

CONNECTING
EXPERTS.

CHILLVENTA eSPECIAL

Refrigeration | AC & Ventilation | Heat Pumps

13.–15.10.2020

NÜRNBERG MESSE

How to make any heating/cooling device more silent

Wir entwickeln und produzieren die
effizientesten Ventilatoren für die Zukunft

ZIEHL-ABEGG

Die Königsklasse

*der Lufttechnik,
Regeltechnik und Antriebstechnik*

Einzigartige
Kunststoffproduktion
für bionische Hightech-
Ventilatoren

Welcome



How to make any heating/cooling device more silent

Michael Kraus / Product Management Axial Fans and Application Management Heat Pumps



Considerations

Considerations

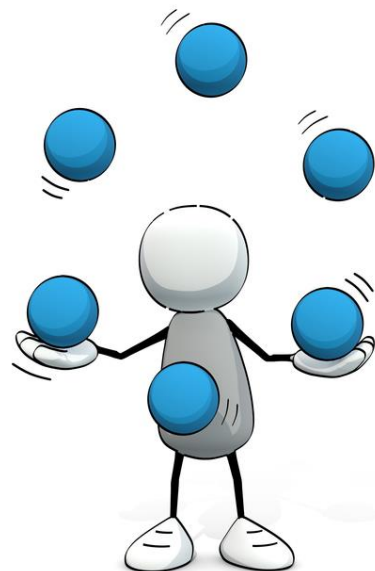
Noise and noise pollution

- Studies show that noise is increasingly becoming a risk to human health
 - You can't get used to noise
 - Different legislations to regulate noise are active (e.g. TA Lärm)
 - Trend to more air conditioners and especially air/water heat pumps
 - Several countries (e.g. Netherlands, Austria) begin to discuss lower limits for sound power emission for heat pumps
- Devices have become even more silent in the future

Considerations

Regulation, Installation, Technology

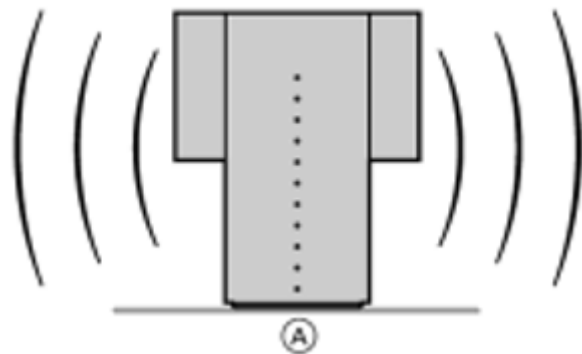
- Legal and regulatory considerations
 - Fans: Current legislative EU/327/2011 (=ErP2015)
 - When will the next tier be active? ErP202?
 - What will be the efficiency threshold?
 - Trade-off between best acoustics and highest efficiency
- Technical considerations for devices
 - Examples of problems of optimization
 - Acoustic & efficiency vs. compact units with small footprint
 - Evaporator: Sensitivity to icing vs. tip clearance (=acoustics)
 -



Influence parameters on acoustics

Influence on acoustic performance

What the user hears:



„My device is too loud“

What are the noise sources?

- Unfavourable installation on site
 - Reflection of sound (e.g. walls)
 - High backpressure and turbulences of air
 - Missing mechanical decoupling of structure and device
- Unfavourable design device
 - (Fluid path: compressor, piping)
 - Air path
 - Fan
 - “System influences”

Influence on acoustic performance

Influence parameters air path

Depending on **fan**

- Acoustics of fan aerodynamics
- Motor noise

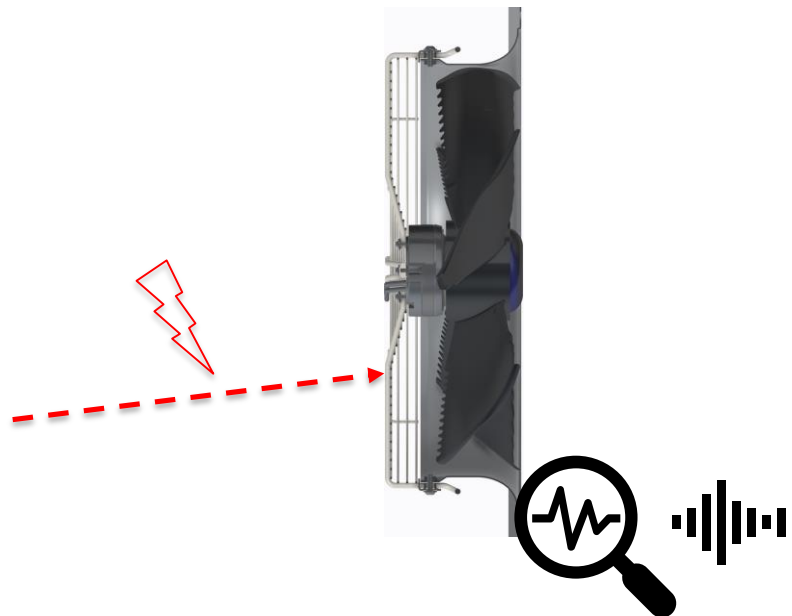


Influence on acoustic performance

Influence parameters air path

Depending on **fan**

- Acoustics of fan aerodynamics
- Motor noise
- Vibrations due to imbalance (structure borne!)



Influence on acoustic performance

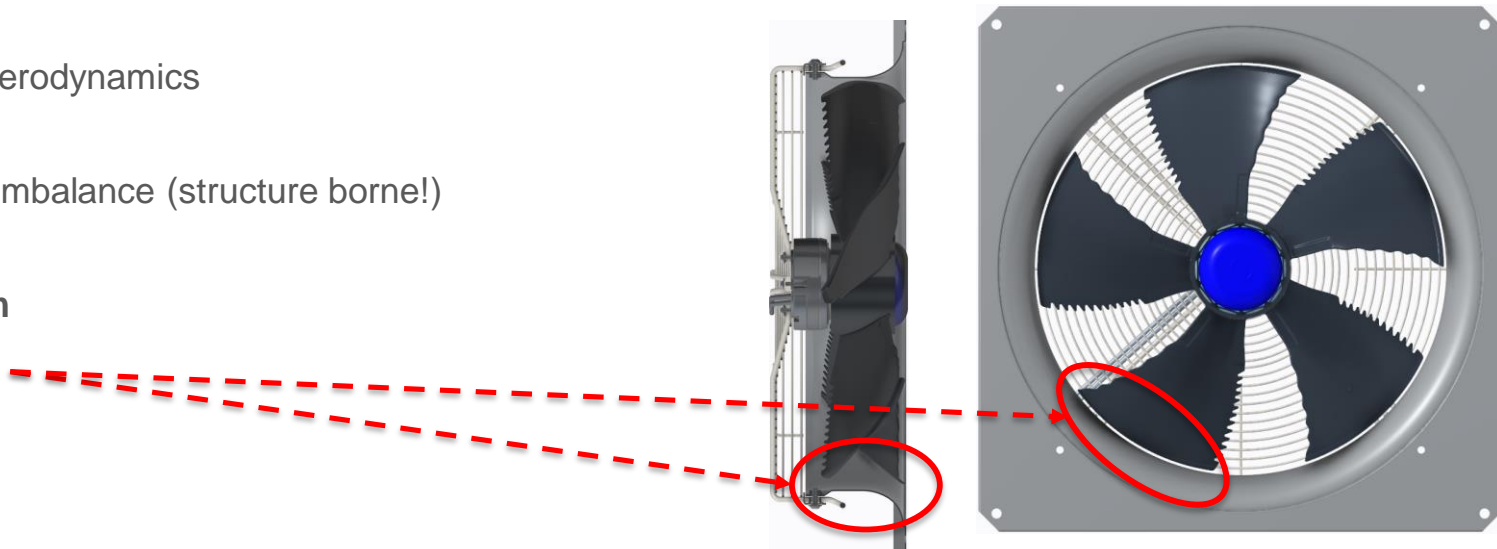
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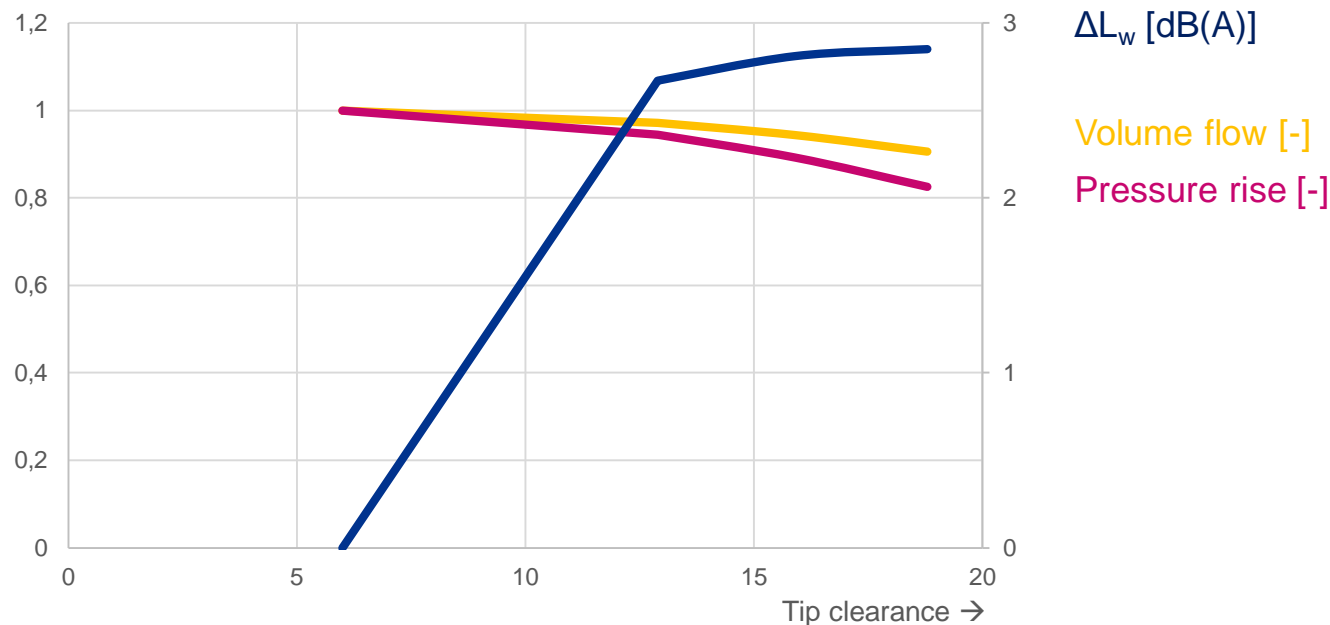
Depending on **system**

- Tip clearance



Influence on acoustic performance

Tip clearance



Influence on acoustic performance

Influence parameters air path

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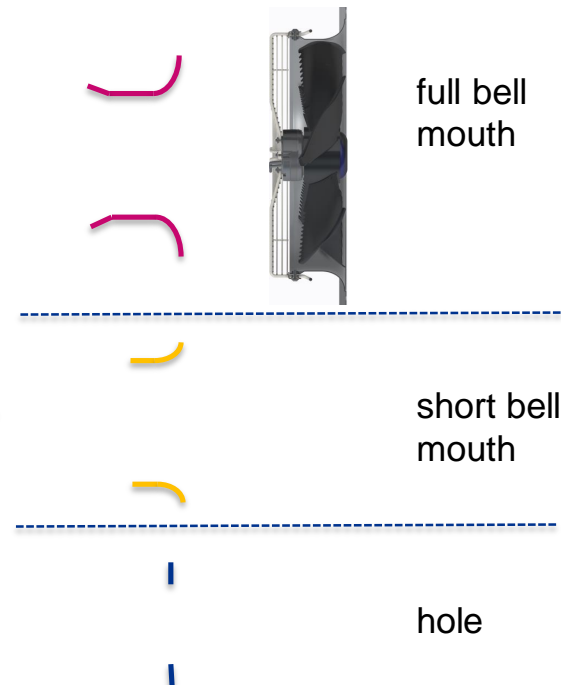
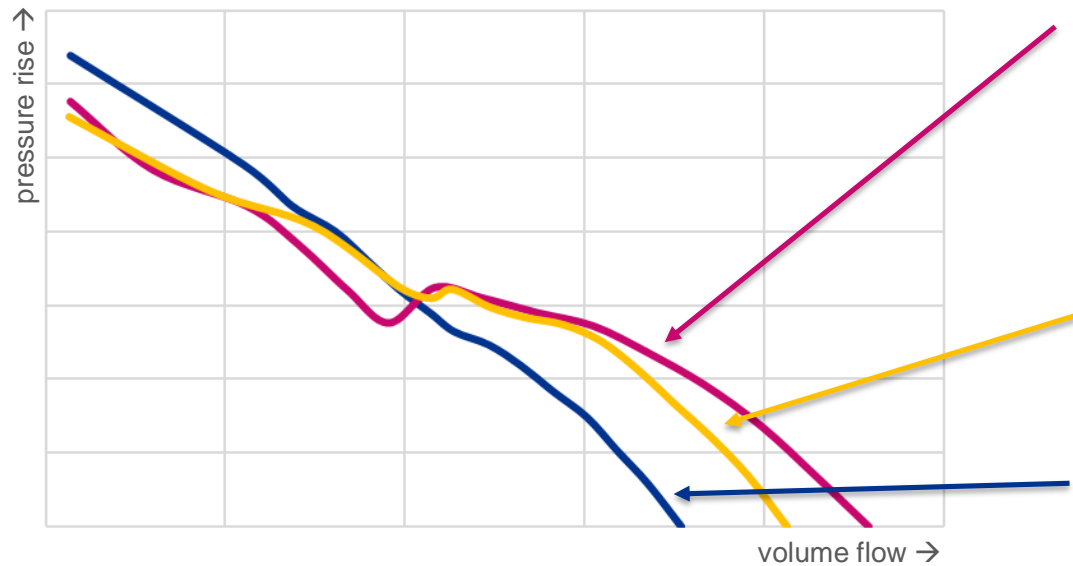
Depending on **system**

- Tip clearance
- Geometry of nozzle



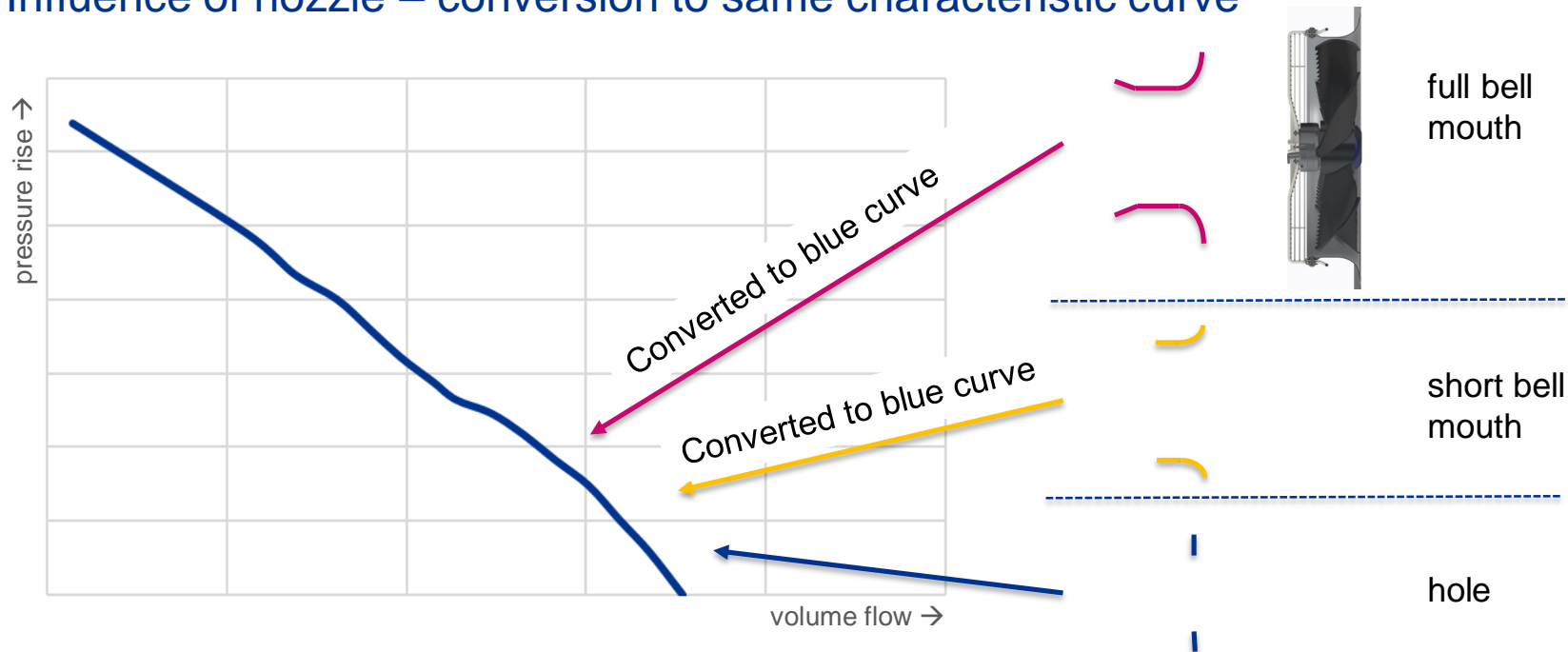
Influence on acoustic performance

Geometry of nozzle



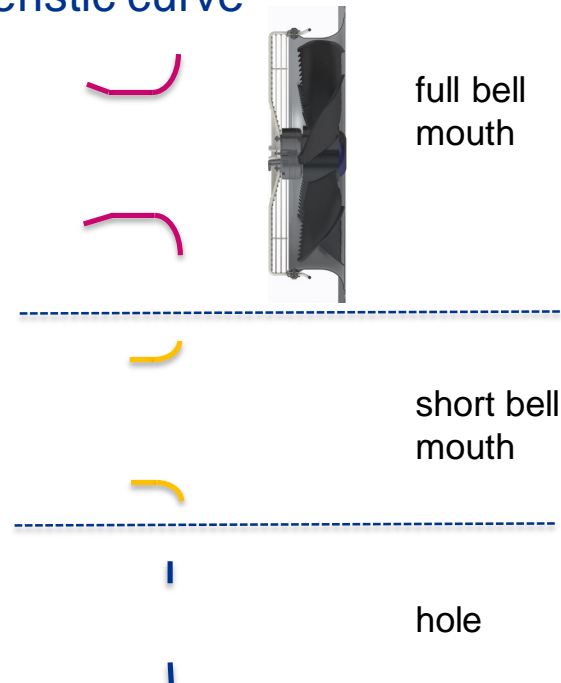
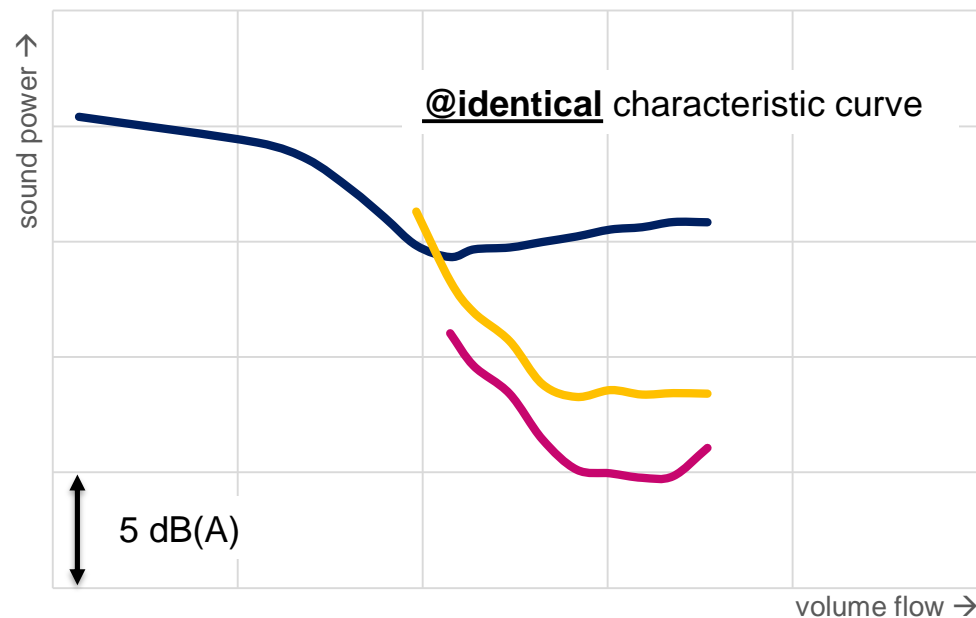
Influence on acoustic performance

Influence of nozzle – conversion to same characteristic curve



Influence on acoustic performance

Influence of nozzle – acoustics at identical characteristic curve



Influence on acoustic performance

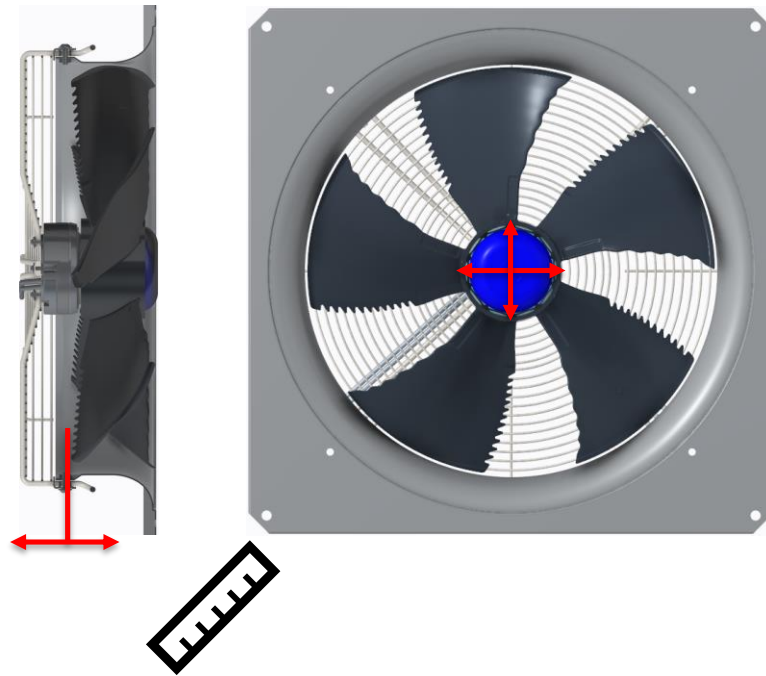
Influence parameters air path

Depending on **fan**

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Depending on **system**

- Tip clearance
- Geometry of nozzle
- Position of fan in nozzle



Influence on acoustic performance

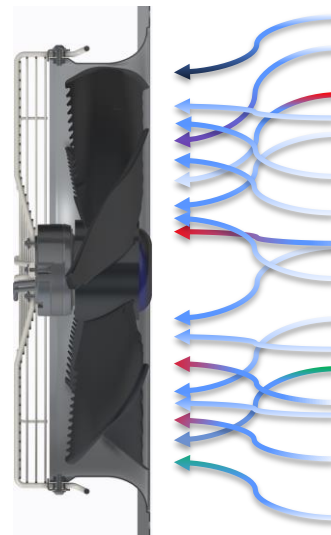
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Depending on **fan**

- Acoustics of fan aerodynamics
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Depending on **system**

- Tip clearance
- Geometry of nozzle
- Position of fan in nozzle
- Obstruction/Turbulence (suction AND pressure side)
 - e.g. Grille, heat exchanger, struts of device



Turbulence = Noise

Influence on acoustic performance

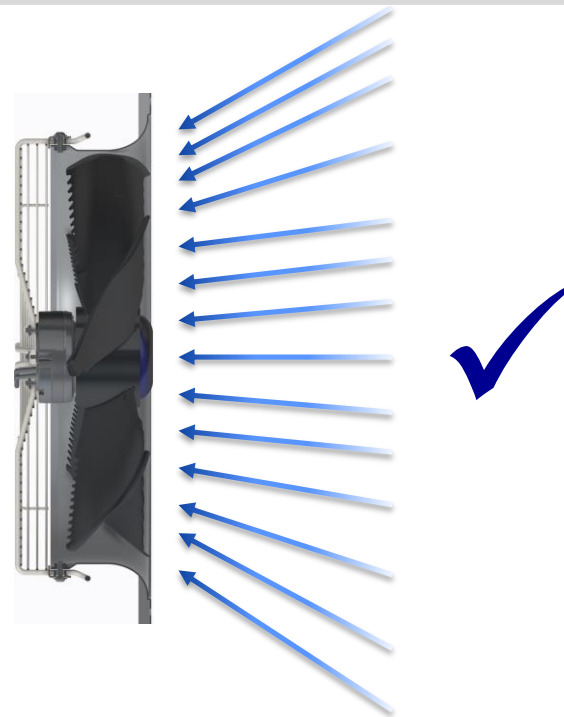
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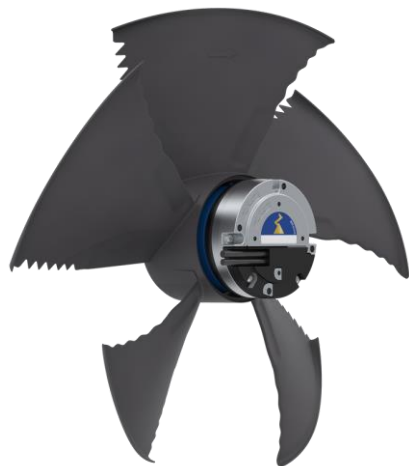
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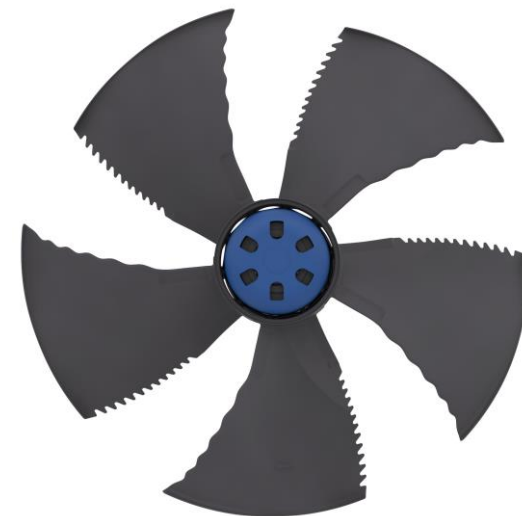
FE3owlet with EC072



FE3owlet EC072 - details

Fan based technical data - Fact & Figures

- Impeller sizes: 350 – 450
 - Design: FE3owlet
 - serrated trailing edge
 - winglet
 - sickle shape
 - air foil
 - corrugated leading edge →
- } known for best acoustics
- latest biomimetic insights to handle unfavourable inflow conditions
- Impeller : black high performance composite
 - ErP: 202x compliant



FE3owlet EC072 - details

System based Facts & Figures

Depending on **fan**

- ✓ Best acoustics of fan aerodynamics
- ✓ Minimal motor noise
- ✓ Extremely low vibrations due to imbalance

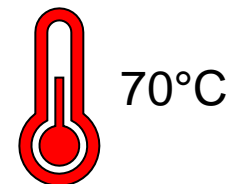
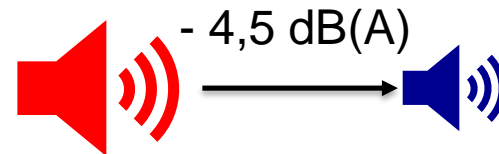
Depending on **system**

- ✓ Ideal tip clearance
- ✓ Best geometry of nozzle
- ✓ Optimal position of fan in nozzle
- ✓ Only mandatory obstruction/turbulence due to the guard grille



FE3owlet EC072 - details

- FE3owlet with EC072 which is up to 4,5 dB(A) more quiet than market standard.
- FE3owlet with EC072 can handle up to 70°C fluid temperature, which is 10K more than market standard





Conclusion

Conclusion

Design and installation considerations for cooling and heating devices

- Proper design to exploit full potential of fans in devices is necessary
- Proper installation to exploit full potential of device on site is necessary
- Team play of manufacturer, installer and planner



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**Thank you for your
attention.**

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