

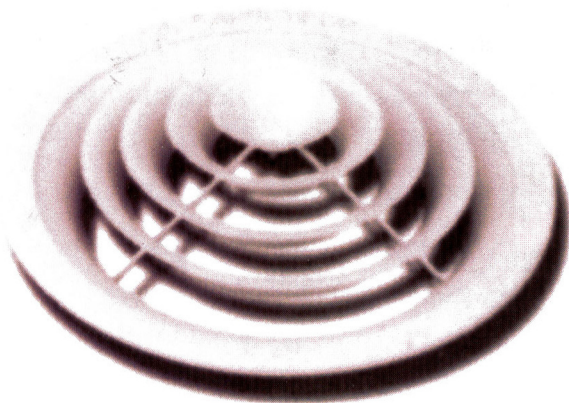


GALVA BAHI
Duct & air outlets



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Duct & air outlets

CIRCULAR DIFFUSERS



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GLOSSARY OF TERMS AND DEFINITIONS

- GRILLE** : A Louvered covering for an opening through which air passes.
- DIFFUSER** : An outlet discharging supply air in multiple layers with a spreading pattern.
- DAMPER** : A device used to control the volume of air passing through a duct /or air outlet by varying the cross sectional area.
- REGISTER** : A grille which is equipped with a damper.
- ASPECT RATIO** : The ratio of the long side to the short side of a duct section/or air outlet.
- CFM** : A measure of volume of air in cubic feet per minute .
- VELOCITY (V_k)** : The velocity in feet per minute is the velocity measured with an Anor velometer and 2220A jet on the face of the outlet .
- TERMINAL VELOCITY (V_t)** : The velocity 1N FPM of the air stream at the throw (T) from the air outlet. Values from 75 to 200 FPM are in common use.
- EFFECTIVE AREA (A_k)** : The calculated area of an outlet based on the average measured velocity at the face v_k .
- THROW** : The distance measured in feet that the air stream travels from the outlet to the point of terminal velocity .
- DROP** : The vertical distance the air moves between the time it leaves the outlet and the time it reaches the end of its throw.
- INDUCTION** : Induction is the entrainment of room air by the air ejected from the outlet and in result of the velocity of the outlet air. The air coming directly from the outlet primary air. The room air, which is picked - up, is called secondary air. The entire stream composed of a mixture of primary and secondary air.
- WALL / CEILING EFFECT** : The tendency of an air stream moving along wall or ceiling surface to remain in contact with that surface. This effect extends the throw and reduces the drop of the air stream.
- STATIC PRESSURE (P_s)** : The outward force exerted by the air within a duct and /or collar of an air outlet device measured in inches of water .
- VELOCITY PRESSURE (P_v)** : The pressure in inches of water equated to a velocity that exists for a given air volume in the duct and/or air outlet collar area.
- TOTAL PRESSURE (P_t)** : The sum of the velocity pressure (P_v) and static pressure (P_s) measured in inches of water .
- SOUND POWER LEVEL (LW)** : The total sound created by a grille under a specific condition of operation not including specific room acoustic absorption value reductions per frequency octave band. The basis of LW must be stated re 10^{-13} watts, or 10^{-12} watts.
- SOUND PRESSURE LEVEL (LP)** : Sound pressure measured in the test room or occupied room with a sound level meter referenced to .0002 microbar. Sound pressure may be measured in octave band with octave band analyzer or total sound pressure in all octaves can be measured.
- NOISE CRITERIA** : The air outlet device sound rating in pressure level at given condition of operation based on established criteria and specific room acoustic absorption value. Catalog NC rating are base on sound power level (LW) re 10^{-13} watts minus An 18-db room attenuation in all octave bands.

CD-1

- Fixed diffuser rings
- Central screw installation or fixing with three peripheral screws
- Peripheral foamy sealing strip
- Registers E2, J2, L2, J3

CD-2

- Fixed diffuser cone-form rings
- Central screw installation or fastening with three peripheral screws
- Peripheral foamy sealing strip
- Registers E2, J2, L2, J3

Dimensions of volume control dampers L2, J2, J3, E2 for CD-1 and CD-2

Size	ϕ D-52 (mm)	ϕ D+24 (mm)	ϕ D+11 (mm)
1	140	216	203
2	196	272	259
3	252	328	315
4	308	384	371
5	364	440	427
6	420	496	483
7	476	552	539
8	532	608	595

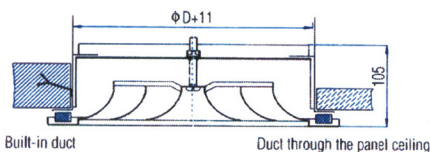
CD-1 and CD-2 dimensions

Size	D (mm)	A (mm)	H (mm)	CD-1 A_{ef} (m ²)	CD-2 A_{ef} (m ²)
1	192	224	30	0,0085	0,0090
2	248	300	45	0,0157	0,0167
3	304	356	60	0,0257	0,0282
4	360	412	75	0,0381	0,0422
5	416	468	90	0,0536	0,0618
6	472	542	98	0,0730	0,0812
7	528	598	112	0,0955	0,1037
8	584	654	126	0,1150	0,1235

Installation of circular diffusers CD-1, CD-2

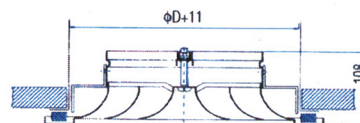
Installation 7

- Installation with crossbar
Designation: **CD-1/7, CD-2/7**



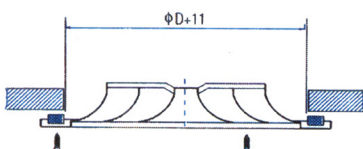
Installation 8

- Installation on register fastened in the duct. Register has three girders.
Designation: **CD-1/8-(L2, J2), CD-2/8-(L2, J2)**



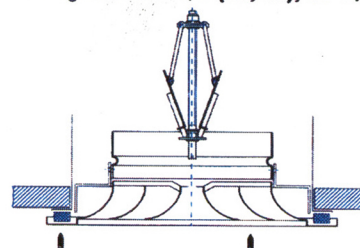
Installation X (without opening in the middle)

- Installation with crossbar
Designation: **CD-1/X, CD-2/X**



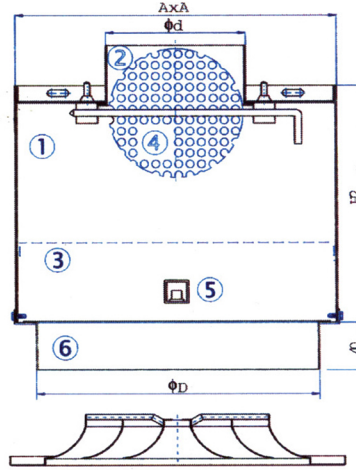
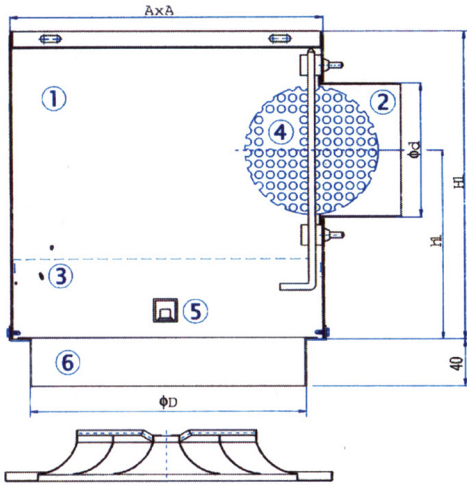
Installation V (with opening in the middle)

- Direct installation in the ceiling with three screws. Register is previously fastened in the duct.
Designation: **CD-1/V-(E2, J3), CD-2/V-(E2, J3)**





Installation of CD-1 and CD-2 with plenum box



- 1 Plenum box
- 2 Inlet spigot
- 3 Perforated steel sheet
- 4 Volume control damper
- 5 Cross-bar
- 6 Adapter

Size	A	H1	h1	H2	φ D	φ d
1	254	260	160	200	204	123
2	310	290	170	200	260	158
3	366	330	190	300	319	198
4	390	330	190	300	370	198
5	452	380	215	300	430	248
6	510	380	215	300	488	248
7	815	450	250	300	540	313
8	815	450	250	300	596	313

Ordering key:

CD-1/7-J2 Size 2

- L2 Registers
- J2
- J3
- E2
- 7 Installation with the cross-bar
- 8 Installation on volume control damper fastened in the duct
- X Three boreholes on the ring without central borehole
- V Three boreholes on the ring + central borehole (installation is suitable for combination of diffusers with registers J3 and E2).
- CD-1 Diffuser type
- CD-2

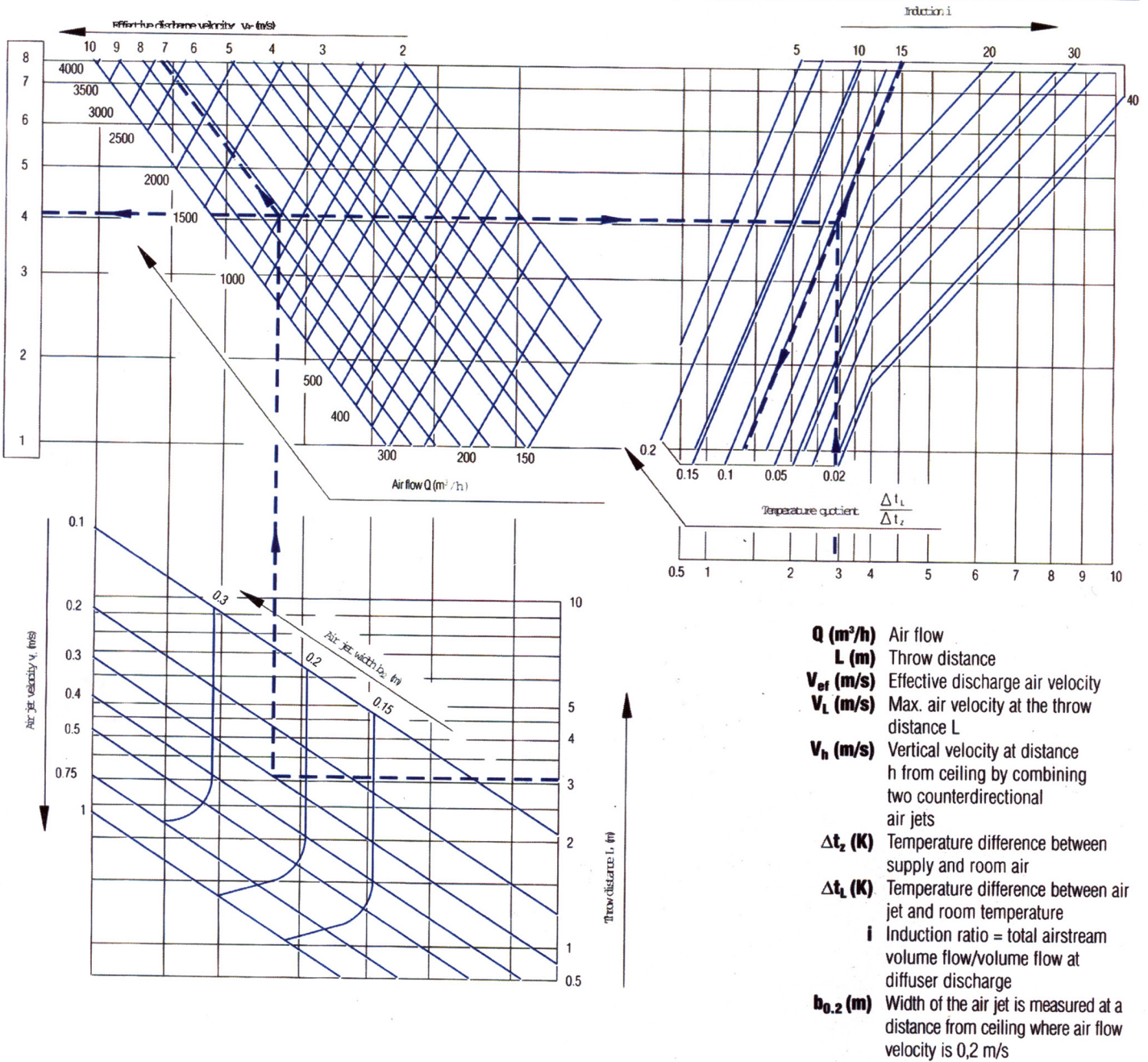
Ordering key for CD-1, CD-2 with plenum box

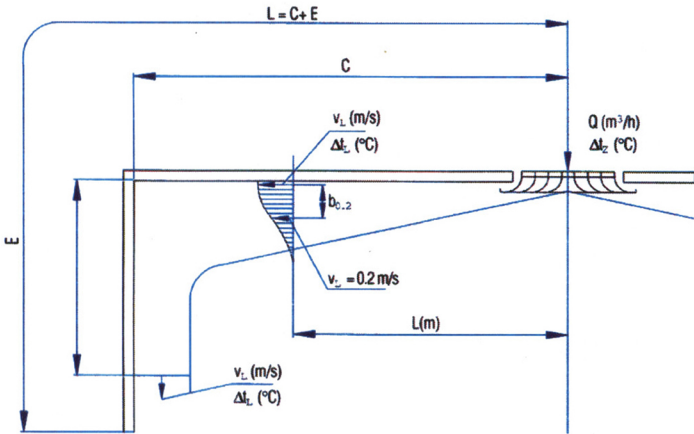
CD-1/Z/S/E2 Size 2

- E2 Volume control damper
- S Side entry spigot
- V Top entry spigot
- Z Air supply
- A Air exhaust
- CD-1 Types
- CD-2

Only central installation can be used when installing on a plenum box.

Diagram for determining the size, induction and temperature of the air jet flow of the circular diffusers CD-1





Example:

Given:

Air flow: $Q = 1000 \text{ m}^3/\text{h}$, $L = 3 \text{ m}$
 Air jet velocity: $V_L = 0.3 \text{ m/s}$
 Temperature difference: $\Delta t_z = 5 \text{ }^\circ\text{C}$

Solution:

From the diagram select the diffuser CD-1 size 4.

effective outlet velocity $v_{ef} = 7.2 \text{ m/s}$
 temperature quotient $\Delta t_L / \Delta t_z = 0.08$
 temperature difference $\Delta t_L = 0.08 \times 5 = 0.4 \text{ }^\circ\text{C}$
 induction $i = 16$
 width of the air jet $b_{0,2} = 0.22 \text{ m}$

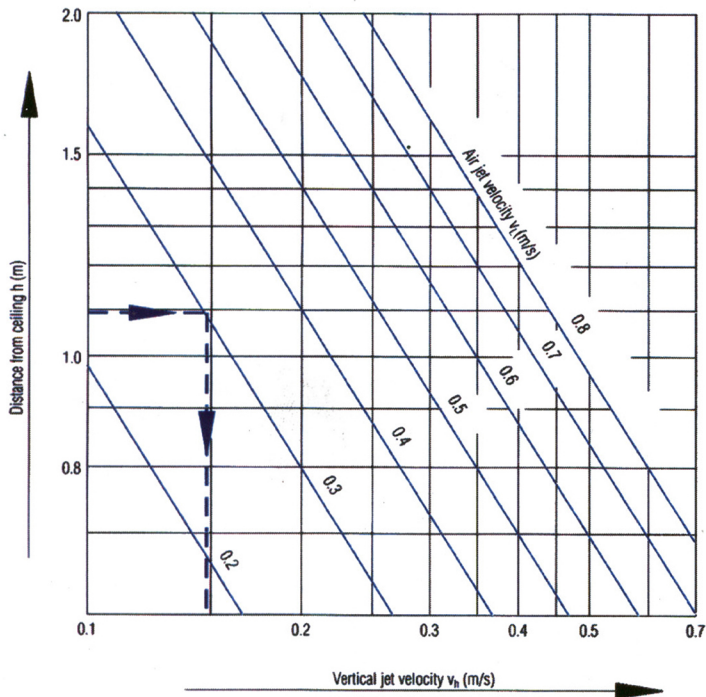
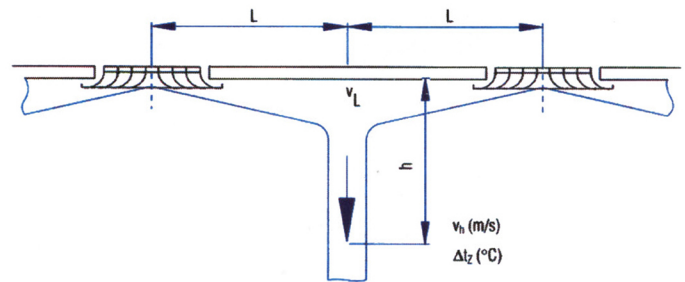
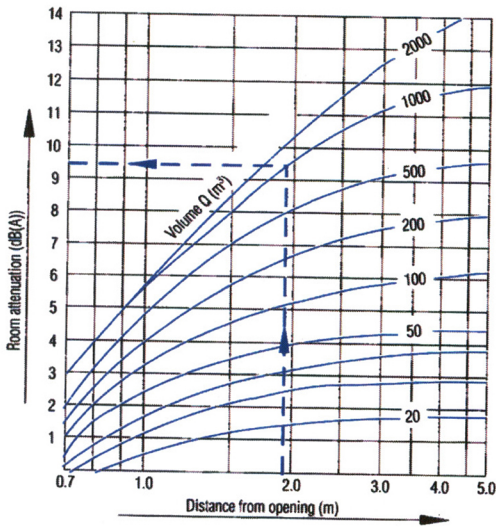


Diagram for determination of vertical velocity



Max temperature quotient $\Delta t_L / \Delta t_z$ determined using the diagram 1 for temperature quotient:

$L_{\text{diagram}} = L + h$



Room attenuation diagram

Q_9 (m³) calculated volume, depending on room reflectance
 Q (m³) actual room volume

The following data are necessary to calculate the volume Q_9 .

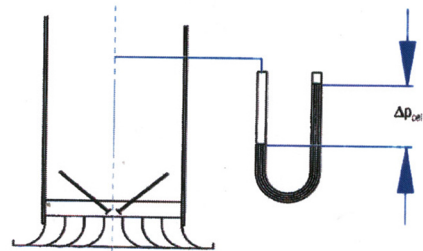
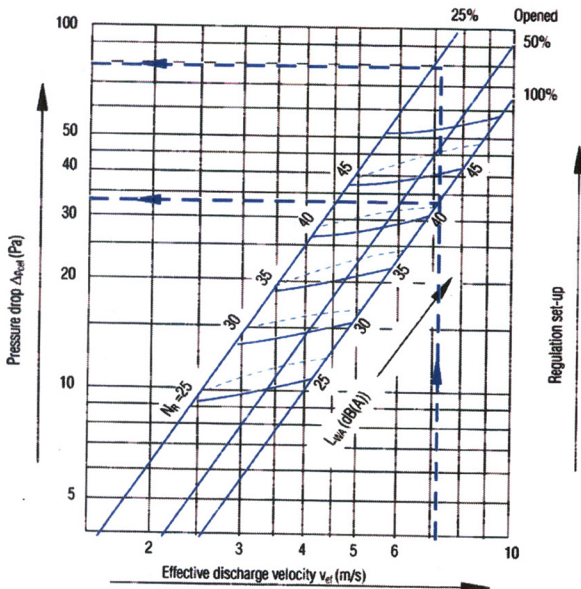
1. Normal rooms $Q_9 = Q$
2. Rooms with highly reflective walls $Q_9 = 0.5Q$
3. Rooms with absorption walls $Q_9 = 2Q$

Δp_{ce1} (Pa) Pressure drop

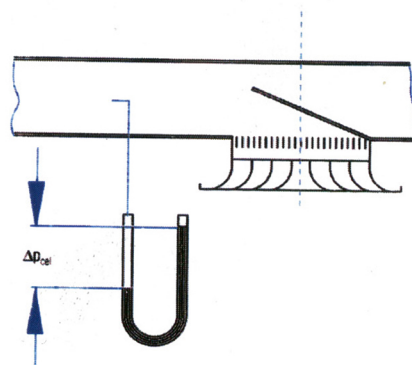
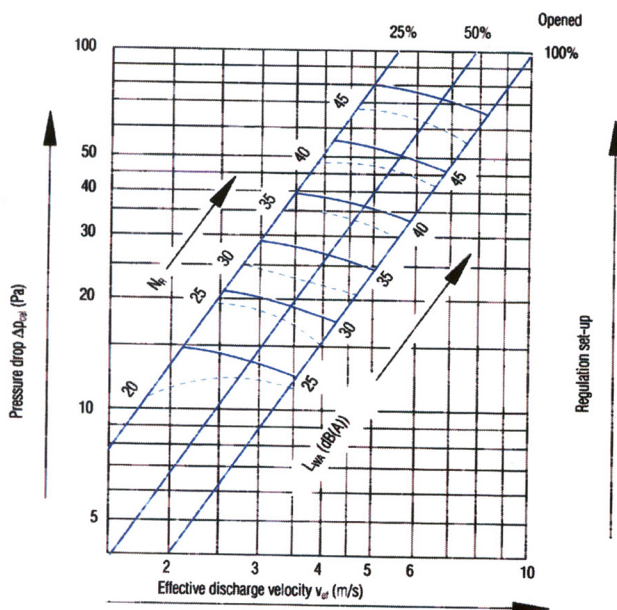
L_{WA} (dB(A)) Sound power level

N_R Max. value according to ISO

Pressure drop diagram (Valid for volume control damper J2)

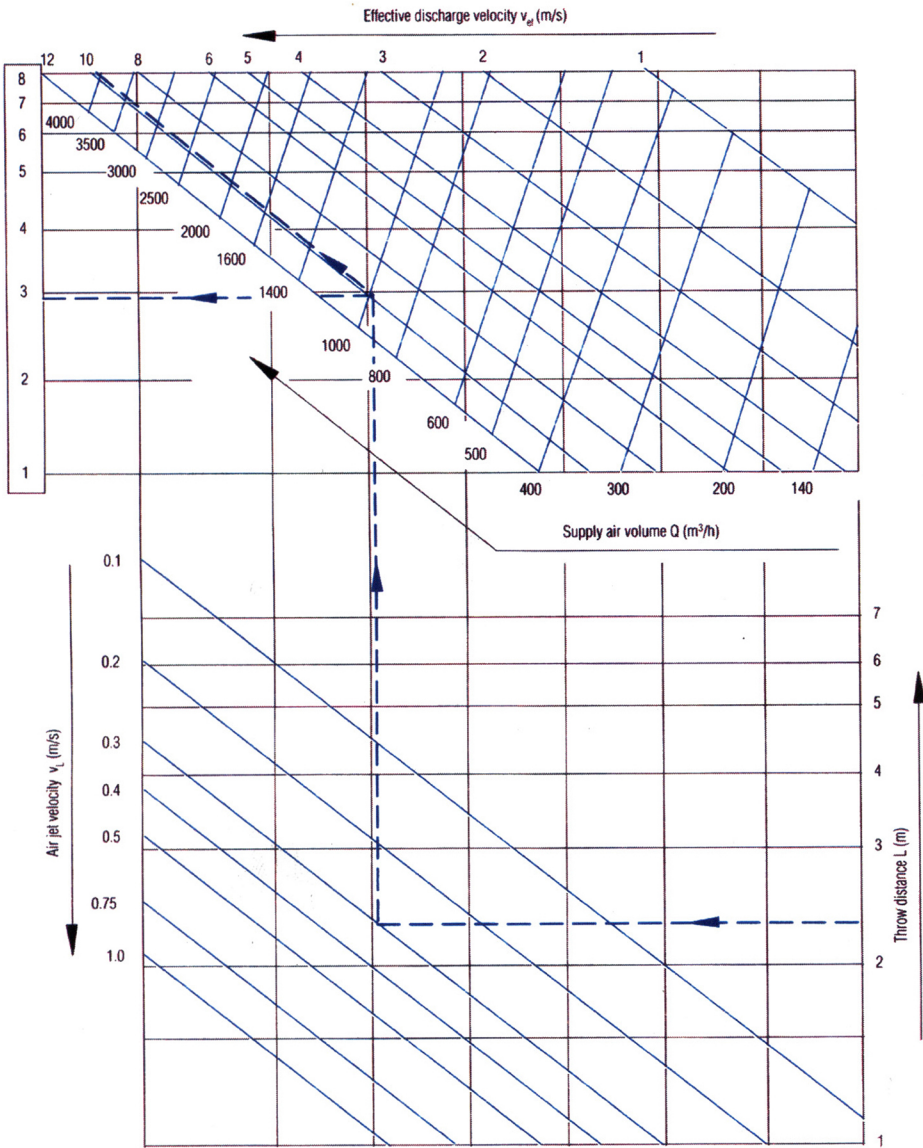


Pressure drop diagram (Valid for volume control damper E2)

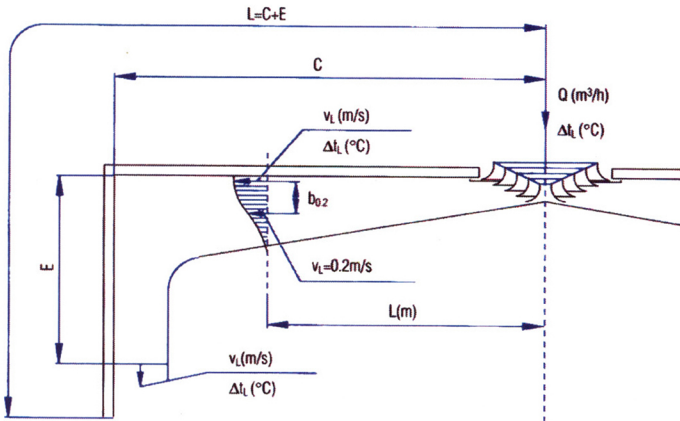




Sizing diagram for circular diffusers CD-2



- Q (m³/h)** Air flow
- L (m)** Throw distance
- v_{eff} (m/s)** Effective discharge air velocity
- v_L (m/s)** Max. air velocity at the throw distance L
- v_h (m/s)** Vertical velocity at distance h from ceiling by combining two counterdirectional air jets
- Δt_z (K)** Temperature difference between supply and room air
- Δt_i (K)** Temperature difference between air jet and room temperature
- i** Induction ratio = total airstream volume flow/volume flow at diffuser discharge
- b_{0,2} (m)** Width of the air jet is measured at a distance from ceiling where air flow velocity is 0,2 m/s
- Δp_{cel} (Pa)** Pressure drop
- L_{WA} (db(A))** Sound power level
- N_R** Border value according to ISO



Example:

Given:

Air flow volume: $Q = 1000 \text{ m}^3/\text{h}$, $L = 2.4 \text{ m}$
 Air jet velocity: $V_L = 0.3 \text{ m/s}$
 Temperature difference: $\Delta t_L = 5 \text{ }^\circ\text{C}$

Solution:

From the diagram select the diffuser CD-2 size 3.

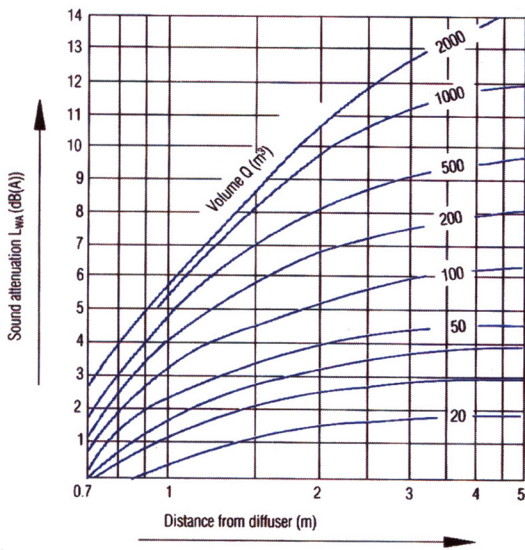
Effective discharge velocity $v_{ef} = 9.8 \text{ m/s}$

Diagram for approximate determination of room attenuation

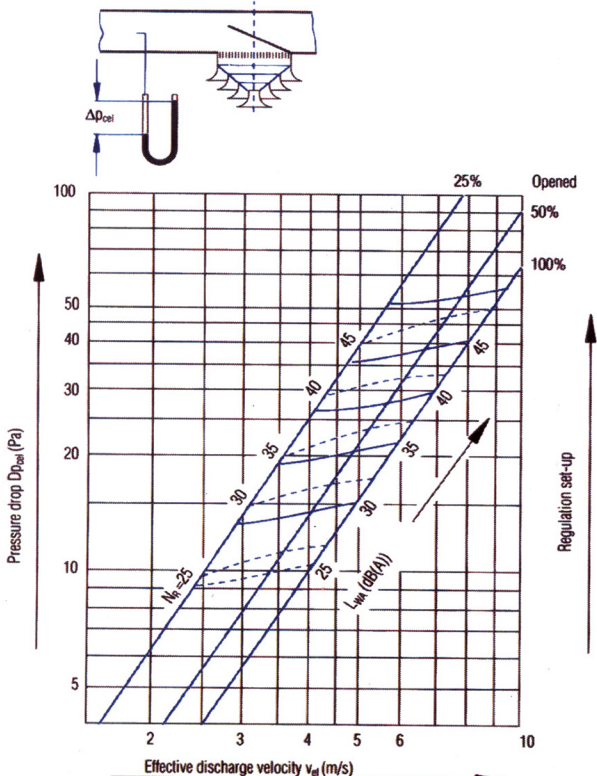
$Q_9 \text{ (m}^3\text{)}$ calculated volume, depending on room reflectance
 $Q \text{ (m}^3\text{)}$ actual room volume

The following data are necessary to calculate the volume Q_9 .

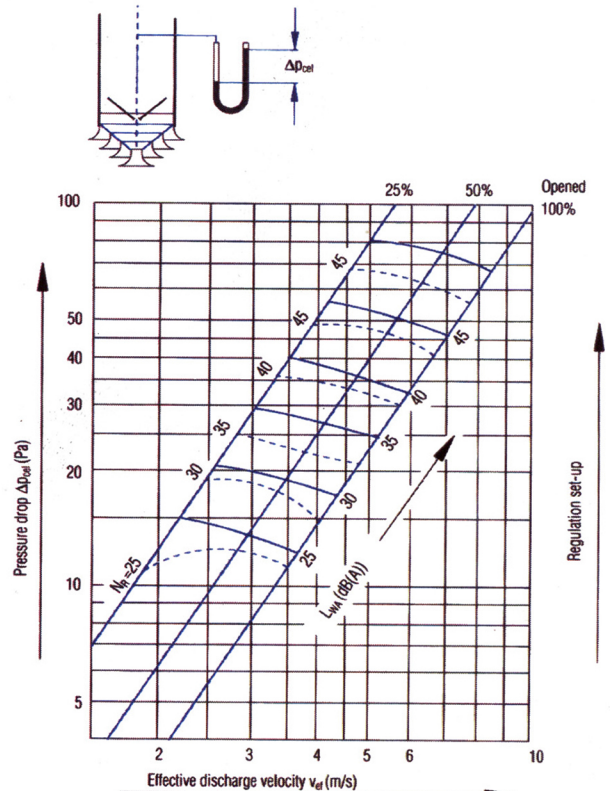
1. Normal rooms $Q_9 = Q$
2. rooms with highly reflective walls $Q_9 = 0.5Q$
3. Rooms with absorption walls $Q_9 = 2Q$

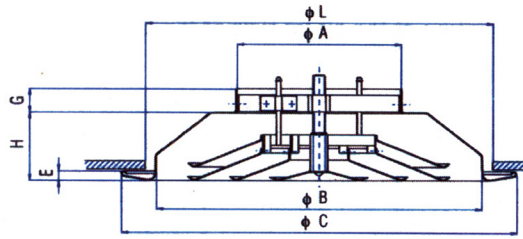


Pressure drop diagram (Valid for register J2)



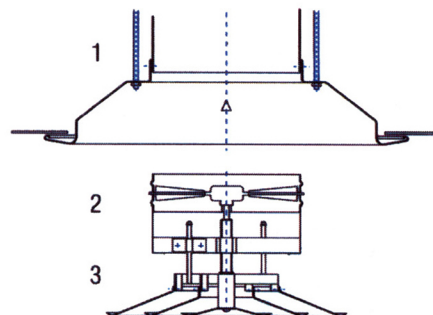
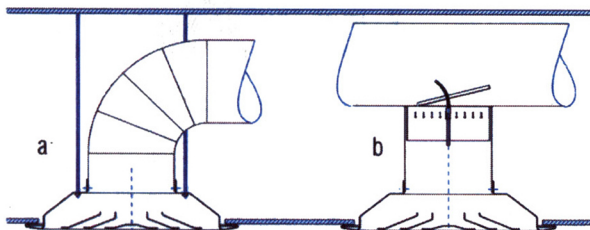
Pressure drop diagram (Valid for register E2)





CD-3 Dimensions table

Size	φ A	φ B	φ C	E	G	H	φ L	CD-3 Aef (m ²)
150	154	305	377	12	28	72	320	0,0265
200	205	405	495	14	32	88	420	0,0873
250	256	505	613	17	36	104	520	0,1090
300	305	605	731	19	40	120	620	0,1730
350	361	705	850	22	48	136	720	0,2469
400	409	805	967	24	52	152	820	0,3295
450	460	905	1085	26	56	166	920	0,4460
500	511	1005	1203	29	65	182	1020	0,5820



CD-3

- Height-adjustable diffuser rings
- Installation via the fixed basic ring
- Peripheral foamy sealing strip
- Registers E3,J3

Application:

By adjusting inner diffuser rings, it is possible to achieve different discharge angles. By heating air jet has to be directed downwards, while cooling application requires horizontal discharge. Diffuser CD-3 has a high air handling capacity.

**Dimensions of registers
E3, J3, M, N for CD-3**

φ a	φ D-52	φ D+24	h	k
-	133	228	103	134
-	183	279	147	166
245	233	323	185	202
295	283	379	214	245
345	333	435	269	264
395	383	483	269	330
445	433	534	325	352
495	483	585	347	400

Installation types

- Installation with flexible tube without regulation
- Installation with extension into the duct - regulation with register E3

Instructions for installations

Separate inner rings from the outer ring. Rotate the core of the connected rings and remove it from the diffuser.

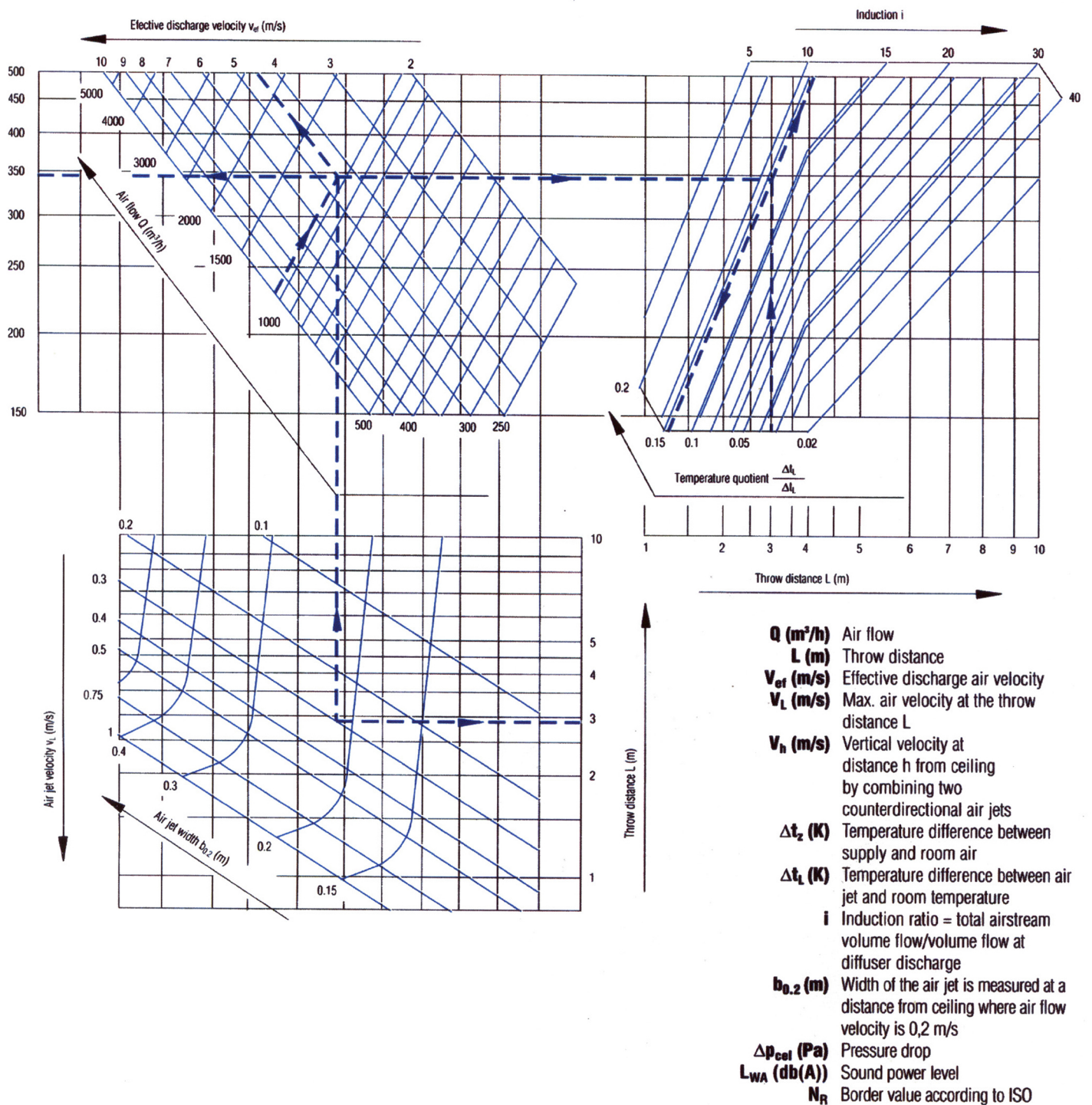
1. Install the outer ring according to project requirements.
2. Install volume control damper if required.
3. Replace the inner rings.

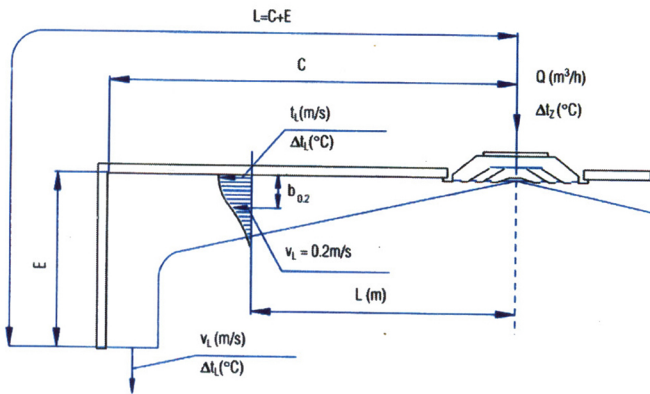
To set-up the position of inner rings, rotate the middle ring. Use longer screw driver to set-up the register through the opening in the centre of diffuser.

Ordering example:

Circular diffuser: **CD-3/E3**
Size: **4**
Pcs: **12**

Diagram for determining the size, induction and temperature of the air jet flow of the circular diffusers CD-3





Example:

Given:

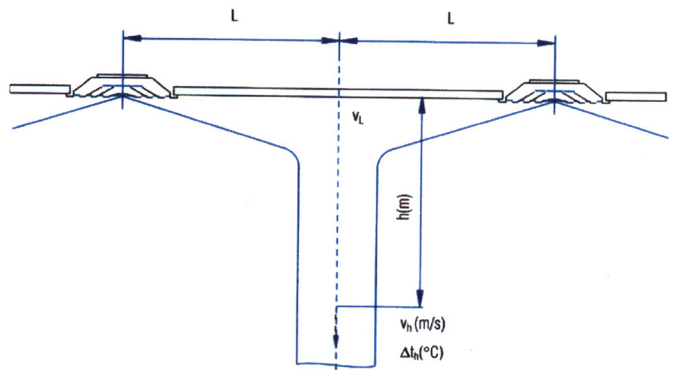
Air flow: $Q = 1150 \text{ m}^3/\text{h}$, $L = 3 \text{ m}$
 Air jet velocity: $V_1 = 0.3 \text{ m/s}$
 Temperature difference: $\Delta t_2 = 5 \text{ }^\circ\text{C}$

Solution:

From the diagram select the diffuser CD-3 size 350.

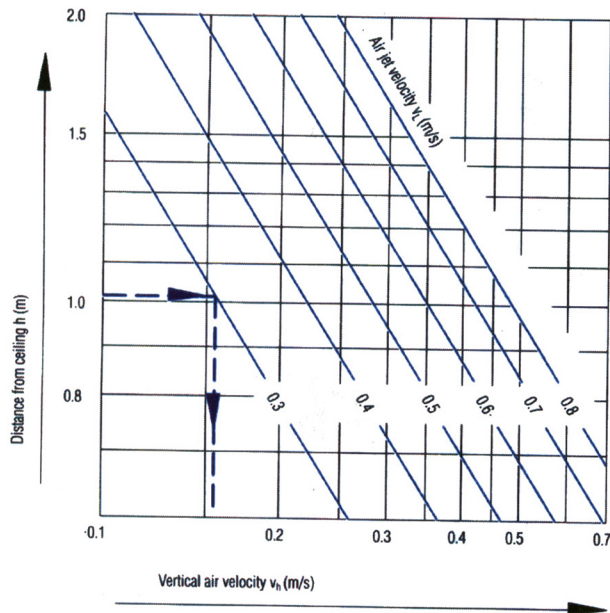
Effective outlet velocity $v_{ef} = 4.7 \text{ m/s}$
 Temperature quotient $\Delta t_L / \Delta t_2 = 0.12$
 Temperature difference $\Delta t_L = 0.12 \times 5 = 0.6 \text{ }^\circ\text{C}$
 Induction $i = 13$
 Width of the air jet $b_{0.2} = 0.23 \text{ m}$

Diagram for determination of vertical velocity



Max temperature quotient $\Delta t_h / \Delta t_2$ determined using the diagram 1 for temperature quotient;

$L_{\text{diagram}} = L + h$



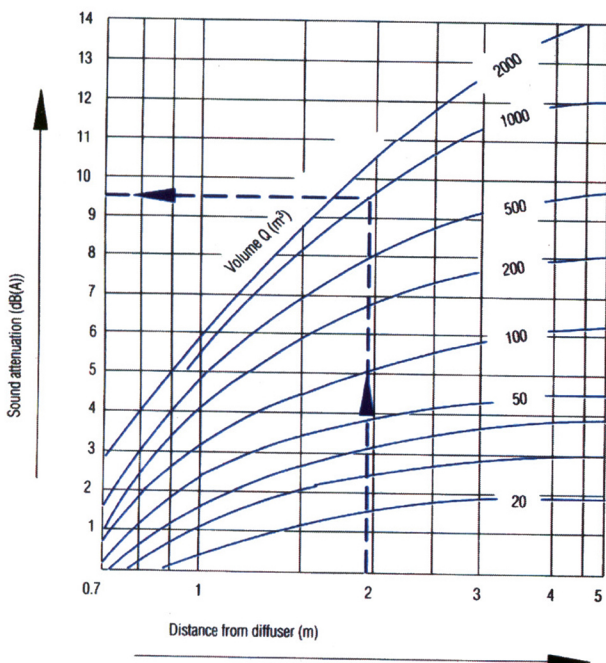
Room attenuation diagram

$Q_9 \text{ (m}^3\text{)}$ calculated volume, depending on room reflectance
 $Q \text{ (m}^3\text{)}$ actual room volume

The following data are necessary to calculate the volume Q_9 .

1. Normal rooms $Q_9 = Q$
2. Rooms with highly reflective walls $Q_9 = 0.5Q$
3. Rooms with absorption walls $Q_9 = 2Q$

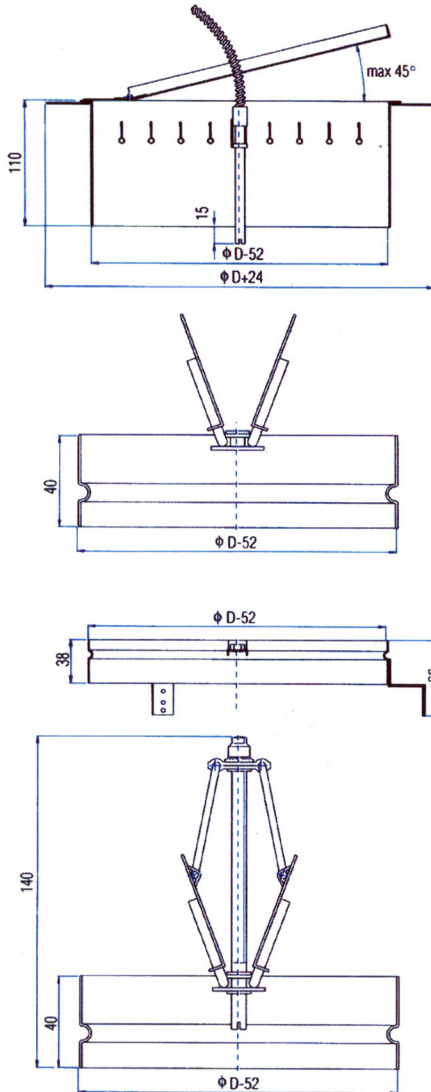
$\Delta p_{cat} \text{ (Pa)}$ Pressure drop
 $L_{WA} \text{ (db(A))}$ Sound power level
 N_R Max. value according to ISO





When adjusting the system, desired operating conditions are obtained by the means of ventilation elements control. Registers are installed for additional air volume control, thus influencing air velocity and throw distance as well.

Registers are made of sheet steel and corrosion protected with dipcoat processing in black water soluble colour.



E2, E3

Register E2 or E3 consists of deflector flap and drop-shaped blades. They are used to deflect and control air from the duct and to distribute air jet evenly. Volume control damper E3 is designed to fit circular diffuser CD-3.

J2

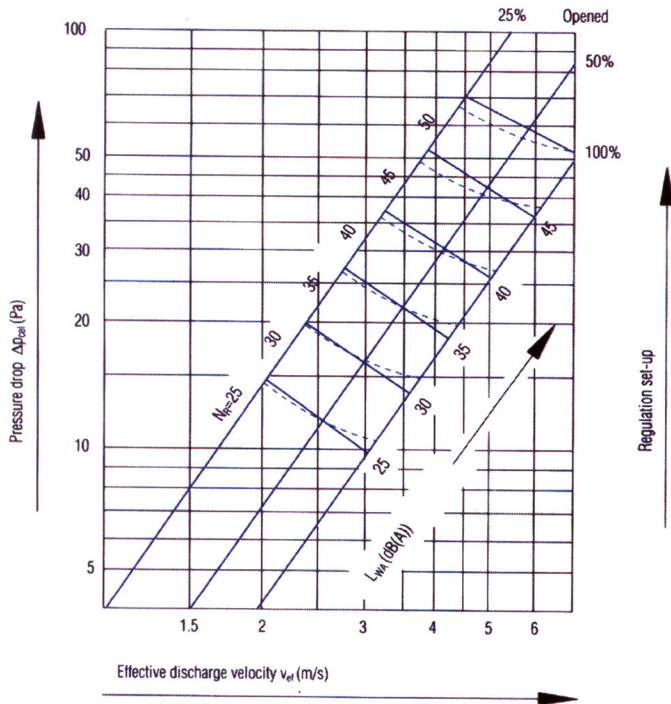
Register J2 has two separately adjustable deflector flaps. It is used to deflect and control air flow from the duct. Central installation of circular diffuser on built-in crossbar is also possible.

L2

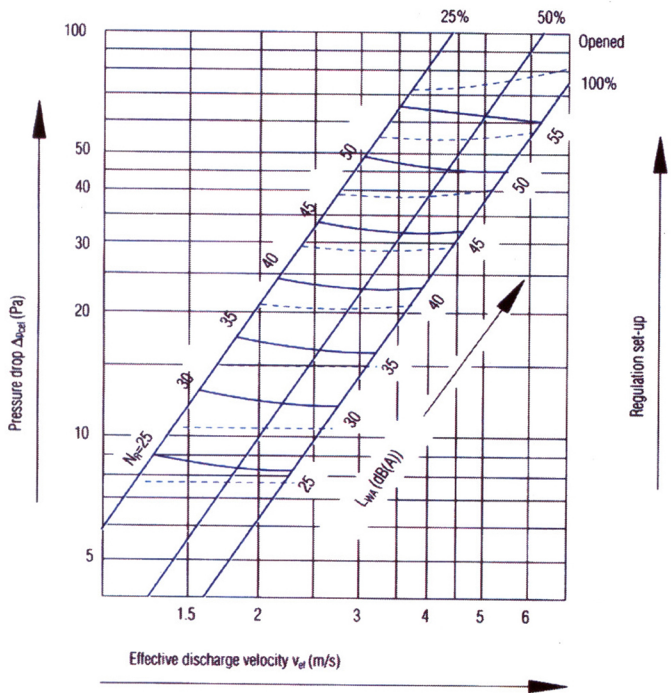
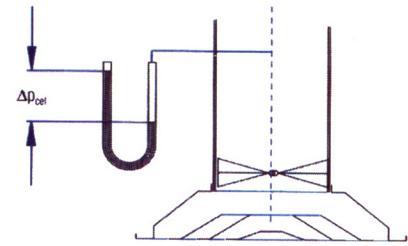
Element without regulation facilities is designed for the central installation of circular diffuser. Crossbar is a component part of L2. Picture shows L2/8 - angle irons for duct installation.

J3

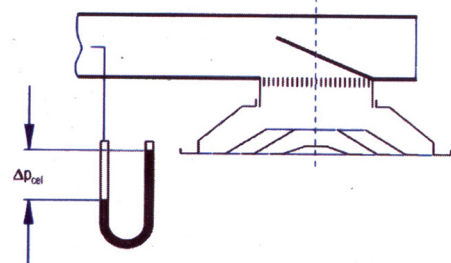
Register J3 has two continuously adjustable deflector flaps. It is used to deflect and control air flow from the duct. Central installation is not possible which makes them suitable for self-supporting installation.



Pressure drop diagram (Valid for register J3 and M)

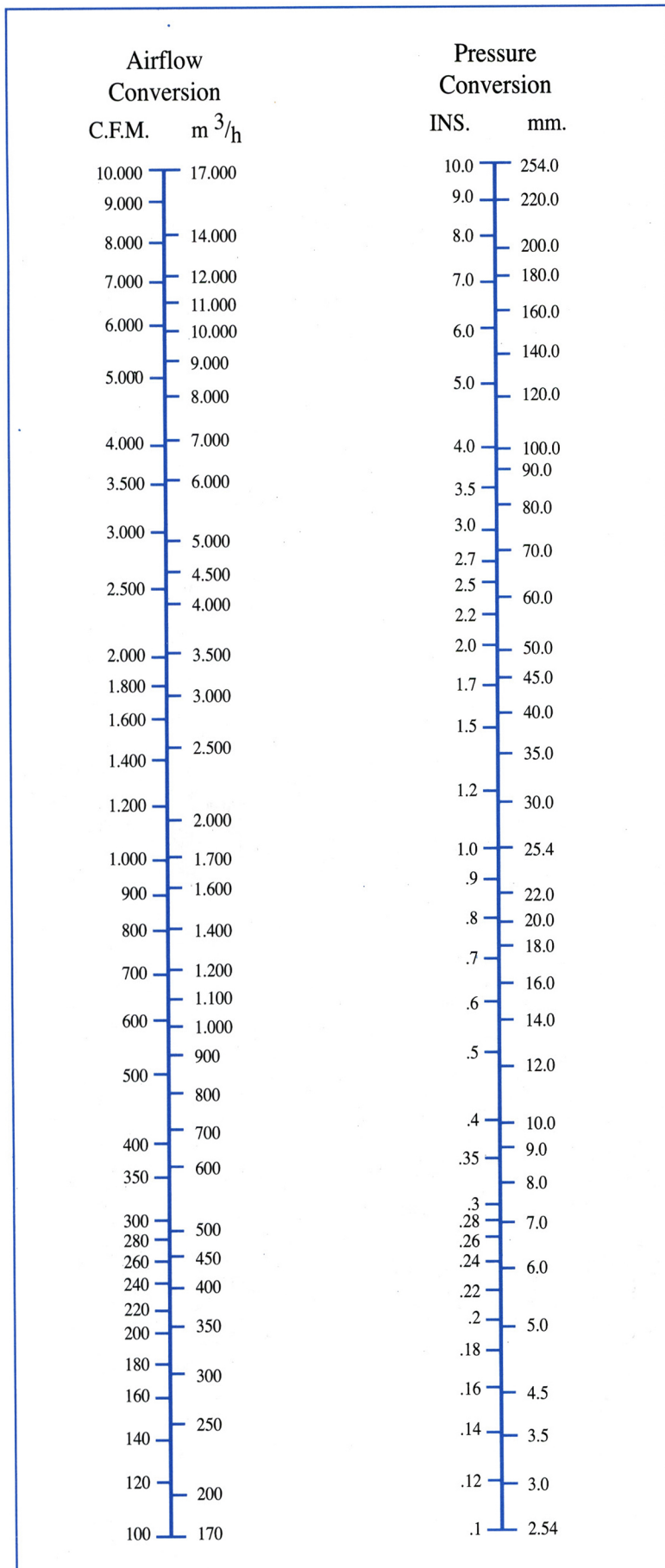


Pressure drop diagram (Valid for register E3)





AIRFLOW-/PRESSURE CONVERSION CHART



RECOMMENDED AIR CHANGES PER HOUR (FOR VENTILATION)

Assembly rooms	4 - 8
Bakeries	20 - 30
banks / building societies	4 - 8
Bathrooms	6 - 10
Bedrooms	2 - 4
■ Billiard rooms	6 - 8
Boiler rooms	15 - 30
Cafes and coffee bars	10 - 12
Canteens	8 - 12
Cellars	3 - 10
Churches	1 - 3
■ Cinemas and theatres	10 - 15
Club rooms	12 minimum
Compressor rooms	10 - 12
Conference rooms	8 - 12
Dance halls	12 minimum
Electroplating shops	10 - 12
Engine rooms	15 - 30
Entrance halls, corridors	3 - 5
Factories and workshops	8 - 10
Foundries	15 - 30
Garages	6 - 8
Glasshouses	25 - 60
Gymnasiums	6 minimum
Hairdressing salons	10 - 15
Hospitals - sterilising	15 - 25
Kitchens - domestic	15 - 20
- commercial	30 minimum
Laboratories	6 - 15
Laundries	10 - 30
Lavatories	6 - 15
Lecture theatres	5 - 8
Libraries	3 - 5
Living rooms	3 - 6
Offices	6 - 10
Paint shops (not cellulose)	10 - 20
Photo and X-ray darkrooms	10 - 15
Public house bars	12 minimum
Recording control rooms	15 - 25
Recording studios	10 - 12
Restaurants	8 - 12
Schoolrooms	5 - 7
Shops and supermarkets	8 - 15
Shower baths	15 - 20
Stores and warehouses	3 - 6
Squash courts	4 minimum
Swimming baths	10 - 15
Utility rooms	15 - 20
Welding shops	15 - 30

■ Increase by 50% where heavy smoking occurs or if the room is underground.