Air diffusers and dampers

Product description

General
This section describes how Swegon reports specifications on its products.
A description of what is addressed under heading in the product presentation is given below.

Quick facts
Some of the product’s most important characteristics are presented here in bulleted format. Used for initial identification of the product.
Example quick facts:
► Flexible distribution pattern, easily adjustable
► Cleanable, removable damper
► Simple commissioning, fixed measurement outlets
► Manages air flows substantially below room temperature
► Alternative duct connection rear/side

Quick selection
Provides a quick overview of the product’s technical performance with respect to air flow and sound level. The table also indicates the total pressure at which the values apply.
Example:
EAGLE Ceiling size 250-600 with ALS 200-250
On the row corresponding to 250-600, we see that air flow 83 l/s results in sound level 25 dB(A). If we increase the flow to 114 l/s, we reach a sound level of 35 dB(A).
Note that sound and flow apply at total pressure of 50 Pa.

### AIRFLOW – SOUND LEVEL

<table>
<thead>
<tr>
<th>EAGLE Ceiling Size</th>
<th>ALS Size</th>
<th>25 dB(A) l/s</th>
<th>30 dB(A) m³/h</th>
<th>35 dB(A) l/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>125-400</td>
<td>100-125</td>
<td>25</td>
<td>90</td>
<td>31</td>
</tr>
<tr>
<td>125-600</td>
<td>100-125</td>
<td>24</td>
<td>86</td>
<td>30</td>
</tr>
<tr>
<td>160-400</td>
<td>125-160</td>
<td>37</td>
<td>133</td>
<td>47</td>
</tr>
<tr>
<td>160-600</td>
<td>125-160</td>
<td>36</td>
<td>130</td>
<td>45</td>
</tr>
<tr>
<td>200-500</td>
<td>160-200</td>
<td>54</td>
<td>194</td>
<td>68</td>
</tr>
<tr>
<td>200-600</td>
<td>160-200</td>
<td>52</td>
<td>187</td>
<td>66</td>
</tr>
<tr>
<td>250-500</td>
<td>200-250</td>
<td>77</td>
<td>277</td>
<td>97</td>
</tr>
<tr>
<td>250-600</td>
<td>200-250</td>
<td>83</td>
<td>299</td>
<td>99</td>
</tr>
<tr>
<td>315-500</td>
<td>250-315</td>
<td>98</td>
<td>353</td>
<td>120</td>
</tr>
<tr>
<td>315-600</td>
<td>250-315</td>
<td>112</td>
<td>403</td>
<td>132</td>
</tr>
<tr>
<td>400-600</td>
<td>315-400</td>
<td>155</td>
<td>558</td>
<td>180</td>
</tr>
</tbody>
</table>

The data specified in the table is applicable to supply air and 50 Pa total pressure if an ALS commissioning box is used.

Technical description
All the information on the material and how the product shall be used and maintained is given under this heading.

Design
A description of the product’s design and included parts is given here.
The casing of commissioning boxes has air tightness class C. The damper has pressure class A, max 1000 Pa over the damper leaf. The damper’s housing is class C. Closed circular damper has class 4.
Closed rectangular damper has class 3.
Classification per standard EN 12237 and EN 12589.

Material and surface treatment
A description of what material the product is made from and its surface treatment is given here.
All air diffusers, with a few exceptions, are painted in our white standard colour with colour code NCS S 0500-N/RAL 9003. All painting is done by electrostatic powder coating, which is oven-cured. This provides good impact resistance and scratch resistance and a very high-surface finish.
Colours other than standard are available. Contact your nearest sales representative for more information.

All air diffuser products can manage an operating and ambient temperature of max. +80°C.
The table below per standard SS-EN ISO 12944-2.
Accessories
Relevant accessories with description are under this heading.

Adaptation
If the product is available in an odd size, other material quality, design or similar, this is indicated here.

Project planning
Any project planning tips regarding special properties etc. are presented under this heading.

Installation
Here a description is given of how products shall be installed against building framing or connected to the duct system.

Commissioning
If the product features measurement and regulation functions, it is stated here how this is configured.

Maintenance
Description of how the diffuser should be cleaned and how accessibility from connected duct is possible.

Environment
Information on the product’s components. Environmental product declaration.

Sizing
All information on performance and the conditions in which the sizing data are obtained is presented under this heading.

Acoustic data
Sound level is indicated in dB(A) for products that open into rooms and apply to rooms with 10 m² equivalent sound absorption area. Any deviations are presented in the respective product sheet.

For products that do not open into rooms (duct products), sound output level is indicated in dB.

Measurement of air diffuser per ISO 5135 and ISO 3741, which refer to broadband sound of stable character is made per the so-called “Comparative method”, which means that the effective sound pressure level for a calibrated sound source with known sound output (method II and ASHRAE 36-72).

Measurement of sound attenuators per EN-ISO 7235 without air flow.

\[ L_w = \text{Sound output level in octave band dB above 1 pW.} \ (10^{-12} \text{ W}) \]
\[ L_A = \text{Sound level dB(A) according to standardised frequency-weighting A. All sound levels here refer to 1 m² equivalent sound absorption area.} \]
\[ \Delta L = \text{Sound attenuation in octave band (dB)} \]
\[ K_{OK} = \text{Correction for calculation of } L_w \text{-value from } L_A \text{ or } L_{\text{Wgt}} \text{ values} \]

Reported sound level \( L_{\text{Wgt}} \) dB can be divided into octave bands using the conversion factor \( K_{OK} \).

Formula: \[ L_w = L_{\text{Wgt}} + K_{OK} \]

See calculation program on our site www.swegon.com

\[ L_w = L_{\text{Wgt}} + K_{OK} \]

For products with reported sound level in dB(A), outlet attenuation is included in the reported sound attenuation data.

Air flow \( q \)
Air flow is indicated in l/s and m³/h. Description is given in the sizing diagram for each respective product.

Basic facts
Calculation of air velocity in streams
In an approximate calculation of isothermic and free (undisturbed) air stream velocity, the following equations are used:

Supply air diffuser with shaft symmetric stream:

\[ \frac{V_x}{V_0} = K_1 \sqrt{\frac{A_{\text{eff}}}{X}} \]

\( X \) = Distance from the diffuser, m
\( V_x \) = Highest speed in the current at distance \( x \) from the diffuser, m/s
\( V_0 \) = Speed in the diffuser outlet, m/s
\( K_1 \) = Diffuser coefficient (approx. 6-8)
\( A_{\text{eff}} \) = Diffuser’s effective outlet area, m²
\( A_{\text{eff}} \) = \( q/V_0 \) where \( q \) = air flow through the diffuser, m³/s

Supply air diffuser with flat stream (through long slots):

\[ \frac{V_x}{V_0} = \sqrt{K_2} \cdot \frac{b}{X} \]

\( K_2 \) = Diffuser coefficient (approx. 6-8)
\( b \) = Stream’s initial thickness, m

Supply air diffuser with radial stream (through circular slot):

\[ \frac{V_x}{V_0} = K_3 \sqrt{\frac{A_{\text{eff}}}{X}} \]

\( K_3 \) = Diffuser coefficient (approx. 1)
Air diffuser

Throw length l_{0.2}
Test method per EN 12238. Throw length measurements are evaluated per the diagram below.

Throw length (l_{0.2}) is reported as the greatest distance from the centre of a supply air diffuser to the isovel 0.2 m/s in isothermic air discharge. Throw length l_{0.2} is described for all Swegon air diffusers.

The values indicated in the sizing diagrams apply for isothermic discharge. Check of the supply air diffuser’s throw length is also done at the maximum temperature below room temperature permissible for the given diffuser type.

For air diffusers, the throw length applies for installation on ceilings. Certain supply air diffusers can be mounted in free blowing configuration, whereby throw length is reduced by approx. 20%. “Free” installation means that the air distributor’s outlet opening is at least 400 mm from the ceiling.

Near zone
Test method per EN 12239. For low-velocity diffusers, the near zone is reported as the distance from wall to the isovel 0.20 m/s. The speed is measured at the distance from the floor at which the maximum value is obtained.

Sizing diagram
General
Unless otherwise stated for each respective product, the sizing diagram presents:

- Data under isothermic conditions
- Throw length with end velocity 0.2 m/s
- Sound level L_{A} dB(A) 10 m² equivalent sound absorption
- Total sound power level L_{Wtot} in dB
- Pressure drop p_{t} in Pa
- Air flow q in l/s and m³/h

Additional diagram types may be available for some products.

Pressure drop p
In the sizing diagram for the air diffuser, the pressure drop is indicated as total pressure (p_{t}). Certain diagrams also indicate static pressure drop (p_{s}). Note how accurately the pressure drop is indicated. Pressure drop (p_{t}) is defined as the sum of the static pressure drop (p_{s}) and the dynamic pressure (p_{d}) over an air diffuser.

\[ p_{t} = p_{s} + p_{d} \]

For a supply air diffuser, the total pressure drop is the sum of the two positive pressures and thereby has a numerical value greater than the static pressure drop. At the extract air diffuser, the static pressure drop is negative and the total pressure drop is thereby a lower numerical value than the static pressure drop.

\[ p_{t} = (-p_{s}) + p_{d} \]

Dynamic pressure is calculated as follows:

\[ P_{d} = \frac{v^{2}}{2} \rho \text{ Pa} \]

where \( v \) indicates intake velocity in m/s
\( \rho \) indicates air density kg/m³

13
Throw length and near zone

Throw length \( l_{0.2} \)
The following figures are used in the sizing diagrams for the majority of supply air diffusers to symbolise the various directions of diffusion.
The directions of distribution are clearly stated in other sizing diagrams.

Near zone \( a_{0.20} \) and \( b_{0.20} \)
Reported in the low-velocity diffuser’s sizing diagram to show the size of the near zone isovel.

Near zone isovel

Dimensions and weight
Provides detailed information on the product’s key dimensions and weight.

Specification
Describes how the products shall be specified in orders or in program document.

1 = Counter rotation
2 = Clockwise swirl
3 = 4-way
4 = 3-way
5 = 2-way centre
6 = 2-way corner
7 = 1-way
8 = Vertical
Example of sizing diagram

**COLIBRI CR 125-400 + ALS 100-125, one step**

![Sizing diagram COLIBRI CR + ALS, one step.](image)

Example COLIBRI CR + ALS
30 l/s at 30 dB(A) results in 50 Pa and throw length 1.3 m in the clockwise swirl picture.
1.8 m at 4-way (see diagram)
2.3 m at 3-way (see diagram)
2.7 m at 2-way
4.1 m at 1-way

**EAGLE Single, overview diagram**

![Sizing diagram EAGLE Single.](image)

Example EAGLE Single. Size 160 and 60 l/s.
At 30 dB(A), results in 16 Pa and throw length 2.2 m.

**DHC 125 + REG**

![Sizing diagram DHC + REG](image)

Example DHC + REG.
50 l/s at 30 dB(A) results in 100 Pa and near zone 0.5 m a₁₂ and 1.4 m b₁₂.