Technical information

Ceiling air diffuser
INDULCLIP
INDUDRALL
KOMBICLIP

- Draught-free air distribution
- Differences in supply air temperature of up to –12 K
- 7 sizes from 210 to 800 mm, round or square
- Many different designs
### Description

#### INDULCLIP
A highly inductive ceiling air diffuser available in designs featuring different shapes and colours. The individual clip elements of the ceiling air diffuser deliver high levels of comfort thanks to draught-free air distribution.

- Temperature differences of up to –12 K
- Sizes from 300 ... 800 mm
- Air flow rate from 100…1500 m³/h
- Plenum box with butterfly damper that can be adjusted from inside the room

#### INDUDRALL
A visually appealing highly inductive ceiling air diffuser featuring a designer front plate. The INDUDRALL has been developed specifically for comfort applications. It is ideal for locations where boundary conditions make installation difficult (low room heights, high closeness, high air exchange rate per hour and high thermal loads, for example). Thanks to its very high induction ratio, it can even be installed without a suspended ceiling.

- Temperature differences of up to –12 K
- Extremely low ambient air velocities
- Sizes from 300 ... 800 mm
- Air flow rate from 100…1600 m³/h
- Plenum box with butterfly damper that can be adjusted from inside the room

#### KOMBICLIP
The KOMBICLIP air diffuser combines both clip and swirl elements. These deliver high levels of comfort thanks to draught-free air distribution, in particular where low air flow rates are concerned.

- Temperature differences of up to –12 K
- Size 210 mm
- Air flow rate from 20…200 m³/h
- Installation with a central fastening that cannot be seen from inside the room
## Product overview

### Series INDULCLIP

<table>
<thead>
<tr>
<th>INDULCLIP RR</th>
<th>INDULCLIP RQ</th>
</tr>
</thead>
</table>

#### Round

<table>
<thead>
<tr>
<th>Size</th>
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<th>500</th>
<th>600/625</th>
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<th>300</th>
<th>400</th>
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<th>600/625</th>
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#### Square

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<th>Size</th>
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<th>400</th>
<th>500</th>
<th>600/625</th>
<th>800</th>
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</thead>
</table>

### Acoustic

**Sound power level** $L_w [dB(A)] = 60 \times \log (\dot{V}) [m^3/h] - X [dB(A)]$

- **For supply air**
  - $X [dB(A)]$
    - 94
    - 109
    - 120
    - 128
    - 136
    - 95
    - 110
    - 122
    - 130
    - 138

- **For extract air (with elements)**
  - $X [dB(A)]$
    - 89
    - 103
    - 114
    - 122
    - 132
    - 91
    - 105
    - 117
    - 124
    - 134

- **For extract air (without elements)**
  - $X [dB(A)]$
    - 101
    - 114
    - 124
    - 132
    - 134
    - 105
    - 117
    - 128
    - 135
    - 138

### Maximum air flow rate [m$^3$/h]

- **at $L_w = 35$ dB(A)**
  - 138
  - 248
  - 388
  - 524
  - 713
  - 146
  - 262
  - 411
  - 557
  - 765

- **at $L_w = 40$ dB(A)**
  - 168
  - 300
  - 470
  - 635
  - 864
  - 177
  - 317
  - 497
  - 675
  - 927

- **at $L_w = 45$ dB(A)**
  - 203
  - 364
  - 570
  - 769
  - 1047
  - 214
  - 384
  - 603
  - 818
  - 1123

- **at $L_w = 50$ dB(A)**
  - 246
  - 441
  - 690
  - 932
  - 1268
  - 259
  - 465
  - 730
  - 991
  - 1360

### Minimum necessary air flow rate [m$^3$/h]

- **40**
- **60**
- **100**
- **170**
- **280**
- **60**
- **60**
- **100**
- **170**
- **280**

### Pressure loss $\Delta p_{st} [Pa] = \dot{V}^2 [m^3/h] / k$

- **For supply air** $k = 693$
  - 2660
  - 7530
  - 18600
  - 47800
  - 693
  - 2660
  - 7530
  - 18600
  - 47800

- **For extract air (with elements)** $k = 423$
  - 1450
  - 4030
  - 8870
  - 18000
  - 423
  - 1450
  - 4030
  - 8870
  - 18000

- **For extract air (without elements)** $k = 1130$
  - 3610
  - 8910
  - 22800
  - 28800
  - 1130
  - 3610
  - 8910
  - 22800
  - 28800

### Dimensions [mm]

- **Plenum box height in [mm]**
  - 210
  - 245
  - 285
  - 335
  - 335
  - 210
  - 245
  - 285
  - 335
  - 335

- **Nominal size, socket**
  - 125
  - 160
  - 200
  - 250
  - 250
  - 125
  - 160
  - 200
  - 250
  - 250

### Types of mounting

- **4-point fastening**
  - ✓
  - ✓
  - ✓
  - -
  - -
  - ✓
  - ✓
  - ✓
  - ✓
  - -

- **Central fastening**
  - ✓
  - ✓
  - ✓
  - ✓
  - ✓
  - ✓
  - ✓
  - ✓
  - ✓
  - ✓

- **Stock availability of square**
  - -
  - -
  - -
  - -
  - ✓
  - ✓
  - ✓
  - ✓
  - -
## Ceiling air diffuser INDULCLIP // INDUDRALL // KOMBICLIP

### Technical modifications reserved

**Kiefer Klimatechnik**  
www.kieferklima.de

### INDULCLIP RR+  
Round | Square
--- | ---
400 | 500 | 600/625 | 800 | 400 | 500 | 600/625 | 800

| 110 | 124 | 128 | 139 | 111 | 125 | 130 | 141 |
| 109 | 120 | 126 | 136 | 111 | 123 | 128 | 138 |
| 119 | 129 | 135 | 137 | 122 | 132 | 138 | 141 |
| 260 | 443 | 528 | 790 | 274 | 468 | 561 | 845 |
| 315 | 537 | 640 | 957 | 332 | 567 | 680 | 1024 |
| 382 | 650 | 775 | 1159 | 403 | 687 | 823 | 1241 |
| 462 | 788 | 939 | 1404 | 488 | 832 | 997 | 1503 |
| 60 | 120 | 190 | 330 | 60 | 120 | 190 | 330 |
| 3400 | 11300 | 21500 | 66100 | 3400 | 11300 | 21500 | 66100 |
| 2200 | 6030 | 11800 | 22900 | 2200 | 6030 | 11800 | 22900 |
| 5650 | 13900 | 29400 | 38800 | 5650 | 13900 | 29400 | 38800 |
| 245 | 285 | 335 | 335 | 245 | 285 | 335 | 335 |
| 160 | 200 | 250 | 250 | 160 | 200 | 250 | 250 |

- ✓ ✓ - - ✓ ✓ - - ✓ ✓ ✓ ✓ ✓
- ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓
- - - - ✓ ✓ ✓ ✓

### INDULCLIP RQ+  

### KOMBICLIP 210  
Round |
--- |
210 |

- 81 |
- 82 |
- 93 |
- 87 |
- 105 |
- 127 |
- 154 |
- 20 |
- 350 |
- 260 |
- 656 |
- 170 |
- 100 |
- ✓ |
- |

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**Kiefer Klimatechnik**  
www.kieferklima.de  
Ceiling air diffuser INDULCLIP // INDUDRALL // KOMBICLIP  
Technical modifications reserved
## Product overview

### Series INDUDRALL

<table>
<thead>
<tr>
<th>Size</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>600/625</th>
<th>800</th>
<th>300</th>
<th>400</th>
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</table>

### Acoustic

**Sound power level** $L_w [\text{dB(A)}] = 60 \times \log (\dot{V}) [\text{m}^3/\text{h}] – X [\text{dB(A)}]$

- **for supply air**
  - $X [\text{dB(A)}]$  
    - 90  
    - 106  
    - 117  
    - 126  
    - 135  
    - 92   
    - 108  
    - 119  
    - 129  
    - 138  

- **for extract air (with elements)**
  - $X [\text{dB(A)}]$  
    - 92  
    - 107  
    - 116  
    - 129  
    - 138  
    - 92   
    - 107  
    - 117  
    - 129  
    - 139  

- **for extract air (without elements)**
  - $X [\text{dB(A)}]$  
    - 103  
    - 117  
    - 126  
    - 136  
    - 139  
    - 104  
    - 117  
    - 127  
    - 137  
    - 139  

### Maximum air flow rate [m$^3$/h]

- at $L_w$= 35 dB(A)  
  - 121  
  - 221  
  - 338  
  - 488  
  - 682  
  - 133  
  - 243  
  - 375  
  - 540  
  - 773  

- at $L_w$= 40 dB(A)  
  - 147  
  - 267  
  - 410  
  - 592  
  - 826  
  - 161  
  - 295  
  - 454  
  - 654  
  - 936  

- at $L_w$= 45 dB(A)  
  - 178  
  - 324  
  - 496  
  - 717  
  - 1000  
  - 195  
  - 357  
  - 550  
  - 793  
  - 1134  

- at $L_w$= 50 dB(A)  
  - 216  
  - 392  
  - 601  
  - 868  
  - 1212  
  - 236  
  - 433  
  - 667  
  - 961  
  - 1374  

### Minimum necessary air flow rate [m$^3$/h]

- 40  
- 60  
- 120  
- 190  
- 340  
- 40  
- 60  
- 120  
- 190  
- 340

### Pressure loss $\Delta p_{st} [\text{Pa}] = \dot{V}^2 [\text{m}^3/\text{h}] / k$

- **For supply air**
  - $k= 1010$  
  - 4170  
  - 11400  
  - 30600  
  - 70600  
  - 1010  
  - 4170  
  - 11400  
  - 30600  
  - 70600  
  - 70600  

- **For extract air (with elements)**
  - $k= 700$  
  - 2660  
  - 6330  
  - 16600  
  - 26600  
  - 700  
  - 2660  
  - 6330  
  - 16600  
  - 26600  

- **For extract air (without elements)**
  - $k= 1270$  
  - 4360  
  - 9930  
  - 28300  
  - 32300  
  - 1270  
  - 4360  
  - 9930  
  - 28300  
  - 32300  

### Dimensions [mm]

- **Plenum box height in [mm]**
  - 210  
  - 245  
  - 285  
  - 335  
  - 335  
  - 210  
  - 245  
  - 285  
  - 335  
  - 335  

- **Nominal size, socket**
  - 125  
  - 160  
  - 200  
  - 250  
  - 250  
  - 125  
  - 160  
  - 200  
  - 250  
  - 250  

### Types of mounting

- **4-point fastening**
  - ✔️  
  - ✔️  
  - ✔️  
  - -  
  - -  
  - ✔️  
  - ✔️  
  - ✔️  
  - -  
  - -  

- **Central fastening**
  - ✔️  
  - ✔️  
  - ✔️  
  - ✔️  
  - ✔️  
  - ✔️  
  - ✔️  
  - ✔️  
  - ✔️  
  - ✔️  

- **Stock availability of square**
  - -  
  - -  
  - -  
  - -  
  - ✔️  
  - ✔️  
  - ✔️  
  - ✔️  
  - -  

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Ceiling air diffuser INDULCLIP // INDUDRALL // KOMBICLIP

Technical modifications reserved

Kiefer Klimatechnik

www.kieferklima.de
## INDUDRALL V

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</table>

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- ✓ ✓ ✓ ✓ -
Overview INDULCLIP RR/RQ

Type R
With round (RR) or square (RQ) front plate
See pages 20 - 23 for design diagrams.

The front plate is coated in white (RAL 9010). The individual air guide elements are UV-resistant and antistatic. They are available in matt black or light grey (similar to RAL 7035). Other colour combinations for the both front plate and the air guide elements are available on request.

Ranges of application:
• Comfort and industrial applications
• Restaurants and department stores
• Libraries and public buildings

The individual clip elements deliver high levels of comfort thanks to draught-free air distribution.

Types of flow
The air jets flowing through the air guide elements generate a stable tangential flow flush with the ceiling. The Coanda effect draws the jet to the ceiling. The resulting induction of the ambient air causes both temperature and velocity to fall to optimum levels.
Overview INDULCLIP RR/RQ

INDULCLIP RQ 500
500 x 500 mm
INDULCLIP RR 500
Ø 500 mm

INDULCLIP RQ 600/625
600 x 600 mm / 625 x 625 mm
INDULCLIP RR 600/625
Ø 600 mm / Ø 625 mm

INDULCLIP RQ 800
800 x 800 mm
INDULCLIP RR 800
Ø 800 mm

INDULCLIP at University Hospital Salzburg - SALK in Austria.

Discharge characteristics with smoke. Tested in the laboratory of KIEFER.
Overview KOMBICLIP / INDULCLIP RR+/RQ+

KOMBICLIP type
With round front plate
See pages 20 and 21 for design diagrams.

Type R+
With round (RR+) or square (RQ+) front plate
See pages 20 and 21 for design diagrams.

The front plate is coated in white (RAL 9010). The individual air guide elements are UV-resistant and anti-static. They are available in matt black or light grey (similar to RAL 7035). Other colour combinations for the both front plate and the air guide elements are available on request.

Ranges of application:
- Comfort and industrial applications
- Restaurants and department stores
- Libraries and public buildings

The individual clip elements deliver high levels of comfort thanks to draught-free air distribution. This INDULCLIP design is characterized by the increased number of clip elements.

The INDULCLIP air guide elements
Proven highly inductive air guide elements, which can be combined to create customized linear diffusers.

The INDULCLIP elements can be supplied either as component parts of a complete air diffuser or as individual parts. In each case, the air flow rate is determined by the number of INDULCLIP air guide elements used and how they are arranged, as well as by the installation height, the spacing between elements and the acoustic requirement.

Create your own personal design – we’ll calculate the technical data for you!
<table>
<thead>
<tr>
<th>Model</th>
<th>Size/Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDULCLIP RQ 500+</td>
<td>500 x 500 mm</td>
</tr>
<tr>
<td>INDULCLIP RR 500+</td>
<td>Ø 500 mm</td>
</tr>
<tr>
<td>INDULCLIP RQ 600+/625+</td>
<td>600 x 600 mm / 625 x 625 mm</td>
</tr>
<tr>
<td>INDULCLIP RR 600+/625+</td>
<td>Ø 600 mm / Ø 625 mm</td>
</tr>
<tr>
<td>INDULCLIP RQ 800+</td>
<td>800 x 800 mm</td>
</tr>
<tr>
<td>INDULCLIP RR 800+</td>
<td>Ø 800 mm</td>
</tr>
</tbody>
</table>

INDULCLIP in visible assembly at the office of Breuninger Stuttgart.
Overview INDUDRALL KR/KQ

Type K
With round (KR) or square (KQ) front plate
See pages 28 - 31 for design diagrams.

The front plate is coated in white (RAL 9010). The individual air guide elements are UV-resistant and anti-static. They are available in matt black or light grey (similar to RAL 7035). Other colour combinations for the both front plate and the air guide elements are available on request.

Ranges of application:
- Comfort and industrial applications
- Restaurants and department stores
- Libraries and public buildings

The individual swirl elements deliver high levels of comfort thanks to draught-free air distribution.

Types of flow
With the INDUDRALL, air flows out of the front plate like a fan. Each of the blocks, which are made up of single elements generates jets, which are ideal for ambient air induction. Hardly have the jets exited the diffuser than the sub-normal temperatures are reduced to the greatest possible extent. A highly turbulent ambient air flow is created, representing the optimum with regard to low ambient air velocities and temperature differences.
Overview INDUDRALL KR/KQ

INDUDRALL KQ 500
500 x 500 mm
INDUDRALL KR 500
Ø 500 mm

INDUDRALL KQ 600/625
600 x 600 mm / 625 x 625 mm
INDUDRALL KR 600/625
Ø 600 mm / Ø 625 mm

INDUDRALL KQ 800
800 x 800 mm
INDUDRALL KR 800
Ø 800 mm

INDUDRALL at Land Securities Head Office London.

Discharge characteristics in smoke.
Kiefer ambient air flow laboratory.
Overview INDUDRALL V

Type V
With square front plate
See pages 32 - 33 for design diagrams.

The front plate is coated in white (RAL 9010). The individual air guide elements are UV-resistant and antistatic. They are available in matt black or light grey (similar to RAL 7035). Other colour combinations for the both front plate and the air guide elements are available on request.

Ranges of application:
- Comfort and industrial applications
- Restaurants and department stores
- Libraries and public buildings

The individual swirl elements deliver high levels of comfort thanks to draught-free air distribution.

The INDUDRALL air guide elements
Proven highly inductive air guide elements, which can be combined to create customized linear diffusers.

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Create your own personal design – we’ll calculate the technical data for you!
Overview INDUDRALL V

INDUDRALL V 500
500 x 500 mm

INDUDRALL V 600
600 x 600 mm / 625 x 625 mm

INDUDRALL V 800
800 x 800 mm

Fielmann Store, Stuttgart
Technical notes

Types of mounting

The ceiling air diffusers can be fitted with two different types of mounting system:

- 4-point fastening using countersunk self-tapping screws with cap
- Central fastening using a screw in the centre of the plate

The plenum box has a butterfly damper for making adjustments from inside the room. Each box also features 4 drill holes Ø 9 mm for attachment purposes.

KOMBICLIP fastening

Invisible central fastening to the central cross-bar with M6 x 30 screw for quick installation.

Instructions for arranging the diffusers

Recommendation:

Set the parallel distances with $2 \times x_1$ or $2 \times x_2 \leq 4$ m for a room height of approx. 3 m. If possible, the diffusers should be arranged uniformly in the room and the load to which each one is exposed should be equally distributed.

- Wall distance $x_{w1}$ or $x_{w2} \geq x_1$ or $x_2$
- Aim for symmetrical jet geometry and uniform arrangement of air diffusers in the room

Lay out with the smaller dimension of $x_1 \times x_2$. If there is only one diffuser in the room, the layout must be based on the smaller dimension of $x_{w1}, x_{w2}$.

Definition of jet path

- $x_1, x_2, x_{w1}, x_{w2}$
- $y$
- $H$
- $X_{1,2}$
Technical notes

Dimensions of the plenum box + front plate

Square (RQ, RQ+, KQ, V)

<table>
<thead>
<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>H₁</th>
<th>H₂</th>
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<tr>
<td>400x400</td>
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Round (RR, RR+, KR, KOMBICLIP)

<table>
<thead>
<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>H₁</th>
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<td>210</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Ø 480</td>
<td>400</td>
<td>382</td>
<td>189</td>
<td>140</td>
<td>245</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ø 580</td>
<td>500</td>
<td>482</td>
<td>100</td>
<td>185</td>
<td>285</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ø 680</td>
<td>600</td>
<td>582</td>
<td>240</td>
<td>185</td>
<td>335</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ø 880</td>
<td>800</td>
<td>782</td>
<td>240</td>
<td>185</td>
<td>335</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KOMBICLIP</td>
<td>210</td>
<td>185</td>
<td>90</td>
<td>110</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Measurement methods and standards

According to DIN EN ISO 7730:2007, the "local air velocity" is the air velocity measured at an arbitrary point in the common area and averaged over 3 minutes.

Measurement method: DIN EN 13182:2002
Common area: DIN EN 13779:2007

The limits of the “common area” and the maximum permissible “local air velocity” must be coordinated between the building owner and planners or installers.

Our selection diagrams indicate the “average local air velocity” in cooling mode. It was determined from numerous measurement points distributed evenly in the room, of the reference level relevant to the design. 50% of the velocities are greater than the diagram value and 50% are less.

The actual “local air velocities” that occur can be influenced by the level of turbulence from mixed-air streams on the one hand and by ambient air motions not caused by the air flow system on the other (cold facades, heaters and similar).

We supply products complying with the standards of machine and equipment manufacturing with dimensional tolerances in accordance with DIN ISO 2768 Part 1 and 2. In contrast, the extruded aluminium profiles often used in many other products have tolerances according to DIN EN 755-9:2008-06. Depending on the combination and surface treatment of the components and extruded profiles, additional dimensional deviations of 2 mm can occur. Due to manufacturing tolerances, the caloric performance is subject to a tolerance range of ± 10%, and the acoustic values to a tolerance range of ± 2 dB.
Technical notes

Design and dimensioning information

The design and dimensioning diagrams in our Technical Information document are valid for air exchange rates of 1.5 to 12 h⁻¹.

The maximum supply air temperature should be limited to 1 K above ambient temperature, so that room flushing will be sufficient in every operating state.

In cooling operations, the high induction gives rise to temperature differences of up to –12 K. This leads to a reduction in air flow rate combined with a simultaneous drop in investment costs for air conditioning equipment, ducting, etc. Naturally, operating costs also fall.

### Additional pressure loss with different damper settings

<table>
<thead>
<tr>
<th>Factor</th>
<th>SUPPLY AIR</th>
<th>EXTRACT AIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal size socket</td>
<td>0 %</td>
<td>25 %</td>
</tr>
<tr>
<td>125</td>
<td>190</td>
<td>370</td>
</tr>
<tr>
<td>160</td>
<td>433</td>
<td>1160</td>
</tr>
<tr>
<td>200</td>
<td>715</td>
<td>2130</td>
</tr>
<tr>
<td>250</td>
<td>1140</td>
<td>3700</td>
</tr>
</tbody>
</table>

**Formula:** \( \Delta p_{at} = \text{(air flow rate}^2 / \text{factor}) \)

**Example:**
- Socket: 250 mm
- Air flow rate: 500 m³/h
- Damper setting: 25 %
- \( \Delta p_{at} = (500 \text{m}^3/\text{h})^2 / 3700 \)
- \( \Delta p_{at} = 68 \text{ Pa} \)

The values are valid for all types.

**Recommendation:**
- Ambient air velocity from: \( \dot{v} = 0.12…0.15 \text{ m/s at seated level for the highest demands.} \)
- Ambient air velocity from: \( \dot{v} = 0.15…0.17 \text{ m/s at seated level for elevated demands.} \)
- For VAV systems (variable air flow rate systems), the flow through the supply air diffusers can be increased by 5 to 10 %. The bandwidth of the sound pressure levels according to DIN 13779 can be utilised.

**Note:**
- The acoustic diagrams on pages 19, 21, 23, 25, 27, 29, 31 and 33 indicate the average sound pressure level. For diffusers evenly distributed over the ceiling surface, the sound pressure level is also even.
Design example

Given:
- Surface area: \( A = 8 \text{ m} \times 12 \text{ m} = 96 \text{ m}^2 \)
- Room height: \( H = 3.5 \text{ m} \)
- Air flow rate: \( 4,800 \text{ m}^3/\text{h} \)
- Reverberation time: 1.2 s
- Maximum sound pressure level in the room: 40 dB(A)
- \( x_1 = 2 \text{ m} \) \( x_2 = 1.5 \text{ m} \)

Selected:
- Quantity: 8
- Air diffuser: RQ 600/625
- Ambient air velocity reference level: 1.8 m

Calculated:
- \( V_{\text{diffuser}} = \frac{\dot{V}_{\text{room}}}{\text{Quantity}} = \frac{4,800 \text{ m}^3/\text{h}}{8} = 600 \text{ m}^3/\text{h} \)
- \( V_{\text{spez.}} = \frac{\dot{V}}{A} = \frac{4,800 \text{ m}^3/\text{h}}{96 \text{ m}^2} = 50 \text{ m}^3/\text{hm}^2 \)

Sound pressure level (from diagram): 33 dB(A)
- Correction \( \Delta L_H (H = 3.5 \text{ m}) \) = -0.7 dB(A)
- Correction \( \Delta L_{TN} (T_N = 1.2 \text{ s}) \) = +3.0 dB(A)

Actual sound pressure level in the room: 35.3 dB(A)

\( y = \text{Room height} – \text{Reference level} \) (\( y = 3.5 – 1.8 = 1.7 \text{ m} \))

Average ambient air velocity (from diagram): 0.14 m/s

Correction values \( \Delta L_{TN} \) for other reverberation times:

<table>
<thead>
<tr>
<th>( T_N ) [s]</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>1.0</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta L_{TN} ) [dB(A)]</td>
<td>-1.8</td>
<td>-0.8</td>
<td>0</td>
<td>+0.7</td>
<td>+1.2</td>
<td>+1.8</td>
<td>+2.2</td>
<td>+3.0</td>
</tr>
</tbody>
</table>

Correction values \( \Delta L_H \) for other room heights:

<table>
<thead>
<tr>
<th>( H ) [m]</th>
<th>2.5</th>
<th>2.7</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>4.5</th>
<th>5.0</th>
<th>6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta L_H ) [dB(A)]</td>
<td>+0.8</td>
<td>+0.4</td>
<td>0</td>
<td>-0.7</td>
<td>-1.2</td>
<td>-1.8</td>
<td>-2.2</td>
<td>-3.0</td>
</tr>
</tbody>
</table>
Ventilation design parameters

RR 300

Average ambient air velocity $\bar{v}$ [m/s]

Pressure loss $\Delta p_{st} = \frac{\bar{V}^2}{K}$ [Pa]

Supply air

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR 300</td>
<td>K = 693</td>
<td>K = 423</td>
<td>K = 1130</td>
</tr>
<tr>
<td>RR 400</td>
<td>K = 2660</td>
<td>K = 1450</td>
<td>K = 3610</td>
</tr>
<tr>
<td>RR 500</td>
<td>K = 7530</td>
<td>K = 4030</td>
<td>K = 8910</td>
</tr>
</tbody>
</table>

RR 400

Average ambient air velocity $\bar{v}$ [m/s]

RR 500

Average ambient air velocity $\bar{v}$ [m/s]

RR 600/625

Average ambient air velocity $\bar{v}$ [m/s]

RR 800

Average ambient air velocity $\bar{v}$ [m/s]

KOMBICLIP 210

Supply air

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR 300</td>
<td>K = 693</td>
<td>K = 423</td>
<td>K = 1130</td>
</tr>
<tr>
<td>RR 400</td>
<td>K = 2660</td>
<td>K = 1450</td>
<td>K = 3610</td>
</tr>
<tr>
<td>RR 500</td>
<td>K = 7530</td>
<td>K = 4030</td>
<td>K = 8910</td>
</tr>
<tr>
<td>RR 600/625</td>
<td>K = 18600</td>
<td>K = 8870</td>
<td>K = 22800</td>
</tr>
<tr>
<td>RR 800</td>
<td>K = 47800</td>
<td>K = 18000</td>
<td>K = 28800</td>
</tr>
<tr>
<td>Kombiclip</td>
<td>K = 350</td>
<td>K = 260</td>
<td>K = 656</td>
</tr>
</tbody>
</table>

$\bar{V} = \frac{m^3}{h}$

$\Delta p_{st} = \frac{\bar{V}^2}{K}$ [Pa]

$\bar{V} = \frac{m^3}{h}$
Design INDULCLIP RR / KOMBICLIP

Acoustic design

The acoustic diagrams are valid for:
Room height: 3.0 m
Reverberation time: 0.6 s
with damper fully open

Correction values $\Delta L_{TN}$ for other reverberation times

<table>
<thead>
<tr>
<th>$T_n$ [s]</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>1.0</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta L_{TN}$ [dB(A)]</td>
<td>-1.8</td>
<td>-0.8</td>
<td>0</td>
<td>+0.7</td>
<td>+1.2</td>
<td>+1.8</td>
<td>+2.2</td>
<td>+3.0</td>
</tr>
</tbody>
</table>

Correction values $\Delta L_{H}$ for other room heights

<table>
<thead>
<tr>
<th>$H$ [m]</th>
<th>2.5</th>
<th>2.7</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>4.5</th>
<th>5.0</th>
<th>6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta L_{H}$ [dB(A)]</td>
<td>+0.8</td>
<td>+0.4</td>
<td>0</td>
<td>-0.7</td>
<td>-1.2</td>
<td>-1.8</td>
<td>-2.2</td>
<td>-3.0</td>
</tr>
</tbody>
</table>
Ventilation design parameters

**RQ 300**
Average ambient air velocity \( \bar{v} \) [m/s]

- \( \Delta p_{st} = \frac{\bar{V}^2}{K} \) [Pa]
- \( \bar{V} = m^3/h \)

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air with elements</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ 300</td>
<td>K = 693</td>
<td>K = 423</td>
<td>K = 1130</td>
</tr>
<tr>
<td>RQ 400</td>
<td>K = 2660</td>
<td>K = 1450</td>
<td>K = 3610</td>
</tr>
<tr>
<td>RQ 500</td>
<td>K = 7530</td>
<td>K = 4030</td>
<td>K = 8910</td>
</tr>
</tbody>
</table>

**RQ 400**
Average ambient air velocity \( \bar{v} \) [m/s]

- \( \Delta p_{st} = \frac{\bar{V}^2}{K} \) [Pa]
- \( \bar{V} = m^3/h \)

**RQ 500**
Average ambient air velocity \( \bar{v} \) [m/s]

- \( \Delta p_{st} = \frac{\bar{V}^2}{K} \) [Pa]
- \( \bar{V} = m^3/h \)
Acoustic design

**Design INDULCLIP RQ**

The acoustic diagrams are valid for:
- Room height: 3.0 m
- Reverberation time: 0.6 s
- with damper fully open

**Correction values $\Delta L_{TN}$ for other reverberation times**

<table>
<thead>
<tr>
<th>$T_w$ [s]</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>1.0</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta L_{TN}$ [dB(A)]</td>
<td>-1.8</td>
<td>-0.8</td>
<td>0</td>
<td>+0.7</td>
<td>+1.2</td>
<td>+1.8</td>
<td>+2.2</td>
<td>+3.0</td>
</tr>
</tbody>
</table>

**Correction values $\Delta L_{H}$ for other room heights**

<table>
<thead>
<tr>
<th>$H$ [m]</th>
<th>2.5</th>
<th>2.7</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>4.5</th>
<th>5.0</th>
<th>6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta L_{H}$ [dB(A)]</td>
<td>+0.8</td>
<td>+0.4</td>
<td>0</td>
<td>-0.7</td>
<td>-1.2</td>
<td>-1.8</td>
<td>-2.2</td>
<td>-3.0</td>
</tr>
</tbody>
</table>
Ventilation design parameters

RR 400+
Average ambient air velocity $\dot{v}$ [m/s]

RR 500+
Average ambient air velocity $\dot{v}$ [m/s]

RR 600+/625+
Average ambient air velocity $\dot{v}$ [m/s]

RR 800+
Average ambient air velocity $\dot{v}$ [m/s]

Pressure loss $\Delta p_{st} = \frac{\dot{V}^2}{K}$ [Pa]

$\dot{V} = m^3/h$

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR400+</td>
<td>K = 3400</td>
<td>K = 2200</td>
<td>K = 5650</td>
</tr>
<tr>
<td>RR500+</td>
<td>K = 11300</td>
<td>K = 6030</td>
<td>K = 13900</td>
</tr>
<tr>
<td>RR600+/625+</td>
<td>K = 21500</td>
<td>K = 11800</td>
<td>K = 29400</td>
</tr>
<tr>
<td>RR800+</td>
<td>K = 66100</td>
<td>K = 22900</td>
<td>K = 38800</td>
</tr>
</tbody>
</table>
Acoustic design

**Design INDULCLIP RR+**

**RR 400+**

- Specific air change rate \([\text{m}^3/\text{h} \cdot \text{m}^2]\)
- Sound pressure level in the room \([\text{dB}(A)]\)

**RR 500+**

- Specific air change rate \([\text{m}^3/\text{h} \cdot \text{m}^2]\)
- Sound pressure level in the room \([\text{dB}(A)]\)

**RR 600+/625+**

- Specific air change rate \([\text{m}^3/\text{h} \cdot \text{m}^2]\)
- Sound pressure level in the room \([\text{dB}(A)]\)

**RR 800+**

- Specific air change rate \([\text{m}^3/\text{h} \cdot \text{m}^2]\)
- Sound pressure level in the room \([\text{dB}(A)]\)

The acoustic diagrams are valid for:
- Room height: 3.0 m
- Reverberation time: 0.6 s
- with damper fully open

### Correction values \(\Delta L_{TN}\) for other reverberation times

<table>
<thead>
<tr>
<th>(T_N [\text{s}])</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>1.0</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\Delta L_{TN} [\text{dB}(A)])</td>
<td>-1.8</td>
<td>-0.8</td>
<td>0</td>
<td>+0.7</td>
<td>+1.2</td>
<td>+1.8</td>
<td>+2.2</td>
<td>+3.0</td>
</tr>
</tbody>
</table>

### Correction values \(\Delta L_H\) for other room heights

<table>
<thead>
<tr>
<th>(H [\text{m}])</th>
<th>2.5</th>
<th>2.7</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>4.5</th>
<th>5.0</th>
<th>6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\Delta L_H [\text{dB}(A)])</td>
<td>+0.8</td>
<td>+0.4</td>
<td>0</td>
<td>-0.7</td>
<td>-1.2</td>
<td>-1.8</td>
<td>-2.2</td>
<td>-3.0</td>
</tr>
</tbody>
</table>
Design INDULCLIP RQ+

Ventilation design parameters

**RQ 400+**

Average ambient air velocity $\bar{v}$ [m/s]

<table>
<thead>
<tr>
<th>Horizontal jet path $x$ [m]</th>
<th>Vertical jet path $y$ [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Supply air flow rate $\dot{V}$ [m$^3$/h]

Pressure loss $\Delta p_{st} = \frac{V^2}{K}$ [Pa]

$V = m^3$/h

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air with elements</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ400+</td>
<td>K = 3400</td>
<td>K = 2200</td>
<td>K = 5650</td>
</tr>
<tr>
<td>RQ500+</td>
<td>K = 11300</td>
<td>K = 6030</td>
<td>K = 13900</td>
</tr>
<tr>
<td>RQ600+/625+</td>
<td>K = 21500</td>
<td>K = 11800</td>
<td>K = 29400</td>
</tr>
</tbody>
</table>

**RQ 500+**

Average ambient air velocity $\bar{v}$ [m/s]

<table>
<thead>
<tr>
<th>Horizontal jet path $x$ [m]</th>
<th>Vertical jet path $y$ [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Supply air flow rate $\dot{V}$ [m$^3$/h]

Pressure loss $\Delta p_{st} = \frac{V^2}{K}$ [Pa]

$V = m^3$/h

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air with elements</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ400+</td>
<td>K = 3400</td>
<td>K = 2200</td>
<td>K = 5650</td>
</tr>
<tr>
<td>RQ500+</td>
<td>K = 11300</td>
<td>K = 6030</td>
<td>K = 13900</td>
</tr>
<tr>
<td>RQ600+/625+</td>
<td>K = 21500</td>
<td>K = 11800</td>
<td>K = 29400</td>
</tr>
</tbody>
</table>

**RQ 600+/625+**

Average ambient air velocity $\bar{v}$ [m/s]

<table>
<thead>
<tr>
<th>Horizontal jet path $x$ [m]</th>
<th>Vertical jet path $y$ [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Supply air flow rate $\dot{V}$ [m$^3$/h]

Pressure loss $\Delta p_{st} = \frac{V^2}{K}$ [Pa]

$V = m^3$/h

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air with elements</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ800+</td>
<td>K = 66100</td>
<td>K = 22900</td>
<td>K = 38800</td>
</tr>
</tbody>
</table>

Kiefer Klimatechnik

www.kieferklima.de
Acoustic design

**RQ 400+**

Specific air change rate \([\text{m}^3/\text{h}]\)

- Supply air flow rate \(\dot{V}\) [m³/h]

<table>
<thead>
<tr>
<th>(\dot{V}) [m³/h]</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
<th>400</th>
<th>450</th>
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</tbody>
</table>

**RQ 500+**

Specific air change rate \([\text{m}^3/\text{h}]\)

- Supply air flow rate \(\dot{V}\) [m³/h]

<table>
<thead>
<tr>
<th>(\dot{V}) [m³/h]</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
<th>400</th>
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</tr>
</tbody>
</table>

**RQ 600+/625+**

Specific air change rate \([\text{m}^3/\text{h}]\)

- Supply air flow rate \(\dot{V}\) [m³/h]

<table>
<thead>
<tr>
<th>(\dot{V}) [m³/h]</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
<th>400</th>
<th>450</th>
<th>500</th>
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</tr>
</tbody>
</table>

**RQ 800+**

Specific air change rate \([\text{m}^3/\text{h}]\)

- Supply air flow rate \(\dot{V}\) [m³/h]

<table>
<thead>
<tr>
<th>(\dot{V}) [m³/h]</th>
<th>600</th>
<th>700</th>
<th>800</th>
<th>900</th>
<th>1000</th>
</tr>
</thead>
<tbody>
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<td>50</td>
</tr>
</tbody>
</table>

**The acoustic diagrams are valid for:**
- Room height: 3.0 m
- Reverberation time: 0.6 s
- with damper fully open

**Correction values \(\Delta L_{TN}\) for other reverberation times**

<table>
<thead>
<tr>
<th>(T_n) [s]</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>1.0</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\Delta L_{TN}) [dB(A)]</td>
<td>-1.8</td>
<td>-0.8</td>
<td>0</td>
<td>+0.7</td>
<td>+1.2</td>
<td>+1.8</td>
<td>+2.2</td>
<td>+3.0</td>
</tr>
</tbody>
</table>

**Correction values \(\Delta L_{L}\) for other room heights**

<table>
<thead>
<tr>
<th>(H) [m]</th>
<th>2.5</th>
<th>2.7</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>4.5</th>
<th>5.0</th>
<th>6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\Delta L_{L}) [dB(A)]</td>
<td>+0.8</td>
<td>+0.4</td>
<td>0</td>
<td>-0.7</td>
<td>-1.2</td>
<td>-1.8</td>
<td>-2.2</td>
<td>-3.0</td>
</tr>
</tbody>
</table>
Ventilation design parameters

**Design INDUDRALL KR**

### Pressure loss

\[ \Delta p_{st} = \frac{V^2}{K} \text{ [Pa]} \]

\[ V = m^3/h \]

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air with elements</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>KR300</td>
<td>K = 1010</td>
<td>K = 700</td>
<td>K = 1270</td>
</tr>
<tr>
<td>KR400</td>
<td>K = 4170</td>
<td>K = 2660</td>
<td>K = 4360</td>
</tr>
<tr>
<td>KR500</td>
<td>K = 11400</td>
<td>K = 6330</td>
<td>K = 9930</td>
</tr>
</tbody>
</table>

### KR 300

Average ambient air velocity \( \bar{v} \) [m/s]

<table>
<thead>
<tr>
<th>Vertical jet path y [m]</th>
<th>Supply air flow rate ( q ) [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>100</td>
</tr>
<tr>
<td>1.0</td>
<td>200</td>
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<tr>
<td>1.5</td>
<td>300</td>
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<tr>
<td>2.0</td>
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<td>4.5</td>
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<td>5.0</td>
<td>1000</td>
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</tbody>
</table>

### KR 400

Average ambient air velocity \( \bar{v} \) [m/s]

<table>
<thead>
<tr>
<th>Vertical jet path y [m]</th>
<th>Supply air flow rate ( q ) [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>100</td>
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<tr>
<td>1.0</td>
<td>200</td>
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<tr>
<td>1.5</td>
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<td>4.5</td>
<td>900</td>
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<tr>
<td>5.0</td>
<td>1000</td>
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</tbody>
</table>

### KR 500

Average ambient air velocity \( \bar{v} \) [m/s]

<table>
<thead>
<tr>
<th>Vertical jet path y [m]</th>
<th>Supply air flow rate ( q ) [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>100</td>
</tr>
<tr>
<td>1.0</td>
<td>200</td>
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<tr>
<td>1.5</td>
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<td>4.5</td>
<td>900</td>
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<td>5.0</td>
<td>1000</td>
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</tbody>
</table>

### KR 600/625

Average ambient air velocity \( \bar{v} \) [m/s]

<table>
<thead>
<tr>
<th>Vertical jet path y [m]</th>
<th>Supply air flow rate ( q ) [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>100</td>
</tr>
<tr>
<td>1.0</td>
<td>200</td>
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<td>1.5</td>
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<tr>
<td>4.5</td>
<td>900</td>
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<tr>
<td>5.0</td>
<td>1000</td>
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</tbody>
</table>

### KR 800

Average ambient air velocity \( \bar{v} \) [m/s]

<table>
<thead>
<tr>
<th>Vertical jet path y [m]</th>
<th>Supply air flow rate ( q ) [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
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<tr>
<td>1.0</td>
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<tr>
<td>4.5</td>
<td>900</td>
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<tr>
<td>5.0</td>
<td>1000</td>
</tr>
</tbody>
</table>
Design INDUDRALL KR

Acoustic design

KR 300

KR 400

KR 500

KR 600/625

KR 800

The acoustic diagrams are valid for:
Room height: 3.0 m
Reverberation time: 0.6 s
with damper fully open

Correction values $\Delta L_{IN}$ for other reverberation times

<table>
<thead>
<tr>
<th>$T_N$ [s]</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>1.0</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta L_{IN}$ [dB(A)]</td>
<td>-1.8</td>
<td>-0.8</td>
<td>0</td>
<td>+0.7</td>
<td>+1.2</td>
<td>+1.8</td>
<td>+2.2</td>
<td>+3.0</td>
</tr>
</tbody>
</table>

Correction values $\Delta L_H$ for other room heights

<table>
<thead>
<tr>
<th>$H$ [m]</th>
<th>2.5</th>
<th>2.7</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>4.5</th>
<th>5.0</th>
<th>6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta L_H$ [dB(A)]</td>
<td>+0.8</td>
<td>+0.4</td>
<td>0</td>
<td>-0.7</td>
<td>-1.2</td>
<td>-1.8</td>
<td>-2.2</td>
<td>-3.0</td>
</tr>
</tbody>
</table>
Ventilation design parameters

**KQ 300**

- Average ambient air velocity $v$ [m/s]
- Supply air
- Extract air with elements
- Extract air without elements

**KQ 400**

- Average ambient air velocity $v$ [m/s]
- Supply air
- Extract air with elements
- Extract air without elements

**KQ 500**

- Average ambient air velocity $v$ [m/s]
- Supply air
- Extract air with elements
- Extract air without elements

**KQ 600/625**

- Average ambient air velocity $v$ [m/s]
- Supply air
- Extract air with elements
- Extract air without elements

**KQ 800**

- Average ambient air velocity $v$ [m/s]
- Supply air
- Extract air with elements
- Extract air without elements

### Pressure loss

$\Delta p_{st} = \frac{\dot{V}^2}{K}$ [Pa]

- $\dot{V} = m^3/h$

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
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<tbody>
<tr>
<td>KQ300</td>
<td>K = 1010</td>
<td>K = 700</td>
<td>K = 1270</td>
</tr>
<tr>
<td>KQ400</td>
<td>K = 4170</td>
<td>K = 2660</td>
<td>K = 4360</td>
</tr>
<tr>
<td>KQ500</td>
<td>K = 11400</td>
<td>K = 6330</td>
<td>K = 9930</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>KQ600/625</td>
<td>K = 30600</td>
<td>K = 16600</td>
<td>K = 28300</td>
</tr>
<tr>
<td>KQ800</td>
<td>K = 70600</td>
<td>K = 26600</td>
<td>K = 32300</td>
</tr>
</tbody>
</table>
The acoustic diagrams are valid for:
Room height: 3.0 m
Reverberation time: 0.6 s
with damper fully open

Correction values $\Delta L_{TN}$ for other reverberation times

<table>
<thead>
<tr>
<th>$T_N$ [s]</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>1.0</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta L_{TN}$ [dB(A)]</td>
<td>-1.8</td>
<td>-0.8</td>
<td>0</td>
<td>+0.7</td>
<td>+1.2</td>
<td>+1.8</td>
<td>+2.2</td>
<td>+3.0</td>
</tr>
</tbody>
</table>

Correction values $\Delta L_H$ for other room heights

<table>
<thead>
<tr>
<th>H [m]</th>
<th>2.5</th>
<th>2.7</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>4.5</th>
<th>5.0</th>
<th>6.0</th>
</tr>
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<tbody>
<tr>
<td>$\Delta L_H$ [dB(A)]</td>
<td>+0.8</td>
<td>+0.4</td>
<td>0</td>
<td>-0.7</td>
<td>-1.2</td>
<td>-1.8</td>
<td>-2.2</td>
<td>-3.0</td>
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</table>
Design INDUDRALL V

Ventilation design parameters

### V 300

- **Average ambient air velocity** $v$ [m/s]
- **Pressure loss** $\Delta p_{st} = \frac{\dot{V}^2}{K}$ [Pa]

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air with elements</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>V300</td>
<td>K = 835</td>
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<td>K = 1240</td>
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<tr>
<td>V400</td>
<td>K = 4180</td>
<td>K = 2750</td>
<td>K = 4530</td>
</tr>
<tr>
<td>V500</td>
<td>K = 12900</td>
<td>K = 6440</td>
<td>K = 10000</td>
</tr>
</tbody>
</table>

### V 400

- **Average ambient air velocity** $v$ [m/s]
- **Pressure loss** $\Delta p_{st} = \frac{\dot{V}^2}{K}$ [Pa]

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air with elements</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>V600/625</td>
<td>K = 32800</td>
<td>K = 16400</td>
<td>K = 24100</td>
</tr>
<tr>
<td>V800</td>
<td>K = 71000</td>
<td>K = 26300</td>
<td>K = 38300</td>
</tr>
</tbody>
</table>

### V 500

- **Average ambient air velocity** $v$ [m/s]
- **Pressure loss** $\Delta p_{st} = \frac{\dot{V}^2}{K}$ [Pa]

<table>
<thead>
<tr>
<th>Size</th>
<th>Supply air with elements</th>
<th>Extract air with elements</th>
<th>Extract air without elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>V300</td>
<td>K = 835</td>
<td>K = 620</td>
<td>K = 1240</td>
</tr>
<tr>
<td>V400</td>
<td>K = 4180</td>
<td>K = 2750</td>
<td>K = 4530</td>
</tr>
<tr>
<td>V500</td>
<td>K = 12900</td>
<td>K = 6440</td>
<td>K = 10000</td>
</tr>
</tbody>
</table>

### Pressure loss $\Delta p_{st} = \frac{\dot{V}^2}{K}$ [Pa]

- $\dot{V} = m^3/h$
## Design INDUDRALL V

### Acoustic design

#### V 300

<table>
<thead>
<tr>
<th>Supply air flow rate V [m³/h]</th>
<th>Room sound pressure level in the room [dB(A)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>70  80  90  100</td>
<td>30</td>
</tr>
<tr>
<td>150 160 170 180</td>
<td>35</td>
</tr>
<tr>
<td>200 210 220 230</td>
<td>40</td>
</tr>
<tr>
<td>250 260 270 280</td>
<td>45</td>
</tr>
<tr>
<td>300 310 320 330</td>
<td>50</td>
</tr>
</tbody>
</table>

#### V 400

<table>
<thead>
<tr>
<th>Supply air flow rate V [m³/h]</th>
<th>Room sound pressure level in the room [dB(A)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 160 170 180</td>
<td>30</td>
</tr>
<tr>
<td>200 210 220 230</td>
<td>35</td>
</tr>
<tr>
<td>250 260 270 280</td>
<td>40</td>
</tr>
<tr>
<td>300 310 320 330</td>
<td>45</td>
</tr>
<tr>
<td>350 360 370 380</td>
<td>50</td>
</tr>
</tbody>
</table>

#### V 500

<table>
<thead>
<tr>
<th>Supply air flow rate V [m³/h]</th>
<th>Room sound pressure level in the room [dB(A)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 210 220 230</td>
<td>30</td>
</tr>
<tr>
<td>250 260 270 280</td>
<td>35</td>
</tr>
<tr>
<td>300 310 320 330</td>
<td>40</td>
</tr>
<tr>
<td>350 360 370 380</td>
<td>45</td>
</tr>
<tr>
<td>400 410 420 430</td>
<td>50</td>
</tr>
</tbody>
</table>

#### V 600/625

<table>
<thead>
<tr>
<th>Supply air flow rate V [m³/h]</th>
<th>Room sound pressure level in the room [dB(A)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 260 270 280</td>
<td>30</td>
</tr>
<tr>
<td>300 310 320 330</td>
<td>35</td>
</tr>
<tr>
<td>350 360 370 380</td>
<td>40</td>
</tr>
<tr>
<td>400 410 420 430</td>
<td>45</td>
</tr>
<tr>
<td>450 460 470 480</td>
<td>50</td>
</tr>
</tbody>
</table>

#### V 800

<table>
<thead>
<tr>
<th>Supply air flow rate V [m³/h]</th>
<th>Room sound pressure level in the room [dB(A)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 310 320 330</td>
<td>30</td>
</tr>
<tr>
<td>350 360 370 380</td>
<td>35</td>
</tr>
<tr>
<td>400 410 420 430</td>
<td>40</td>
</tr>
<tr>
<td>450 460 470 480</td>
<td>45</td>
</tr>
<tr>
<td>500 510 520 530</td>
<td>50</td>
</tr>
</tbody>
</table>

### The acoustic diagrams are valid for:
- Room height: 3.0 m
- Reverberation time: 0.6 s
- with damper fully open

### Correction values $\Delta L_{TN}$ for other reverberation times

<table>
<thead>
<tr>
<th>$T_{n}$ [s]</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>1.0</th>
<th>1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta L_{TN}$ [dB(A)]</td>
<td>-1.8</td>
<td>-0.8</td>
<td>0</td>
<td>+0.7</td>
<td>+1.2</td>
<td>+1.8</td>
<td>+2.2</td>
<td>+3.0</td>
</tr>
</tbody>
</table>

### Correction values $\Delta L_{H}$ for other room heights

<table>
<thead>
<tr>
<th>$H$ [m]</th>
<th>2.5</th>
<th>2.7</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>4.5</th>
<th>5.0</th>
<th>6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta L_{H}$ [dB(A)]</td>
<td>+0.8</td>
<td>+0.4</td>
<td>0</td>
<td>-0.7</td>
<td>-1.2</td>
<td>-1.8</td>
<td>-2.2</td>
<td>-3.0</td>
</tr>
</tbody>
</table>
Ceiling air diffuser INDULCLIP
for supply or extract air, square or round type, with high induction and supply air temperature differences of up to –12K, suitable for variable air flow rate systems.
The highly inductive air guide elements have been developed specifically for applications requiring high levels of comfort. They ensure draught-free air distribution.

Size:
☐ 300 mm  ☐ 400 mm  ☐ 500 mm  ☐ 600/625 mm  ☐ 800 mm

Air diffuser comprising:

Front plate
Galvanized sheet steel front plate, powder-coated in RAL 9010 with highly inductive air guide elements

Front plate shape:
☐ Square  ☐ Round

Hole pattern:
☐ Type R  ☐ Type R+ (increased air flow rate)

Air guide elements colour:
☐ Matt black  ☐ Light grey (similar to RAL 7035)  ☐ White (similar to RAL 9010)

Fastening:
☐ 4-point screw fastening  ☐ Central fastening
(only in square design)

No. __________  Qty. __________  Unit price __________

Plenum box
Plenum box for INDULCLIP ceiling air diffuser made from galvanized sheet steel, 8 attachment points Ø 9 mm, with circular connection socket and butterfly damper that can be operated from inside the room, includes flow straightener punched sheet for optimum approach flow at the front plate.

☐ Square  ☐ Round

No. __________  Qty. __________  Unit price __________

Manufacturer: Maschinenfabrik Gg. Kiefer GmbH
Series: Ceiling air diffuser
Type: INDULCLIP

Special designs
Plenum box:
☐ Special socket  ☐ Special height

Front plate:
☐ Special colour to RAL  ☐ Special colour to NCS
☐ Square for insertion in grid ceiling  ☐ Square for universal walling system

No. __________  Qty. __________  Unit price __________

Tender texts can be downloaded from www.kieferklima.de
Ceiling air diffuser INDUDRALL
for supply or extract air, square or round type, with high induction and supply air temperature differences of up to –12K, suitable for variable air flow rate systems.
The highly inductive air guide elements have been developed specifically for applications requiring high levels of comfort. They ensure draught-free air distribution.
Size:
☐ 300 mm   ☐ 400 mm   ☐ 500 mm   ☐ 600/625 mm   ☐ 800 mm

Air diffuser comprising:

Front plate
Galvanized sheet steel front plate, powder-coated in RAL 9010 with highly inductive air guide elements
Front plate shape:
☐ Square   ☐ Round
Hole pattern:
☐ Type K   ☐ Type V
Air guide elements colour:
☐ Matt black   ☐ Light grey (similar to RAL 7035)   ☐ White (similar RAL 9010)
Fastening:
☐ 4-point screw fastening   ☐ Central fastening
(only in square design)
No. __________   Qty. __________   Unit price __________

Plenum box
Plenum box for INDUDRALL ceiling air diffuser made from galvanized sheet steel, 8 attachment points Ø 9 mm, with circular connection socket and butterfly damper that can be operated from inside the room, includes flow straightener punched sheet for optimum approach flow at the front plate.
☐ Square   ☐ Round
No. __________   Qty. __________   Unit price __________

Manufacturer: Maschinenfabrik Gg. Kiefer GmbH
Series: Ceiling air diffuser
Type: INDUDRALL

Special designs
Plenum box:
☐ Special socket   ☐ Special height
Front plate:
☐ Special colour to RAL   ☐ Special colour to NCS
☐ Square for insertion in grid ceiling   ☐ Square for universal walling system
No. __________   Qty. __________   Unit price __________

Tender texts can be downloaded from www.kieferklima.de
Ceiling air diffuser KOMBICLIP

for supply or extract air, round type, with high induction and supply air temperature differences of up to –12K, suitable for variable air flow rate systems.
The highly inductive air guide elements have been developed specifically for applications requiring high levels of comfort. They ensure draught-free air distribution.

Size: 210 mm

Air diffuser comprising:

Front plate
Galvanized sheet steel front plate, powder-coated in RAL 9010 with highly inductive air guide elements
Front plate shape: Round
Air guide elements colour:
☐ Matt black       ☐ Light grey (similar to RAL 7035)

Fastening:
Invisible quick installation option with M6 x 30 screw. Diffuser is fastened to the centre cross-bar of the plenum box.

No. __________   Qty. __________   Unit price __________

Plenum box
Plenum box for KOMBICLIP ceiling air diffuser made from galvanized sheet steel, 3 attachment points Ø 9 mm, includes cross-bar for invisible quick installation option.

No. __________   Qty. __________   Unit price __________

Manufacturer: Maschinenfabrik Gg. Kiefer GmbH
Series: Ceiling air diffuser
Type: KOMBICLIP

Special designs
Round type plenum box
☐ Special socket       ☐ Special height

Front plate:
☐ Special colour to RAL       ☐ Special colour to NCS

No. __________   Qty. __________   Unit price __________

Tender texts can be downloaded from www.kieferklima.de
Data required for the technical design and offer preparation:

Recipient:  
info@kieferklima.de

Sender:  
Kiefer Klimatechnik GmbH
Heilbronner Straße 380-396
70469 Stuttgart

Ceiling air diffuser:  
☐ INDULCLIP  
☐ INDUDRALL  
☐ KOMBICLIP

Project:

Customer project no.:  

Date/Associate:  

Kiefer project no.:  

<table>
<thead>
<tr>
<th>Room or module name</th>
<th>Sample room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of these rooms/modules</td>
<td></td>
</tr>
<tr>
<td>Supply air flow rate [m³/h]</td>
<td>4000</td>
</tr>
<tr>
<td>Room width [m]</td>
<td>8</td>
</tr>
<tr>
<td>Room length [m]</td>
<td>12</td>
</tr>
<tr>
<td>Area [m²]</td>
<td>96</td>
</tr>
<tr>
<td>Room height [m]</td>
<td>3.5</td>
</tr>
<tr>
<td>Cooling load [W]</td>
<td>10,000</td>
</tr>
<tr>
<td>Ambient air temperature [°C]</td>
<td>26</td>
</tr>
<tr>
<td>Supply air temperature [°C]</td>
<td>18</td>
</tr>
<tr>
<td>Average ambient air velocity [m/s]</td>
<td>0.17</td>
</tr>
<tr>
<td>at room height [m]</td>
<td>1.8</td>
</tr>
<tr>
<td>Sound pressure level in the room [dB(A)]</td>
<td>40</td>
</tr>
<tr>
<td>at reverberation time [s]</td>
<td>0.8</td>
</tr>
</tbody>
</table>
The climate specialist

Product Range

Components:
Linear, wall, ceiling and air outlet diffusers, chilled ceiling panels, recirculation coolers, cross-flow units, concrete core cooling with air. Axial and radial ventilators, hot-gas ventilators, plastic ventilators.

Systems:
All types of conditioning systems for maximum comfort (offices, administrative buildings, stores, hospitals, libraries, museums and similar) and industrial applications (machine construction, high-tech, textile, plastics, chemicals, automotive, food and drink industry and similar).

Services

Consulting and planning:
We provide advice concerning all aspects of our systems and create system analyses and cost estimates based on cooling load / pipe network / energy cost / efficiency calculations. We also develop proposals concerning suggested layouts for air distribution, lighting and ceiling systems; and compile lighting-related data using the latest software tools, as well as developing and implementing control-technology related concepts in our own MSR division. We are furthermore able to draw on a wealth of experience from previous projects when it comes to designing innovative products and new projects.

Laboratory:

Maintenance and servicing:
All kinds of air-conditioning and climate control systems as part of maintenance and service contracts.

With release of this printing, all earlier versions of the Technical Information lose their validity.