



E-MAG

MALMEDIE LAUNCHES IT'S FIRST ELECTRONIC MAGAZINE (E-MAG)

In a more and more globalized world, in which processes and companies are connected closely together, **information flow** is a **key success factor** to ensure an efficient and value adding working environment. It is therefore important and mandatory that ideas and information are shared and spread throughout the whole organization including its business partners so that success can be guaranteed also for the future.

At present, Malmedie is working together with 29 representatives throughout the world and we regard each one of you as a **major success factor** for which we are very grateful. Having you as our reliable and trusted partner enables us all to have excellent market knowledge, access to customers and in the end a fruitful business.

Malmedie is mainly known for 3 different types of mechanical couplings which can be found throughout various applications and industries. This advantage of a widely spread range of usage cases is primary a **benefit**. However, sometimes this can be seen also as a **challenge** as not all of us are having a clear view on all these possibilities. Each one of us is coming from a certain industry or working environment and it is therefore clear, that we are here and there not aware of all industries and possible applications which could be addressed or served. The main intention of this E-MAG is to **share and exchange the experiences** we mutually achieved already and to give you further insights of possible applications.

Beside the general portfolio of couplings, Malmedie is providing also **system solutions** such as our **SOS-System** or our newly invented **ISC-Coupling**. These solutions require even a deeper understanding of the overall application and its working principle. It is therefore our aim to provide you with further information, updates and practical examples of these systems within this and the following MALMEDIE E-MAG's.

We hope that we can establish a **solid networking** and **information platform** with this E-MAG that can help to strength, share and deepen the communication within the Malmedie network. **Suggestions and practical examples** such as highlights but also lowlights from **your side** are therefore **highly appreciated and wanted**.

In first instance, the E-MAG is meant only for our representatives - but if you think it can be of interest for other people please feel free to address it to selected **customers**.

Let's learn from each other and do the right things!



IN THIS MAGAZINE

E-Stops on Hoist Systems	2
The new ISC-Coupling.....	2
Prototype Installation.....	2
Hot straightening machine with Safety-Coupling	3
Innovations for Safety-Couplings	3
LORC test bench	4
Safety-Coupling for LORC	4
New coupling series FOUR-ONE .	5

CONTENT OF THIS ISSUE

- Gearbox protection with a new Coupling type.
- Safety-Coupling with automatic (remote) re-setting system.
- Safety-Coupling for 12.100 kNm
- New motor couplings.



E-Stops on hoist systems of STS-Cranes

On modern container cranes, problems with the infinite strength of the hoist gearboxes are occurring regularly.

The design of the gearbox is usually made based on the performance characteristics (acceleration, motor data, etc.) of the hoist unit.

Due to the fact, that the terminal operators are requesting high safety factors for the brake system in many cases, it happens that the **brake power** is far **“oversized”**. In the standard / normal operation mode where the mechanical brakes are acting mainly as “holding” brakes, oversizing of the brake system is not harmful to the gearbox.

The situation is, however, totally **different** when malfunctions or over speeds on the hoist system occur which then lead to **Emergency Stops (E-Stops)** during lifting or lowering modes. In that case, the over dimensioned brakes are having a negative impact on the lifetime expectation of the gearboxes due to the very short deceleration time.

The secondary emergency brakes which are located

at the rope drum are applied first respectively at least faster than the service brakes in case of E-Stops. That leads, specifically on E-Stop “down” (lowering) to a negative stress reversal on the tooth flanks in the gearbox caused by the rotating masses from motors, coupling and the gearbox itself.

The sum out of the flank and axial clearances provoke now a free angle movement until the opposite tooth flanks of the gearings are in contact.

As a result, the opposite flanks are **now hit with full impulse by the rotating masses**.

This load scenario **significantly** influences the lifetime expectation of the gearbox and bearings in a negative way.

*“ The ISC-Coupling is **the** Safeguard for the Gearbox!
In case of E-Stop Inertia Stress are reduced by approx. 35%.”*

Prototype Installation of the ISC Coupling

At a German Container Terminal, problems with stability under load on the gearboxes occurred repeatedly on various STS cranes.

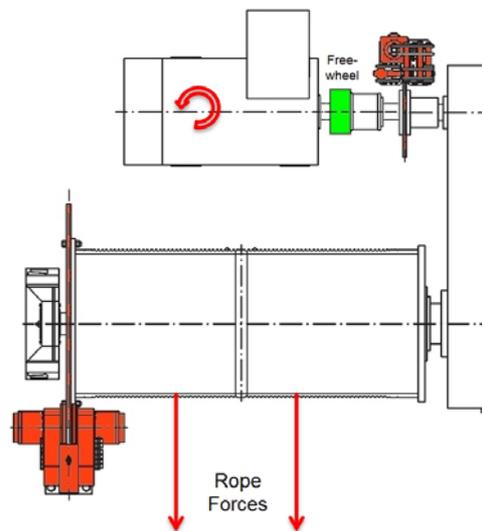
After the new ISC Coupling was presented to the Terminal it became clear, that our new system can lead to a significant extension of the gearbox lifetime and therefore in the interest of terminal operators.

It was mutually agreed, that one STS crane will be retrofitted with the new ISC coupling as a first reference installation.

The retrofit is scheduled on the STS in the last two weeks of September 2015.

The new ISC-Coupling

Inertia Stress Compensation Coupling.



To avoid an overload of the gearbox in the load scenario „E-Stop downwards“ , it is mandatory that all rotating masses on the high speed side of the gearbox are separated immediately.

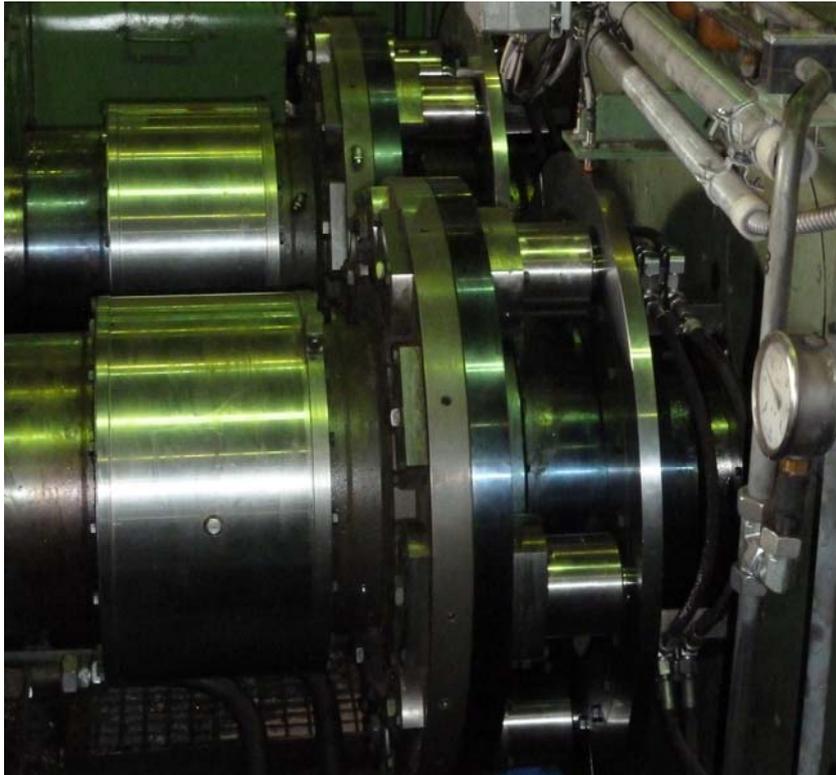
The principle working way of a hoist gearbox foresees only one “load direction” due to gravity, i.e. wire ropes are always under tension, no matter if loads are lifted or lowered. However, for lifting and lowering different rotation directions are of course needed.

During lowering mode, the direction of rotation and the direction of force is opposite and the motor is preventing here a free fall of the load (motor decelerates). The newly invented ISC-Coupling (based on a **freewheel**) is able to transmit a torque in the one direction and in the

other direction it can rotate free. By this, the harming and impulsive torque in load case “E-Stop” down is set off the drive train. (**Malmedie Patent** Application DE 10 2013 209 361.6 + PCT/EP2014/052693)

Inside the gearbox then only the rotating masses of the gearbox shaft remain. In case the freewheel is installed on the motor shaft only the masses of the coupling and brake disc have to be considered further. By this, a **reduction of the gearbox stresses of approx. 35%** from the initial values can be achieved.

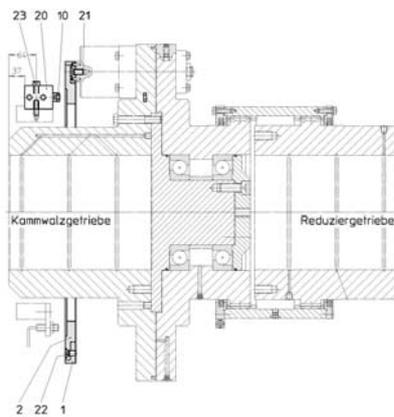
In case that the freewheel is installed on the gearbox shaft directly, the stresses can be reduced even further.



Safety-coupling with automatic (remote) re-setting device

Hot straightening machine with Safety-Coupling

The main task for a Safety-Coupling is to transmit torque up to a certain value and once that value is reached the coupling shall disengage, so that the other components are protected



from any damage. Solely mechanically acting Safety-Elements are replacing shear pins where the separating function is destructive.

The Safety-Elements are disengaging during overload condition within 1 ms in a **non destructive way** and the drive train can rotate free. By default, the re-setting is done by locking the safety elements back in with a light hit at the back of the elements.

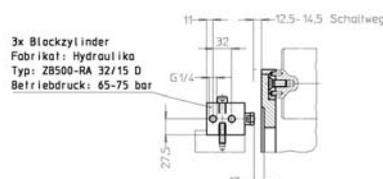
A quick and efficient re-setting without replac-

ing any materials and any special tools can be therefore guaranteed.

In a close cooperation with our German customer "Dillinger Hütte" we developed a reliable add-on feature in order to reduce the down times further. On their hot straightening machine line, the manual re-setting process was replaced and the **re-setting** of the Safety-Elements is now **remotely triggered** by hydraulic cylinders instead.

If a load condition exceeds the shut-off torque which was set, the coupling separates immediately and **sensors** are processing a signal to the system control so that the drive motors are switched off.

Subsequently, it can be examined what the reason for the overload and tripping was. As soon as the problem is detected and eliminated, the coupling is **re-set automatically within seconds** and the straightening machine gets back to operation mode. This solution can be applied to various other applications.



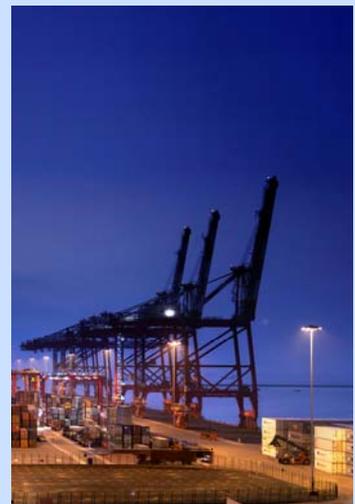
Innovations for Safety-Couplings.

Looking around rolling mills worldwide, Malmedie Safety-Couplings are successfully installed and in operation already for more than 30 years.

As competition is getting fierce for Malmedie nowadays, it is a key aim for us to develop new products and solutions so that our position and reputation in the global market remains as the „technology leader“ when it comes to couplings.

As for that reason innovations are the fundament of our working and business model and we are therefore anxious to develop our product portfolio continuously further.

One example for this is the **automatic re-setting device** for our Safety-Coupling which can be also retrofitted into most of the applications. Another development is a newly designed Safety-Element for applications where large radial impact loads exist.



LORC test bench for wind turbine nacelles

LORC was founded in 2009 by the major players in the offshore renewables sector with the aim to design and construct state-of-the-art test facilities for wind turbine drive trains.

The Nacelle test field which is located in Munkebo Denmark is constructed to simulate every possible operation mode for wind turbines up to 10MW.

With its own harbor, a 1000t Goliath shipyard crane and a 100t indoor overhead crane, the transportation and handling of turbines in every size is well guaranteed.

The facility was put into operation in spring 2015.

For more information please refer to <http://www.lorc.dk/>



Safety-Coupling for LORC commissioned

The biggest ever build MALMEDIE Safety-Coupling was installed and commissioned in July 2015.

The coupling is installed at LORC (DK) and protects in a safe and reliable way their test bench for wind turbines against overloads.

advantages in this application. Firstly, the bearing system is significantly smaller due to the design. This results in lower costs and less installation space. In addition it is easier to re-engage the Safety-Elements when they are arranged radial.



With an astonishing shut-off torque of **12.100.000 Nm**, the coupling is equipped with 21 Safety-Elements ASE40.

Depending on the installed amount of Safety-Elements different shut-off torque values can be realized. With an installation of 6 Safety-Elements for example, the shut-off torque is set to 3.357.100 Nm.

Combinations over all symmetric steps are possible and the shut-off torque can vary between any value in a range of 1.728.500 to 12.100.000 Nm. By increasing the Safety-Element No. from 21 to 24, even **14.000.000 Nm** can be achieved.

To realize the different shut-off torque values single Safety-Elements can be engaged or disengaged by a **hydraulic puller unit**. (see picture right)

Due to the high axial forces of the Safety-Elements, a radial arrangement of the elements on the outside surface was chosen.

The triggering accuracy is on a very high level as the centrifugal force can be regarded untended due to the relatively low speed.

The acting principle of this design has several

The schedule foresees that LORC will run the first tests in week 36-37 this year with a start shut-off torque of 1.728.500 Nm. The maximum deviation shall not exceed +/- 10%.



Malmedie is developing the new motor coupling series **FOUR-ONE**

Our new coupling series **FOUR-ONE** unites 4 different coupling types but - all with the advantage, that they are having the **same installation dimensions**. The customer therefore has the choice to switch between the four coupling types depending on the required functionality for the relevant application.

Even if it should turn out, that in first instance not the correct coupling type was chosen, a change to a different coupling type at a later stage is no problem as the interchangeability is guaranteed. The same is of course applicable for retrofits.

The **FOUR-ONE** series is designed as a modular system so that combinations of all 4

couplings are possible with brake discs if the customer requests this.

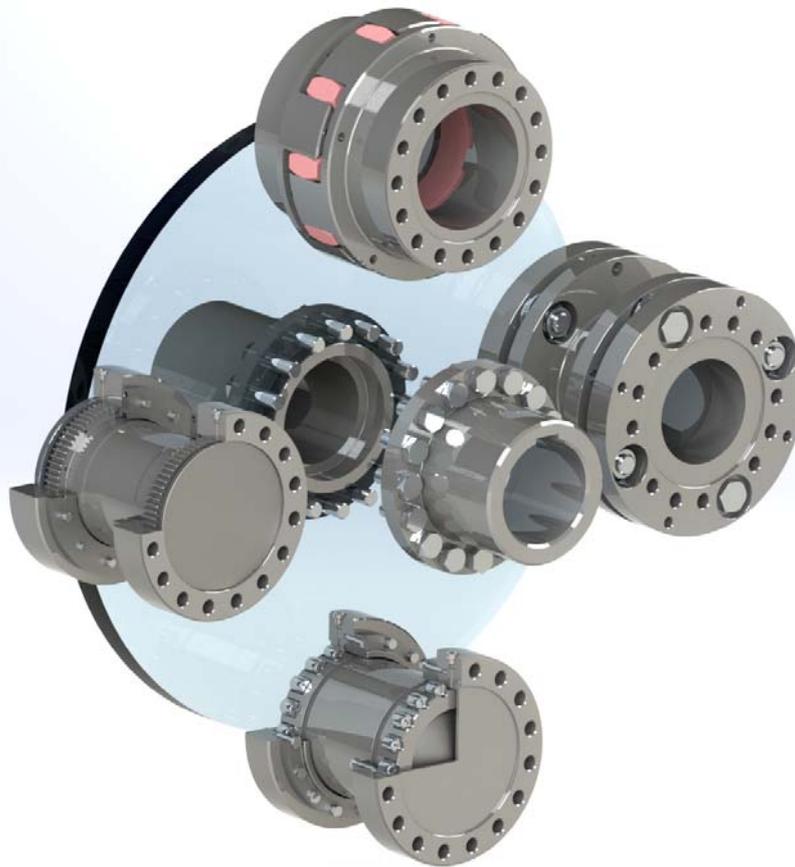
Available couplings of the **FOUR-ONE** system are an torsional **elastic claw** coupling, a torsional rigid **barrel** coupling, a torsional rigid **multiple-disc** coupling and a torsional rigid **gear** coupling.

All models are two hinged (cardanic), so that without any additional radial force an offset can be compensated.

The execution as barrel coupling for example is a good choice for applications where relatively low speeds exist but high torques occur. The multiple disc type on the other side is designed for applications with small deflections and without maintenance.



“FOUR-ONE means four different systems in one dimension.”



About the editor

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We want your expertise!

We would appreciate to receive also **your input** and support for the future E-MAGs. Let us share the experiences and the feedback **you receive** from our customers worldwide, so that we can learn from them and consider their comments in our working.

It is further planned, that in each future E-MAG one of our representatives / business partners and its organization will be introduced.

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