FlowGrid for Axial and Centrifugal Fans

Less noise – better quality of life.

The engineer’s choice
FlowGrid stands for... efficient noise reduction features in cooling, ventilation and air-conditioning technology. 

ebm-papst offers a future-oriented solution for the problem of high-performance technology generating disturbing noise: FlowGrid for axial and centrifugal fans. The grill on the air inlet side drastically reduces the noise emissions and minimizes disturbing low frequency tones.

There are often problems wherever people and technology share space. The movement of air, for example, often goes hand in hand with noise. With FlowGrid, noise-generating disturbances in the fan inflow are a thing of the past!

FlowGrid

by ebmpapst

patent pending

Situation
Excess noise is the result of the inflow of air to a fan being disturbed. Asymmetrical inlet conditions, such as the walls of a device being at different distances from the fan, create powerful vortices. In the narrowest areas, these combine to form vortex strings. These turbulences then hit the rotating blades of the fan, generating noise – specifically a broadband noise and additional narrowband, tonal frequency components, known as propeller noise or tonal noise.

Noise spectrum
The tonal noise consists of the blade-passing noise and its harmonics. The frequency of the blade-passing noise can be calculated based on the fan speed and the number of blades. The harmonics of the blade-passing noise are integer multiples of it. An axial fan with five blades and 1,200 rpm, for example, would result in a blade-passing noise with a frequency of 100 Hz. The respective frequency of the blade-passing noise and its harmonics result in high elevations in the sound pressure level, especially in the low-frequency range. It is exactly this level where it is particularly difficult to reduce noise. Passive noise-reduction measures often mean large space requirements and high costs.

Solution
FlowGrid, the grill on the air intake side, drastically reduces the noise-generating disturbances. The vortex strings are split when hitting the grille and considerably weakened as they flow through it. This reduces the sound pressure in the entire frequency range, but particularly the disturbing low frequency tonal range. The result is a considerably lower sound pressure level and a noise which is less disturbing. This means that noise regulations can be complied with more easily and the well-being of people in the direct vicinity is not affected.

A clear improvement: FlowGrid reduces the sound pressure level and considerably weakens tonal noise.

Formation of air vortices due to an asymmetrical intake area.

The noise spectrum is characterized by narrowband, tonal frequency components – tonal noise.

Noise disturbances – Cause and solution

Whether it’s heat pumps in the garden, supermarket condensers or ventilation systems on an industrial property: FlowGrid, the innovative air inlet grill from ebm-papst, uses technical expertise to provide drastic noise reduction.
Reduced noise range
- Lower noise level
- Drastically reduced tonal noise

Maintaining efficiency
- Air performance unaffected
- No increase in input power

Effective environmental protection
- Noise reduction as an important part of environmentally friendly operation

Robust design
- Made from composite material
- Available with flammability class UL94-5VA

Quick assembly
- Through-holes for simple mounting
- Customer-specific mounting on request

FlowGrid for axial and centrifugal fans

As a global player, we have to consider global issues. This also includes acting in an environmentally-conscious way. An important part of this is the reduction of noise, which plays a major role in regard to general quality of life. With FlowGrid, ebm-papst is making a clear contribution to active noise reduction. The innovative air-intake grills work with both axial and centrifugal fans while not affecting their high efficiency in any way. Using them can help to reduce or entirely avoid the use of cost-intensive, passive noise-reduction measures. It is no surprise then that FlowGrid has a patent pending. The measurement results detailed below show the benefits that FlowGrid can offer.

Radial applications

<table>
<thead>
<tr>
<th>Low profile air handling unit with RadiPac Ø 250</th>
<th>Air purifier with RadiCal Ø 310</th>
<th>Air-water heat pump with RadiCal Ø 450</th>
<th>Central air handling unit with RadiCal Ø 630</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td>Function</td>
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</tr>
<tr>
<td>Ventilation and aeration of rooms, with or without load recovery</td>
<td>Creating a comfortable climate through purifying the air from allergens and dust particles</td>
<td>Ventilation and aeration of rooms, with or without load recovery</td>
<td>Central ventilation and aeration of rooms, with or without load recovery and active air treatment</td>
</tr>
<tr>
<td>Design</td>
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<td>Design</td>
<td>Design</td>
</tr>
<tr>
<td>The spaces to be air-conditioned are supplied with conditioned air via ducts.</td>
<td>The fan is installed in a housing with a filter for airborne material.</td>
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<td>Apart from the fans, components such as filters, heat exchangers, humidifiers and dehumidifiers are installed in the device.</td>
</tr>
<tr>
<td>Noise reduction regulations must be complied with. Furthermore, the disturbing tonal noise should be prevented from entering the rooms.</td>
<td>The air inflow is disturbed by the filter on the intake side and by the limited installation dimensions. As the devices are mostly installed in areas where people live or spend long periods of time, reducing noise emissions plays an important role.</td>
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<td>The fans press air through the device and then through ventilation ducts.</td>
</tr>
<tr>
<td>Reduction of the noise level by 2.5 dB(A) and of the blade-passing noise by 9 dB.</td>
<td>Noise is reduced from the outside air. This is used to heat the residential building via a circulatory system.</td>
<td>Noise reduction by 2.5 dB(A) and the blade-passing noise by 9 dB.</td>
<td>Noise limit values are complied with and the blade-passing noise is reduced by 4 dB. This results in less disturbing noise.</td>
</tr>
</tbody>
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<tr>
<th>FlowGrid for axial and centrifugal fans</th>
<th>Less noise – Proven by measurement results</th>
</tr>
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<td>Function</td>
<td>Radial applications</td>
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<td>Ventilation and aeration of rooms, with or without load recovery</td>
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</tr>
<tr>
<td>Design</td>
<td>Design: The fan is installed in a housing with a filter for airborne material.</td>
</tr>
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<td>Noise reduction regulations must be complied with. Furthermore, the disturbing tonal noise should be prevented from entering the rooms.</td>
<td>Challenge: The air inflow is disturbed by the filter on the intake side and by the limited installation dimensions. As the devices are mostly installed in areas where people live or spend long periods of time, reducing noise emissions plays an important role.</td>
</tr>
<tr>
<td>Benefits of FlowGrid</td>
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</tr>
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<td>Reduction of the noise level by 2.5 dB(A) and of the blade-passing noise by 9 dB.</td>
<td>All examples were measured under laboratory conditions. The results are dependent upon the design of the units.</td>
</tr>
</tbody>
</table>

Δ - Sound power level  Δ - Blade-passing noise sound pressure level

- 2.5 dB(A)  - 9 dB
- 2.8 dB(A)  - 10 dB
- 2.5 dB(A)  - 4 dB
- 3.3 dB(A)  - 9 dB

Air purifier with RadiCal Ø 310
Air-water heat pump with RadiCal Ø 450
Central air handling unit with RadiCal Ø 630

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The sound of silence

Function
Heat is extracted from the outside air. This is done to heat the residential building via a circulatory system.

Design
The axial fan is installed directly behind an evaporator for horizontal or vertical air conduction.

Challenge
In compact heat pumps, the evaporator is placed very close to the fan. Excess noise is created by the installation position. As heat pumps are used in residential buildings, however, noise limit values need to be complied with.

Benefits of FlowGrid
Noise limit values are complied with and the blade-passing noise is reduced by 12 dB.

Function
Extraction of heat arising in a coolant circuit.

Design
One or multiple axial fans extract outside air through a horizontally arranged heat exchanger.

Challenge
The fans are placed very close to the heat exchanger. This results in the air inflow being disturbed. If multiple fans are used in one condenser, the uneven air inflow becomes stronger.

Benefits of FlowGrid
Reduction of the noise level by 3.9 dB(A) and a huge reduction of the blade-passing noise by 16 dB. This results in much less disturbing noise.

Function
Extraction of heat arising in a coolant circuit.

Design
One or multiple axial fans extract outside air through a vertically arranged heat exchanger.

Challenge
Due to the size of the heat exchanger, the distances between it and the fan vary greatly. This leads to turbulence being created in the intake area.

Benefits of FlowGrid
Reduction of the noise level by 1.3 dB(A) and of the blade-passing noise by 7 dB.

Function
Extraction of heat arising in a coolant circuit.

Design
Outside air is sucked through a heat exchanger. The condenser, with a horizontally arranged exchanger, has an axial fan with an AxiTop diffuser unit installed on the pressure side.

Challenge
Despite an already low noise level, there is still a disturbing tonal noise.

Benefits of FlowGrid
Additional reduction of the noise level by 2.8 dB(A) and of the blade-passing noise by 12 dB.

Air-water heat pump with HyBlade® Ø 630
Condenser with HyBlade® Ø 710
Y-shaped condenser with HyBlade® Ø 800
Condenser with HyBlade® Ø 800 and AxiTop

Would you like to find out more?
If you need an installation guide or more information about FlowGrid dimensions in general, download the manual from this site: http://flowgrid.ebmpapst.us

Or scan the QR code here:

Closed FlowGrid Solution
Unlike the larger open FlowGrid grills, the smaller sizes of 190 to 250 have a complete grid cover, combining optimum air conduction with contact protection as per DIN EN ISO 13857 (“Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs”). Thus, it removes the need for an additional fan guard, which would negatively affect the intake flow.
## FlowGrid – Always a good solution

FlowGrid is completely enclosed and works as a grill guard.

### Version A

<table>
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<tr>
<th>UL 94-HB Part Number</th>
<th>RadiCal</th>
<th>RadiPac</th>
<th>HyBlade (^\circ)</th>
<th>A</th>
<th>B</th>
<th>C</th>
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</tbody>
</table>

A: Minimum installation dimension  
B: Outer diameter  
C: Pitch circle diameter  
D: Reference diameter for matching with the nozzle  
E: Hole diameter  
S: Thickness of mounting tabs  
H: Installation height  

### Version B

*FlowGrid is completely enclosed and works as a grill guard.

The reference diameter must be at least equal to the nozzle diameter at the bent outer end (D ≥ X).

All dimensions in mm.

### Notes

**Version A**

- FlowGrid is completely enclosed and works as a grill guard.

**Version B**

- FlowGrid is completely enclosed and works as a grill guard.