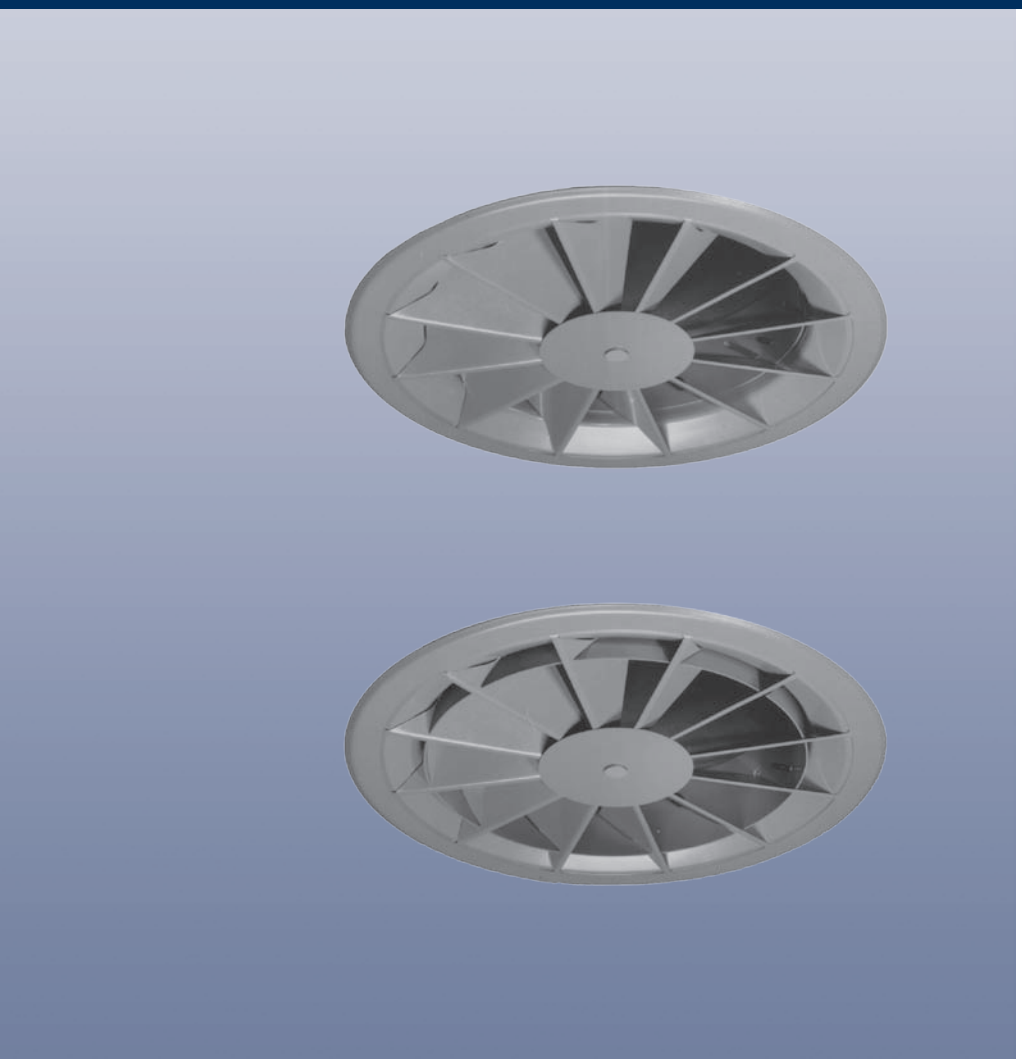
KOMPONENTEN
Applied system solutions



Adjustable radial outlet RA-V....

DS 4063 E 04.2013

Adjustable radial outlet

Construction design

Preliminary remarks

KRANTZ KOMPONENTEN has developed its wellknown, successful radial outlet into an **adjustable radial outlet**. The supply air can be discharged from almost horizontal to vertically downwards. Special features are its low height and simple construction; it operates in the same way as our famous variable twist outlet.

The adjustable radial outlet generates turbulent mixing air flow and is well suited for indoor spaces with no significant pollutant loads as well as for large discharge heights. It can be installed flush with the ceiling or free-hanging.

Construction design

The air outlet element consists of the outlet casing **1a**, the moulded face **1b** and the built-in radial vanes **1c**. The fixed disc **3** with fastening screw **4** is located in the centre of the discharge plane. The discharge direction is adjusted by rotating a vertically mobile guide ring **5**. Depending on size, the maximum lift ranges from 16 mm to 36 mm. For manual adjustment, the guide ring is fitted with two opposite cams **6** on the inside.

For motorized adjustment, a servomotor **7** is fastened to a console **7a** above the outlet casing **1a**. The radial outlet can be removed downwards after loosening the fastening screw **4**.

Fig. 1: **Adjustable radial outlet with circular face**
Top: **Guide ring retracted for cooling**
Bottom: **Guide ring extracted for heating**

The adjustable radial outlet is available with circular or square face. The square face can be optionally fitted with an outer skirting contact edge for ceiling attachment or with a 90° turn-up for installation in square tile ceilings.

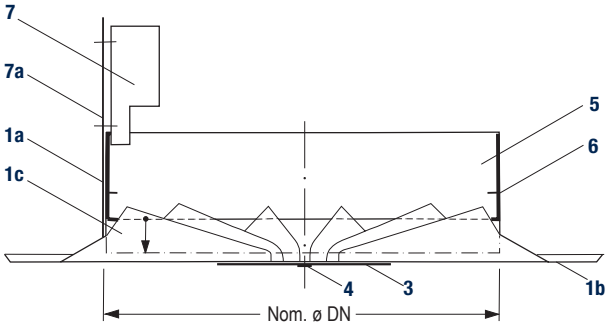


Fig. 2: **Adjustable radial outlet with circular face**

The air outlet can be connected to the duct system either directly using a circular duct **15** to EN 1506 (by others) or via a connection box **8** (see pages 4 and 5). Using a spigot **17** (by others), the adjustable radial outlet can also be fitted onto the bottom of a rectangular duct.

At the side of the connection box is the connection spigot **11** for junction to the duct system. A volume flow damper **9** can be preinstalled in the connection spigot and operated either directly at the spigot or from the room via an adjustment device **14**.

The connection spigot is available smooth or with a lip seal **11a** (on request).

For increased insertion loss, the connection box is available with acoustic lining.

Mode of operation

Depending on the connection type, the supply air flows either directly from the air duct or via the connection box into the air outlet and through its radial vanes into the room. This produces high-induction air jets with pronounced turbulence. If the vertically mobile guide ring is in the upper position, the air jets glide along the curved exit, resulting in a radial, horizontal jet deflection. The resultant jet pattern causes a strong admixture with ambient air and, consequently, rapid equalization of supply air temperature and indoor air temperature.

In the upper guide ring position, supply air discharge is radial and horizontal. It is used for air supply in rooms with low discharge height or high cooling loads (Figure 3a).

If the guide ring is moved downwards, the supply air jets shift progressively to vertical.

Adjustable radial outlet

Mode of operation

The guide ring is positioned between upper and lower position where air discharge is from large heights and the HVAC system is operating in the partial load range (Figure 3b).

When the guide ring is fully extracted, all the supply air flows downwards. This position is selected for heating or heating-up operation (Figure 3c).

The adjustable radial outlet is ideal for both commercial and industrial applications.

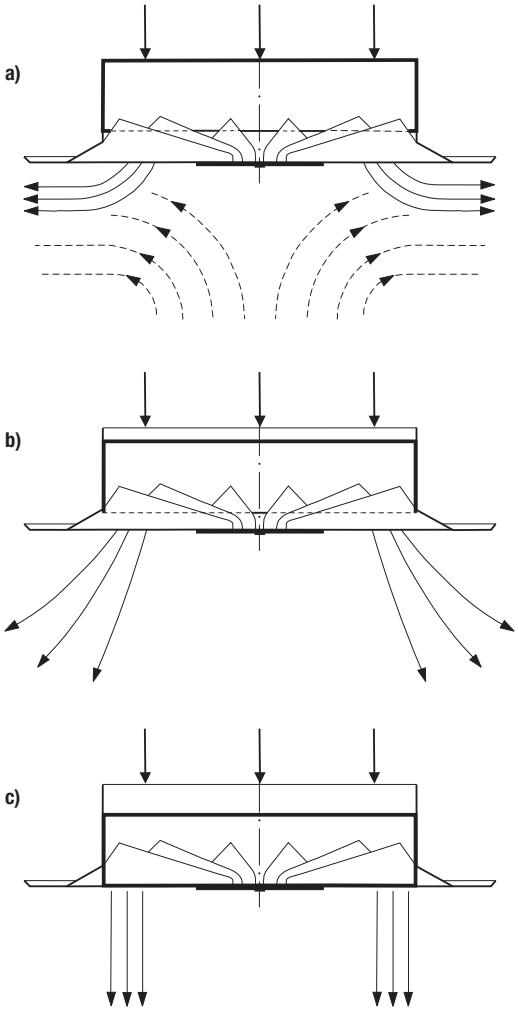


Fig. 3: Jet pattern of adjustable radial outlet at different positions of the guide ring

Air outlet data

Nom. ø DN	Volume flow rate $\dot{V}_{min}$ l/s	$\dot{V}_{min}$ m^3/h	$\dot{V}_{max}$ l/s	$\dot{V}_{max}$ m^3/h	Discharge height H m	Max. temperature difference supply air–indoor air $\Delta\vartheta$ Cooling K	Heating K
200	61	220	222	800	2.5 – 6	–12	12
224	78	280	280	1 000	2.8 – 6		15
250	97	350	360	1 300	2.8 – 6		15
315	116	560	555	2 000	3 – 8		15
355	194	700	695	2 500	3 – 9		15
400	250	900	1 055	3 800	3.5 – 12		15
500	444	1 600	1 530	5 500	4 – 13		15

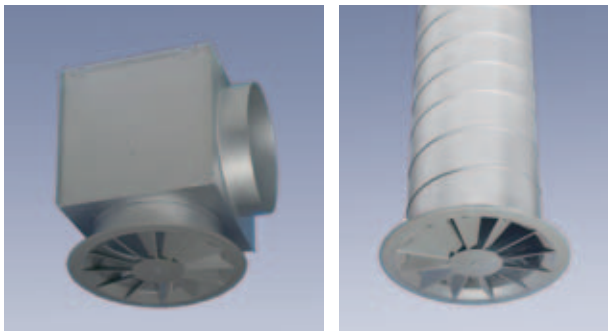
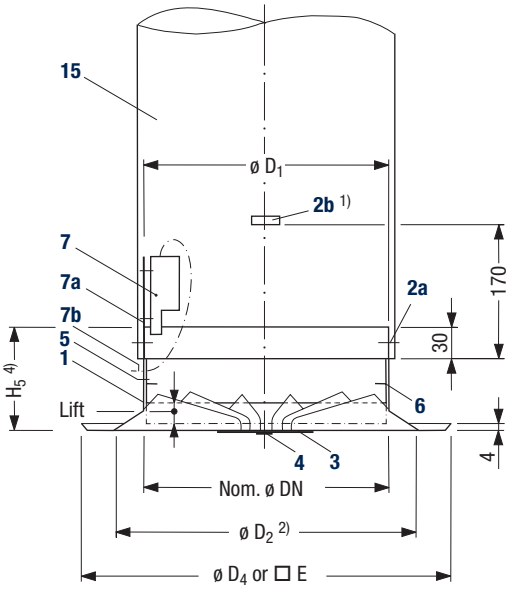


Fig. 4: **Photographs of connection types**
Left: **With connection box**
Right: **Connection to spiral seam duct**

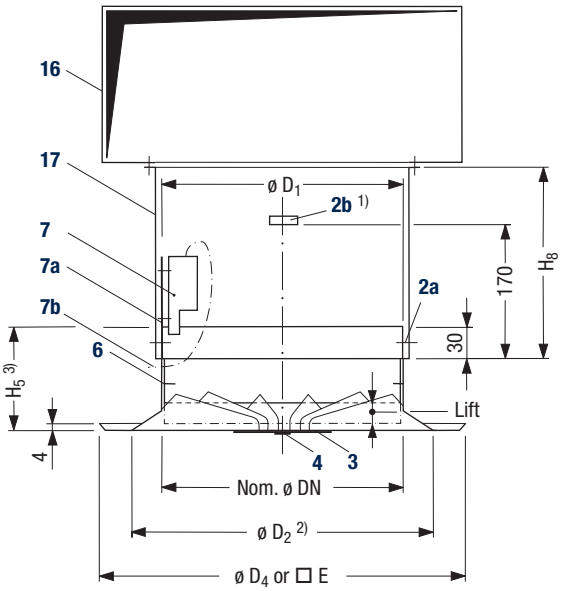
Adjustable radial outlet

Connection types and dimensions

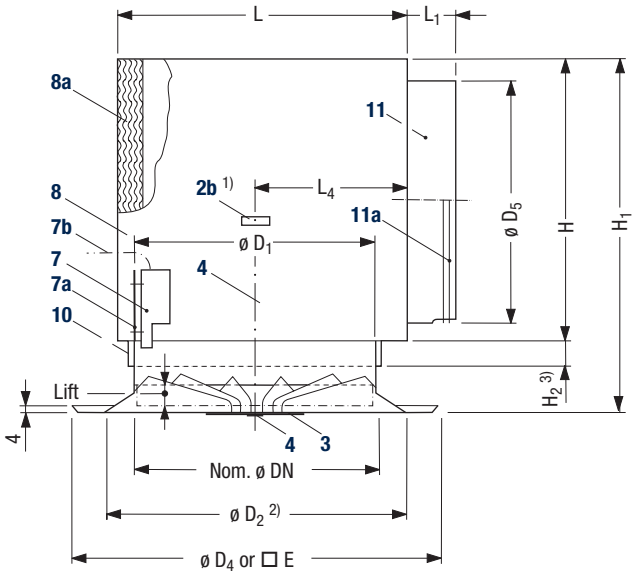
Connection to circular duct

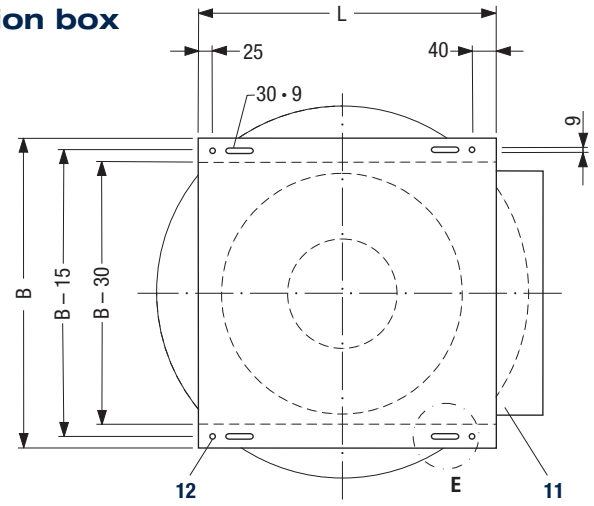


Connection to air duct with spigot



Connection to connection box





Top view

Nom. ø DN	Dimensions in mm																	Weight in kg 4)	
	L	B	ø D_4	□ E 5)	H	L_1	L_4	H_1	$H_{2\text{-}M}$ 3)	$H_{2\text{-}E}$ 3)	$H_{5\text{-}M}$ 3)	$H_{5\text{-}E}$ 3)	H_8	Lift	ø D_1	ø D_2 2)	ø D_5	①	②
200	265	280	300		250	40	140	325	59	29	105	125	250	16	199	242	199	1.4	5.4
224	290	305	336		275	40	152	355	62	31	110	130	300	18	223	271	223	1.5	6.1
250	315	330	375	595	300	60	165	386	66	33	116	136	350	20	249	302	249	2.1	7.3
315	380	395	470	620	365	60	197	463	74	37	128	148	450	24	314	380	314	3.1	10.7
355	420	435	530		405	60	217	512	80	41	137	157	450	27	354	428	354	3.7	12.9
400	465	480	600		450	80	240	566	86	44	146	174	500	30	399	482	399	4.5	15.7
500	565	580	750	—	550	80	290	686	100	49	166	186	500	36	499	602	499	7.8	17.2

1) Standard for connection box, optional for duct connection

2) Ceiling cutout

3) Index 'M' with manual adjustment, 'E' with adjustment by electric servomotor

4) Weight without servomotor; weight of servomotor 0.5 – 1.2 kg
① air outlet; ② air outlet with connection box

5) Standard dimensions, others on request (see also table on page 5)

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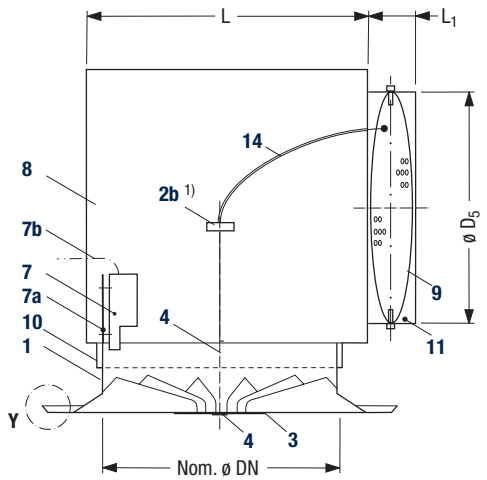
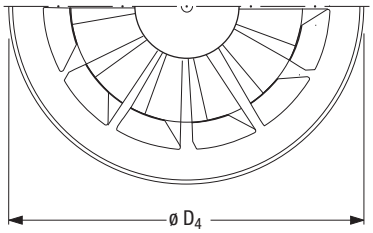
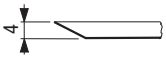
Adjustable radial outlet

Connection types and data

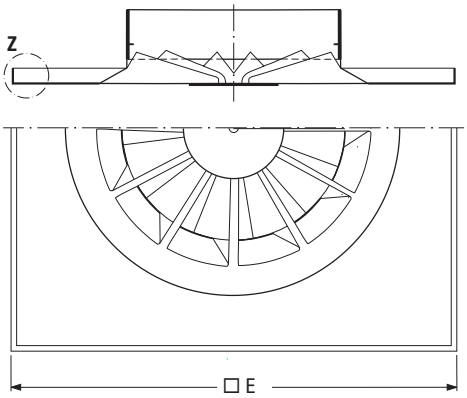
Connection box with V̇ damper in connection spigot, adjustable from room







Detail Y
Flush contact edge
for ceiling attachment



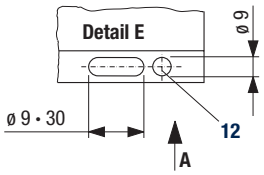
Detail Z
90° turn-up for installation
in square tile ceilings

Dimensions in mm

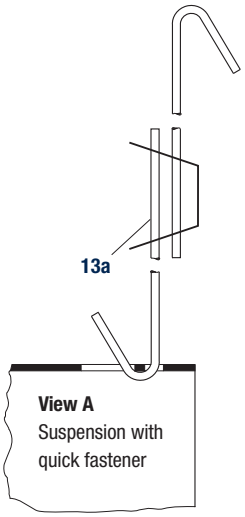
DN	Contact edge 2) Detail Y min. □ E	max. □ E	90° turn-up 2) Detail Z min. □ E	max. □ E	Circular face Ø D_4
200	295		285		300
224	325		320		336
250	360		350		375
315	435	715	425	680	470
355	485		475		530
400	540		540		600
500	655		655		750

Possible external dimensions of outlet faces

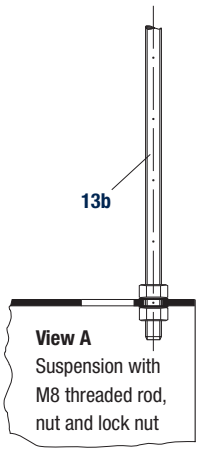
Suspensions



Detail E, page 4



View A
Suspension with
quick fastener



View A
Suspension with
M8 threaded rod,
nut and lock nut

Key for all pages

- **1** Adjustable radial outlet
- **1a** Outlet casing
- **1b** Face
- **2a** Screw or rivet fastener
- **2b** Crossbeam for central fastening 3)
- **3** Disc
- **4** Fastening screw M6 for DN 200, M8 from DN 224 upwards
- **5** Guide ring
- **6** Cam for manual adjustment
- **7** Servomotor with cable (0.9 m)
- **7a** Console
- **7b** Cable bushing
- **8** Connection box
- **8a** Acoustic lining (optional)
- **9** V̇ damper (optional)
- **10** Sleeve at connection box
- **11** Connection spigot, smooth
- **11a** Connection spigot with lip seal on request
- **12** Bore for suspension
- **13a** Suspension with quick fastener 5)
- **13b** Suspension with M8 threaded rod and nuts 5)
- **14** Adjustment device for V̇ damper (optional)
- **15** Circular duct (by others)
- **16** Rectangular duct (by others)
- **17** Spigot for connection to rectangular duct (by others)

1) Turn-up with different height on request!

2) Min. and max. dimensions for specific requirements on request

3) Standard for connection box, optional for duct connection

5) Suspension by others

Adjustable radial outlet

Comfort criteria

Sound power level and pressure drop

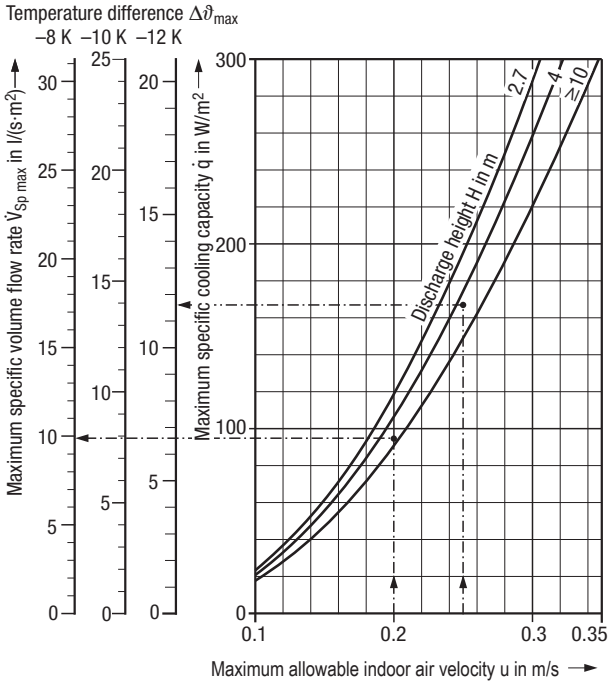
Sound power level and pressure drop are influenced by air volume flow rate, connection type and guide ring position. Values for sound power level and pressure drop can be read off the nomograms on pages 7 to 9. Sound power levels across octave band centre frequencies for all nominal sizes are tabulated on page 10.

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.

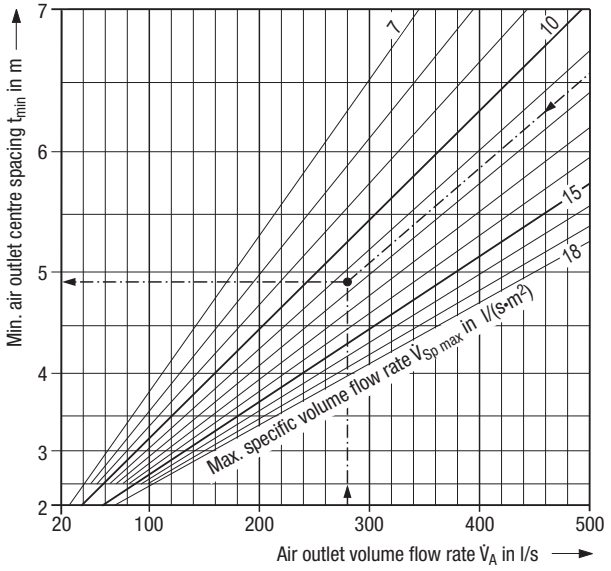


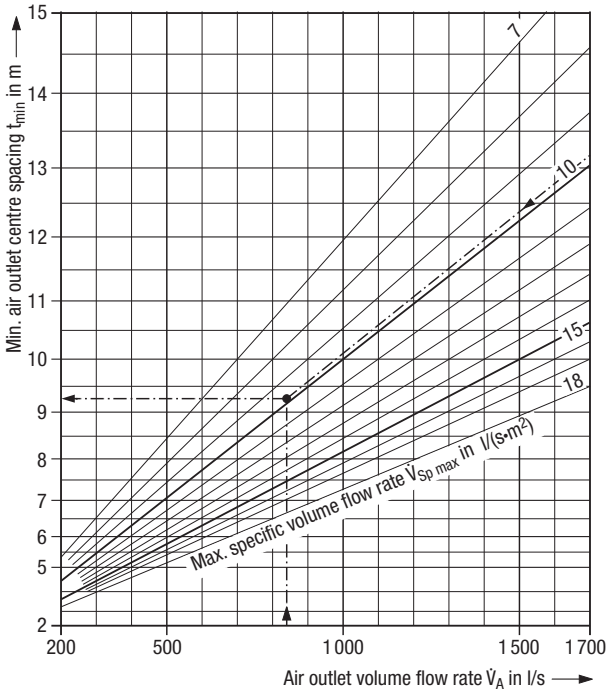
Graph 1: Maximum specific volume flow rate

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

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
$\dot{V}_{A\ min\ H}$	=	min. volume flow rate per air outlet in l/s, when heating, with $\Delta\vartheta$ = ..K
$\dot{V}_{Sp\ max}$	=	max. specific volume flow rate per m² of floor area 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
RV	=	Duct connection, vertical discharge
RH	=	Duct connection, horizontal discharge
KV	=	Connection box, vertical discharge
KH	=	Connection box, horizontal discharge

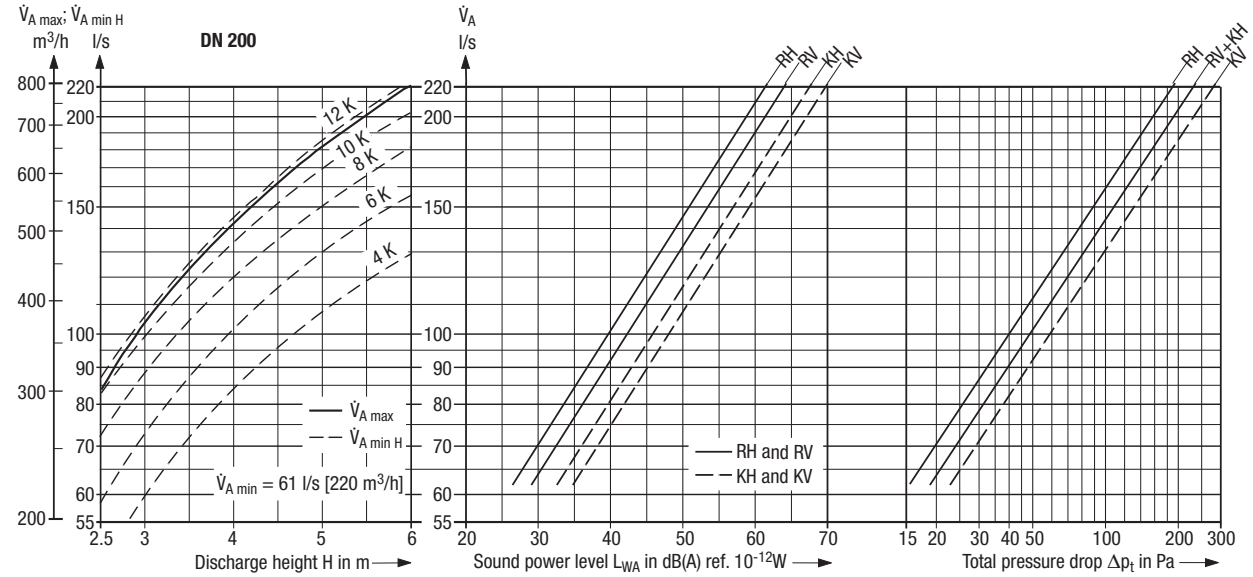


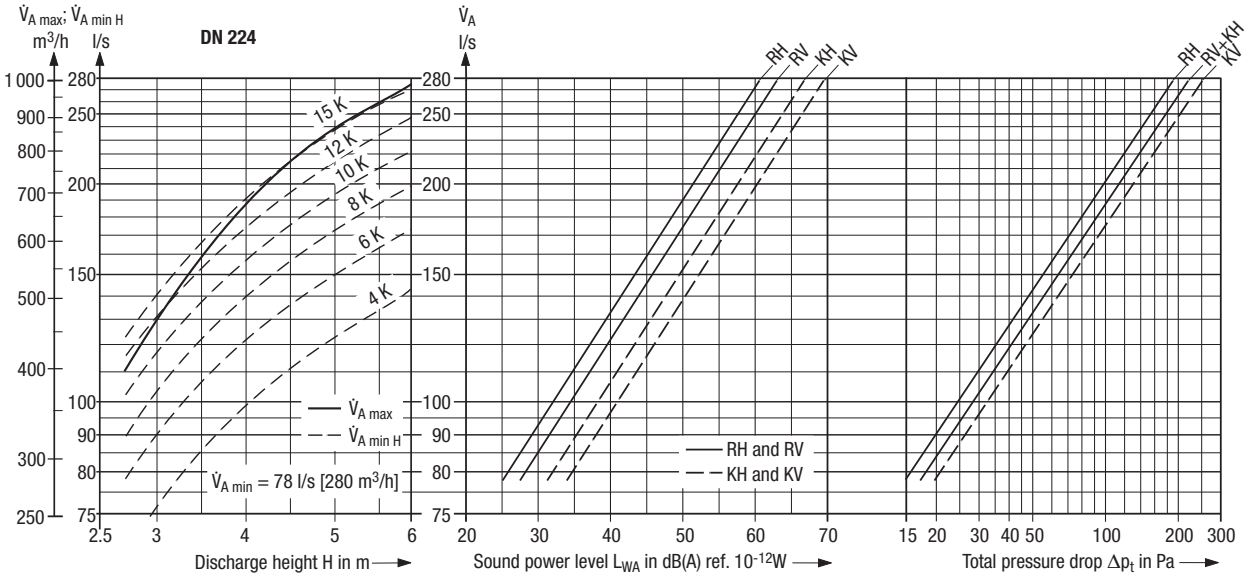


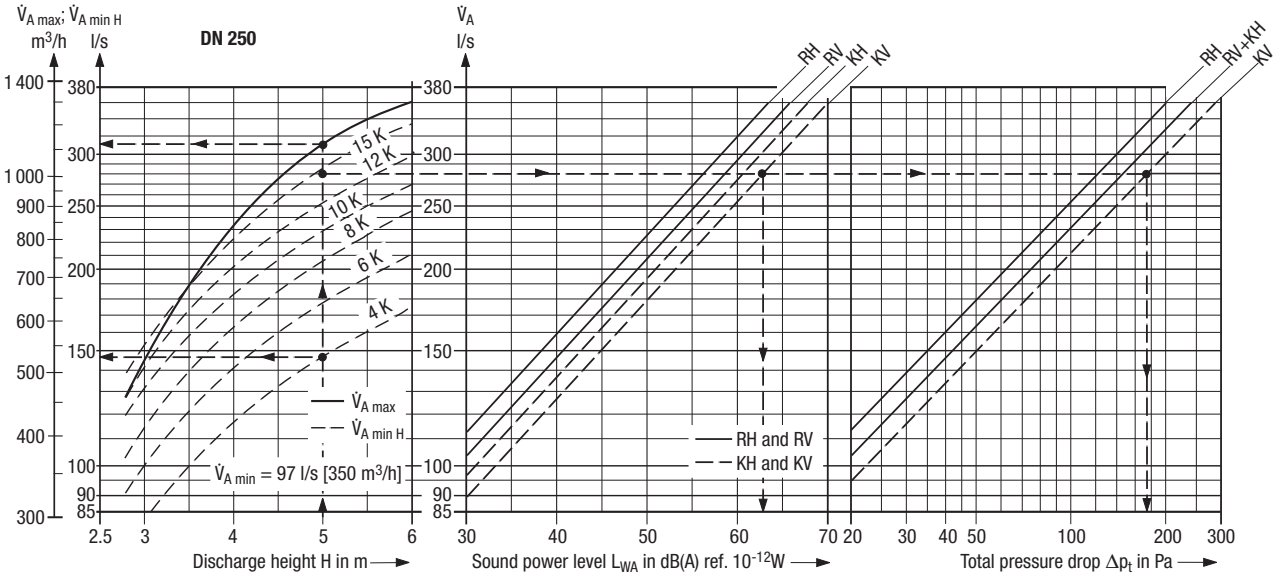
Graph 2: Minimum air outlet centre spacing

Adjustable radial outlet

Nomograms

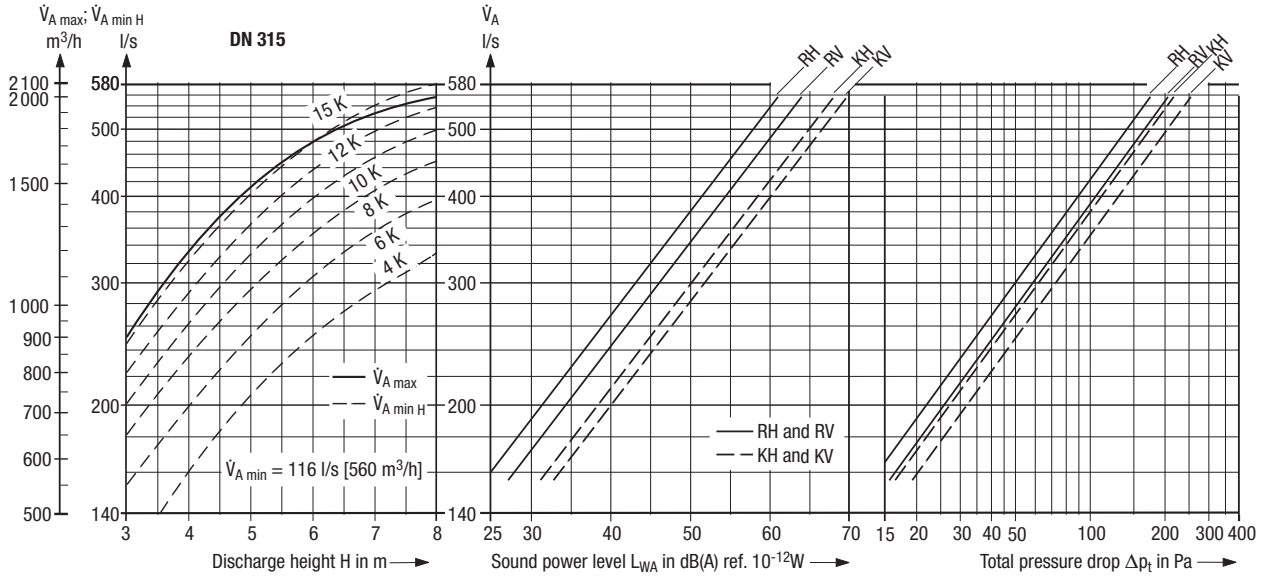


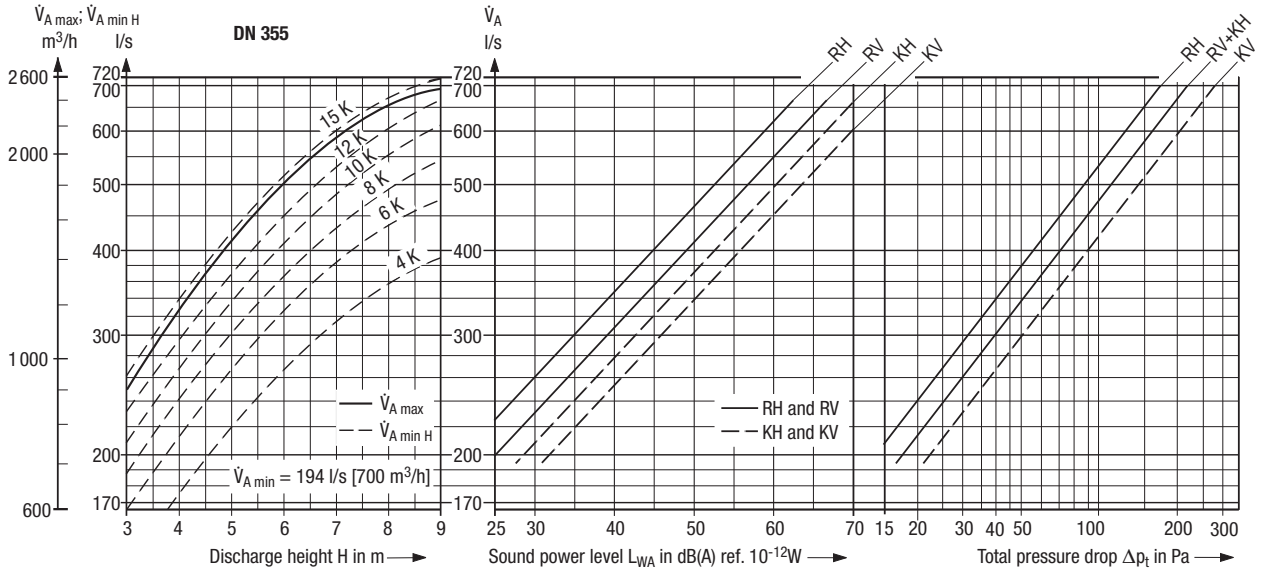


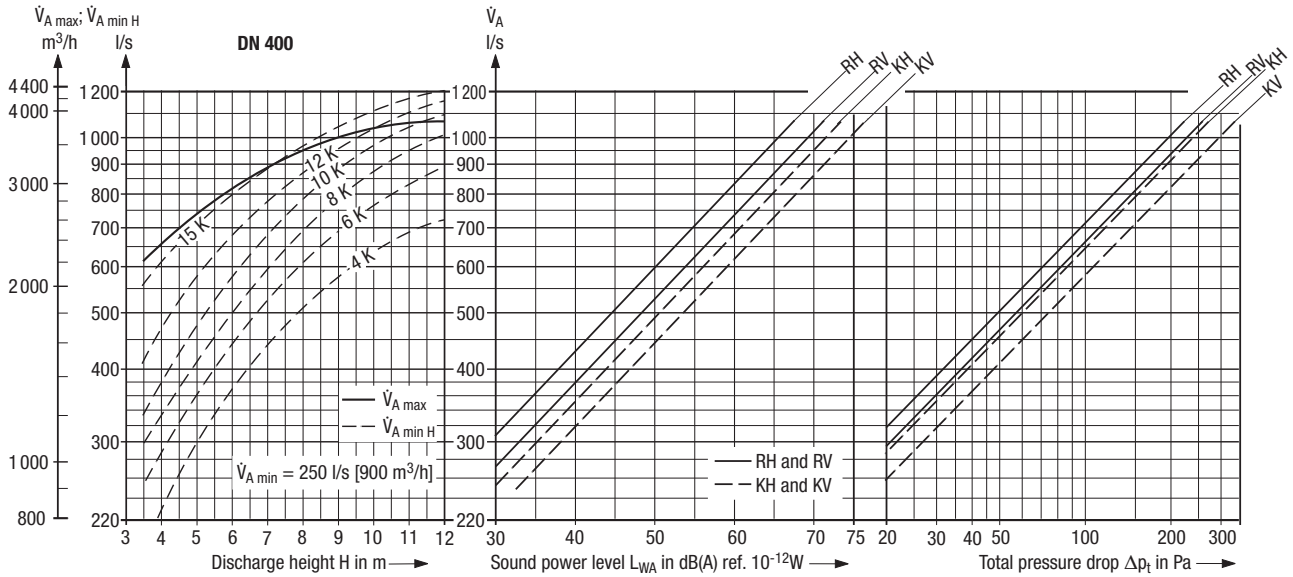


Adjustable radial outlet

Nomograms

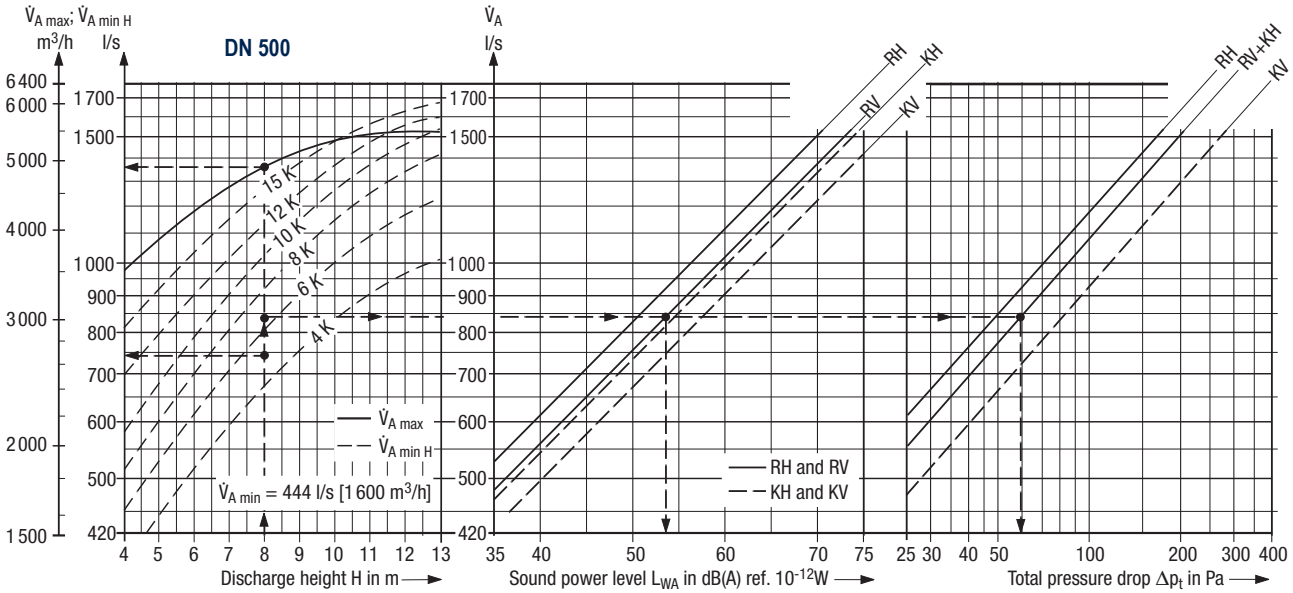






Adjustable radial outlet

Nomogram



Layout example for air outlet size:		**DN 250** Connection box	**DN 500** Duct connection
Place of use:		Shopping mall	Congress centre
1 Supply air volume flow rate	$\dot{V}$	5 600 l/s	13 440 l/s
2 Discharge height	H	5 m	8 m
3 Floor area	A	645 m²	1 600 m²
4 Max. allowable sound power level	L_{WA}	65 dB(A) ref. 10^{-12}W	55 dB(A) ref. 10^{-12}W
5 Max. temperature difference supply air–return air			
– $\Delta\vartheta$ when cooling		–12 K	–8 K
– $\Delta\vartheta$ when heating		+4 K	+5 K
6 Comfort criteria (see page 6)			
– Max. allowable indoor air velocity	u	Graph 1, p. 6 0.25 m/s	Graph 1, p. 6 0.2 m/s
– Max. specific volume flow rate	$\dot{V}_{Sp\,max}$	Graph 1, p. 6 11.6 l/(s·m²)	Graph 1, p. 6 9.8 l/(s·m²)
– Actual specific volume flow rate	$\dot{V}_{Sp\,tats}$	[from **1** : **3**] 8.7 l/(s·m²)	[from **1** : **3**] 8.4 l/(s·m²)
Criterion is met if $\dot{V}_{Sp\,tats} < \dot{V}_{Sp\,max}$			
From nomogram		Page 7, bottom	Page 9, top
7 $\dot{V}_{A\,max}$		311 l/s	1 333 l/s
8 $\dot{V}_{A\,min\,H}$		147 l/s	744 l/s
	at	$\Delta\vartheta$ = +4 K	$\Delta\vartheta$ = +5 K
9 $\dot{V}_A$	selected	280 l/s	840 l/s
10 Z	[$\dot{V}$: $\dot{V}_A$]	20 units	16 units
11 $L_{WA\,max}$		≈ 62 dB(A) ref. 10^{-12}W	54 dB(A) ref. 10^{-12}W
12 $\Delta p_{t\,max}$		≈ 174 Pa	60 Pa
13 t_{min}	[Graph 2 on page 6]	≈ 4.9 m	≈ 9.3 m

Fig. 5: Adjustable radial outlet in the meeting room of a hotel

Adjustable radial outlet

Sound power level and total pressure drop

Air outlet volume flow rate $\dot{V}$		Duct connection	Total pressure drop Δp_t	Sound power level L_W in dB ref. 10^{-12} W									Box connection	Total pressure drop Δp_t	Sound power level L_W in dB ref. 10^{-12} W								
				L_{WA}	Octave band centre frequency in Hz										L_{WA}	Octave band centre frequency in Hz							
l/s	m^3/h		Pa	dB(A)	63	125	250	500	1 K	2 K	4 K	8 K		Pa	dB(A)	63	125	250	500	1 K	2 K	4 K	8 K
DN 200																							
83	300	RH	28	35	37	41	33	33	28	27	19	—	KH	33	41	36	47	43	35	36	32	24	—
		RV	35	37	26	41	35	36	31	29	22	—	KV	40	43	33	49	45	38	38	35	27	15
153	550	RH	93	51	49	53	50	50	45	43	40	29	KH	112	57	49	61	59	51	52	50	44	33
		RV	116	53	39	52	49	51	47	46	44	37	KV	136	59	47	61	59	53	54	52	48	41
222	800	RH	196	62	55	61	60	60	55	53	53	48	KH	237	68	57	69	68	62	62	60	57	50
		RV	245	64	50	59	58	60	56	56	58	55	KV	287	69	55	68	67	62	63	62	61	58
DN 224																							
111	400	RH	30	35	37	33	35	34	31	24	15	—	KH	35	41	47	44	42	37	36	31	20	—
		RV	35	38	36	36	38	37	33	28	22	—	KV	41	43	45	44	43	40	39	33	26	14
194	700	RH	93	50	50	48	50	48	45	42	37	28	KH	106	57	59	58	57	52	52	50	44	35
		RV	106	53	49	47	51	50	47	45	43	36	KV	125	59	58	57	57	54	54	52	48	41
278	1 000	RH	189	61	59	58	59	58	55	53	51	45	KH	217	68	66	67	66	62	62	61	58	52
		RV	217	63	57	54	59	59	56	56	56	53	KV	255	70	67	66	65	63	64	64	63	58
DN 250																							
139	500	RH	30	36	38	33	35	36	31	24	15	—	KH	35	41	52	44	42	38	36	31	19	—
		RV	36	39	33	33	37	38	33	28	22	—	KV	43	42	39	45	42	39	38	34	25	11
250	900	RH	96	52	55	50	50	51	47	44	39	30	KH	115	57	55	58	56	54	53	50	44	35
		RV	117	55	47	48	51	53	49	47	47	39	KV	138	59	55	58	56	54	54	52	49	41
361	1 300	RH	201	63	66	61	60	61	57	56	54	47	KH	239	69	64	67	65	63	63	62	60	52
		RV	244	67	56	56	60	62	58	59	62	58	KV	289	71	66	66	65	64	65	64	65	60
DN 315																							
278	1 000	RH	43	41	46	42	39	39	37	32	24	10	KH	53	48	53	50	48	44	44	39	31	18
		RV	50	43	46	43	42	41	39	34	29	14	KV	63	49	52	50	48	46	45	41	36	22
417	1 500	RH	98	52	57	53	50	49	48	45	40	29	KH	118	60	64	59	59	55	55	52	47	38
		RV	113	56	54	51	53	52	50	48	47	37	KV	142	61	62	60	60	57	56	54	52	43
556	2 000	RH	173	61	65	61	57	56	56	55	51	43	KH	211	69	71	66	66	63	64	62	59	52
		RV	201	65	59	57	60	60	58	58	59	53	KV	253	71	69	67	68	64	65	64	63	58
DN 355																							
333	1 200	RH	38	39	40	40	38	38	34	30	27	16	KH	50	47	50	51	45	45	43	38	29	16
		RV	48	43	33	42	40	40	38	34	30	23	KV	63	50	49	52	46	46	46	41	35	20
500	1 800	RH	87	52	54	52	49	50	47	44	40	30	KH	112	60	60	60	55	56	56	54	47	37
		RV	109	56	46	51	51	51	50	50	49	39	KV	141	63	57	62	56	57	57	56	55	42
667	2 400	RH	154	61	63	60	57	57	55	54	50	40	KH	199	70	67	66	63	63	65	66	60	52
		RV	193	66	56	58	59	59	58	60	62	50	KV	250	73	63	70	63	64	65	67	69	57
DN 400																							
444	1 600	RH	38	41	42	42	40	40	35	31	23	13	KH	47	47	50	49	45	45	43	38	29	18
		RV	45	45	43	44	42	43	40	36	30	15	KV	59	50	50	51	46	47	45	42	37	24
667	2 400	RH	86	53	56	53	51	51	48	45	40	31	KH	105	59	60	59	56	56	55	52	46	36
		RV	102	57	58	54	53	53	51	51	48	37	KV	133	62	61	61	57	58	57	56	53	42
889	3 200	RH	153	62	66	61	58	59	57	56	52	44	KH	187	68	67	67	64	64	64	62	58	49
		RV	181	66	69	61	62	60	59	60	60	52	KV	236	71	68	68	64	65	65	66	64	54
DN 500																							
556	2 000	RH	22	37	44	43	37	35	32	24	14	—	KH	27	41	51	47	39	39	36	29	19	—
		RV	27	40	43	44	38	38	35	30	20	—	KV	36	44	52	47	41	41	40	36	26	12
833	3 000	RH	49	50	55	53	48	47	45	41	33	22	KH	60	54	62	56	51	51	50	45	37	26
		RV	61	53	58	54	49	49	48	47	40	28	KV	81	57	62	58	52	52	52	51	44	34
1 111	4 000	RH	87	60	63	60	55	56	54	54	46	37	KH	106	64	69	63	59	60	60	56	50	41
		RV	108	63	68	61	56	57	57	59	53	43	KV	144	67	69	65	60	60	61	62	57	50

RH = Duct connection, horizontal discharge

RV = Duct connection, vertical discharge

KH = Connection box, horizontal discharge

KV = Connection box, vertical discharge

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Adjustable radial outlet

Fig. 6: Vertical discharge when heating, discharge from great height

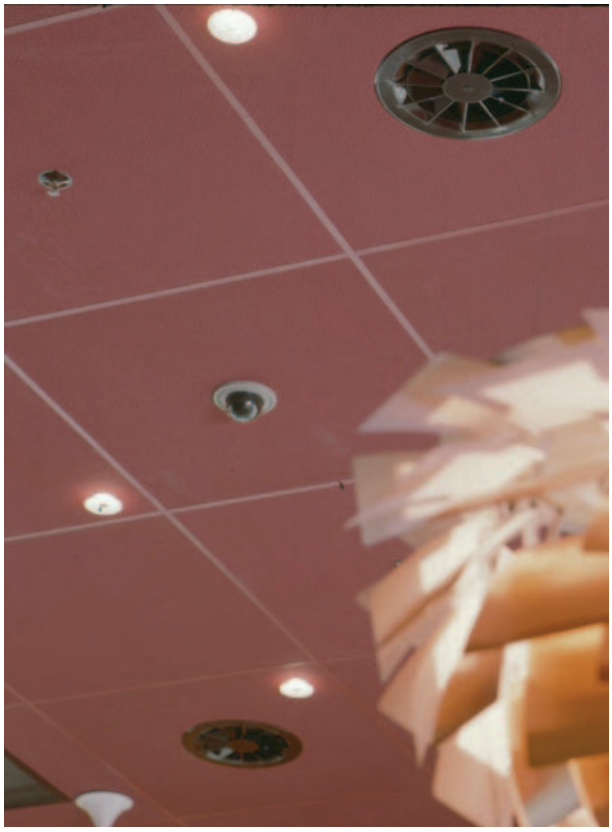

Fig. 7: Adjustable radial outlet in the ceiling of a restaurant, sectional view

Main features

- Turbulent mixing air flow
- Discharge direction steplessly adjustable from horizontal to vertical (downwards)
- Stable supply air jets, also at minimum volume flow rate
- Discharge heights of 2.5 m to 13 m, depending on nominal diameter and volume flow rate
- Jet penetration depth adaptable to room height and heat load
- Adjustment either manually or with servomotor
- Radial vanes flush with face
- For installation flush with suspended ceilings or free-hanging from the ceiling
- 7 sizes from DN 200 to DN 500
- Volume flow rate range from 61 to 1 530 l/s [220 to 5 500 m^3/h]
- Max. temperature difference supply air–indoor air: –12 K when cooling, +15 K when heating
- Radial outlet easily removable from the bottom
- Connection either to a circular duct to EN 1506 or to the rectangular air duct via a spigot, or to a connection box with connection spigot; connection box optionally available with acoustic lining
- $\dot{V}$ damper optionally available for type with connection box, adjustable from room
- Spigot of connection box either smooth or with lip seal (on request)
- Available as standard with circular or square face
- Radial outlet made of painted sheet metal; connection box made of galvanized sheet metal

Adjustable radial outlet

Type code and tender text

Type code

RA-V _ __ – DN ___ – __ __ – ___ – ____

Adjustable radial outlet | Mounting | Geometry | Size | Connection type | Damper | Insulation | Adjustment | Surface finish

Mounting

D = flush with ceiling
F = freely suspended (free-hanging)

Geometry

RS = round face
Q1 = square face for square tile ceiling 600 mm x 600 mm [1)]
Q2 = square face for square tile ceiling 625 mm x 625 mm [1)]

Size

200	=	DN 200	355	=	DN 355
224	=	DN 224	400	=	DN 400
250	=	DN 250	500	=	DN 500
315	=	DN 315			

Connection type

0 = no connection piece (only discharge element)
R = duct connection with rivet or screw connection
T = duct connection with central fastening screw and cross bar
K = connection box

Damper

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

Insulation

0 = without acoustic lining
I = with acoustic lining

Adjustment

	DN 200 – DN 400	DN 500
MA = manual	•	•
E1 = „Siemens servomotor, 0 – 10 V modulation“, rotation drive type GDB161.1E	•	
E2 = „Siemens servomotor, 3-point type, 24 V“, rotation drive type GDB131.1E	•	
E3 = „Siemens servomotor, 3-point type, 230 V“, rotation drive type GDB331.1E	•	
E4 = „Belimo servomotor, 0 – 10 V modulation“, rotation drive type LM24A-SR	•	
E5 = „Belimo servomotor, 3-point type, 24 V“, rotation drive type LM24A	•	
E6 = „Belimo servomotor, 3-point type, 230 V“, rotation drive type LM230A	•	
E7 = „Belimo servomotor, 0 – 10 V modulation“, rotation drive type NM24A-SR		•
E8 = „Belimo servomotor, 3-point drive, 24 V“, rotation drive type NM24A		•
E9 = „Belimo servomotor, 3-point drive, 230 V“, rotation drive type NM230A		•
E13 = „Siemens servomotor, 0 – 10 V modulation“, rotation drive type GLB161.1E		•
E14 = „Siemens servomotor, 3-point type, 24 V“, rotation drive type GLB131.1E		•
E15 = „Siemens servomotor, 3-point type, 230 V“, rotation drive type GLB331.1E		•

Surface finish

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

Tender text

..... units

Adjustable radial outlet for air distribution at large discharge heights and generation of high-quality indoor air flow with high-induction radial air jets, discharge direction steplessly adjustable from horizontal to vertical (downwards),

consisting of:

- low outlet element with circular casing, moulded face and radial vanes – vane underside flush with surrounding face –, either with circular face for flush mounting or with square face with turn-up for installation in square tile ceiling,
  vertically mobile guide ring for adjustment of discharge direction from nearly horizontal to vertical, manually or by electric servomotor,
  disc with central fastening screw;
- optionally designed for connection to the duct system, directly to a circular duct or via a spigot; fastening either with surrounding riveting or screwing (by others) or with central fastening screw for crossbeam [2)] to be provided with the radial outlet.
- optional flat connection box with lateral spigot, bottom sleeve to accommodate the radial outlet, and internal crossbeam for central fastening of outlet, including bores in upper box flanges, for suspension, optionally fitted with:
  - volume flow damper adjustable from room,
  - acoustic lining.

Mounting flush with ceiling or freely suspended.

Material:

- Radial outlet element made of galvanized sheet metal, visible air outlet parts painted to RAL ....
- Connection box made of galvanized sheet metal.

Make: KRANTZ KOMPONENTEN
Type: RA-V _ __ – DN ___ – __ __ __ – ___ – ____

Subject to technical alterations.

[1)] Square face only up to DN 400

[2)] Best used for placement of radial outlets in false ceilings

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