KTR for Wind Power Technology

Drive Technology
Brake Systems
Cooling Systems
KTR – when you want to aim high with wind turbines.

We set things in motion … even if we need to take to the air to do so – up to 150 metres to be precise! KTR systems are designed to reliably perform their tasks under extreme loads during continuous operation in wind turbines. Our systems manage this so well that we are now world leaders in the manufacture of couplings and braking systems in the wind energy sector. KTR products run at top speed in over 70,000 wind turbines and, while you have been reading this, even more have been installed – and this number is set to increase!
Setting things in motion for over 50 years.

**Experience and commitment**

KTR products are more than just a driving force in wind turbines. We have been involved in the development of drive components for mechanical and plant engineering across a range of industries for over 50 years. Throughout this time, as a leading manufacturer of high-grade power transmission technology, hydraulic components and braking and cooling systems, KTR has been a dependable partner to any company wishing to keep things moving forward.

Everything started with the further development of the tried-and-tested curved tooth coupling® – KTR is always seeking to develop and improve. The result was revolutionary: a maintenance-free coupling which combined plastic and steel for the very first time. Its name: BoWex®. This was shortly followed by the ROTEX®, which went on to be the first brand coupling to become a DIN standard. Since then, KTR has built up a virtually unlimited product range, or, to quote a few figures, KTR provides well over 20,000 different couplings and other power transmission component groups. This range is complemented by powerful braking systems and high-performance cooling systems that, alongside couplings, form an integral operation unit in wind turbines. If what you are looking for does not happen to be in the standard range, KTR develops more than 20,000 new products and product variants every year on behalf of our clients. We see ourselves not only as a supplier but also as a problem solver, including finding the optimum, most cost-effective solutions for customer applications.

**Planning and service**

KTR is also at your service when you are planning your wind turbine. If required, our trained sales staff and application engineers will provide you with support right from the planning stage. And at www.KTR.com, a CAD library, assembly instructions and a wealth of information about our products is just a click away.

If your wind turbine happens to need one of our 3,500 standard products in the hydraulics range you can count on us for top quality, but also for exceptionally rapid delivery: orders are delivered on the same day within Germany if placed before 2 p.m. Furthermore, our data hub allows direct communication with other systems, ensuring speedy order processing. After all, we don’t want your rotor blades to come to a standstill.
Clean, powerful and inexhaustible – wind is a natural source of energy with enormous potential. But that’s also where the challenges lie: nature is unpredictable. Extreme cold and heat, wet, strong winds, squalls, storms and turbulence – anyone who makes great demands on the weather will also be stretched to the limit themselves. That’s why KTR components are also designed in such a way that they withstand extremely high loads even under the toughest conditions while producing optimum results.

A driving force in wind energy

A breath of fresh air in energy supply - the international wind energy market has been growing for years and KTR has been a driving force within the industry since the beginning. To be more precise, in 1988 the design of the first coupling for use between the gears and the generator was developed. More than 25 years later, we are the world market leader in this area, a development which speaks for the quality of our components and the satisfaction of our customers.

In this respect, Germany is somewhat of a pioneer when it comes to wind energy technology. As the largest user of wind energy and the largest exporter of expertise and systems engineering, Germany is where development is decisively advanced and passed on to other parts of the world.

A critical part of this cutting-edge technology is mechanical couplings, which not only transmit the torque between the gears and generator; they also protect the power transmission system in the wind turbine with the aid of an integrated torque limiter, thus having a decisive effect on its service life.
Clean performance worldwide

There are many winds throughout the world which could drive a wind turbine: a monsoon, chinook, mistral, foehn, bora, ghibli, sharqi or zonda. The likelihood that they also cause a KTR coupling to rotate as they blow is high as KTR shaft couplings are used in wind turbines with nominal outputs between 250 kW and 8 MW across Europe, Asia and America.

And what if a little more power is needed? No problem: as a development partner for leading manufacturers, we are continually extending our range to include new models with greater power ranges. That’s also why we are always able to offer tailored couplings for the latest turbine generations.

And what if you’d like quality not just in individual, customised items, but also in a full range? Here you are. All individual components in our multifunctional assembly groups – consisting of couplings, electrical decoupling, brakes, including sensor discs, and safety clutch – have been specially developed for use in wind turbines.

Even if you don’t need a conventional coupling, you can still rely on KTR components: KTR braking systems, for example, provide a powerful grip on wind turbines via the classic hydraulic brake KTR-STOP® and our electromechanical EMB-STOP. Or, perhaps, you require one of our highly effective overload protection systems to safeguard against extreme peaks in torque, as frequently used in special modern generators with low speeds which are flange mounted directly onto the gears.

Partnership-based support

In a world where standards are constantly increasing, expectations are also rising when it comes to performance. Bigger, more efficient, and longer service life – these are just three of the requirements demanded of modern wind turbines. Anyone who truly wishes to exploit the potential of wind needs a partner who is familiar with the sector – such as KTR. Because we take the wind out of the sails of many problems, thanks to our years of experience with wind turbines, we can help you channel the wind so that it efficiently drives your projects forward.
High-quality work from the outset.

Flexible design

Motion brings constant advancement. Naturally, this also applies to all components in your wind turbine. What happens if you continue to develop or completely redesign the drivetrain, for example? Well, we can help you find just the right coupling. All components and systems for wind turbines are developed and tested in the Power Transmission Center, a modern research-and-development centre with a multifunctional assembly hall. In this centre alone, engineers have more than 25 hydraulic and electric test benches at their disposal on which extensive durability and load tests are carried out. We take an ice-cold approach in the environmental chamber, where anticipated environmental conditions are simulated with temperatures down to −50 degrees. With 3D coordinate measuring machines, we can meticulously check the dimensional stability of couplings. And we also perform an individual quality control check on the sliding hub, thus ensuring that power generation is not only problem-free, but also guaranteed to function for a long time.

Precise production

Your wind turbine deserves the best. That’s why each tailored component is manufactured with the highest precision. Precise down to thousandth of a percentage point, machines can be flexibly configured so that even customised orders can be completed quickly and precisely.

After manufacture, we also provide the right configuration and make the exact torque settings for the torque limiter – using a computer, of course. No adjustments are then needed when components are installed at a later stage and your coupling can spring into action immediately.

Detailed documentation

Trust is good, but control is better. This also applies to our products. That’s why we have introduced complete documentation for all test results, enabling us to fully retrace settings and balance quality for coupling components. And, for further reassurance of quality, KTR couplings and brakes are not only specified for use in wind turbines, they are also certified by organisations such as Germanischer Lloyd and other certification providers. To achieve this, the components transmitting torque have been inspected to verify their resistance and long service life, while exhaustive breakage and durability tests are carried out on the GRP spacers for the couplings.

Problem-free installation

The wrench used for installation of couplings in the confined installation space in a nacelle is a completely ordinary torque wrench. This is sufficient to easily install a RADEX®-N securely. The times when giant bolts needed to be fitted with a large tool and even greater force are now a thing of the past as we now use special clamping nuts for thread sizes M2 and larger. ‘Less is more’ is our motto in this case: we simply combine several small screws to achieve the required pretension in the threaded bolt. Furthermore, what is easy to install is also easy to disassemble. Thus, you save on two levels: both in terms of time and strain on your nerves.

Even if your wind turbine is already up and running, KTR will remain a reliable partner. On request, we can assist you with advice and support for maintenance of your wind turbine. Our industry and product experts are at your service at all times and as we have built up a dense service network worldwide, we can respond with great speed and flexibility to your questions and requests. Give us a try!
What drives wind turbines.
And brakes them. And cools them.

1. Cooling system
2. Oil-pump-and-filtration unit
3. RADEX®-N steel lamina coupling
4. KTR-STOP® braking system for peak periods
   or
   EMB-STOP braking system for peak periods
5. DATAFLEX® torque measurement system
6. KTR-STOP® YAW azimuth braking system
7. KTR-STOP® RL hydraulic rotor lock
   or
   EMB-STOP RL electromechanical rotor lock
KTR designed the steel lamina coupling RADEX®-N specifically to be the best in wind turbines. This means that the backlash-free, all-steel coupling, with laminae made of high-strength spring steel, needs to compensate for high displacement despite its torsional rigidity. Regarding wind turbines, this is the great challenge everyone faces. Gears and generators are normally mounted on elastic dampers, meaning relative movements occur, which may lead to very high displacement in the drivetrain. Accordingly, the RADEX®-N can compensate for such shaft displacement on a consistent basis.

Another advantage of the RADEX®-N is the GRP spacer, which provides electrical insulation by blocking any leakage current and preventing it from spreading from the generator to the gears, where it would damage bearings and teeth.

**Laminae in top form**

The key element in the RADEX®-N is the specially treated unique laminae. Alternately interlinked with hubs and spacers, they are fastened in place with highly resistant fitting screws to ensure optimum displacement and an increase in power densities.

The laminae sets were developed at KTR using FEM calculations. The result: the characteristic fitted shape, which allows torque transmission, torsional rigidity and the required displacement potential, is ideally combined.

**System overload prevention**

A wind power coupling is rarely supplied on its own. In most cases at KTR couplings are ordered alongside a brake disc up to 1,600 mm in diameter and a sensor disc for monitoring speed - a wise decision because an overload system also ensures precise torque limitation, even under highly unfavourable conditions.

The RUFLEX® sliding hub is ideal for this task. It is fitted with special friction pads, which are stick-slip-free and extremely resistant to wear when in use. The sliding hub is ready-calibrated in the factory and then disappears into the coupling spacer, thus saving space.

As soon as the precise, preset slide moment is reached, the flux of force is restricted and your system is protected against load peaks in the generator. And what’s more, this slide moment can be reproduced by the RUFLEX® up to 1000 times, thus protecting systems from stress and significantly reducing the servicing required.
Braking with power – KTR braking systems.

Secure grip

When the brakes grip in a wind turbine, they must live up to their promise and you can completely rely on the quality of a KTR braking system. KTR has not only revolutionised hydraulic brakes, but has also tripled the power spectrum of electromechanical brakes making KTR one of the few manufacturers able to offer its clients two different braking systems which function in completely different ways yet still deliver excellent results.

Hydraulic force

The system in the KTR-STOP® rotor brake is a conventional disc brake with a floating caliper. It reliably performs its function even in storms, freezing cold and, on request, in salty sea air. KTR-STOP® produces braking forces between 1 and 1,200 kN and thanks to additional guide systems and optimum utilisation of materials, our braking systems require only a very few short intervals for maintenance before being ready for use again.

Electro-mechanical pressure

The EMB-STOP produces its braking force using a purely electromagnetic system. No hydraulics also means no maintenance tasks such as oil change and disposal – making EMB-STOP virtually maintenance-free. A second advantage is its strong contact pressure, between 2.5 kN and 1,600 kN, which can be gently increased in a controlled fashion thus protecting the material and, ultimately, your wallet.

Complete range

KTR products are also state of the art. When the nacelle needs to be held in position or the rotor needs to be firmly secured, even a large wind turbine comes to a complete stop thanks to the azimuth brakes and rotor lock.
Cooling with care – KTR cooling systems.

Increase in standards

Wind turbines are becoming more and more powerful – and requirements for thermal management in the nacelle are also increasing. The heat produced from generators, frequency inverters and gears needs to be dissipated in a specific way. KTR also offers different solutions for heat dissipation to ensure that your wind turbine remains functional by avoiding a need to stop due to overheating.

Compact dimensions

Space is calculated to the centimetre in a nacelle. That’s why KTR cooling units also produce their maximum outputs from such a tiny space. KTR offers tailor-made water-glycol cooling units for individual cooling requirements for generators and inverters and integrated or separate oil-air coolers for cooling transmission fluid. All coolers come fully equipped with electric motors, fans and optional bypass systems. The cooling elements are made of weight-saving aluminium, and the fan guard and frame from tough stainless steel.

Protective covering

Wind turbines must be equipped to withstand all weather conditions. If they then also enter service as an offshore system, they must also incorporate protection against salty sea air. That’s why we apply a special cathodic dip coating to these KTR coolers, guaranteeing optimum corrosion resistance. The motors in the fan drivers feature twice the protection: thanks to their design with an IP 56 protection rating and a special coating for offshore use. This coating protects the heat exchanger fully in each lamina and has no unfavourable effect on heat transmission.

A breath of fresh air

The MMC eco is a fresh face among our coolers. And what’s more, it is also highly intelligent because it only produces as much cooling air as it actually needs at any given moment. A sensor determines the temperature and rate of change, and conveys this information to a control unit. This unit then anticipates and informs the fan how hard – or how little – it needs to work. This ingenious communication not only reduces noise emissions significantly, but operating costs are also so low that the MMC eco cooler pays for itself in a short time. Clearly a solution for cool calculators!
## PRODUCT OVERVIEW FOR WIND TURBINES

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<th>ROTEX®</th>
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Overview of literature

The KTR product portfolio is as varied as its areas of use, whether you require the perfect power transmission system, effective brakes, space-saving cooling systems or precision hydraulics on land, water or high in the air. These catalogues and brochures offer an overview. Available at www.ktr.com

Product catalogues

Individual sector brochures
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