PENLINK

INTRODUCTION

Penlink Slip Rings for Large Offshore Cranes

Slip rings are essential for the reliable rotational transmission of power, data, and signals in large cranes. This application note explores the design and functionality of our advanced slip rings, meticulously crafted to meet the most demanding requirements.

Our slip rings are engineered to perform in extreme conditions, including offshore operations, and can be customized with hydraulic rotary unions for cooling systems. The use of heat-resistant, flame-retardant, and halogen-free cables ensures both flexibility and exceptional transmission. This document offers an in-depth examination of our cutting-edge slip ring solutions, rigorously tested and certified to deliver unmatched performance.

We Deliver Slip Rings For Your Demanding Applications Where It Is Critical That Rotational Transmission Is Reliable.

The slip ring is a powerful and important part of any rotating application where the transmission of power, data and signals needs to run without interruption.

When designing a large slip ring that can be over 3 meters tall or more, it's important to have relevant experience and know how. We have a widespread knowledge in this area and can guarantee that our products will meet your requirements.

Our slip rings can have a high number of circuits for power and can transfer signals such as Profinet, Ethernet, CANbus and more. It's even possible to integrate a fiber optical joint if needed.

When required, we make sure that the slip ring is DNV and BV certified so it can operate in any demanding environment. For example, we have many slip rings that are used for offshore operations where the environment can get extreme.

It is also possible to combine the slip ring with a hydraulic rotary union that can transfer cooling liquids for your cooling system. The swivel is built in stainless steel and have an integrated leakage control system.

We document everything during design of the slip rings to make sure that we live up to expected quality standards. For each project we deliver the test documents with the unit to our customer.

CASE:

We Delivered A 3-meter-tall Slip Ring For A 5000mt Crane, Used When Installing Offshore Wind Turbines.

Challenge: The customer asked us to help them with the design and production of a large slip ring, to be used with a DC drive line crane. The challenge was that each motor require 2000A DC supply with a high short circuit rating. The slip ring also need to be integrated into a swivel for cooling water, transferring 34 m3/hour of water. The unit needed to be BV certificated and tested in an external workshop to ensure fulfilling the requirements.

Penlink Slip Ring Design with Power and Signal Transmission, Efficient Cooling, and Safety Features

For this slip ring, we started with a design with three different chambers, making it 3.4m tall. To ensure that the power transmissions don't create any shortage we put the rings for each motor in separated chambers. This enables continuous current of 2000Ax3, 930V and a 75kVA short circuit rating.

For the signals, we used fiber brush technology. This technology allows for an excellent transfer of power and signals, and there are no debris or similar from the slip ring fiber brushes. The optical slip ring has 10 separate independent channels, and no external power is required to fulfill its function.

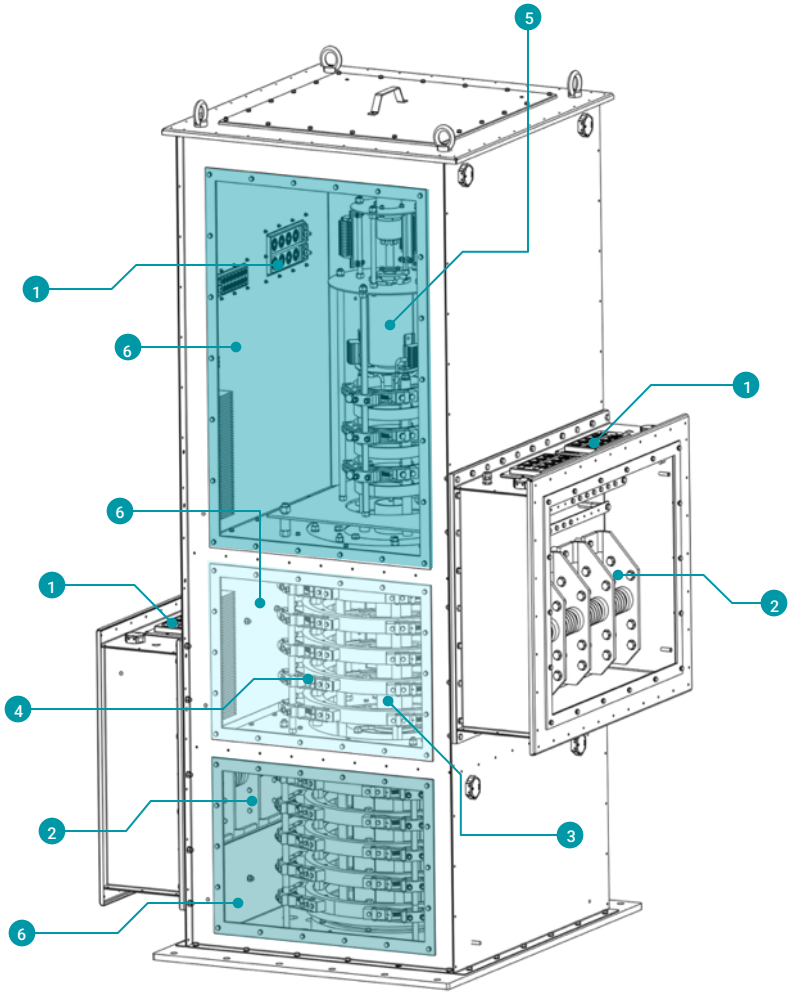
For cooling of the motors, we integrated an 850kg water swivel of stainless steel that transfers cooling liquid continuously under use. The need of transmission was for 34 m3/hour. The swivel has a built-in leakage control system to make sure no water can leak undetected into the slip ring. The cables used in this construction are heat resistant and of flame retardant material. They are highly flexible with excellent transmission due to the small copper wiring, and the cables are halogen free.

Before shipping the final product off to our customer, we made sure to FAT test it and certified it according to DNV and BV requirements in a laboratory in the Netherlands.

Crane Slip Ring

Design of The Slip Ring

1. Crane Cable Into Junction Box
2. Copper Bars
3. Power Slip Ring
4. Power Brushes & Holders
5. Auxiliary Power & Signals
6. Separated Chambers



Possible Technical Specification

Chamber	Item	Qty	Voltage	Ampere	Notes
1	PE 1	1	-	1000A	
1	Motor1 DC-	2	930VDC(to DC+)	1000A	*)
1	Motor1 DC+	2	930VDC(to DC-)	1000A	
2	PE 2	1	-	1000A	
2	Motor2 DC-	2	930VDC(to DC+)	1000A	*)
2	Motor2 DC+	2	930VDC(to DC-)	1000A	
3	440VAC Supply	6	440VAC	200A	
3	PA/GA	4	110VAC		
3	Fire Detection	4	24VDC		
3	HVAC Signal	2	24VDC		
3	Emergency Stops	14	24VDC		
3	Spare	6	24VDC		
3	Optical Network Signal	10			

*) Normal operation is 925A for 25 min followed by 25 min of no load (0A).

Advanced Cooling System Integration with Dual-Passage Water Swivel for Offshore Cranes

The cooling system for our customer's crane was installed inside the vessel and not in the actual crane, therefor we integrated the swivel on the bottom side of the slip ring.

To be able to cool down the application the swivel needed to handle 34m^3 of cooling liquid to pass through it every hour. To meet this challenge, the swivel was designed with 2 passages with Ø60mm passage size each. The design also had a hollow shaft of Ø225mm for the power cables to pass through it. The result was an 850 kg stainless steel swivel unit, with a built-in leakage control system. The unit also had dual sealing to increase the performance and lifetime in the harsh environment it's going to be installed into.

Our deep knowledge and understanding of sealing and bearing technology allows us to provide safe and reliable fluid transfer solutions for offshore cranes. We can design and manufacture single and multiple flow passage swivels to meet your needs.

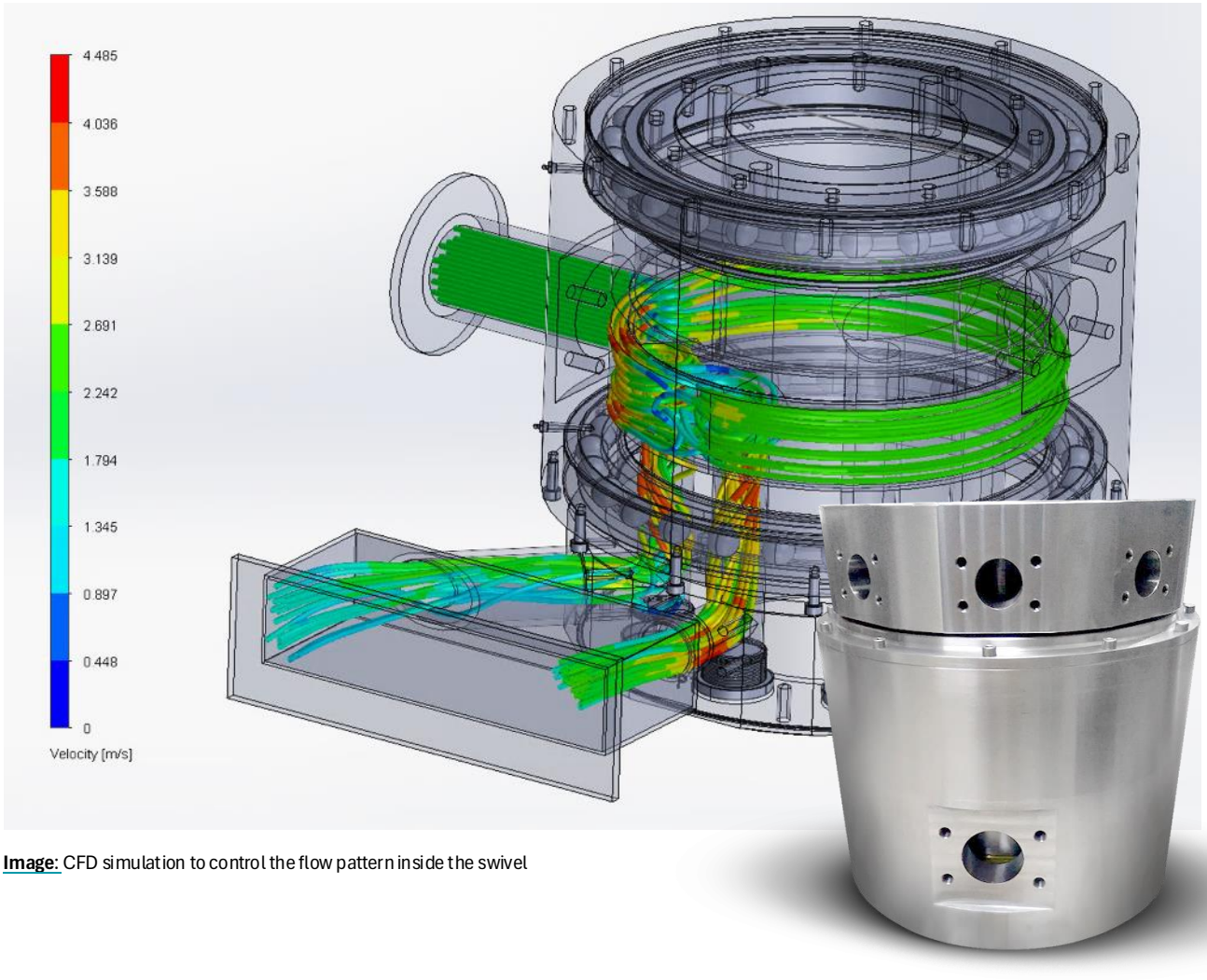


Image: CFD simulation to control the flow pattern inside the swivel

HEAT STABILIZATION SETUP

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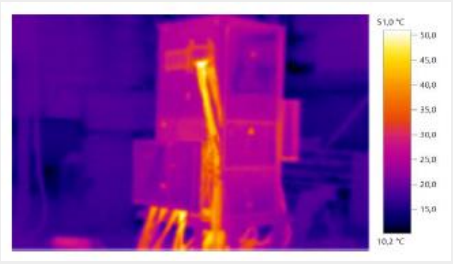
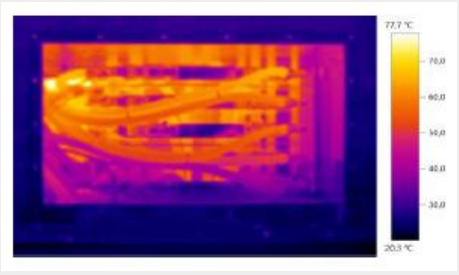


CHAMBER A



CHAMBER A

FAT / Certified 3rd Party Witness Testing

To ensure the slip ring's performance, third part testing was carried out. The slip ring was rigged up with temperature sensors and a large generator was used to provide the 2000A that was required. The test cycle was decided together with BV auditors, and was performed both with a ramp up, and a 1h peak test. The images above illustrates the FAT testing. Our slip ring successfully handled the test and got certified by the BV auditor.

Our main design for this type of slip ring fulfill the requirements of many different standards and regulations, and have received certifications from DNV GL, BV, ATEX, IECEX before. But we know that all projects are different; therefore, our design can be adaptable for different requirement, and we can modify our design to suit your needs.

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Penlink Slip Rings For Cranes

Our products are designed with a focus on high power capacity, reliable signal transmission, durable construction, and operational flexibility. We understand the unique challenges faced in crane applications and offer customized solutions to ensure optimal performance and safety.

Partnering with Penlink means choosing a company that prioritizes your needs, delivers exceptional products, and offers comprehensive support. We are dedicated to enhancing the efficiency, reliability, and safety of your crane operations.

Thank you for considering Penlink for your slip ring needs. We look forward to working with you to achieve your operational goals. If you have any questions or need further information, please don't hesitate to contact us.

Key Features

- → High Power Capacity
- → Reliable Signal Transmission
- → Durable Construction
- → Operational Flexibility

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