

Movement by Perfection



The Royal League in ventilation, control and drive technology

Technical report

Highly efficient fans for ships –
the Marine series from ZIEHL-ABEGG

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The civil shipping segment is a rapidly growing area in the transport sector. This applies equally to the transportation of freight by tankers or container ships as well as passenger transport services on cruise ships or ferries. Another equally important area is the offshore industry – especially in the age of renewable energy. All ships and offshore facilities have areas for storing technology such as machine rooms or control stations as well as areas where the people on board can work and live. Optimum ventilation and air conditioning is required everywhere, offering comfort for the crew and passengers, ensuring the quality of cargo, guaranteeing generally hassle-free operation and also touching on safety-relevant aspects. For example, the types of ventilation used on ships range from simple portholes and dorade fans to technical systems, though ventilation technology powered by electric motors has only been in use for around 70 years.

Requirements arising from environmental influences, risks inherent in the ship itself and energy consumption

Fans used on ships not only have to ensure continuous service, but are also exposed to strong environmental influences and risks arising from the ship itself. (Salt) water, humidity, heat and cold and the consequences of these, such as corrosion or condensation, are just as important to consider as the risk of constant movement, strong tilt or vibrations caused by the ship. For example, low-frequency vibrations caused by machines can be transmitted via the ship's hull to a fan and affect its natural vibrations. Another problem arises from the fact that, despite increasing requirements presented by larger ships, for example, the limitation of energy consumption is also becoming more important in the maritime industry. So, fans are needed that strike a balance between low energy consumption with high efficiency, while also withstanding the harsh conditions at sea

From land to sea – marine fans from Ziehl-Abegg

ZIEHL-ABEGG has many years of expertise in designing highly efficient fans developed in conjunction with its customers and is now bringing this efficiency on board. The focal point here is the ZA-Marine series from ZIEHL-ABEGG, a series of reinforced, floor-standing built-in fan modules (ER modules) that can be equipped with centrifugal impellers and marine-certified standard motors of various power levels. For instance, with the ZABluefin-Steel and the C-series, high-efficiency, tried-and-tested impellers are already available from on-shore fans. The fans are available in a total of 14 sizes and with three impeller variants in sizes the 250–1000 up to a maximum static pressure increase of 3000 Pa. Thanks to the ZABluefin's innovative bionic blade design and corresponding, controllable drives, the fans operate with maximum energy efficiency.

Manufactured according to maritime requirements – the motors

All fans are fitted with IEC-maritime-specified motors supplied by well-known manufacturers such as ABB, Hoyer, Siemens and WEG and are manufactured and tested in accordance with the regulations of the leading classification societies. The motors are connected to the impeller via a fixed hub and, depending on the size, are equipped with a corrosion-resistant aluminium housing or a robust and low-vibration cast housing.



Figure 1 - ZA-Marine fan with reinforced C-impeller and ER built-in module

A specially developed coating for salt water resistance in accordance with ISO 12944 (C3 coating for coastal areas with low salt content, C4 coating for industrial and coastal areas with moderate salt contamination and the offshore special coating system C5) provides increased corrosion protection. The motors are available for different power connections of 3~ 380–690V/50/60 Hz.

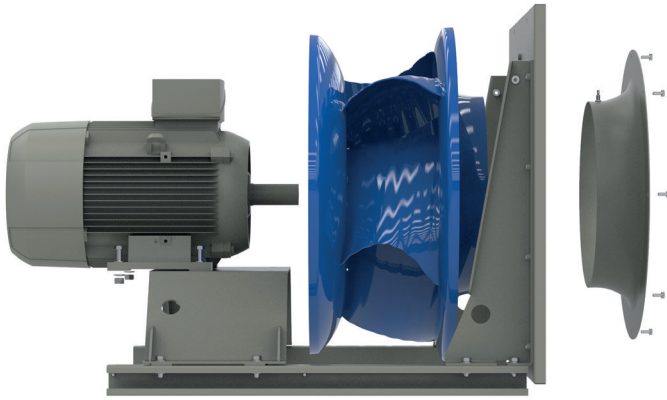


Figure 2 - ZA-Marine ER module with ZABluefin Easy to disassemble for maintenance

Reinforcement and coating – special design features

The shaft height of the marine version of the fans is lower compared to the onshore version up to size 710, which facilitates a compact, flat design and accommodates the often limited space on board. However, the weight comparison shows that the maritime variants weigh approximately 10% more, which is down to the reinforced components, which in turn are essential for seaworthiness with their extended requirements. For example, increased strength of the frame parts, reinforcement of the material on the support elements or a higher sheet thickness on the nozzle plate improves stability. All connections are joined with A2 or A4 stainless steel screws. The motor bracket also has reinforced sheets, and the four bracing plates on the outside are welded on both sides, as are the two base plates. The inlet nozzle, also fastened with A2/A4 screws, has (except for the C3000 model range) a standard mounting hole pattern for attaching connection compensators or safety grilles as well as an integrated connection for volume flow determination by means of differential pressure measurement. The individual components now not only have to be protected against vibrations, but especially against the consequences of salt water. In contrast to the on-shore versions, the modules from the ZA-Marine series have a high-quality coating, depending on the ambient conditions (salt content) in accordance with the Ziehl-Abegg-defined corrosion protection class BKK1 in the colour pebble grey (RAL 7034) or the higher-quality multi-layer system BKK4 in stone grey (RAL 7030). The impeller is always painted in ultramarine blue (RAL 5002), regardless of the fan module's protection class.

According to company standards based on many years of experience in corrosion protection, for example for external transformation fans, the coatings must each withstand a salt spray test for corrosion testing (according to DIN EN ISO 9227) and a condensation test (according to DIN EN ISO 6270–2). In sizes up to 630, the fan module's basic profiles are made of galvanised and powder-coated steel C-rail profiles, while the larger modules are made of sturdy aluminium profiles. Despite the module being coated, continuous earthing is ensured, usually via an external grounding clamp. It should also be mentioned that the total additional material required is not associated with any increased environmental stress, as these are recyclable materials.

Not just the fan – important additional system components

The fan module can be connected to the suction side components via a flexible connection compensator to compensate for vibrations. The connection compensator is implemented for all sizes and has the same mounting hole pattern as the screwed inlet nozzle, so that no further holes are required in the nozzle plate. To further improve quality, ZIEHL-ABEGG recommends mounting the unit on tested EluFlex_rubber dampers as a second element of vibration decoupling – also in view of the fan's surroundings. These guarantee very good vibration absorption thanks to the lowest natural frequencies and optimum shock absorption due to high energy absorption, which is reflected in the extremely high statics and noise reduction resulting from the absence of natural vibrations. As an important safety feature, the EluFlex_dampers are designed to be tear-resistant, which ensures stability in the intended position, even under the strongest loads.

Voluntary testing and certification

The ZIEHL-ABEGG portfolio is defined for non-essential services, i.e. it does not relate to safety-relevant aspects for basic ship operations. There is no explicit DNV classification testing standard for non-safety-relevant ventilation modules themselves. However, ZIEHL-ABEGG has voluntarily carried out tests in cooperation with TREO (Laboratory for Environmental Simulation) on behalf of the classification society DNV, in which the fan was exposed to extremely tough conditions over a long period of time, with regard to mechanical stability and impact resistance (insulation resistance test, inclination test and vibration test) and corrosion protection (salt spray test, cold test, hot steam test and dry heat test) (DNV tests where the fan has been exposed to extremely harsh conditions over a long period of time, such as mechanical stability and impact resistance (insulation resistance test, tilt test and vibration test) and corrosion protection (salt spray test, cold test, hot steam test and dry heat test) (DNV standard CG-0339). The successful test series ended with a certificate, which verifies the high quality of the fans for customers. It should be noted here that the fans only receive DNV certification in conjunction with the EluFlex rubber damper.

Conclusion

With the use of its special high-efficiency fans in a maritime setting, their upgrades in line with conditions at sea and their subjection to a wide range of tests for certification, ZIEHL-ABEGG is able to tap into a new industry. The COVID-19 pandemic partially slowed down shipping traffic, and ships that were unable to sail during this period were decommissioned due to their age. These cannot be used in future. The hype around cruises is expected to increase further, and more and larger transport vessels will be needed in the future. The need for wind power, for example, makes the expansion of offshore facilities essential. All these ships and offshore farms need new machines, including in an area as important as ventilation technology. This opens up a new market for ZIEHL-ABEGG fans.

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