without roller												**Roller and receptacle color**
						9003 = White 9010 = Cream 00SB = Solar Black (Standard black matte) 00SM = Silver Mat (Standard metallic grey) _____ = RAL color (write RAL color number)										**Diffuser color**
							S = Plenum with side inlet T = Plenum with top inlet X = Without plenum										**Plenum**
								I = With acoustic insulation A = With closed cell acoustic insulation X = Without insulation									**Acoustic insulation**
									F = With fireproof insulation and fireproof damper (balancing damper not available) X = Without fireproof insulation and fireproof damper								**Fireproof insulation**
										D = With axial damper (for side inlet only with standard airflow) R = With radial damper (for top and side inlet) * X = Without damper							**Balancing damper**
DAL358 - Q - 300 - 603 - ST - W - 9003 - S - X - X - X																			**Example**

Notes :
Blue : Standard, in stock
*Not available on oval collar

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