



CRA

Swirl Diffuser

Description

The CRA type diffusers are designed for ceiling applications. They can be used for supply air in cooling.

Properties

The CRA type diffusers have fixed blades. For supply air purposes, they are characteristically suitable for horizontal constant or variable flow air throws. Even at 25% of its rated capacity, the performance is stable. These diffusers are recommended for use with ceiling heights up to 4 m., with a supply air temperature difference of $\pm 10^{\circ}\text{C}$. It is important that these diffusers are installed flush with the ceiling for best performance. In cases where they are installed apart from the ceiling, a special nozzle is added to the outlet, to compensate for the absence of the ceiling.

Materials

The diffuser body, blades and nozzle are manufactured from 1.2 mm thick steel sheet.

Surface Treatment

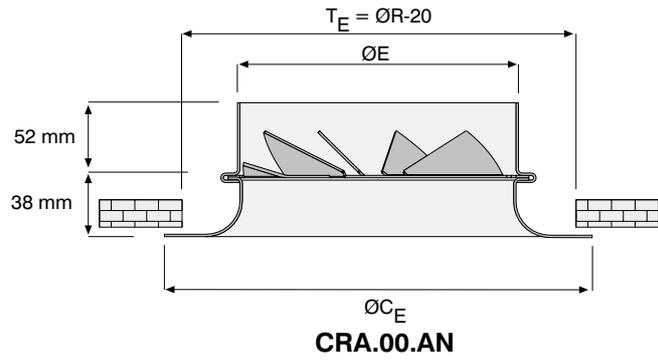
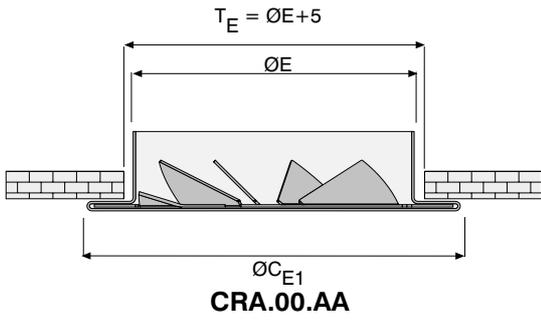
The surfaces of the diffuser is first cleaned, then painted with electrostatic powder paint to 20% gloss RAL 9010 (white) as standard. Other colours are also available upon request.

Accessories

Plenum Box

The plenum box is used to achieve optimum throw characteristics. It has the inlet either at the top or at one side. Depending on request, a damper can be installed at the inlet, which can be operated internally or externally (has to be specified with the order). The plenum boxes are made from 0.6 mm thick galvanized steel sheets and have 4 hanging brackets on their body. Optionally, a 6 mm thick acoustic foam can be laid inside the plenum box.

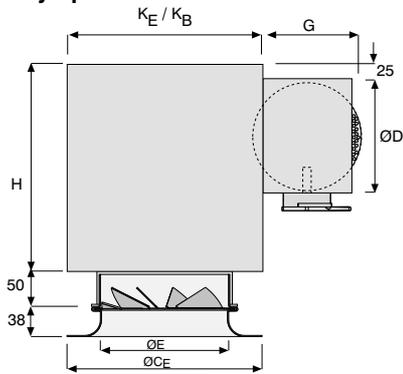
Dimensions



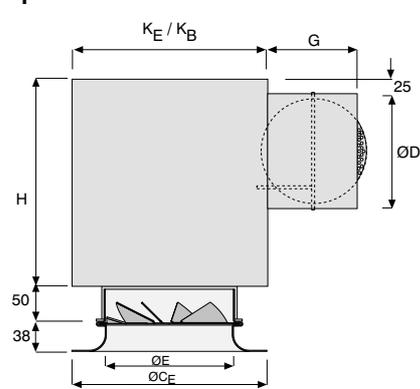
Standard Dimensions (mm)

OE	OE_C	OE_{C1}	K_E/K_B	H	OD	G
125	200	158	216	260	117	125
160	250	197	265	280	142	125
200	300	241	290	310	170	125
250	350	295	476	330	193	150
315	450	364	567	410	270	175
400	580	450	615	450	305	200

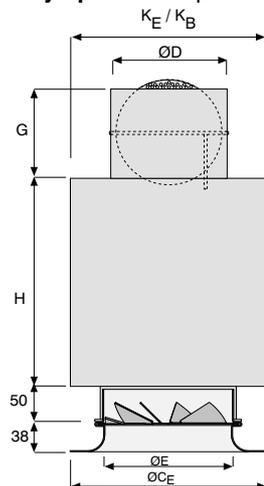
Externally operated Side inlet



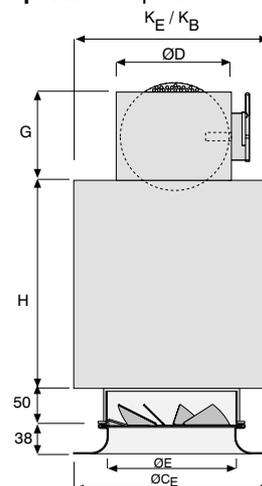
Internally operated Side inlet



Externally operated Top inlet

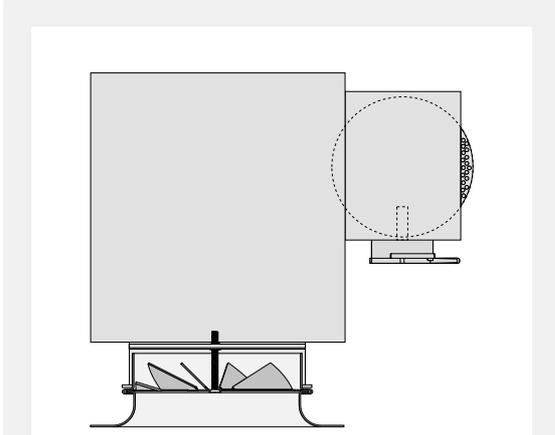


Internally operated Top inlet



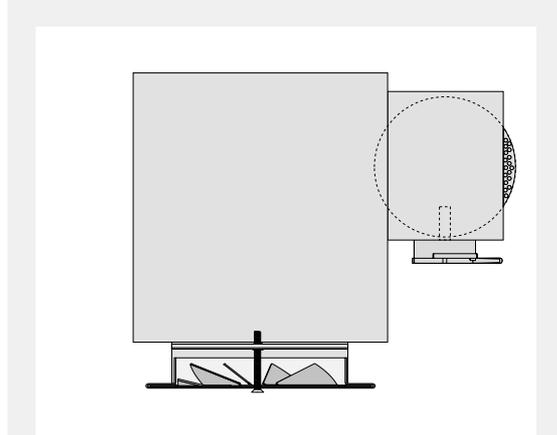
Installation

With nozzle



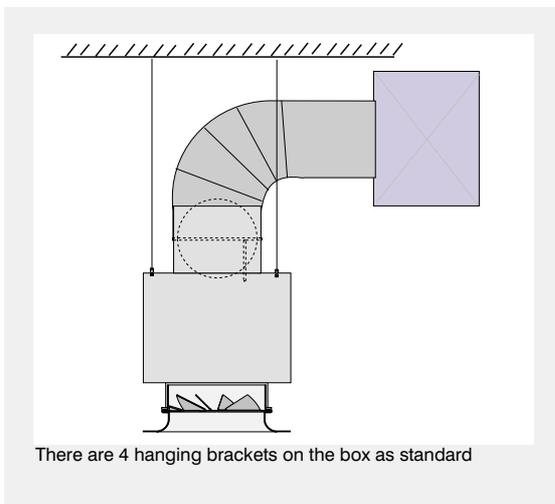
A screw $\varnothing 6 \times 71$, painted the same colour, is given with the product.

Without nozzle



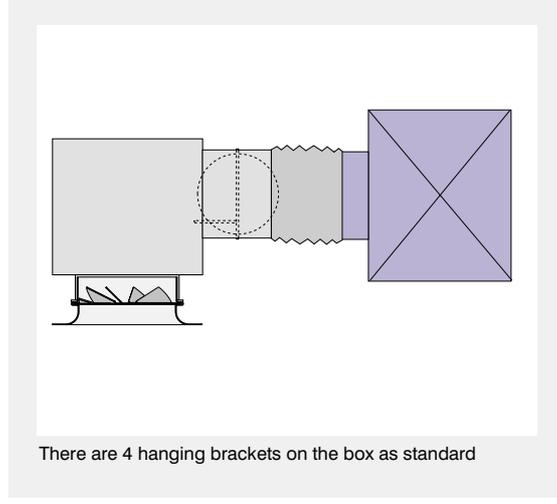
A screw $\varnothing 6 \times 71$, painted the same colour, is given with the product.

Plenum Box Installation (Top inlet)



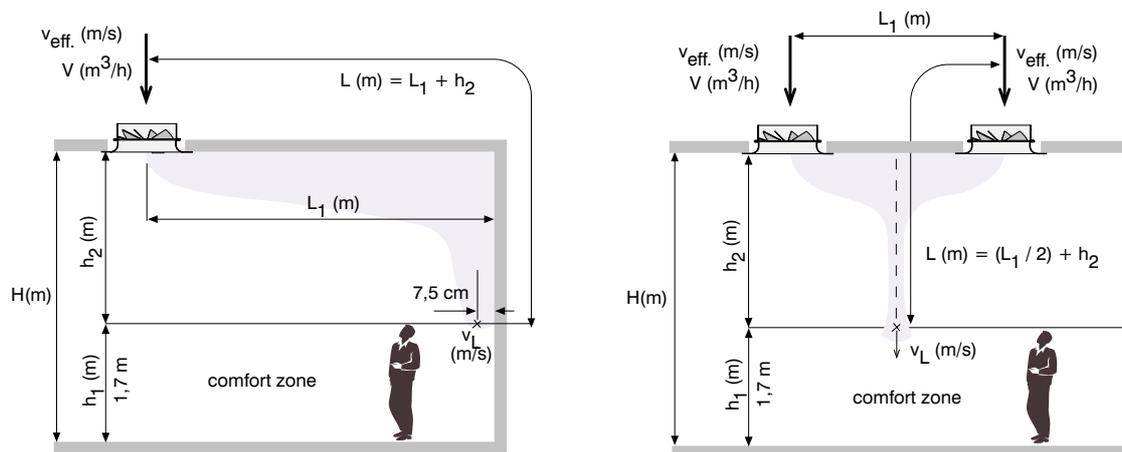
There are 4 hanging brackets on the box as standard

Plenum Box Installation (Side inlet)



There are 4 hanging brackets on the box as standard

Nomenclature



L₁	Distance between diffuser centres or diffuser centre and wall. (m)
h₁	Comfort zone height (m)
h₂	Distance between a diffuser and comfort zone (m)
v_{eff.}	Effective outlet velocity (m/s)
v_L	Velocity of core in comfort zone
Δt₀	Difference between supply air and room temperature (°C)
Δt_L	Difference between core and comfort zone temperature (°C)
L	Throw distance (m)
V	Air flow rate (m ³ /h)
H	Room height (m)
S	Sound power level dB(A)

To achieve "Coanda effect", the outlet velocity must be greater than 2m/s. The general comfort conditions require that the sound power level is below 40 dB(A). The height of the comfort zone is taken as 1.70m above the floor. It is important that 0.25 m/s core velocity is not exceeded in this zone.

Note: The tables are given for installations flush with the ceiling (with Coanda effect). For installations apart from the ceiling, the values must be multiplied by 0.7

With Nozzle

Size ØE (mm)	Flow Rate V (m ³ /h)	Throw, L (m)		Pressure loss ΔP (Pa)	Sound power level S (dB(A))
		v _L =0,25 m/s	v _L =0,10 m/s		
125	35	0,75	1,85	5	<20
	60	1,25	3,10	13	20
	80	1,70	4,25	22	29
	100	2,20	5,40	34	35
	125	2,75	7,00	54	41
160	45	0,65	1,65	4	<20
	80	1,20	3,10	9	<20
	110	1,60	4,10	18	27
	145	2,10	5,35	30	34
	180	2,55	6,70	46	40
200	70	0,90	2,60	3	<20
	110	1,35	3,95	8	<20
	155	2,00	5,75	16	26
	200	2,50	7,35	25	33
	250	3,30	9,65	40	39
250	110	1,10	2,75	4	<20
	180	1,80	4,60	9	<20
	250	2,60	6,50	18	26
	325	3,20	8,00	29	34
	400	4,00	10,00	44	40
315	200	1,40	3,80	5	<20
	330	2,25	6,30	11	24
	460	3,20	9,05	21	34
	590	4,35	11,90	35	42
	720	5,50	15,50	52	49
400	250	1,65	4,95	5	<20
	430	2,70	8,00	11	21
	610	4,10	11,80	22	32
	790	5,75	16,90	35	40
	970	7,55	22,00	50	45

Technical Data

Without Nozzle

Size ØE (mm)	Flow Rate V (m ³ /h)	Throw, L (m)		Pressure loss ΔP (Pa)	Sound power level S (dB(A))
		v _L = 0,25 m/s	v _L = 0,10 m/s		
125	25	0,70	1,75	4	<20
	40	1,05	2,65	9	22
	50	1,40	3,45	15	27
	60	1,65	4,10	21	34
	75	2,20	5,40	34	40
160	30	0,55	1,45	3	<20
	50	1,00	2,65	8	20
	75	1,55	4,10	18	21
	100	1,95	5,15	32	38
	125	2,45	6,40	50	44
200	50	0,70	1,65	3	<20
	80	1,20	2,85	7	<20
	115	1,75	4,30	14	24
	150	2,30	5,60	24	32
	180	2,65	6,50	35	37
250	80	0,80	2,05	3	<20
	130	1,30	3,25	8	<20
	190	1,90	4,80	18	27
	240	2,40	6,00	27	33
	290	2,90	7,25	42	39
315	150	1,15	2,90	4	<20
	240	1,85	4,60	8	<20
	340	2,70	6,60	17	30
	440	3,55	8,80	28	38
	540	4,60	11,30	42	45
400	200	1,80	4,55	3	<20
	335	2,40	6,15	10	26
	475	3,35	8,60	20	35
	610	4,60	11,80	35	42
	750	6,20	16,00	50	48

Technical Data

Temperature gradients along the throw path are read from the table below, depending on the Δt_o , Δt_L and throw length values. The temperature of the core at L metres from the diffuser, differs from the room temperature by the value read from the tables. The difference is plus in heating and minus in cooling. The less the difference, the better the comfort conditions.

Temperature gradients along the throw path

With Nozzle		Δt_L (°C) Values					
Size ØE (mm)	Throw L (m)	Δt_o (°C)					
		4	6	8	10	12	14
125	0,5	0,40	0,59	0,79	0,99	1,19	1,38
	1,0	0,25	0,37	0,49	0,62	0,74	0,86
	1,5	0,17	0,25	0,34	0,42	0,50	0,59
	2,0	0,13	0,19	0,26	0,32	0,38	0,45
	3,0	0,09	0,13	0,17	0,22	0,26	0,30
	4,0	0,07	0,10	0,13	0,17	0,20	0,23
	5,0	0,05	0,08	0,11	0,13	0,16	0,19
	6,0	0,04	0,07	0,09	0,11	0,13	0,16
	7,0	0,04	0,06	0,08	0,10	0,12	0,14
160	0,5	0,48	0,71	0,95	1,19	1,43	1,67
	1,0	0,25	0,37	0,49	0,62	0,74	0,86
	1,5	0,17	0,25	0,34	0,42	0,50	0,59
	2,0	0,13	0,19	0,26	0,32	0,38	0,45
	3,0	0,09	0,13	0,17	0,22	0,26	0,30
	4,0	0,07	0,10	0,13	0,17	0,20	0,23
	5,0	0,05	0,08	0,11	0,13	0,16	0,19
	6,0	0,04	0,07	0,09	0,11	0,13	0,16
	7,0	0,04	0,06	0,08	0,10	0,12	0,14
200	1,0	0,33	0,49	0,66	0,82	0,99	1,15
	2,0	0,17	0,25	0,33	0,41	0,50	0,58
	3,0	0,11	0,17	0,22	0,28	0,33	0,39
	4,0	0,08	0,12	0,17	0,21	0,25	0,29
	5,0	0,07	0,10	0,13	0,17	0,20	0,23
	6,0	0,06	0,08	0,11	0,14	0,17	0,19
	7,0	0,05	0,07	0,10	0,12	0,14	0,17
	8,0	0,04	0,06	0,08	0,10	0,12	0,15
	9,0	0,04	0,06	0,07	0,09	0,11	0,13
	10,0	0,03	0,05	0,07	0,08	0,10	0,12
250	1,0	0,52	0,77	1,03	1,29	1,55	1,81
	2,0	0,26	0,39	0,52	0,65	0,78	0,91
	3,0	0,17	0,26	0,35	0,43	0,52	0,61
	4,0	0,13	0,20	0,26	0,33	0,39	0,46
	5,0	0,10	0,16	0,21	0,26	0,31	0,37
	6,0	0,09	0,13	0,17	0,22	0,26	0,31
	7,0	0,07	0,11	0,15	0,19	0,22	0,26
	8,0	0,07	0,10	0,13	0,16	0,20	0,23
	9,0	0,06	0,09	0,12	0,15	0,18	0,20
	10,0	0,05	0,08	0,10	0,13	0,16	0,18

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Temperature gradients along the throw path

With Nozzle		Δt_L (°C) Values					
Size ØE (mm)	Throw L (m)	Δt_0 (°C)					
		4	6	8	10	12	14
315	1,0	0,57	0,86	1,15	1,44	1,72	2,01
	2,0	0,29	0,43	0,58	0,72	0,87	1,01
	3,0	0,19	0,29	0,39	0,49	0,58	0,68
	4,0	0,15	0,22	0,29	0,37	0,44	0,51
	5,0	0,12	0,18	0,23	0,29	0,35	0,41
	7,0	0,08	0,13	0,17	0,21	0,25	0,29
	9,0	0,07	0,10	0,13	0,16	0,20	0,23
	11,0	0,05	0,08	0,11	0,13	0,16	0,19
	13,0	0,05	0,07	0,09	0,11	0,14	0,16
	15,0	0,04	0,06	0,08	0,10	0,12	0,14
400	2,0	0,40	0,59	0,79	0,99	1,19	1,38
	4,0	0,20	0,30	0,40	0,50	0,60	0,70
	6,0	0,13	0,20	0,27	0,33	0,40	0,46
	8,0	0,10	0,15	0,20	0,25	0,30	0,35
	10,0	0,08	0,12	0,16	0,20	0,24	0,28
	12,0	0,07	0,10	0,13	0,17	0,20	0,23
	14,0	0,06	0,09	0,11	0,14	0,17	0,20
	16,0	0,05	0,08	0,10	0,13	0,15	0,18
	18,0	0,04	0,07	0,09	0,11	0,13	0,16
	20,0	0,04	0,06	0,08	0,10	0,12	0,14

Technical Data

Temperature gradients along the throw path are read from the table below, depending on the Δt_0 , Δt_L and throw length values. The temperature of the core at L metres from the diffuser, differs from the room temperature by the value read from the tables. The difference is plus in heating and minus in cooling. The less the difference, the better the comfort conditions.

Temperature gradients along the throw path

Without Nozzle		Δt_L (°C) Values					
Size ØE (mm)	Throw L (m)	Δt_0 (°C)					
		4	6	8	10	12	14
125	0,5	0,30	0,45	0,60	0,75	0,90	1,05
	1,0	0,19	0,28	0,38	0,47	0,56	0,66
	1,5	0,13	0,19	0,25	0,32	0,38	0,45
	2,0	0,10	0,15	0,19	0,24	0,29	0,34
	3,0	0,07	0,10	0,13	0,16	0,20	0,23
	4,0	0,05	0,08	0,10	0,13	0,15	0,18
	5,0	0,04	0,06	0,08	0,10	0,12	0,14
	6,0	0,03	0,05	0,07	0,09	0,10	0,12
160	0,5	0,35	0,53	0,71	0,88	1,06	1,23
	1,0	0,18	0,27	0,37	0,46	0,55	0,64
	1,5	0,12	0,19	0,25	0,31	0,37	0,43
	2,0	0,09	0,14	0,19	0,24	0,28	0,33
	3,0	0,06	0,10	0,13	0,16	0,19	0,22
	4,0	0,05	0,07	0,10	0,12	0,15	0,17
	5,0	0,04	0,06	0,08	0,10	0,12	0,14
	6,0	0,03	0,05	0,07	0,08	0,10	0,12
200	1,0	0,28	0,41	0,55	0,69	0,83	0,97
	2,0	0,14	0,21	0,28	0,35	0,42	0,49
	3,0	0,09	0,14	0,19	0,23	0,28	0,32
	4,0	0,07	0,10	0,14	0,17	0,21	0,24
	5,0	0,06	0,08	0,11	0,14	0,17	0,20
	6,0	0,05	0,07	0,09	0,12	0,14	0,16
	7,0	0,04	0,06	0,08	0,10	0,12	0,14
	8,0	0,03	0,05	0,07	0,09	0,10	0,12
	9,0	0,03	0,05	0,06	0,08	0,09	0,11
	10,0	0,03	0,05	0,07	0,08	0,10	0,12
250	1,0	0,43	0,65	0,87	1,08	1,30	1,52
	2,0	0,22	0,33	0,44	0,55	0,65	0,76
	3,0	0,15	0,22	0,29	0,36	0,44	0,51
	4,0	0,11	0,16	0,22	0,27	0,33	0,38
	5,0	0,09	0,13	0,18	0,22	0,26	0,31
	6,0	0,07	0,11	0,15	0,18	0,22	0,26
	7,0	0,06	0,09	0,13	0,16	0,19	0,22
	8,0	0,06	0,08	0,11	0,14	0,17	0,19
	9,0	0,05	0,07	0,10	0,12	0,15	0,17
	10,0	0,04	0,07	0,09	0,11	0,13	0,15

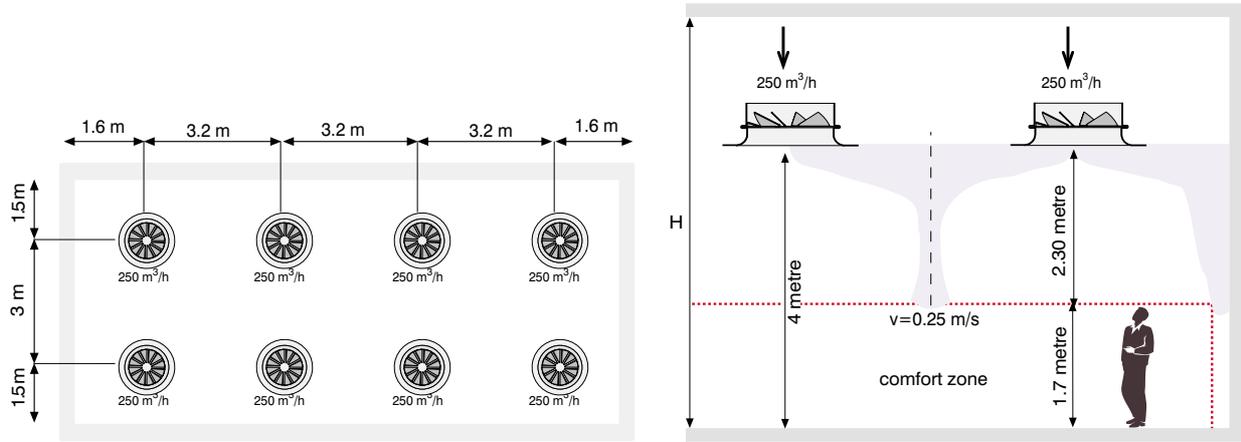
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Temperature gradients along the throw path

Without Nozzle		Δt_L (°C) Values					
Size ØE (mm)	Throw L (m)	Δt_0 (°C)					
		4	6	8	10	12	14
315	1,0	0,51	0,76	1,01	1,26	1,52	1,77
	2,0	0,25	0,38	0,51	0,64	0,76	0,89
	3,0	0,17	0,26	0,34	0,43	0,51	0,60
	4,0	0,13	0,19	0,26	0,32	0,39	0,45
	5,0	0,10	0,15	0,21	0,26	0,31	0,36
	6,0	0,09	0,13	0,17	0,21	0,26	0,30
	7,0	0,07	0,11	0,15	0,18	0,22	0,26
	8,0	0,06	0,10	0,13	0,16	0,19	0,23
	10,0	0,05	0,08	0,10	0,13	0,16	0,18
	12	0,04	0,06	0,09	0,11	0,13	0,15
400	1,0	0,70	1,05	1,40	1,75	2,10	2,45
	2,0	0,35	0,53	0,70	0,88	1,06	1,23
	3,0	0,24	0,35	0,47	0,59	0,71	0,82
	4,0	0,18	0,27	0,35	0,44	0,53	0,62
	6,0	0,12	0,18	0,24	0,30	0,35	0,41
	8,0	0,09	0,13	0,18	0,22	0,27	0,31
	10,0	0,07	0,11	0,14	0,18	0,21	0,25
	12,0	0,06	0,09	0,12	0,15	0,18	0,21
	14,0	0,05	0,08	0,10	0,13	0,15	0,18
	16,0	0,04	0,07	0,09	0,11	0,13	0,16

Example:

Air at $2000 \text{ m}^3/\text{h}$, is to be supplied into a room with dimensions $12.8 \times 6 \text{ m}$, and a height of 4 m . The supply air is 8°C below room temperature and 8 diffusers with nozzles will be used. Determine diffuser spacings so that the core velocity in comfort zone is below 0.25 m/s .

**Solution:**

- 1) Diffusers are placed on the ceiling plan symmetrically.
- 2) Air flow rate per diffuser is calculated as $2000 / 8 = 250 \text{ m}^3/\text{h}$.
- 3) Calculation of path length to the comfort zone:
 Minimum distance: $L = 1.50 + 2.30 = 3.80 \text{ m}$
 Maximum distance: $L = 1.60 + 2.30 = 3.90 \text{ m}$.
- 4) From the table on page 6, the most suitable size is found as 250 mm ; for $250 \text{ m}^3/\text{h}$ and 3.80 m throw.
- 5) From the same table with interpolation, pressure loss is read as 18 Pa and sound power level as 26 dB(A) .
- 6) From the table on page 8; for 250 mm size, $\Delta t_0 = 8^\circ\text{C}$, and 3.80 m throw, Δt_L is found by interpolation as 0.28°C .

Specification Text

Air diffuser for ceiling installation. The diffuser will be manufactured from 1.2 mm thick steel sheets, and will be painted to ordered request with electrostatic powder paint and a minimum thickness of 60µ. The plenum box will be manufactured from 0.6 mm galvanized steel sheets by seams. There will be 4 hanging brackets on the box. Optionally, the entry spigot will be equipped with a volume control damper, operated externally or internally, depending

on request. Also, optionally, 6-mm thick acoustic foam (according to BS 476 Part 6 & 7 Class 0) will be installed inside the plenum box.

Order Code

Model		CRA.00.AN.10 -315 -9010	
Product type	00...Circular	ØE (mm) Refer to page 3	Indicate RAL colour code
Accessories	AA...Without nozzle AN...With nozzle		
Installation	00...Without screw holes 10...With screw holes 40...Fixing with bridge	Standard Dimensions	Colour Code

Plenum Box Order Code

Model		PLD.10.S B.1 1-567x 410 x 270 x 1	
Installation	10...With screw 40...Fixing with bridge	Please indicate if special dimensions are requested $K_E / K_B \times H \times \text{ØD (mm)} \times s$ (no.of inlet spigots)	
Box Inlet	S...Side Inlet T...Top Inlet		
Spigot Damper	A...Without damper B...Externally operated C...Internally operated		
Perforated Rectifier Plate	0...Without plate 1...With plate		
Insulation	0...Without insulation 1...With acoustic insulation		
		Plenum Box Dimensions	

C

CRA

Swirl Diffuser

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TÜV Rheinland Group



DIN EN ISO 9001:2000

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