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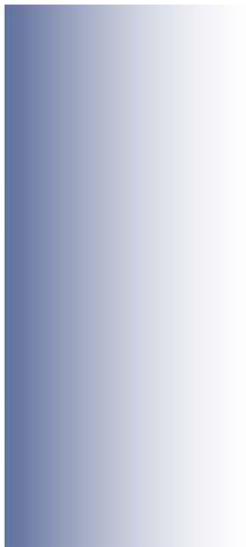
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SCHLEIFRING

Slip Ring Solutions | **Industrial Applications**





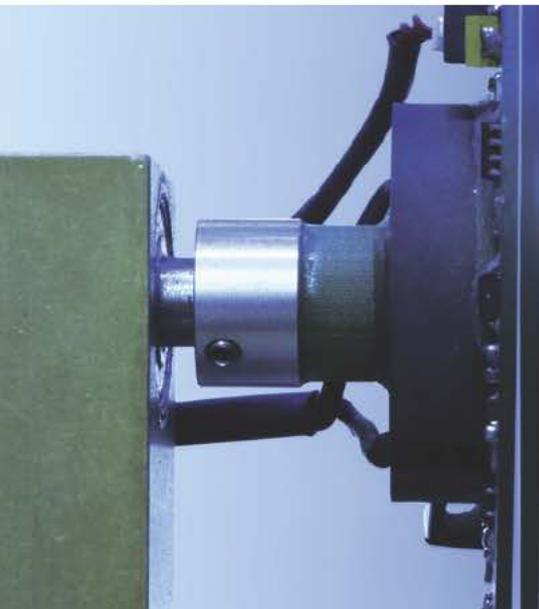
SCHLEIFRING Headquarters in Fürstenfeldbruck, Germany



Quality in Detail

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About SCHLEIFRING

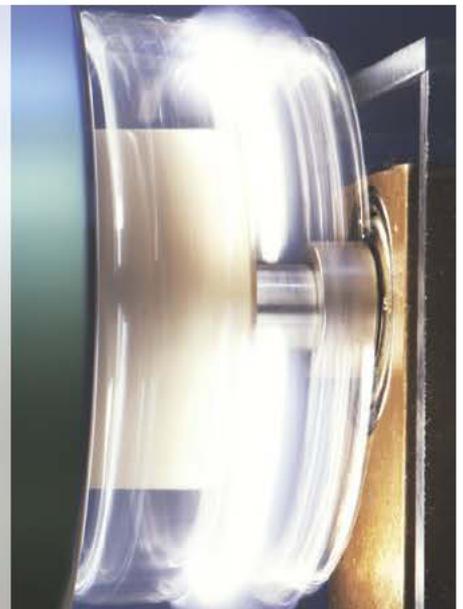


More than 3,000 customers rely on SCHLEIFRING solutions.

Our customers are specialized in complex technical products in aviation & space travel, energy industry and automation markets as well as the medical sector.

In virtually all high-tech industries our solutions successfully provide the rotating interface behind the process. The outstanding quality of our precision products in medical technology is proven and our products lead the field in space surveillance.

We maintain a global network of sales and service establishments so that we can be close to our customers in over fifty countries in the world.



Exclusively for industrial applications SCHLEIFRING offers a wide range of rotary joints, from standard designs for simple tasks up to highly complex customer-specific systems often involving several hundred rings.

These slip rings and rotary joints facilitate the supply of power and the transmission of electrical signals, all common data bus signals, Gigabit Ethernet to optical signals, as well as media from stationary to rotating planes.

Austria • Switzerland • Italy • France • Spain • Benelux • Portugal • Poland • Turkey • Sweden



Norway • Belarus • Israel • India • China • Japan • Singapore • Australia • Canada • USA

Schleifring und Apparatebau GmbH | Germany

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Germany

**Schleifring Transmission
Technology Beijing Co., Ltd.**
Beijing | China

**Schleifring Medical
Systems, LLC**
Elgin, IL | USA

Non-Contacting Transmission | **Capacitive Data Link GigaCAP®**

The application of industrial standard protocols is highly in demand. Communication standards like Gigabit Ethernet or Fibre Channel are supported and allow data rates up to 10 GBit/s.

This way, the system integration of the data channels is being simplified as components from the IT marketplace can be used. The modular design allows for quick and easy adaptation to suit customer-specific applications.



Features:

- Multiple channels stackable
- Unidirectional or bidirectional
- Max. diameter: 2000 mm
- Height: 25 mm/1" per stack plus housing
- Shapes: two platters for 2 channels in metal housing
- Rotational speed: only limited by mechanical restrictions

Classic applications

- Automation, industrial scanners
- Customer specific-applications
- Radar, periscopes

Wear-resistant, high noise immunity combined with excellent EMC qualities, high reliability and bit error rates of $<10^{-12}$.

Non-Contacting Transmission | **Inductive Power**

In addition to contacting slip rings, non-contacting rotary joints are becoming more and more popular.

SCHLEIFRING's worldwide patented technology for inductive, non-contacting power transmission allows voltages of 24 V and 400 V within a range of 1 W to 10 KW.

Especially in applications with high rotational speeds our non-contacting slip rings ensure a wearless long operating lifetime, which is not realizable with any contacting transmission system.



This new compact hybrid unit combines non-contacting power and signal transmission, allowing e.g. temperature monitoring of rollers in foil processing machines.

Non-contacting power and signal transmission provides a wide range of options for industrial innovations.

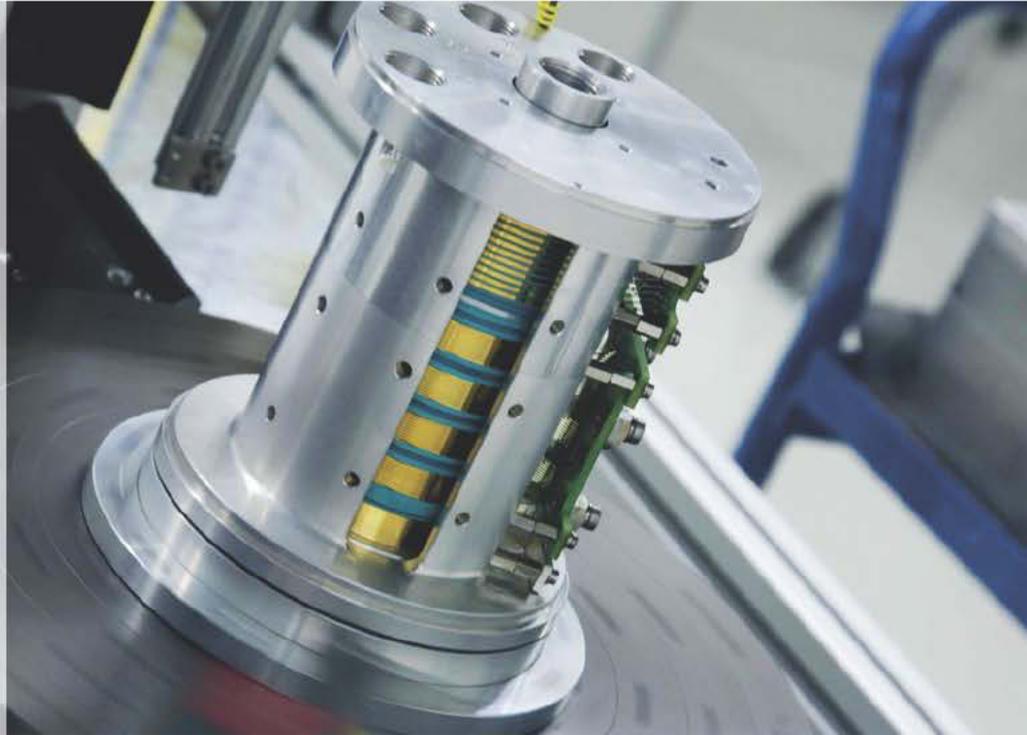
Classic applications

- Clean room application
- Vacuum technology
- Semiconductor industry
- Printing machines
- Balancing machines
- Pick and place machines
- Packaging lines
- Plastics processing machines
- Bottling machines

Contacting Transmission | **Signal & Data Transmission**

The slip ring is an essential device for the supply of power and the transmission of electrical signals. The quality of the slip ring therefore is a key determinant in the quality of the overall system.

Due to the constantly increasing volume of transmitted data nowadays, contacting slip ring systems use precious metal sliding technology to encounter the physical limitations.



Sensitive data and digital signals e.g. piezo or strain gauge signals

SCHLEIFRING's gold wire technology and the contact configuration of silver graphite brushes on brass rings allow excellent results in signal and data transmission:

- Extremely low electrical noise and contact resistance
- Long operational life with low maintenance
- High contact reliability
- Crosstalk isolation
- Reliable operation under shock, vibration and extreme temperatures
- Transmission of all common bus systems

Contacting Transmission | **Power Transmission**



Our slip rings provide the dynamic electrical connection between mechanical static and rotating elements. They operate as rotary interfaces continually transferring electrical power over 360 degrees and up.

Slip rings are produced in various types and sizes depending on:

- Electrical requirements
- Mechanical properties and requirements
- Operating environment
- Customers needs

From low to high power

SCHLEIFRING's silver braid brushes or silver graphite brushes on silver rings as well as the gold wire technology provide optimum power transmission. Depending on its technical requirement it allows excellent results in the transmission of low power up to and over 1000 A with high rotational speed and long operating life at the same time.

Optical Transmission | **Fiber Optical Rotary Joints**

Optical fibers transmit reliably high data rates over long distances. SCHLEIFRING offers fiber optical rotary joints for a direct link to optical fibers.

FORJs transmit any kind of digital or analog optical signals independent of the data protocol.

Highlights:

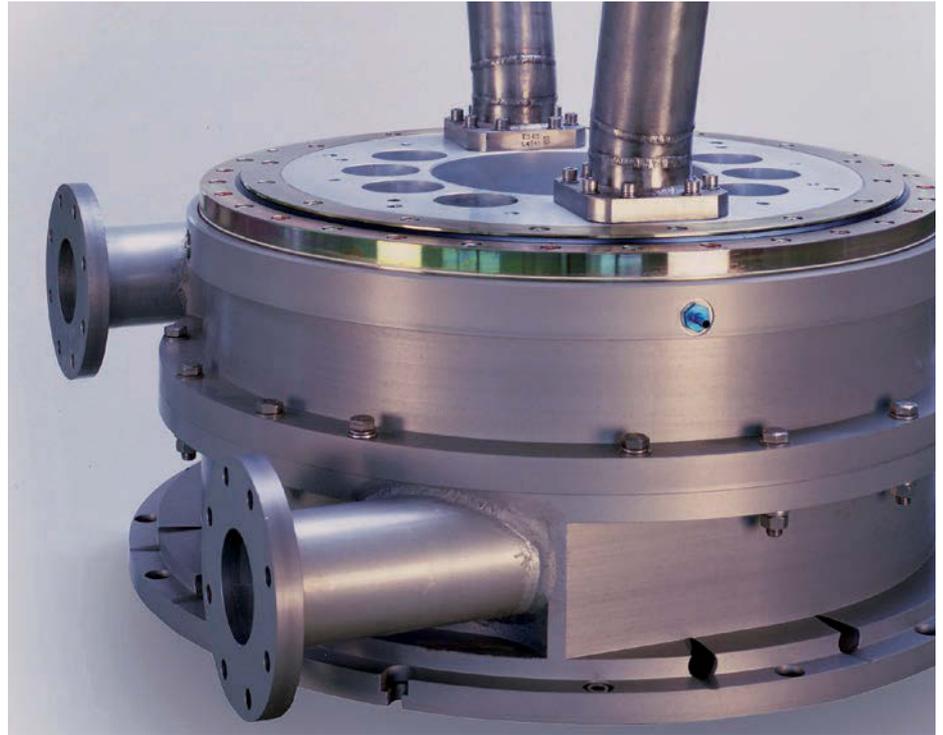
- Data rates of 10 Gbit/s or higher
- Unaffected by EMI
- Temperature range: -40 °C to 85 °C
- Up to a capacity of 32 fibers



Classic applications:

- Ground and ship radar systems
- Offshore industry
- Unmanned aerial vehicles (UAV)
- Mining industry

Contacting Transmission | **Media Rotary Joints**



SCHLEIFRING offers sophisticated solutions for the transmission of fluids like water, oil and cooling fluids, as well as gas and air – optimized to customer's application.

Media rotary joints integrated within slip ring assemblies are as well available as complete rotary joint units, consisting of media slip ring, optical rotary joint, encoder and/or microwave rotary joint.

No matter whether our customer needs specific solutions for high pressure, high speed or high flow rates – SCHLEIFRING provides the highest quality systems for optimum lifetime.

Specific Housings

Constantly and rapidly changing demands call upon SCHLEIFRING's traditional skills of design engineering, unique technical knowledge and exact manufacturing standards.

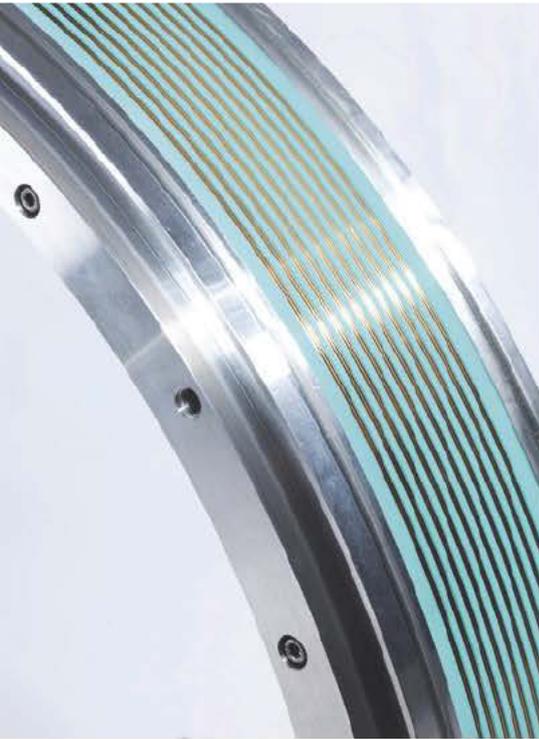
The so far achieved market share enables SCHLEIFRING to make investments in new state-of-the-art design tools, such as Solid Edge® computer-aided design (CAD) system, as well as the employment of more than 50 development & design engineers.



Cylindric housings

- Aluminum, stainless steel investment casting
- Material durability tested even in very aggressive environment

Specific Housings



Free inner bore

Specific applications require slip rings with a large free inner bore. SCHLEIFRING designs meet these high demands, from 6 mm up to a free inner diameter of 2000 mm.



Explosion-proof

- Units for Ex Zone 1 and 2 with EX p and Ex d certification
- Enclosures in marine stainless steel certified by ABS, DNV, BV or Lloyds



Compact design

Even at high rotational speeds resilient miniature slip rings are the ideal solution for signal transmission whenever space and/or weight is limited. These slip rings require no maintenance or service during its specified lifetime.

Customized Slip Rings | **Customized Service**



Our service department is a team of highly qualified service engineers. We offer an allround package from comprehensive counselling and competent support at development stage over detailed documentation to a comprehensible training on the system and maintenance training on-site. The systematical support and maintenance by our experts solves eventual problems before they may arise.

High quality standards, secured by our internal quality management system, assure our customers the delivery of first class products. Every employee is trained with regards to the SCHLEIFRING quality philosophy. The current state of DIN EN ISO 9001:2008 is continuously controlled and yearly inspected by TÜV Süd.

We support our clients throughout the entire operating life of the product right through to its disposal.



SCHLEIFRING
Life-Cycle Management



DEVELOPMENT STAGE

Our years of experience pave the way for continuous and sustainable improvement of our products.

We counsel our customers competently in all questions concerning product and development. At the same time we can revert to the knowhow of our sales and mechanical engineers and experiences of previous applications.



ON-SITE REPAIR

We organize the important documents and spare parts and send our service engineers to their operations worldwide.

Of course our service engineers have all necessary further education, like e.g. certified Offshore-License-Training BOSIET and HUET & EBS, to be able to reach remote operation sites by helicopter.



PRODUCT RECYCLING

SCHLEIFRING attaches great importance to the responsible use of natural resources, environmental protection and targeted environmental management as key conditions for sustainable development.

All components are dismantled and recycled after their operating time. Precious metals get separated, cleaned and returned to the production process. Residual component parts are properly disposed.

We surely offer an exact documentation of all important development steps, checking documents and certificates as well as an assembly instruction to assure a correct initial operation.

In exceptional cases our service engineers do specific deepening maintenance trainings in-house or on our customers site to explain technical questions clearly and comprehensively.

DOCUMENTATION

CYCLE



FRING

EMENT

Cost efficient spare part supply by optimal networking plays a key role at SCHLEIFRING. A first class inventory management increases the availability of components at the same time.

Our customers directly benefit from these efficiency in production results concerning dates, costs and delivery service.

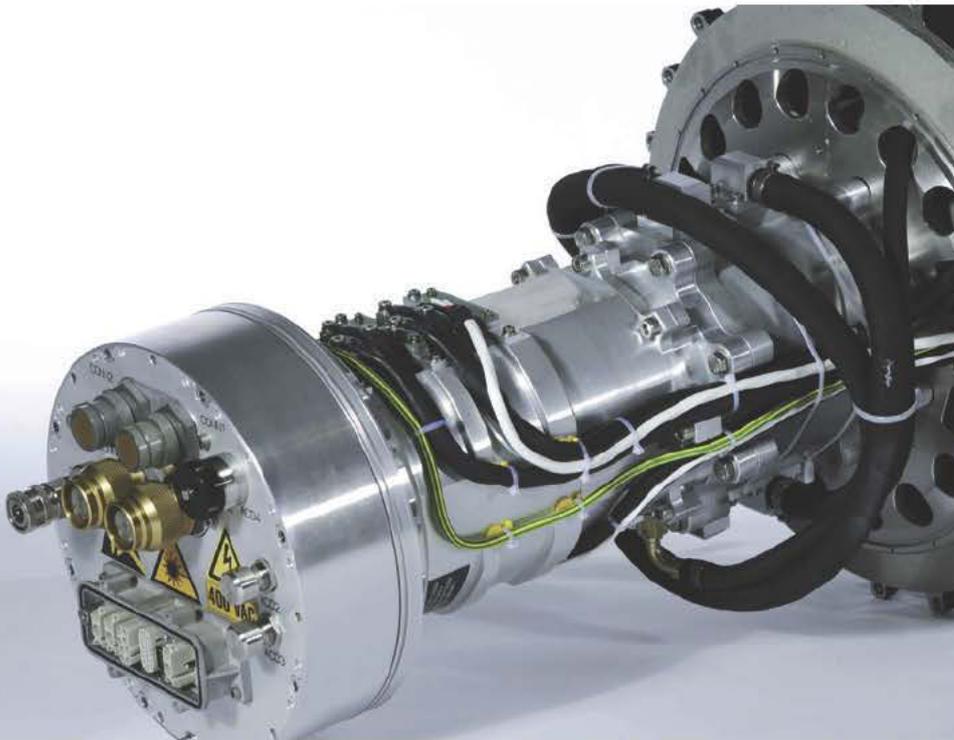
SPARE PART
SUPPLY

Due to our competent support and technical maintenance throughout the entire operating life, our slip rings always run with state-of-the-art technology.

In case of repair orders, all components will be checked exactly and replaced if necessary. Furthermore we offer constant controlling of all processes as well as maintenance and support regulated by MIL-standards.

REPAIR &
MODERNIZATION

Hybrid Units



Slip ring systems combining a multitude of transmission technologies

The field of applications for our products range from standard designs for simple tasks to highly complex customer-specific systems often involving several hundred rings.

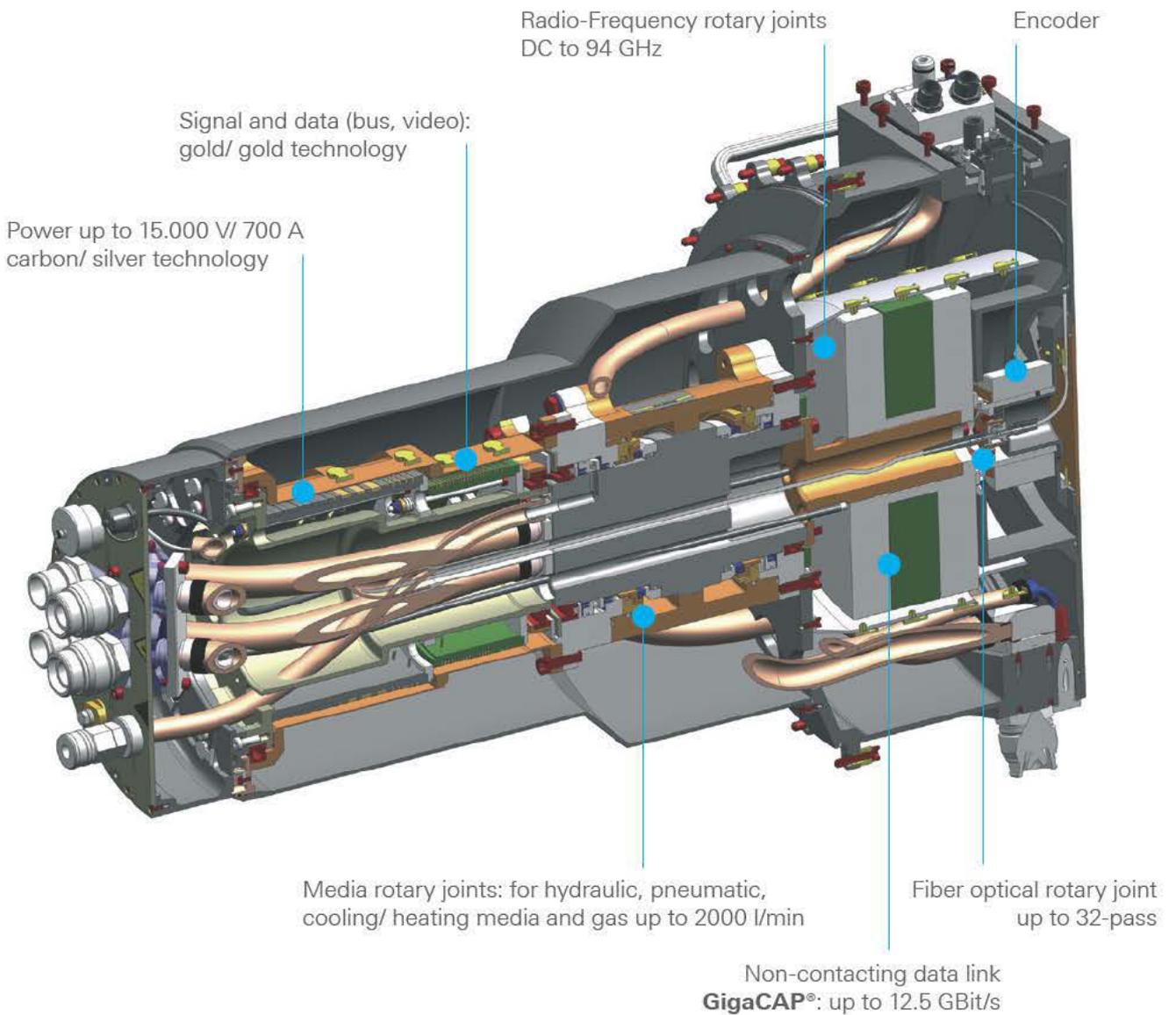
Hybrid slip ring units combine various transmission technologies to transmit electrical power, signals, bus data, RF signals and media in one system.

Because of the great variety of demands made upon the slip ring assembly, it is imperative that the system designers give thought to the space available and performance expected early in the design stage.

The product shown contains:

- Power up to 15.000 V/ 700 A carbon/ silver technology
- Signal and data (bus, video): gold/ gold technology
- Radio-Frequency rotary joints DC to 94 GHz
- Encoder
- Fiber optical rotary joint
- Non-contacting data link up to 10 GBit/s **GigaCAP®**
- Media rotary joints for hydraulic, pneumatic, cooling/ heating media, gas up to 2000 l/ min

You find a cross section outlined on the next page!



Non-contacting Signal & Data Transmission | Printing Machines

Requirements for industrial applications concerning operational lifetime and data transmission rates (e.g. Fast-/GigaBit-Ethernet, Profinet) are higher than ever before.

Therefore SCHLEIFRING offers the adequate answer: Non-contacting power- and data transmission.

Without the general use of brushes running on metallic surfaces this system is almost free of maintenance at continuous high rotational speeds.

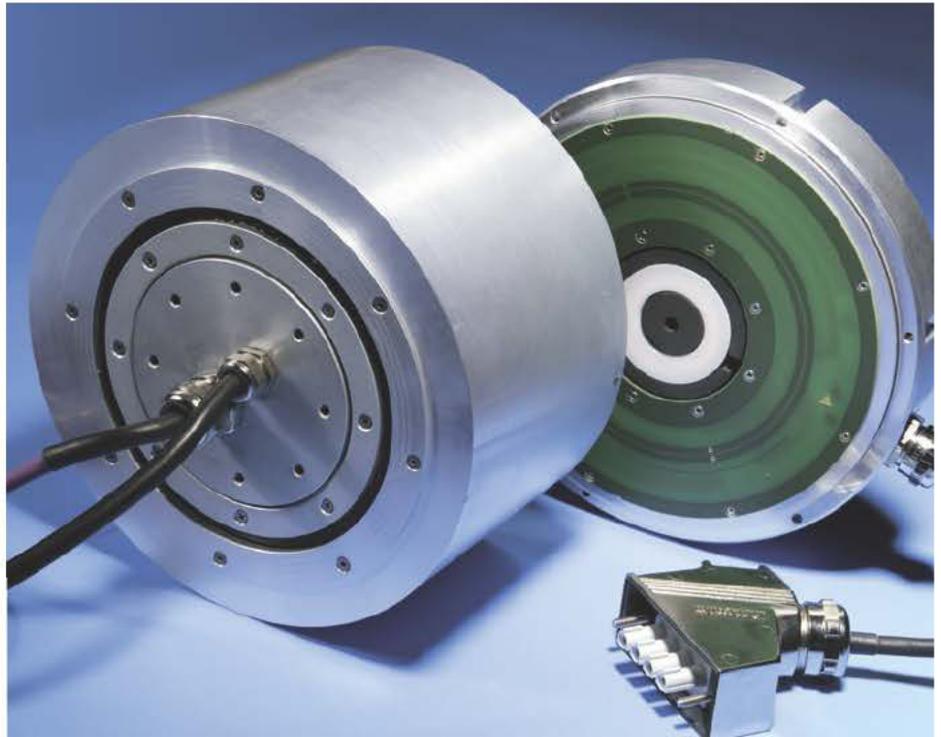
Functionality:

The power is inductively transmitted from stator to rotor by a rotationally symmetric transformer. Efficiency is over 95 % which means less than 5 % heat development.

Currently slip ring systems from 1 W to 10 kW are used for industrial applications; for medical applications systems of up to 200 kW.

Data transmission occurs capacitively in the near field.

Benefit: external interfering fields have no influence on bit error rates $< 10^{-12}$ at data rates of up to 10 GBit/s per channel (in parallel circuit > 40 GBit/s).



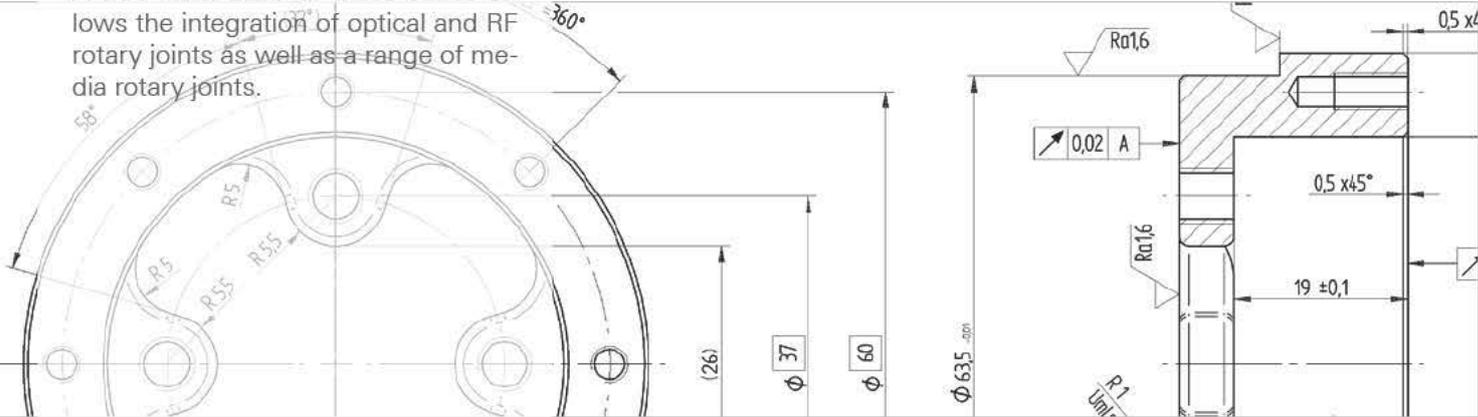
Slip Ring Units | Turntables

A standard of highest flexibility

The slip rings of the standard series G200, G300 and G400 offer by their modular design highest flexibility for the transmission of electrical power, signals, data of bus systems and video for many demanding rotating applications. An additional option range of optical and RF-rotary joints as well as media rotary joints for air, water and oil completes this series.

Modular design

Three basic units and 15 different modules allow millions of variations. The modules can be selected from a table and combined in many ways to meet your specific requirements. One slip ring system allows the transmission of up to 126 rings. The housing length of the slip ring is defined by the number and type of modules stacked. A free inner bore of these series allows the integration of optical and RF rotary joints as well as a range of media rotary joints.



Self-contained & Capsuled Systems | **Bottling Machines**



Systems for the pharma and food industry

Particularly designed for industrial control equipment in the pharmaceutical, chemical and food industry, SCHLEIFRING offers self-contained capsule slip ring solutions with stainless steel housing. All versions are resistant to water and dust ingress acc. (industrial protection class IP 65 EN 60529) and designed to operate in a temperature range of up to +70° C.

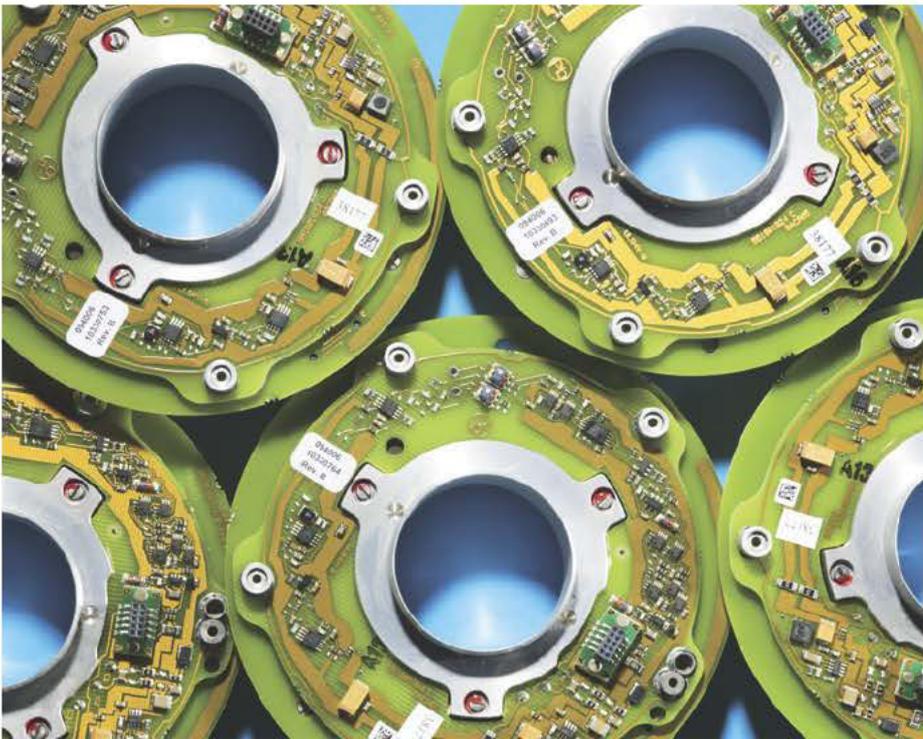
The gold wire technology guarantees excellent results in the transmission of power, data and common bus signal such as Profibus and Fast Ethernet. The electrical slip ring is optionally available with media rotary joint.

Just as diverse as the applications in the pharmaceutical and food industries are the requirements for the slip ring systems.

SCHLEIFRING's silver braid brush contact configuration guarantees best results in signal transmission, even at high rotational speeds.



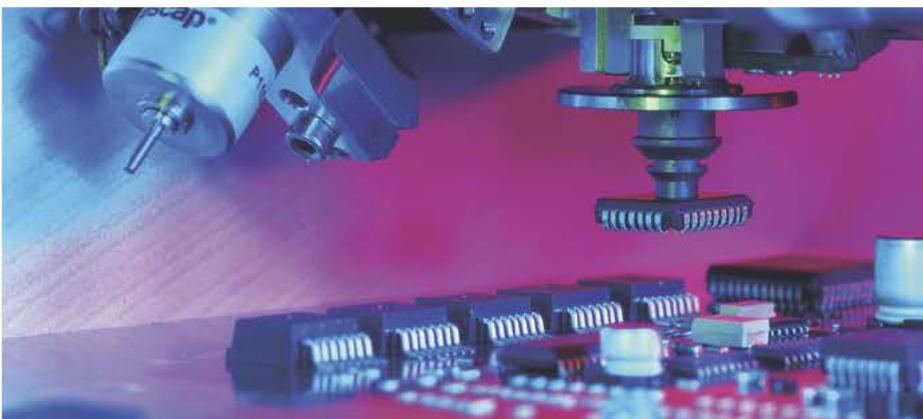
Compact PCB Slip Rings | **Pick & Place Machines**



SCHLEIFRING developed this compact and reliable PCB technology in close cooperation with the robotics and handling industry as well as for pick and place machines. Slip rings in this product group allow for a reliable transmission of electrical power, signals and data of all common bus systems in various demanding applications.

Modular systems

- Module and brush block integrated into customer-specific designs
- Systems with bearing
- Self-contained systems with aluminum housing
- **GigaCAP®** CAN bus



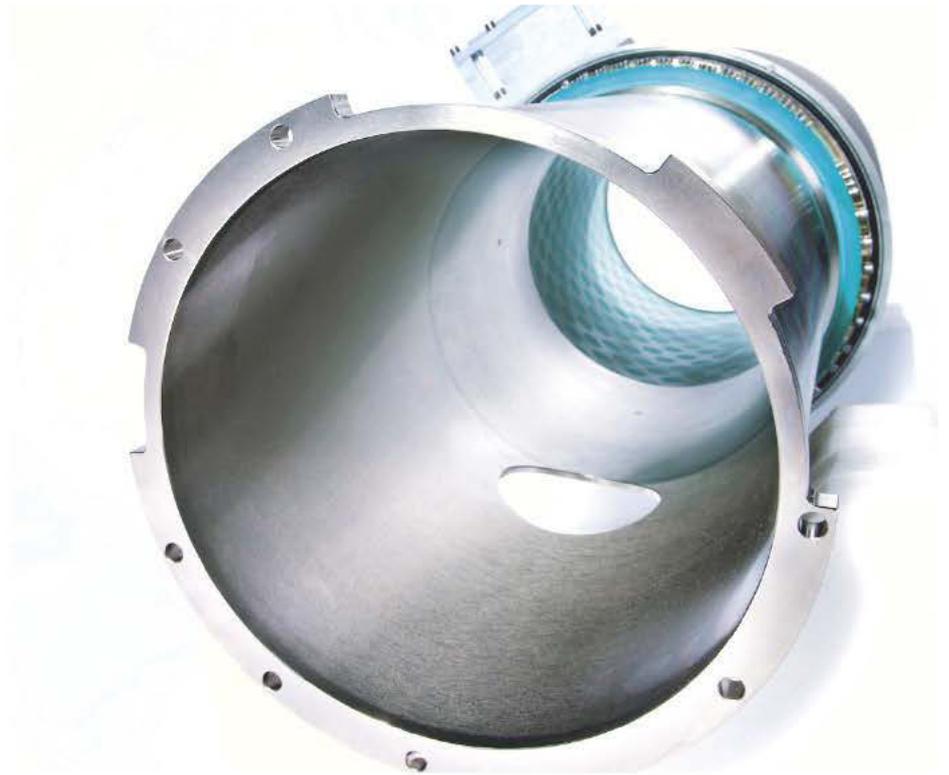
Special characteristics:

- Compact design
- High contact reliability due to multi-contact brushes
- Good cross talk isolation and low electrical noise
- Virtually no wear and long operating lifetime

Slip Ring Systems | Machine Tools

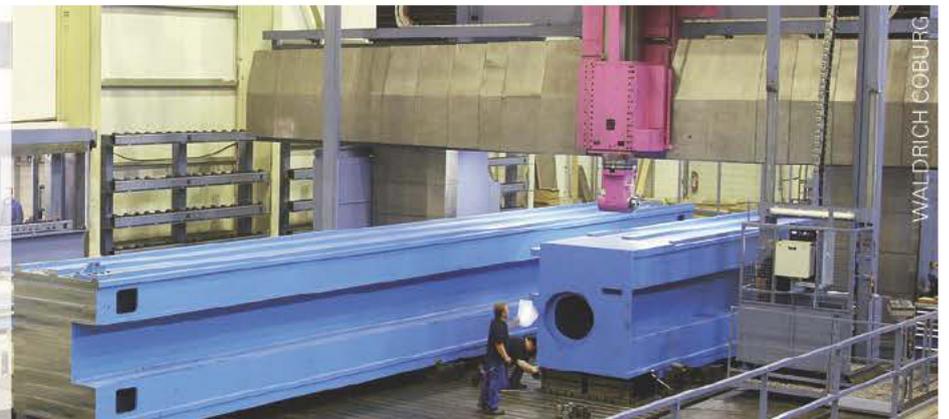
High currents for operating tools, sensor data for electronic positioning controls, integrated encoder systems, compact configuration, robust design – these are the critical characteristics of a slip ring for machine tools. Depending on the application, either pure gold-contact slip rings or hybrid solutions with graphite brushes can be used for power transmission.

The design of the slip rings is individually customized to the ever-increasing customers' requirements along with high protection class.



Modular configuration

- Very small space requirement for each transmission circuit
- Excellent contact reliability
- Good cross-talk attenuation
- Low electrical noise
- Long lifetime
- Rotor mounting flange
- Free inner bore

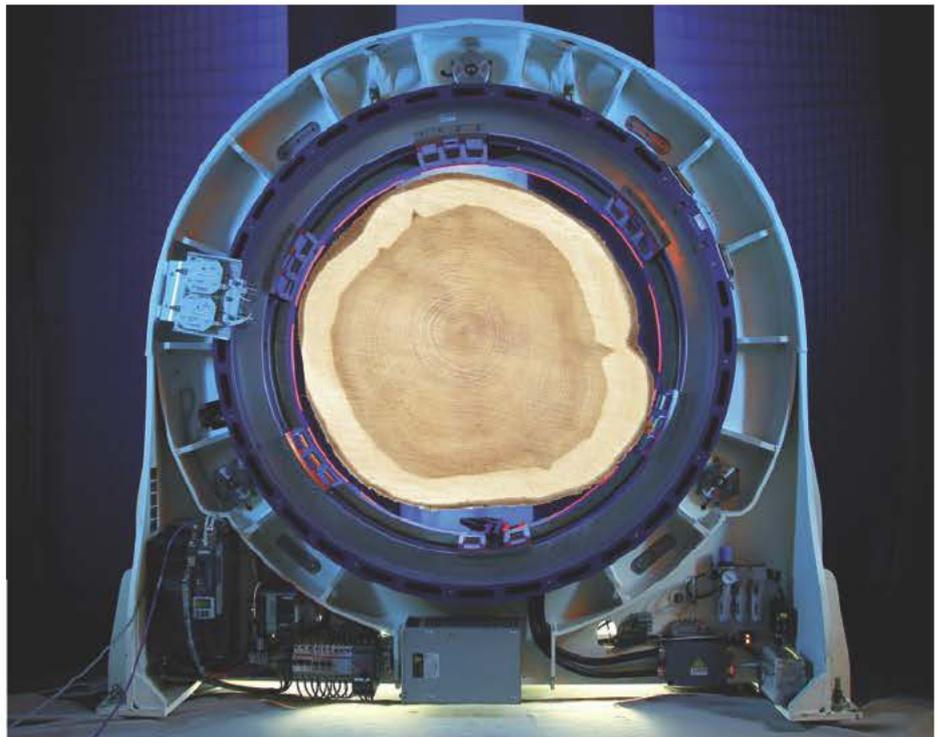


WALDRICH COBURG

Scanning Technology | **Commercial Sector**

SCHLEIFRING is market leader in the worldwide requirement for sophisticated rotary joints and slip ring systems for CT scanners. These rotary joints with free inner diameters of up to 2000 mm facilitate the supply of power for the X-ray tube, the transmission of all bus systems as well as the non-contacting transmission of digital image data of up to 10 GBit/s per transmission link.

The sophisticated manufacturing process includes research & development, design and production of transmitter and receiver electronics, the respective plastic casting and machining technology as well as demanding mechanical production from miniaturized techniques up to HSC 5-axis milling with diameters of up to 2 meters.

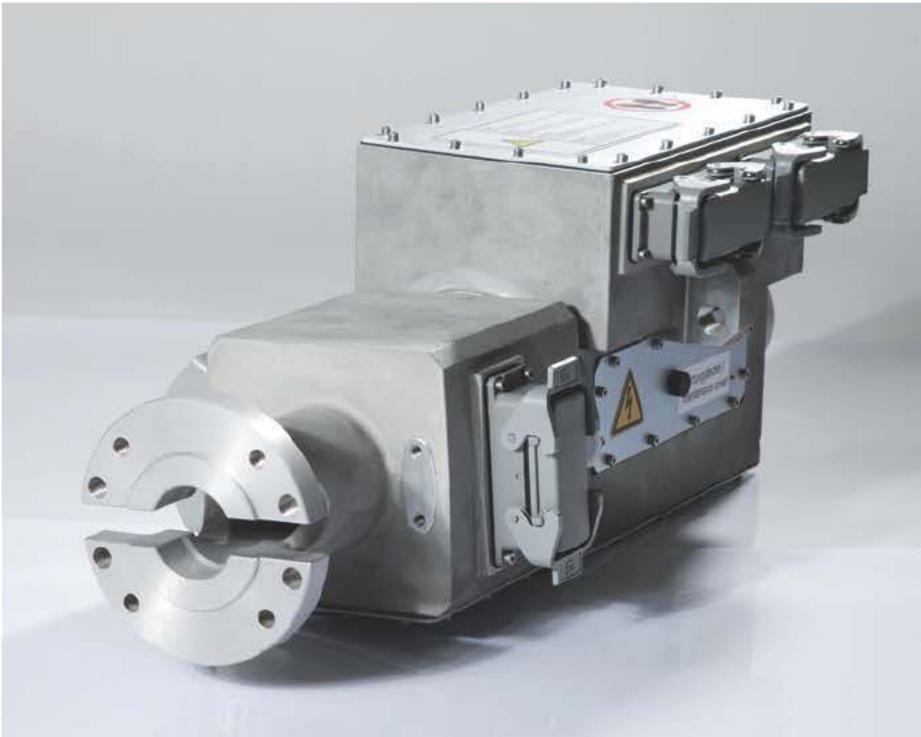


Slip ring systems for

- CT-Machines
- Contacting Power and Control Data
- Non-contacting high data rate transmission
- Integrated Encoder
- Gantry systems for Medical Machines



Renewable Energy | Pitch Control Slip Rings For Wind Turbines



SCHLEIFRING's pitch control slip rings provide reliable power, signal and data transmission under the harshest environmental conditions. Giant rotor blades reap the winds energy onshore and offshore. They supply millions of people with clean energy.

The worlds most successful OEMs and operators trust that SCHLEIFRING makes the most reliable and safest pitch control slip rings available. We help them to reduce operational costs therefore making wind energy cheaper and even more competitive.

SCHLEIFRING's pitch control slip rings are tailor-made designs for electrical and hydraulical pitch systems. They are a critical component of the overall system ensuring that the turbine is under control at anytime and, of course, combinable with each transmission technology mentioned on the pages before.



Underwater Applications | Naval & Offshore Systems

High voltage slip ring systems

Optical, electrical and signal slip rings are elements of a swivel stack system used for deep sea oil and gas production. They transmit power for oil pumps and valves located on the bottom of the sea as well as data for control systems.

Designed for extreme environmental conditions and long lifetime.

The complete swivels are tested up to IP68, certified for Ex d or Ex p and verified by BV, DNV, Lloyds or ABS.

Ex-proof fiber optical rotary joints

A compact 4 to 32 pass fiber optical rotary joint for single fibers in an Ex d certified stainless steel housing facilitates the transmission of electrical signals and data bus signals even under highly exacting use in offshore applications. The technical features –

passive, bidirectional and unaffected by EMI, EMP and ESD – allow for the transfer of data rates depending on the data fed into the system. An integrated connector box allows access to customized reinforced cables and connection with the fiber optical rotary joint by FC/SC connectors.



Industrial Applications



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