

Fiber Optic Rotary Joints

Technical brochure



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About SCHLEIFRING

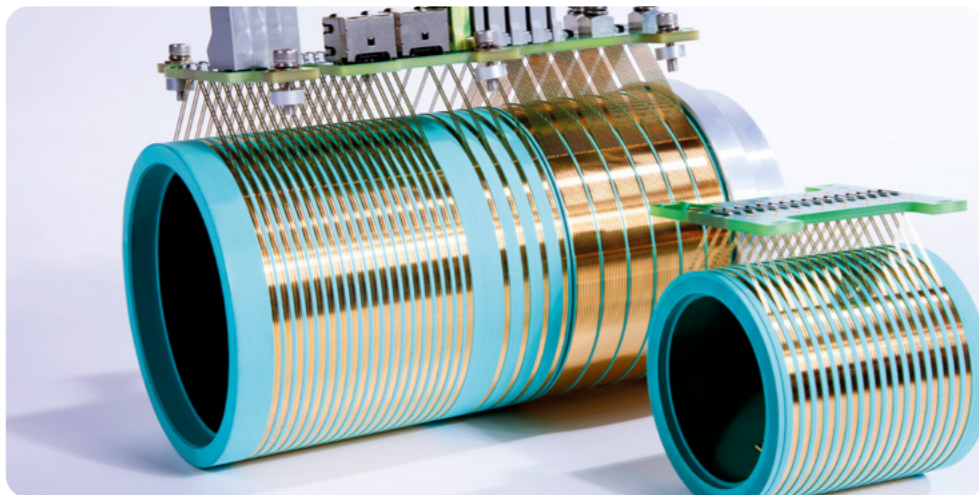
More than 3,000 customers rely on SCHLEIFRING solutions. Our customers are specialists in complex technical products in the defense sector, the energy and automation industries as well as the medical sector.



With over 50 years of experience and a global network in over 50 countries, SCHLEIFRING is a trusted long-term partner and key supplier to the world's leading system integrators.

Our slip rings enable seamless integration and top performance across a wide range of demanding and critical applications such as wind energy, medical, robotics, industrial and defense.

For decades, our high-performance solutions have ensured precise and reliable transmission of power, data and fluid in advanced systems.



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With our global footprint, we offer state-of-the-art manufacturing for our slip ring solutions in all our production sites. This enables us to serve our customers wherever it is required.

Fiber Optic Rotary Joints portfolio

SCHLEIFRING Fiber Optic Rotary Joints (FORJs) are built to perform in the most demanding environments. Our FORJs meet the highest standards for durability, signal integrity, and reliability, whether deployed in aerospace, defense, industrial automation or medical systems.

Enabling high-speed data transmission across rotating interfaces, FORJs are fully passive optical systems – requiring no power, generating no heat and remaining immune to electromagnetic interference (EMI) regardless of fiber length. They transmit all types of digital or analog optical signals irrespective of the data protocol used.

Technical Highlights:

- Operating temperature range: -55 °C to 85 °C
- Capacity: Up to 60 fibers
- Durability: Long service life via contactless technology

Established Use Cases:

- Defense & Aerospace: Ground and marine radar systems, Unmanned Aerial Vehicles (UAVs)
- Industrial: Offshore industry and mining

Hybrid & Stand-alone Solutions:

For more comprehensive rotary interfaces, we offer hybrid slip rings. These assemblies combine an electrical slip ring with a FORJ, allowing power and optical signals to be transferred through a single joint.



**Multi-channel
Ø12.5 mm**

A compact multi-channel solution designed to fit seamlessly into space-constrained systems. Versatile and reliable, wherever integration demands are high.

- Compact multi-channel platform for tight integrations
- Highly versatile across a wide range of applications



**Multi-channel
Ø28 mm**

Purpose-built for applications that need more optical channels than a compact FORJ can offer, without the footprint of a full-size FORJ. A precise fit in the middle of the performance range.

- Fills the gap between compact and full-size designs
- Balanced channel density in a space-efficient housing



**Multi-channel
Ø60 mm**

The adaptable backbone of complex rotating systems, available in a wide range of channel configurations. A robust, high-capacity design built to match your exact application requirements.

- Wide range of channel configurations available
- High-capacity design for complex rotating systems



**Multi-channel
Ø60 mm low IL**

Pushing the boundaries of multi-channel optical performance. Insertion loss values once reserved for single-channel designs – now available at scale.

- Lowest insertion loss in the multi-channel lineup
- Maximum insertion loss < 2 dB
- Best suited for demanding applications such as radar systems



Single-channel

Engineered for applications where every fraction of signal loss counts. The reference standard for optical rotary joints.

- Reference-class insertion loss performance
- Optimized for precision-critical applications
- The benchmark in single-channel optical transmission

Optical system parameters

The efficiency of an optical system is governed by specific physical constraints, primarily attenuation and dispersion. While these factors define the theoretical power budget of the system, the actual performance depends on the quality and consistency of the integrated components.

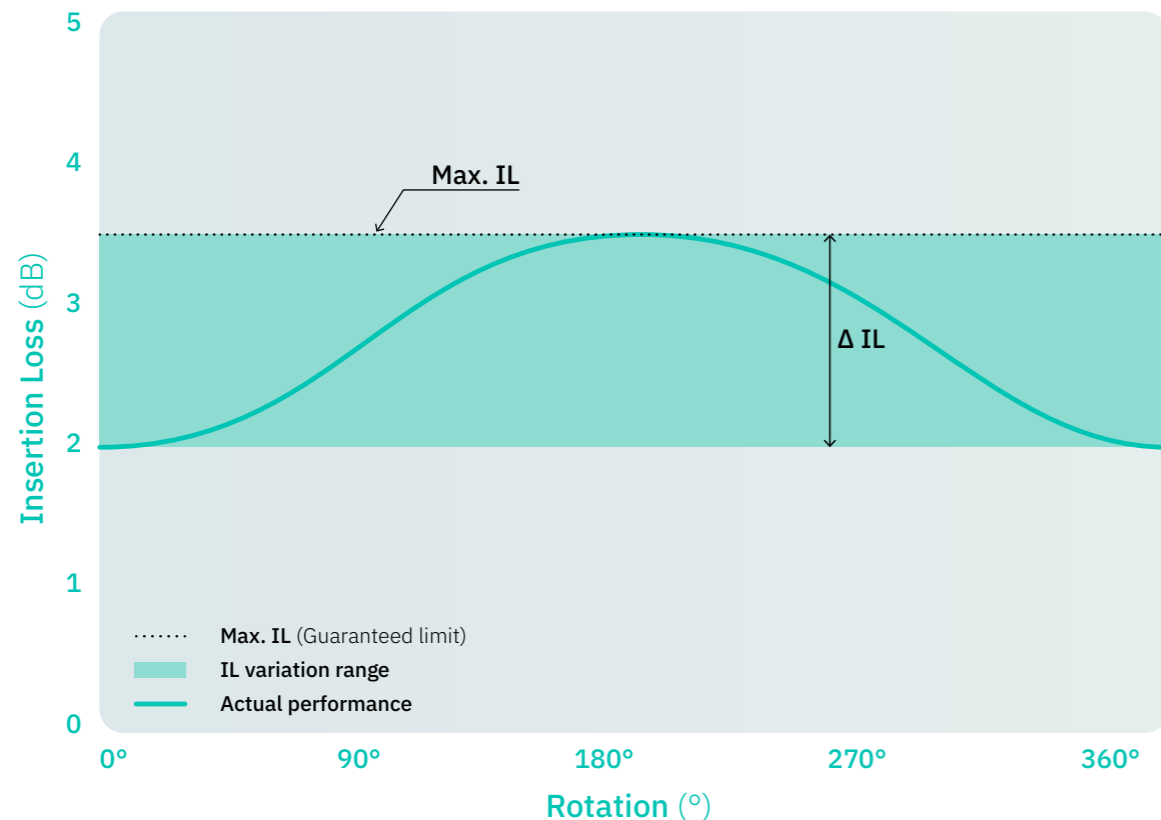
In system design, managing the precise power loss at each connection is essential. We therefore characterize our products based on two definitive metrics: Maximum insertion loss (Max IL) and IL variation (Δ IL).

Defining the performance limit:

Reliable power budgeting requires a clear understanding of the upper limits of signal loss. Unlike “typical” values, which can lead to calculation errors, the maximum insertion loss serves as a guaranteed boundary.

- **Fixed threshold:** The maximum insertion loss is the definitive limit. All signal activity remains below this threshold, ensuring the system’s power requirements are consistently met.
- **Controlled Variation:** The IL variation represents the fluctuations during rotation. Our engineering ensures these fluctuations are tightly managed and always stay within the verified safety margin.
- **Predictable performance:** By specifying the peak values rather than averages, we provide the transparency necessary for precise and secure system architecture.

Maximum Insertion Loss (max. IL) & IL variation (Δ IL)



Different fiber types



Single-mode (SM) fiber:

A small-core optical fiber limits the light to only one mode of propagation. The typical core diameter is 9 microns. SM fibers are the best choice for long-haul links and high data rates >10 Gbit/s. The standard wavelengths are 1310 nm and 1550 nm. SM fibers offer optimum signal quality.

Multimode (MM) fiber:

Due to its large core, this type of optical fiber allows the transmission of light using different parts (multiple modes) along the link. The high number of modes limits the maximum link length at high data rates. Typical core diameters are 50 or 62.5 microns. MM fibers are commonly used for short-haul links at data rates up to 10 Gbit/s. Typical wavelengths are 850 nm or 1310 nm.

Single-channel FORJ

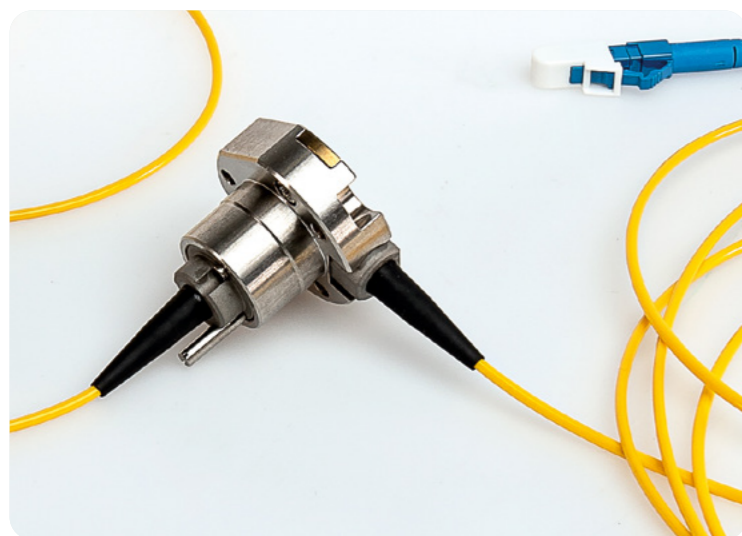
Uncompromising signal integrity in a single channel

When only the best optical performance will do, the single-channel FORJ sets the benchmark. Designed for applications where insertion loss is mission-critical, this FORJ delivers exceptional signal quality across continuous 360° rotation – with no interruption, no degradation.

Its single-channel architecture allows for an optimized optical path, achieving insertion loss values that multi-channel designs simply cannot match. Whether integrated into precision instrumentation, medical imaging systems, or high-speed sensing platforms, the single-channel FORJ is the reference-class solution for demanding environments.

Key Benefits:

- Best-in-class insertion loss performance
- Single-mode (SM) & multimode (MM) versions available
- Ideal where optical signal quality is non-negotiable
- Available as 90° L-style



Single-channel FORJ 90° L-style



Single-channel FORJ 180°

Technical data single-channel FORJ

	1-CH - SM	1-CH - MM
Interface		
No. of optical channels	1	1
Fiber type	ITU-T G.657.A1 (Single-Mode E9/125µm)	ISO/IEC 11801 OM4 (Multi-Mode G50/125µm) ISO/IEC 11801 OM1 (Multi-Mode G62.5/125µm)
Jacket	900µm buffered fiber	900µm buffered fiber
Weight	~ 70 g	~ 70 g
Diameter	20 mm	20 mm
Length	73 mm	73 mm
Optical characteristics		
Wavelength range	1260 nm ... 1625 nm	820 nm ... 880 nm & 1280 ... 1350 nm
Wavelength used for specification	1310 nm & 1550 nm	850 nm
Max. insertion loss	< 1.5 dB	< 2.0 dB
Max. insertion loss variation (during rotation)	< 0.5 dB	< 0.5 dB
Min. return loss	> 40 dB	> 27 dB
Max. optical power handling (up to)	27 dbm / 500 mW	27 dbm / 500 mW
Mechanical characteristics		
Max. rotational speed	500 rpm	
Service life	200 million revolutions	
Environmental characteristics		
Temperature range operation	-40°C ... +85°C	
Temperature range storage	-40°C ... +85°C	
Max. temperature gradient	2°C / min	
Humidity (non-condensing)	MIL-STD-810E	
Shock	MIL-STD-202G	
Vibration	MIL-STD-810F	
Protection Classification	IP 40	

* All values based on LuxCis/APC (A-inc 801) connector termination.

Ø12.5 mm FORJ

Compact design. Big versatility.



Multi-channel FORJ 180°

Space is at a premium in modern rotating systems – and the Ø12.5 mm FORJ was engineered with exactly that in mind. At just 12.5 mm in diameter, it is one of the most compact fiber optic rotary joints available, yet supports up to 10 SM channels or 2 MM channels, making it a remarkably versatile solution for tight integration scenarios.

From UAV payloads and robotic joints to compact slip ring assemblies and portable test equipment, this FORJ fits where others don't – without compromising on reliability or optical performance.

Key Benefits:

- Ultra-compact 12.5 mm outer diameter
- Up to 10 channels SM / 2 channels MM
- Ideal for space-constrained and weight-sensitive applications
- Available as 90° L-style



Multi-channel FORJ 90° L-style

Technical data multi-channel Ø12.5 mm FORJ

	12.5 mm - SM	12.5 mm - MM	
Interface			
No. of optical channels	10	2	
Fiber type	ITU-T G.657.A2 (Single-Mode E9/125µm)	ISO/IEC 11801 OM1 (Multimode G62.5/125µm) ISO/IEC 11801 OM3 (Multimode G50/125µm)	
Jacket	500µm tight buffer	900µm tight buffer	
Weight	~ 50 to 90 g	~ 50 g	
Diameter	12.5 mm	12.5 mm	
Length	112 mm	112 mm	
Optical characteristics			
Wavelength range	1260 nm ... 1625 nm	820 nm ... 880 nm & 1280 nm ... 1350 nm	
Wavelength used for specification	1310 nm & 1550 nm	850 nm	1300 nm
Max. insertion loss*	3.5 dB	4.5 dB	3.5 dB
Max. insertion loss variation during rotation at optimized wavelength*	2.0 dB	1.0 dB	
Min. return loss	40 dB	30 dB	
Min. crosstalk attenuation	50 dB	40 dB	
Max. optical power handling (up to)	20 dBm / 100 mW	20 dBm / 100 mW	
Max. continuous optical power handling per fiber	10 dBm / 10 mW	10 dBm / 10 mW	
Mechanical characteristics			
Max. rotational speed	150 rpm		
Service life	50 million revolutions		
Environmental characteristics			
Temperature range operation	-55°C ... +85°C		
Temperature range storage	-55°C ... +85°C		
Max. temperature gradient	2°C / min		
Humidity (non-condensing)	MIL-STD-810E		
Shock	MIL-STD-202G		
Vibration	MIL-STD-810F		
Protection Classification	IP 40		

* All values based on LuxCis/APC (A/rinc 801) connector termination.

Ø28 mm mid-size FORJ

The right balance between size and channel density

Bridging the gap between the compact Ø12.5 mm and the full-size Ø60 mm FORJ, the Ø28 mm FORJ offers a compelling combination of channel density and spatial efficiency. With support for up to 48 SM channels or 12 MM channels, it covers a wide range of system requirements without the bulk of a larger housing.

This makes it the go-to choice for applications that have outgrown the compact format but don't require the full capacity of the Ø60 mm series – delivering exactly the right performance where it's needed.

Key Benefits:

- Up to 48 channels SM / 12 channels MM
- Compact 28 mm diameter for mid-density applications
- Single-mode & multimode configurations available
- 90° L-style available soon



Multi-channel FORJ 180°

Technical data multi-channel Ø28 mm FORJ

	28 mm - SM	28 mm - MM
Interface		
No. of optical channels	48	12
Fiber type	ITU-T G.657.A2 (Single-Mode E9/125µm)	ISO/IEC 11801 OM1 (Multimode G62.5/125µm) ISO/IEC 11801 OM4 (Multimode G50/125µm)
Jacket	500µm tight buffer	500µm tight buffer
Weight	~ 220 g (10 ch)	~ 220 g
Diameter	28 mm	28 mm
Length	137 mm	137 mm
Optical characteristics		
Wavelength range	1260 nm ... 1625 nm	820 nm ... 880 nm & 1280 nm ... 1350 nm
Optimized wavelength	1310 nm or 1550 nm	850 nm or 1300 nm
Max. insertion loss*	3.5 dB	3.5 dB
Max. insertion loss variation during rotation at optimized wavelength*	1.5 dB	1.0 dB
Min. return loss	40 dB	30 dB
Min. crosstalk attenuation	50 dB	40 dB
Max. optical power handling (up to)	20 dBm / 100 mW	20 dBm / 100 mW
Max. continuous optical power handling per fiber	10 dBm / 10 mW	10 dBm / 10 mW
Mechanical characteristics		
Max. rotational speed	200 rpm	
Service life	50 million revolutions	
Environmental characteristics		
Temperature range operation	-55°C ... +85°C	
Temperature range storage	-55°C ... +85°C	
Max. temperature gradient	2°C / min	
Humidity (non-condensing)	MIL-STD-810E	
Shock	MIL-STD-202G	
Vibration	MIL-STD-810F	
Protection Classification	IP 40	

* All values based on LuxCis/APC (A/rinc 801) connector termination.

Ø60 mm multi-channel FORJ

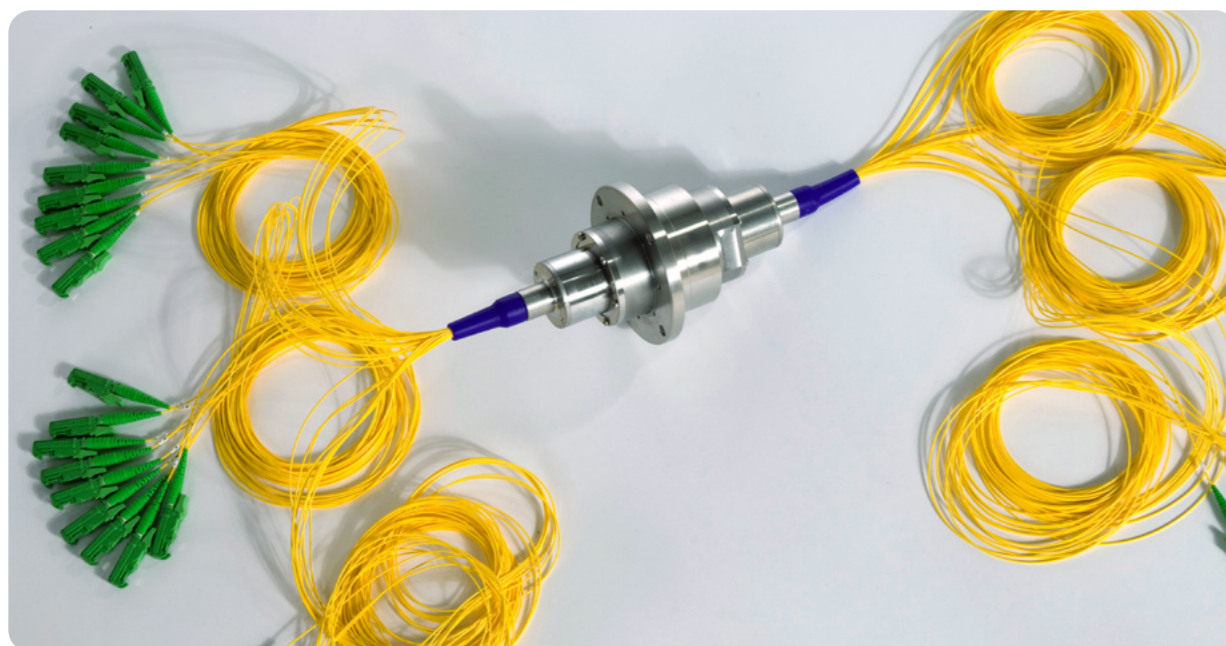
Maximum capacity.
Maximum flexibility.

The Ø60 mm FORJ is the all-rounder of the product family. Supporting up to 60 SM channels or 28 MM channels, it is built for high-demand systems – yet remains fully scalable to your actual requirements.

From defense and surveillance systems to industrial automation and complex fiber sensor networks, the Ø 60 mm FORJ adapts to your architecture – not the other way around.

Key Benefits:

- Up to 60 channels SM / 28 channels MM
- Flexible channel population – only configure what you need
- Robust 60 mm housing for high-channel-count environments



Multi-channel FORJ

Technical data multi-channel Ø60 mm FORJ

	Multi-Ch SM	Multi-Ch MM
Interface		
No. of optical channels	32 / 60	28
Fiber type	ITU-T G.657.A2 (Single-Mode E9/125µm)	ISO/IEC 11801 OM1 (Multimode G62.5/125µm) ISO/IEC 11801 OM3 (Multimode G50/125µm)
Jacket	900µm tight buffer	900µm tight buffer
Weight	~ 1.5 kg	~ 1.5 kg
Diameter	60 mm	60 mm
Length	200 mm	200 mm
Optical characteristics		
Wavelength range	1260 nm ... 1625 nm	820 nm ... 880 nm & 1280 nm ... 1350 nm
Optimized wavelength	1310, 1430 or 1550 nm	850 or 1300 nm
Insertion loss at optimized wavelength*	< 3.5 dB	< 3.5 dB
Max. insertion loss variation during rotation at optimized wavelength*	< 1.5 dB	< 1.0 dB
Min. return loss	> 40 dB	> 30 dB
Min. crosstalk attenuation	> 50 dB	> 40 dB
Max. optical power handling (up to)	20 dBm / 100 mW	20 dBm / 100 mW
Max. continuous optical power handling per fiber	10 dBm / 10 mW	10 dBm / 10 mW
Mechanical characteristics		
Max. rotational speed	100 rpm	
Service life	200 million revolutions	
Environmental characteristics		
Temperature range operation	-40°C ... +85°C	
Temperature range storage	-40°C ... +85°C	
Max. temperature gradient	2°C / min	
Humidity (non-condensing)	MIL-STD-810E	
Shock	MIL-STD-202G	
Vibration	MIL-STD-810F	
Protection Classification	IP 50	

* All values based on LuxCis/APC (A/rinc 801) connector termination.

Ø60 mm low-IL multi-channel FORJ

Multi-channel performance. Single-channel precision.

This low-IL FORJ redefines what is possible in multi-channel optical rotary joints. Engineered for applications where insertion loss cannot be traded away for channel count, this variant achieves IL values that approach those of a single-channel FORJ – a remarkable feat at up to 20 SM channels.

If your system demands both high channel density and uncompromising signal quality, this is the solution.

Key Benefits:

- Lowest insertion loss in the multi-channel FORJ lineup
- Up to 20 channels SM
- Optical performance approaching that of the single-channel FORJ
- Insertion loss < 2dB



Low-IL multi-channel FORJ

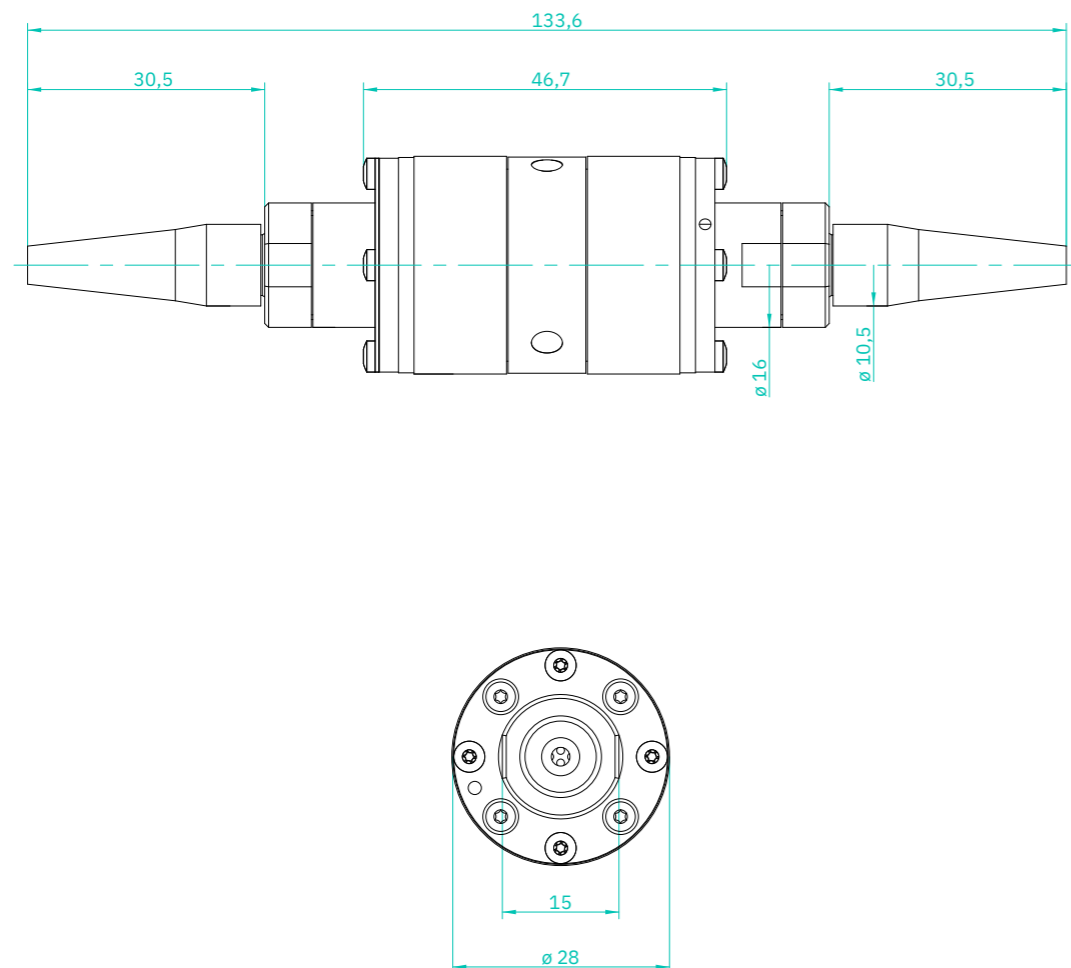
Technical data multi-channel Ø60 mm FORJ

	Multi-Ch SM low IL
Interface	
No. of optical channels	20
Fiber type	ITU-T G.657.A2 (Single-Mode E9/125µm)
Jacket	900µm tight buffer
Weight	~ 1.5 kg
Diameter	60 mm
Length	200 mm
Optical characteristics	
Wavelength range	1260 nm ... 1625 nm
Optimized wavelength	1310, 1430 or 1550 nm
Insertion loss at optimized wavelength*	< 2.0 dB
Max. insertion loss variation during rotation at optimized wavelength*	< 0.8 dB
Min. return loss	> 40 dB
Min. crosstalk attenuation	> 50 dB
Max. optical power handling (up to)	20 dBm / 100 mW
Max. continuous optical power handling per fiber	10 dBm / 10 mW
Mechanical characteristics	
Max. rotational speed	100 rpm
Service life	200 million revolutions
Environmental characteristics	
Temperature range operation	-40°C ... +85°C
Temperature range storage	-40°C ... +85°C
Max. temperature gradient	2°C / min
Humidity (non-condensing)	MIL-STD-810E
Shock	MIL-STD-202G
Vibration	MIL-STD-810F
Protection Classification	IP 40

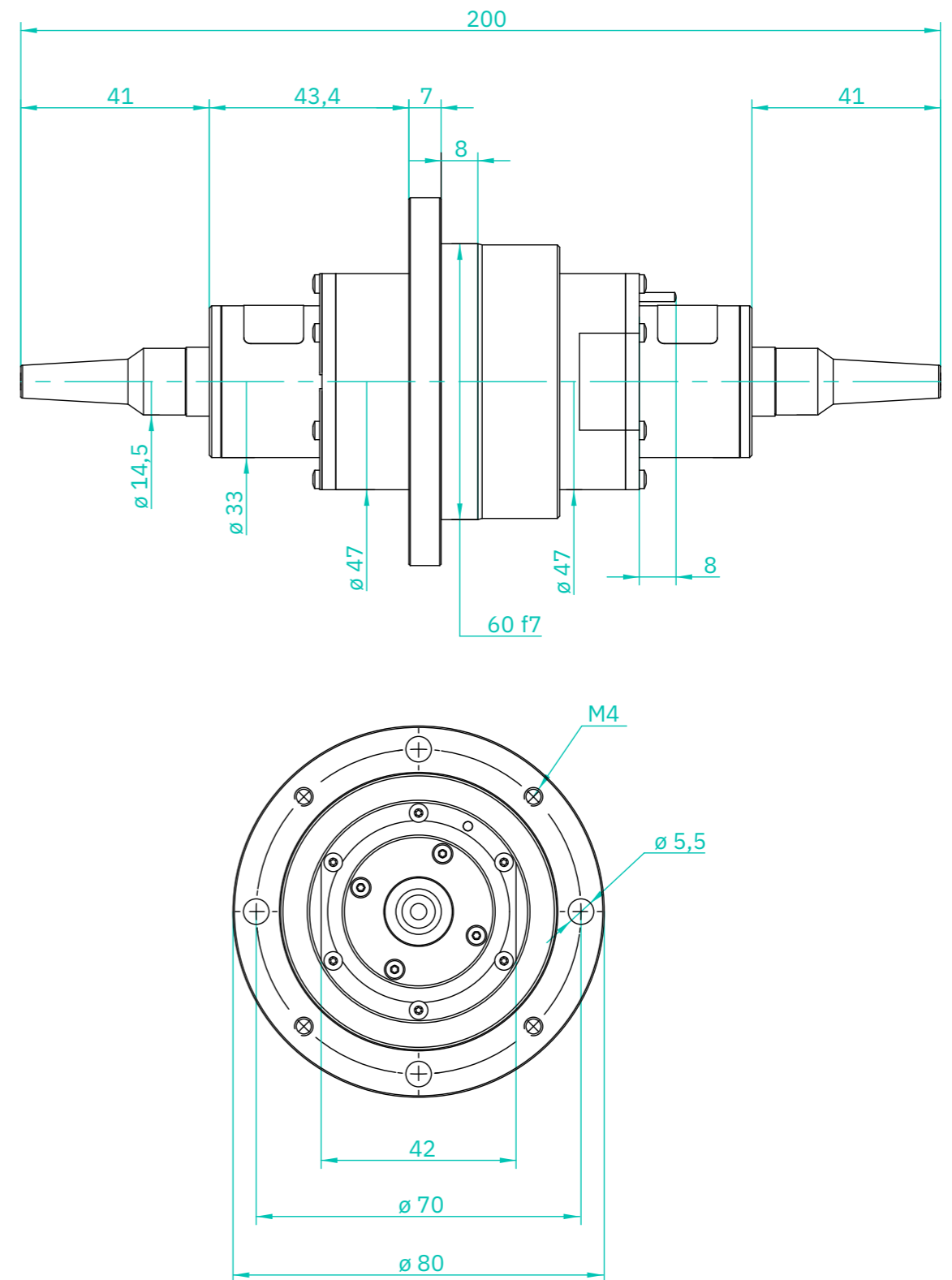
* All values based on LuxCis/APC (Arinc 801) connector termination.

FORJ drawings

Multi-channel Ø28 mm 180°



Multi-channel Ø60 mm: 180° and low-IL





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