FlowGrid for Axial and Centrifugal Fans

Less noise — better quality of life.
Innovating for people

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 reduces the sound pressure level and considerably weakens tonal noise. The noise spectrum is characterized by narrowband, tonal frequency components – tonal noise.

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.

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.

Formation of air vortices due to an asymmetrical intake area.
The sound of silence

FlowGrid for axial and centrifugal fans

Reduced noise range
- Lower noise level
- Dramatically 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

Compact design
- Low space requirements
- Less acoustic insulation work

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

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

Less noise – Proven by measurement results

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>Function</th>
<th>Design</th>
<th>Challenge</th>
<th>Benefits of FlowGrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilation and aerating of rooms, with or without heat recovery.</td>
<td>The spaces to be air-conditioned are supplied with conditioned air via ducts. The sound is carried through the ducts into the rooms, requiring the use of additional noise-reduction measures such as acoustic insulation.</td>
<td>Noise reduction regulations must be complied with. Furthermore, the disturbing tonal noise should be prevented from entering the rooms.</td>
<td>Reduction of the noise level by 2.5 dB(A) and of the blade-passing noise by 9 dB. Acoustic insulation costs can be greatly reduced.</td>
</tr>
<tr>
<td>Function</td>
<td>Design</td>
<td>Challenge</td>
<td>Benefits of FlowGrid</td>
</tr>
<tr>
<td>Creating a comfortable climate through purifying the air from allergens and dust particles.</td>
<td>The fan is installed in a housing with a filter for airborne material.</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>
<td>Reduction of the noise level by 2.5 dB(A) and of the blade passing noise by 9 dB. Acoustic insulation costs can be greatly reduced.</td>
</tr>
<tr>
<td>Function</td>
<td>Design</td>
<td>Challenge</td>
<td>Benefits of FlowGrid</td>
</tr>
<tr>
<td>Noise is extracted from the outside air.</td>
<td>The centrifugal fan is installed in a housing directly behind an evaporator.</td>
<td>In compact heat pumps, the evaporator is placed very close to the fan. Excess noise is created by the disturbed air inflow. As they are used in residential buildings, however, noise limit values need to be complied with.</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>
<tr>
<td>Function</td>
<td>Design</td>
<td>Challenge</td>
<td>Benefits of FlowGrid</td>
</tr>
<tr>
<td>Central ventilation and aerating of rooms, with or without heat recovery and outside air treatment.</td>
<td>Apart from the fans, components such as filters, heat exchangers, humidifiers and dehumidifiers are installed in the device. The fans press air through the device and then through ventilation ducts.</td>
<td>Significant turbulences at the fan inlet, due to low distances between the fan and the walls in the intake area, as well as components of the device, impede the flow of air.</td>
<td>Reduction of the noise level by 3.3 dB(A) and of the blade-passing noise by 9 dB, reducing the need for acoustic insulation.</td>
</tr>
</tbody>
</table>

All examples were measured under laboratory conditions. The results are dependent upon the design of the units.
The sound of silence

Function
Heat is extracted from the outside air. This is used 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.

Axial applications

<table>
<thead>
<tr>
<th>Function</th>
<th>Extraction of heat arising in a coolant circuit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>One or multiple axial fans extract outside air through a horizontally arranged heat exchanger.</td>
</tr>
<tr>
<td>Challenge</td>
<td>Due to the use of the heat exchanger, the distance between it and the fan very greatly. This leads to turbulence being created in the intake area.</td>
</tr>
<tr>
<td>Benefits of FlowGrid</td>
<td>Reduction of the noise level by 3.8 dB(A) and of the blade-passing noise by 7 dB.</td>
</tr>
</tbody>
</table>

Air-water heat pump with HyBlade® Ø 630

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**

---

**Version A**

FlowGrid is completely enclosed and works as a grill guard.

---

**Version B**

---

<table>
<thead>
<tr>
<th>UL 94-HB Part Number</th>
<th>UL 94-V0R Part Number</th>
<th>RadiCal</th>
<th>RadiPac</th>
<th>HyBlade®</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>S</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>00190-2-2957*</td>
<td>00191-2-2957</td>
<td>175,190</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>170</td>
<td>155-160</td>
<td>150</td>
<td>4.5</td>
<td>2.0</td>
<td>30</td>
</tr>
<tr>
<td>00250-2-2957*</td>
<td>–</td>
<td>220,235,250</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>205</td>
<td>193</td>
<td>167</td>
<td>4.5</td>
<td>2.0</td>
<td>36</td>
</tr>
<tr>
<td>20380-2-2957</td>
<td>20381-2-2957</td>
<td>280</td>
<td>220,225,250,280</td>
<td>–</td>
<td>–</td>
<td>280</td>
<td>245-260</td>
<td>245</td>
<td>4.5</td>
<td>3.5</td>
<td>40</td>
</tr>
<tr>
<td>25310-2-2957</td>
<td>25311-2-2957</td>
<td>310</td>
<td>–</td>
<td>250</td>
<td>310</td>
<td>290</td>
<td>262</td>
<td>4.0</td>
<td>3.5</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>00400-2-2957</td>
<td>00401-2-2957</td>
<td>355,400</td>
<td>–</td>
<td>–</td>
<td>365</td>
<td>335-345</td>
<td>325</td>
<td>4.0</td>
<td>3.0</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>35305-2-2957</td>
<td>35306-2-2957</td>
<td>450,500</td>
<td>400,450,500</td>
<td>330,315,330,350</td>
<td>–</td>
<td>470</td>
<td>440</td>
<td>412</td>
<td>4.0</td>
<td>3.0</td>
<td>71</td>
</tr>
<tr>
<td>00630-2-2957</td>
<td>00631-2-2957</td>
<td>560,630</td>
<td>560,630</td>
<td>400</td>
<td>–</td>
<td>580</td>
<td>545</td>
<td>532</td>
<td>10</td>
<td>3.0</td>
<td>90</td>
</tr>
<tr>
<td>50710-2-2957</td>
<td>50711-2-2957</td>
<td>710</td>
<td>–</td>
<td>500,500</td>
<td>580</td>
<td>666</td>
<td>630</td>
<td>580</td>
<td>10</td>
<td>3.0</td>
<td>106</td>
</tr>
<tr>
<td>63000-2-2957</td>
<td>63001-2-2957</td>
<td>–</td>
<td>800</td>
<td>560,630</td>
<td>734</td>
<td>785</td>
<td>750</td>
<td>724</td>
<td>10</td>
<td>3.0</td>
<td>125</td>
</tr>
<tr>
<td>80000-2-2957</td>
<td>80001-2-2957</td>
<td>–</td>
<td>900</td>
<td>710,830</td>
<td>930</td>
<td>995</td>
<td>950</td>
<td>920</td>
<td>10</td>
<td>3.5</td>
<td>131</td>
</tr>
<tr>
<td>91000-2-2957</td>
<td>91001-2-2957</td>
<td>–</td>
<td>–</td>
<td>910</td>
<td>1035</td>
<td>1105</td>
<td>1075</td>
<td>1025</td>
<td>10</td>
<td>3.5</td>
<td>164</td>
</tr>
</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  

X: Nozzle diameter at bent outer end  

*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
Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

**ebm-papst:**

00190-2-2957  00250-2-2957  00191-2-2957