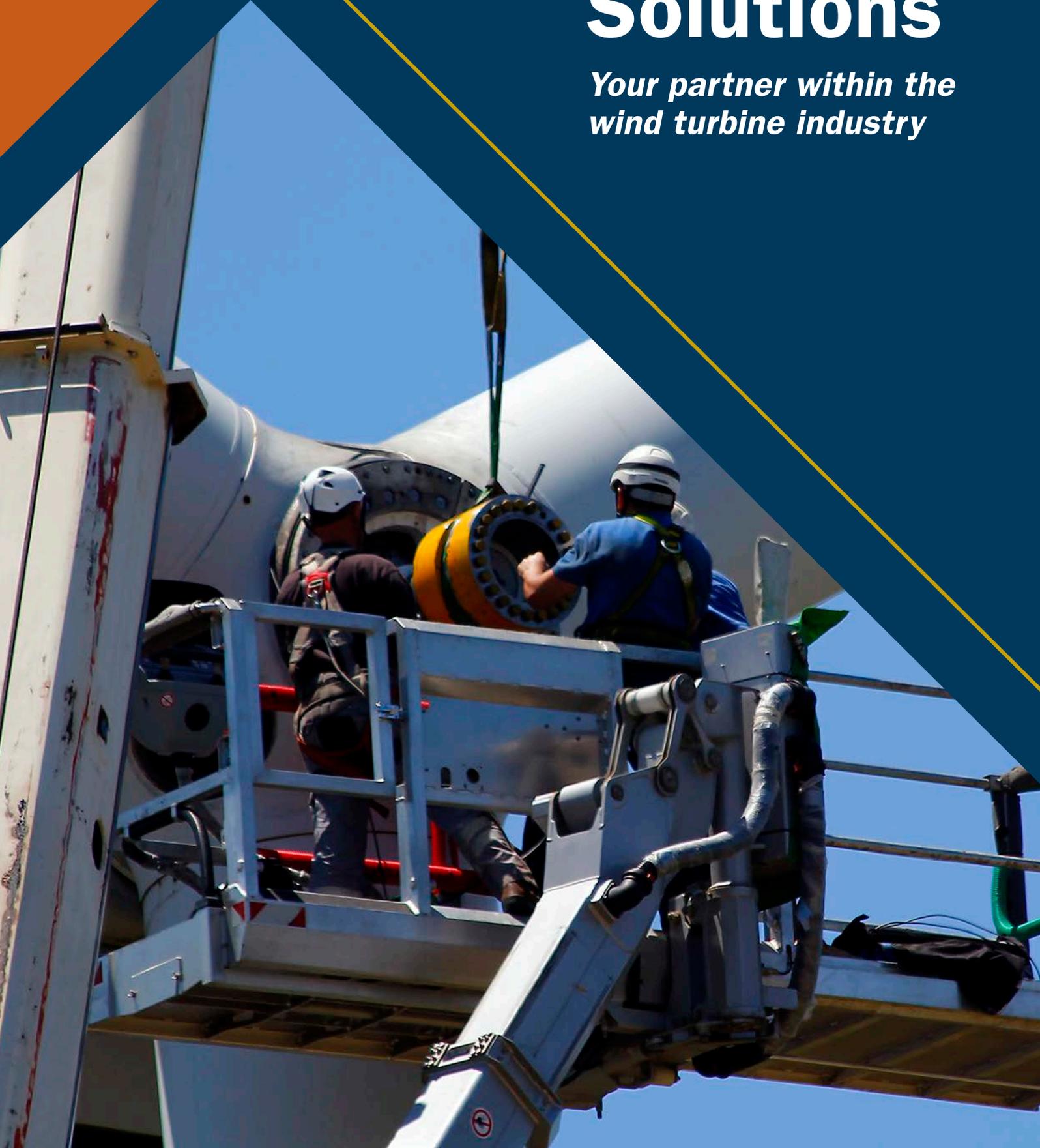




FRITZ SCHUR ENERGY

Reliable Hydraulic Solutions

*Your partner within the
wind turbine industry*





In terms of wind as a renewable energy source, Fritz Schur Energy is part of an extremely interesting development within the industry. As one of the leading suppliers, we have a visionary agenda, we have a strong business focus – and we have a bright future ahead of us.



*Mads-Ole Astrupgaard
CEO, Fritz Schur Energy
Chairman of the Board at the Danish Wind Industry Association*





Get to know Fritz Schur Energy

Fritz Schur Energy is a leading supplier of hydraulic system solutions and components to and for the wind industry.

We design, assemble, test, optimize and support reliable wind turbine solutions. We develop prototypes and put them into serial production. We also specialise in spare parts and retrofit, offering original hydraulic spare parts and components, technical consultancy on hydraulic solutions, retrofit solutions, and training and support.

Based in Denmark, and with offices in the US and China, Fritz Schur Energy has 30 years of experience in the wind turbine industry. More than 100 dedicated employees from fitters to engineers work continuously in pursuit of fulfilling our vision "Delivering on our promises".

Over time, Fritz Schur Energy has designed prototypes and serial produced hydraulic solutions for various high profile customers. Today, more than 16.000 systems with hydraulic solutions from Fritz Schur Energy are up and running. This includes systems for extreme conditions – more than 1.000 systems have been for offshore installations.

At Fritz Schur Energy, we create the hydraulic pitch systems of the future. Our solutions integrate hydraulic supply and control for various nacelle functions – solutions that reduce demand for space and weight.

Fritz Schur Energy continuously strive to contribute to bringing down the cost of energy for our customers by developing new solutions for modularisation and standardisation.

Wind Energy Together

Partnerships, **Promises** and Pitch Systems

Your partner within the wind turbine industry

We build on relations: The foundation is our strong and loyal customer partnerships, our stable and long lasting relations with leading suppliers worldwide and our devoted liaisons with skilled employees with solid technical insight in the wind turbine industry, both on- and offshore.

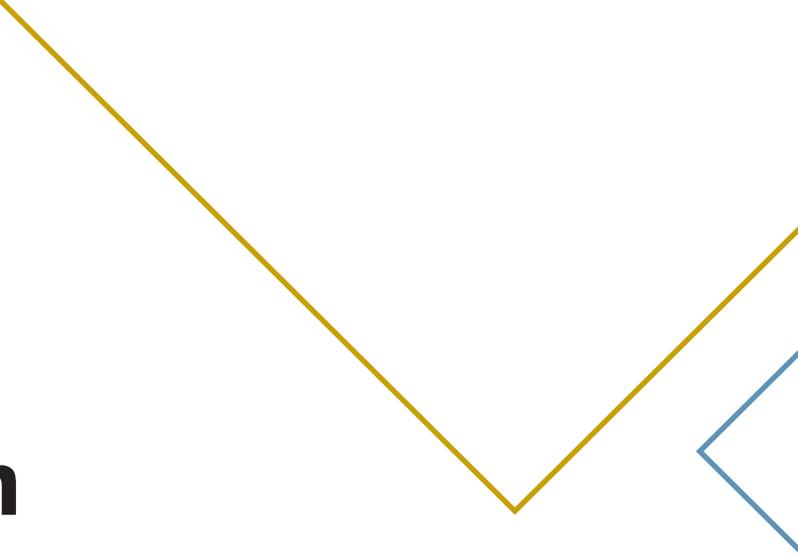
We deliver on our promises

Together with our customers, we have developed reliable compact hydraulic solutions for on- and offshore turbines combining requirements for high forces and low weight. Thereby we provide competitive advantages for our customers as well as the wind turbine owners.

Pitch systems of the future

We believe that hydraulic pitch is the pitch system of the future – under all climatic conditions. The hydraulic system is a safe and proven technology, and has been used for a far longer period than other systems. With hydraulic pitch you get lower overall costs, which again is equal to a better payback on the investment.





We **deliver** on our promises

In a challenging, competitive market it is not enough merely to foster a great idea. It is imperative to develop, nurture and manage the project throughout the entire process to reach the targeted goal at the right time.

Fritz Schur Energy excels in process management from the early development start-up and design phase, through analysis, plan, testing and execution, and all the way to the final evaluation. Our design and assembly process is based on a true customer partnership with a strong focus on customer needs, cost of energy and quality.

Powered by knowledge

There are people behind every task from inhouse engineers to fitters. Each one with unique knowledge, working closely with customers and suppliers to achieve the best long-term returns.

The way we work

Based on the principles of LEAN, our series production and supply chain management of solutions and components are subject to high demands for quality assurance, testing and documentation of flawless production. Fritz Schur Energy has achieved the quality management system standard ISO 9001, a further guarantee to our partners of the way we work and deliver on our promises.

When and where you need it

Fritz Schur Energy's hydraulic solutions mainly consist of standard components from leading global and regional hydraulic component suppliers with a widespread distribution network. This enables easy access to original spare parts and support.



Choosing a hydraulic system

Fritz Schur Energy is based on hydraulic systems for wind turbines.

One of the major advantages of including more functions in a hydraulic system is that modern wind turbine design often has a hydraulic power unit for supplying the brake system. By including more functions through an expansion of the central power unit, an optimal space/weight and power ratio is achieved in the most cost efficient way.

A basic advantage of hydraulic drives compared to i.e. electric based drives is exactly the power/size ratio on the motors. A hydraulic motor in a certain size can provide much higher forces compared to an electric motor with same size. This not only saves space and weight, it also enables easy scaling to larger wind turbine designs.

The main reasons for using hydraulics are the high power density and the simplicity coming from using few components to realise complex and fast moving machines with a high degree of safety.

Quality matters

Fritz Schur Energy only uses components of highest and newest standards, which are designed to withstand the loads and vibrations present in a wind turbine. Process control and management in production as well as thorough training of staff involved in handling the hydraulic system are evident. As such, Fritz Schur Energy offers to train our customer's fitters, service engineers and service technicians to achieve the required standards.

Pitch system of the future

Hydraulic pitch control is a system where the blade angle is controlled by one or more hydraulic cylinders placed in the hub of the turbine. It is a drive system, which under emergency control can operate without an external power supply. Furthermore, hydraulic pitch control is not sensitive to vibrations, and failure safe operation is easily achieved with only a few non-electrical components.

Why use hydraulic pitch systems in wind turbines?

- Reliable: A known and proven technology, used in most offshore turbines
- Robust: Low component sensitivity to environment
- Simple: Low number of components
- Integrated: Most components are assembled and tested integrated in manifolds and the power unit
- Safe: No electrical power is required for emergency stop
- Available/high uptime: Shortest possible downtime in case of emergency stops

High reliability with hydraulic pitch systems

To achieve the optimum performance of the hydraulic systems, some precautions must be considered already in the development and design phase. For instance, Fritz Schur Energy only uses components from leading high quality hydraulic component suppliers. Furthermore, a clean and well working system is secured through proper maintenance.





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