nad KLIMA

MADE IN CANADA

DRA

Duct diffuseur

catalog 1.1.4

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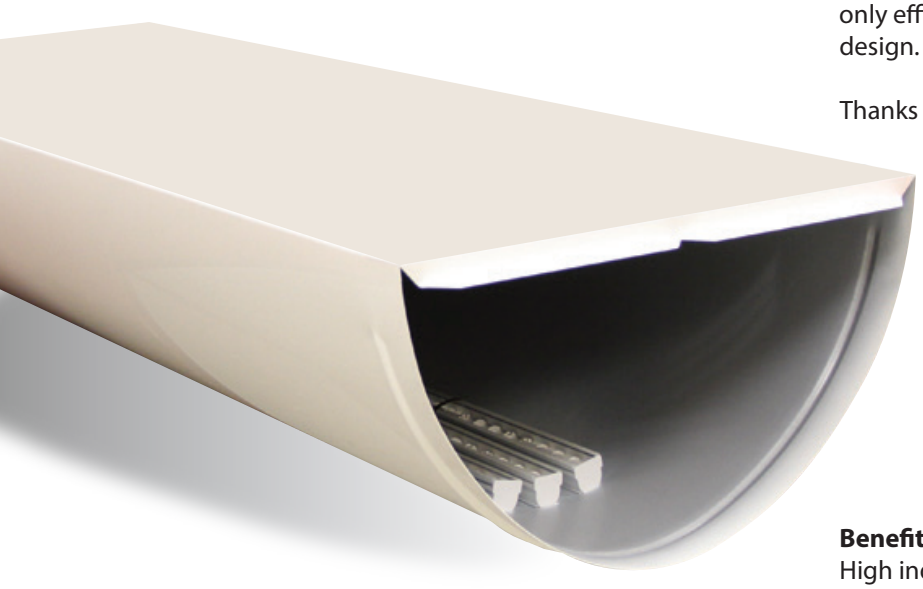
Refer to the digital version on **www. nadklima.com**

Version 2019

DRA

Presentation and benefits

The DRA is a high induction diffuser with dual applications. It can serve as a diffuser or it can be used as a duct. It is particularly suited for rooms with low ceilings and can be mounted directly into the ceiling.



The DRA diffuser is made of galvanneal steel covered with powder coated paint. The standard manufacture size is 1450 mm (57 in) long. Alternatively, it is available in different lengths to meet your needs.

It is ideal for applications where technology must be not only efficient but also integrated into the architectural design.

Thanks to the eccentric rollers, the semi-circular DRA diffuser is able to offer multi-directional air flow.

Whether in cooling or heating mode, the DRA duct diffuser can guarantee comfort to the occupants, due to its proven technology.

Areas of application

- Rooms with restricted height
- Commercial and industrial spaces
- Office areas
- Entrance halls
- Residential
- Restaurants

Benefits

High induction diffuser which allows air homogeny in a room: temperature, humidity and density.

- Increased comfort in the occupied zone
  - Comfortable air movement
  - Low temperature differences
  - Low noise
- The eccentric rollers allow an adjustment of the airflow in a 180° range
- Possibility of changing air flow direction after installation
- Possibility of reducing the total airflow up to 30% in VAV.
- Possibity of eliminating heating baseboard through heating with the diffuser
- Simplify the ventilation network and reduce installation costs
- Easy adaption to systems with variable or constant airflow

Easy to maintain

- Powder coated paint which minimizes dust collection and makes it easy to clean.
- Low accumulation of dust in the duct because dust is purged by the slots.

Durability

- The powder coated paint prevents chipping.
- Steel suspension rail and duct made of galvanized steel covered with a thermo-lacquered paint.

Easy installation

- Installed using a suspension rail, threaded rods or directly into the ceiling.

Configuration and accessories

Composition
The DRA is a semi-circular diffuser with a smooth finish, on which slots are mounted lengthwise. The number of slots is determined by the amount of air flow required and the duct's diameter.

The slots contain 100 mm long ABS eccentric rollers (black, cream or white).

The eccentric rollers are provided with alphanumeric guides, which allow adjustment of the airflow pattern across a 180° range. The DRA diffuser is constructed in diameters from 305 mm (12 in) up to 1118 mm (44 in).

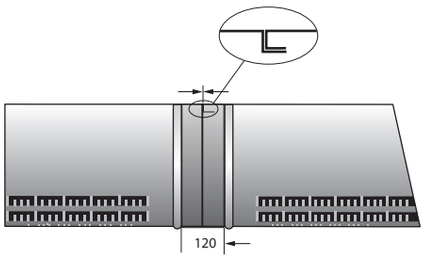
Passive ducts without slots are available in the same dimensions as the active DRAs in order to ensure the uniformity of the duct network.

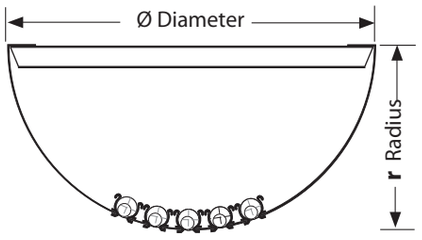
Accessories
All of the standard accessories (elbows, sleeves, reducers, multi-branch connectors, etc.) are available.

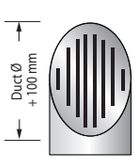
For air balancing reasons, a reducer or a balancing damper is required between multiple sections (see page 4).

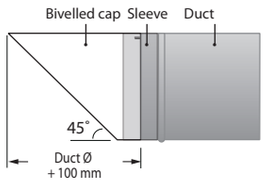
Assembly
The DRA diffuser sections are linked by connection sleeves, which are adapted to the diameter of the duct.

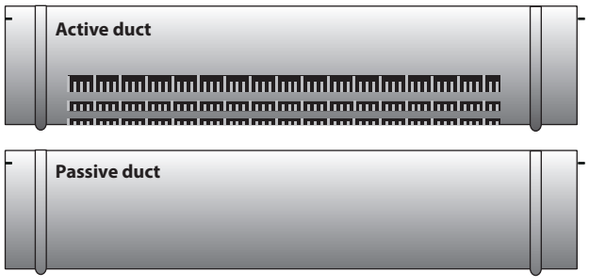
Standard sleeve: 120 mm (4 3/4 in)
No spacing between DRA



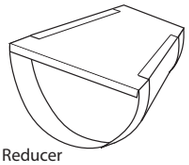








Detailed manufacturing of a transformation

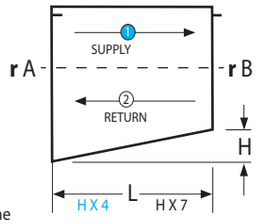


Orientation of the airflow

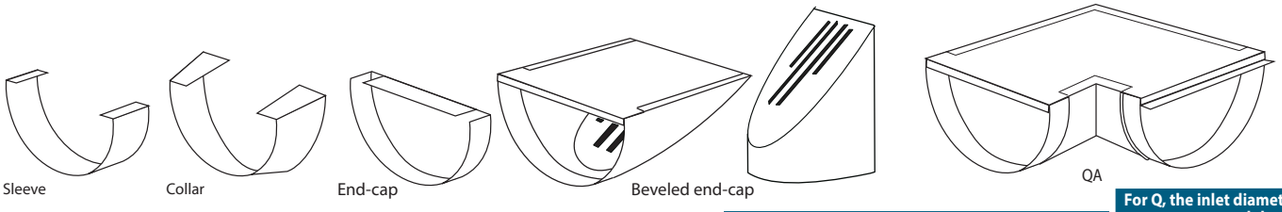
① H/L = 1/4
② H/L = 1/7

① L = H X 4
② L = H X 7

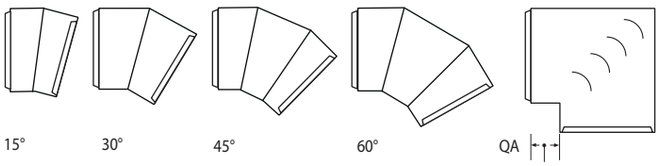
H = r A - r B



Note : The standard length of reducers is rounded to the next whole foot. (ex.: L = 1.3 ft will be: L = 2 ft)

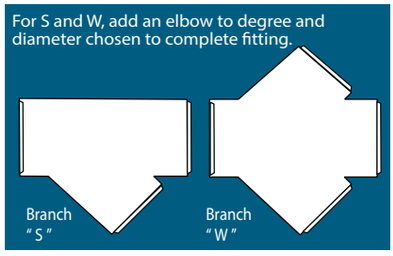


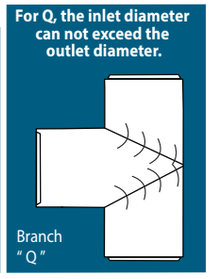
Elbows and connectors



The standard radius is based on : r (c/c) = 1.5Ø

The standard inner corner of QA is 100 mm (4 in)





Operation and direction of airflow

Mode of operation

The eccentric rollers form, combined with aluminum air guiding slots, an optimal air flow.

A drop in pressure occurs when approching the rollers' surface. As air leaves the slot, it is stable and generates a low level of acoustic power.

The flow maintains a powerful induction of ambient air.

The eccentric rollers' positioning allows for an adjustment of the air jet's direction, with or without reduction in the exit area. The rollers have small plates to guide the air, which support a dense airflow and maintain the air jet's direction perpendicular to the rollers' axis.

Setting of the air jet direction

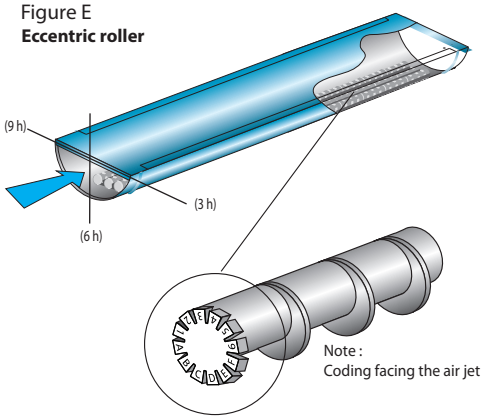
Thanks to the shape of the eccentric rollers and adjustment dial with alphanumeric characters, the air jet's direction at the diffuser's outlet can vary up to 180°. For each direction, there are two (2) rollers positions ("reduced" or "not reduced"), as illustrated in figure E.

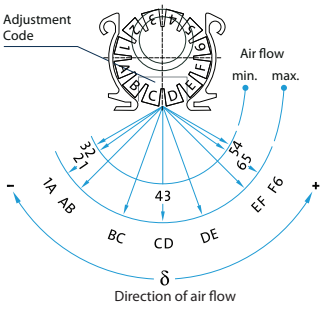
The length of each roller is 100 mm and they are individually adjustable. As a result, the combinations of airflow are almost infinite. In manufacturing, the ducts are individually adjusted for each project. The standard setting for the rollers is set to diffusion mode in positions "21" and "65" alternately. This setting produces strong induction, which can be used to meet heating and cooling needs, thereby creating high mixing levels.

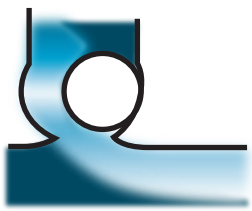
As a result, the divergent mode allows jets to blow in more accurate directions.

This mode also allows a longer projection of the airflow. In specific zones, which are usually difficult to cover, a specialized setting can be created. Figures C and D show the relationship between the position of the eccentric roller and the direction of exiting airflow. Note that to maximize air projection, multiple jets can be orientated in the same direction to optimize the coverage of a zone, even when heating..

Figure E
Eccentric roller







Examples of application

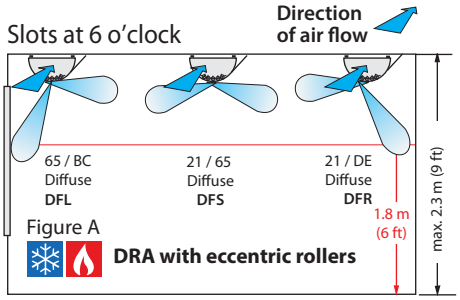


Figure A
DRA with eccentric rollers

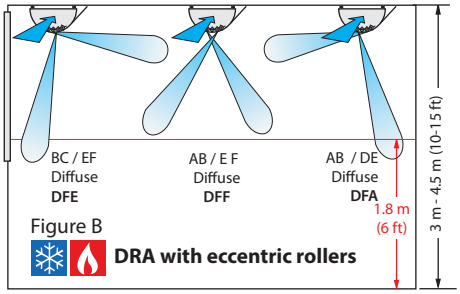


Figure B
DRA with eccentric rollers

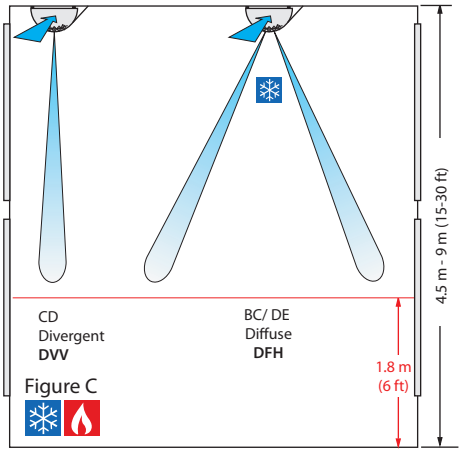


Figure C

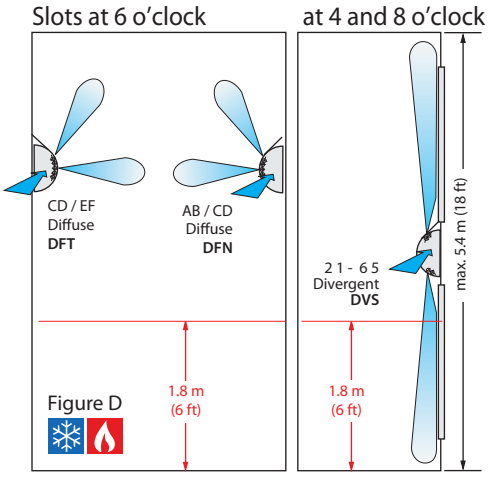


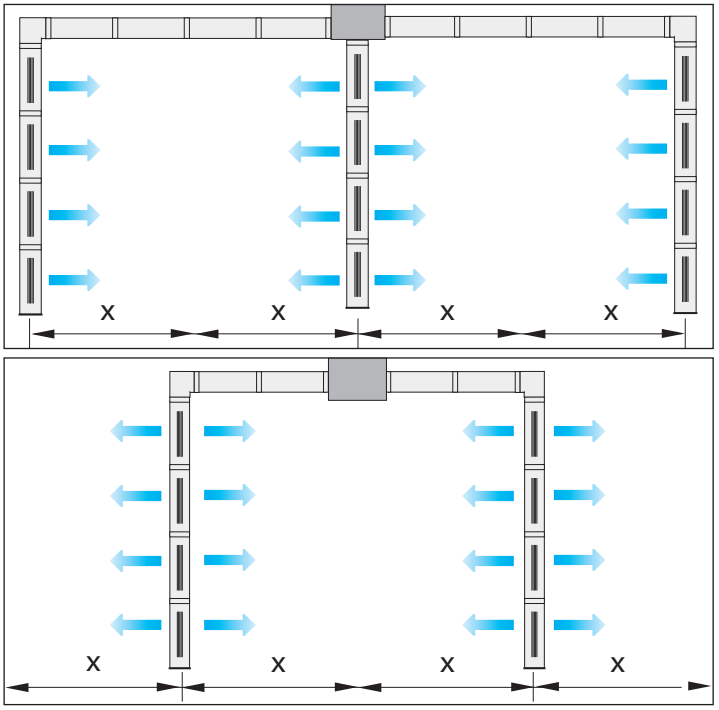
Figure D

Range of application and duct dimensions

Maximum installation space

Air flow by meter of slot of DRA $\dot{V}_o$	Installation height of of the DRA H	Recommended space between DRA X MAXIMUM
m³/h/m (cfm/li. ft)	**m (ft)**	**m (ft)**
50 - 100 (9 - 19)	≤ 3 (10)	5 (16)
100 - 150 (19 - 27)	3 - 4.3 (10 - 14)	7 (22)
150 - 170 (27 - 31)	4.3 - 7 (14 - 23)	8 (26)

Cooling only: keep the maximum distance X depending on the height, but keep the airflow by meter of the slot at 50 – 120 m³/h/m.



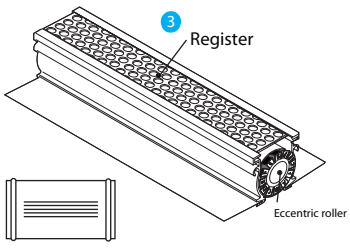
Aerodynamic balancing and reducer placement

To optimize a uniform airflow in the DRA diffuser, the total length must not exceed 7.25 m (24 ft) without using a reducer or a balancing damper. For a diffuser greater than 7.25 m (24 ft), a reducer must be installed at the center (see 1) or, to keep the same diameter of the duct, replaced with a balancing key (see 2). Once there are more than 4.5 m (15 ft) of active ducts, it is recommended to install a register for air balancing (see 3).

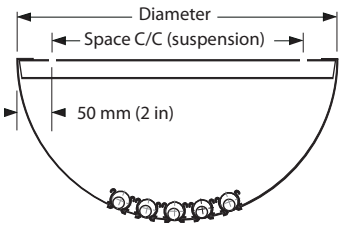
Dimension of duct and number of slots

Diameter ø		Flow CFM		Flow l/s		Spacing C/C Suspension holes		Slots Qty
in	(mm)	Min.	Max.	Min.	Max.	in	(mm)	from 1 to
12	(305)	171	260	81	123	8	(203)	3
14	(356)	261	370	124	175	10	(229)	4
16	(406)	371	610	176	288	12	(305)	6
18	(457)	611	790	289	373	14	(356)	7
20	(508)	791	980	374	462	16	(406)	10
22	(559)	981	1200	463	566	18	(457)	12
24	(610)	1201	1440	567	679	20	(508)	13
26	(660)	1441	1700	680	802	22	(559)	14
28	(711)	1701	1980	803	934	24	(610)	14
30	(762)	1981	2290	935	1080	26	(660)	14
32	(813)	2291	2620	1081	1236	28	(711)	14
34	(864)	2621	2970	1237	1401	30	(762)	14
36	(914)	2971	3340	1402	1575	32	(813)	14
38	(965)	3341	3730	1576	1759	34	(864)	14
40	(1016)	3731	4140	1760	1953	36	(914)	14
42	(1067)	4141	4580	1954	2160	38	(964)	14
44	(1118)	4581	5040	2161	2377	40	(1016)	14

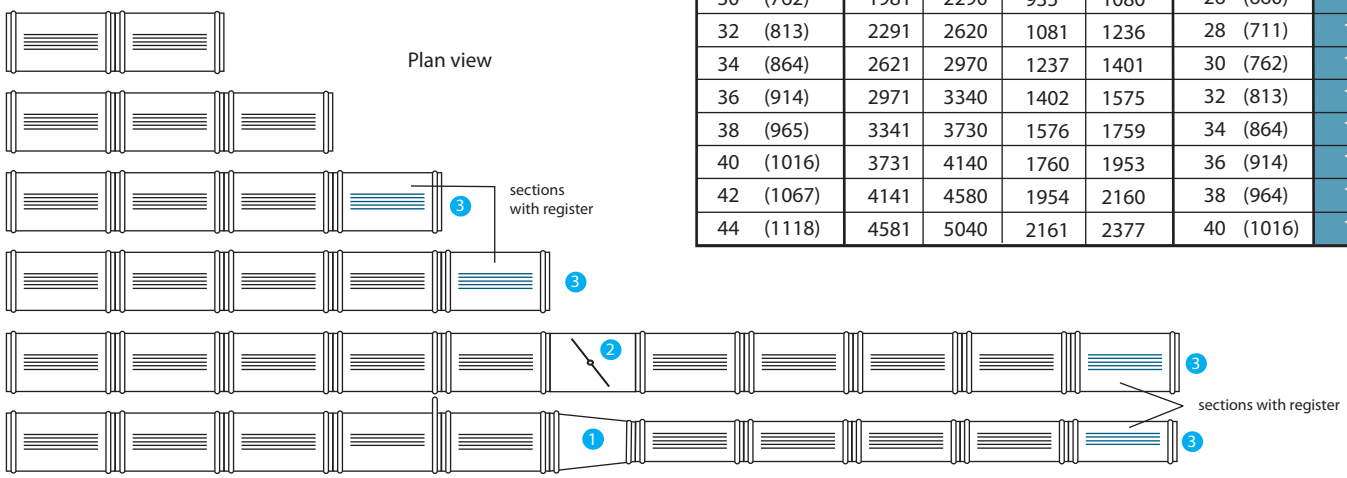
Reducer and register emplacement



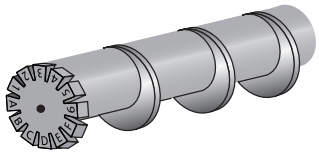
Duct dimensions



Plan view



Selecting the number of slots



Important:

To make a selection of DRA, the total airflow must be calculated for a 1 m length of active slots.

Specifications:

Height at the bottom of the duct: H = 4 m
Airflow by diffuser: $\dot{V}o = 420\ m^3/h$
Cooling: $\Delta T = -10°C$
Heating: $\Delta T = +10°C$
Length of the DRA: $L_R = 1450$ mm

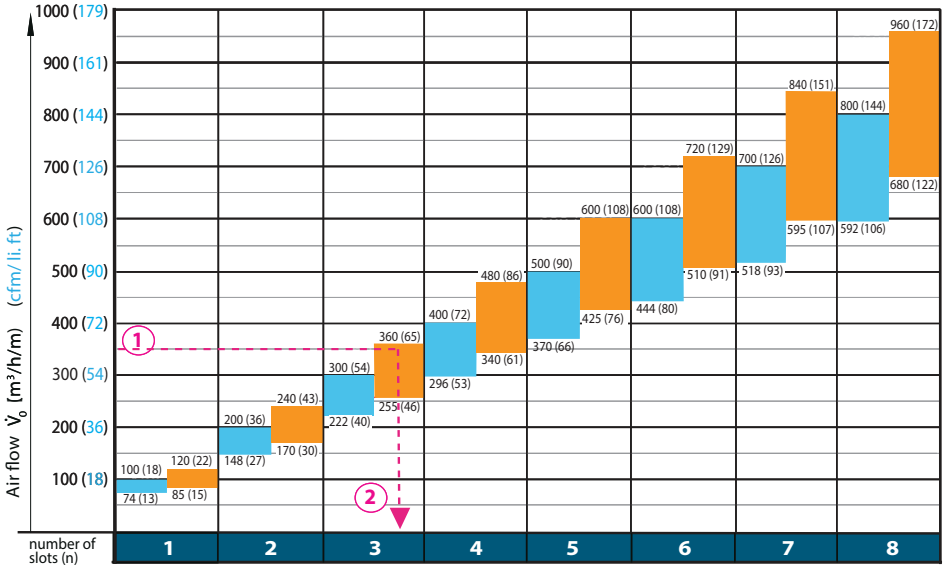
Required:

1- Airflow per meter of slot section
2- Number of slots n

Solution:

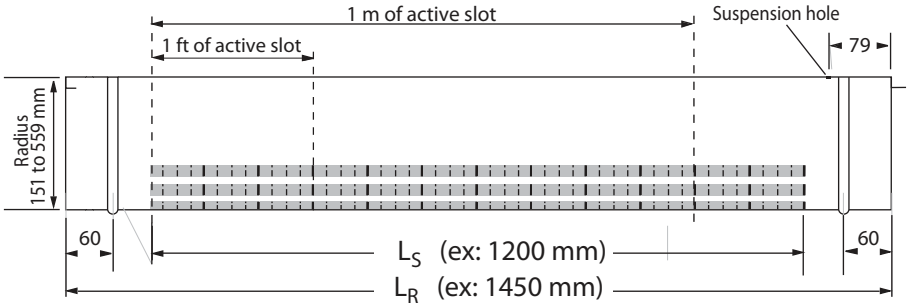
1- The length of DRA slot is determined by the following:
$L_S = L_R - 250\ mm = 1200\ mm$
We find the airflow by meter of slot section:
$\dot{V}_o\ (m^3/h\ DRA) \times F = \dot{V}_o (m^3/h/m)$
$420\ (m^3/h) \times 0.83 = 349\ (m^3/h/m)$ ①

2- Using the diagram "Selecting the number of slots", for a height of 4 m and with a heating application, we find the number of slots: n = 3 ②



Air Flow by meter of slot of DRA $\dot{V}_o$	m³/h/m/slot (cfm/li. ft/slot)
Cooling only for all heights. Heating and cooling for heights ≤ 3.0 m (10 ft)	74 - 100 (13-18)
Heating and cooling or heating only for heights of 3.0 m (10 ft) – 4.3 m (14 ft)	85 - 120 (15 - 21)

- In the case where heating mode can not be selected with the initial air flow, reduce the slot length L_S in accordance with the recommended air flow per meter of slot.
- In a critical acoustic environment, increase the number of slots.

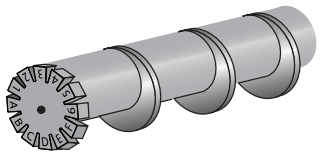


Air flow conversion by meter of slot length:

$\dot{V}_o\ (m^3/h\ DRA) \times F = \dot{V}_o\ (m^3/h/m)$
$\dot{V}_o\ (cfm/DRA) \times F = \dot{V}_o\ (cfm/li.\ ft)$

Length of DRA L_R	Length of slot L_S (mm)	(li. ft)	Multiplication factor F ($m^3/h/m$)	(cfm/li. ft)	
1000	(800)	(2.62)	1.25	(0.382)	
1100	(900)	(2.95)	1.11	(0.339)	
1200	(1000)	(3.28)	1.00	(0.305)	
1300	(1100)	(3.60)	0.91	(0.278)	
1400	(1200)	(3.94)	0.83	(0.254)	
1450	(1200)	(3.94)	0.83	(0.254)	Standard

Air flow velocity diagrams

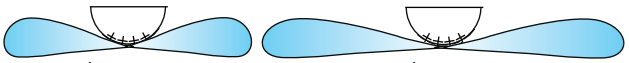


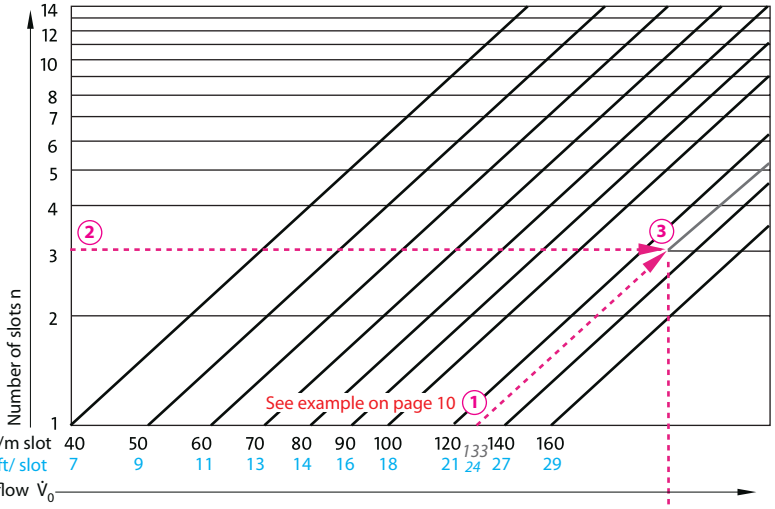
Airstream pattern
(roller position)

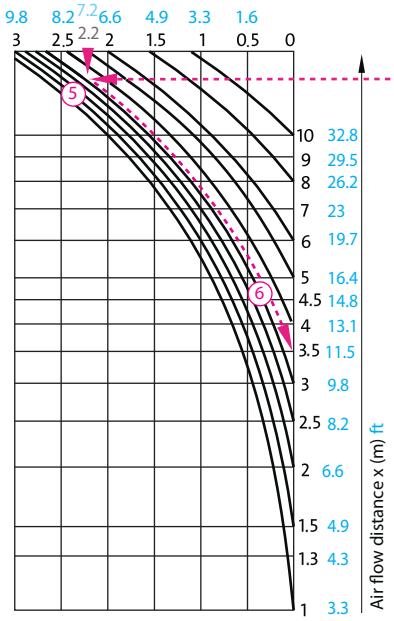
V_{max} = k1 x $V_{max\ diagram}$

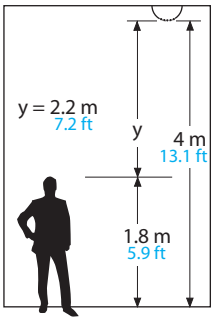
Diffuse
(1 x 21 / 1x 65)
standard

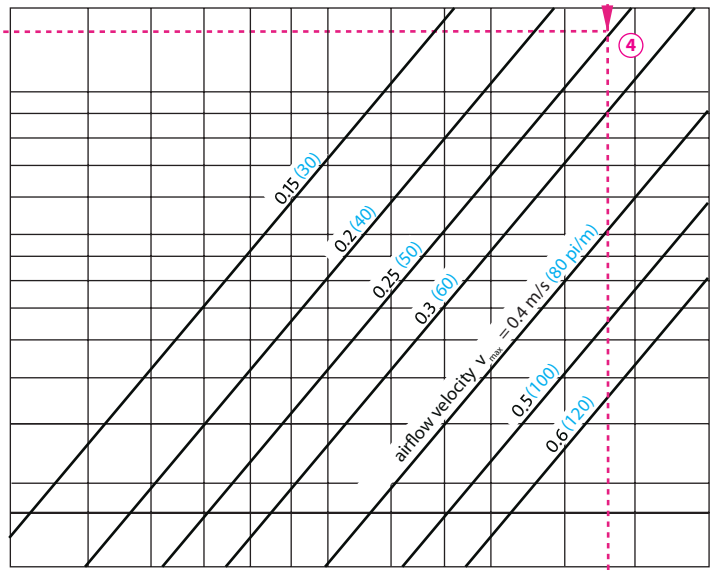
Diverging
(half left 21 -
half right 65)

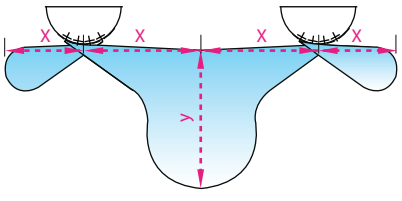




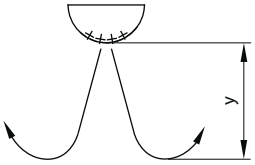


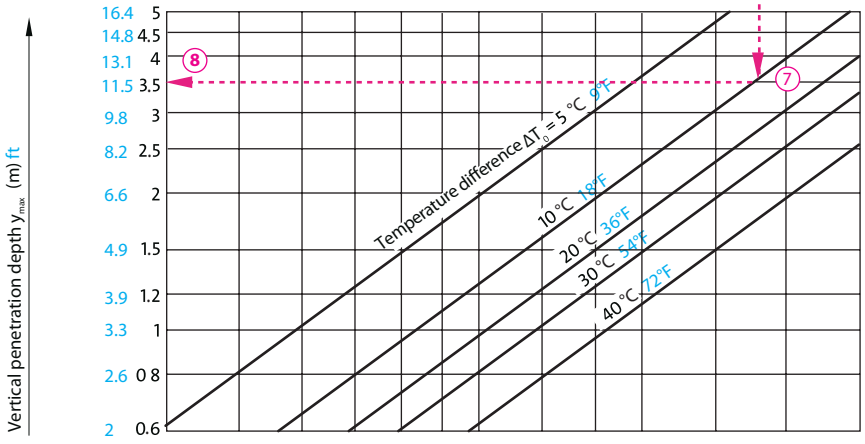




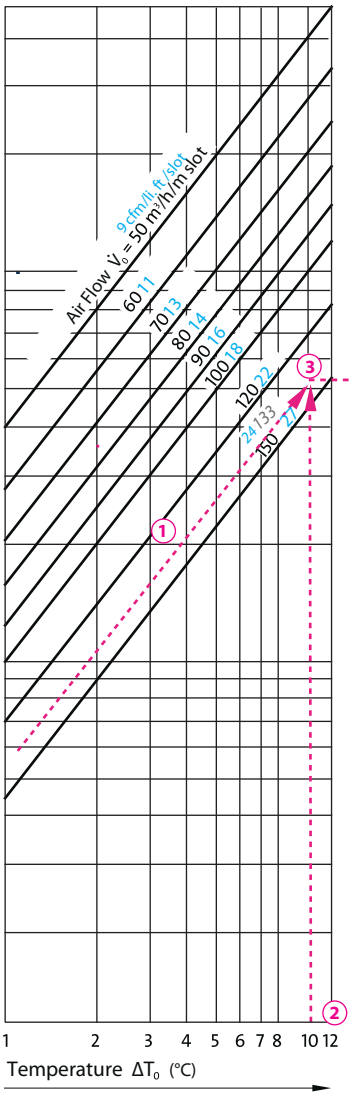


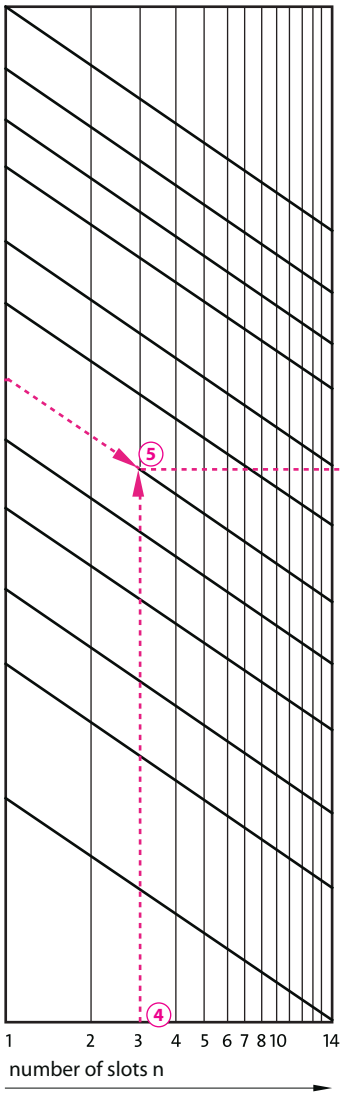
Vertical
(All CD)

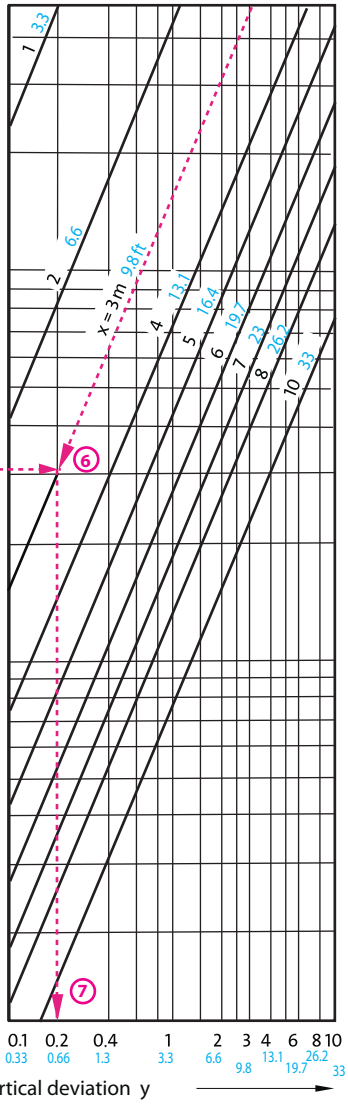


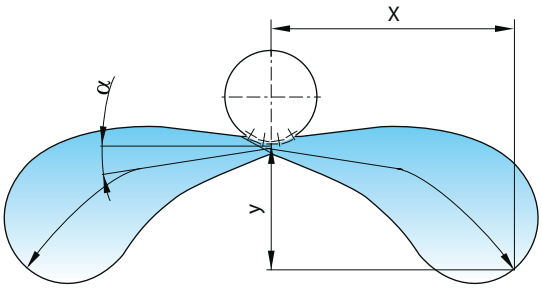


Vertical deflection

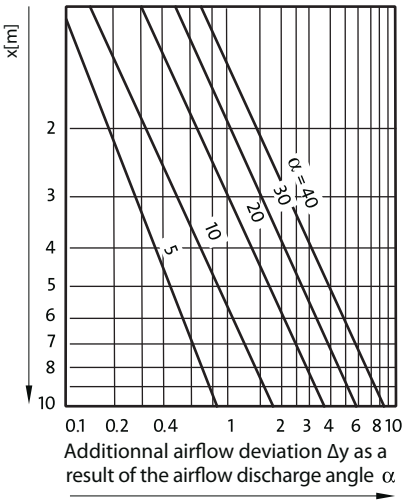






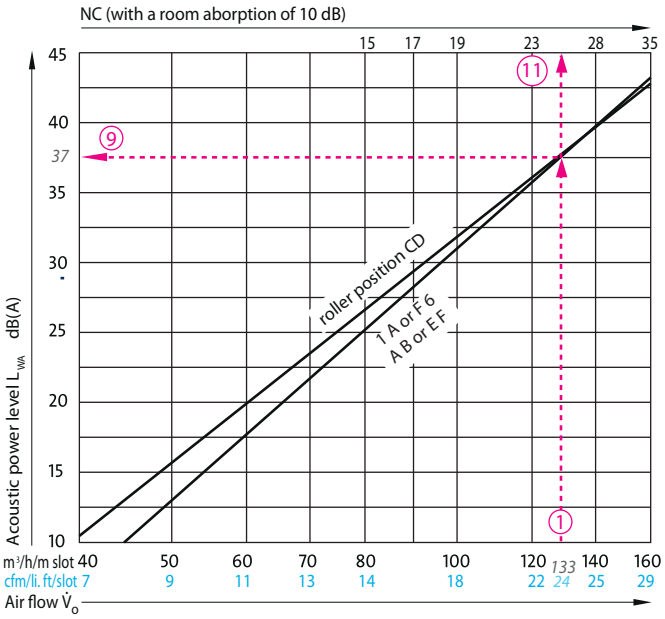


The values of y are valid for the "horizontal jet diffusion" setting.
For the setting "horizontal jet divergence", the value is multiplied by a 0.9 factor.



Acoustic power diagrams

DRA with eccentric rollers



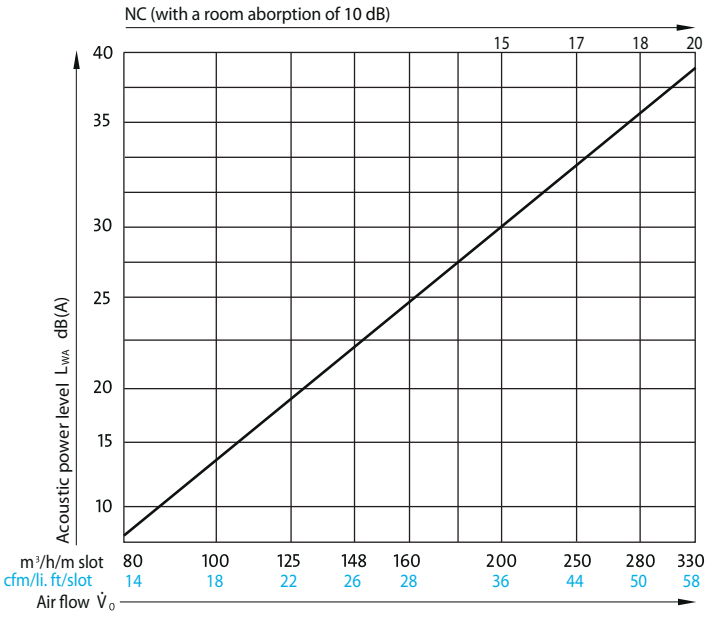
Number of slots	1	2	3	4	5	6	7
NC diagram +	0	3	7	10	13	17	20

Number of slots	8	9	10	11	12	13	14
NC diagram +	24	27	30	33	36	39	42

Number of slots n	$L_{WA} = L_{WA\ Diagram} + \Delta L_{WA}$		
	$L_R = 1000$ $L_S = 800$ ΔL_{WA}	$L_R = 1450$ $L_S = 1200$ ΔL_{WA}	$L_R = 1700$ $L_S = 1500$ ΔL_{WA}
1	0.0	2.1	2.7
2	3.0	5.1	5.7
3	4.7	6.8 (10)	7.5
4	6.0	8.1	8.8
5	7.0	9.1	9.7
6	7.8	9.8	10.5
7	8.4	10.5	11.2
8	9.0	11.1	11.8
9	9.5	11.6	12.3
10	10.0	12.1	12.7
11	10.4	12.5	-
12	10.8	12.9	-
13	11.1	13.2	-
14	11.5	13.5	-

L_R = Duct length L_S = Slot length Standard

DRA with nozzle roller



Number of slots	1	2	3	4	5	6	7
NC diagram +	0	5	8	11	15	19	24

Data: ((DRA with eccentric rollers)
- Total airflow: 1920 m³/h
- Number of DRA sections: 4
- Number of slots per DRA: 3
- Length of the DRA: L_R = 1500 mm
- Length of the slot: L_S = 1200 mm

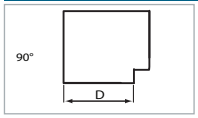
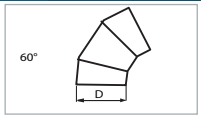
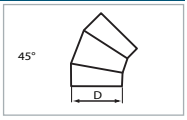
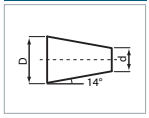
Required:
1. Air flow by meter of slot
2. Critical air flow distance X
3. Vertical penetration in heating Y_{max}
4. Acoustic power generated L_{WA} and noise criteria (NC)

Solution:

1. From total air flow, number of sections of DRA and slots, we find:
   (1920 m³ /h ÷ 4 DRA) ÷ 3 slots = 160 m³/h per slot
   For a 1200 mm slot length, we calculate the air flow per meter of slot
   160 m³ /h x 0.83 = 133 m³ /h/m slot (1)
2. From the dimensions diagram, the air velocity in occupied area of 0.25 m/s (4) and a distance after meeting of y = 4 m - 1.8 m= 2.2 m (5) we find a distance of air flow: X = 3.5 m (6) (see page 7).
3. For a temperature difference of +10 °C (7), we find the vertical penetration: Y_{max} = 3.5 m. (8)
4. From the acoustic power diagram, we read: $L_{WA\ diagram}$= 37 dB(A) (9) and a number of slots n = 3: ΔL_{WA}= 6.8 dB(A) (10)
   Finally, the acoustic power generated is:
   $L_{WA} = L_{WA\ diagram} + \Delta L_{WA}$ = 43.8 dB(A) - 10 dB(A) = 33.8 dB(A)

   Noise criteria (NC) = 25 (11)

Loss of pressure

ΔP duct		ΔP Pressure loss by diameter in elbows $\frac{r}{D} = 1.5$						ΔP Reducer	
Diameter of the duct Ø	ΔP Pressure drop by diameter of regular duct 5 m/s (1000 fpm)								
		Pa	inches of water	Pa	inches of water	Pa	inches of water	Pa	inches of water
302 (12) (7)	3.3 (0.41)	14.9	0.06	2.5	0.01	2.5	0.010	7.5	0.03
353 (14)	2.7 (0.34)	14.9	0.06	2.5	0.01	2.5	0.010	10.0	0.04
403 (16)	2.6 (0.32)	17.4	0.07	5.0	0.02	2.7	0.011	12.5	0.05
454 (18)	1.8 (0.23)	19.9	0.08	5.0	0.02	2.7	0.011	15.0	0.06
505 (20) (6)	1.1 (0.14)	19.9 (10)	0.08	5.0	0.02	2.7	0.011	15.0 (9)	0.06
556 (22)	1.1 (0.13)	22.4	0.09	7.5	0.03	3.0	0.012	17.4	0.07
607 (24)	1.0 (0.12)	22.4	0.09	10.0	0.04	3.0	0.012	17.4	0.07
657 (26) (5)	0.9 (0.11)	22.4	0.09	10.0	0.04	3.0	0.012	17.4 (8)	0.07
708 (28)	0.9 (0.11)	24.9	0.10	10.0	0.04	3.0	0.012	20.0	0.08
759 (30)	0.8 (0.10)	27.4	0.11	10.0	0.04	3.7	0.015	22.4	0.09
810 (32)	0.8 (0.10)	27.4	0.11	12.5	0.05	3.7	0.015	22.4	0.09
861 (34)	0.7 (0.08)	30.0	0.12	12.5	0.05	3.7	0.015	22.4	0.09
911 (36)	0.6 (0.07)	30.0	0.12	12.5	0.05	4.7	0.019	27.4	0.11
962 (38)	0.6 (0.07)	30.0	0.12	12.5	0.05	5.2	0.021	32.5	0.13
1013 (40)	0.4 (0.05)	32.4	0.13	12.5	0.05	6.2	0.025	32.5	0.13
1064 (42)	0.4 (0.05)	32.4	0.13	15.0	0.06	7.2	0.029	32.5	0.13
1115 (44)	0.4 (0.05)	32.4	0.13	15.0	0.06	7.2	0.029	32.5	0.13

ΔP rollers	
Air flow for slot length of 1 meter	ΔP Loss of pressure over all rollers (1A / F6)
m^3/hm (cfm/ft)	**Pa (inches of water)**
50 (9)	21 (0.08)
55 (10)	22 (0.09)
60 (11)	22 (0.09)
65 (12)	23 (0.09)
70 (13)	24 (0.09)
75 (13)	24 (0.10)
80 (14)	25 (0.10)
85 (15)	26 (0.10)
90 (16)	27 (0.11)
95 (17)	27 (0.11)
100 (18)	28 (0.11)
105 (19)	29 (0.12)
110 (20)	30 (0.12)
115 (21)	31 (0.12)
120 (22)	33 (0.13)
125 (22)	34 (0.14)
130 (23)	35 (0.14)
135 (24)	36 (0.14)
140 (25)	38 (0.15)
145 (26)	39 (0.16) (4)
150 (27)	40 (0.16)
155 (28)	42 (0.17)
160 (29)	43 (0.17)
165 (30)	44 (0.18)
170 (31)	45 (0.18)

Correction factor for different air velocities in duct:
ΔP = F x ΔP (v = 1000 fpm)

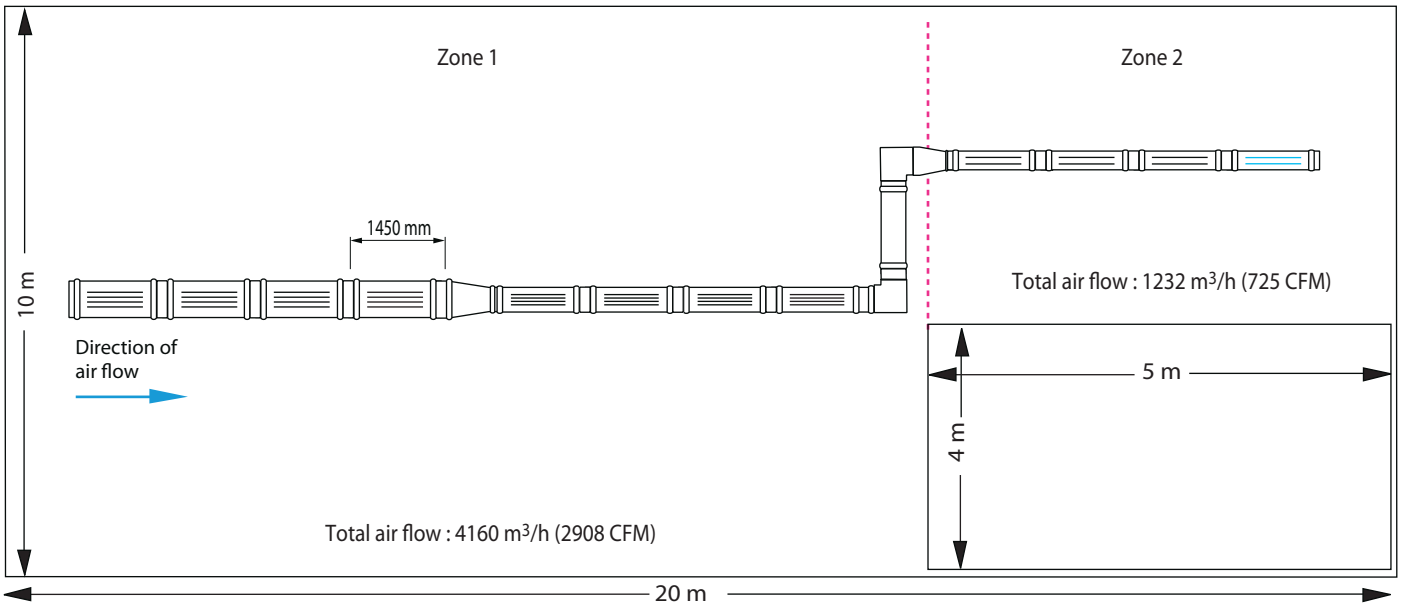
Air velocity in duct	ΔP Pressure drop by diameter in straight duct	ΔP Pressure drop in elbows	ΔP Pressure drop in reducer	
m/s (fpm)	F	F	F	
3 (600)	0.4	0.5	0.3	
4 (800)	0.7	0.7	0.6	
5 (1000)	1.0	1.0	1.0	Recommended
6 (1200)	1.4	1.3	1.4	
7 (1400)	1.6	1.6	1.8	

Correction factor

for different adjustments of rollers:
ΔP = F x ΔP (standard adjustment)

Roll adjustment	F
1A / F6	1.0
AB / EF	1.0
CD	1.1
21 / 65	1.1
32 / 54	1.4
CD / 65 - CD / 21	1.1

Example of calculation



Data:
Air diffusion in two zones
Air speed in the duct: 5 m/s (1000 fpm)
Temperature difference: ΔT = +10°C
Height at the bottom of the duct: 4 m

Zone 1: consists of two (2) sections
Section n° 1:
- 4 x (active DRA, L = 1450 mm, D = 657 mm)
- airflow per DRA: 520 m³/h

Section n° 2:
- 1 reducer (657 mm to 505 mm)
- 4 x (active DRA, L = 1450 mm, D = 505 mm)
- 1 x (passive DRA, L = 1450 mm, D = 505 mm)
- 2 x (90° elbow, D = 505 mm)
- airflow per DRA: 520 m³/h

Zone 2: consists of one section
- 1 reducer (505 mm to 305 mm)
- 4 x (active DRA, L = 1450 mm, D = 305 mm)
- 1 x (end cap, D = 305 mm)
- airflow per DRA: 308 m³/h

Questions:
1. What are the total airflows by meter of slot in each zone and the number of corresponding slots?

2. What is the acoustic level L_{WA} ?

3. What are the pressure losses of the installation?

Solutions:
1. The total airflow by meter of slots depends on the airflow diffused by the DRA.

Zone 1: For airflow per DRA of 520 m³/h and a length of 1450 mm, we calculate the airflow by meter of slots:
520 m³/h x 0.83 = 432 m³/h/m
With the table "Selecting the number of slots", on page five (5) and for heating mode with a duct height of 4 m, we determine the number of slots: n = 4.

Zone 2: the same way, we calculate the airflow by meter of slot sections:
308 m³/h x 0.83 = 255 m³/h/m
We determine the number of slots: n = 3.

2. With the diagram of acoustic power, the eccentric roller set in positions 21/65 (diffusion) and three (3) slots per DRA:
432 m³/h/m ÷ 3 = 144 m³/h/m
$L_{WA} = L_{WA}$ Diagram + ΔL_{WA} =
41 + 8.1 - 10 dB(A) = 39.1 dB(A)

3. The system's pressure lost is due to air restriction going in the rollers and air friction against the inner walls of the straight ducts, elbows and reducers.

3.1 Loss of pressure at the rollers: with the "Loss of pressure" table and an airflow by meter of slots of 144 m³/h/m, we read ΔP3.1 = 39 Pa ④

3.2 The pressure loss by duct diameter is:

Zone 1, section 1
The total length of 4 x active DRAs of a diameter D = 657 mm is:
L = 4 x 1450 mm = 5.8 m, where:
ΔP3.2.1 = 5.8 m x 0.9 Pa/m = 5.2 Pa ⑤

Zone 1, section 2
The total length of 4 x active DRAs and 1x passive DRA of diameter D = 505mm is: L = 5 x 1450 mm = 7.25 m, where:
ΔP 3.2.2 = 7.25 m x 1.1 Pa/m = 8.0 Pa ⑥

Zone 2
The total length of 4 x active DRAs of a diameter D = 302 mm is:
L = 4 x 1450 mm = 5.8 m, where:
ΔP3.2.3 = 5.8 m x 3.3 Pa/m = 18.1 Pa ⑦

The total loss of pressure in the straight ducts is: ΔP3.2 = 5.2 + 8.0 + 19.1 = 32.3 Pa

3.3 The loss of pressure in the reducers:
The equivalent in length of the loss of pressure for two reducers (α = 14°) is:
ΔP3.3 = 17.4 +15 Pa = 32.4 Pa ⑧⑨

3.4 The loss of pressure in the elbows:
The loss of pressure for two (2) 90° elbows with a diameter D = 505 mm is:
ΔP3.4 = 2 x 19.9 Pa = 39.8 Pa ⑩

Finally, the system's total pressure loss is:
ΔP3 = ΔP3.1 + ΔP3.2 + ΔP3.3 + ΔP3.4 so:
ΔP3 = 75 Pa

Notes: For a system height of 3 m, a single DRA is sufficient to cover an area of 10 m (33 ft).
(The placement of vents at 0° (6 o'clock) with the rollers set in position AB/EF (diffuse)).

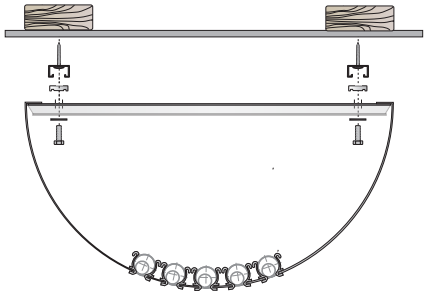
Dimensions, weight and installation

Dimensions and weight

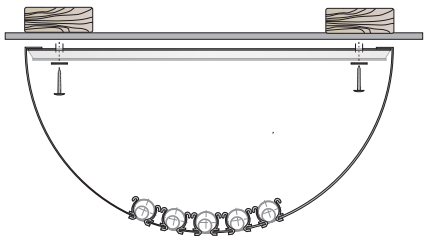
Length of duct - L_R	1000	1450
Length of slot - L_S	800	1200

	Weight per slot (kg)	
	0.30	0.44
Diameter in (mm)	Weight of passive DRA (kg)	
	Sheet thickness: 0.85 mm	
12 (305)	5.92	8.34
14 (356)	6.88	9.71
16 (406)	7.85	11.08
18 (457)	8.82	12.45
	Sheet thickness: 1.00 mm	
20 (508)	11.53	16.28
22 (559)	12.67	17.90
24 (610)	13.81	19.51
26 (660)	14.95	21.13
28 (711)	16.09	22.75
30 (762)	17.23	24.36
32 (813)	18.37	25.98
34 (864)	19.51	27.59
36 (914)	20.65	29.21
38 (965)	21.80	30.82
40 (1016)	22.94	32.44
42 (1067)	24.08	34.05
44 (1118)	25.22	35.67

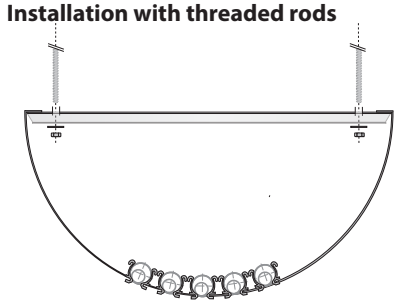
Installation with rail



Installation directly under the ceiling



Installation with threaded rods



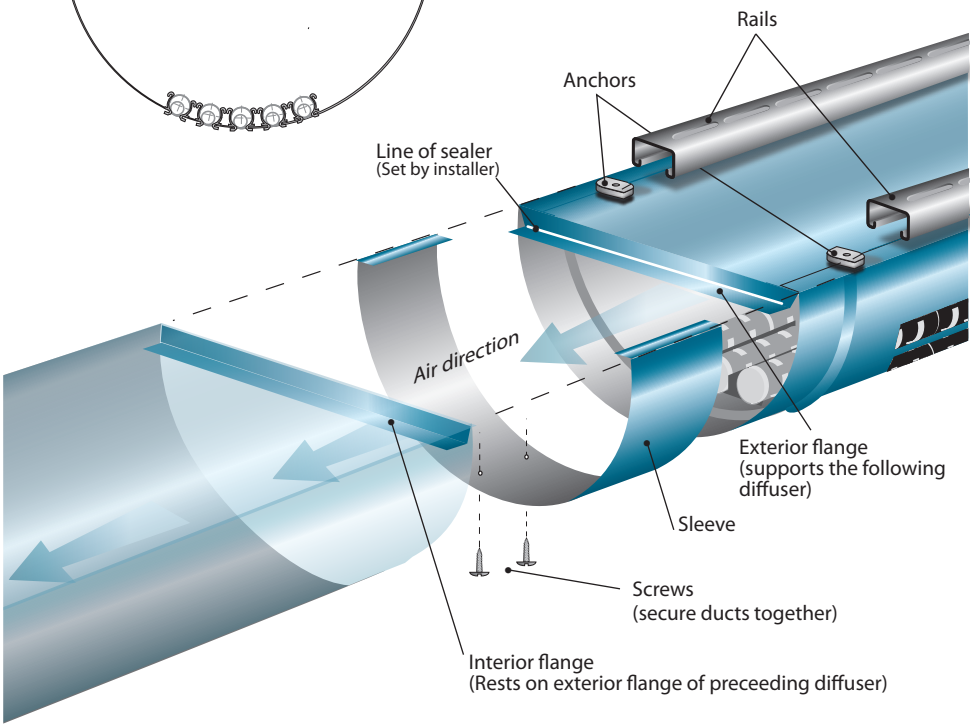
Installation

The individual DRA sections are assembled together by using sleeves specially adapted to the design and diameter of the duct.

At the extremity, where air exits the duct, a protruding exterior flange acts as a support for the following diffuser which has an interior flange. To unite both diffusers securely together, an adapted sleeve is fixed in between the two diffusers with two screws.

Special attention must be taken regarding the final diffuser, which will have interior flanges on both extremities. The final extremity will receive the cap which completes the section.

A sticker will indicate the direction in which the ducts must be installed.



RIO, Montréal, Canada

Specifications

1. Description and physical characteristics

1.1 The high induction duct diffuser shall be made of 22 ga brushed steel for ducts inferior to 508 mm (20 in) in diameter, and 20 ga for diameters superior or equal to 508 mm (20 in).

1.2 The DRA shall be available in diameters ranging from 305 mm (12 in) to 1118 mm (44 in).
The sections shall be assembled using union sleeves.

1.3 The duct diffuser shall be painted with a TGIC-free polyester powder coat. It shall have a smooth surface for easy cleaning. The colour shall be chosen by the architect or the customer. The diffuser paint shall be guaranteed against peeling for a minimum period of 5 years when used under normal conditions.

1.4 The duct diffuser shall be supplied with slots containing ABS (black, cream or white) eccentric rollers. The 100 mm (4 in) long eccentric rollers shall be alphanumerically identified, allowing for an adjustment of the air flow pattern over 180 degrees.

1.5 The union sleeves shall not exceed the duct's dimensions by more than 3 mm (1/8 in), and will be rounded to facilitate cleaning.
The duct shall have an as smooth as possible surface to maintain an esthetic appeal.

1.6 A reducer fitting or a perforated balancing damper with a self locking mechanism, allowing for an air output between 25% and 100%, shall be installed after a maximum of 5 consecutive active sections of the same diameter. A slot register shall be integrated to the last active section of the system.

1.7 The duct diffuser can be passive, without slots.

2. Installation and suspension

2.1 The DRA duct can be screwed directly to the ceiling in the holes designed for this purpose. The suspension screws will be supplied by the installer.

2.2 When required, the duct diffuser's suspension shall be available in three options.

2.2.1 Rail suspension

The duct diffuser shall be slid into a suspended steel rail, offering a solution for varied types of ceilings. The rail shall be painted according to the RAL colour chart and chosen by the architect or customer.

2.2.2 Suspension by metallic cable

The duct diffuser shall be suspended by a metallic cable (aviation style) 7 x 7 or 7 x 9, made of galvanised or stainless steel (304 or 316), of medium or high traction resistance.

2.2.3 Suspension by threaded rods 9.5 mm (3/8 in) provided by the installer. The threaded rods can be covered with rod covers supplied by the manufacturer of the diffuser. The color of the rod cover, according to the RAL color chart, will be the choice of the architect or the customer.

2.3 When the duct diffuser goes through a wall, a collar adapted to the duct diffuser shall be supplied by the manufacturer.

2.4 The standard accessories shall have the same finish as the duct diffuser (elbows, sleeves, reducers, branches, etc.).

2.5 Each diffuser shall be identified with a label. This label shall contain the section number, direction of the air flow, number of slots and positioning of the eccentric rollers.

3. Performances

The manufacturer shall demonstrate for approval the performance curves indicating air velocity in the distance, pressure loss and sound power level generated by the diffuser.

4. Adjustment

4.1 Adjusting the eccentric rollers shall be done by the manufacturer according to the required output.

4.2 The adjustment of the eccentric rollers shall be possible even after the installation of the diffuser, in order to meet new output requirements.

5. Balancing

5.1 Balancing the diffusers shall be done by a ventilation balancing technician, accredited as a qualified professionnal.

5.2 When required, the technician shall refer to the eccentric roller adjustment mode available in the manufacturers' reference manual.

6. Required quality: NAD Klima model DRA

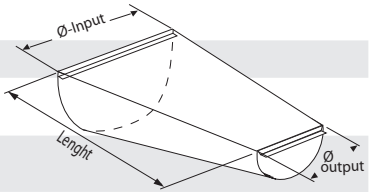
Codification

DRA	**Product**
1000, 1450	**Length L_R**
0800, 1200 ____ = Special length (write in mm) XXXX = Non applicable (passive duct)	**Length of slots L_S**
305, 356, 406, 457, 508, 559, 610, 660, 711, 762, 813, 864, 914, 965, 1016, 1067, 1118	**Diffuser diameter Ø**
X = Passive 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	**Number of slots**
004 = Slots at 60°(4h) 005 = Slots at 30°(5h) 006 = Slots at 0° (6h) 007 = Slots at -30° (7h) 008 = Slots at -60° (8h) 048 = Slots at (4h) and at -60° (8h) 468 = Slots at (4h), 0° (6h) and at -60° (8h) AAA = Other (specify in annotation) XXX = Passive	**Slot position**
XXX = Passive DFS = Diffuse standard 21/ 65 DFR = Diffuse window DE / 21 DFL = Diffuse window BC / 65 DFF = Diffuse height AB / EF DFT = Diffuse CD / EF DFN = Diffuse CD / AB DFH = Diffuse height BC / DE DFA = Diffuse AB / DE DVB = Divergent 21 DVD = Divergent 65 DVV = Vertical divergent CD	**Air flow**
W = White roller (RAL 9003) C = Cream roller (RAL 9010) B = Black roller X = Without roller	**Roller color**
9003 = White 9010 = Cream 00SB = Solar Black (Standard matte black) 00SM = Silver Matte (Standard metallic grey) ____ = RAL color (write the color number of RAL)	**Diffuser color**
A = With closed-cell acoustic insulation X = Without insulation	**Acoustic insulation**
D = With damper X = Without damper	**Balancing damper**
R = With register (perforated plate) X = Without register	**Register**
DRA - 1450 - 1200 - 305 - 1 - 006 - DFS - W - 9003 - X - X	**Exemple**

Notes:
Our thermolacqued colors are available in the RAL chart only.
Metallic colors available on request.
Blue: Standard

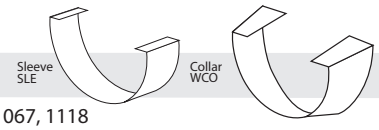
Codification of accessories

Codification for reducers



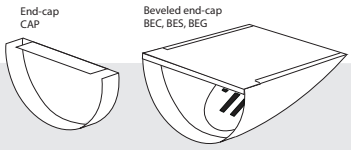
DRA	RED = Reducer	**Product**
	356, 406, 457, 508, 559, 610, 660, 711, 762, 813, 864, 914, 965, 1016, 1067, 1118	**Ø input diameter**
	305, 356, 406, 457, 508, 559, 610, 660, 711, 762, 813, 864, 914, 965, 1016, 1067	**Ø output diameter**
	S = Standard α = 14° A = Other (specified in annotation)	**Length**
	9003 = White 9010 = Cream 00SB = Solar Black (Standard matte black) 00SM = Silver Matte (Standard metallic grey) ____ = RAL color (write the number of RAL color)	**Color**
	A = With insulation with closed cells X = Without insulation	**Acoustic insulation**
DRA - RED - 356 - 305 - S - 9003 - X		**Example**

Codification for sleeve and collar



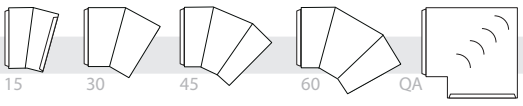
DRA	SLE (Sleeve), WCO (Collar)	**Product**
	305, 356, 406, 457, 508, 559, 610, 660, 711, 762, 813, 864, 914, 965, 1016, 1067, 1118	**Diameter**
	9003 = White 9010 = Cream 00SB = Solar Black (Standard matte black) 00SM = Silver Matte (Standard metallic grey) ____ = RAL color (write the number of RAL color)	**Color**
DRA - SLE - 203 - 9003		**Example**

Codification for end-cap



DRA	CAP (End-cap), BEC (Beveled end-cap with or without logo), BES (Beveled end-cap+slots), BEG (Return beveled end-cap)	**Product**
	305, 356, 406, 457, 508, 559, 610, 660, 711, 762, 813, 864, 914, 965, 1016, 1067, 1118	**Diameter**
	9003 = White 9010 = Cream 00SB = Solar Black (Standard matte black) 00SM = Silver Matte (Standard metallic grey) ____ = RAL color (write the number of RAL color)	**Color**
	A = With insulation with closed cells X = Without insulation	**Acoustic insulation**
DRA - CAP - 305 - 9003 - X		**Example**

Codification for elbows



DRA	ELB = Elbows	**Product**
	15, 30, 45, 60, QA	**Angle**
	305, 356, 406, 457, 508, 559, 610, 660, 711, 762, 813, 864, 914, 965, 1016, 1067, 1118	**Diameter**
	S = Standard (r (c/c)= 1.5 Ø) (inner corner of the QA: 100 mm) see on page 2 A = Other (specified in annotation)	**Radius**
	9003 = White 9010 = Cream 00SB = Solar Black (Standard matte black) 00SM = Silver Matte (Standard metallic grey) ____ = RAL color (write the number of RAL color)	**Color**
	A = With insulation with closed cells X = Without insulation	**Acoustic insulation**
DRA - ELB - 15 - 305 - S - 9003 - X		**Example**

Codification of accessories

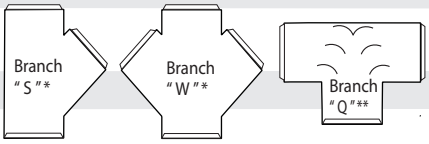
Coding for the branches

DRA BRA = raccord — **Product**

305, 356, 406, 457, 508, 559, 610, 660, 711, 762, 813, 864, 914, 965, 1016, 1067, 1118 — **ØD - Input diameter**

305, 356, 406, 457, 508, 559, 610, 660, 711, 762, 813, 864, 914, 965, 1016, 1067, 1118 — **Ød1 - Output diameter**

305, 356, 406, 457, 508, 559, 610, 660, 711, 762, 813, 864, 914, 965, 1016, 1067, 1118 — **Ød2 - Output diameter** (For « W » branch only)



S*, W*, Q** — **Configuration**

9003 = White
9010 = Cream
00SB = Solar Black (Standard matte black)
00SM = Silver Matte (Standard metallic grey)
____ = RAL color (write the number of RAL color)

Color

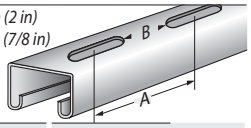
A = With insulation with closed cells
X = Without insulation — **Acoustic insulation**

DRA - BRA - 305 - 305 - 203 - S - 9003 - X — Annotation — **Example**

Notes : The « W » branch may have two different outlet diameters. * For « S » and « W » fittings, add an elbow to the degree and diameter chosen to complete the branch.
** For « Q », the input diameter can not exceed the output diameter.
Our thermolacquered paint are available in the RAL color chart only. Metallic colors available on request.

Coding for anchorage system, with rail

RAI S-33 Steel rail
22 mm X 41 mm X 3048 mm
(7/8 in X 1 5/8 in X 10 li. ft)
can be paint

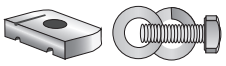


9003 = White
9010 = Cream
____ = RAL color (4 number)
XXXX = Non paint — **Color**

RAI - S33 - 9003 — Example

Accessories supplied with the steel rail (S33) (2/DRA)

RKS Fastening system
Bolt, washer, lock washer and nut



Coding for suspension accessories with threaded rods
(threaded rods are supplied by the installer)

RCT Threaded rod cover
16 mm X 3.05 m (5/8 in X 10 ft)

9003 = White
9010 = Cream
00SB = Solar Black
00SM = Silver Matte
____ = RAL color* (write the 4 numbers)
XXXX = Non paint — **Color**

RCT - 9003 — Example

Touch-up spray paint

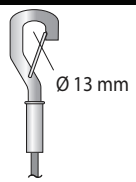
CAN 9003 Paint can (RAL 9003)
CAN _____ Paint can (other colour RAL)
(write the number of the color)

CAN - 9003 — Example

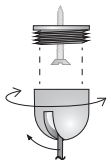
Anchorage with cable

Description of anchors for the ceiling

CPA Anchor with hook
nickel plated
Ø 13 mm X 70 mm X 14.3 mm
(Ø 1/2 in X 2 3/4 in X 9/16 in)

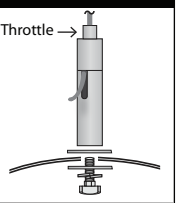


CCP Swiveling anchor
nickel plated
Not adjustable
Ø 25 mm X 28.5 mm
(Ø 1 in X 1 1/8 in)
(screw not supplied)



Description of anchor for the diffuser

CCA Anchor for duct
Adjustment throttle
nickel plated
Ø 1 mm X 50 mm
(Ø 3/4 in X 2 in)



XXXX = Without cable
3048 mm - standard (10 ft) — **Cable length**

A = Nickel plated steel (standard)
S = Stainless Steel (optional)

CPA - 3048 - A — Example

J.Armand-Bombardier Museum, Valcourt, Canada

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