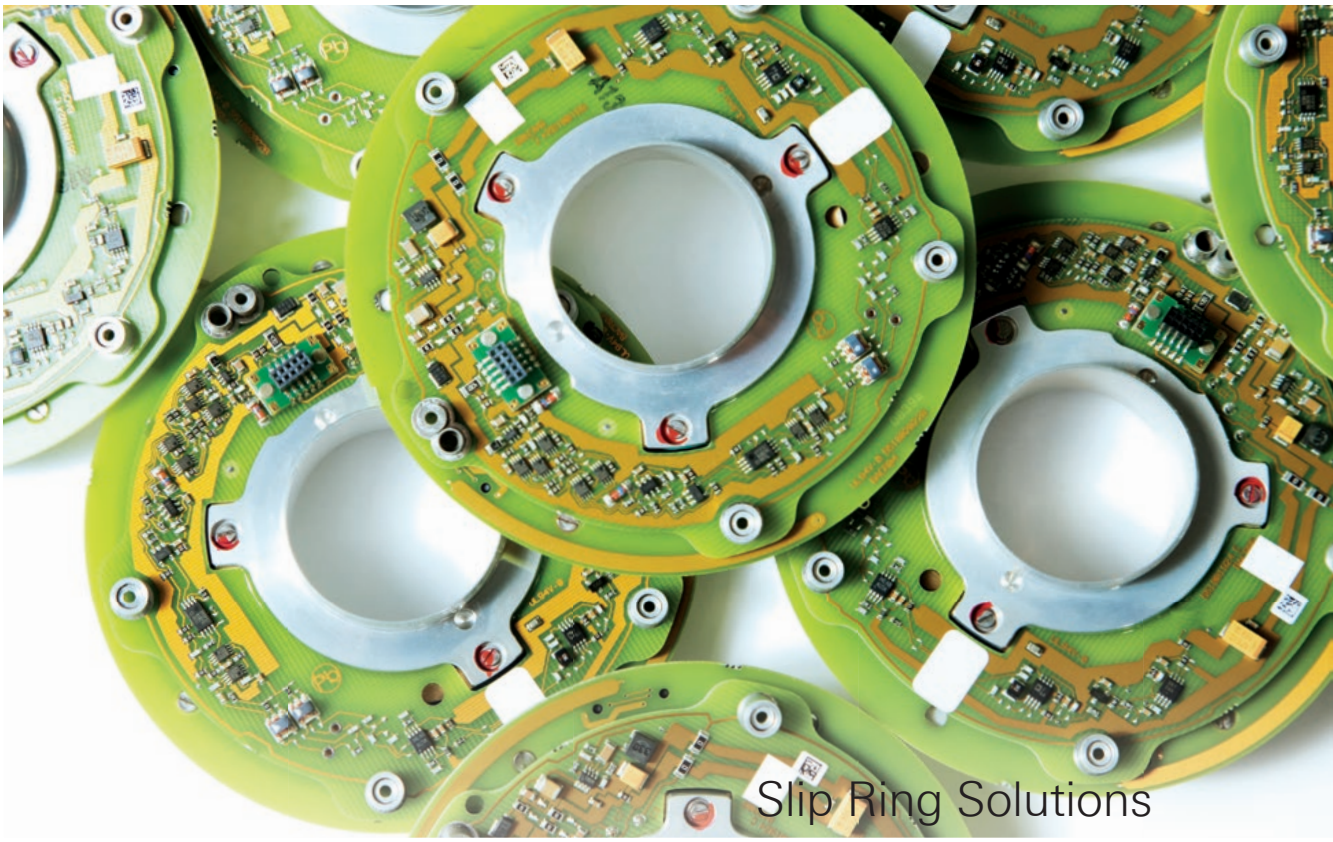
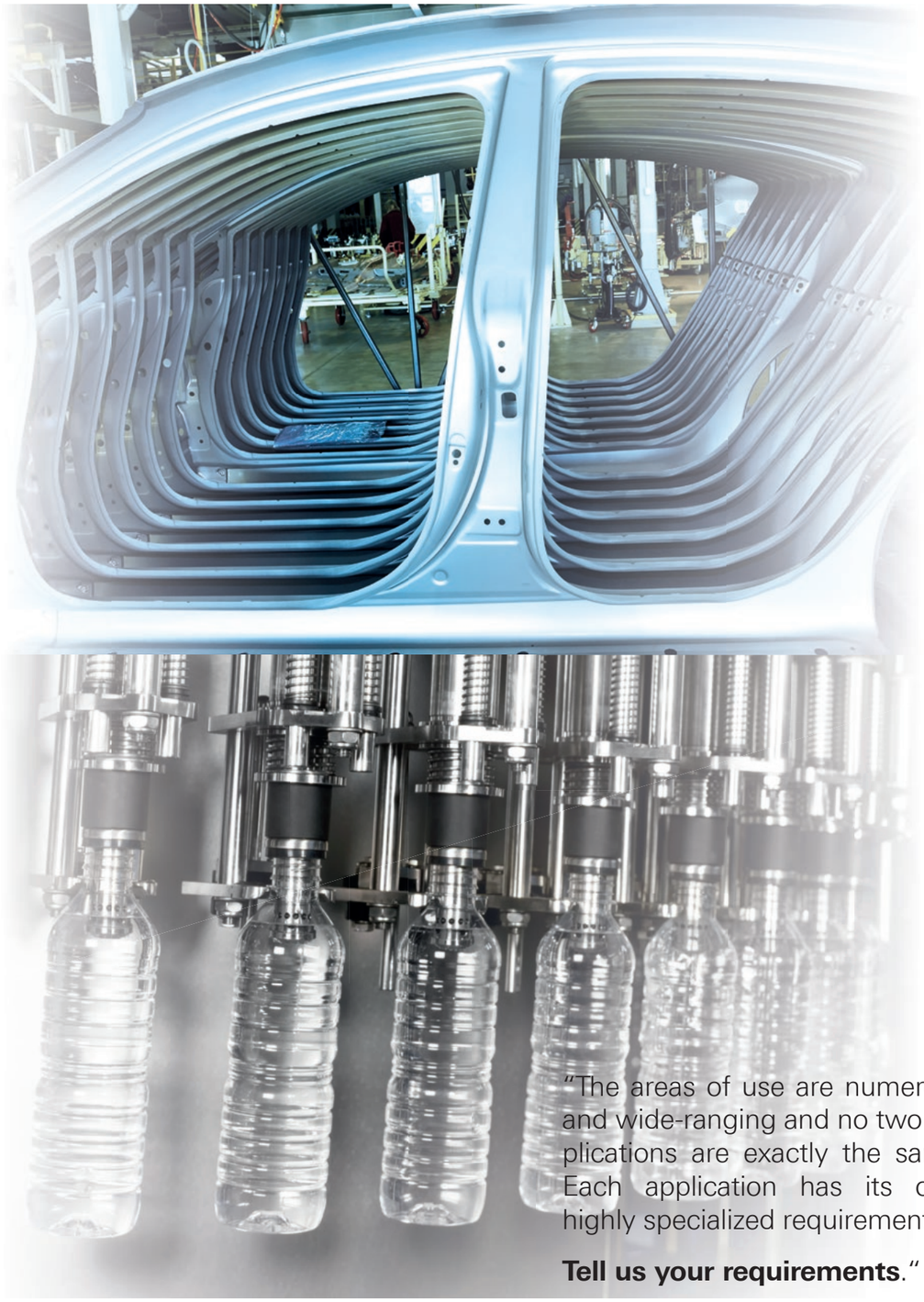
SCHLEIFRING



Slip Ring Solutions

Industrial Applications

Contents



"The areas of use are numerous and wide-ranging and no two applications are exactly the same. Each application has its own highly specialized requirements.

Tell us your requirements."

About SCHLEIFRING

Company Name

Slip rings are our business. That is why we called our company SCHLEIFRING. This is the German word for slip ring.

Foundation

1974

Company Philosophy

This is what we stand for:

- highly innovation-based products
- sustainable quality
- fair competition

Certified Management System

We fulfill the requirements of DIN EN ISO 9001:2008

Employees

More than 650 and we are growing steadily.

Patents

More than 230 in the last ten years. And the number is still increasing.

Research & Development

More than 15% of our employees work in R&D in 9 different laboratories.

Corporate Video

Learn about all our miscellaneous applications in our corporate video and experience our technologies.

Worldwide Network

SCHLEIFRING GmbH, Germany

Headquarters and plant — Fuerstenfeldbruck, Germany
Production plant — Kaufbeuren, Germany
XRing Technologies GmbH — Fuerstenfeldbruck, Germany

SCHLEIFRING Group worldwide

Schleifring North America, LLC — Chelmsford, MA, USA
Schleifring Medical Systems, LLC — Elgin, IL, USA
Schleifring Systems Ltd. — Newbury, UK
Schleifring Transmission Technology (Tianjin) Co. Ltd. — Tianjin, China

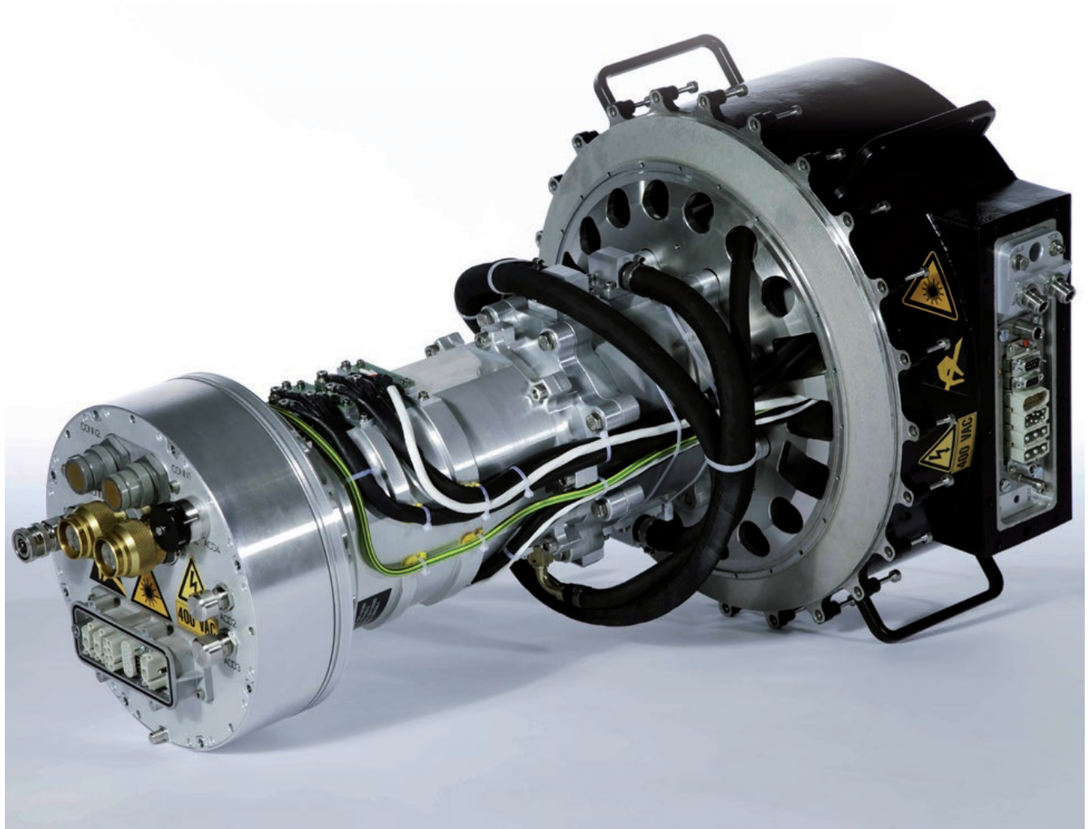
Slip Ring Systems Combining a Multitude of Transmission Technologies

The range of applications for our products covers standard designs for simple tasks up to highly complex customer-specific systems often involving several hundred rings.
Hybrid slip ring units combine various transmission technologies to transmit electrical power, signals, data BUS, 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.

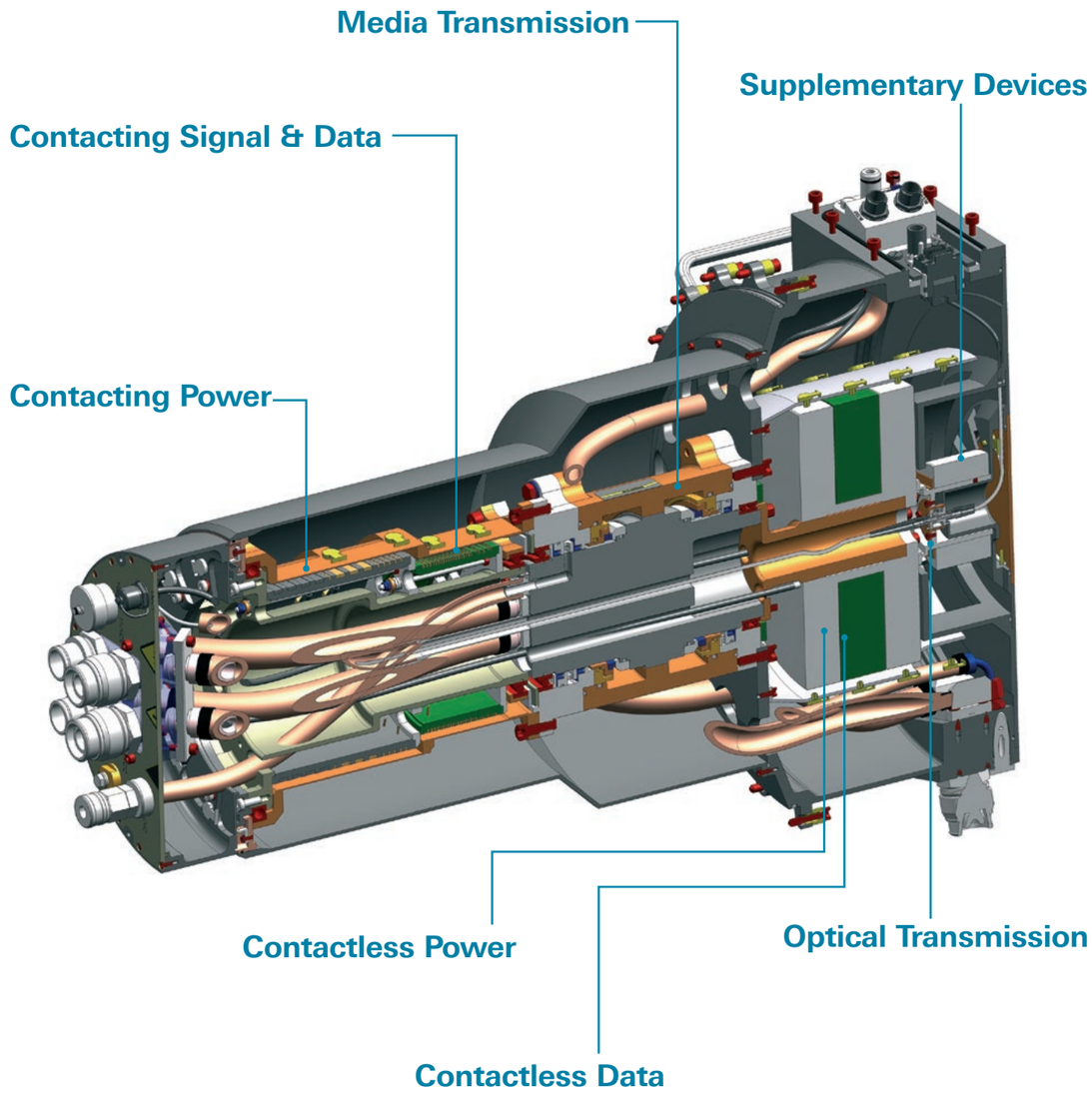
The Product Shown Contains:

- Power up to 5,000 V/ 1,000 A carbon/silver technology
- Signal and data (BUS, video): gold/gold technology
- Radio frequency rotary joints up to 94 GHz
- Encoder
- Fiber-optic rotary joint
- Contactless data link up to 10 Gbit/s: **GigaCAP**
- Media rotary joints for hydraulic, pneumatic, cooling/ heating media, gas up to 2,000 l/min

A cross section of this product is shown on the next page!



Design Engineering
Hybrid Units



Transmission Technologies
Contactless Transmission | Capacitive Data Link GigaCAP

The application of industrial standard protocols is in high demand. Communication standards such as Gigabit Ethernet or Fiber Channel are supported and allow for data rates up to 10 Gbit/s.

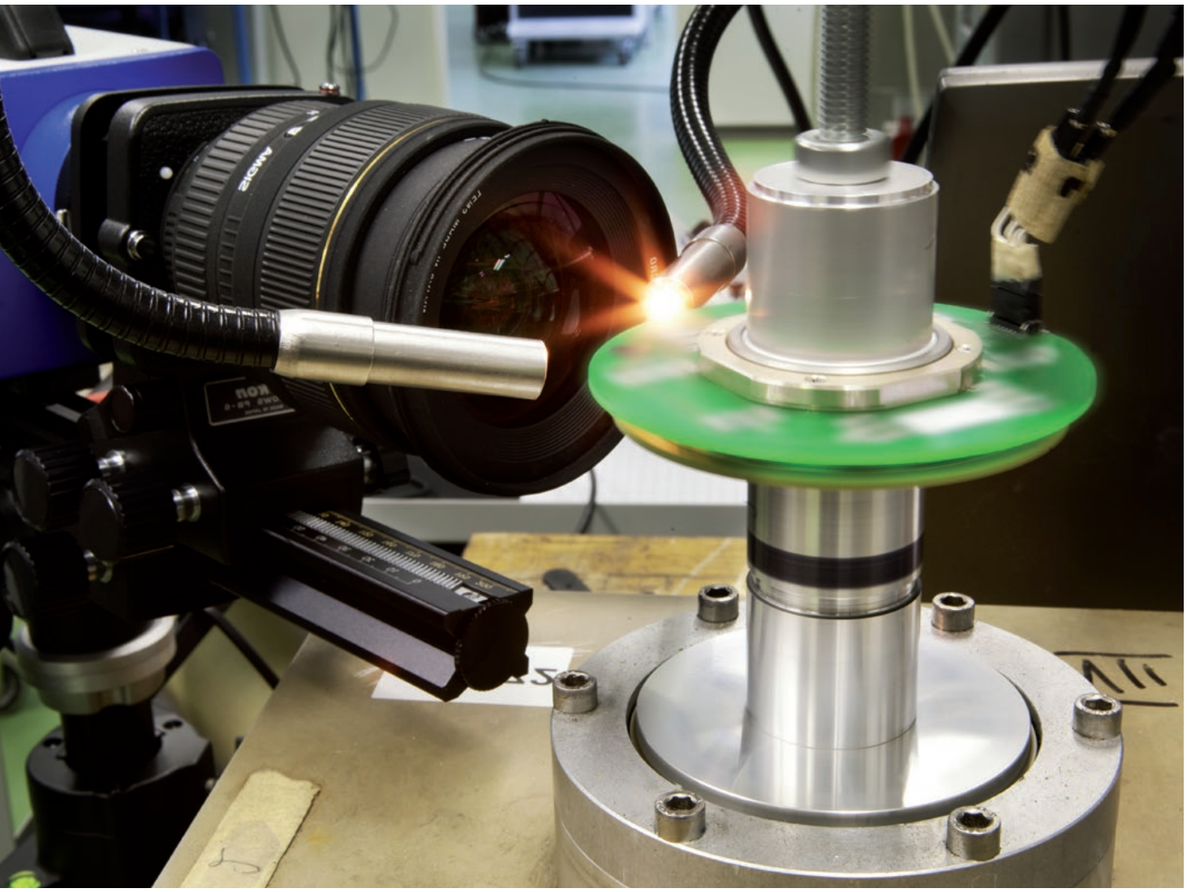
Thus, the system integration of the data channels is simplified, as components from the IT marketplace can be used. The modular design allows the system to be quickly and easily adapted to customer-specific applications.

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 $< 10^{-12}$.

- Common data links
- Unidirectional or bidirectional
- Diameter: 80 to 1500 mm
- Data speed up to 10 Gbit
- Rotational speed: only limited by mechanical restrictions



Transmission Technologies
Contactless Transmission | Inductive Power

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

SCHLEIFRING's worldwide-patented technology for inductive, contactless power transmission allows voltages of 24 V up to 400 V within a range of 10 W to 125 KW. Especially in applications with high rotational speeds, our contactless slip rings ensure a long, wear-free service life, which cannot be achieved with a contacting transmission system.

This new compact hybrid unit combines contactless power and signal transmission, allowing temperature monitoring of rollers in foil processing machines for instance.

- Power range of 10 W to 125 KW
- High rotational speeds
- Combination with contactless data transmission
- Power loss < 3%

Contactless power and signal transmission provides a wide range of options for industrial innovations.

Classic Applications

- Cleanroom applications
- Vacuum technology
- Semiconductor industry
- Printing machines
- Balancing machines
- Pick-and-place machines
- Packaging lines
- Plastic processing machines
- Bottling machines

Transmission Technologies
Contacting Transmission | Power Transmission

Our slip rings provide the dynamic electrical connection between static and rotating mechanical elements. They operate as rotary interfaces, continually transferring electrical power in any direction.

Slip Rings are Produced in Various Types and Sizes Depending on:

- Electrical requirements
- Mechanical property requirements
- Operating environment
- Customer needs

From Low to High Power

SCHLEIFRING's silver braid brushes or silver-graphite brushes on silver rings provide for optimum power transmission.

Depending on the technical requirements, they allow excellent transmission of low power up to and above 1,000 A at high rotational speeds and with a long service life.

Carbon brushes for high-power applications and long service life without maintenance.

Carbon brush-based slip rings are produced in various types and sizes depending on:

- Operating environment
- High speed
- Current
- Voltage
- No lubrication

Transmission Technologies
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 is therefore a key factor for 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 counter the physical limitations.

Sensitive Data and Digital Signals e.g. piezoelectric or strain gauge signals

SCHLEIFRING's gold-wire technology allow for excellent signal and data transmission:

- Low electrical noise
- Low contact resistance
- Long operational life
- High contact reliability
- Transmission of all common bus systems

Transmission Technologies
Optical Transmission | Fiber-Optic Rotary Joints

Optical fibers transmit high data rates reliably over long distances. SCHLEIFRING offers fiber-optic rotary joints to provide a direct link to optical fibers.
FORJs passively transmit any kind of digital or analog optical signals independent of the data protocol.

Highlights:

- Unlimited data rates
- Unaffected by EMI
- Temperature range: -40 °C to 85 °C
- Single-, dual- and multi-channels up to 60 channels
- Single-mode and multi-mode
- Low insertion loss

Classic Applications:

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

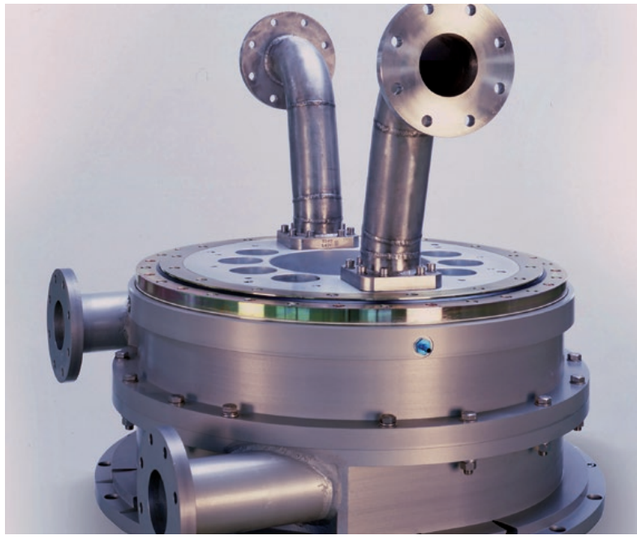
Transmission Technologies
Contacting Transmission | Media Rotary Joints

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

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

Whether our customer needs specific solutions for high pressures, high speeds or high flow rates, SCHLEIFRING provides the highest-quality systems for optimum service lives.

- Transmission of fluids (Water, oil, cooling fluids) and gas
- High pressure, high speed, high flow rates
- Media rotary joints integrated with slip rings assemblies



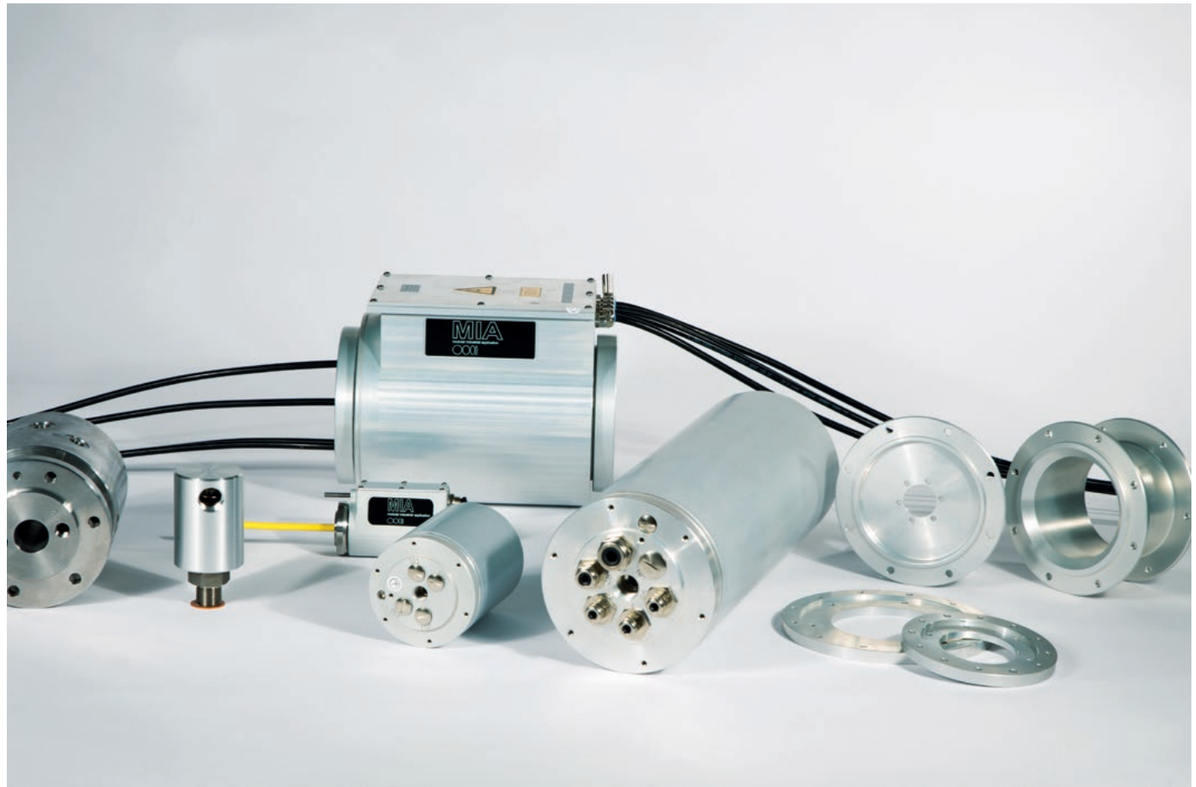
Our Standards
MIA | Modular Industrial Application

- MIA stand for the combination of individual solutions with the advantages of standard slip rings
- 100 Million different combinations of power, signal, data links, media and optic rotary joints
- Extreme short delivery time (10 working days) due to standardized interfaces
- Make your own slip ring using our web-based configurator

MIA MIA

modular industrial application

Fiber Optics



Our Standards
GigaPLUG

The Contactless Connector

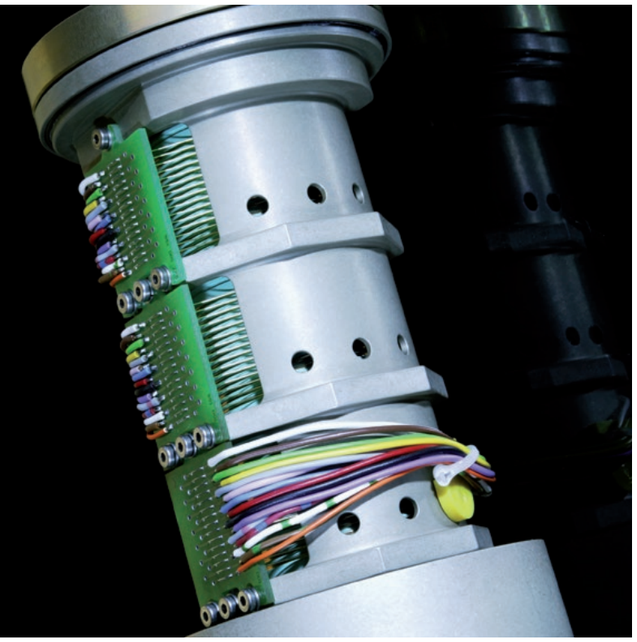
The GigaCap technology is based on a contactless, capacitive electronic transmission technology.

Your benefit: it is non-contacting and thus guarantees wear-free operation over an almost unlimited period of time! Data based on Ethernet is converted and transmitted over an air gap without losses. Using identical elements on both sides, the signal is converted back without loss. As this patented connector works in both directions, it can be used in all Ethernet-based systems. Integrated software recognises which Ethernet connection is being utilized and acts accordingly (autonegotiation).

- Ethernet-based data links
- Power over Ethernet
- M12 Cat6 connector
- Air gap, angular and axial misalignment
- Protection class IP 65
- Housing Ø 40 x 100 mm, SS 316
- No mechanical wear, no maintenance
- Realtime capability
- Vibration/ shock resistant
- Suitable for harsh environments
- Easy integration (customized solutions)
- Unlimited plug-in cycles without wearing

GigaPLUG

Design Engineering
Specific Housings



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

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

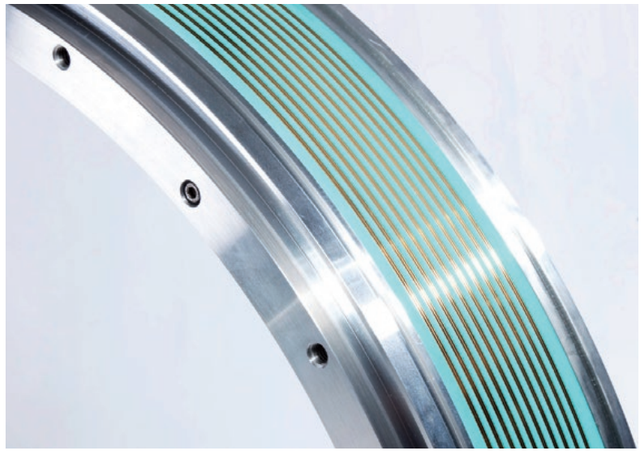
Cylindrical Housings

- Aluminum, coated steel or stainless steel
- Material durability tested even in very aggressive environments

Design Engineering
Specific Housings

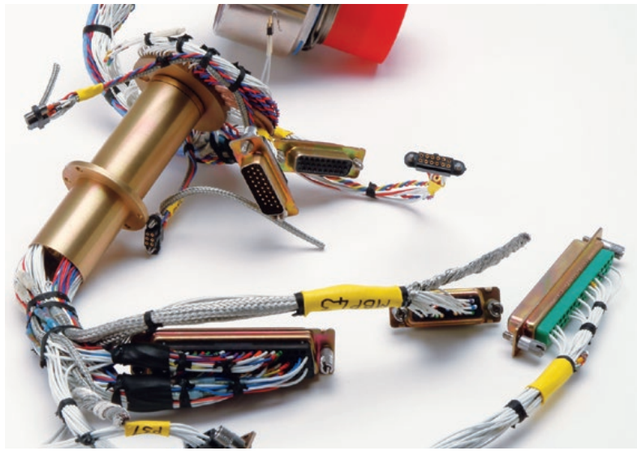
Free Inner Bore

Specific applications require slip rings with a large free inner bore.
SCHLEIFRING designs meet these high demands, offering free inner bores ranging from 6 mm up to 1,000 mm.



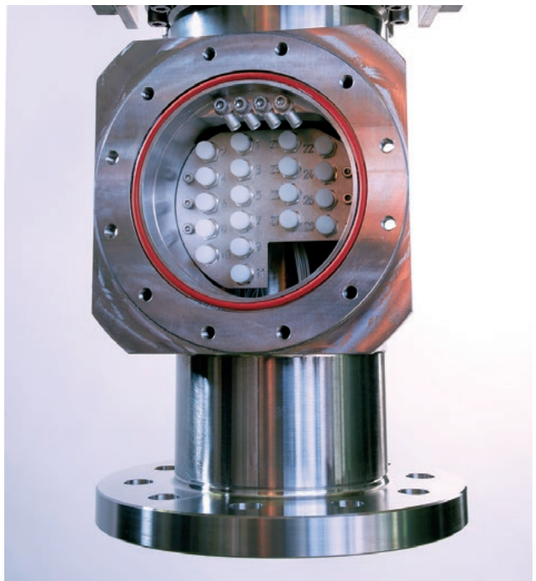
Compact Design

Even at high rotational speeds resilient miniature slip rings are the ideal solution for signal transmission whenever space is tight and/or weight is a limiting factor. These slip rings require no maintenance during their nominal service life.



Explosion-Proof

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



Industrial Applications
Printing & Converting Machines

The requirements for industrial applications with regard to service life and data transmission rates (e.g. Fast / GigaBit Ethernet, Profinet) are higher than ever before.

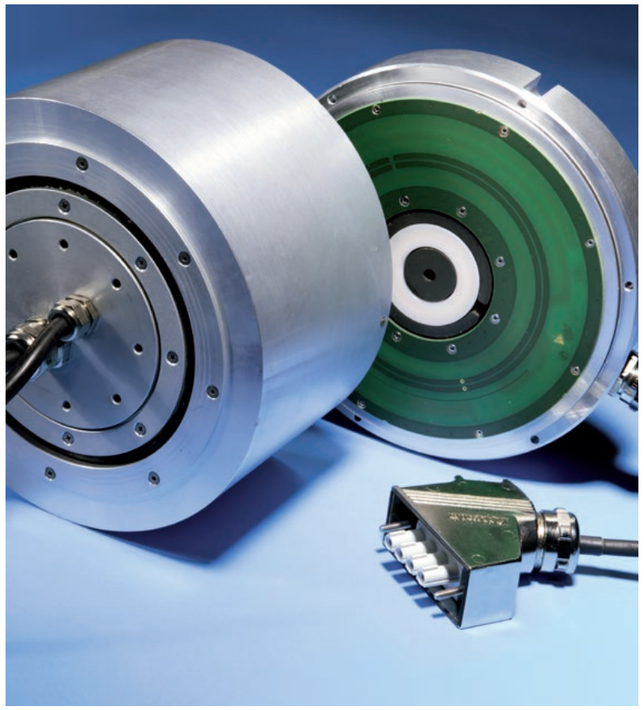
For this reason, SCHLEIFRING offers the ideal solution: contactless power and data transmission.

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

Functionality:

The power is transmitted inductively from the stator to the rotor by a rotationally symmetric transformer. The resulting efficiency is over 95 %, meaning that the heat development is less than 5 %.
Currently, slip ring systems from 10 W to 100 KW are used for industrial applications.
Data transmission occurs capacitively in the near field.

Advantages: external interference fields have no influence on bit error rates < 10^{-12} at data rates of up to 10 Gbit/s per channel.



Industrial Applications
Food & Beverage

Systems for the Pharmaceutical and Food Processing Industries

Designed especially for industrial control equipment in the pharmaceutical, chemical and food processing industries, SCHLEIFRING offers self-contained capsule slip ring solutions with stainless steel housings. All versions are resistant to water and dust ingress (industrial protection class IP65 according to EN 60529) and designed to operate at temperatures up to +70 °C.

The gold-wire technology guarantees excellent results with regard to the transmission of power, data and common BUS signals such as Profibus and Fast Ethernet. The electrical slip ring is optionally available with a media rotary joint.

The requirements on the slip ring systems are as varied as the applications in the pharmaceutical and food processing industries themselves.

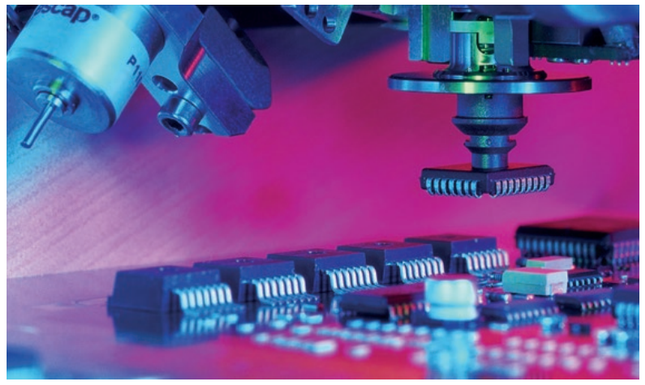
SCHLEIFRING's silver braid brush contact configuration guarantees the best signal transmission results even at high rotational speeds.

Industrial Applications
Automation & Robotic Slip Rings

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

Modular Systems

- Module and brush block integrated into customer-specific designs
- Systems with bearings
- Self-contained systems with aluminum housings
- **GigaCAP** CAN BUS



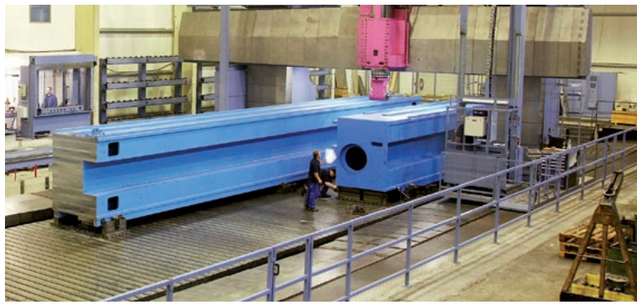
Special Characteristics:

- Compact design
- High contact reliability due to multi-contact brushes
- Good crosstalk isolation and low electrical noise
- Virtually wear-free with a long service life

Industrial Applications
Tooling & Laser Machines

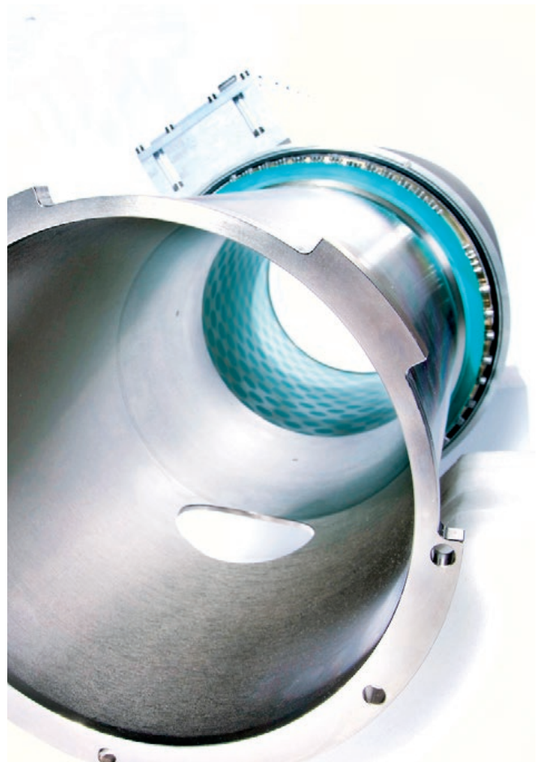
Transmission of high currents for operating tools, transmission of sensor data for electronic position controls, integrated encoder systems, compact and robust design – these are the most important characteristics of a slip ring for use in machine tools. Depending on the application, either gold-on-gold contacting slip rings or hybrid solutions with graphite brushes can be used for power transmission.

The slip ring is individually customized according to the ever-increasing customer requirements and the need for high protection class ratings.



Modular Configuration

- Very low space requirement for each transmission circuit
- Excellent contact reliability
- Good crosstalk and attenuation
- Low electrical noise
- Long service life
- Rotor mounting flange
- Free inner bore



Industrial Applications
Aerospace

A compact slip ring design for harsh environmental conditions in the aerospace industry

- High reliability
- Compact design
- Low torque
- Extreme temperature range
- Lightning protection available
- Vacuum-capable
- Shock resistance

Industrial Applications
Naval & Offshore Systems

Ex-Proof Fiber-Optic Rotary Joints

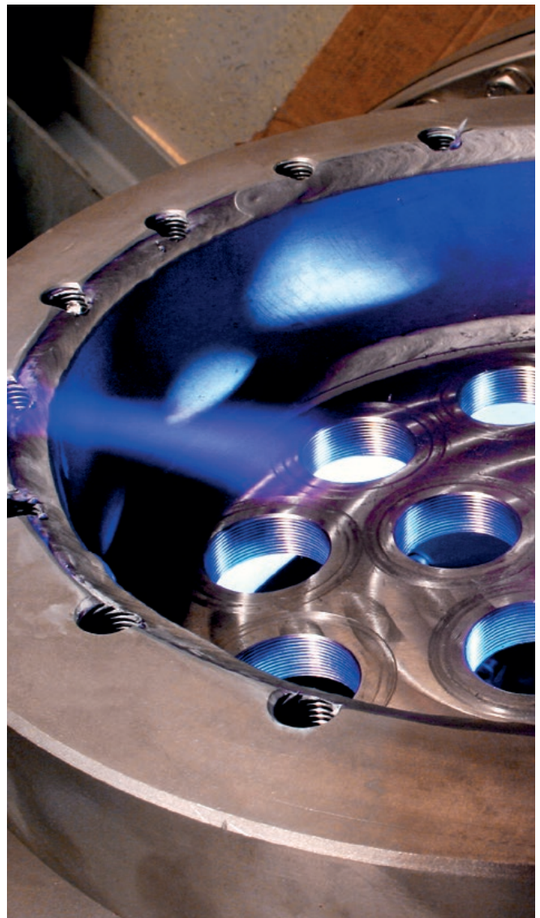
A compact 4- to 60-channel fiber-optic rotary joint for single fibers in an Ex d-certified stainless steel housing allows the transmission of data BUS signals even under highly exacting use in offshore applications. The technical features – passive, bidirectional and unaffected by EMI, EMP and ESD – allow for the transfer of data rates relative to the data fed into the system. An integrated connector box enables customized reinforced cables to be accessed and fiber-optic rotary joints to be connected via optical connectors.

Low-Voltage Slip Ring Systems

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

Designed for extreme environmental conditions and long service lives.

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



Life Cycle Management

Development Support

We offer our customers expert advice and services on all questions concerning products and development. In doing so, we can provide customized prototyping and product qualification.

Documentation

We offer precise documentation of all important development steps, control of all documents and certificates as well as manuals for installation and maintenance to guarantee a trouble-free service life.

On-Site Repair

Of course, our service engineers have the necessary training for the job, having, for example, offshore certification to BOSIET, HUET and EBS, allowing them to reach remote sites by helicopter.

Spare Parts Supply

Quality, delivery and cost efficiency drives our process in production as well as after-sales.

Product Recycling

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

Repair & Modernization

Proficient technical support and maintenance over the entire service life ensure that your slip rings always run on state-of-the-art technology.

We constantly monitor all necessary processes and provide maintenance and support according to MIL standards.

Would you like to know more?

Our new solutions and cutting-edge technology will keep your world turning. So have a look at our specialized brochures covering a wide range of other applications at:

https://www.schleifring.de/downloads

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