Improved Productivity in Mining.
SafeSet Torque-limiting Couplings and Connection Couplings
Imagine yourself in a tunnel, or in a vast open pit mining area, somewhere in a remote location. The machine you are operating is huge. It is connected to a large network of other equipment used for transporting and extracting minerals. Every minute of production downtime costs a fortune.

Suddenly you hear a terrible noise. You notice that something is seriously wrong. Something is stuck. But what? And where? The huge driveline is twisting. How about the workers down the line? Are they in danger?

Most applications in mining require heavy investments in machinery and technology. High demands in personal security is mandatory. Big and expensive machinery means high downtime costs. It puts extreme performance demands on the machinery and above all, on the driveline. It is important to protect the driveline from overload caused by unexpected problems in the production process.

Regardless of the application, the challenges in mining are similar. The key to reliability and efficiency in mining is a smooth and problem free production process, with a minimum amount of downtime.
Make the Torque Work for You

Torque makes the world go round. In every industry there is a need to transmit torque as well as limit it. To be effective you need to control torque. SafeSet couplings make the torque work for you.

Voith manufactures and develops the world leading torque-limiting and connection couplings used in many different industries worldwide. In mining applications, torque-limiting couplings protect big and heavy machinery by releasing or slipping at a very precise set torque. Connection couplings are used for torque transmitting, often in conveying and excavating.

SafeSet torque-limiting couplings and connection couplings from Voith:

- Prevent damage of machinery, which leads to financial savings
- Increase production uptime and minimize loss of production, which also increases profit
- Lengthen the life span of the machinery by avoiding overload cases
- Provide a backlash free connection

SafeSet torque-limiting couplings and connection couplings from Voith not only avoid machinery damage due to overload, they also improve processes and increase production. All couplings are specifically adapted for the application intended, to ensure best possible use.
Crushing
Uncrushable objects – machine parts, too hard materials or too big pieces – getting stuck in the crusher.
Gyratory Crusher, Cone Crusher, Sizer, Roller Crusher

Grinding
Too much material or uncrushables in the mill might cause a rapid increase in torque or a total blockage of the machine.
Ball Mill, Sag Mill, AG Mill, Roller Press HPG, HRC

Tunnelling
Hard rock layers, or too high drilling speed cause torque peaks. This can also occur during commissioning.
Tunnel Boring Machine (TBM) – Hard Rock
Earth Pressure Balance (EPB) – Soft Ground

Conveying
Falling stones or metal parts which get stuck might lead to a chain break, due to blockage of the conveyor. A chain break requires a very time-consuming repair.
Belt Conveyer, Apron Feeder, Chain Conveyer (AFC)

Excavating
During excavation hard stone layers can cause sudden torque peaks. The driveline components such as gears for example, might suffer severe damage.
Continuous Miners, Bucket Wheel Excavator, Shearer heads

1  AFC/Shearer head
2  Bucket Wheel Excavator
3  Cone Crusher
4  Tunnel Boring Machine
5  Ball Mill
Torque-limiting Designed for Increased Performance

The outstanding accuracy of SafeSet torque limiters from Voith substantially improve productivity. This enables your equipment to work at a maximum level.

Reduced downtime
The safety coupling SafeSet is the most precise torque limiter available on the market. SafeSet couplings only release when the set torque is really exceeded. This minimizes operating stoppages and downtime. The adjustable release torque allows an optimized driveline for maximum output.

Improved performance
SafeSet couplings eliminates rapid torque peaks, improve the production process and lengthens the life span of the driveline. The process-improving couplings SmartSet and AutoSet have a slipping function. The couplings restrict short torque peaks, without disconnecting transmission entirely. This protects the driveline and maximizes production output.
Torque Transmission Developed for Optimized Drivelines

World leading connection couplings from Voith transfer the most torque in relation to size. This adds high performance and allows for more effective dimensioning of the driveline.

**Easy maintenance and service**
Connection couplings HyCon, HyLoc and HyGrip provide a backlash-free, friction connection. They are suitable for shaft-flange, shaft-hub or shaft-shaft connections. The setting and releasing of the connections occur hydraulically, which enables fast installation, service and maintenance. Easy assembly means short stoppages for service, which increases production uptime.

**Optimal design**
The compact design also improves process control and thereby the service life of the driveline. All models can be customized to suit existing, as well as newly designed interfaces.
SafeSet
The Torque-limiting Safety Coupling

SafeSet torque-limiting couplings prevent machine damage in high value rotating equipment. It works like a mechanical fuse in the driveline by protecting the system from costly breakdowns.

Operation
The SafeSet principle is simple: friction and flexibility. No material fatigue, a constant torque transmission and adaptability. We develop solutions for the most demanding application requirements.

Some of the available design options:

- Torque release between 1 and 20,000 kNm
- Adjustable torque settings from 50 to 100 % of max torque setting
- Slip and release mechanism at a preset torque
- Immediate release for over-torque situations
- 24-hour operation in release condition (optional)

Design
The SafeSet coupling includes a twin-walled hollow sleeve. Friction is produced upon expansion by pressurized hydraulic oil. The integrated shear tube holds pressure to ensure a constant, but easily adaptable torque transmission. In an overload situation the coupling slips and the shear tube shears off. Oil pressure drops and the frictional surfaces separate. The coupling rotates on the bearings without transmitting any torque.

Benefits

+ Maximum driveline protection: damaging inertias disengage at once
+ Set torque remains constant over time
+ Quick resetting for maximum uptime
+ Custom made to suit individual requirements
SafeSet being pressurized

- Shaft
- Oil charge port
- Bearings (on each side)
- SafeSet sleeve
- Hub
- Seals (on each side)

SafeSet following a release

- Shear tube
- Shear ring
AutoSet and SmartSet
Process-improving Couplings

AutoSet and SmartSet are torque-limiting couplings with a slipping function to optimize processes.

**Operation AutoSet**
AutoSet handles short duration dynamic peak torques without releasing. It is completely automatic and resets itself.

**Benefits of AutoSet**
- Is preset to the required slip torque – easy installation and ready to use
- Slips approximately 180 degrees without fully releasing – thus copes with long duration overloads without interrupting production
- Automatically resets itself to the preset torque limit after a release. The downtime is a minimum, 1–5 minutes.

**Operation SmartSet**
SmartSet is developed from SafeSet with the additional ability to also slip without releasing, to reduce short duration and dynamic peak torques.

**Benefits of SmartSet**
- Ability to reduce transient torques at start-up – the drive-line does not have to cope with the extreme overloads it creates
- Accurate and constant release torque – safe performance over time
- Adjustable release torque – easy to use for safe commissioning or upgrade of the driveline

AutoSet SA-F

SmartSet SM-F/P
HyCon, HyLoc and HyGrip are connection couplings which provide a backlash-free, frictional connection.

**Operation**
Setting and resetting is performed hydraulically. Depending on the application, various operating principles are utilized, all of which provide the benefit of backlash-free connection.

The couplings are available as shaft-shaft, shaft-hub or shaft-flange connections. Customized solutions are often created.

**Benefits**

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<th>Benefits</th>
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<tr>
<td>+ Simple clamping process optimal for applications that require frequent changes</td>
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<td>+ Self-centering technique plus the benefit of a backlash free connection</td>
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<td>+ High torque transmission capacity relative to the space required</td>
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<td>+ Driveline dynamics profit from low inertia thanks to reduced coupling mass</td>
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**HyCon S/SX for shaft to shaft**

**HyGrip HG-B for shaft to hub**
Crushing
Cone/Gyratory Crusher

Uncrushable objects in the crushing chamber cause the crusher to stop. The inertia of the driveline and motor continue to deliver torque, which can cause severe damage or overheating.

Challenge
If the cone suddenly stops, high torque and overheating will cause damage to all the driveline components and lead to a long stop in production.

Solution
Replace belt drives with a direct drive. Installing a SafeSet torque-limiting coupling deals with torque overloads safely and quickly. This ensures all parts of the driveline are protected. Voith can also provide flexible couplings to cope with misalignments and torsional vibrations.
Crushing
Sizer/Roller Crusher

The rollers can easily become blocked by uncrushables, however the inertia in the driveline continues to produce torque. This can result in major damage to the driveline and motor and cause production downtime.

Challenge
When the rollers are jammed the overload continues until the driveline or motor break down, causing major damage and production downtime.

Solution
SafeSet torque-limiting couplings control the torque and absorb shock loading, protecting the driveshaft and motor. SafeSet instantly disconnects the inertia from the crusher.
Grinding
Ball/Sag/AG Mill, Roller Press HPGR/HRC

The dual pinion drives can come out of sync due to power problems or disturbances in the motor control system. Frozen charge inside the mill might cause torque peaks or consequential damage.

Challenge
If the dual pinion drives do not work simultaneously, they will be at risk of severe torque overload, which can ultimately cause serious damage to the mill. Torque peaks can occur during startup if frozen or solidified minerals have built up inside the mill. As it starts to rotate, pieces of frozen charge might cause a blockage.

Solution
SafeSet torque-limiting couplings protect the driveline from torque peaks, when there are synchronization problems or overloads caused by frozen charge during start-up.
Challenge
If the large pinion-shaped cutter is blocked, vital parts of the transmission and the driveline components are at risk of being destroyed, leading to machine stoppage.

Solution
Installation of SafeSet torque-limiting couplings either on the back of the motors or between the hollow shaft and the torque shaft, or in line with the drive units.

Tunneling
TBM/EPB

Due to the varying hardness of soil and rock layers, torque peaks are hard to predict. Excessive torque levels can occur particularly during start-up and commissioning.
Conveying
Armored Face Conveyer (AFC)/Apron Feeder

AFC’s can suffer downtime due to conveyor chain breakage or driveline failure. This is often a result of torque overloads caused by material getting stuck.

Challenge.
An overload can cause damage to the drive chain and extensive downtime, as the conveyor needs to be cleared of built up rock or coal.

Solution
SafeSet torque-limiting couplings protect the chain by slipping and limiting the torque peaks. The coupling is designed to either release at longer durations, or not release at all, to prevent the drive from disengaging completely.
Excavating
Continuous Miner / Road header / Shearer head

The cutter head can come to a sudden stop when it encounters hard material or gaps. The system inertia continues until something breaks along the driveline.

**Challenge**
If the motor or inertia continues after the cutter head stops, the torque creates a shock load for the gear box and could cause significant damage and downtime.

**Solution**
SafeSet torque-limiting couplings absorb the torque by slipping and protecting the gear box during high peaks.
Service and Maintenance

The quality of our products is exceptionally high and the life span is long. Nevertheless, all mechanical drive components need correct service and maintenance to ensure reliable performance.

Our most important task is to help our customers to prevent unplanned stoppages and production downtime. By providing correct installation, training of your maintenance personnel and frequent service we make sure your equipment meets its full design potential.

Our service personnel are present during installation, initial start-up and final commissioning. At the same time we instruct your personnel how to operate the couplings and how to optimize their settings.

Whenever our customers need support we provide it instantly. Our service personnel use the latest technology and all their knowledge and experience to provide the service needed.

We carry out scheduled servicing and repairs on our couplings in order to reduce life cycle costs, and guarantee their continuous operating performance. Furthermore, we propose possible improvements and upgrades.

Voith has regional service centers worldwide. We offer different types of service solutions tailored to your specific needs.
Voith – Engineered Reliability

Voith is a globally active engineering company. With its broad portfolio covering plants, products and industrial services, Voith supplies essential markets: energy, oil & gas, paper, raw materials and transport & automotive.

Founded in 1867, Voith employs more than 42,000 people, generates 5.7 billion Euros in sales, operates in about 50 countries around the world and is today one of the biggest family-owned companies in Europe. The holding company, Voith GmbH, is based in Heidenheim/Brenz, Germany.

Voith Turbo SafeSet are the experts in development and manufacture of torque-limiting and connection couplings within Voith. For over 30 years the company has supplied the market with the most reliable systems available. By combining engineering skills, innovative strength and solid base Voith Turbo SafeSet is a partner to rely on for generations to come.