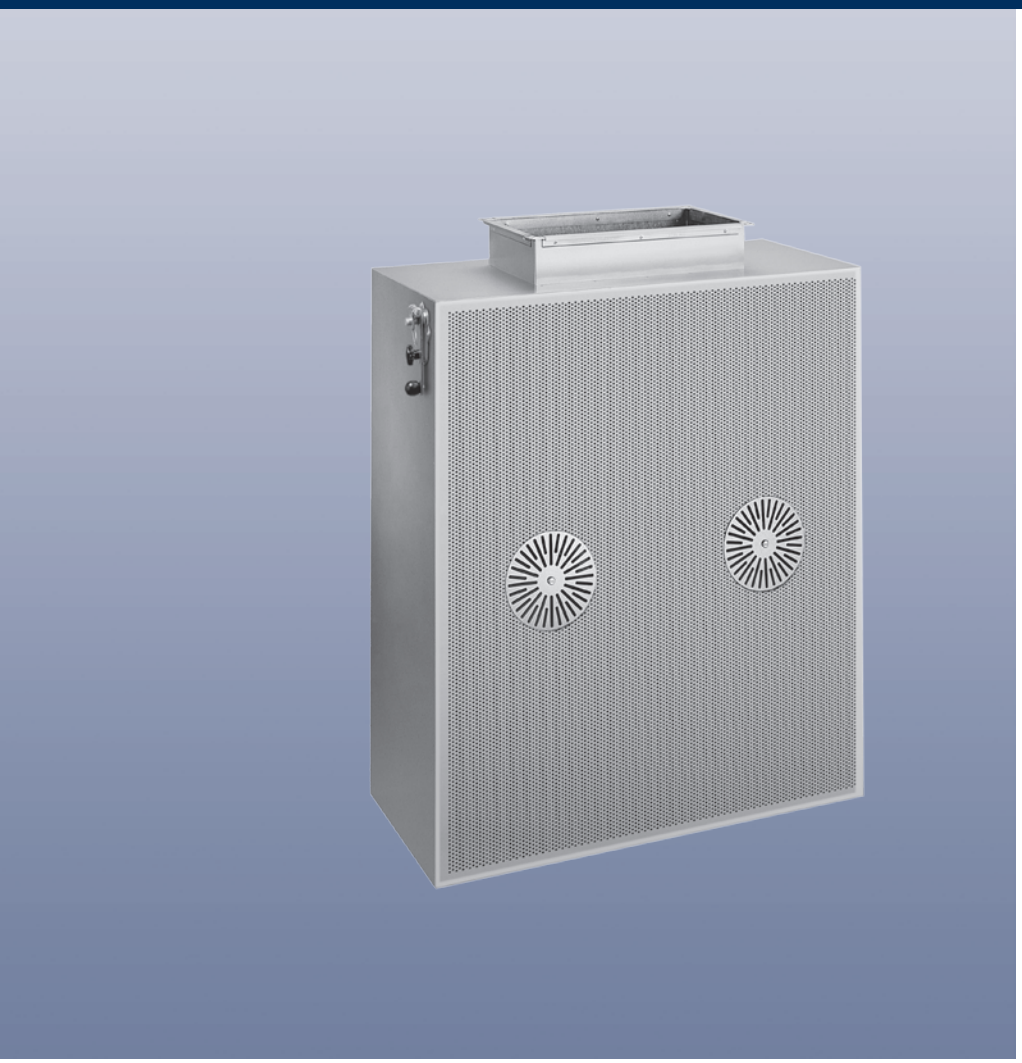
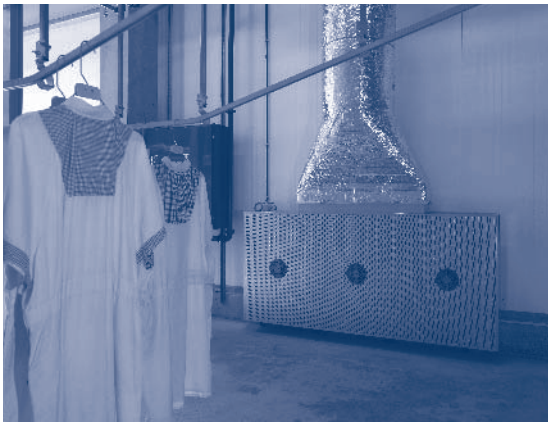
KOMPONENTEN®
Applied system solutions





Rectangular displacement outlet VA-RN....

– with adjustment device VA-RV....

DS 4009 E 06.2012

Rectangular displacement outlet

Design and function

Preliminary remarks

Displacement air outlets are used in rooms with high concentrations of pollutants and heat loads. If the specific weight of the pollutants is lighter than that of air, the pollutants can be displaced upwards and removed by placing the displacement outlets on the floor.
With high heat loads, the air that flows upwards due to buoyancy forces is compensated by an equal amount of supply air. For this purpose, the displacement outlets are placed along the wall, directly above the floor.
With single placement and correct layout, a mass load factor of 20% and a heat load factor of 45% [1] can be achieved. In contrast to turbulent mixing ventilation (mass and heat load factors between 90% and 100%), only a 45% supply air volume flow rate is needed. Therefore, a corresponding reduction in operating and investment costs is possible.

When cooling, the colder supply air is discharged horizontally and flows – due to gravity – deep into the room, in a layer close to the floor.
When heating, the warm supply air is supposed to be discharged towards the floor to avoid an early upflow due to buoyancy. This can be done with the adjustable rectangular displacement outlet.

To meet all needs, KRANTZ KOMPONENTEN provides the rectangular displacement outlet without adjustment device VA-RN, or with adjustment device VA-RV.

Construction design

The **non-adjustable** rectangular displacement outlet mainly consists of the housing **1** with flat discharge surface **2**, the air inlet spigot **3** and the built-in air guide **5**. The air inlet spigot is fitted at the top, in the centre or off-centre. It has a connection flange **4** to fit standard corner flanges.

The **adjustable** outlet is additionally fitted with an air damper **7** with control lever **8** or damper control with electric actuator.

The discharge surface **2** is made of finely perforated metal sheet and contains 2 to 3 twist outlets **6**, depending on the outlet size.

The adjustable outlet has a service opening for maintenance and cleaning work. If the spigot is positioned off-centre, the service opening is placed on the opposite side of the connection spigot.
The outlet housing with the built-in parts, the air inlet spigot and the finely perforated front plate are made of galvanized sheet metal. The twist outlets are made of polycarbonate.

Mode of operation

The perforated metal sheet generates low-turbulence air jets with a pronounced displacement pattern. The twist outlets, in contrast, produce high-momentum supply air jets with high induction. The interaction of both jet components creates a stable total jet bundle with higher coverage. Figure 2 shows the indoor air flow pattern for a typical arrangement of the air outlets along a wall.

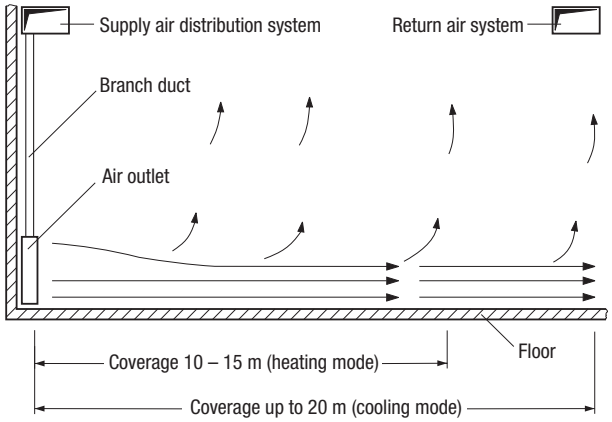


Figure 2: Air flow pattern

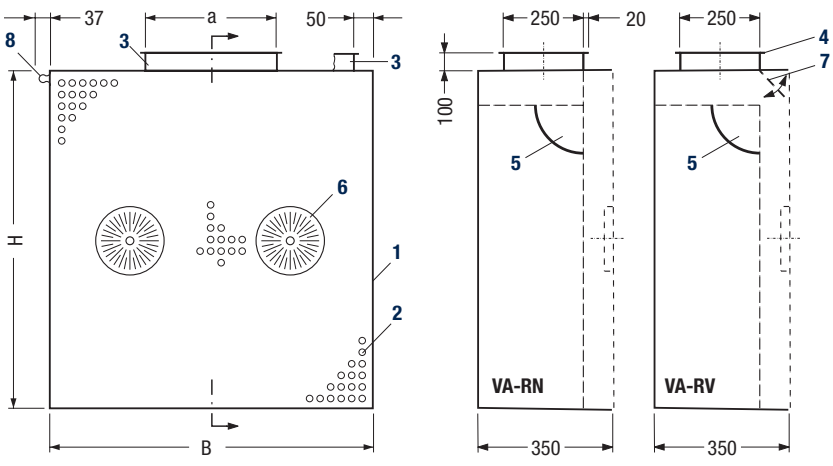


Figure 1: Rectangular displacement outlet, standard sizes with dimensions and weights

Dimensions [2] in mm and weight W in kg				
Size	1		2	
Height H	765		1 150	
Width B	a	W	a	W
1 000	315	38	500	45
1 500	500	60	710	67
2 000	630	88	1 000	89
2 500	800	104	1 250	112

[1] The mass load factor is the ratio of pollutant concentration at the workplace to pollutant concentration in return air measured in %.
The heat load factor is the ratio of heat load at the workplace to total heat load measured in %.

[2] Other dimensions on request

Rectangular displacement outlet

Mode of operation

Cooling mode: Rectangular displacement outlet with or without adjustment device

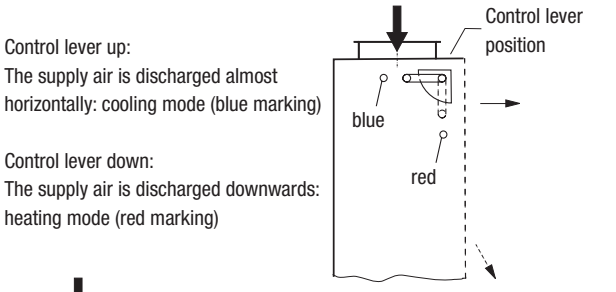
In cooling mode, the indoor air flow pattern is the same whether the air jets are generated by the non-adjustable type or by the adjustable type with the air damper being closed. The supply air is discharged horizontally and slides more or less along the floor; it penetrates the room up to 20 m in depth, depending on the outlet flow rate. Due to buoyancy forces (generated by machinery, lighting, occupants, etc.) the air ascends gradually, flushes the occupied zone and is then extracted at ceiling level along with the displaced pollutants.

The supply air jet contact to the floor depends on the temperature difference between supply air and indoor air. The lower the supply air temperature (cooling mode), the closer the supply air contact to the floor.

Heating mode: Rectangular displacement outlet with adjustment device

In low-turbulence displacement flow, if the supply air temperature exceeds the room temperature (heating mode), the air damper **7** is opened. The air jets are inclined to the floor and the warm supply air covers a larger area. The coverage is 10 to 15 m, depending on the outlet flow rate and temperature difference between supply air and indoor air. The entire surrounding area is flushed sufficiently. Pollutants and heat loads are conveyed by the ascending indoor air to the extract points.

Figure 5: Rectangular displacement outlet with adjustment device



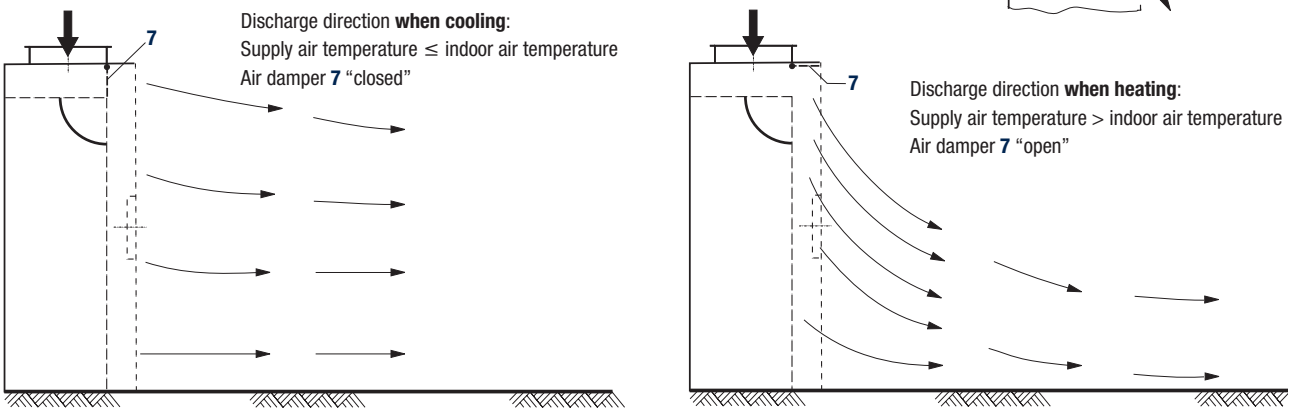


Figure 3: Influence of adjustment device on discharge flow, with corresponding control lever position

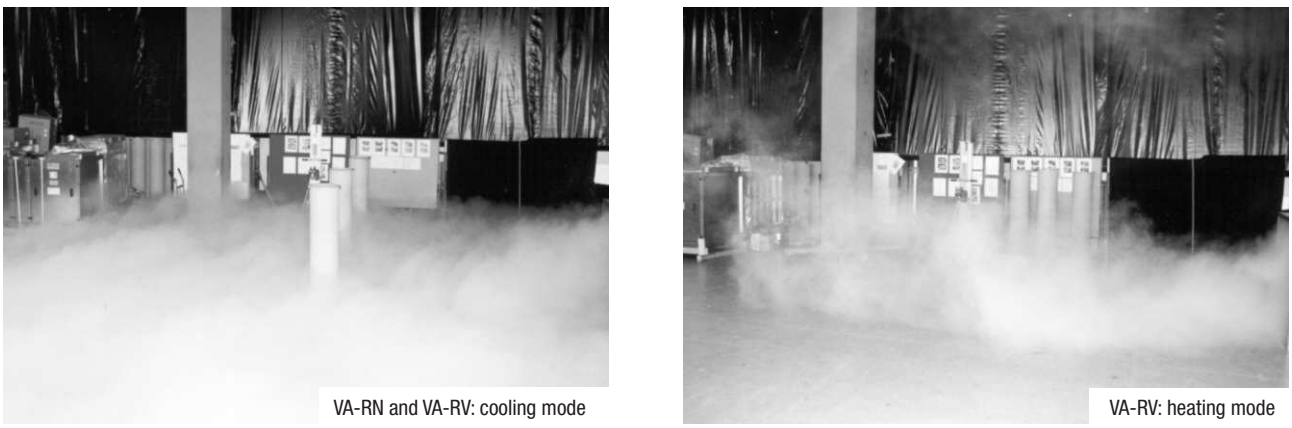


Figure 4: Dispersion of supply air made visible with smoke tracer

Rectangular displacement outlet

Layout

Layout

Typical applications for the rectangular displacement outlet are printing halls, ironing shops, laundries, foundries and similar industrial fields of application.

The right air volume flow rate per outlet for each application depends on the distance to the next permanent workplace.

This relation is shown in the chart in Figure 6. The sound power level and the pressure drop for the respective air outlet volume flow rate can be read off the chart as well.

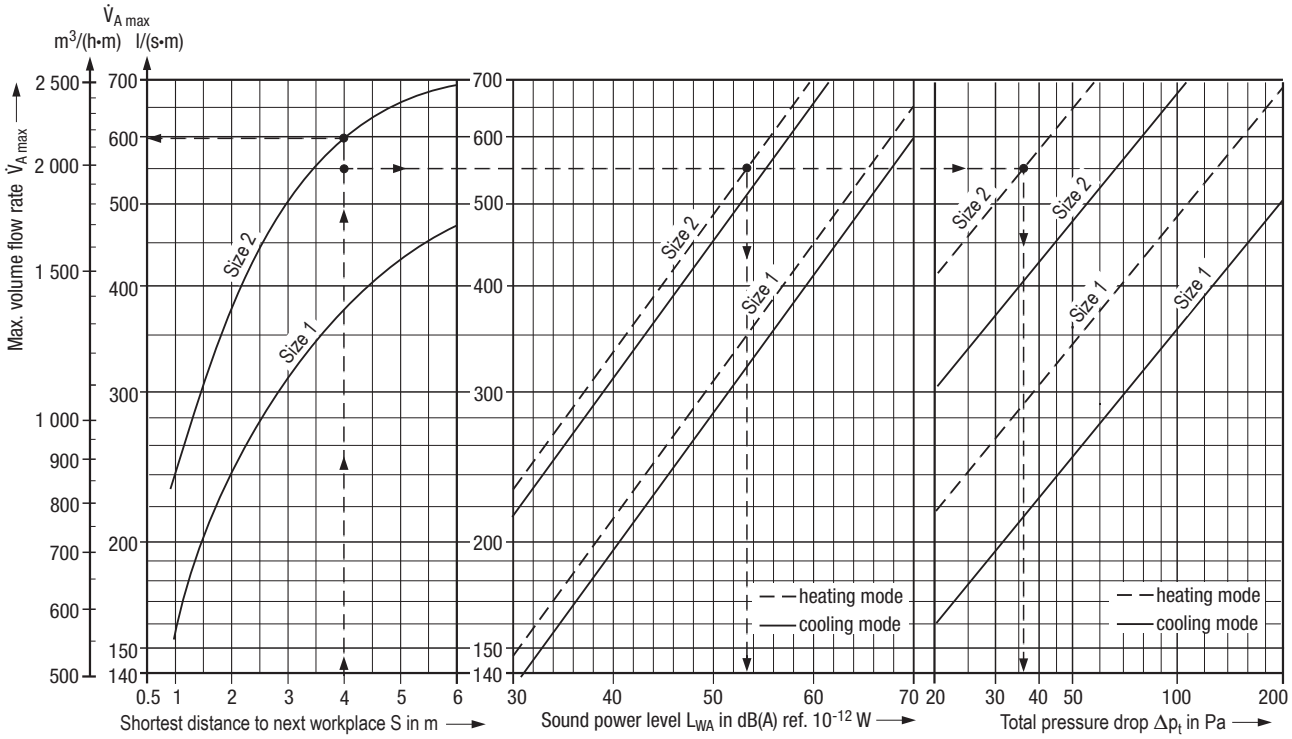


Figure 6: Chart for layout

Layout example (heating mode):

1 Volume flow rate $\dot{V}$ = 13 350 l/s

2 Shortest distance to next workplace S = 4 m

3 Size = 2

4 Width B = 2 m

From chart:

5 $\dot{V}_{A\,max}$ = 605 l/(s•m)

6 $\dot{V}_{A\,selected}$ = 550 l/(s•m)

7 Z_1 = 24 m (**1** : **6**)

8 Z_2 = 12 units (**7** : **4**)

9 L_{WA} ≈ 54 dB(A) ref. 10^{-12} W

10 Δp_t ≈ 37 Pa

Figure 7: Air outlet in an industrial textile cleaning facility

Figure 8: Air outlet in an ironing shop

Rectangular displacement outlet

Features, type code and tender text

Features

- Low-turbulence displacement flow
- Installation on or directly above the floor
- Adjustable air outlet option to alter discharge direction for larger coverage with warm supply air (heating mode)
- Adjustment either manually or with electric servomotor
- Coverage up to 20 m (cooling mode)
- Max. temperature difference supply air to indoor air:
  – when cooling $\Delta\vartheta$ = –8 K
  – adjustable type, when heating $\Delta\vartheta$ = +6 K
- Volume flow rate up to 695 l/(s•m) [2 500 m^3/(h•m)]
- Small depth of 350 mm
- Duct connection by flange joint from the top
- Air outlets can be arranged closely adjacent in a row
- Displacement outlet made of galvanized sheet metal; built-in twist outlets made of polycarbonate
- Robust construction with few adjustable parts
- Special designs, also with other lengths, available on request

Type code

VA-R _ – ____ / ____ – __ – __ – __

Displacement outlet | Adjustability | Height | Width | Adjustment | Position of adjustment device | Position of connection spigot

Adjustability

N = non-adjustable V = adjustable

Height

765 = height 765 mm 1150 = height 1 150 mm

Width

1000 = width 1 000 mm 2000 = width 2 000 mm

1500 = width 1 500 mm 2500 = width 2 500 mm

Adjustment

MA = manual

E7 = „Belimo actuator, 0 – 10 V modulation“, rotation drive type NM24A-SR

E13 = „Siemens actuator, 0 – 10 V modulation“, rotation drive type GLB161.1E

Position of adjustment device

R = to the right (related to air flow direction) - standard

L = to the left (related to air flow direction)

Position of connection spigot [1)]

M = connection spigot in top centre

L = connection spigot to the left (related to air flow direction)

R = connection spigot to the right (related to air flow direction)

Tender text

..... units

Rectangular displacement outlet for installation on or directly above the floor, with low induction effect and minimal mixing of supply air and indoor air, for optimum displacement of pollutants from the occupied zone;
adjustable option available for large coverage with warm supply air (heating mode), adjustment either manually or with electric actuator,

consisting of:
– rectangular housing with small depth and built-in air guide; discharge surface made of finely perforated sheet metal with built-in twist outlets,
– connection spigot with flange,
– with manual or electric adjustment device to alter the discharge direction when cooling or heating. Placement of the adjustment device either to the right or to the left [1)].

Material:
– Housing with built-in parts, air inlet spigot and perforated front plate made of galvanized sheet metal; visible outlet parts (except twist outlets) optionally powder coated to RAL ....
– Twist outlets made of polycarbonate body-tinted in a colour similar to RAL 7037, dusty grey

Make: KRANTZ KOMPONENTEN
Type: VA-R _ – ____ / ____ – __ – __ – __

Subject to technical alterations.

[1)] If the connection spigot is situated to the left or to the right in direction of air flow, with electric adjustment the actuator has to be installed opposite the connection spigot for accessibility.

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