

**Cooling Experts Around the Globe**



# **Cooling Systems for Wind Power Onshore and Offshore**



# AKG - A Century of Experience



## Technical Competence

It is reassuring feeling to work with strong and reputable partner like AKG, especially when the conditions are tough and unforgiving like in wind power generation. With a **100 year experience** in reliable cooling solutions we were also among the first to supply into wind turbines in the 1990s. Since then thousands of AKG products work in the field day in day out on all continents and the numbers are growing every day. Our quality level is the benchmark in our industry.

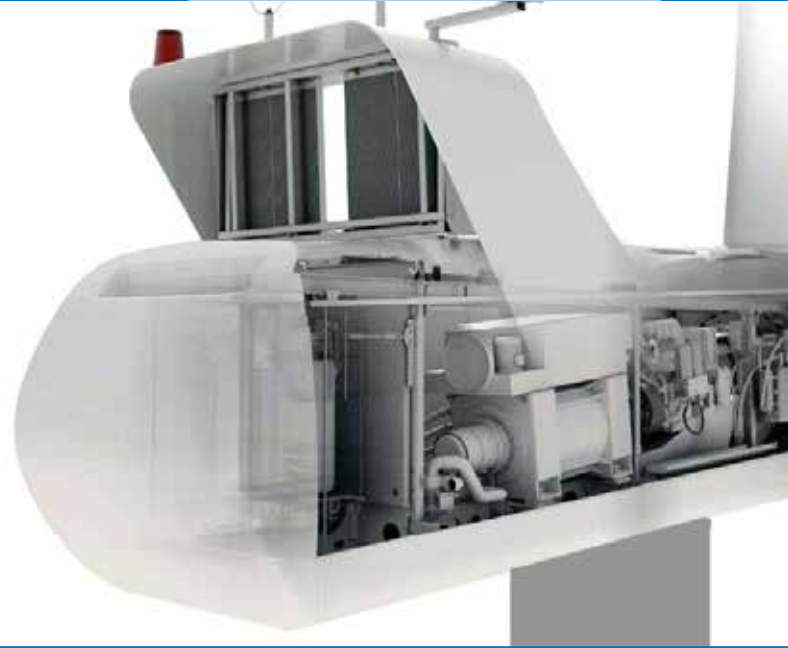
## Engineered Solutions for a Perfect Application Fit

We understand our customer needs in wind turbine cooling and their specific requirements and challenges. AKG's engineering and design teams are well trained and experienced to create cooling systems that are perfect solutions to our customers cooling requirements and challenges. High reliability, low maintenance and corrosion protection are typical benefits of AKG cooling solutions, as our aluminum technology, including long-life alloys, has a proven performance in wind farms around the world. Each of our products is engineered, designed and manufactured to a custom specification. AKG uses the latest and highest quality simulation, calculation and CAD-tools and our production facilities are equipped and managed with the necessary flexibility to handle a great variety of products.

## Standardized Components and Optimal Total Cost of Ownership

AKG's product portfolio for wind power applications derives from all the industries we are serving, ranging from light weight aerospace coolers to massive mining excavator coolers and from safely heat exchangers for compressor to electronics cold plates. For wind power application we can pick the right components and the best technology. We always look at the whole life cycle cost including maintenance to find the optimum. AKG's supply chain is as global as our production footprint aiming to source at best costs. In parallel we manage the diversification of our sourcing risks and play according to local content requirements.

AKG is leading the industry when it comes developing new standards and platforms. Looking at development time and costs this is a considerable competitive advantage. Solutions built on the basis of standardized components are typically First-time-right and the most cost efficient.



## Innovation and In-House Product Validation for a Speedy Time to Market

Time is of the essence when it comes to new product development and introduction. AKG has the resources and the attitude to move fast. We efficiently use the most up to date project and engineering tools and are able to provide prototypes with short lead time. In AKG's in-house Research and Development Centre all Wind Industry typical cooling system validation test can be conducted. In addition we have a full database of references from more than two decades in the wind power industry.

## Worldwide Presence

AKG is as global as our customers. We have engineering and production for wind power applications in Europe, Turkey, USA, India, China and Brazil. With the global presence, extensive logistics and supply chain network, AKG can deliver cooling solutions from any region, complying with national sourcing needs.

## AKG As Lifelong Partner

Be it large assemblies of small components or individual coolers in big or small series, AKG will cater for your needs. Our hallmark is superior reliability, high performance and easy maintenance for a full product life time. AKG's service business unit is even looking beyond: We supply the aftermarket and repair and service AKG's own as well as many other coolers.

## WE HELP YOU ACHIEVE YOUR GOALS:

- Reliable, highly available power generation
- Larger and more efficient turbines
- Optimized electricity generation costs
- Smooth operation without disruption
- Localized production in growing markets
- Global products with local supply chain
- Standardized and modularized solutions

## WE OFFER YOU:

- Robust, powerful, reliable cooling systems to protect key components from overheating
- Tailorized solutions for failure free operation and optimized Total Costs of Ownership
- Rapid product development and prototyping to reduce development time and costs
- Regional production in growth markets to meet local sourcing requirements
- AKG's high quality standards for validation, testing and serial production to reduce Life Cycle Costs
- Easy installation and low maintenance requirements to reduce installation costs and Life Cycle Costs
- Constant drive to innovate and develop next generation cooling solutions up to market readiness



# AKG - The Supplier of Innovative High-Performance Cooling Systems for Wind Power Generation



Wind Turbine Individual Component Cooling for Converter and Gearbox

AKG Cooling System Solution

Active cooling unit with fan

Scope of supply:



Heat exchanger, fan unit including motor and shroud, mounting frame plus auxiliary devices

Active cooling unit key technical features:

- High heat exchanger power density and long heat exchanger durability due to aluminium tube-fin or bar plate technology
- Intelligent fan speed control with EC motor technology

Benefits

- Reduced cost of operation with intelligent control devices and high performance heat exchangers



Cooling of Transmission Components

AKG Cooling System Solution


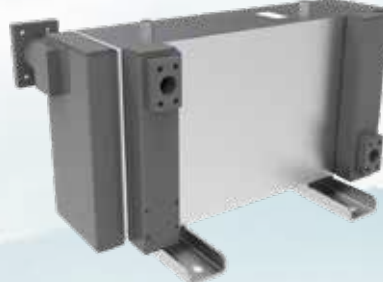
High-performance liquid-to-liquid aluminum heat exchangers for cooling of transmission components

Transmission cooler technical features:

- Aluminum heat exchangers in bar-plate design or one-shot brazed design for high durability or light weight applications
- Customized solutions with high geometrical flexibility
- Cooler design verified by FEM / CFD calculations

Benefits

- Maximum design flexibility due to tailor-made cooling solutions
- Superior heat exchanger performance and validation processes based on in-on in-house development and testing capabilities



Transformer Fluid Cooling and Circulation

AKG Cooling System Solution

Customized and fully integrated liquid-to-liquid safety heat exchanger module

Scope of supply:


Safety heat exchanger, pump for transformer fluid, mounting frame, piping, auxiliary devices

Technical features:

- Heat exchanger features safety passage with drainage to ensure 100% separation of the fluid circuits
- Modular cooler design with high flexibility in thermal and geometric sizing

Benefits

- Safe and cost-efficient transformer operation due to safety heat exchanger technology and power consumption optimized pump / heat heat exchanger design
- Ready to install subassembly for easy mountability



Rooftop Passive Heat Exchanger Assembly

AKG Cooling System Solution

Passive fluid-to-air heat exchanger

Scope of supply:


Heat exchanger panels, main frame, piping, auxiliary devices

Cooling system key technical features:

- Aluminum heat exchangers in bar-plate design or one-shot brazed design for high durability or light weight applications
- Offshore-ready with corrosion protection class up to C5M acc. to EN 12944 / requirements
- Customized solutions based on CFD-simulation optimized design

Benefits

- Maximum design flexibility due to tailor-made cooling solutions and modular system
- Approach superior heat exchanger performance and validation processes based on in-house development and testing capabilities



Cooling of Power Electronic Components (IGBT / Control Cabinet)

AKG Cooling System Solution

High-performance aluminum heat exchangers for cooling of electronic electronic components with air and liquid cold plates

Cold plate key technical features:

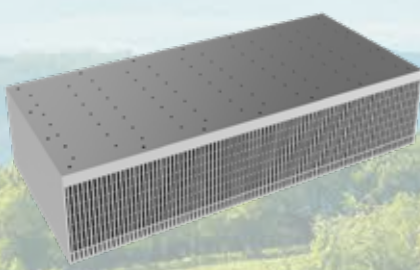
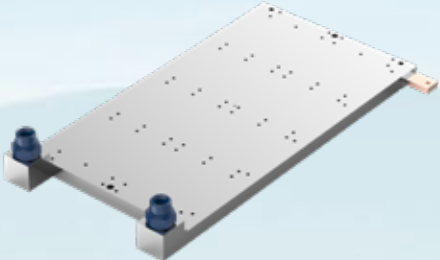
- Pressure-resistant and robust due to the brazed design
- Excellent heat transfer properties with low pressure losses
- Customized solutions with high geometrical flexibility based on CFD-simulation optimized design

Control cabinet cooler key technical features:

- High production flexibility with glued and brazed production technology
- Tailor-made design to fit into existing installation space

Benefits

- Optimal cost / performance ratio
- Maximum flexibility und durability due to robust and fully customized design solutions



Circulation and Distribution of the Main Cooling Circuits Fluid

AKG Cooling System Solution

Tailor-made pump stations for different cooling circuit types and sizes

Scope of supply:

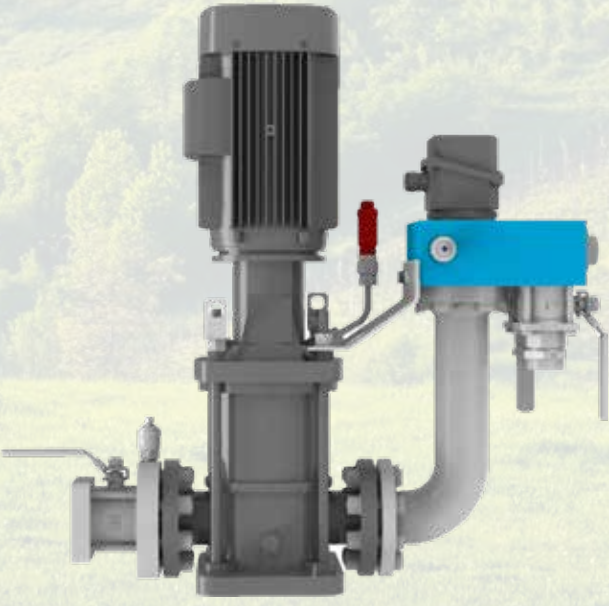
Pump, mounting plate, sensors (pressure, temperature), flow split device, heater, cut-off valves, control blocks and expansion vessels

Pump unit key technical features:

- Individual design with integrated measurement and heating devices to meet customers specific requirements
- Canned motor pump configuration for maintenance-free pump operation

Benefits

- Reduced life cycle cost due to high durability, maintenance free operation and performance and optimized canned motor pump design
- Flexibility in design with different pump technologies and 100% customized solutions





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## AKG - A STRONG GLOBALLY INTEGRATED GROUP OF COMPANIES

*AKG is a leading global supplier of high-performance coolers and heat exchangers, providing custom system solutions with the highest quality standards. Around the world 2,500 employees work at 12 manufacturing facilities located in Germany, France, Latvia, Turkey, the USA, Brazil, China and India.*

*Together with a number of sales offices in additional countries and regions, AKG's cooling experts are on duty around the clock. Longstanding partnerships with global OEM customers from 24 lines of business - including construction machinery, compressed air systems, agricultural, forestry machines, wind power and many others - give fresh and innovative inspiration for AKG's line of pre-engineered cooling systems as well.*

*AKG operates one of the world's largest researches, development, measurement and validation centres for cooling solutions and customized applications. For 100 years, AKG's heat exchangers have stood for innovative solutions as well as the highest standard of engineering and manufacturing expertise.*