

**Optimize your propulsion system
with class approved connection
and torque limiting coupling**

An aerial photograph of a ship's wake in the ocean. The water is dark blue with white foam from the ship's wake. The word "DRIVE" is overlaid in large, bold, green capital letters across the center of the image, with the ship's wake passing through the middle of the letters.

DRIVE





- 1 Freight and tug vessels
- 2 Ferry
- 3 Yacht

Good vessel design withstands any adverse sea condition's

Conditions at sea are often rough, with strong winds, towering waves, and dangerous currents. The environment in ports and docks is also challenging, with obstacles and debris in the water.

Marine faring vessels must withstand extreme forces while providing steady and smooth propulsion. Any issues at sea or over a large body of water can lead to dangerous situations for personnel, the equipment, or the ship itself. Once things go wrong, it can mean days in the dry dock, which costs a fortune.

Precision maneuverability, reliable shaft connections, and torque protection are essential for all applications, be it cargo

vessels, ferries, tugboats, yachts, offshore supply vessels, cruise ships, or naval vessels.

Safe operation and reliable protection can be ensured when installing connection and torque-limiting couplings; these units ensure your driveline operates optimally irrespective of the weather.



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The mainstay of your operation

Your first choice for easy operation and excellent accuracy, our friction-based driveline technology, namely our connection and torque-limiting couplings ensure an optimized driveline and safe protection of the drive system.

An optimized solution for every marine vessel, HyCon is the most compact, low-weight connection coupling for conventional propulsion drives.

Protecting propellers, water jets, thrusters, and necessary deck machinery from overload; SafeSet torque limiting couplings ensure expensive time in dry dock and repair is kept to the bare minimum.

Offering a constant torque transmission and adaptability with no material fatigue, every coupling is adapted explicitly for the intended application to ensure optimal operation. HyCon and SafeSet are class approved by DNV and project bounded approvals can be achieved at all different classification societies involved.

Connection couplings and torque-limiting couplings:

- Prevents damage to machinery, which facilitates long-term financial savings
- Increases availability of the driveline and minimizes the time in the dry dock
- Lengthens the lifespan of the machinery
- Increases torque and payload capacity

HyCon and SafeSet are DNV-approved





Photo © Kroonborg Wagenborg

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- 1 Conventional drive systems
- 2 Thruster drive systems
- 3 Linear jet drive systems

Propulsion drive system	Description	Product	Solution
Conventional	Shaft propulsion system	HyCon SafeSet	Shaft connection Driveline protection
Thruster	Propellers placed in rotatable pods which eliminates the use of rudders	SafeSet	Driveline protection
Water jet	Water is drawn through an impeller to create a water jet for high speed propulsion	HyCon SafeSet	Shaft connection Driveline protection

HyCon – where connection is key

Easily installed with no oil leakage, this DNV-approved HyCon connection coupling range ensures a reliable, low-weight friction connection with outstanding performance and torque capacity.

Operation

The HyCon connection coupling consists mainly of a tapered sleeve and a tapered hub. A piston space is created through a sealed piston sleeve, which exerts hydraulic axial forces on the hub when applying oil pressure. Consequently, the hub is pushed up onto the tapered inner sleeve, creating a secure connection. The tapered surfaces are separated by hydraulic oil pressure. The surface of the taper is sealed on both sides; thus, no oil leakage can occur. This ensures a minimized environmental impact, an essential responsibility for every naval application.

Design features:

- Minimized hydrodynamic turbulence, if located outboard
- Torque capacity available from 1 to 20 000 kNm
- Shaft-to-shaft and shaft-to-flange connections
- Backlash-free connection
- Flange bolts can be tightened before drive-up
- No oil leakage due to a sealed taper surface on both sides

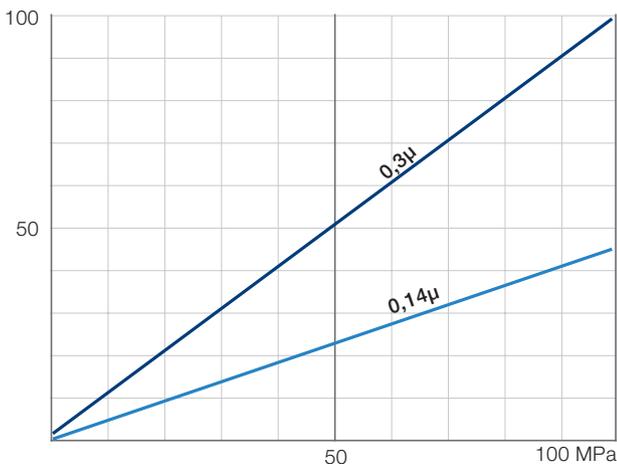
Doubled torque capacity with high friction coating

High friction coating (HFC) makes HyCon the most compact and effective connection coupling available on the market. A thin fatigue and wear-resistant tungsten carbide layer is plasma sprayed onto the inner surface of the coupling. HFC strengthens the bond between the shaft and sleeve and more than doubles the torque capacity. The test combined HFC with aluminum bronze, regular/stainless steel, and titanium. Test results below verify that the coefficient of friction is not dependent upon the type of metal surface the HFC is combined with.

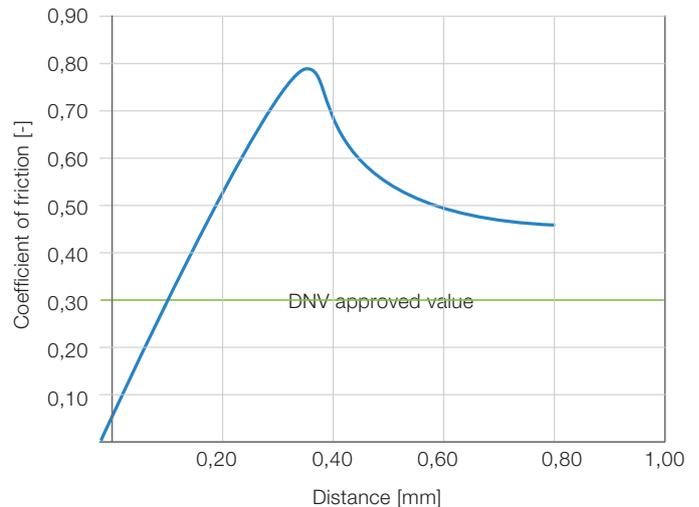
Benefits:

- + Increased payload capacity due to a minimum of 40% reduced system weight
- + Safe and fast installation, setting, and releasing
- + Only one pump for setting and releasing
- + Easy to position axially and radially
- + Shock load resistant
- + Simple clamping process optimal for applications that require frequent changes
- + Sealed tapered surfaces ensure protection against seawater

HFC doubles the friction coefficient



Friction test indicates static: 0,76 & sliding: 0,46



HyCon functional principle

HyCon S/SX

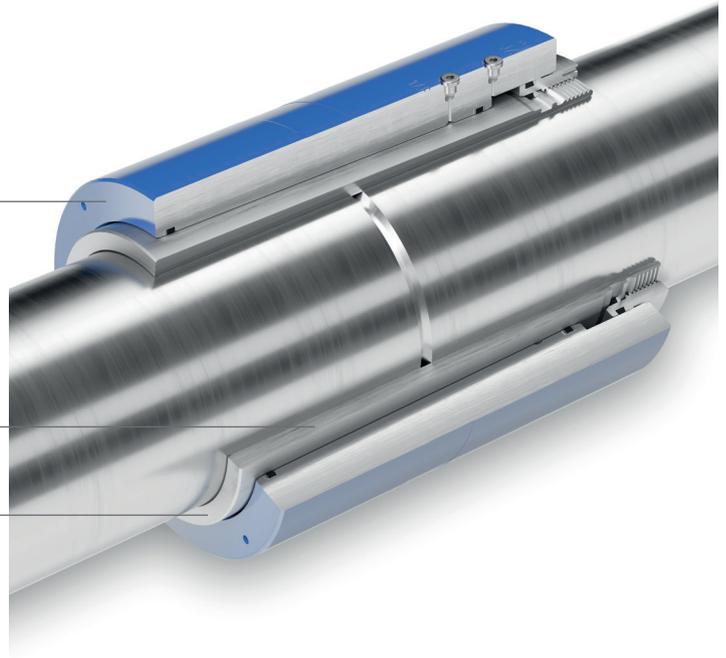
Setting

By moving the outer sleeve up on the taper, the friction connection between coupling and shaft are created.

Outer sleeve

Inner sleeve

Piston sleeve



HyCon F/FX

Releasing

By moving the outer sleeve down on the taper, the friction connection releases between coupling and shaft.

Flange sleeve

Outer sleeve

Piston sleeve

Flange bolts



SafeSet and SafeSet EZi – instant driveline protection

Working like a mechanical fuse in the driveline, these couplings protect the marine vessel or application from a costly breakdown.

SafeSet releases instantly if the torque exceeds the set level in an overload peak torque situation. New to the product portfolio, SafeSet EZi has an additional function and can withstand short torque peaks without disengaging. This peak-shaving function facilitates protection during quick transient loads without releasing — the coupling releases exactly as the SafeSet Classic in a more prolonged overload situation.

The SafeSet 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. The coupling slips, and the shear tube shears off in an overload situation. Oil pressure drops, and the frictional surfaces separate. The coupling rotates on the bearings without transmitting any torque.

Design features:

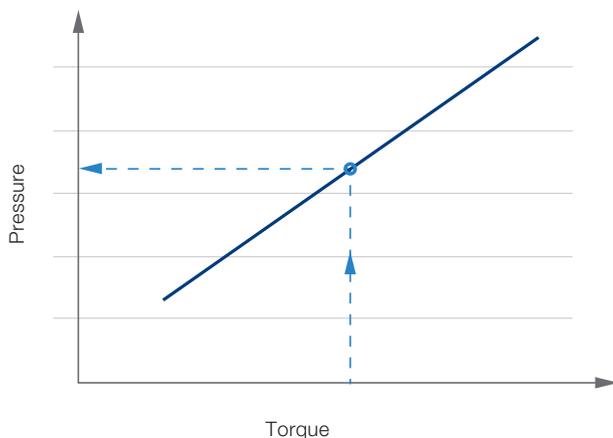
- Torque release between 1 and 20 000 kNm
- Adjustable torque settings to suit all applications
- Immediate protection and release at a preset torque in the event of a torque overload

The SafeSet torque-limiting coupling is DNV approved, which makes it the ideal choice for safe operation in the marine industry.

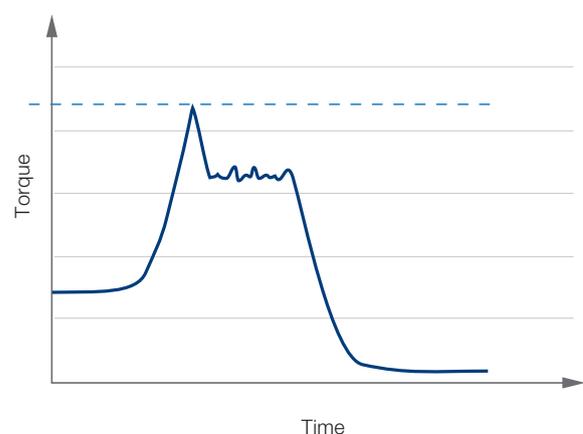
Benefits:

- + Maximum driveline protection
- + Set torque remains constant over time
- + Quick resetting for maximum uptime
- + SafeSet is custom made to suit individual requirements
- + Minimize standstill in dry dock
- + SafeSet EZi, our next-generation torque limiting coupling, has further technical improvements like its peak saving function

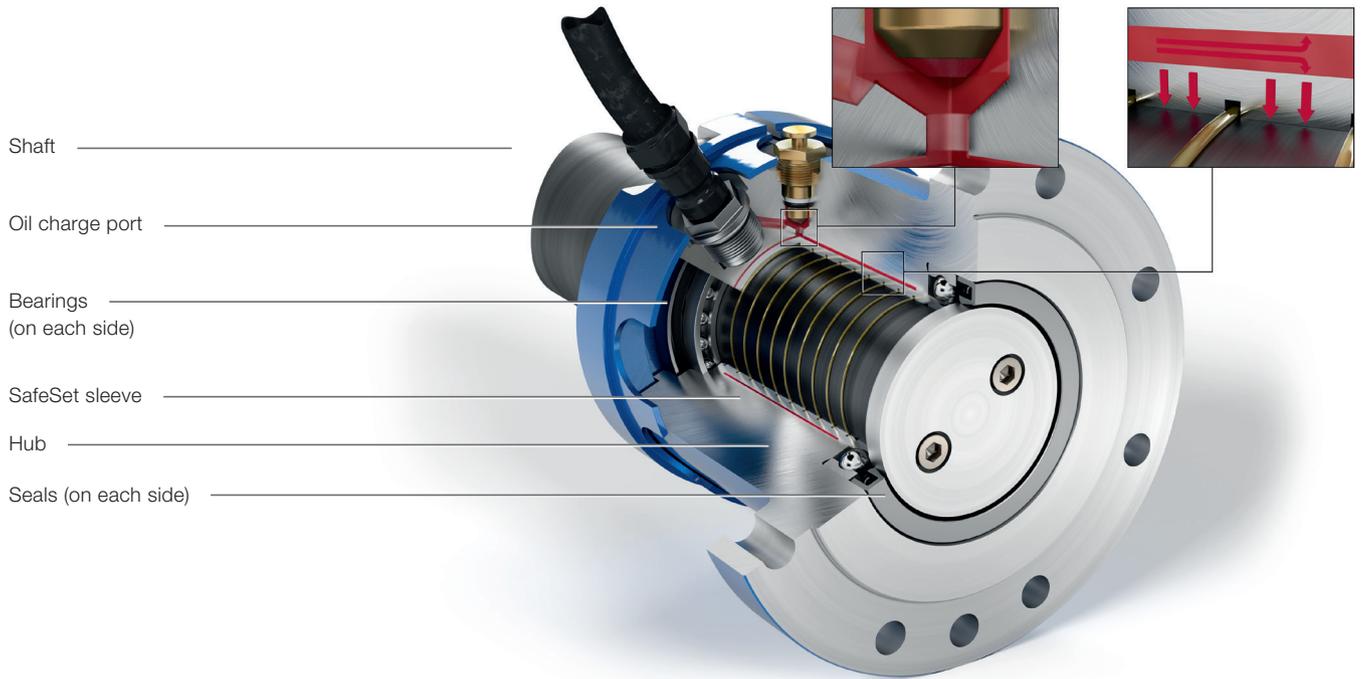
Calibration diagram



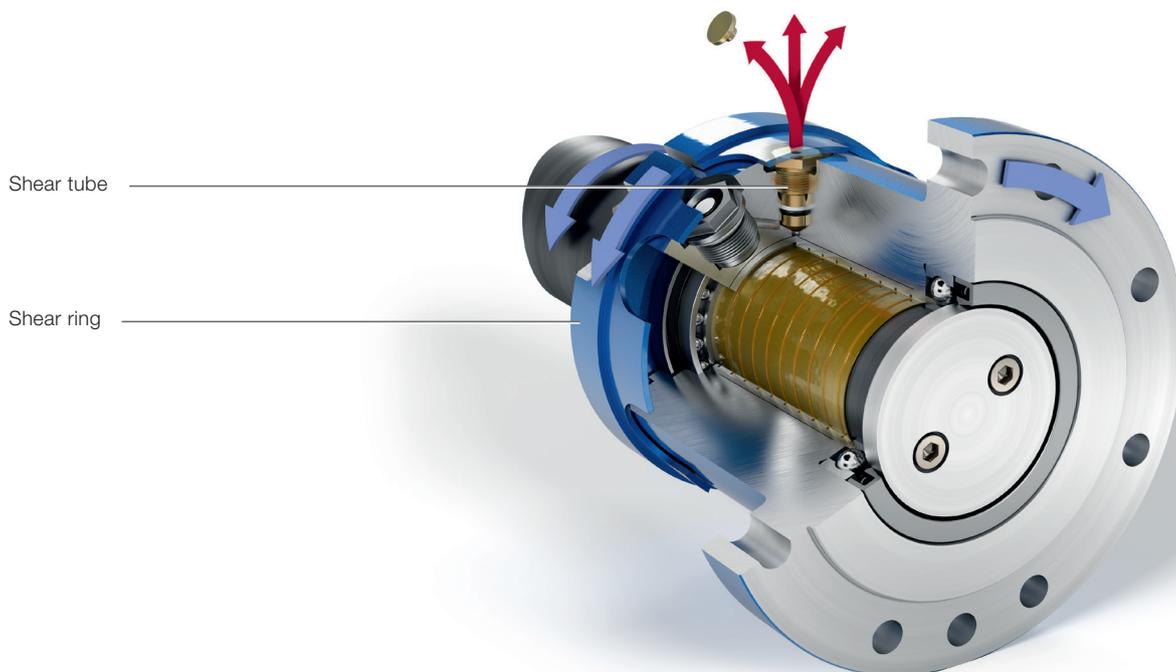
Typical release curve



SafeSet being pressurized



SafeSet following a release





Conventional drives

A conventional shaft-driven propulsion drive is the most common system for the majority of vessels, due to their high performance, efficiency, and reliability.

Providing a backlash-free and secure friction connection for propulsion shafts; our HyCon connection couplings are preferred by most naval designers.

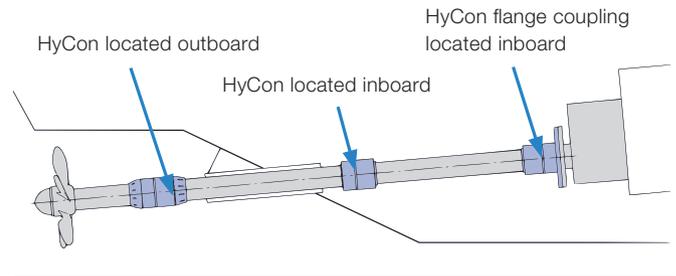
The HyCon coupling has a high torque capacity in relation to its size and weight. It can be built in stainless steel to withstand corrosion or manufactured in other unique materials, such as titanium or anti-magnetic material, sometimes required in naval vessels.

SafeSet can protect drivelines with fixed-pitch propellers from overload when navigating in shallow water.

HyCon connection couplings and SafeSet torque-limiting coupling can be found in these vessels:

- Tankers and carriers
- Offshore supply vessels
- Cargo ships
- Naval vessels
- Container ships
- Dredgers
- Car transport ships
- Cruise ships and ferries
- Megayachts
- Pilot boats
- Fire-fighting vessels

HyCon in a fixed pitch drive



HyCon integration

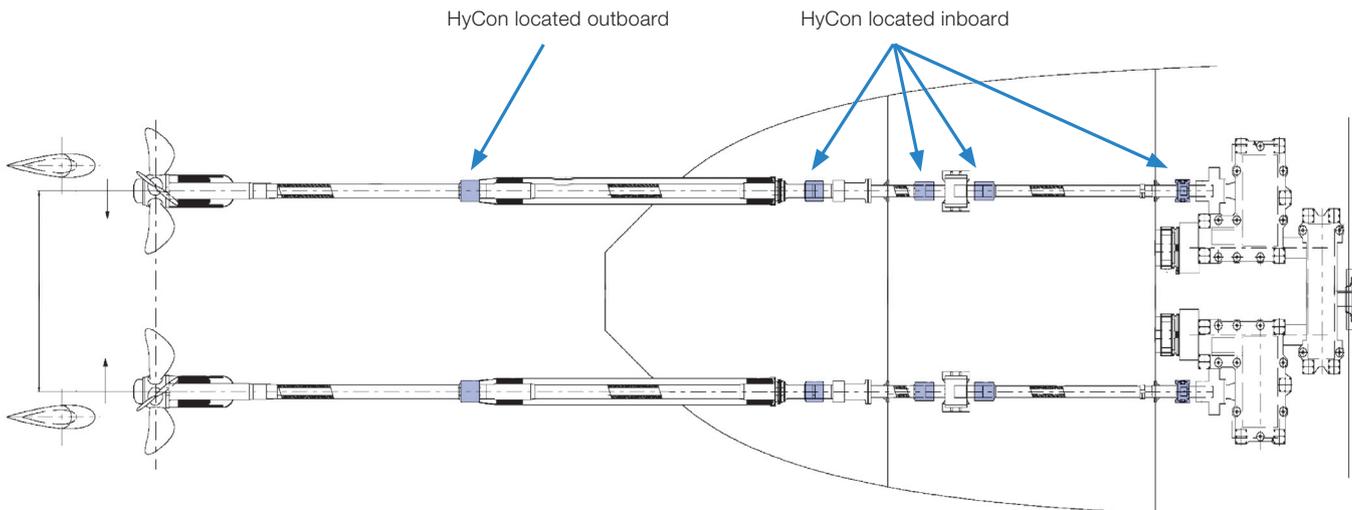




Photo © Taiwan Navigation Co Ltd

Thrusters

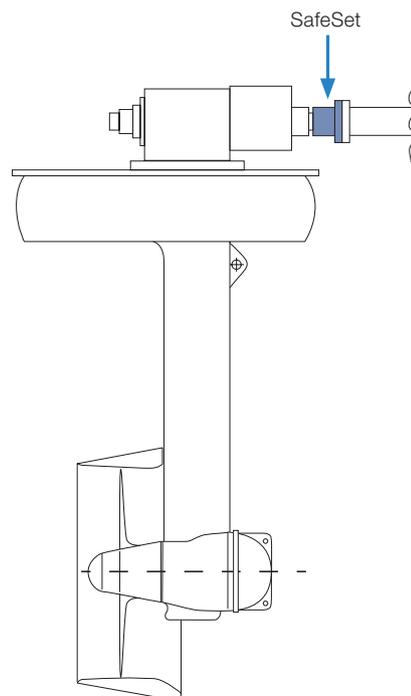
Many vessels use azimuth thrusters because of optimum maneuverability, decreased stopping distance, and greater fuel efficiency. The thruster pod allows the propellers to rotate 360 degrees, eliminating the need for a rudder.

SafeSet torque limiting couplings, when installed between the prime mover and the angular gearbox protect all drive components from unexpected torque peaks.

SafeSet torque limiting couplings can be installed in:

- Tugboats
- Offshore supply vessels
- Ferries
- Naval vessels
- Cruise ships
- Dredgers

SafeSet installed onto the input shaft to the angular gearbox of the thruster





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Photo © Marine Jet Power AB

- 1 Tugboat
- 2 Patrol boat

Water jets

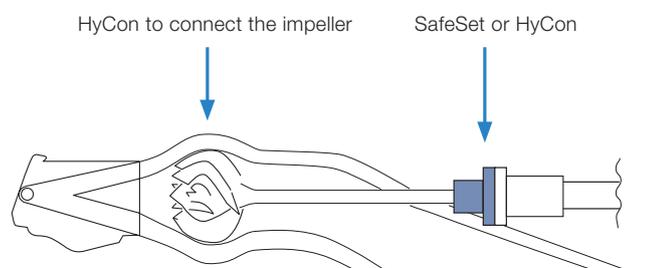
Water jets provide the perfect propulsion for marine vessels that require fast acceleration and easy maneuverability in shallow water with speeds of between 20-50 knots. These water jet units generate propulsive thrust by drawing in water and then accelerating and expelling it through a nozzle at high velocity.

Torque protection is required when the impeller water intake pulls other objects in from the water, and a blockage results. With the propeller jammed, the motor and driveline inertia continue to deliver torque, which can cause severe damage and possibly time in the dry dock.

SafeSet torque-limiting couplings and HyCon connection couplings can be installed in:

- Pilot boats
- Fire-fighting vessels
- Patrol boats
- Ferries
- Naval vessels
- Megayachts

SafeSet or HyCon installed to protect or connect the driveline of a waterjet





Harbor and deck machinery

Preventing unplanned operational stoppages by optimizing the drivelines in harbor and deck machinery such as cranes, loaders, dredger pumps, and excavators are necessary, especially as these are essentially the areas where torque peaks can occur.

Installed between the motor and driveline equipment, SafeSet protects cargo handling and deck machinery from overloads resulting in machinery damage. The couplings also improve processes by minimizing downtime and extending the lifespan of the driveline.



Voith Service – Part of Your Business

Voith is a reliable partner for the entire service life of your driveline, offering a wide range of services and support when and wherever you need it.

You can rely on us during every part of the process, from installation to initial start-up and final commissioning. Our technicians ensure the trouble-free start-up of your machine, which provides peace of mind that it is correctly installed.

Furthermore, Voith trains your personnel to operate the coupling, which optimizes performance and maintains constant reliability.

Proactive maintenance of torque limiting couplings increases the service life, improves performance, and reduces your torque couplings lifecycle costs to ensure maximum return on your investment.

Contact us today:

Torque limiting couplings:



Connection couplings:





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