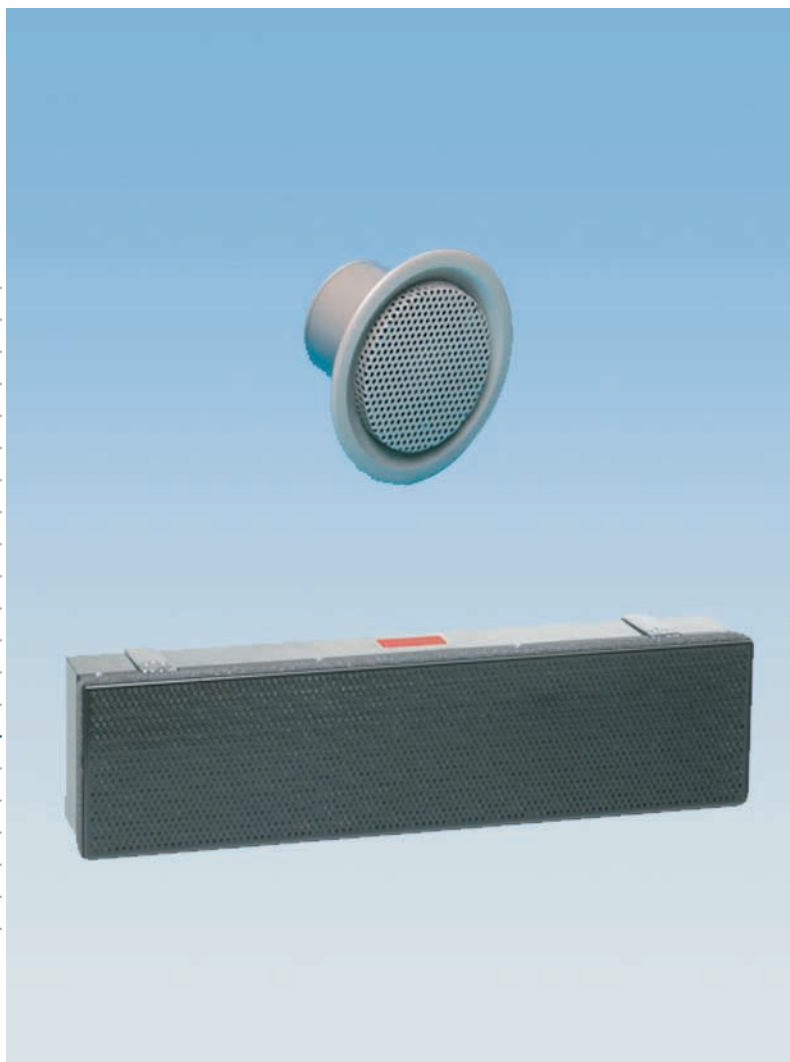


Please note,  
type code is new,  
see last page.

## Technical Selection



Step displacement outlets Q-S....

*Kranz*

DS 4054 E 08.2007

### Preliminary remarks

Step displacement outlets are used to supply air in assembly rooms with seating arranged on stepped floors, such as lecture halls, congress halls, theatres, etc. They operate according to the principle of displacement ventilation and are designed for installation in the step front, directly behind the seats.

KRANTZ KOMPONENTEN provides 2 types:

- Linear step displacement outlet, frequently installed as a continuous band, standard height  $H = 120$  mm
- Circular step displacement outlet, sizes DN 80 and DN 100.

The air is supplied to the outlets from the pressurized plenum located under the steps.  
Patent rights registered.

### Construction design

#### Linear step displacement outlet

The linear step displacement outlet is made up of a cassette with a perforated intake **1a** (at the back) or **1b** (at the bottom), a built-in jet straightener **2** and a finely perforated frontal plate **3** for air discharge.

The outlet cassette is available with or without frame. In the frame option **11** the cassette is inserted till it abuts the step front and is fastened at the frame. There are two ways of fastening: with wood screws **11a** or with claw fasteners **12**. To ensure airtightness, the rear of the frame is fitted with sealing strip **6**.

In the frameless type, the cassette is inserted into the step front with about 5 – 10 mm backspace and fixed to prefitted fixing brackets **5** by push-in connections **4**. To ensure airtightness, this cassette is fitted with skirting sealing strip **6**.

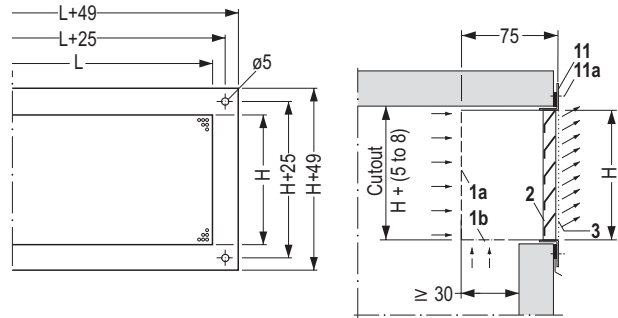
Cassettes with frames are used for higher steps.

Cassettes without frames are most suitable for lower steps. They are also useful for installation in curved steps. These cassettes can also be placed in polygonal rows.

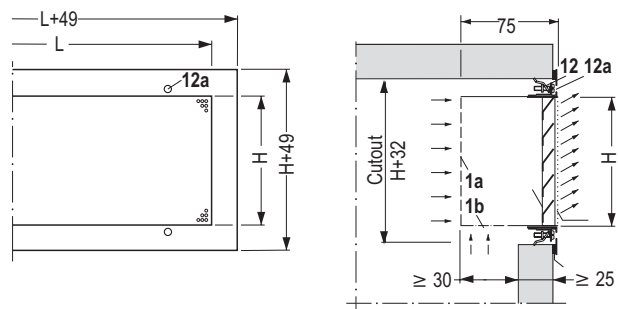
#### Note:

When ordering please indicate:  
air supply from the back or the bottom.

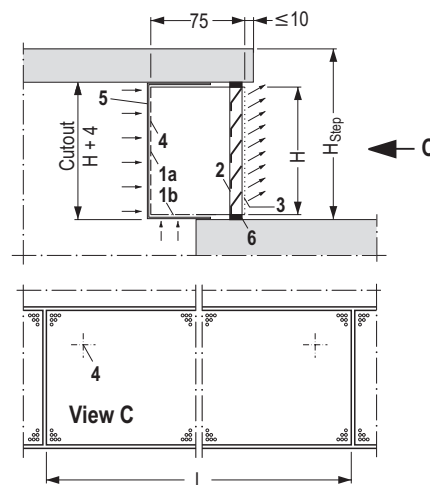
#### Linear step displacement outlet



– with frame and screws **11a**



– with frame and claw fasteners **12**



– without frame, with push-in connections **4** at fixing brackets **5**

Fig. 1: Linear step outlets – installation options for various types

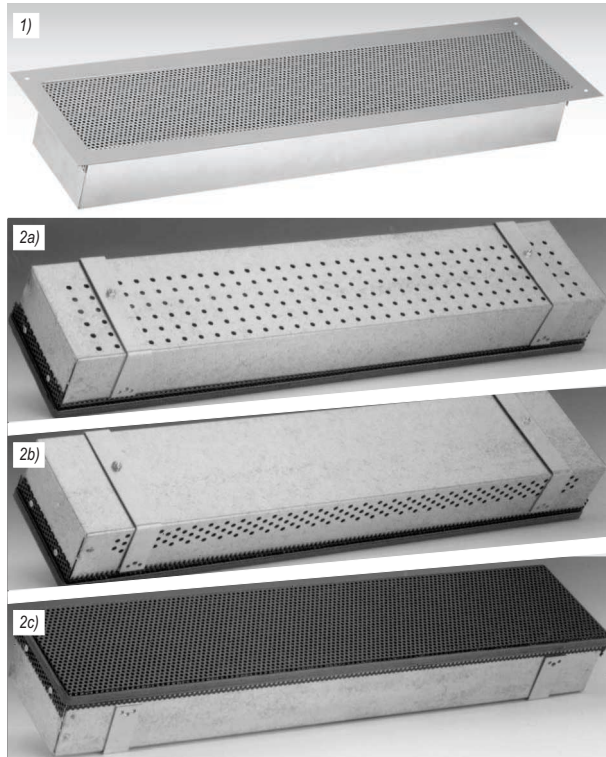


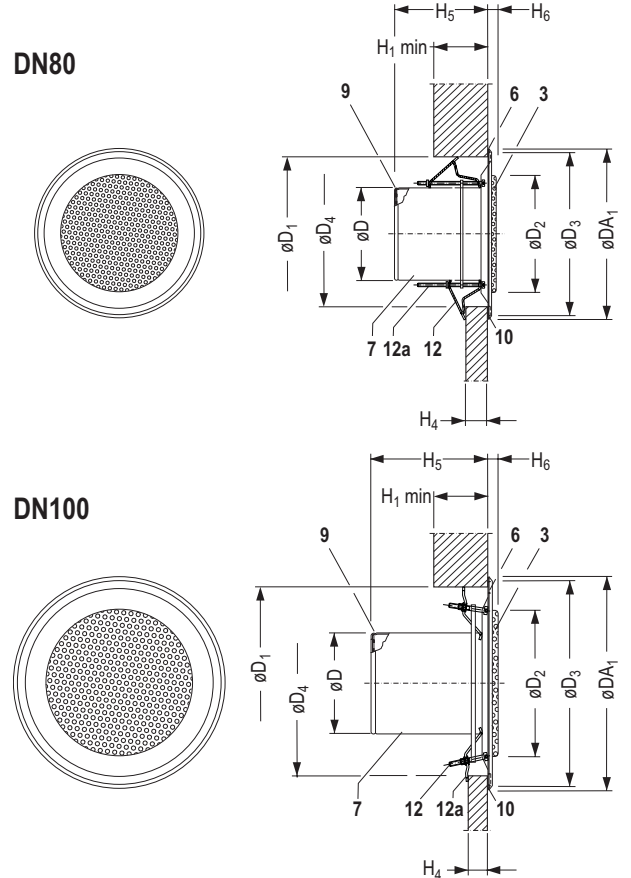
Fig. 2: Linear step displacement outlet  
 1) with frame for screw fastening  
 2) without frame, with fixing brackets  
 2a) – Air intake at the back  
 2b) – Air intake at the bottom  
 2c) – Frontal plate for air discharge

### Circular step displacement outlet

The main components of the air outlet are the circular housing 7, the fixed throttle 9 and the exit flange 10 with finely perforated frontal plate 3. The frontal plate is easily removable for cleaning purposes. The outlet will be fastened to the step by means of two claw fasteners 12 with concealed screws 12a. To ensure airtightness, the rear of the exit flange is fitted with sealing strip 6.



Fig. 3: Circular step displacement outlet



ø DN	ø D mm	ø D <sub>1</sub> mm	ø D <sub>2</sub> mm	ø D <sub>3</sub> mm	ø D <sub>4</sub> mm
80	79 <sup>±0.5</sup>	127 <sup>±1</sup>	100	140	132 <sup>±1</sup>
100	99 <sup>±0.5</sup>	177 <sup>±1</sup>	160	206	182 <sup>±1</sup>

	ø DA <sub>1</sub> mm	H <sub>1</sub> min mm	H <sub>4</sub> mm	H <sub>5</sub> mm	H <sub>6</sub> mm
80	146	28	20	80	7
100	212	50	20	76	11

**Note:**

For claw fastener fitting in step front, the following applies:  
 – H<sub>1</sub> min for øD<sub>1</sub>  
 – H<sub>4</sub> for øD<sub>4</sub>

Fig. 4: Circular step displacement outlet

**Key for all pages**

- 1a Perforated intake, at the back
- 1b Perforated intake, at the bottom
- 2 Jet straightener
- 3 Perforated frontal plate
- 4 Push-in connection
- 5 Fixing bracket
- 6 Skirting sealing strip
- 7 Circular housing
- 9 Fixed throttle
- 10 Exit flange
- 11 Frame
- 11a Screw
- 12 Claw fastener
- 12a Claw fastener screw, concealed

### Mode of operation

The supply air flows from the pressurized plenum of the raised floor into the air outlet. The perforated intake or the fixed throttle (depending on the outlet type) generates an even air flow.

The perforated frontal plate generates a low-turbulence discharge flow with low momentum and even penetration depth.

With the linear step displacement outlet, the built-in jet straightener raises the air flow from the floor, thus counteracting any jet constriction and acceleration effects. The air velocities in the foot zone are low.

With the circular step displacement outlet, the supply air is spread out radially; this considerably reduces the indoor air velocities.

Due to buoyancy forces, the supply air then ascends to the breathing space of the seated person.

The air velocities around the feet of the seated persons may reach up to 0.17 m/s, but usually remain under 0.16 m/s. At heights > 0.3 m above the floor, the air velocities are < 0.10 m/s. The turbulence intensity is about 20%.

The circular step displacement outlet is available in DN 80 and DN 100. Size DN 80 ( $\dot{V}_{\max} = 10 \text{ l/s}$  [ $35 \text{ m}^3/\text{h}$ ]) suffices for supplying one person with fresh air. DN 100 ( $\dot{V}_{\max} = 16.5 \text{ l/s}$  [ $60 \text{ m}^3/\text{h}$ ]) can supply up to 2 persons.

The minimum spacing between two outlets of size  
 – DN 80 is 500 mm  
 – DN 100 is 1100 mm.

The air temperature in the leg zone is 1-2 K above the supply air temperature. To comply with the occupied zone's temperature specified by EN ISO 7730, the supply air temperature should be  $\geq 19^\circ\text{C}$ .

Buoyancy forces give rise to a vertical temperature gradient of up to 2 K/m, depending on thermal load and room height. This results in the return air temperature under the ceiling being higher than the room temperature in the breathing space of the seated person. With small temperature differences between supply air and indoor air ( $\Delta\vartheta_{\text{ZL-RL}} \leq -4 \text{ K}$ , see Figures 5 and 6), the heat loads of the occupants and lights can be removed effectively.

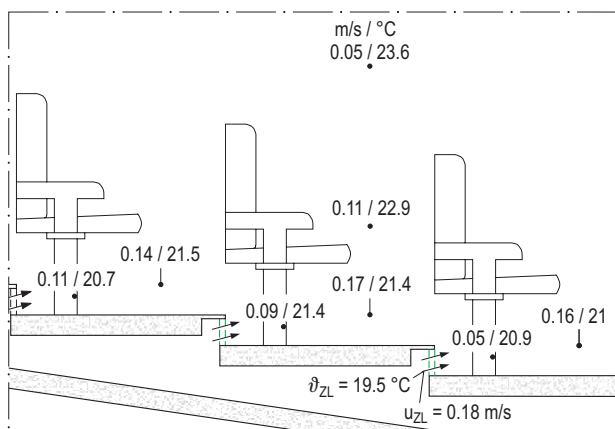
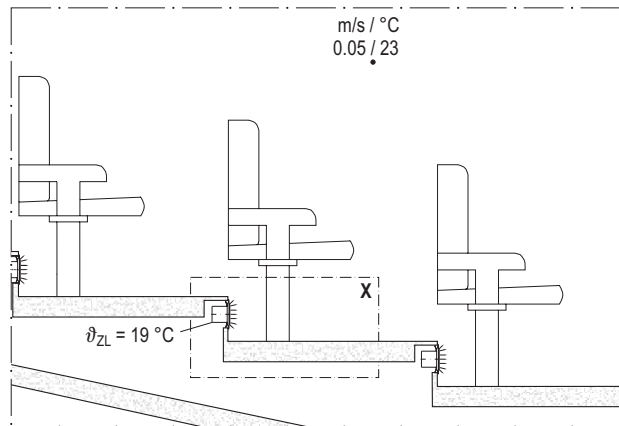


Fig. 5: Linear step displacement outlet  
 Example of air velocities and temperatures in the leg zone, supply air volume flow rate  $21 \text{ l/s} \cdot \text{m}$  [ $75 \text{ m}^3/(\text{h} \cdot \text{m})$ ] or  $12.5 \text{ l/s}$  [ $45 \text{ m}^3/\text{h}$ ] per person; temperature difference  $\Delta\vartheta_{\text{ZL-RL}} = -4 \text{ K}$ .



Detail X

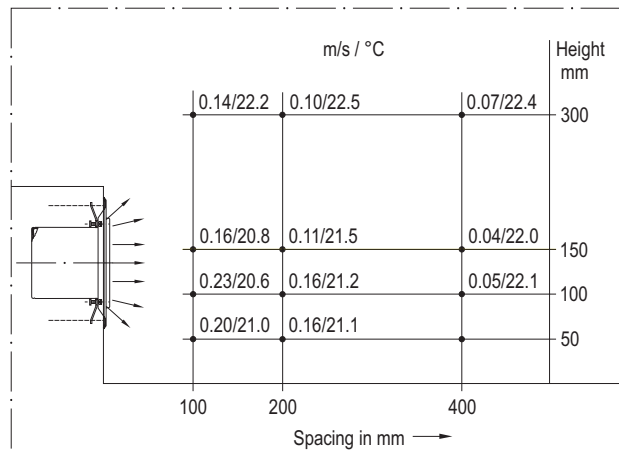


Fig. 6: Circular step displacement outlet DN 80  
 Example of air velocities and temperatures in the leg zone, supply air volume flow rate  $10 \text{ l/s}$  [ $35 \text{ m}^3/\text{h}$ ] per outlet, outlet spacing  $0.65 \text{ m}$ ; temperature difference  $\Delta\vartheta_{\text{ZL-RL}} = -4 \text{ K}$ .

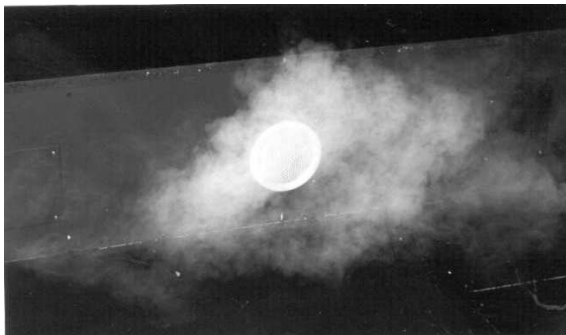
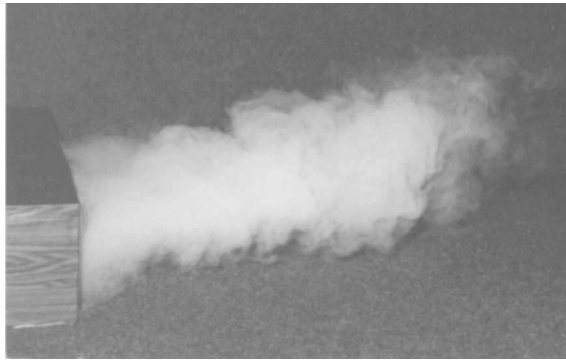
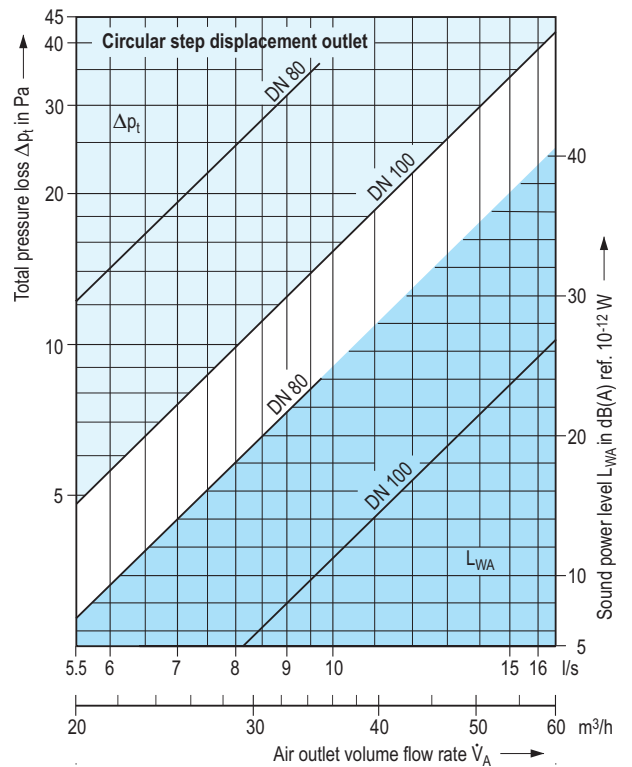
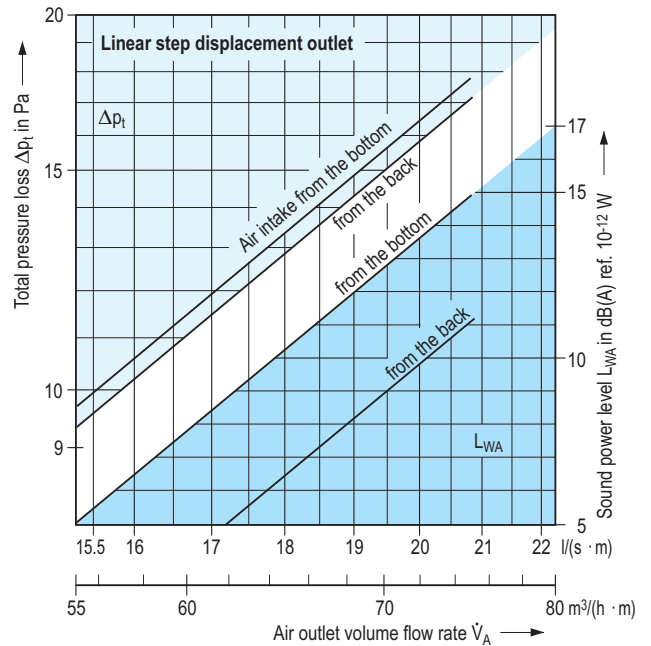


Fig. 7: Jet pattern made visible with smoke tracer  
top: Linear step displacement outlet  
bottom: Circular step displacement outlet

### Sound power level and pressure loss



### Technical data

	Linear step displacement outlet	Circular step displacement outlet	
		DN 80	DN 100
Max. supply air volume flow rate	21 l/(s · m)	10 l/s	16.5 l/s
	75 m <sup>3</sup> /(h · m)	35 m <sup>3</sup> /h	60 m <sup>3</sup> /h
Discharge velocity	≤ 0.18 m/s	Largely radial discharge	
Supply air temperature	≥ 19°C	≥ 19°C	
Temperature difference supply air–indoor air <sup>1)</sup>	≤ - 4 K	≤ - 4 K	
	≤ -12 K	≤ -12 K	
Height or largest visible diameter	120 mm <sup>2)</sup>	Ø 146 mm	Ø 212 mm
Depth	75 mm	80 mm	
Length	Preferably 1200 mm for 2 seats	—	

Step displacement outlet		Air outlet volume flow rate				Total pressure loss $\Delta p_t$ Pa	Sound power level $L_{WA}$ in dB ref. $10^{-12}$ W								
		$\dot{V}_A$					$L_{WA}$ dB(A)	Octave band centre frequency in Hz							
		l/s	m <sup>3</sup> /h	l/(s · m)	m <sup>3</sup> /(h · m)			125	250	500	1 K	2 K	4 K	8 K	
Linear	H = 120 mm, L = 1200 mm	20	72	17	60	11	4	11	7	< 7	< 7	< 7	< 7	< 7	< 7
	Intake from the back	25	90	21	75	17	11	18	11	7	9	< 7	< 7	< 7	< 7
	H = 120 mm, L = 1200 mm	20	72	17	60	12	8	15	8	< 7	< 7	< 7	< 7	< 7	
	Intake from the bottom	25	90	21	75	18	15	22	15	12	11	< 7	< 7	< 7	
Circular	DN 80	7	25	—	—	19	14	18	11	10	8	< 7	< 7	< 7	
		10	35	—	—	36	24	26	18	19	22	13	< 7	< 7	
	DN 100	11	40	—	—	18	14	16	10	11	7	< 7	< 7	< 7	
		16.5	60	—	—	42	27	24	21	24	24	18	11	< 7	

<sup>1)</sup> At head level of seated person  
<sup>2)</sup> Other heights, possibly including inactive surfaces, on request

### Linear step displacement outlet

Type with frame and screws: Fig. 8a

Type with frame and claw fasteners: Fig. 8b

The air outlet is inserted in the correct position (see 'Top' label) into the step cutout till it abuts the step front. It is then aligned vertically and horizontally. The frame with rear sealing strip is pressed against the step front and screwed up (Fig. 8a) or locked by turning the lock screws of the claw fasteners (Fig. 8b).

Type without frame: Fig. 8c

Two fixing brackets per outlet are to be fastened by the client inside the step cutout, using tacks or screws. While each fixing bracket is fitted with a fastening bolt, the back wall of the air outlet has 2 openings provided with springs. When inserting the outlet and pressing it against the fixing brackets, the fastening bolts catch into the springs; the outlet is fixed.

The fixing brackets and a template for their correct positioning are supplied together with the outlets.

Please take care that:

- the fixing brackets are put in place with the fastening bolts in their upper halves,
- the air outlet is inserted in the correct position (see 'Top' label).

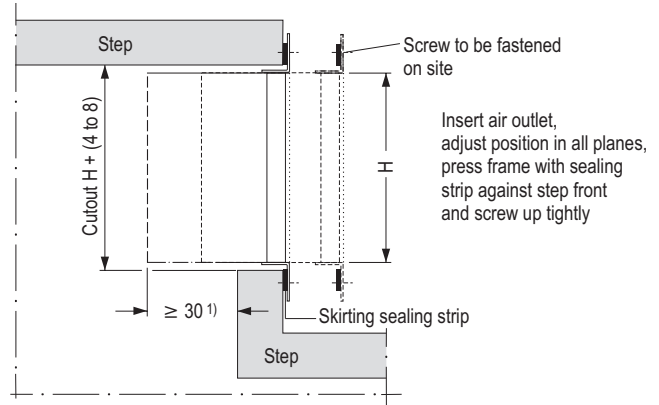


Fig. 8a: Type with frame and screws

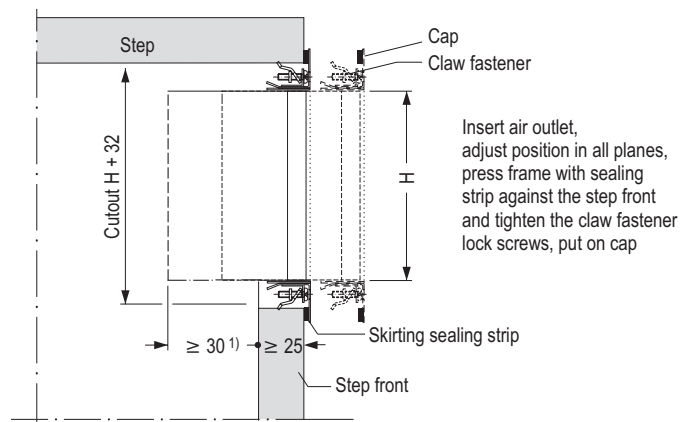
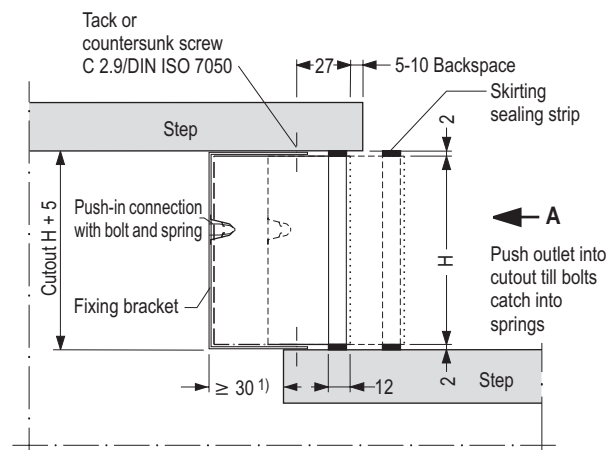
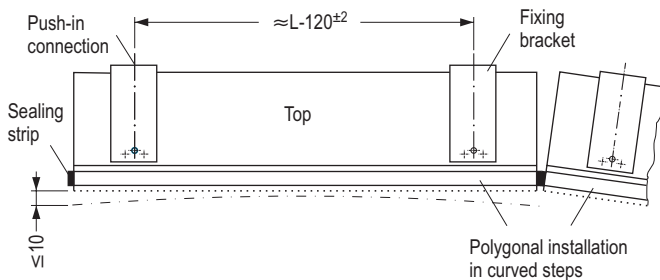
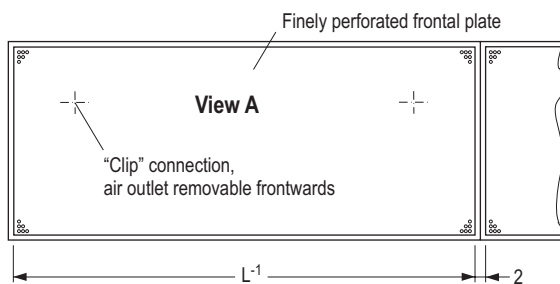


Fig. 8b: Type with frame and claw fasteners



1) With air flow from the bottom

Fig. 8c: Type without frame for fastening to fixing brackets

Fig. 8: Mounting sketch for linear step displacement outlet with and without frame

### Circular step displacement outlet

Take off the outlet's frontal plate by loosening the fastening screw (see detail Y) with the special Allen key (with hexagonal ball head) provided with the outlet. Insert the outlet into the circular cutout and adjust it so that the slot provided for locking the frontal plate is at the top (see detail X). Tighten the screws of the claw fasteners evenly while pressing on the outlet. Hook the frontal plate into the slot of the outlet housing and screw it up (see detail Y).

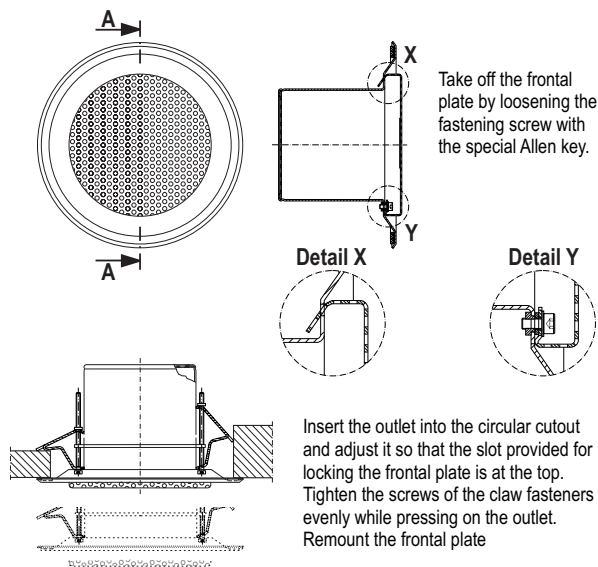


Fig. 9: Mounting sketch for circular step displacement outlet, showing DN 80 (Similar mounting for DN 100)

### Features

- Air distribution system for lecture halls, congress halls, theatres and other assembly rooms with or without fixed seating
- Installation in wooden or concrete steps
- Low-turbulence jet dispersion close to floor according to the principle of displacement ventilation
- Avoidance of jet constriction and acceleration effects thanks to built-in jet straightener in the linear step displacement outlet
- Ideal jet spread with great reduction of indoor air velocity with the circular displacement outlet
- Draught-free fresh air supply to the occupied zone
- Available in linear shape, height = 120 mm, or circular shape, size DN 80 and size DN 100
- Air supply from pressurized plenum under the floor
- Air intake from the back. With the linear step displacement outlet, air intake also possible from the bottom
- Very low sound power level
- Volume flow rate up to 21 l/(s · m) [75 m<sup>3</sup>/(h · m)] for linear step displacement outlet and up to 16.5 l/s [60 m<sup>3</sup>/h] for circular step displacement outlet
- Temperature differences between: supply air and indoor air up to - 4 K, supply air and return air up to - 12 K, depending on thermal load and room height
- Linear step displacement outlet available with or without frame; circular step displacement outlet fitted with exit flange
- Depending on type, fastening to step with fixing brackets, screws, or claw fasteners

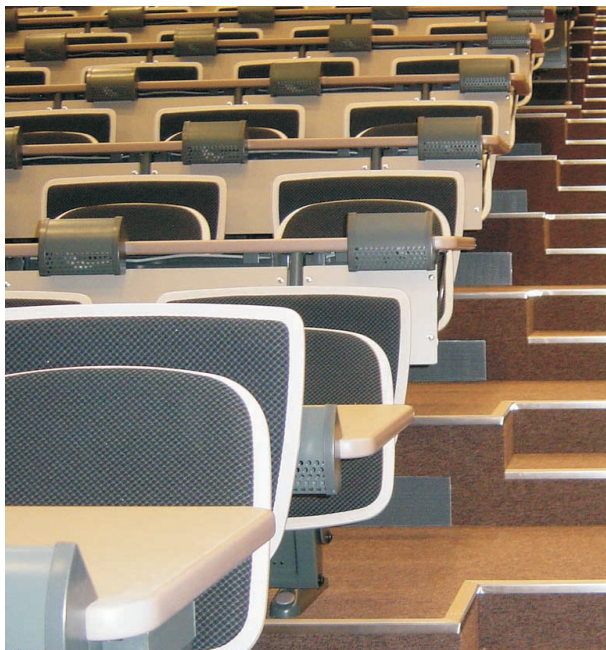


Fig. 10: Linear step displacement outlet in the Kansai University, Osaka



Fig. 11: Circular step displacement outlet, University of Leipzig

## Type code

Q - S - - - - -  
 Step displacement outlet  
 Kind / Function  
 Height / Diameter  
 Length (Q-SL only)  
 Fastening

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

Kind / Function  
 L - Linear  
 R - Circular  
 displacement  
 outlet

Height (Q-SL): 120 mm

Length (Q-SL)  
 500, 1000, 1200 mm

## Diameter (Q-SR)

DN 80 and DN 100 mm

## Fastening

B = with fixing brackets (Q-SL)

S = with screws (Q-SL)

K = with claw fasteners (Q-SL and Q-SR)

## Examples:

Linear step displacement outlet 120 mm high,  
 1000 mm long, with frame and screws

Q-SL-120-1000-S

Circular step displacement outlet, size DN 80

Q-SR-DN 80-K

## Tender text

..... units

**Linear step displacement outlet**, type Q-SL,  
 **Circular step displacement outlet**, type Q-SR,  
 for installation in a step cutout or bore, designed for  
 low-turbulence, draught-free fresh air supply to the oc-  
 cupied zone,  
 consisting of:

finely perforated frontal plate to generate low-turbulence  
 discharge flow according to the principle of displace-  
 ment ventilation,

perforated intake or fixed throttle for even air supply,  
 especially when several outlets are connected to the  
 floor plenum.

## Type Q-SL

Air intake from pressurized plenum, intake at  the back,  
 the bottom of the outlet,  
 jet straightener to raise jet on discharge side,  
 with frame and  
 screws,  
 claw fasteners <sup>1)</sup>,  
 without frame, with fixing brackets for push-in con-  
 nection,  
 skirting seal for ensuring airtightness.

## Technical data

Volume flow rate: ..... l/s (m<sup>3</sup>/h)  
 Perm. sound power level: ..... dB(A) ref. 10<sup>-12</sup> W  
 Pressure loss: ..... Pa  
 Height / Length: 120 mm <sup>2)</sup> / ..... mm  
 Step displacement outlet: Galvanized sheet metal  
 Visible part painted to RAL .....  
 Jet straightener: Polycarbonate PC GF 10, dark grey  
 Make: KRANTZ KOMPONENTEN  
 Type: Q - SL - 120 - \_\_\_ - \_\_\_

## Accessories:

..... units  
 Template for fastening type B (with fixing brackets)

## Type Q-SR

Air intake from pressurized plenum,  
 skirting seal at the back of the exit flange to ensure  
 airtightness,  
 concealed hexagon socket screws at claw fasteners.

## Technical data

Volume flow rate: ..... l/s (m<sup>3</sup>/h)  
 Perm. sound power level: ..... dB(A) ref. 10<sup>-12</sup> W  
 Pressure loss: ..... Pa  
 Size: DN .....  
 Step displacement outlet: Galvanized sheet metal  
 Visible part painted to RAL .....  
 Make: KRANTZ KOMPONENTEN  
 Type: Q - SR - DN\_\_\_ - K

– Subject to technical alterations –

<sup>1)</sup> Colourless cap; RAL colour on request

<sup>2)</sup> Other heights on request

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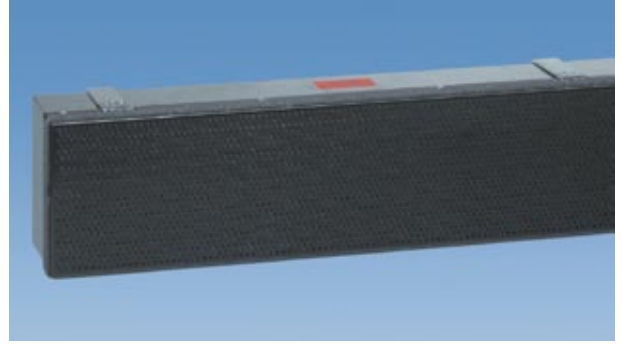
info@krantz.de | www.krantz.de





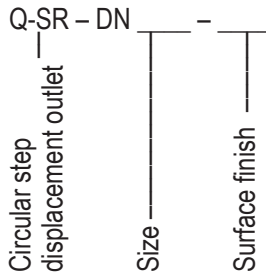


Circular step displacement outlet



Linear step displacement outlet

### Type code



#### Size

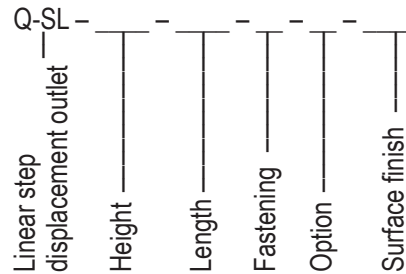
- 80 = DN 80
- 100 = DN 100

#### Surface finish

- .... = Face painted to RAL ....

Subject to technical alteration.

### Type code



#### Height <sup>2)</sup>

- 120 = Height 120 mm

#### Length

- 500 = 500 mm
- 1000 = 1000 mm
- 1200 = 1200 mm

#### Fastening

- B = with bracket
- K = with claw fastener
- S = with screws

#### Option

- H = Air intake from the rear
- U = Air intake from the bottom

#### Surface finish

- .... = Face painted to RAL ....

Subject to technical alteration.

<sup>2)</sup> Other heights on request