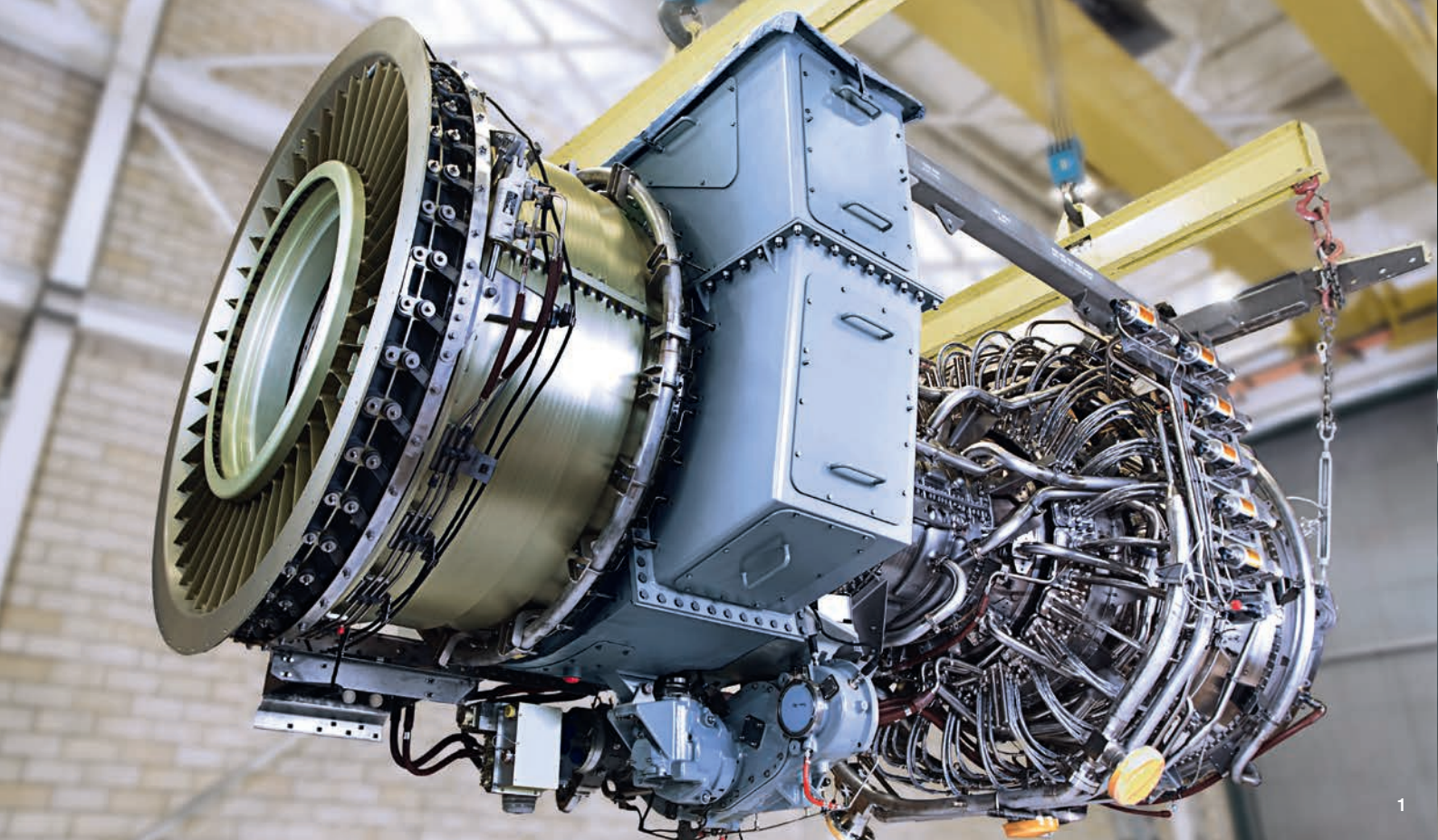




Your safeguard against power blackout SmartSet torque limiting coupling

The Voith SmartSet torque limiting coupling enables safe and smooth operation of power generation plants despite power system faults, with the ability to slip and release in the case of a catastrophic failure.



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The Voith solution allows energy suppliers to comply with grid code regulations

The European energy market has been facing new challenges since the release of the new grid code EU 2016/631 introduced by the European Network of Transmission System Operators for Electricity (ENTSO-E). It obliges power providers to remain on the grid for seconds to stabilize it during a fault ride-through (FRT). Gas and steam turbine generator set owners have to certify their ability to withstand grid faults to avoid cascading failure in the region.

Limit torque peaks

An FRT exposes the driveline of the generator set to large torque peaks. These peaks can damage or even destroy the complete set and affect the overall grid situation negatively. To help prevent scenarios with blackouts and be compliant with new grid code, generator set owners have two options: they could either scale up their drivelines, which is costly and increases the size of the set, or, implement a non-releasing torque limiting coupling, like Voith's SmartSet.

Stay connected to the grid

The latter solution enables the power generator to stay connected to the grid in case of a failure, both during and after its occurrence. In order for grid owners to ensure grid code

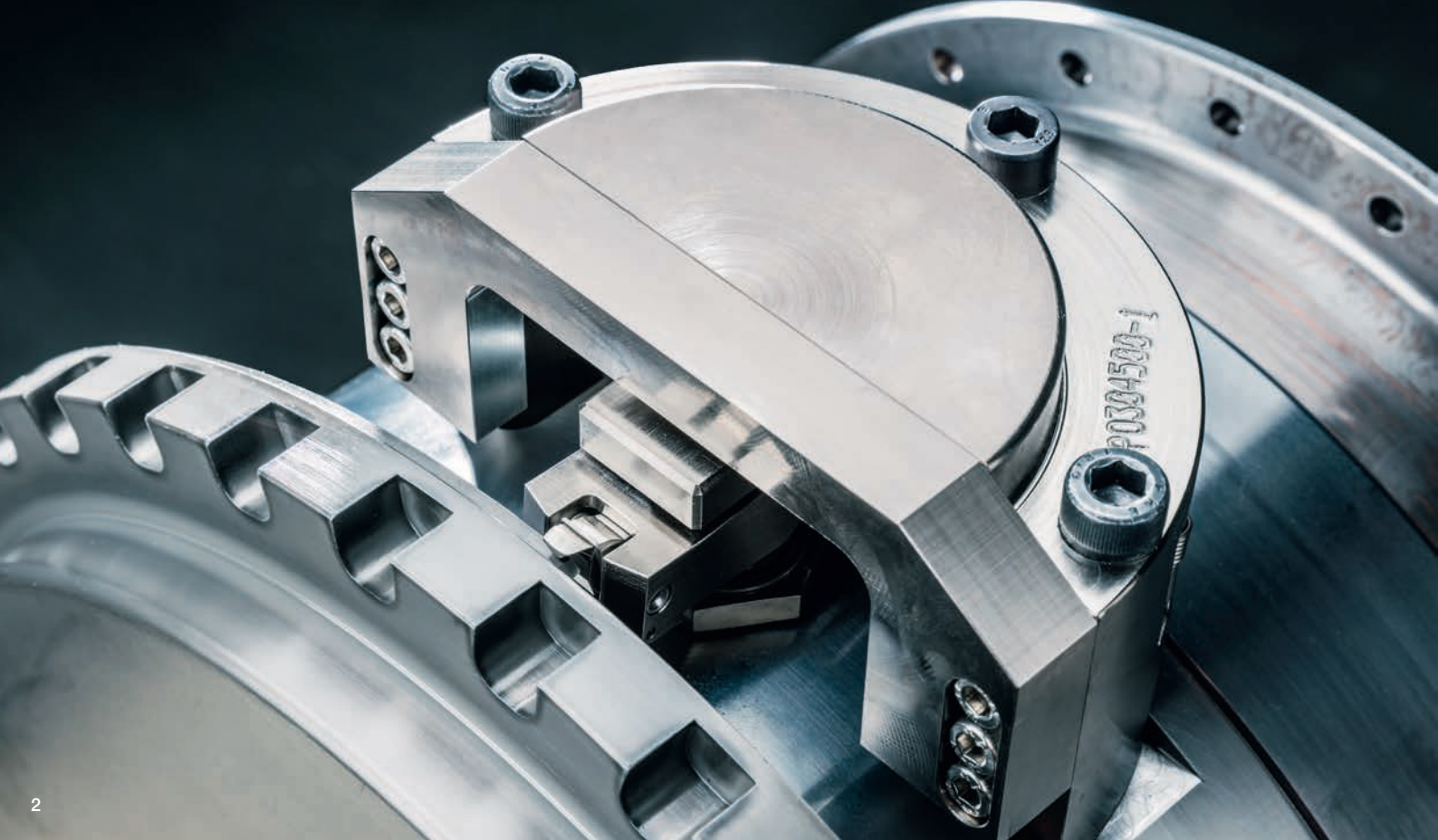
compliance, the driveline must offer fault ride-through for a minimum specified time of typically 150 milliseconds. Power generation systems incorporating shear elements that release the drive completely upon seeing a torque spike cannot fulfill the fault ride-through requirement. SmartSet however eliminates not only the risk of gas turbine failures but also grid perturbations. This results in increased efficiency and reduced total cost of investment while staying compliant with the EU's regulations.

Add digital intelligence

SmartSet is not affected by fatigue or wear, giving a stable torque setting over its lifetime. SmartSet is developed, using mechanical logic, in a way that gives the coupling the additional slip feature during FRT and only releases in rare case of major failure. The Voith Dtect enables the supervision and monitoring of the torque limiting coupling. Dtect continuously calculates the slip angle and sends a signal to the system indicating how much the coupling has slipped.

Problem solver

Dr.-Ing. Oliver Drubel is an expert when it comes to energy conversion. He habilitated on "Converter Applications and their



1 GE LM 6000

2 SmartSet torque limiting coupling

Influence on Large Electrical Machines". In his current work at Allgemeine Energiewandlungs GmbH in Germany, Dr.-Ing. Drubel analyzes transient torques of turbine shaft lines with torque limiting couplings. He says, "The shaft line must be designed under the consideration that an FRT is possible. Sustainable shaft lines already fulfill the requirements. Designs with SmartSet couplings need an individual shaft line calculation to determine values for the initiation of the limiters."

This must be investigated by a process which takes into account all elements along the shaft line. Designs with SmartSet couplings do not need to scale up the drive line. If this particular coupling slips during the FRT, the shaft line is available for normal operation as soon as the grid recovers. "More challenging disturbances can be handled simpler with SmartSet." Dr.-Ing. Drubel adds.

A tried-and-tested solution

In conclusion, non-releasing torque limiting couplings such as SmartSet increase productivity and extensive field testing has proven that the SmartSet is able to comply with grid code requirements. Generator sets can be retrofitted with SmartSet without the need for any redesigning or upscaling of the

existing drive line components. This application adds new features to the already existing solution. Power providers get a well-trusted mechanical device stabilizing the grid and overcoming potential instability drawbacks.

Contact

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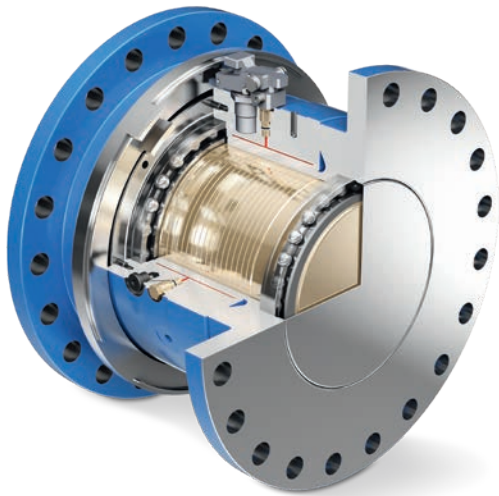
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Stay on the grid, continue production

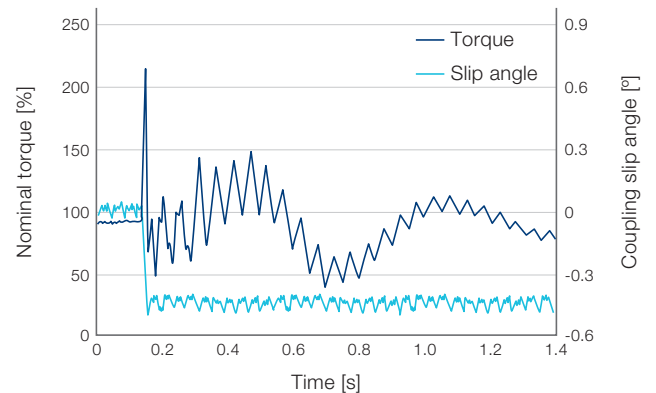
SmartSet couplings protect both plant and power systems

During a voltage dip, the generator is subjected to 7.5 to 16.5 times the rated torque. This is when the Voith SmartSet coupling acts immediately to prevent a low voltage ride through (LVRT). The moment that the set slipping torque is exceeded, the SmartSet limits the torque between the generator and turbine. The coupling then stops slipping as soon as the critical 150 to 300 ms of the voltage dip has passed. Due to its precise and immediate action, the SmartSet coupling is a lasting solution which protects energy producers and electrical power systems against damage and outages. The solution works exceptionally well for turbines with a power range up to 60 MW.

SmartSet torque limiting coupling

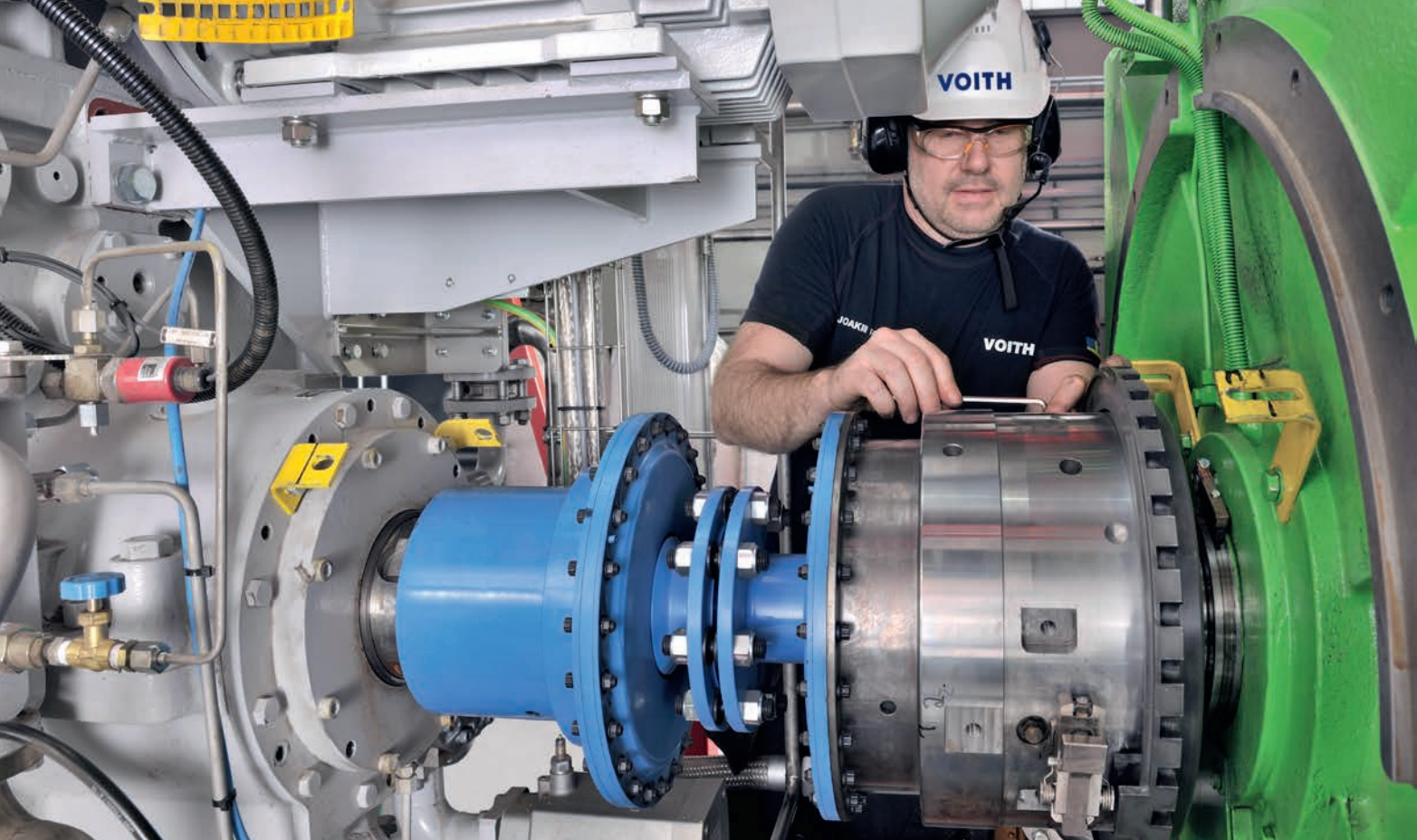


Low voltage ride through (LVRT)



Advantages

- + Maximum driveline protection
- + Process improving coupling with controlled slip
- + Ability to slip without releasing to reduce short duration and dynamic peak torques
- + Fully disengage in case of a catastrophic failure
- + Accurate and constant release
- + Adjustable release torque



Design features

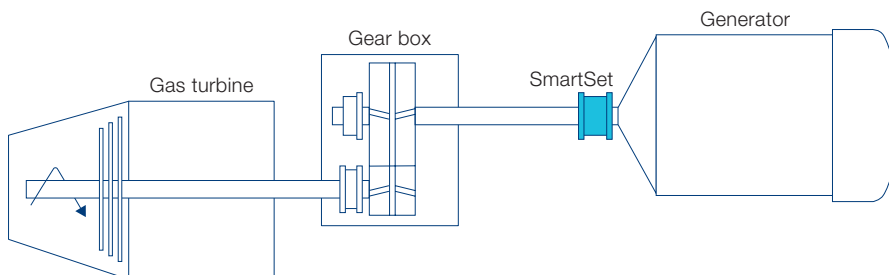
- Ability to slip up to 120 degrees during a torque peak
- Torque release between 1 and 20,000 kNm
- Adjustable torque settings from 50 to 100 percent of maximum torque setting
- Mechanical slip and release mechanism

Service

We offer a wide range of service and support during the entire service life of your driveline:

- Installation
- Commissioning
- Training
- Driveline torque optimization
- Health check
- Major overhaul
- Original spare parts supply
- Repairs
- Modernization and retrofits

SmartSet in a gas turbine



- Limits the torque between the generator and the turbine in the event of a fault without shutdown
- Controls the torque and absorbs shock loading
- Prevents damage caused by inertia
- Increases uptime

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