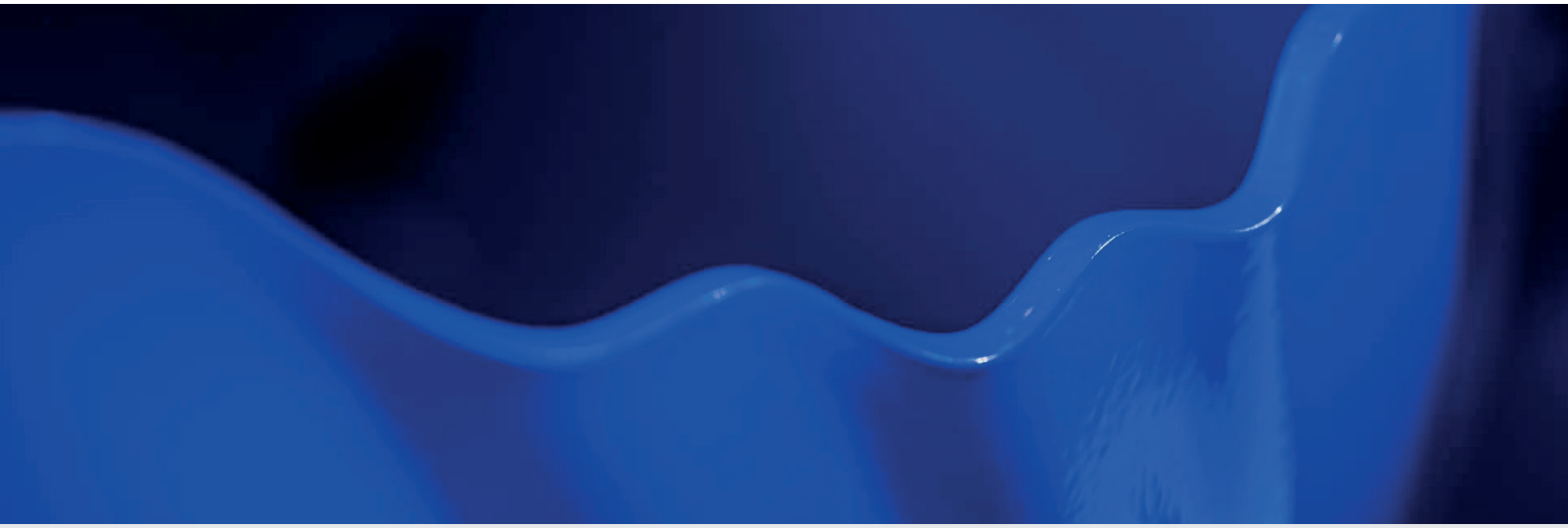
Movement by Perfection



**The Royal League** in ventilation, control and drive technology

# Technical report

ZAbluefin-ECblue – Centrifugal fans, reimagined

ZIEHL-ABEGG

# ZAbluefin-ECblue – Centrifugal fans, reimagined

*Figure 1 – New ZAbluefin centrifugal fan, optimised for air handling units*

Combined with the enhanced ECblue motors, the new ZAbluefin centrifugal fans are the current benchmark when it comes to system efficiency and acoustic behaviour.
Optimised for central air conditioning units, they offer better air handling capacity than previous components while consuming much less energy.

## Ambitious development goals

The goal was to develop a successor to the Cpro impeller series, which was introduced eight years ago and achieved success around the world. At the same time, the tried-and-tested, powerful ECblue drive had to be enhanced in terms of energy efficiency and the latest smart technologies in order to ensure the best possible system performance.
The aim was to achieve the highest possible system efficiency with reduced sound power and minimised installation losses in central air conditioning units.

## New ZAbluefin Bionik impeller provides inspiration for maximum progress

Research findings from the field of bionics led to the wave-shaped, twisted 3D blade design. In particular, findings from the flow behaviour of humpback whale fins yielded the much-hoped-for advance. As such, small humps on the blades' air inlet edge, which are reminiscent of the tubercles on the whale's fin, produce flow-optimised characteristics to prevent flow separation.
The specially twisted blade geometry ensures the best possible flow efficiency over the entire range of characteristics.
The air outlet from the impeller is designed as an opening, rotating diffusor. Combined with the innovative blade design, this achieves the highest efficiencies. Diffuse sound radiation and top acoustics are ensured in particular by the wave-shaped front and rear edges on the impeller and the blade surfaces.

## Advantages when installed

The special contour of the base plate and the five backwards-curved blades of the ZAbluefin impeller create a centrifugal fan with a diagonal character. The diagonal outflow on the pressure side means that the air movement hits adjacent components obliquely, thereby reducing vortex formation. This ensures efficient operation with minimal installation losses, especially in units with small cross-sections.
The more uniform speed profile and lower sound power have other significant advantages. This means that the distance to the next built-in component can be reduced to up to 0.8 ximpeller diameter (C model range 1.0), without taking into account installation losses.
Together with the significant reduction in sound power already mentioned, shorter silencers can also be used, for example. This enables the total length of the installation to be shortened and high-performance systems to be created, even in small spaces.

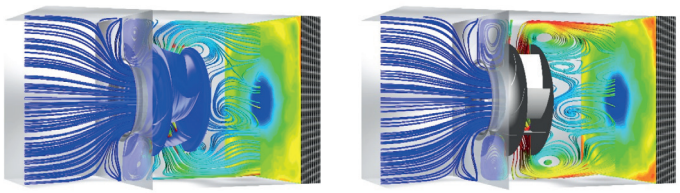


*Figure 2 – Flow comparison of a ZAbluefin with a standard centrifugal fan in an air handling unit.*
*The flow lines indicate the path of imaginary air particles.*
*The colour indicates the degree of turbulence, i.e. an indicator for efficiency losses and noise generation. Blue means low turbulence, red means high turbulence.*
*In addition, a very uneven distribution of air velocity on the heat exchanger can be detected, which also reduces the efficiency of heat transmission.*

## Stable, light and temperature-stable – the high performance composite material ZAmid

When developing the new impeller design, almost everything changed. For instance, the high performance composite material ZAmid, which is familiar from other model ranges, has been consistently improved.

The aramid-fibre-reinforced plastic is as stable as steel, but significantly lighter and exceptionally temperature-stable (-35 °C to +60 °C). In contrast to a steel impeller, the ZAbluefin can be used across the entire temperature range.

In addition, an impeller made of the material ZAmid meets almost all hygiene requirements. The free-running impeller is easy to clean, does not corrode and does not provide bacteria with a breeding ground.

Evidence shows that no substances are “gassed out” of the material. This means that the impellers are also suitable for situations with the most stringent requirements, e.g. in paint shops.

ZAmid is also 100% recyclable, thus conserving valuable resources. ZAbluefin impellers are produced by ZIEHL-ABEGG in its own production facilities. This shortens delivery times and reduces the procurement risk for customers.

## Enhanced high-efficiency ECblue drive

For maximum system efficiency, all components in a system have to fit together perfectly. For this reason, the 2nd generation of the ECblue drive has been perfectly tailored to the impeller. The enhanced “intelligent” EC external rotor motor with an integrated controller is highly efficient and corresponds to the highest energy efficiency class IE5.

## Intricate developments for safe and reliable operation

The 2nd ECblue generation meets the IP55 protection class as standard and symbolises maximum reliability, even in difficult environmental conditions.

Together with the newly designed cooling ring and built-in active temperature management, efficient and reliable operation is ensured.

A vibration sensor has also been integrated for predictive maintenance. This detects and signals any maintenance measures required in good time.

## Flexible and intelligent

Thanks to the Modbus integrated as standard with patented ZIEHL-ABEGG auto-addressing and a high level of flexibility for other BUS systems, the motor offers a number of intelligent communication options. Furthermore, the drive has a replaceable printed circuit board (I/O PCB) and can thus be adapted to customer-specific I/O solutions.

The ECblue is “IoT ready” for a cloud connection via ZIEHL-ABEGG's ZAbluegalaxy platform, the system monitoring solution of the future.

The intelligent electronics also offer the option of controlling the motor using the ZAset mobile app via Bluetooth®. A Bluetooth stick is available as an option.

## No impeller blockage and variable connection

The flat and compact drive is connected to the ZAbluefin impeller via an adapter flange and does not protrude into the impeller. This prevents impeller blockage and increases system efficiency.

With the adapter flange, the impellers can be fitted with a standardised mount for fastening the motor.

As a result, fewer impeller designs are required, which means that less stock has to be kept in storage.

At present, 8 sizes (250–560 mm) are available in 27 variants (0.50-5.60 kW).

## The concept – optimum interaction between components

ZAbluefin impellers can of course also be used with standard motors. However, maximum system efficiency is achieved when the ZAbluefin is combined with the ECblue. The improved air handling capacity optimised for central air handling units (AHU) results in highly efficient operating options with an improved carbon footprint.

With the perfect coordination between the EC motor technology and the high-performance impeller, it achieves the highest system efficiency in its class (up to 71.1%). Energy consumption is up to 5% lower compared to the Cpro model range.

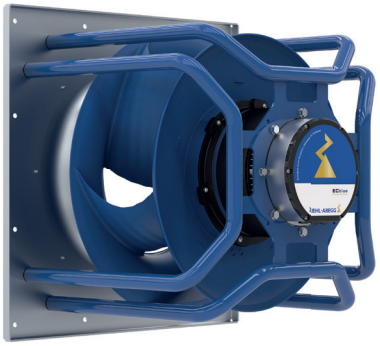


*Figure 3 - Fan as ventilation unit GR with ECblue motor from the 2nd generation*

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## Conclusion

The new and enhanced components from ZIEHL-ABEGG currently offer an outstanding system solution for ventilation, air conditioning and refrigeration technology. In particular, the futuristic impeller developed with the aid of bionics, a cutting-edge blade design and optimised diffuser effect corresponds to what is currently feasible in terms of design and function.
In combination with the intelligent ECblue drive, this results in a highly efficient, quiet fan system that minimises energy consumption while still offering more power. And because it is IoT-ready, you're also well prepared for the future – what more could you want?

## The facts at a glance

Facts about the ZAbluefin impeller:

- Air handling capacity, free blowing volume flows of up to 19,000 m3/h and max. static pressure increase up to 1,800 Pa
- Highest stat. system efficiency up to 71.1%
- Reduced sound power on suction side to -6 dB/on pressure side to -4 dB
- Reduced rotational tone
- Medium temperature -20°C to +60°C, -35°C with spec. measures
- Optimised for use in AHU

Facts about the ECblue drive:

- External rotor EC motor
- Energy efficiency class IE5 (IEC/TS 60034-30-2)
- Protection class IP55
- Integrated vibration sensor
- Interchangeable I/O PCB
- Integrated Modbus with auto-addressing
- Integrated controller
- Integrated active temperature management
- IoT ready

Advantages compared to the predecessor Cpro:

- Increased efficiency +5.9% (GR35)
- Higher system efficiency
- Improved acoustics (-6/-4 dB)
- More uniform flow profile with installation advantages

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