

**Krantz**

RL-C2 radial slot outlet

**Air distribution systems**

*Krantz*

# RL-C2 radial slot outlet

## Introduction

The Krantz RL-C2 radial slot outlet with circular face generates a turbulent mixed flow. It is used for supply and return air distribution in comfort air-conditioning systems and has been optimised both acoustically and in terms of flow. Therefore, the slots, as the most important air distribution elements, were completely redesigned. The geometry was improved using state-of-the-art development and production methods such as CFD analyses and rapid prototyping, until the highest standards of room air flow and acoustics were fulfilled. This has also been confirmed in numerous laboratory measurements.

The air outlet can be installed either flush with the ceiling or freely suspended and is available in 4 different sizes. For special uses such as perimeters and corner areas of rooms the otherwise radially symmetrical air discharge can be individually adjusted using special covers.

## Design

The radial slot outlet essentially consists of the air outlet element **1** with circular face and the blades **1a** for radial air discharge. The air outlet element **1** is available not only with a circular connection box **2a** for freely suspended, visible installation but also with a cubical connection box **2b** for installation flush with the ceiling.

The air is supplied via the connection spigot **3**, which is available with and without volume flow damper **4**. The volume flow damper can be adjusted from the room. The air is guided through the connection box **2** and the air outlet element **1** by blades **1a**.

After undoing the central fixing **5** the air outlet element can be removed easily from below. The whole air outlet unit is suspended from fixing points **6** on the connection box.

If used as a return air inlet, the blades **2** are removed <sup>1)</sup> and on request the box is painted black internally.

- Key**
- 1** Air outlet element
  - 1a** Blades
  - 2a** Circular connection
  - 2b** Cubical connection box
  - 3** Connection spigot
  - 4** Volume flow damper
  - 5** Central fastening
  - 6** Fixing points

<sup>1)</sup> optionally available with blades too

<sup>2)</sup> all blades opened;

$\dot{V}_{A \max}$  and  $\dot{V}_{A \min}$  are reduced by closing individual blades

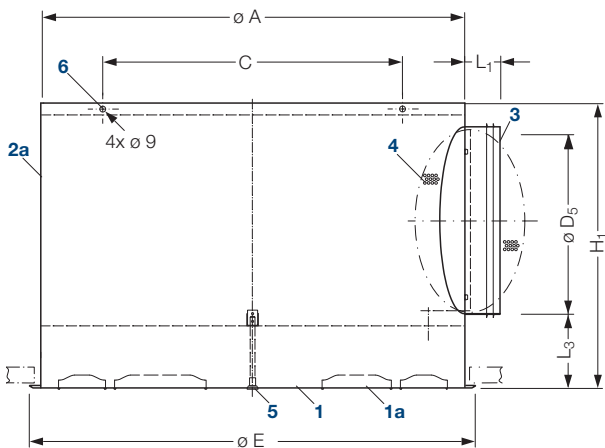


Figure 1: Dimensions with circular connection box

Table 1: Technical data and dimensions

Size		375	470	600	750	
Volume flow rate <sup>2)</sup>	$\dot{V}_{A \max}$	l/s	92	145	220	320
		m <sup>3</sup> /h	330	520	800	1150
	$\dot{V}_{A \min}$	l/s	22	36	61	167
		m <sup>3</sup> /h	80	130	220	600
Discharge height	m	2,5 – 4,5		2,7 – 4,5		
Dimensions						
– ATD	ø E	mm	375	470	600	750
– Circular connection box	ø A	mm	317	402	562	712
	C	mm	225	285	398	504
	ø D <sub>5</sub>	mm	159	199	249	314
	H <sub>1</sub>	mm	285	345	395	480
	L <sub>1</sub>	mm	40	40	60	60
	L <sub>3</sub>	mm	85	105	105	125
– Cubical connection box	B	mm	380	465	625	815
	C	mm	300	380	550	740
	ø D <sub>5</sub>	mm	159	199	249	314
	ø D <sub>6</sub>	mm	314	399	559	708
	H <sub>1</sub>	mm	245	305	355	440
	H <sub>2</sub>	mm	60	80	80	100
	L <sub>1</sub>	mm	40	40	60	60
	L <sub>2</sub>	mm	73	93	93	113
	Weight					
– ATD	kg	1,2	1,9	2,8	4,4	
– Circular connection box	kg	2,9	4,4	7,8	11,6	
– Cubical connection box	kg	4,5	6,0	12,0	18,0	
Max. temperature difference between supply and return air	K	–12 cooling mode (flush with ceiling)				
	K	–10 cooling mode (freely suspended)				
	K	+10 heating mode (<3 m)				
	K	+ 5 heating mode (>3 m)				

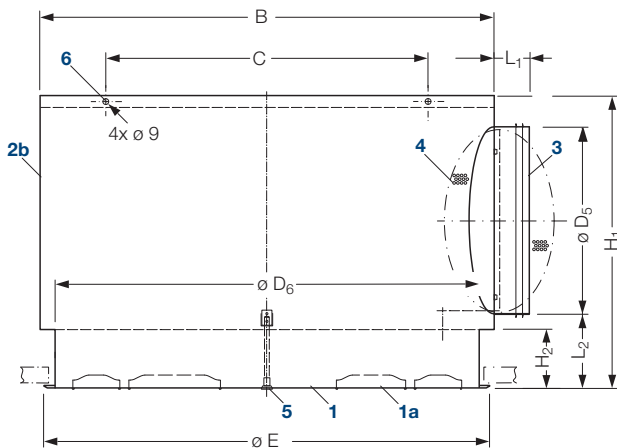


Figure 2: Dimensions with cubical connection box

# RL-C2 radial slot outlet

## Mode of operation

The circular radial slot outlet generates turbulent mixing air flow with high-induction radial air jets. The discharge direction is horizontal.

Due to the specially adapted blade geometry, the same face plate can be used for both flush and freely suspended installation. The air jet exits horizontally below the plate with high velocity. Due to the radial arrangement of the blades, centrifugal force carries the air to the outside far beyond the plate, even with the freely suspended installation. With the flush installation the Coanda effect causes the air jet to be attracted to the ceiling. The large spread of the air jets ensures high induction with the room air and therefore good dissipation of reduction momentum and temperature.

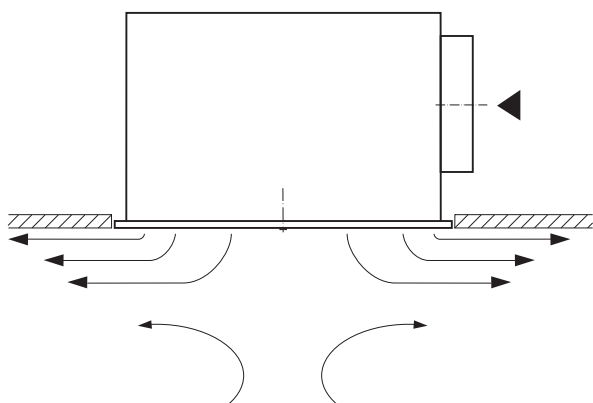


Figure 3: Jet characteristics of outlet installed flush with the ceiling

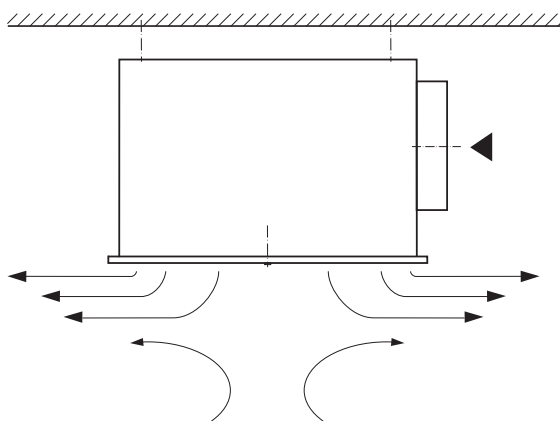


Figure 4: Jet characteristics of outlet freely suspended from the ceiling



Figure 5: Circular radial outlet element with circular connection box

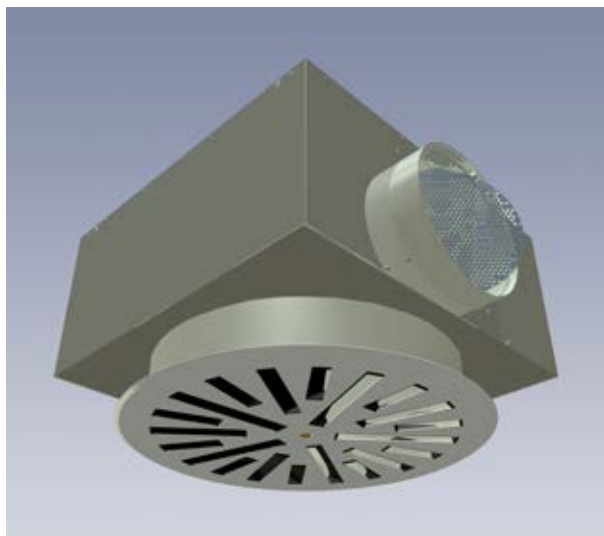


Figure 6: Circular radial outlet element with cubical connection box

### Note

For freely suspended installation we recommend limiting the temperature difference between supply air and room air (or return air) to  $-10\text{ K}$ . This enables stable horizontal air jets to be generated, even with low volume flows.

# RL-C2 radial slot outlet

## Adjustment of discharge direction

### Discharge direction and air flow rates

The radial slot outlet can discharge the supply air horizontally in 4, 3 or 2 directions. For 4-way discharge all blades are open.

If air discharge is required only 3-way, 2-way symmetrical, or 2-way asymmetrical, then several slots are to be closed as shown below.

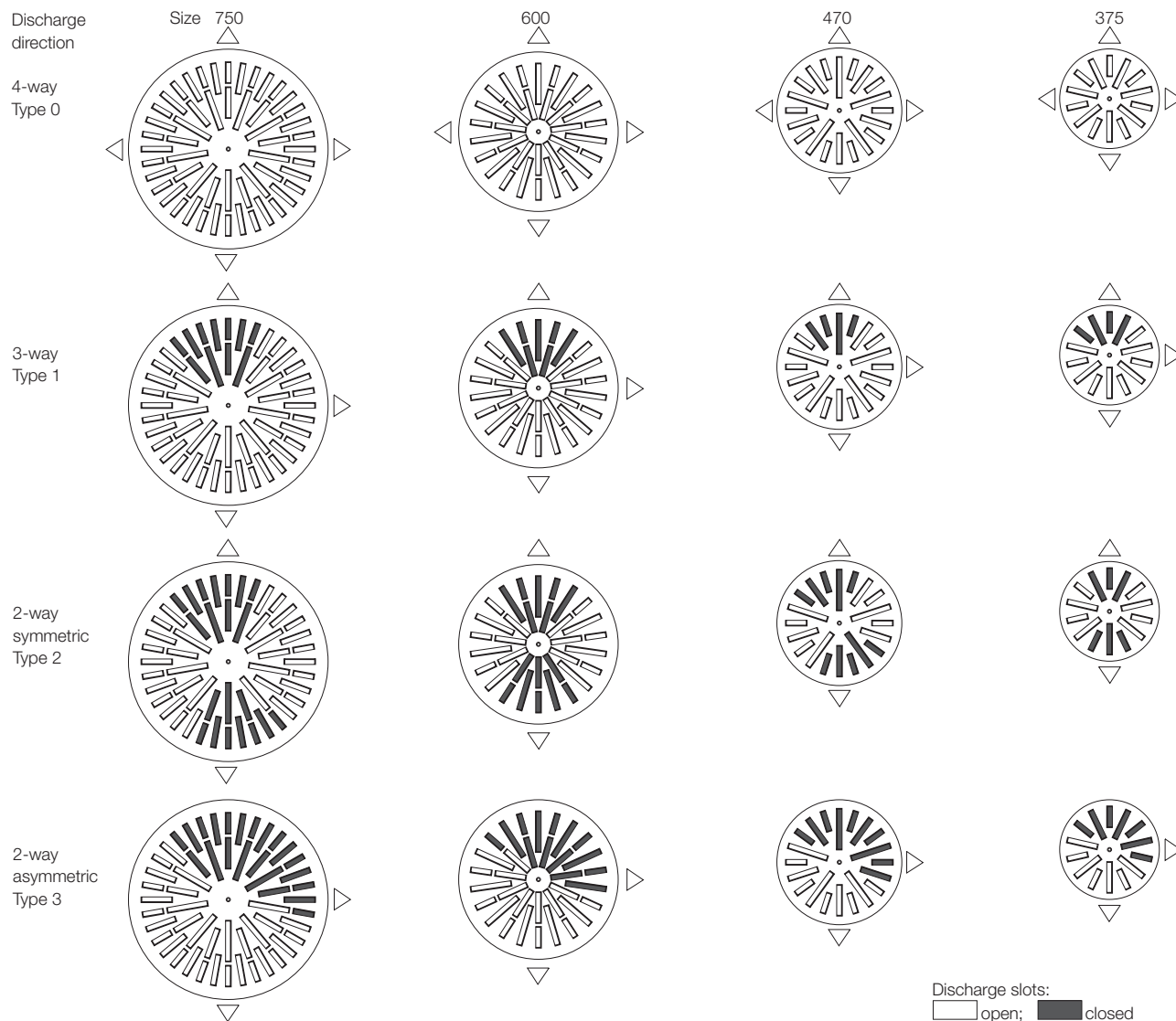
The air flow rate is thus reduced; the related factors can be read from the following table, by use of the following equation:

$$\dot{V}_{\text{Red}} = \dot{V}_A \cdot F$$

**Table 2: Factor F for volume flow reduction**

Jet direction	Size			
	750	600	470	375
4-way	1.0	1.00	1.00	1.00
3-way	0.8	0.78	0.78	0.72
2-way symmetrical	0.6	0.56	0.54	0.59
2-way asymmetrical	0.6	0.56	0.52	0.54

### Adjustment of discharge direction



**Figure 7: Discharge directions obtained by closing several slots**

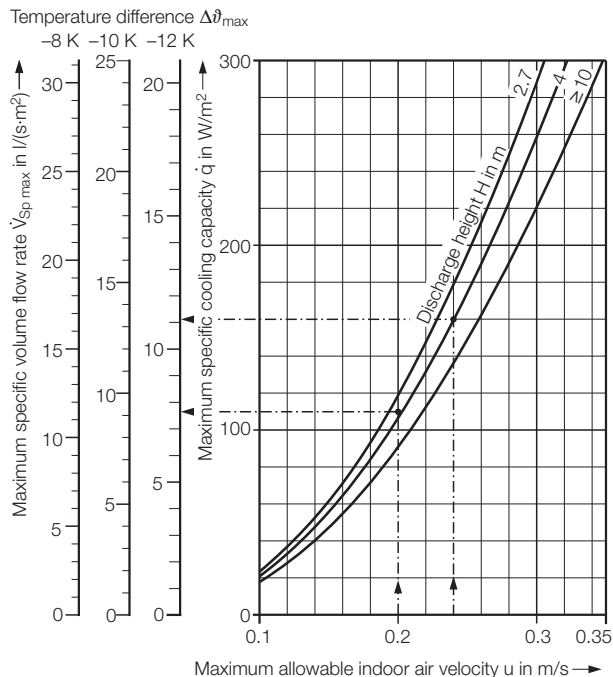
# RL-C2 radial slot outlet

## Comfort criteria <sup>1)</sup>

The outlet layout must comply with the maximum allowable indoor air velocities  $u$  in the occupied zone in 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).

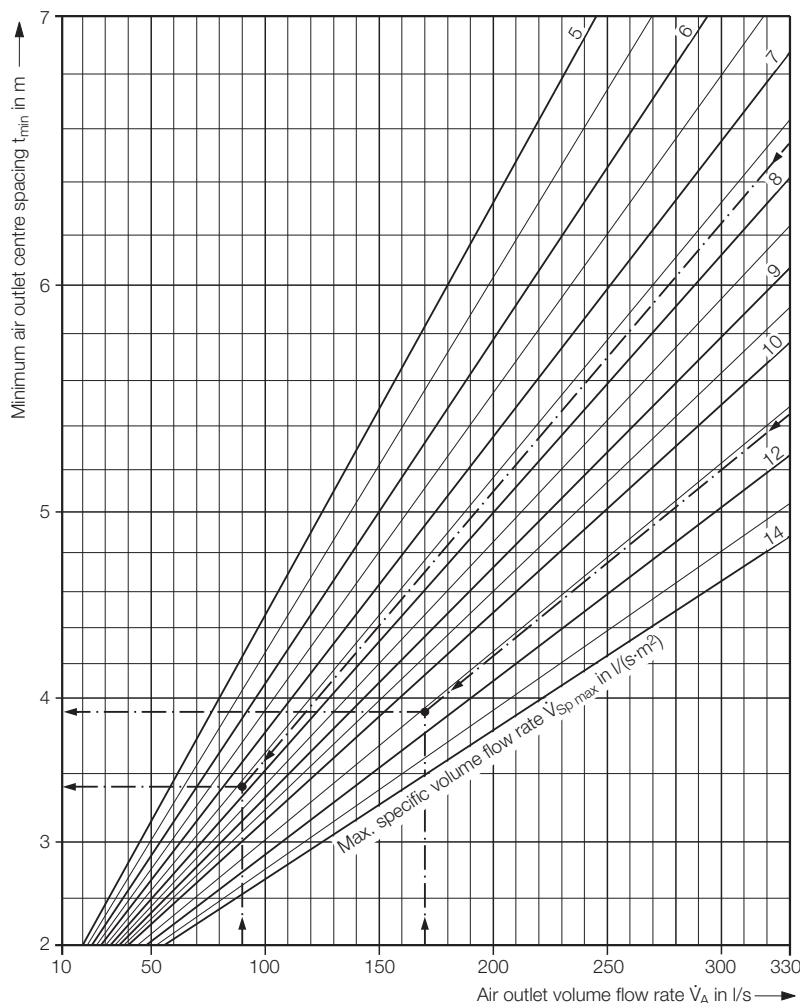
Graph 1 enables the maximum specific volume flow rate  $\dot{V}_{Sp\ max}$  for cooling mode to be determined in relation to the maximum specific cooling capacity and the maximum temperature difference  $\Delta\vartheta_{max}$ . The volume flow rate supplied to the room  $\dot{V}_{Sp\ act}$  may not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

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



Graph 1: Maximum specific volume flow rate

<sup>1)</sup> 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 if cooling in l/s
- $\dot{V}_{A\ min}$  = min. volume flow rate per air outlet if cooling in l/s
- $\dot{V}_{Sp\ max}$  = max. specific volume flow rate per m<sup>2</sup> in l/(s·m<sup>2</sup>)
- $\dot{V}_{Sp\ act}$  = actual specific volume flow rate per m<sup>2</sup> of floor area in l/(s·m<sup>2</sup>)
- $u$  = max. allowable indoor air velocity in m/s
- $\dot{q}$  = max. specific cooling capacity in W/m<sup>2</sup>
- $\Delta\vartheta_{max}$  = 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<sup>-12</sup> W
- $\Delta p_t$  = total pressure drop in Pa

### Size 470 (see layout examples on page 6)

- $\dot{V}_A\ selected$  = 89 l/s
- $\dot{V}_{Sp\ max}$  = 7.6 l/(s·m<sup>2</sup>)
- $t_{min}$  ≈ 3.4 m

### Size 600 (see layout examples on page 6)

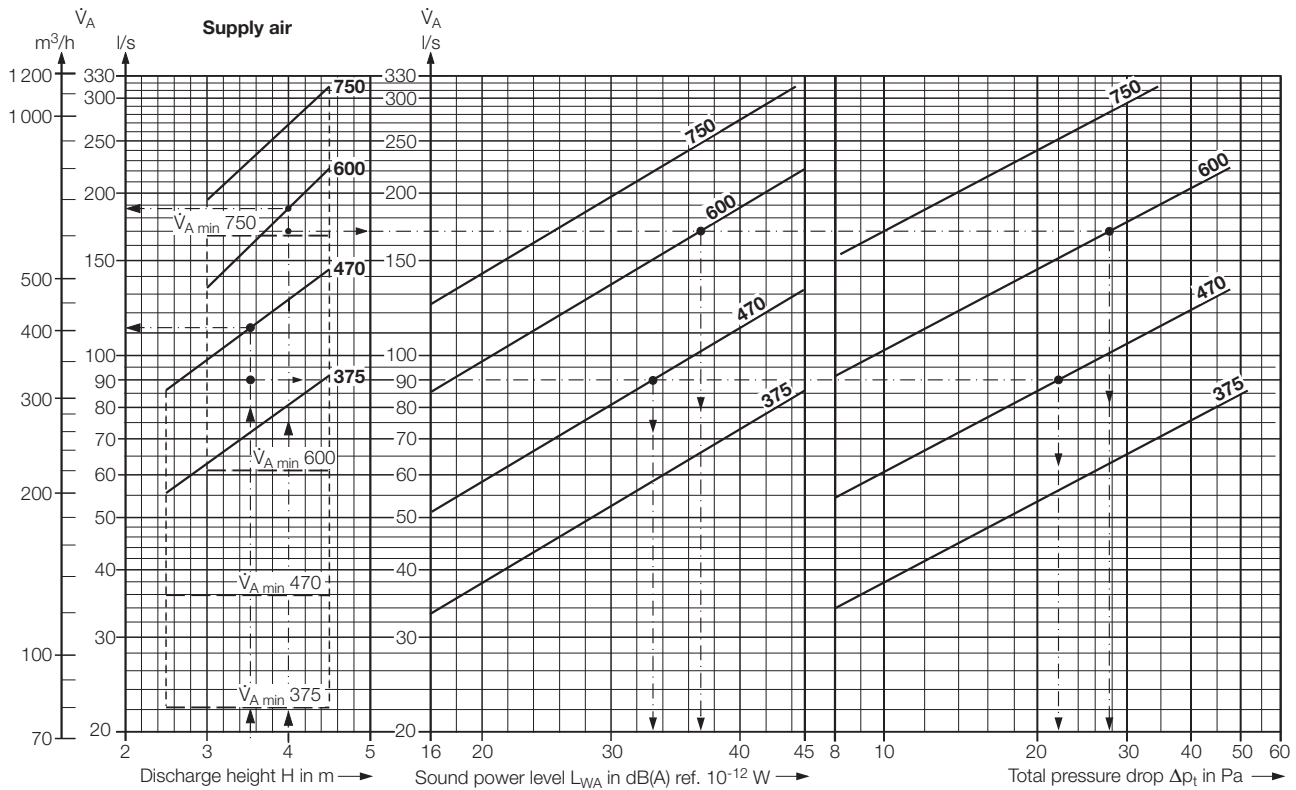
- $\dot{V}_A\ selected$  = 170 l/s
- $\dot{V}_{Sp\ max}$  = 11.1 l/(s·m<sup>2</sup>)
- $t_{min}$  ≈ 3.9 m

Graph 2: Minimum air outlet centre spacing



# RL-C2 radial slot outlet

## Layout for use as supply air outlet



**Table 3: If the cubical connection box is selected, the sound power level and pressure drop change**

Size	$L_{WA}$ in dB(A) ref. $10^{-12}$ W	$\Delta p$ in %
375	+1	-12
470		
600		
750		

**Table 4: Sound power level and pressure drop**

Air outlet volume flow rate $\dot{V}_A$	Pressure drop $\Delta p_t$	Sound power level $L_{W}$ in dB ref. $10^{-12}$ W								
		$L_{WA}$	Octave band centre frequency in Hz							
$l/s$ / $m^3/h$	Pa	dB(A)	63	125	250	500	1K	2K	4K	8K
<b>Size 375</b>										
42 / 150	12	23	25	30	31	19	11	—	—	—
56 / 200	22	31	29	36	39	27	23	10	—	—
69 / 250	35	38	33	41	45	34	32	21	—	—
<b>Size 470</b>										
69 / 250	13	25	30	33	31	21	14	—	—	—
83 / 300	19	31	34	38	36	26	21	—	—	—
97 / 350	26	35	37	43	41	31	27	15	—	—
111 / 400	35	39	40	46	45	34	33	21	—	—
<b>Size 600</b>										
111 / 400	12	24	29	32	29	21	14	—	—	—
139 / 500	18	31	35	39	36	28	21	11	—	—
167 / 600	26	36	41	44	41	34	27	17	—	—
194 / 700	36	41	46	49	46	38	31	22	—	—
<b>Size 750</b>										
139 / 500	7	19	25	27	23	17	12	—	—	—
194 / 700	13	30	36	38	33	28	23	—	—	—
250 / 900	22	37	44	45	41	35	30	16	—	—
305 / 1 100	33	44	50	52	47	42	37	22	—	—

**Table 5: Layout examples**

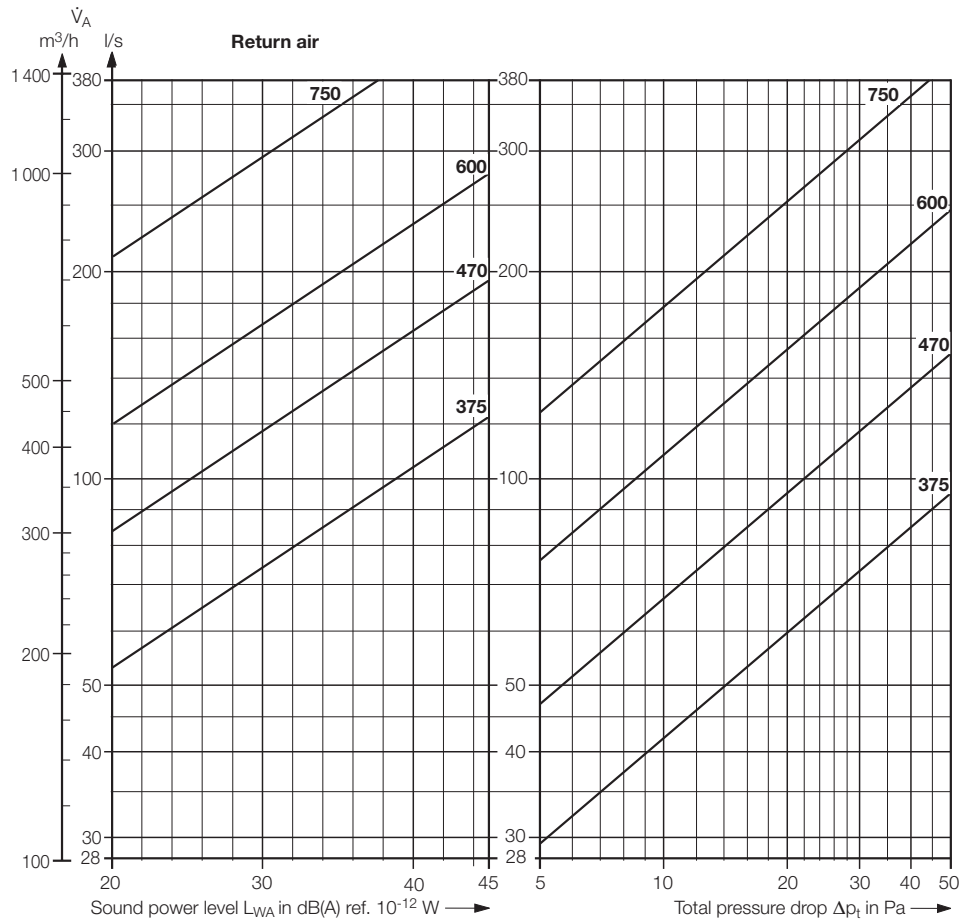
Installation flush with ceiling;			
Size	470	600	
Place of use	Use in toys factory	Department store	
<b>1</b> Supply air volume flow rate $\dot{V}$	$l/s$	5 000	11 000
<b>2</b> Discharge height H	m	3.5	4
<b>3</b> Floor area A	$m^2$	720	2 400
<b>4</b> Max. allowable sound power level $L_{WA}$	dB(A) ref. $10^{-12}$ W	45	45
<b>5</b> Discharge direction		all units 4-way	6 units 3-way rest 4-way
<b>6</b> Comfort criteria (see page 5)			
- Max. allowable indoor air velocity u m/s			
- Max. specific volume flow rate $\dot{V}_{Sp max}$ at $\Delta\theta_{max} = -12$ K	$m^3/(h \cdot m^2)$	0.2	0.24
- Actual specific volume flow rate $\dot{V}_{Sp act}$ [from 1 : 3]	$m^3/(h \cdot m^2)$	7.6	11.1
Criterion is met if $\dot{V}_{Sp actual} < \dot{V}_{Sp max}$		6.9	4.6
<b>From nomogram</b>			
<b>7</b> $\dot{V}_{A max}$	$l/s$	112	192 150 <sup>1)</sup> (192-0.78)   192
<b>8</b> $\dot{V}_A$ selected	$l/s$	90	133 <sup>1)</sup> (170-0.78)   170
<b>9</b> Z	units	56 [from 1 : 8]	6 (specified)   60 <sup>2)</sup>
<b>10</b> $L_{WA}$	dB(A)	33	37   37
<b>11</b> $\Delta p_t$	Pa	22	28   28
<b>12</b> $t_{min}$ [[Graph . S.5 below]	m	$\approx 3.4$	$\approx 3.9$   $\approx 3.9$

<sup>1)</sup> See table page 4

<sup>2)</sup> Number =  $\frac{11\,000 - (133 \cdot 6)}{170} \approx 60$

# RL-C2 radial slot outlet

## Layout for use as return air inlet and features



The diagrams and tables apply to the **circular** connection box with faceplate **without** blades (standard version). All other versions must be determined in accordance with Table 6:

**Table 6: Correction values for sound power level and pressure drop**

Size	$\Delta L_{WA}$ dB(A)	$\Delta p_t$ %
<b>circular</b> connection box		
– with blades		
375	+15	+64
470	+15	+82
600	+11	+70
750	+15	+83
<b>cubic</b> connection box		
– with blades		
375	+10	+69
470	+10	+87
600	+16	+75
750	+10	+88
– without blades		
375		
470	-8	-5
600		
750		

**Table 7: Sound power level and pressure drop**

Air outlet volume flow rate $\dot{V}_A$		Pres- sure drop $\Delta p_t$	Sound power level $L_{Wj}$ in dB ref. $10^{-12}$ W									
			$L_{WA}$ dB(A)	Octave band centre frequency in Hz								
l/s	m³/h	Pa	63	125	250	500	1 K	2 K	4 K	8 K		
<b>Size 375</b>												
69	250	27	28	30	31	32	24	23	15	–	–	
83	300	39	34	35	35	37	28	29	23	10	–	
97	350	52	38	38	39	41	31	34	30	17	–	
111	400	68	42	42	43	44	34	39	37	24	–	
<b>Size 470</b>												
97	350	20	24	23	27	28	24	17	–	–	–	
125	450	34	32	31	34	34	30	28	19	–	–	
153	550	51	39	38	39	39	35	37	28	–	–	
181	650	72	44	44	43	43	38	45	36	–	–	
<b>Size 600</b>												
167	600	23	29	34	33	28	29	22	12	–	–	
194	700	31	34	37	36	32	32	29	20	–	–	
222	800	40	38	39	39	35	35	35	26	13	–	
250	900	51	42	41	42	37	38	40	32	20	–	
<b>Size 750</b>												
222	800	15	21	19	24	17	20	16	–	–	–	
278	1 000	24	28	26	31	23	27	23	12	–	–	
333	1 200	35	34	32	37	29	32	29	17	14	–	
389	1 400	47	38	37	42	34	37	34	22	18	–	

## Features

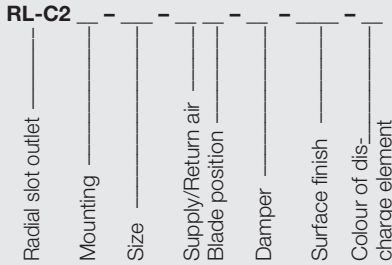
- Turbulent mixing air flow
- Circular air outlet element with circular connection box for freely suspended installation or with cubical connection box for installation flush with ceiling
- Radial symmetrical or asymmetrical jet spread
- Stable supply air jets, even with minimum volume flow
- Maximum temperature difference between supply air and indoor air: –12 K for cooling, +5 K for heating (+10 K up to 3 m room height)
- Low sound power level
- Air outlet element powder-coated to RAL 9010 <sup>1)</sup>
- Black or white blades
- Air outlet element can be removed easily from inside the room
- 4 sizes
- Connection box with built-in volume flow damper, adjustable from the room
- Also available as return air inlet

<sup>1)</sup> other colours on request

# RL-C2 radial slot outlet

## Type code and tender specification text

### Type code



#### Mounting

- D = flush with ceiling (cubical connection box)
- F = freely suspended (circular connection box)

#### Size

- 375 = Size 375                      600 = Size 600
- 470 = Size 470                      750 = Size 750

#### Supply/Return air

- Z = supply air
- A = return air

#### Blade position

##### Supply air

- 0 = 4-way air discharge
- 1 = 3-way air discharge
- 2 = 2-way symmetrical air discharge (180°)
- 3 = 2-way asymmetrical air discharge (90°)

##### Return air

- H = with blades
- N = without blades

#### Damper

- O = without volume flow damper
- R = with volume flow damper adjustable from the room

#### Surface finish

- 9010 = face painted to RAL9010, satin
- .... = face painted to RAL...

#### Colour of discharge element

- S = black similar to RAL 9005
- W = white similar to RAL 9010

## Tender specification text – Supply air outlet

..... units

Radial slot outlet generating high-induction radial air jets for high-quality indoor air flow, with symmetrical or asymmetrical air discharge, for installation flush with ceiling or freely suspended,

consisting of:

- outlet element with circular face and radial, linear slots, discharge direction 4-sided, 3-sided, 2-sided or 2-sided symmetrical asymmetrical; including central fastening screw with cap,
- circular connection box with built-in central fastening for the outlet element, either cubical or circular, suspension brackets on the top, lateral connection spigot with built-in volume flow damper adjustable from room.

Material:

- Outlet element made of galvanized sheet metal, powder-coated, with face painted to RAL 9010, pure white <sup>1)</sup>
- Blades made of polycarbonate PC GF 10, body-tinted similar to RAL 9005, jet-black, or RAL 9010, pure white
- Connection box made of galvanized sheet metal

Make: \_\_\_\_\_ Krantz  
 Type: RL-C2 \_\_ - \_\_ - Z \_\_ - \_\_ - \_\_ - \_\_

## – Return air outlet

..... units

Radial slot outlet as return air inlet, for installation flush with the ceiling or freely suspended,

consisting of:

- outlet element with circular face and radial, linear slots, either with or without blades; including central fastening screw with cap,
- circular connection box with built-in central fastening for the outlet element, either cubic or circular, suspension brackets on the top, lateral connection spigot with built-in volume flow damper adjustable from room.

Material:

- Outlet element made of galvanized sheet metal, powder-coated, with face painted to RAL 9010, pure white <sup>1)</sup>
- Blades made of polycarbonate PC GF 10, dyed similar to RAL 9005, jet-black, or RAL 9010, pure white
- Connection box made of galvanized sheet metal <sup>2)</sup>

Make: \_\_\_\_\_ Krantz  
 Type: RL-C2 \_\_ - \_\_ - A \_\_ - \_\_ - \_\_ - \_\_

Subject to change without notice.

<sup>1)</sup> other colours on request

<sup>2)</sup> On request the connection box is painted black internally





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The logo for Krantz GmbH, featuring the word "Krantz" in a stylized, blue, cursive script font.