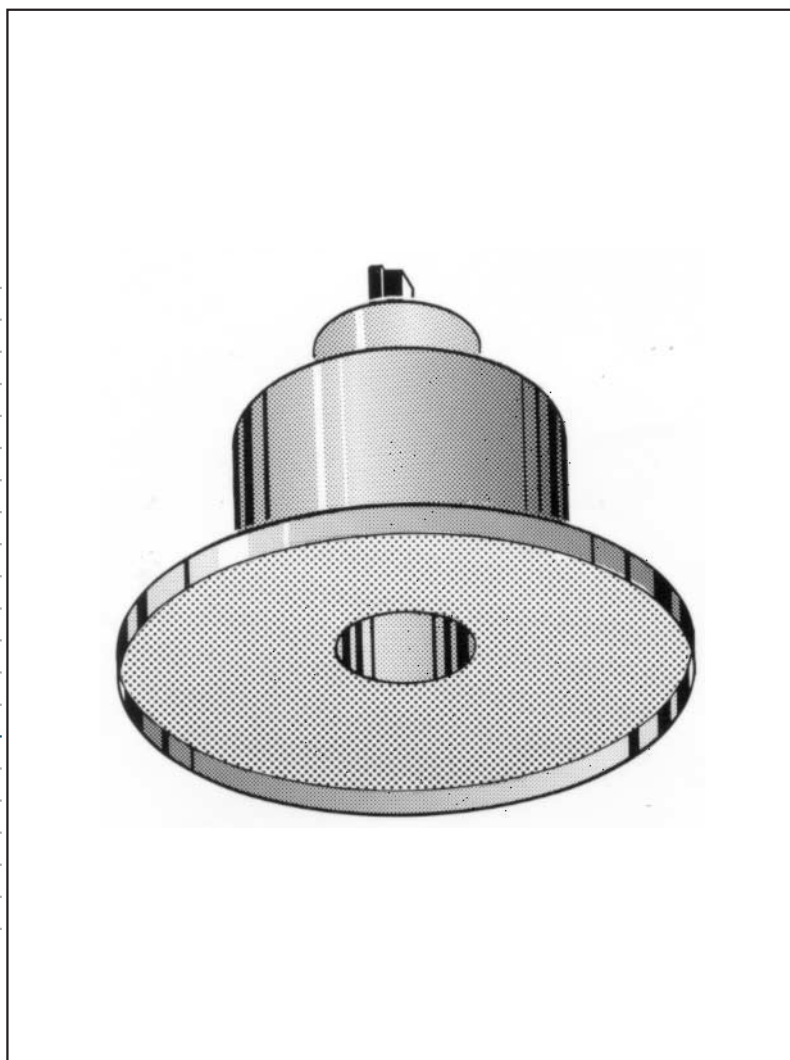


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see last page.

Technical Selection



Radial displacement outlet
type VA-PV....

Preliminary remarks

The function of displacement outlets is to remove pollutants from production sites and workplaces, with minimum admixture of indoor air. Depending on the kind of pollutants and the specific room heat load, they are positioned either above the occupied zone or on the floor.

Generally, the supply air at production sites is discharged as near the occupied zone as possible to keep the load factors for pollution and heat low. This is not always feasible for constructional or production reasons. The radial displacement outlet was developed to ensure the best displacement air flow in the occupied zone for just such cases. It is ideal where low-turbulence supply air needs to be discharged downward from a height of 5 – 8 m above the occupied zone.

The jet spread and hence the penetration depth as well can be adjusted to the temperature difference between supply air and indoor air, making for an effortless optimum indoor air flow at all times for different room heat loads.

Construction design

The radial displacement outlet is made up of the outer cylinder 1 with straight intake 2 and circular exit 3, the core tube 4 with the diaphragm 5 in the lower section and the intake torus in the upper section 6. The volume flow rate passing through the core tube 4 can be regulated by means of the valve disc 7, which can be adjusted with an electric servomotor ¹⁾ 8 or manually. The jet diffuser 9 disperses the jet as required. The air discharge surface 10 is a perforated metal sheet through which the low-turbulence supply air flows. The spread, i.e. the diameter of the supply air jet, is co-determined by the outer ring 11.

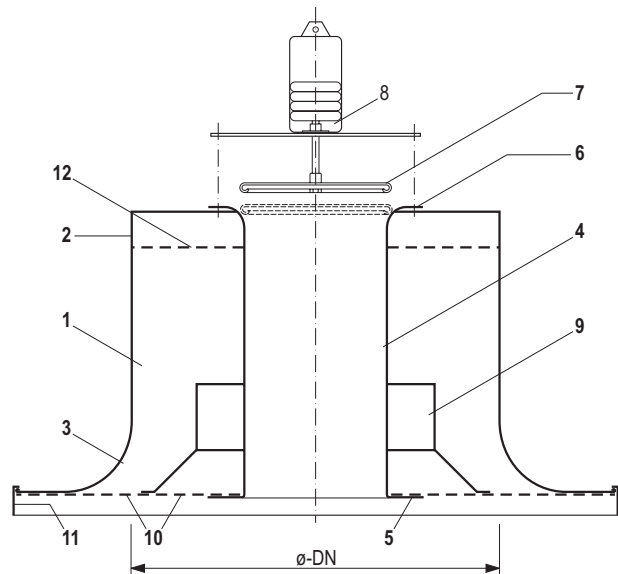
Sizes DN 630 and DN 710 are also fitted with the perforated metal sheet 12. This ensures an even air volume flow rate in the intake cross section.

The radial displacement outlet can be connected directly to a tube to DIN 24 145 or DIN 24 146 or via a connection box. Using a spigot the radial displacement outlet can also be built onto the bottom of a rectangular duct (see Page 5 for details).

The circular body of the outlet is made of aluminium and the perforated metal sheet is of galvanized steel.



Fig. 1: Radial displacement outlet, photo of outlet



- 1 Outer cylinder
- 2 Straight intake
- 3 Circular exit
- 4 Core tube
- 5 Diaphragm
- 6 Intake torus
- 7 Valve disc
- 8 Servomotor
- 9 Jet diffuser
- 10 Air discharge surface
- 11 Outer ring
- 12 Perforated metal sheet (for DN 630 and DN 710)

Nominal diameter DN	Volume flow rate				Discharge height H m	Min. outlet spacing m
	\dot{V}_{min} l/s	\dot{V}_{min} m ³ /h	\dot{V}_{max} l/s	\dot{V}_{max} m ³ /h		
315	280	1 000	555	2 000	5 – 7	3
400	415	1 500	835	3 000	5 – 7	3.5
500	640	2 300	1 250	4 500	6 – 8	4.5
630	890	3 200	1 800	6 500	6 – 8	4.5
710	1 100	4 000	2 220	8 000	6 – 8	5
Max. temperature difference $\Delta\theta$ supply air and indoor air					– 6 K when cooling +10 K when heating	

Fig. 2: Outlet construction, sizes and specifications

1) Pneumatic servomotor on request

Mode of operation

The supply air always flows downward. The spread, i.e. the diameter of the air jet, alters in response to the temperature difference between supply air and indoor air. To ensure an adequate penetration depth when heating, the core tube is opened. A supporting jet then flows vertically downward at a higher momentum thus inducing the remaining supply air and extends the penetration depth. The larger the temperature difference between supply air and indoor air when heating the higher the percentage of the supporting jet should be. If the valve disc is in top position the core tube is fully opened. This position is largely intended for the heating-up process. The jet pattern when cooling and when heating is outlined in Figure 3. It corresponds to the photographs in Figure 8.

The diameter of the supply air jet depends on air volume flow rate, temperature difference between supply air and indoor air, and valve disc lift. It is specified in the table, Figure 4 for each size related to the maximum and minimum outlet volume flow rate.

Nominal diameter DN	Air outlet volume flow rate		Jet diameter D in m for temperature difference $\Delta\vartheta$		
			Cooling		Heating
	\dot{V}_A l/s	\dot{V}_A m ³ /h	- 6 K Lift = 60	- 2 K Lift = 60	+ 4 K Lift 0 mm
315	280	1 000	1.5	2.5	1.0
	555	2 000	2.5	3.0	1.3
400	415	1 500	2.0	3.0	1.2
	835	3 000	3.0	3.5	1.3
500	640	2 300	2.5	3.5	1.3
	1 250	4 500	4.0	4.5	1.4
630	890	3 200	2.8	3.5	1.3
	1 800	6 500	4.5	4.5	1.3
710	1 100	4 000	3.2	4.0	1.3
	2 220	8 000	4.5	5.0	1.5

Fig. 4: Rough diameter D of the supply air jets in m

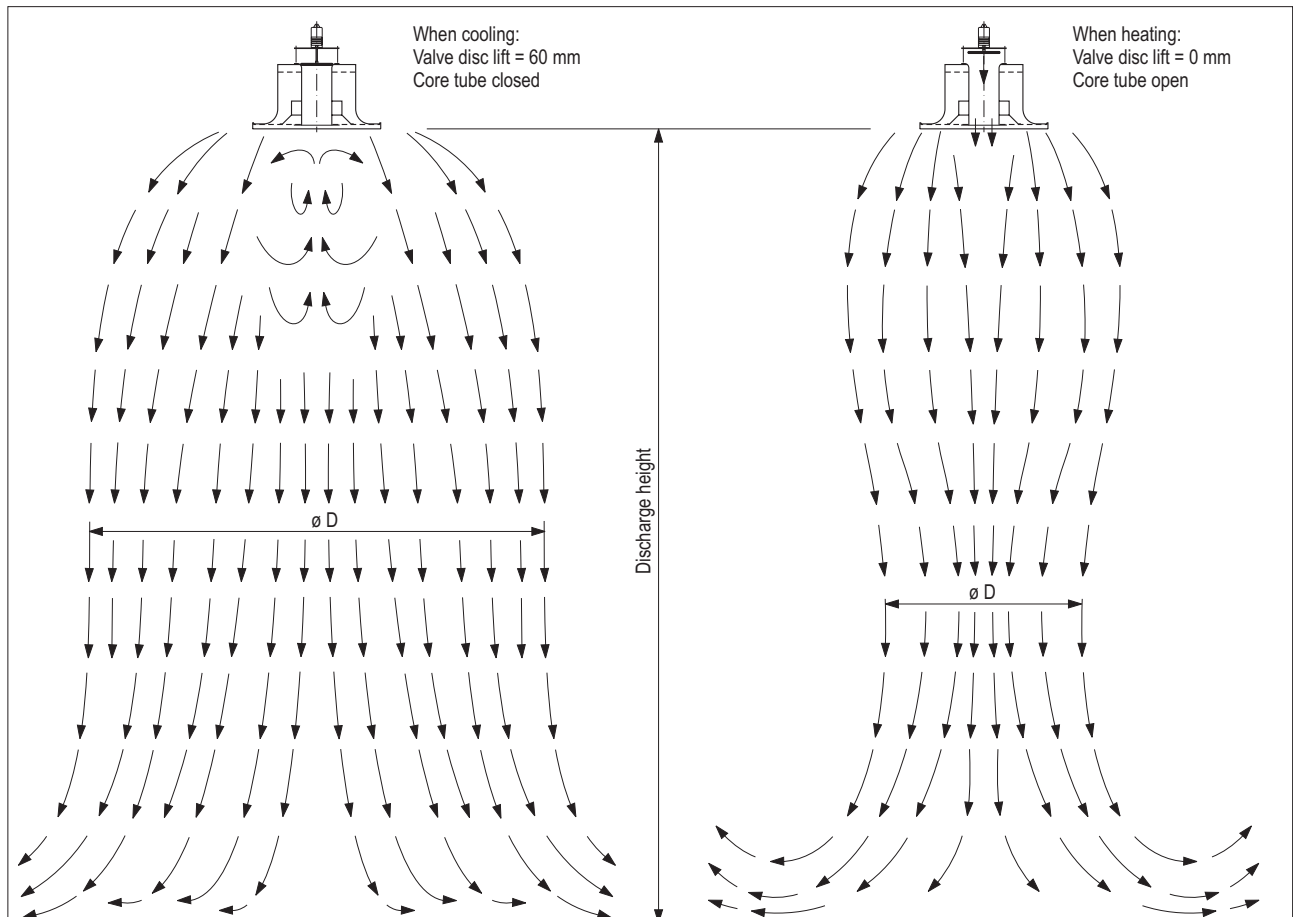


Fig. 3: Jet pattern, left: when cooling, right: when heating

Jet penetration depth

When **heating** with fully opened core tube, the vertical penetration depth of the supply air jet from the outlet depends on volume flow rate and temperature difference between supply air and indoor air. This correlation is shown in Figure 5. The parameters \dot{V}_{min} and \dot{V}_{max} depend on size and can be read off Figure 2. For size DN 630 for example, at a volume flow rate of 1 800 l/s (6 500 m³/h) and $\Delta\vartheta = +8$ K a penetration depth of 6.75 m can be achieved. If the volume flow rate is reduced for the same size to 900 l/s (3 200 m³/h), the penetration depth is shortened to 3.6 m.

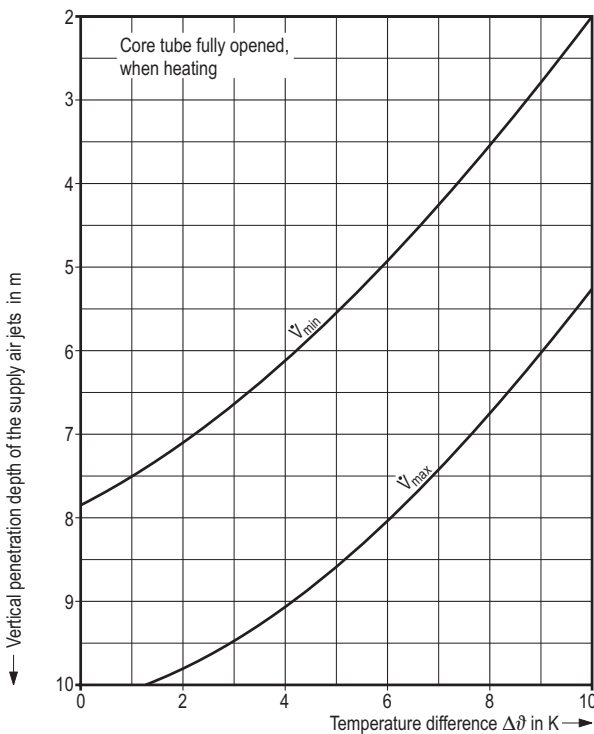


Fig. 5: Vertical penetration depth of the supply air jets depending on temperature difference between supply air and indoor air when heating

When **cooling** the penetration depth is practically unlimited because the cooler supply air tends to flow downward. The criterion are the air velocities under the outlet, which depend on the size and the temperature difference between supply air and indoor air. It is assumed that the core tube is closed when cooling. The max. air velocities 5 m under the outlet are shown by range in Figure 6. For size DN 400 and $\Delta\vartheta = -5$ K for example, the maximum air velocities amount to 0.38 to

0.41 m/s, for $\Delta\vartheta = -3$ K 0.31 to 0.33 m/s. These air velocities are already attained at activity level II (in industry: light work while standing) without affecting the thermal comfort of the personnel.

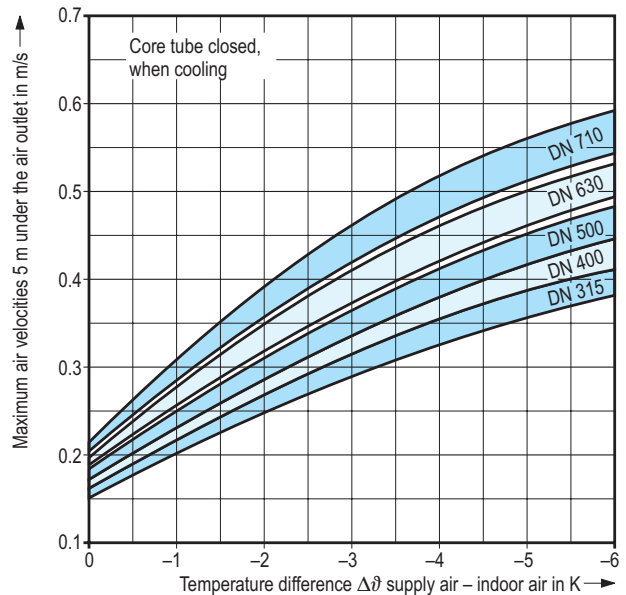


Fig. 6: Ranges of the maximum air velocities 5 m under the air outlet when cooling

The air velocities under the outlet have no effect on thermal comfort when the outlet is installed above the gangway and the supply air between the workplaces is discharged vertically from a height of 5 – 8 m. The pollutants released during production are best removed directly at the workplaces (e.g. at welding places, grinders, etc.). Figure 7 shows a typical arrangement of outlets.

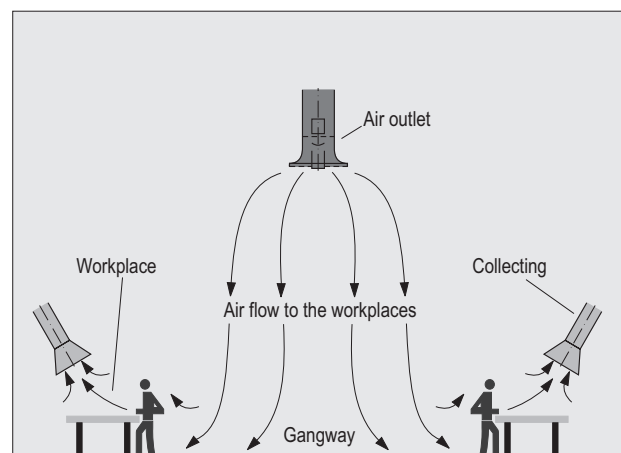
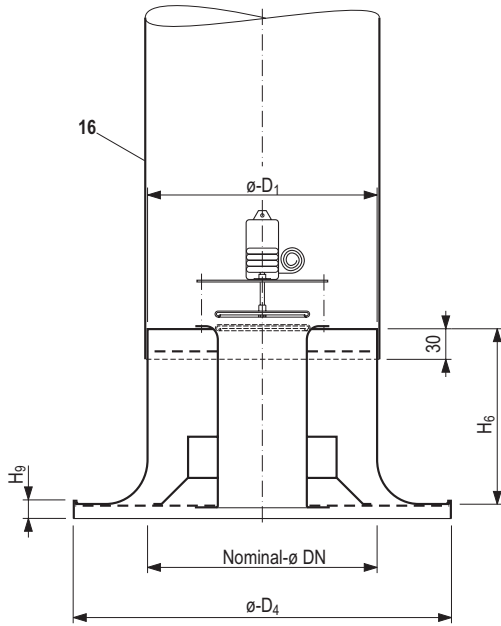
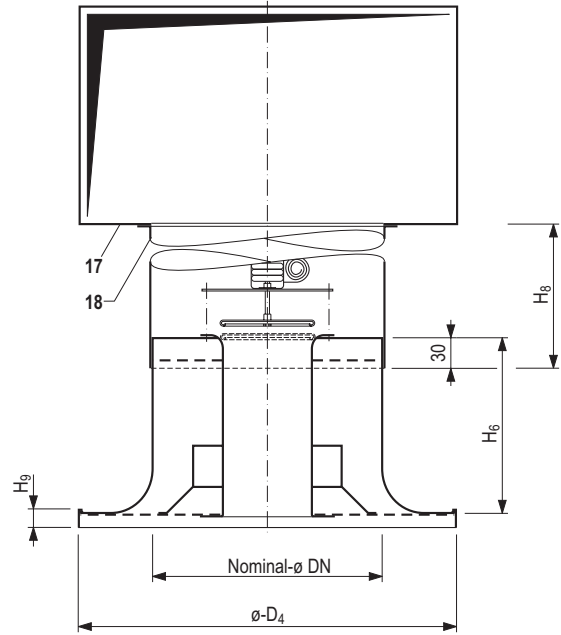


Fig. 7: Radial displacement outlet above the gangway between the workplaces

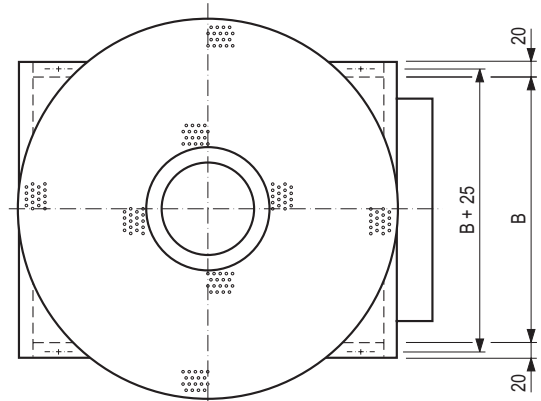
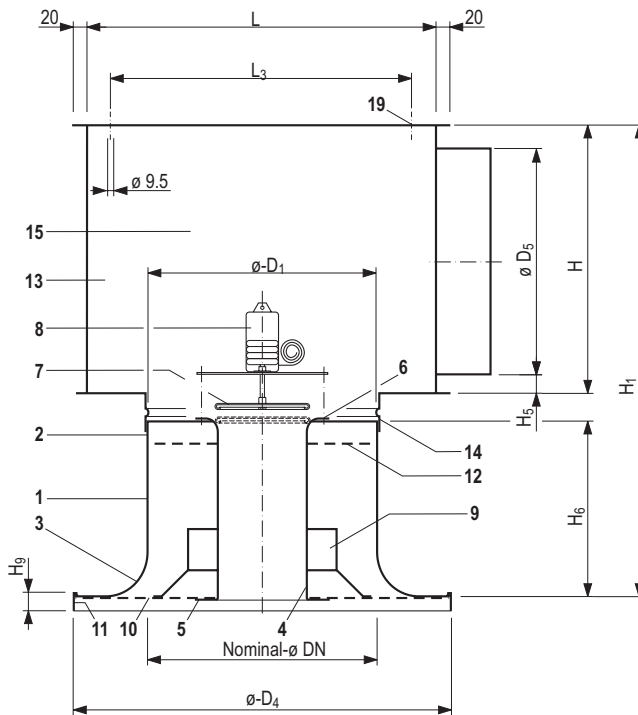
Connection to tube DIN 24 145 or DIN 24 146



Connection to air duct with tube spigot



Connection to connection box



View from below

Key:

- | | | |
|-------------------|---|---------------------------------------|
| 1 Outer cylinder | 9 Jet diffuser | 15 Guide vane |
| 2 Straight intake | 10 Air discharge surface | 16 Tube |
| 3 Circular exit | 11 Outer ring | 17 Duct |
| 4 Core tube | 12 Perforated metal sheet
(for DN 630 a. DN 710) | 18 Tube spigot for
duct connection |
| 5 Diaphragm | 13 Connection box | 19 Bore for
suspension |
| 6 Intake torus | 14 Tube spigot at
connection box | |
| 7 Valve disc | | |
| 8 Servomotor | | |

Nominal diameter DN	Dimensions in mm											Weight in kg ¹⁾		
	L	L ₃	B	H	H ₁	H ₅	H ₆	H ₈ min.	H ₉	D ₁	D ₄	D ₅	Air outlet	With connection box
315	475	415	365	365	655	25	260	240	35	314	525	314	4	14
400	560	500	450	450	780	25	300	300	45	399	650	399	6	21
500	660	600	550	550	860	25	280	375	50	499	800	499	10	31
630	790	730	680	680	1 060	26	350	475	50	628	1 000	628	17	46
710	870	810	760	760	1 140	26	350	525	50	708	1 100	708	21	56

1) Weight without servomotor, weight of servomotor 0.5 kg

Minimum outlet spacing

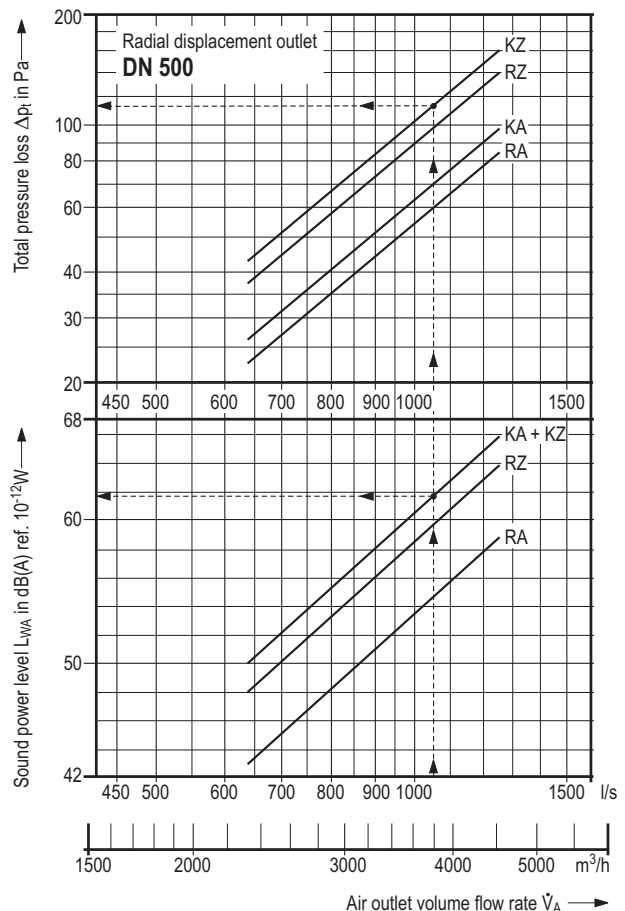
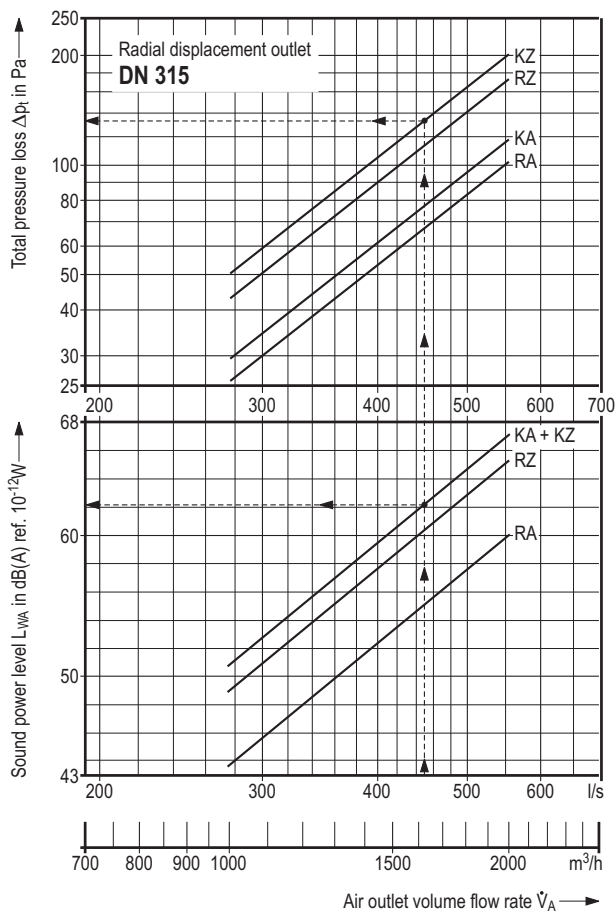
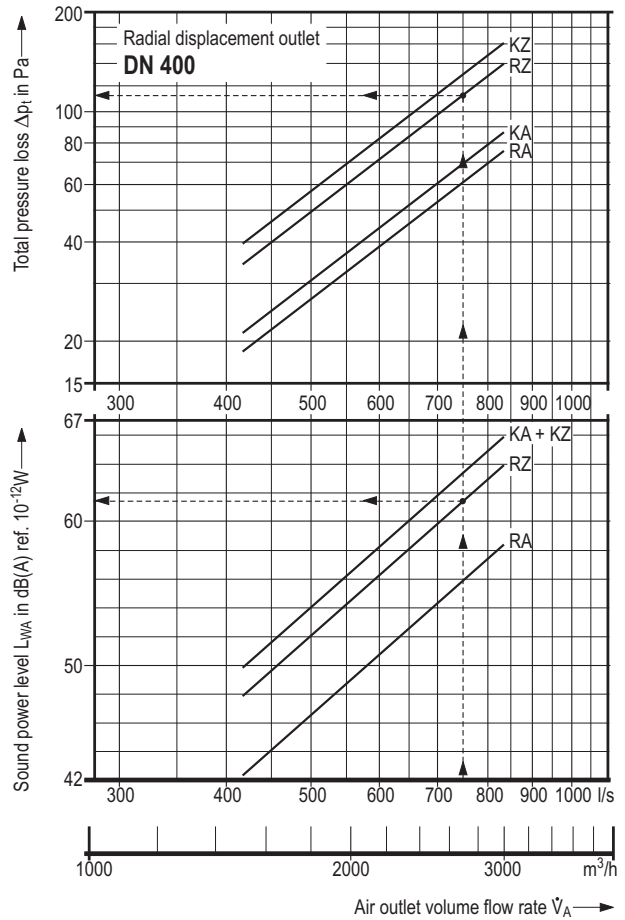
The minimum spacing between outlets must ensure that the vertical supply air jet can disperse unobstructed. Figure 2 shows the minimum outlet spacing for the individual sizes.

Sound power level and pressure loss

Sound power level and pressure loss are influenced by the air outlet volume flow rate, the position of the valve disc and the type of connection and can be read off the following charts.

Key to charts:

- RA = Tube connection, core tube "open"
- RZ = Tube connection, core tube "closed"
- KA = Box connection, core tube "open"
- KZ = Box connection, core tube "closed"



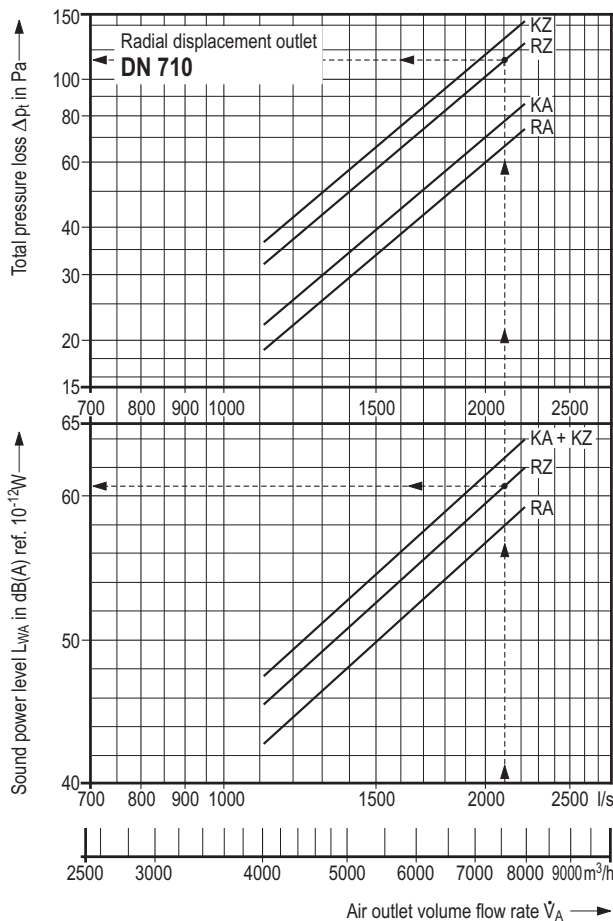
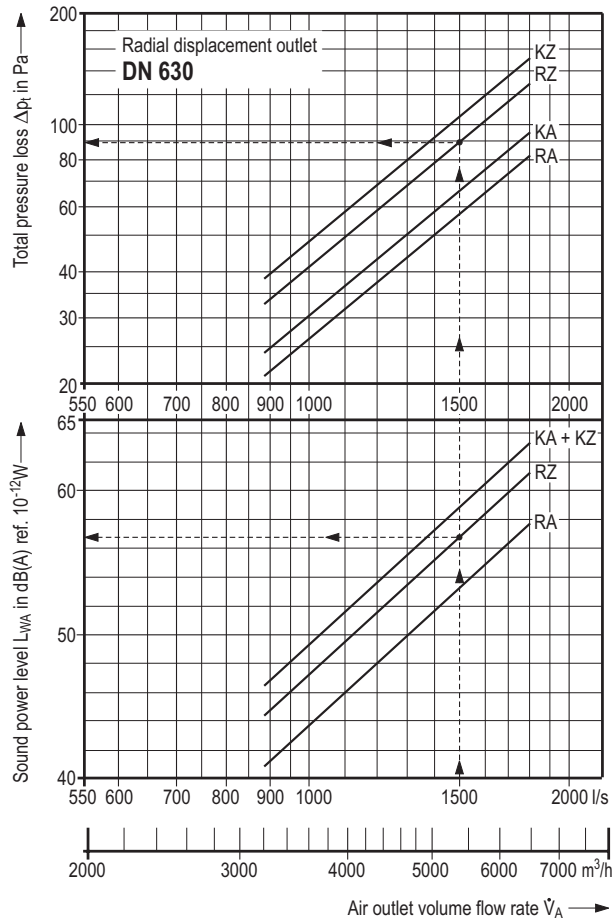


Fig. 8: Vertical discharge from a great height, jet pattern visible using smoke tracer;
Above: when cooling, core tube closed,
Below: when heating, core tube open.

Please note,
type code is new,
see last page.



Fig. 9: Radial displacement outlet in a printing shop

Type code

VA – PV – DN ____ – ____ – ____

Displacement outlet ---
Kind / Function ---
Size ---
Connection type ---
Adjustable ---

Kind /

P = with radial perforated metal sheet plate

V = adjustable

Size

DN 315, DN 400, DN 500,
DN 630, DN 710

Connection type

R = Duct connection or spigot at duct

K = Connection box

Adjustment

M = Manual

E = With electric servomotor

Tender text

..... units

Radial displacement outlet for vertical low-turbulence supply air above the occupied zone in the gangways of production halls; especially suited for workplaces with collection units,

Discharge direction continuously adjustable from inclined to steep downward, ideally responsive to temperature difference between supply air and indoor air, made up of:

Outer cylinder and core tube for the supporting jet with built-in jet diffusor and radial perforated metal sheet for low-turbulence discharge flow,
Valve disc for the supporting jet regulation to adjust jet spread and penetration depth.

Valve disc adjustment

manual. with electric servomotor.

Material:

Circular body Aluminium
Perforated metal sheet Galvanized steel

Visible parts painted to RAL

Connection

direct to circular tube.

via connection box with lateral connection spigot, made of galvanized sheet steel.

Technical specifications

Volume flow rate: l/s (m³/h)

Size: DN

Pressure loss: Pa

Make: KRANTZ KOMponentEN

Type: VA – PV – DN ____ – ____ – ____

Subject to technical alterations!

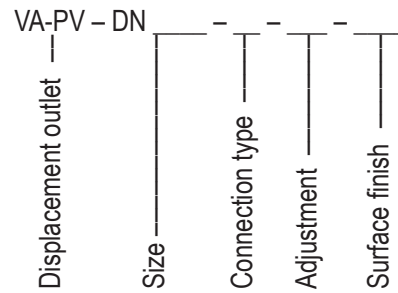
Features

- Low-turbulence displacement air flow
- Vertical downward directed supply air jet ensuring effective fresh air supply
- Discharge height 4 to 8 m
- 5 sizes from DN 315 to DN 710
- Air volume flow rate range from 280 to 2 200 l/s (1 000 to 8 000 m³/h)
- Jet penetration depth adjustable to discharge height and heat load
- Adjustment manual or with servomotor
- Maximum temperature difference between supply air and indoor air –6 K when cooling and +10 K when heating
- Connection via circular tube pipe or connection box
- Material: circular body - aluminium; perforated metal sheet - galvanized steel



Radial displacement outlet

Type code



Size

- 315 = DN 315
- 400 = DN 400
- 500 = DN 500
- 630 = DN 630
- 710 = DN 710

Connection type

- R = Duct connection with rivet or screw connection
- K = Connection box

Adjustment

- MA = manual
- E22 = „Siemens servomotor, 0-10 V modulation“, stroke drive type GDB161.2E
- E23 = „Siemens servomotor, 3-point type, 24 V“, stroke drive type GDB131.2E
- E24 = „Siemens servomotor, 3-point type, 230 V“, stroke drive type GDB331.2E

Surface finish

- = Face painted to RAL

Subject to technical alteration.