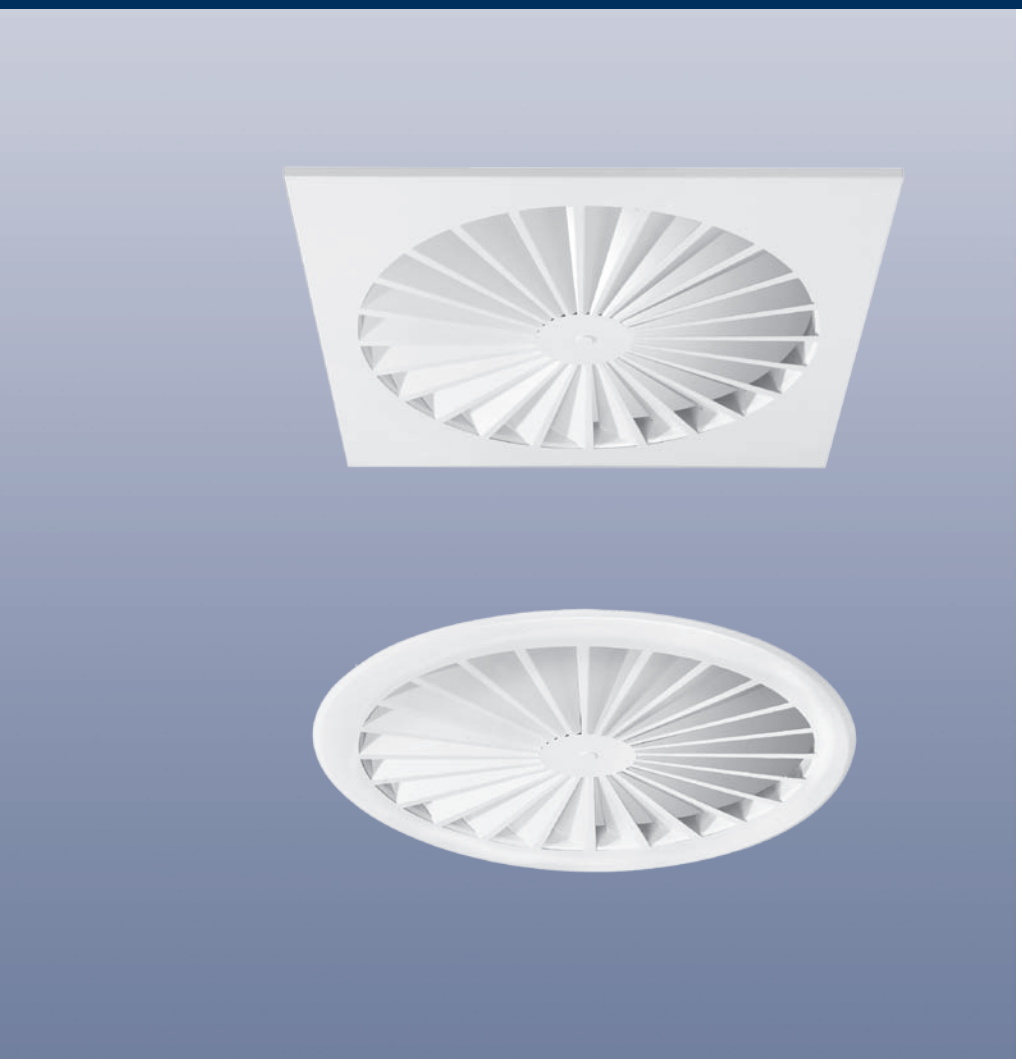
KOMPONENTEN
Applied system solutions



Radial outlet RA-N3....

DS 4131 E 04.2013

Radial outlet RA-N3

Preliminary remarks

KRANTZ KOMPONENTEN radial outlets of the RA-N3 series have 24 fixed radial vanes and are available with square or circular face. They generate high-quality diffuse air flow according to the principle of turbulent mixing ventilation. They can be installed freely suspended from the ceiling, above open grid or expanded metal ceilings, or flush with either closed false ceilings or square tile ceilings.

The RA-N3 offers a very large volume flow rate range. Using one nominal size for RA-N3 outlets within a room enables to get a uniform ceiling design. If only a small volume flow rate is required, a collar can be inserted in the outlet so as to obtain the requested air flow range; the nominal size of all ceiling-mounted RA-N3 outlets being the same, the ceiling design keeps its harmony.
For perimeter and corner zones it is possible to fit the outlets (inside) with segment cover discs. These optional discs are designed to cover certain outlet segments in order to adapt the air discharge direction to the room layout.

RA-N3 radial outlets achieve a high level of thermal comfort and can be used for volume flow rates up to 400 l/s [1 440 m^3/h] at temperature differences up to –12 K when cooling and +10 K when heating for ceiling heights up to 3 m (> 3 m = +5 K).

Range of application

Size	Collar	Volume flow rate $\dot{V}$		Max. temperature difference supply air–indoor air $\Delta\vartheta$
		l/s	m^3/h	
DN 355	0	56 – 175	200 – 630	–12 K when cooling +10 K when heating (≤ 3 m) + 5 K when heating (> 3 m)
	2	38 – 122	135 – 440	
	4	26 – 89	95 – 320	
DN 500	0	125 – 400	450 – 1 440	
	2	86 – 280	310 – 1 010	
	4	61 – 200	220 – 720	

Mode of operation

The radial outlet **1** discharges the supply air in the horizontal direction, this feature being enhanced by the special shape of the exit **1a**. The high-turbulence supply air jets induce a large proportion of indoor air, which leads to the fast equalization of supply air and indoor air temperatures as well as to a rapid decrease in jet velocity.
Thanks to its stable supply air distribution pattern at low sound power levels this outlet can be used for a very wide range of air volume flow rates. Inserting a collar in the outlet enables to additionally vary the flow rate range.

Construction design

The RA-N3 is available in 2 sizes: DN 355 and DN 500. The circular model is fitted on the outside with a flush contact edge for ceiling attachment (see detail Y on page 4). The outlet with square face has a 90° turn-up for installation in square tile ceilings (see detail Z on page 4).
Both outlet models are made of powder coated sheet metal and are fastened to the reducer or connection box with a central screw **5** whose head is concealed by a cap **5a** having the same powder coating as the outlet.

Installation options

The following connection types are available for connection to the duct system.

Connection type A, with reducer for connection to a circular duct or a flexible duct

Connection type D, with connection box for a closed ceiling

Connection type F, with connection box for a square tile ceiling

Radial outlet RA-N3

Connection type A

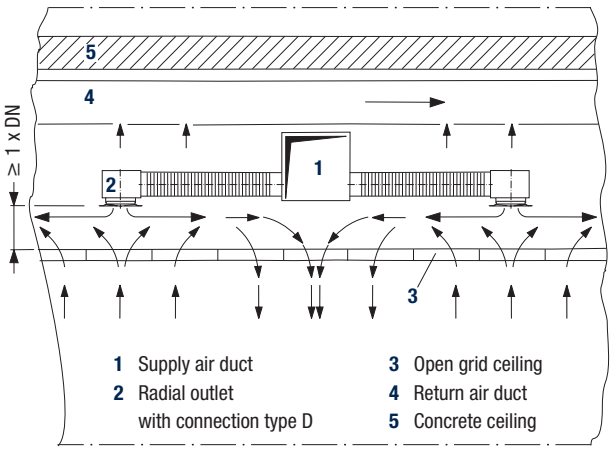
The ‘A’ reducer is fitted with 3 suspension brackets staggered by 90°, for fixing to the ceiling, as well as with a screw nut for the central fastening of the outlet. The reducer can be connected to a spiral seam duct or to a flexible duct. For installation in a closed false ceiling upon completion of said ceiling, the radial outlet with flush contact edge shall be inserted into the reducer through the ceiling cutout and screwed up.

Connection type D

The RA-N3 outlet is connected to the duct system via the lateral spigot of a flat connection box. This connection type is suitable for outlets to be installed above open or closed false ceilings. The connection box is fitted with 4 suspension brackets for fixing to the ceiling and a screw nut for the central fastening of the outlet. The optional volume flow damper positioned in the lateral connection spigot can be adjusted through the openings of the radial outlet. As an option, this connection box can be fitted with acoustic lining.

Connection type F

This connection type is particularly suitable for square tile ceilings. The square radial outlet with connection box is inserted into the ceiling from the top in place of a ceiling tile. The connection box is fixed to the load-bearing ceiling and the outlet is screwed to the connection box via the central fastener.



Radial outlets installed above an open grid ceiling.
The return air is removed evenly through the whole ceiling and extracted by the return air duct positioned immediately above the outlets.

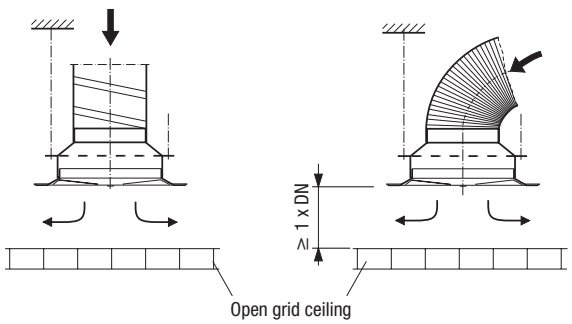
Design specifications

Basically, the radial outlet RA-N3 can also be freely suspended from the ceiling regardless of its connection type (round connection box available on request).

Radial outlets discharging supply air may be positioned close to return air openings or inlets. Disruptions in jet dispersion or risks of short-circuiting are ruled out if the height difference between the planes of return air intake and supply air discharge is minimum 250 mm. If the radial outlet and the return air opening or inlet are in the same plane, the horizontal centre spacing should be at least five times the nominal diameter (5 x DN) of the outlet.

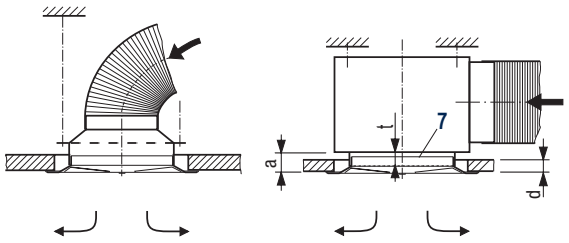
Sketches of installation options

Connection type A



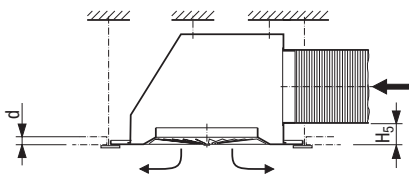
Radial outlet with circular face for installation above an open grid ceiling

Connection type A or D



Radial outlet with circular or square face for installation in a closed false ceiling of medium thickness ‘d’ (d ≤ a) with very low plenum

Connection type F

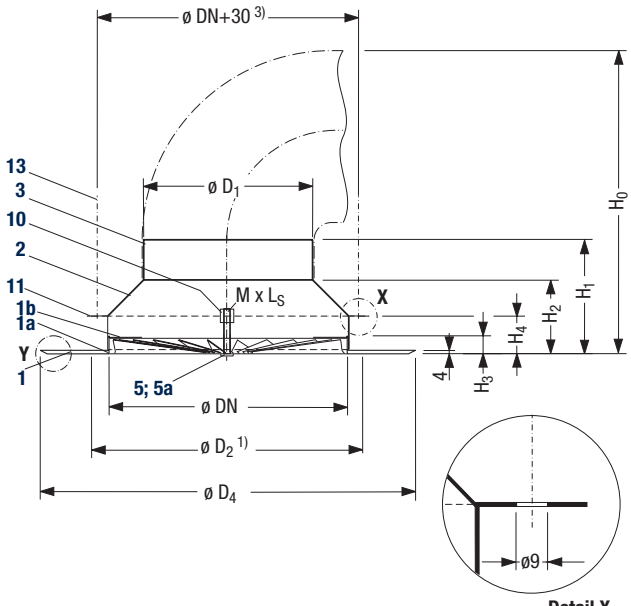


Radial outlet with square face and 90° turn-up for installation in a square tile ceiling with d < H_5

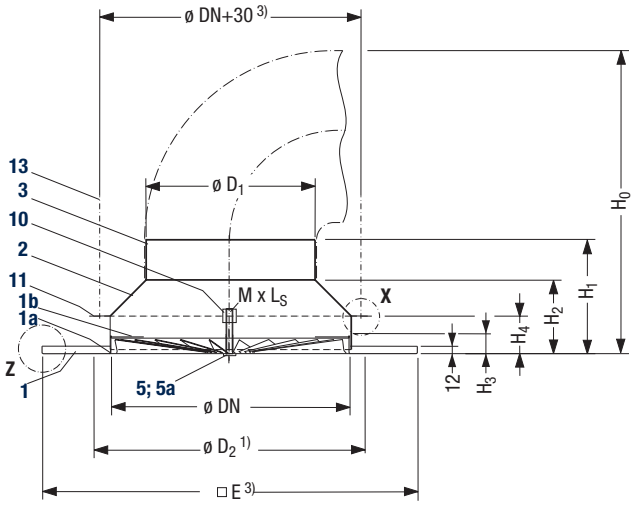
Radial outlet RA-N3

Dimensions of connection type A

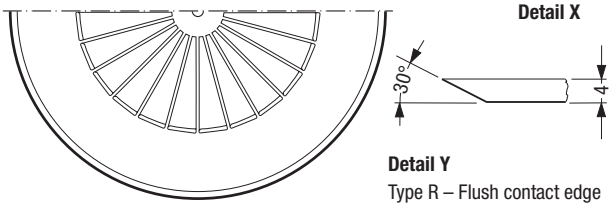
Circular outlet RA-N3R



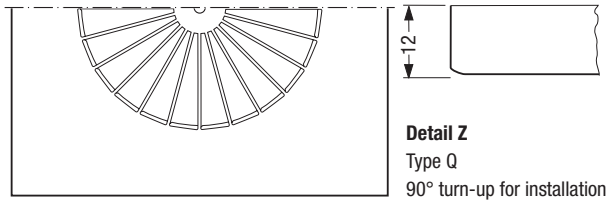
Square outlet RA-N3Q



Detail X

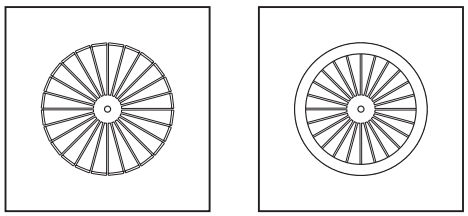


Detail Y
Type R – Flush contact edge for ceiling attachment



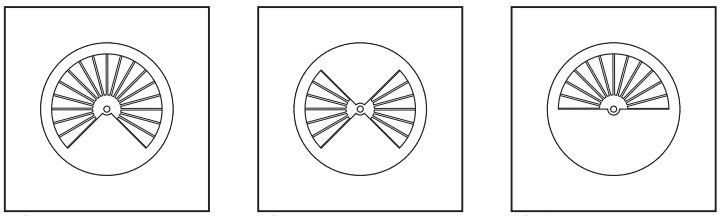
Detail Z
Type Q
90° turn-up for installation in square tile ceilings

Top view of RA-N3 without and with collar



Without collar | With collar 2 or 4

Optional segment cover discs 4) for adapting air discharge to room layout



_/1 for 3-way discharge | _/2 for 2-way symmetric discharge | _/3 for 2-way asymmetric discharge

Key for all pages		Material
1	Radial outlet	sheet metal, powder coated
1a	Exit	
1b	Collar 2)	
2	Reducer	aluminium
3	Circular duct connection	—
4	Connection box	galvanized sheet metal
5	Central fastening screw M8	
5a	Screw cap	brass, powder coated
6	Acoustic lining (optional)	mineral wool

Key for all pages		Material
7	Sleeve at connection box D	galvanized sheet metal
8	Spigot at connection box	
9	Volume flow damper (optional)	
10	Central fastener for radial outlet	
11	Suspension bracket	
12	Bore for suspension by others	
13	Threaded rod or quick fastener (by others)	
14	Adjusting device for volume flow damper (adjustable from room)	

Size / D_1	Collar	H_3 mm	RA-N3Q Ceiling tile	RA-N3Q □ E 3) mm	RA-N3R D_2 1) mm	RA-N3R D_4 mm	RA-N3R with reducer A H_0 mm	H_1 mm	H_2 mm	H_4 mm	M x L_S mm	Weight in kg Air outlet
DN 355/249	0	27	□ 600 □ 625	□ 595 □ 620	405	470	450	171	111	57	8 x 80	approx. 2.0
DN 355/199	2 4						405	176	136			
DN 500/354	0	36	□ 600 □ 625	□ 595 □ 620	580	675	585	199	139	66	8 x 110	approx. 3.6
DN 500/314	2 4						565	219	159			

1) Recommended ceiling cutout

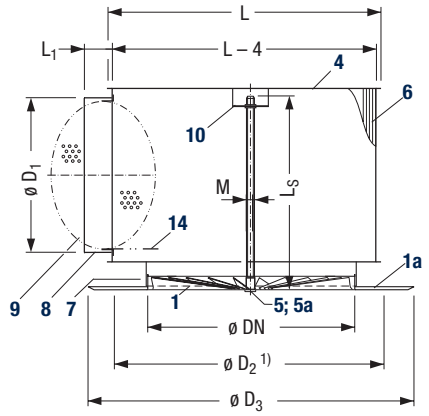
2) Optional segment cover discs for one-way or multi-way discharge

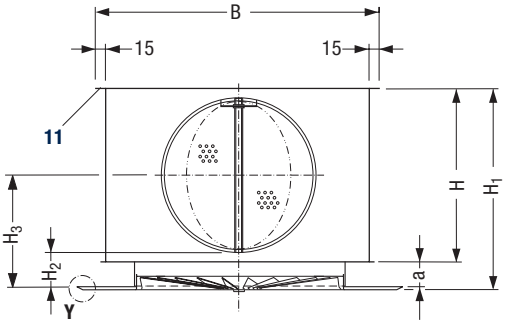
3) Other square dimensions and rectangular design on request

4) The segment cover discs can be turned in order to adapt the air discharge direction to the room layout

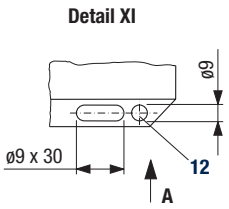
Radial outlet RA-N3

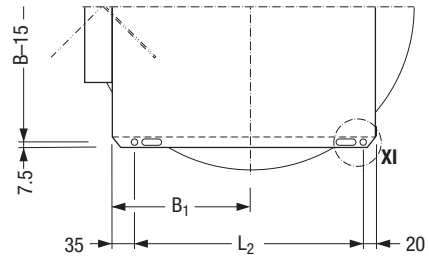
Dimensions of connection types D and F

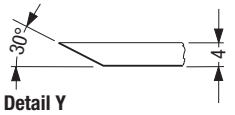




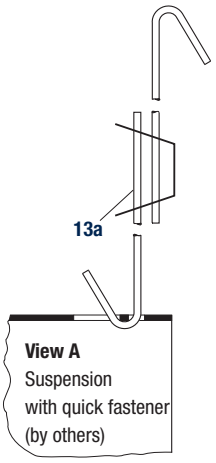
Connection type D



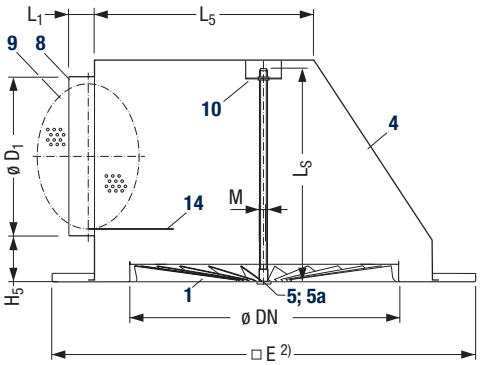


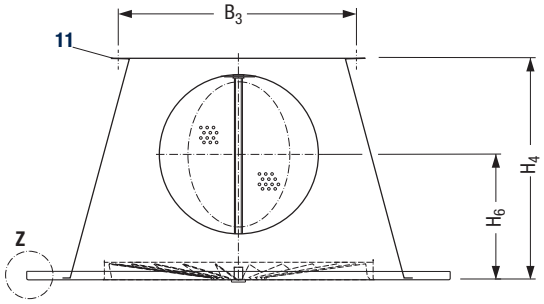


Detail Y
Flush contact edge
for ceiling attachment,
for circular face

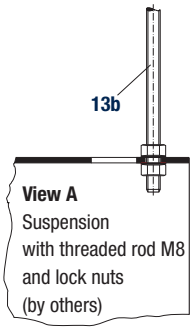


View A
Suspension
with quick fastener
(by others)

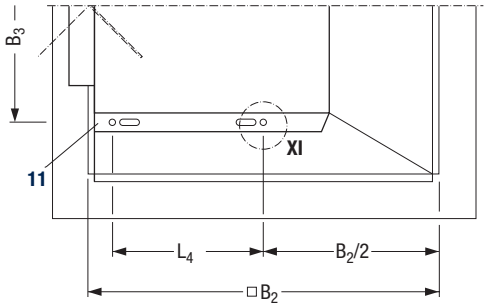




Connection type F
for square outlets



View A
Suspension
with threaded rod M8
and lock nuts
(by others)



Detail Z
90° turn-up for installation
in square tile ceilings

Size / ø D_1	Collar	L_1	Connection type D													Connection type F									
			B	L	B_1	H	H_1	H_2	H_3	D_2 1)	D_3	L_2	a	M x L_S	W 3)	□ E 2)	□ B_2	B_3	L_4	L_5	H_4	H_5	H_6	M x L_S	W 4)
		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
DN 355/249	0	60	435	420	218	275	316	54	175	405	470	365	37	8 x 188	6.2	595	488	346	210	269	328	66	193	8 x 248	7.1
DN 355/199	2 4	40				225	266		150					8 x 160	6.0 6.2	620		372		303	278		166		7.0 7.2
DN 500/354	0	60	580	565	290	380	432	65	238	580	675	510	48	8 x 268	11.7	595	588	384	260	302	443	76	253	8 x 358	9.5
DN 500/314	2 4					340	392		218					8 x 228	11.7 12.0	620		405		319	403		233	8 x 328	9.8 10.1

1) Ceiling cutout

2) Other dimensions on request

3) Weight with volume flow damper, without acoustic lining

4) Weight with collar 4, for □E = 595 mm

Radial outlet RA-N3

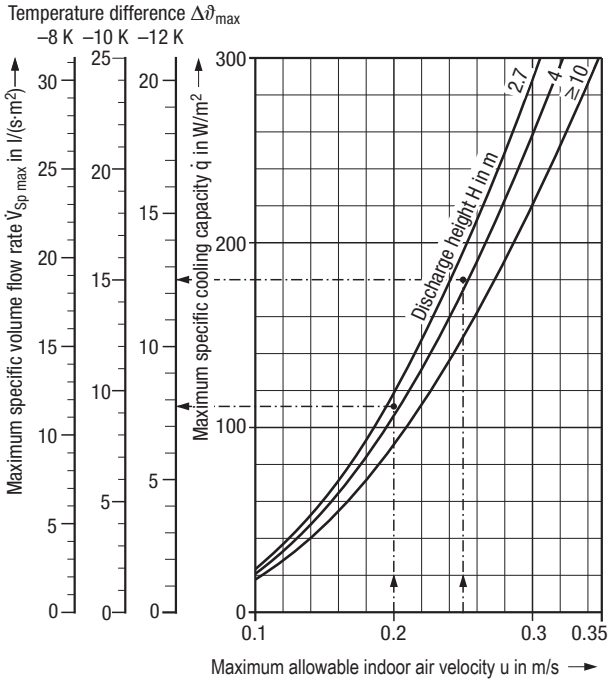
Comfort criteria and minimum air outlet centre spacing

Comfort criteria[1)]

The outlet layout must comply with the maximum allowable indoor air velocities u in the occupied zone in the cooling mode. The indoor air velocity depends on the cooling load that is to be removed from the room. The maximum specific cooling capacity $\dot{q}$ depends on the discharge height and the maximum allowable indoor air velocity u (Graph 1).

Graph 1 enables to determine for the cooling mode the maximum specific volume flow rate $\dot{V}_{Sp\ max}$ in relation to the maximum specific cooling capacity and the maximum temperature difference $\Delta\vartheta_{max}$. The volume flow rate supplied to the room $\dot{V}_{Sp\ tats}$ may not exceed this value.

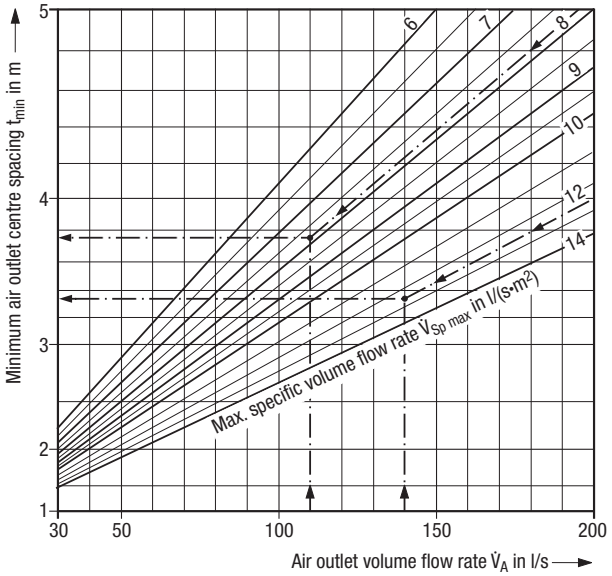
Graph 2 enables to determine the minimum centre spacing between two outlets on the basis of the maximum specific volume flow rate.

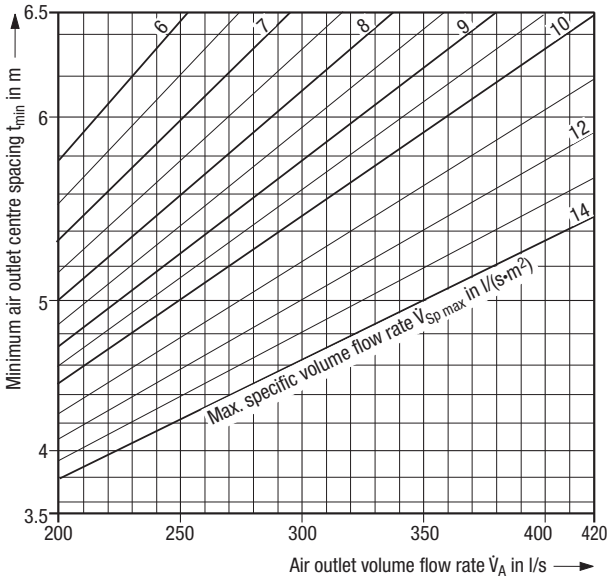


Graph 1: Maximum specific volume flow rate

Key for layout:

$\dot{V}_A$ = volume flow rate per air outlet in l/s
$\dot{V}_{A\ max}$ = max. volume flow rate per air outlet when cooling in l/s
$\dot{V}_{A\ min}$ = min. volume flow rate per air outlet when cooling in l/s
$\dot{V}_{Sp\ max}$ = max. specific volume flow rate per m² in l/(s·m²)
$\dot{V}_{Sp\ tats}$ = actual specific volume flow rate per m² of floor area in l/(s·m²)
u = max. allowable indoor air velocity in m/s
$\dot{q}$ = max. specific cooling capacity in W/m²
$\Delta\vartheta_{max}$ = max. temperature difference supply air to return air in K
t_{min} = minimum air outlet centre spacing in m
H = discharge height in m
L_{WA} = sound power level in dB(A) ref. 10^{-12} W
Δp_t = total pressure drop in Pa



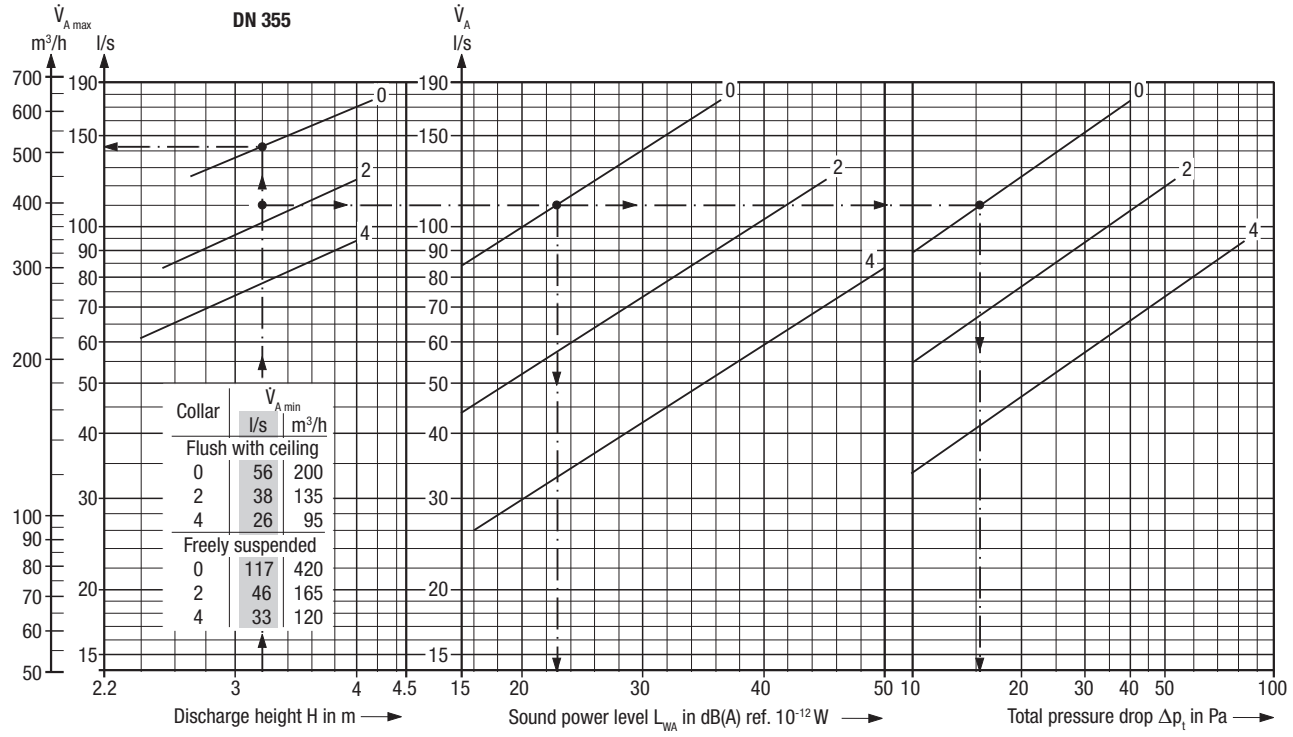


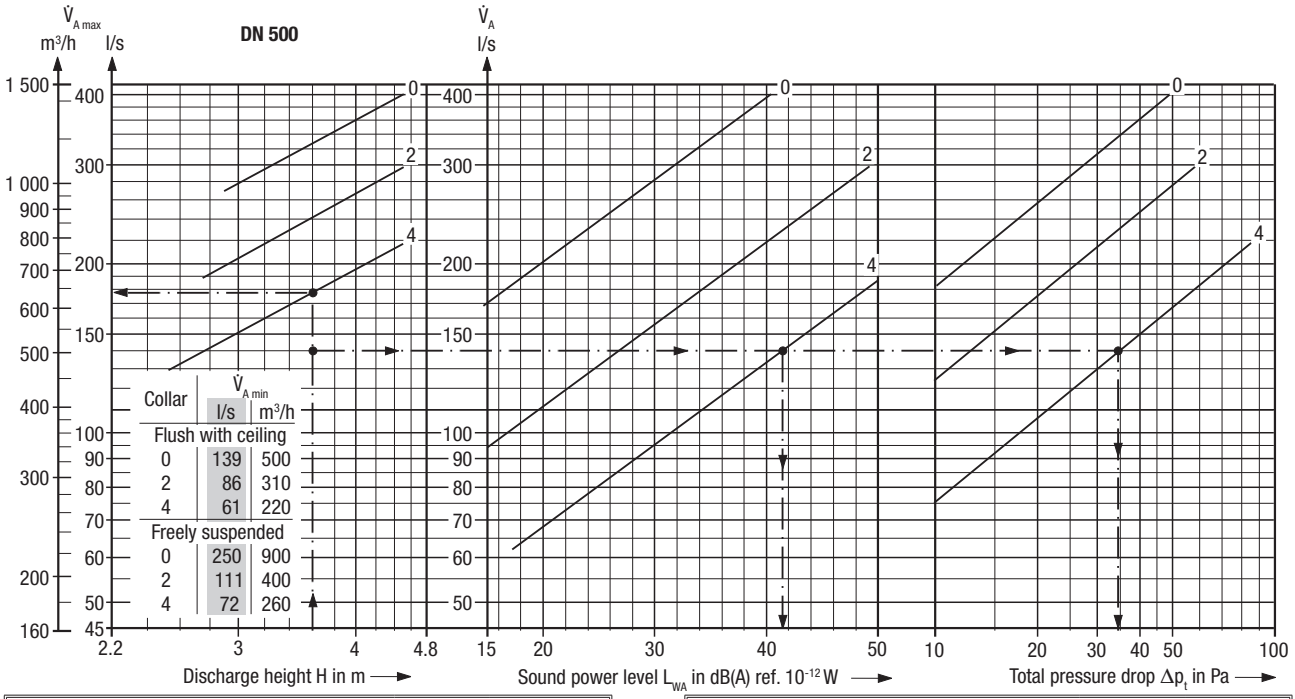
Graph 2: Minimum air outlet centre spacing

[1)] See our brochure ref. TB 69 'Layout specifications for thermal comfort'

Radial outlet RA-N3 used as supply air outlet

Layout sheet for connection type A



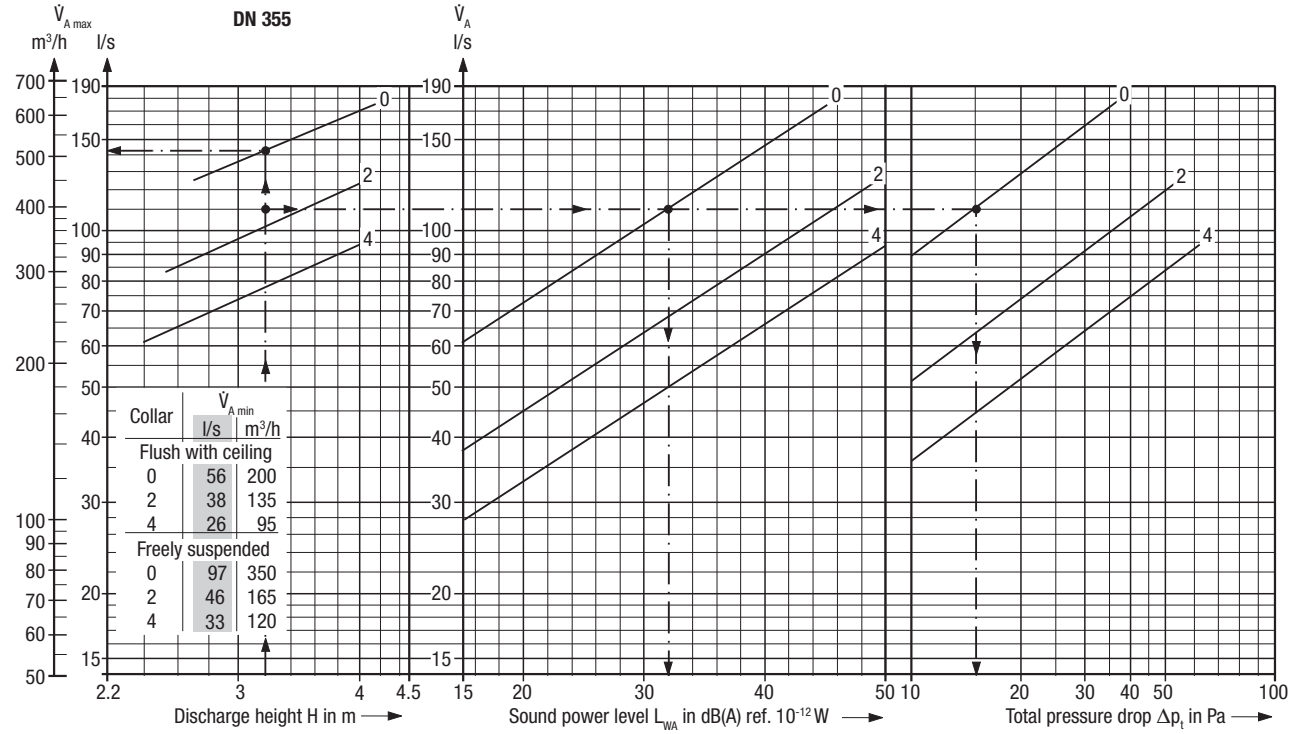


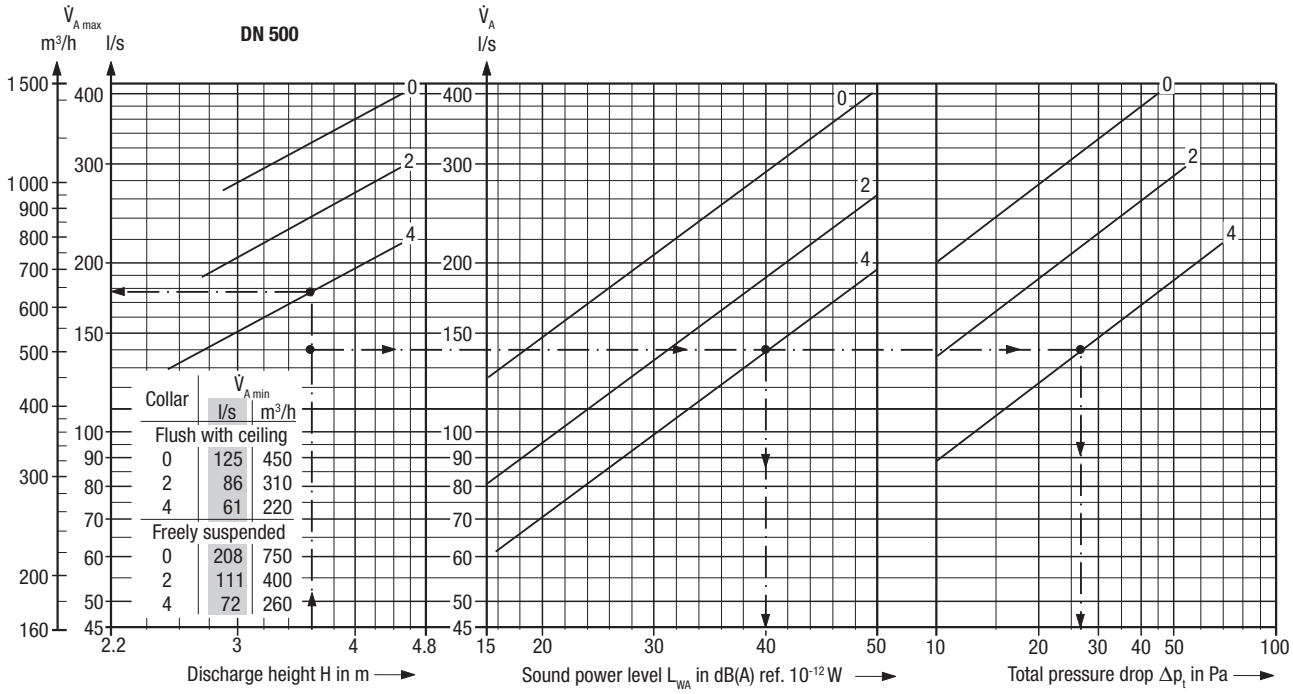
Layout example			**DN 355**	**DN 500**
Size				
Application			Office	Department store
1 Supply air volume flow rate	$\dot{V}$	l/s	650	2 780
2 Discharge height	H	m	3.2	3.6
3 Floor area	A	m^2	120	600
4 Max. allowable sound power level	L_{WA}	dB(A)	35	45
5 Temperature difference	$\Delta\vartheta_{max}$	K	–12	–12
6 Comfort criteria (see page 6)				
– Max. allowable indoor air velocity	u	m/s	0.2	0.25
– Max. specific volume flow rate	$\dot{V}_{Sp\,max}$	l/(s·m^2)	7.8	12.5
– Actual specific volume flow rate [from **1** : **3**]	$\dot{V}_{Sp\,tats}$	l/(s·m^2)	5.4	4.6
Criterion is met if $\dot{V}_{Sp\,tats} < \dot{V}_{Sp\,max}$				

From nomogram			**DN 355**	**DN 500**
Size				
7 $\dot{V}_{A\,max}$		l/s	140	180
8 Z	[≥ $\dot{V}$: $\dot{V}_{A\,max}$]	units	6	17
9 $\dot{V}_A$	[$\dot{V}$: Z]	l/s	110	140
10 L_{WA}		dB(A) ref. 10^{-12}W	≈23	≈41
11 Δp_t		Pa	≈16	≈35
12 t_{min}	[Graph 2 on page 6]	m	≈3.8	≈3.3

Radial outlet RA-N3 used as supply air outlet

Layout sheet for connection types D and F



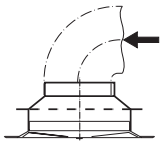


Layout example				
Size			**DN 355**	**DN 500**
Application			Office	Department store
1 Supply air volume flow rate	$\dot{V}$	l/s	650	2 780
2 Discharge height	H	m	3.2	3.6
3 Floor area	A	m^2	120	600
4 Max. allowable sound power level	L_{WA}	dB(A)	35	45
5 Temperature difference	$\Delta\vartheta_{max}$	K	–12	–12
6 Comfort criteria (see page 6)				
– Max. allowable indoor air velocity	u	m/s	0.2	0.25
– Max. specific volume flow rate	$\dot{V}_{Sp\,max}$	l/(s·m^2)	7.8	12.5
– Actual specific volume flow rate [from **1** : **3**]	$\dot{V}_{Sp\,tats}$	l/(s·m^2)	5.4	4.6
Criterion is met if $\dot{V}_{Sp\,tats} < \dot{V}_{Sp\,max}$				

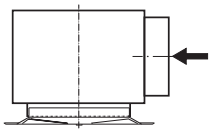
From nomogram				
Size			**DN 355**	**DN 500**
7 $\dot{V}_{A\,max}$		l/s	140	180
8 Z	[≥ $\dot{V}$: $\dot{V}_{A\,max}$]	units	6	17
9 $\dot{V}_A$	[$\dot{V}$: Z]	l/s	110	140
10 L_{WA}		dB(A) ref. 10^{-12}W	≈32	40
11 Δp_t		Pa	≈16	≈27
12 t_{min}	[Graph on page 6]	m	≈3.8	≈3.3

Radial outlet RA-N3 used as supply air outlet

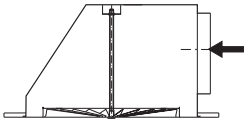
Sound power level and insertion loss



Connection type A



Connection type D



Connection type F

Size/ø D_1	Collar	Connection type A: Air outlet volume flow rate $\dot{V}_A$ l/s	$\dot{V}_A$ m^3/h	Total pressure drop Δp_t Pa	Sound power level L_W in dB ref. 10^{-12} W [1]: L_{WA} dB(A)	Octave band centre frequency in Hz 125	250	500	1 K	2 K	4 K	Connection types D and F: Air outlet volume flow rate $\dot{V}_A$ l/s	$\dot{V}_A$ m^3/h	Total pressure drop Δp_t Pa	Sound power level L_W in dB ref. 10^{-12} W [2]: L_{WA} dB(A)	Octave band centre frequency in Hz 125	250	500	1 K	2 K	4 K
		56	200	4	18	26	22	13	—	—	—	56	200	3	18	26	20	14	—	—	—
DN 355/249	0	111	400	15	24	33	29	21	—	—	—	111	400	14	33	37	38	28	21	—	—
		167	600	36	34	38	36	34	28	16	—	167	600	33	45	48	48	40	38	30	16
		42	150	5	17	23	19	13	—	—	—	42	150	5	20	26	22	13	—	—	—
DN 355/199	2	83	300	23	34	34	37	35	26	14	—	83	300	23	38	45	40	35	29	21	—
		125	450	54	46	41	44	46	42	35	24	125	450	58	50	53	50	46	44	40	29
		28	100	7	20	28	26	14	—	—	—	28	100	6	19	27	23	13	—	—	—
DN 355/199	4	56	200	29	41	35	40	42	34	19	—	56	200	24	37	40	37	36	27	16	—
		83	300	68	50	43	48	49	47	39	29	83	300	56	48	48	46	44	42	38	24
		139	500	5	17	25	19	14	—	—	—	139	500	5	18	30	22	14	—	—	—
DN 500/354	0	250	900	20	27	36	31	26	18	—	—	250	900	15	35	45	41	32	27	16	—
		361	1 300	40	37	41	40	36	33	22	—	361	1 300	31	46	52	50	44	41	35	22
		111	400	8	18	25	21	14	—	—	—	111	400	6	20	32	27	16	11	—	—
DN 500/314	2	194	700	25	37	40	38	36	33	24	—	194	700	19	38	45	43	38	36	28	13
		278	1 000	52	49	47	46	46	45	41	27	278	1 000	42	51	55	51	48	49	45	32
		83	300	12	24	32	28	22	—	—	—	83	300	9	23	34	32	21	12	—	—
DN 500/314	4	139	500	34	41	42	43	41	34	28	15	139	500	24	37	45	42	38	34	27	10
		194	700	69	51	49	48	51	45	42	32	194	700	48	55	53	50	49	46	42	29

[1] Values apply to vertical air supply to the outlet. They are higher for outlet connection to flexible duct and 90° elbow.

[2] Applies to volume flow damper 'open' and connection box without acoustic lining. With acoustic lining (only for connection type D) the values are lower by approx. 2 dB(A) ref. 10^{-12} W. The pressure drop is not influenced by the acoustic lining.

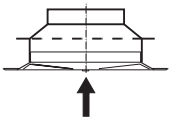
Insertion loss in dB: Size /ø D_1	Collar	Connection box (for connection types D and F) **without** acoustic lining, Octave band centre frequency in Hz 125	250	500	1 K	2 K	4 K
DN 355/199	4	4	2	4	5	3	2
DN 355/199	2	4	2	4	5	3	2
DN 355/249	0	4	2	4	5	4	3
DN 500/314	4	4	2	5	5	4	3
DN 500/314	2	4	2	4	4	3	3
DN 500/354	0	4	2	3	3	3	2

Insertion loss in dB: Size /ø D_1	Collar	Connection box (for connection type D) **with** acoustic lining, Octave band centre frequency in Hz 125	250	500	1 K	2 K	4 K
DN 355/199	4	4	2	5	8	6	7
DN 355/199	2	4	2	5	7	6	8
DN 355/249	0	4	2	6	7	6	7
DN 500/314	4	4	2	6	6	5	6
DN 500/314	2	4	2	5	6	4	5
DN 500/354	0	4	2	5	6	4	4

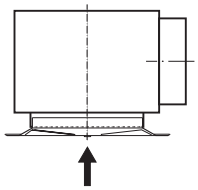
Note: Only the connection box for connection type D can be supplied with acoustic lining

Radial outlet RA-N3 used as return air inlet

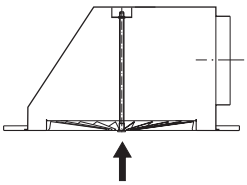
Sound power level and total pressure drop



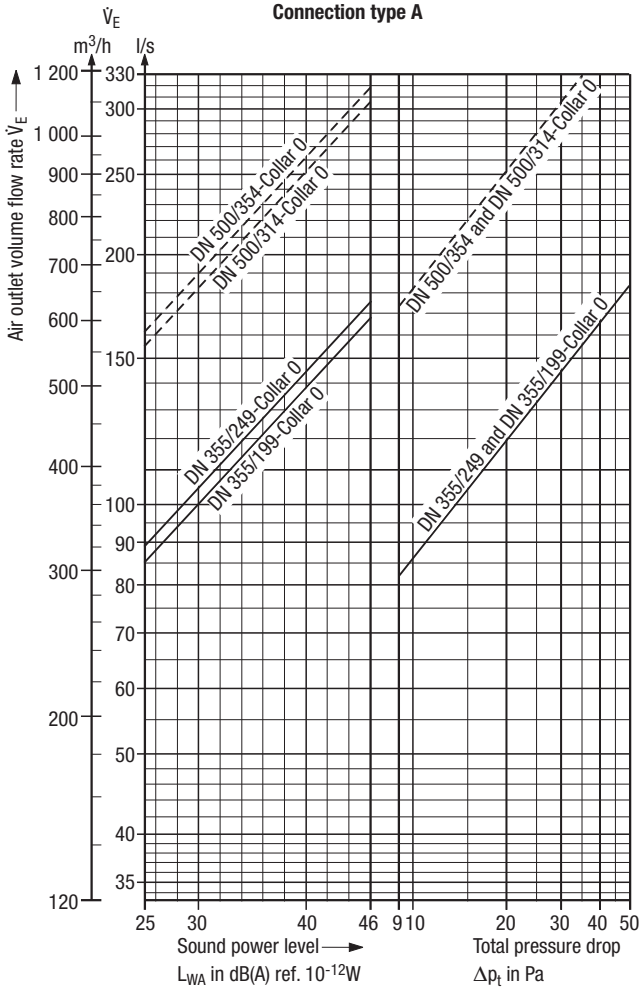
Connection type A

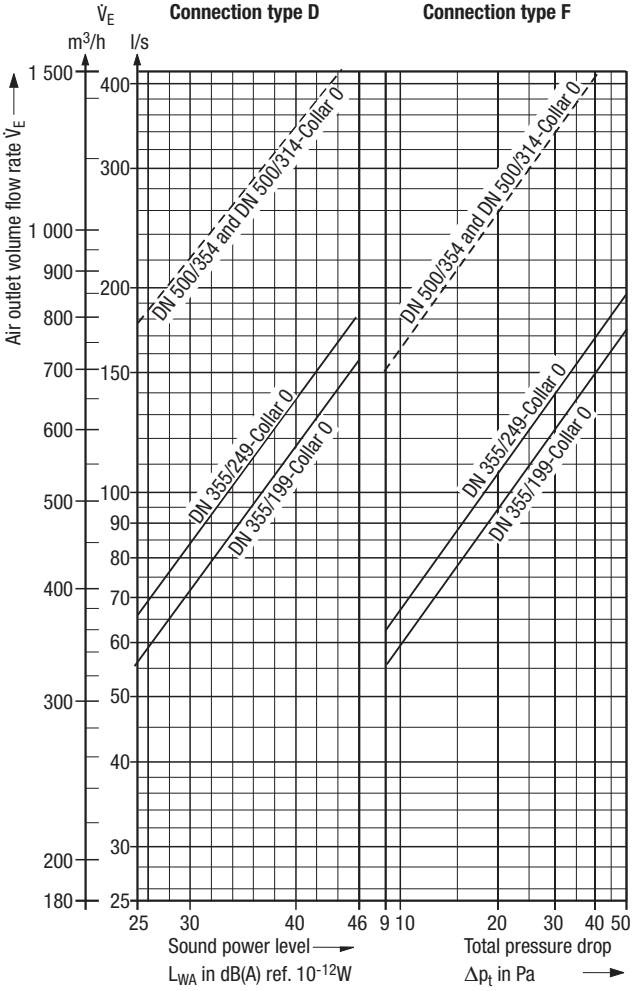


Connection type D



Connection type F





Size / ø D_1	Connection type A				Connection types D and F			
	Air outlet volume flow rate $\dot{V}_E$		Total pressure drop Δp_t	Sound power level L_{WA}	Air outlet volume flow rate $\dot{V}_E$		Total pressure drop Δp_t	Sound power level L_{WA}
	l/s	m³/h	Pa	dB(A) ref. 10^{-12} W	l/s	m³/h	Pa	dB(A) ref. 10^{-12} W
DN 355/249	111	400	17	32	111	400	11	27
	139	500	28	39	139	600	25	38
	167	600	41	44	167	800	45	46
DN 355/199	83	300	10	26	83	300	8	22
	125	450	21	37	125	450	17	33
	167	600	37	45	167	600	30	41
DN 500/354	181	650	10	29	181	650	8	20
	250	900	20	39	250	900	15	29
	278	1 000	25	42	278	1 300	30	40
DN 500/314	139	500	7	23	139	500	4	14
	194	700	12	32	194	700	9	23
	278	1 000	26	43	278	1 000	19	33

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Radial outlet RA-N3

Features

- For high-quality diffuse indoor air flow
- Available with square [1] or circular face
- Stable supply air jets even at minimum volume flow rate
- Available in 2 sizes: DN 355 and DN 500, each with 3 volume flow rate ranges (depending on collar 0, 2, or 4)
- Very large volume flow rate range, which enables a uniform ceiling design due to the use of one outlet size within a room
- Discharge height from 2.4 to 4.5 m
- Maximum temperature difference between supply air and indoor air: –12 K when cooling, +5 K when heating (+10 K up to 3 m ceiling height)
- Low sound power level and pressure drop
- Installation freely suspended from the ceiling, above open grid ceilings, or in closed ceilings
- Outlet element easy to mount and demount from the room side
- Box for connection type F is stackable, i.e. low transport and storage volume
- Outlet element made of powder coated sheet metal, connection box made of Sendzimir galvanized sheet metal
- Segment cover discs (optional) enable to adapt the air discharge to the room layout (3-way discharge, 2-way discharge symmetric or asymmetric); these discs can be turned any time upon outlet installation

[1] Rectangular face with 90° turn-up (12 mm) for rectangular tile ceilings on enquiry

Radial outlet RA-N3

Type code and tender text

Type code

RA-N3 – __ – DN ___ / __ / __ – __ __ __ – ____

Radial outlet | Geometry | Size | Collar | Segment cover | Connection type | Damper | Insulation | Surface finish

Geometry [1]

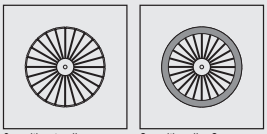
RS = circular face
Q1 = square face for square tile ceiling 600 mm x 600 mm
Q2 = square face for square tile ceiling 625 mm x 625 mm

Size

355 = DN 355
500 = DN 500

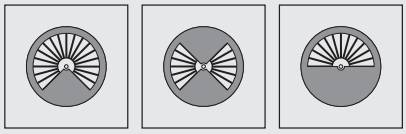
Collar

0 = no collar
2 = collar 2
4 = collar 4



Segment cover

0 = none
1 = for 3-way discharge
2 = for 2-way symmetric discharge
3 = for 2-way asymmetric discharge



Connection type

0 = no connection piece (only outlet element)
A = reducer (connection type A)
D = connection box (connection type D), external sleeve
F = connection box (connection type F), for square face

Damper

0 = no volume flow damper
R = with volume flow damper adjustable from room

Insulation

0 = without acoustic lining
I = with acoustic lining

Surface finish

9010 = face painted to RAL 9010, semi-matt
.... = face painted to RAL ....

Volume flow rate factor for segment cover discs

	Segment cover discs (optional)								
	0/1	0/2	0/3	2/1	2/2	2/3	4/1	4/2	4/3
DN 355	0.83	0.68	0.64	0.85	0.70	0.66	0.89	0.75	0.68
DN 500	0.85	0.68	0.64	0.87	0.70	0.66	0.88	0.73	0.68

Tender text

..... units
Radial outlet for high-quality indoor air flow at minimal temperature gradients in the occupied zone,

consisting of:

- low-height outlet element with spigot, specially shaped face, radial vanes – vane underside flush with surrounding face area – and central fastening screw with cap; outlet face is circular or square
- optional volume flow collars to increase the range of volume flow rates
- optional segment cover discs for 3-way discharge or 2-way symmetric or asymmetric discharge [2]
- optional aluminium reducer (connection type A) with lateral suspension brackets and screw nut for central fastening of outlet
- optional connection box in flat design with screw nut for central fastening of outlet, with lateral suspension brackets and connection spigot,

box design:

- as connection type D for radial outlet with circular or square face, optionally fitted with volume flow damper adjustable from room and optionally fitted with acoustic lining,
- or as connection type F for radial outlet with square face, optionally fitted with volume flow damper adjustable from room.

Materials:
Radial outlet made of sheet metal powder coated to RAL 9010 [3].
Reducer made of aluminium.
Connection box made of galvanized sheet metal.

Make: KRANTZ KOMPONENTEN
Type: RA-N3 – __ – DN ___ / __ / __ – __ __ __ – ____

Subject to technical alteration.

1) Rectangular face with 90° turn-up (12 mm) for rectangular tile ceilings on enquiry
2) The segment cover discs can be turned in order to adapt the air discharge direction to the room layout
3) Other colour on request

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