SPINNER
Rotating Solutions

Fiber Optic Rotary Joints

Edition D/2016

HIGH FREQUENCY PERFORMANCE WORLDWIDE

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SPINNER Fiber Optic Rotary Joints

SPINNER is one of the world's leading producers of high-performance rotary joints. Fiber optic rotary joints (FORJ) in particular call for extremely exacting assembly of all optical and mechanical components in cleanroom environments. And SPINNER provides both from a single source.

We also supply combinations of fiber optic rotary joints with radio frequency (RF) rotary joints, contactless power transmission modules, slip rings, multi-media joints and contactless data transmission. Our specialties also include integrated data and power transmission solutions with a small form factor.

Benefits of Fiber Optic Connections

Digital Data Transmission:

- Up to 40 Gbit/s per channel
- Wavelength-division multiplexing (WDM) allows transmission of multiple data channels via a single fiber optic link
- Highly configurable

Analog Signal Transmission:

- High sensitivity
- Short-haul systems

Fiber Optic Sensors:

- Robust sensors for a wide range of applications EMI; EMI-free signal transmission
- Fiber Bragg Sensors over FORJ
- Fiber optic technology is excellent for resolving problems

Customized Fiber Optic Rotary Joints

The SPINNER FORJ portfolio permits flexible accommodation of your needs with:

- Special fibers
- Extended fiber lengths
- Up to 52 channels
- Extended wavelength range
- Special labeling
- Custom flanges
- Mixed-fiber assembly, e.g. multi- and single-mode fiber in a multi-channel FORJ
- Customized insertion loss values
- Insertion loss bands across different channels
- Customized pre-shipment inspection with testing of certain parameters

Fiber Optic Core Features

Optical Performance Parameters

- Low insertion loss
- High return loss values
- Low variation while rotating

Optical Parameter Tracking While Rotating

- Narrow insertion loss band across all channels of a multi-channel fiber optic rotary joint

Fiber Types

- Single-mode E9/125 µm
- Multi-mode G50/125 µm (also G62.5 / 125 µm)
- Special fibers, e.g. for low bending radiuses or large-core fibers

Environmental Conditions

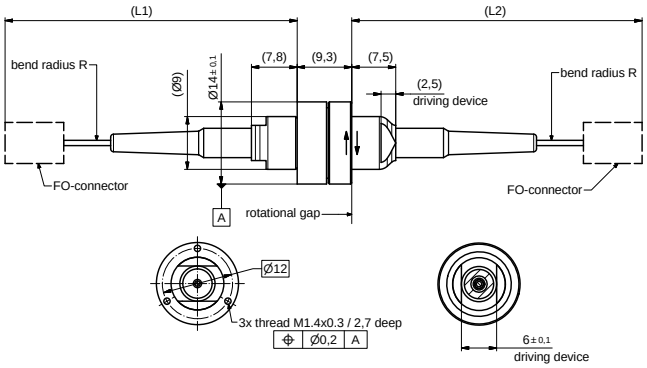
- IP code protection for harsh environmental conditions
- High-temperature capability for implementation in RF systems
- Hydrostatic pressure capability for deep-sea applications

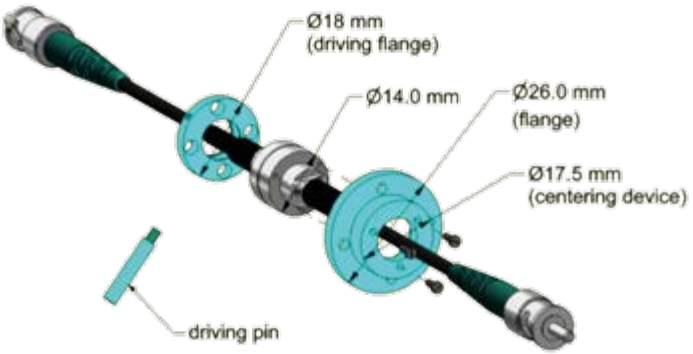
All fiber optic components are assembled in an ISO Class 7 cleanroom environment

SPINNER FORJ Single-Channel

SPINNER FORJ 1.14

The FORJ 1.14 of SPINNER's single-channel family features top performance and extremely compact dimensions. Due to its superior design with single-mode fibers, the typical insertion losses are less than 1.0 dB. Its small dimensions and low weight of only 18 g permit rotational speeds of 10,000 rpm and more.

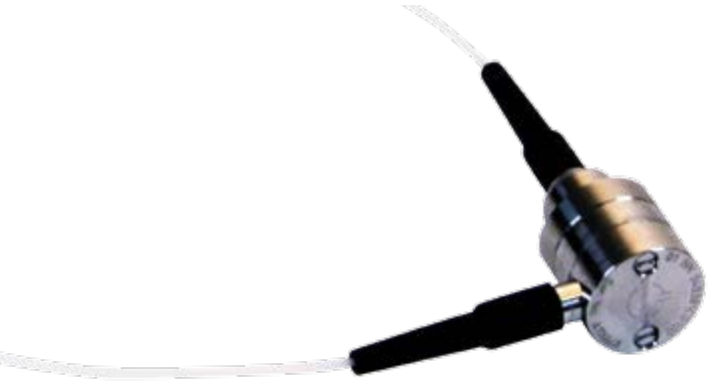


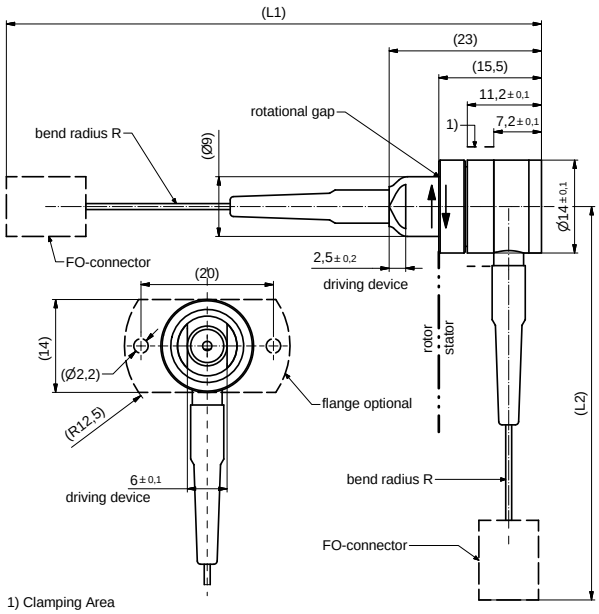


The SPINNER FLEXIFLANGE make it easy to adapt our single-channel FORJs to your application. Just let us know your requirements.

SPINNER FORJ 1.14L

For very low-profile designs in which even the minimum bending radius of optical fiber is a constraint, the SPINNER FORJ 1.14L lets the optical beam turn a tight 90° corner. Based on the SPINNER FORJ 1.14, it features equally outstanding performance.



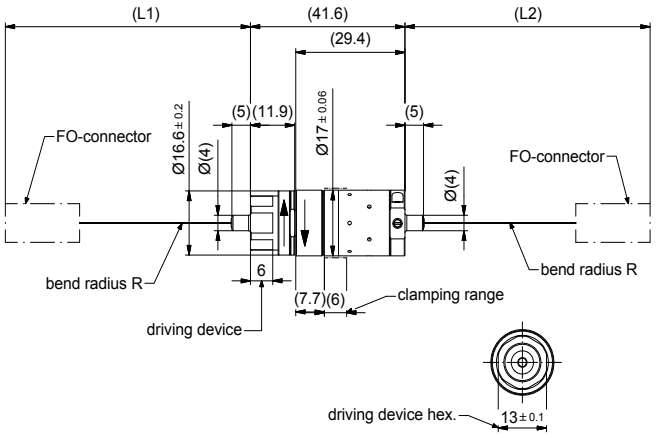


1) Clamping Area

SPINNER FORJ Single-Channel

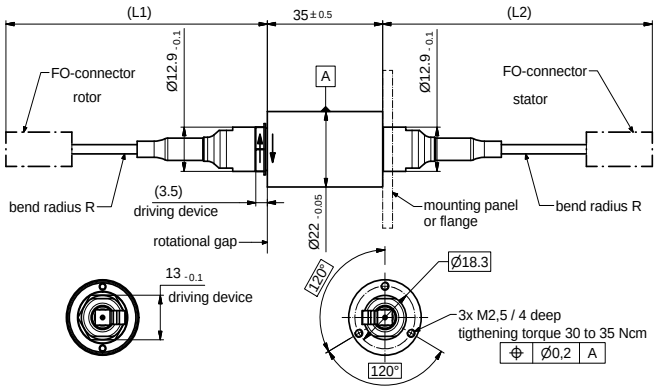
SPINNER FORJ 1.17 / 1.17pc

Developed for the harshest environments, the SPINNER FORJ 1.17 is able to withstand strong vibrations and jolts, high humidity, and immersion in seawater. Its IP68-rated design meets the needs of offshore and underwater vehicles. For deep sea applications as far down as 4500 m, this single-channel fiber optic rotary joint is also available with pressure compensation as the SPINNER FORJ 1.17pc.



SPINNER FORJ 1.22

The SPINNER FORJ 1.22 features IP65-class protection from dust and humidity for industrial applications in harsh environmental conditions. Protective tubing prevents damage to fibers during handling and installation.



SPINNER FORJ Single-Channel

Configure Your SPINNER FORJ Single-Channel:

Rotary Joint	Fiber Optic	Channel Count		Housing Type	Fiber Type		Connectors	Polish		Length L1	Length L2		Extra Feature	Consumer Specific UID
R	O	01	-	X	Z	-	XX	Z	-	XX	ZZ	-	X	XX

Housing Type	
Ø 22 mm (I-Type) IP65	**E**
Ø 17 mm (I-Type) IP68	**F**
Ø 14 mm (I-Type) IP54	**G**
Ø 14 mm (L-Type) IP54	**H**

Fiber Type	
Single-mode E9 / 125	**S**
Multi-mode G50 / 125	**M**
Multi-mode G62.5 / 125	**N**

Any of below listed combinations possible. Please note different polish types for Single-Mode and Multi-Mode fibers. In case of Stratos S900, blank for polish

Connector Type	Polish Single-Mode	Polish Multi-Mode	
FC	**UPC, APC, PC**	**PC**	**FC**
SC	**APC, PC**	**PC**	**SC**
ST	**UPC, PC**	**PC**	**ST**
LC	**UPC, PC**	**PC**	**LC**
LSA	**UPC, PC**	**PC**	**LS**
LuxCis	**APC, PC**	**PC**	**LX**
Molex/LC	**PC**	**PC**	**ML**
Stratos S900	**N/A**	**N/A**	**S9**

Polish	
PC	**P**
APC	**A**
UPC	**U**

Length L1	
Length in 1/10 meter [0.2 … 4 m] longer fiber length on request	

Length L2	
Length in 1/10 meter [0.2 … 4 m] longer fiber length on request	

Blank if not applicable

Extra Feature	
Fiber protective tube, standard: 3mm (bending radius 60mm)	**P**
Fiber protective tube, standard: 1.9mm with itv G.652 (bending radius 15mm)	**T**
250µm base fiber with itu G.652 (bending radius 7.5mm)	**H**
900µm buffer, (bending radius 30mm)	**K**
SPINNER Flexiflange (always with UID)	**F**
Premium packaging (always with UID)	**R**
Premium version (housing type 1.14 / 1.14p)	**E**
Pressure compensated / oil filled (housing type 1.17 / 1.17pc)	**O**

Filled in by SPINNER

Customer specific unique identifier

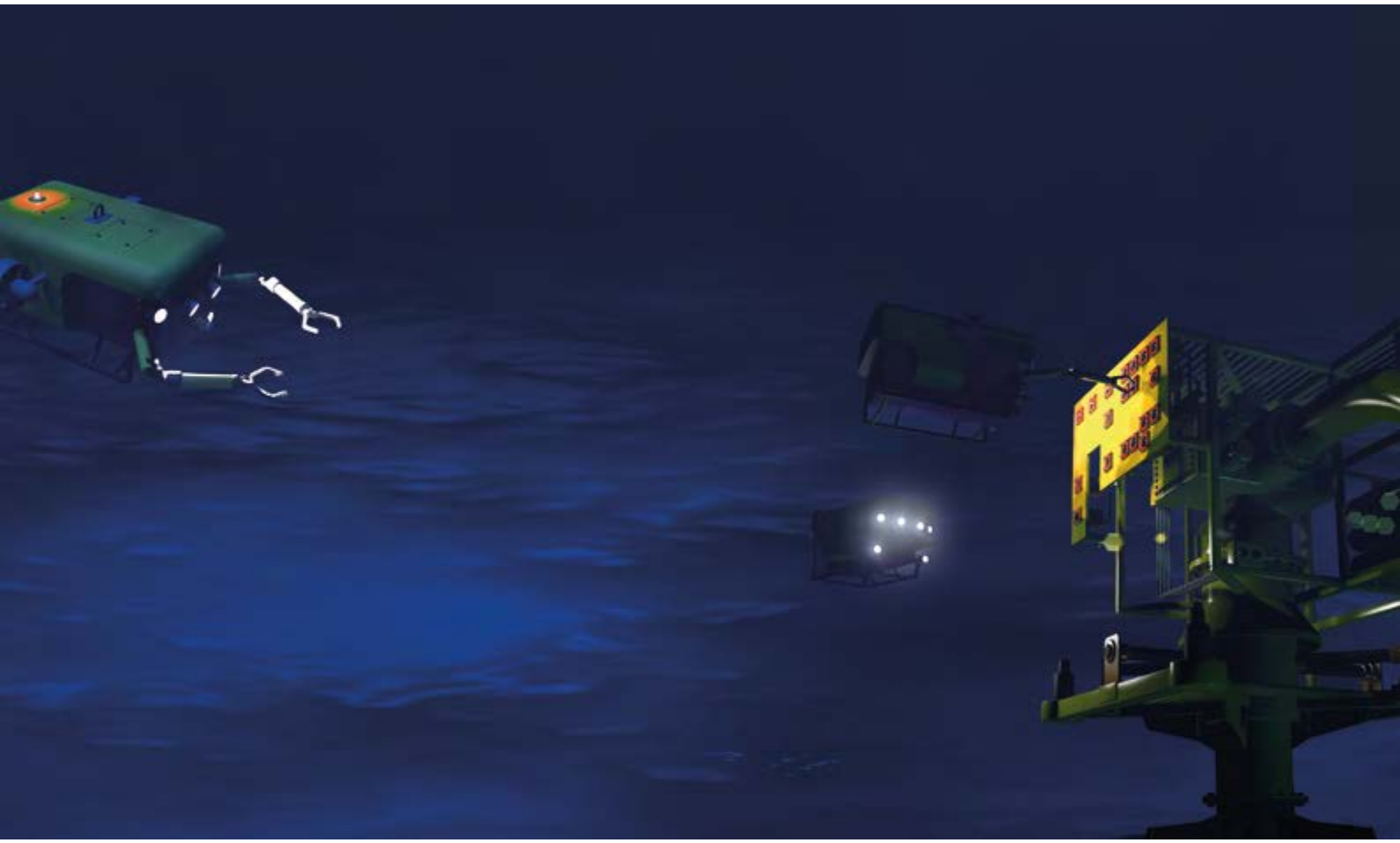
SPINNER FORJ Single-Channel

SPINNER FORJ Single-Channel Specifications for Single-Mode (SM) and Multi-Mode (MM) Fibers

SPINNER FORJ	1.14p	1.14s	1.14L	1.17/ 1.17pc*	1.22
Max. insertion loss (dB)	1.0 (SM) 2.0 (MM)	1.5 (SM) 2.5 (MM)	3.0 (SM) 4.0 (MM)	1.5 (SM) 2.5 (MM)	2.0 (SM) 3.0 (MM)
Max. variation of insertion loss during rotation (dB)	0.5	1.0	1.0	1.0	1.0
Min. return loss (dB)	50 (SM)**	50 (SM)**	50 (SM)**	50 (SM)**	50 (SM)**
Wavelength	1310 nm / 1550 nm (SM) or 850 nm / 1300 nm (MM)				
Rotational speed	3000 rpm	3000 rpm	3000 rpm	60 rpm	1000 rpm
Weight (excl. connectors)	18 g	18 g	20 g	60 g	130 g
Torque	0.06 Nm	0.06 Nm	0.06 Nm	0.3 Nm	0.3 Nm
Degree of protection	IP54	IP54	IP54	IP68*, seawater resist.	IP65
Recommended temperature range	-40°C to +85°C (buffered fiber) / -40°C to +71°C (protective tube)				

* 1.17pc, IP 68 up to 4500m operational depth
** not applicable for MM

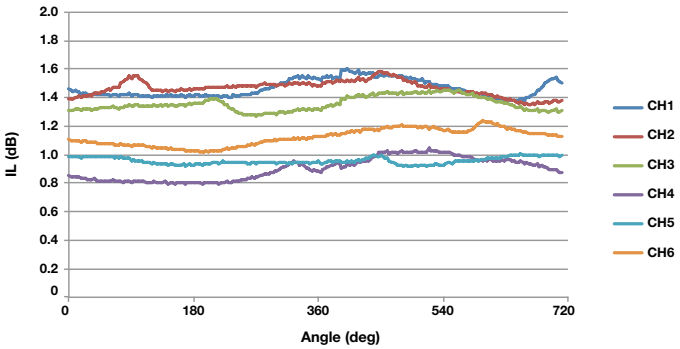
SPINNER FORJ 1.17 / 1.17pc: designed for communicating with ROVs operating at depths down to 4500 m



SPINNER FORJ Multi-Channel

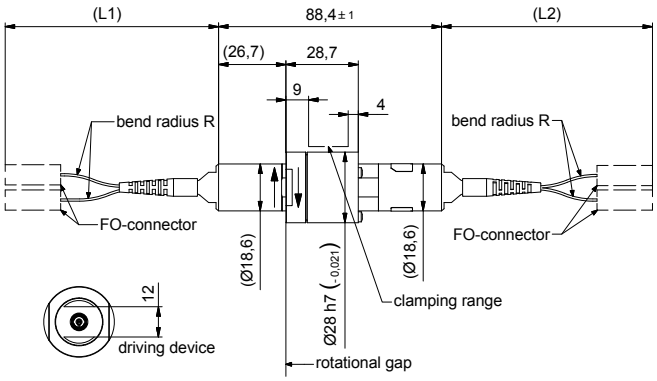
SPINNER multi-channel rotary joints use a dove prism to derotate images arriving via the input fiber for coupling with the output fiber. For up to 20 channels, SPINNER relies on discretely mounted collimators for the individual light propagation paths instead of an optical lens array.

This technology makes it possible to individually adjust and optimize the insertion loss values of each optical fiber channel. The result is superior tracking performance of optical channels during rotation.



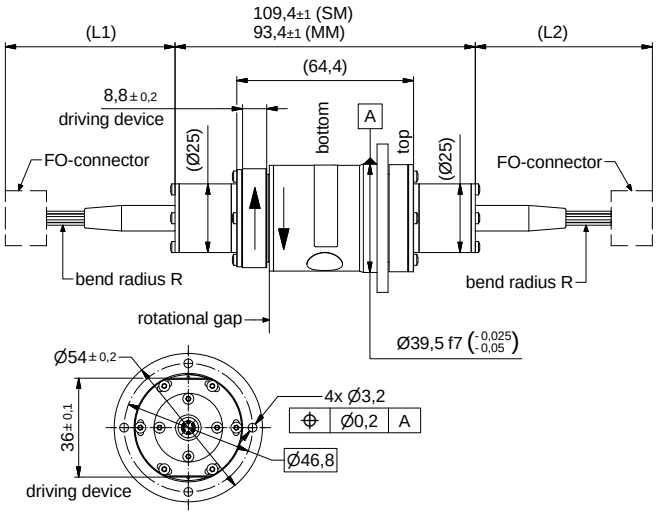
SPINNER FORJ 2.28

The SPINNER FORJ 2.28 meets the need for a basic dual-channel, single-mode rotary joint. Its patented mechanical system makes it very compact with an overall length of just under 90 mm and an outer diameter of only 28 mm. We can supply it with either multi-mode fibers only or a combination of single-mode and multi-mode fibers.



SPINNER FORJ x.40

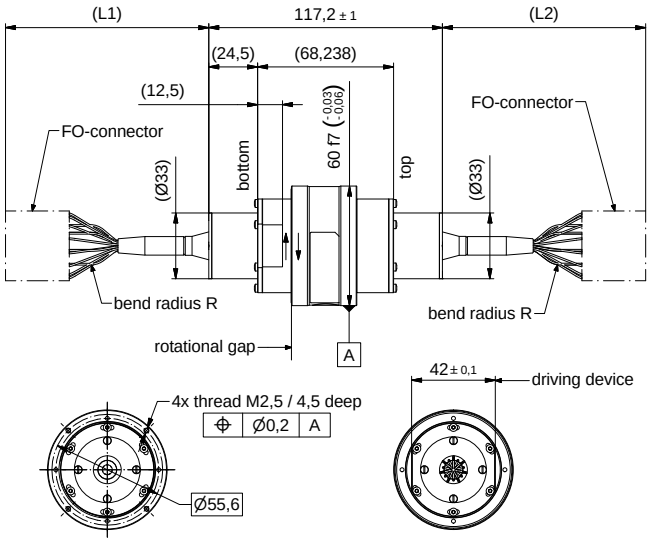
The SPINNER FORJ x.40 delivers market-leading compactness for multi-channel solutions with up to 8 channels, featuring an outer housing diameter of only 39.5 mm. It is available in single-mode, multi-mode, and mixed fiber configurations.



SPINNER FORJ Multi-Channel

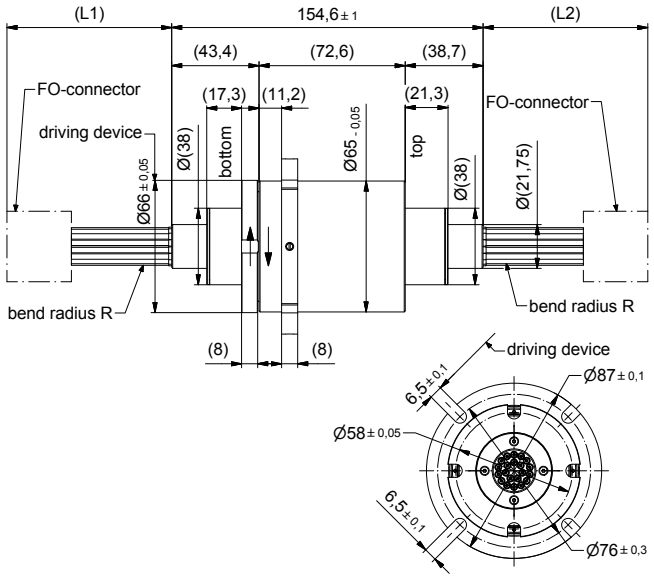
SPINNER FORJ x.60

For multi-channel applications with more than six channels, the SPINNER FORJ x.60 covers the entire range from seven to 52 channels. It is also available in single-mode, multi-mode, and mixed fiber configurations.



SPINNER FORJ x.65

Intended for use under the very harshest environmental conditions, the SPINNER FORJ x.65 withstands brutal vibrations and shocks, high humidity, and seawater. Its IP68-rated design meets the needs of offshore and military applications. Available for up to 52 channels in single-mode and multi-mode fiber configurations and for up to 20 in mixed fiber mode.



SPINNER FORJ Multi-Channel

Configure Your SPINNER FORJ Multi-Channel:

Rotary Joint	Fiber Optic	Channel Count		Housing Type	Fiber Type		Connectors	Polish		Length L1	Length L2		Extra Feature	Consumer Specific UID
R	O	NN	-	X	Z	-	XX	Z	-	XX	ZZ	-	X	XX

Channel Count

Ø 65 or 60 mm [07 … 52]	
Ø 40 mm [03 …06]	
Ø 28 mm [02]	

Housing Type

Ø 65 mm (I-Type) IP65	**A**
Ø 60 mm (I-Type) IP54	**B**
Ø 40 mm (I-Type) IP54	**C**
Ø 28 mm (I-Type) IP54	**D**

Fiber Type

Single-mode E9 / 125	**S**
Multi-mode G50 / 125	**M**
Multi-mode G62.5 / 125	**N**

Connectors

Any of below listed combinations possible. Please note different polish types for Single-Mode and Multi-Mode fibers. In case of Stratos S900, blank for polish

Connector Type	Polish Single-Mode	Polish Multi-Mode	
FC	**APC, UPC**	**PC**	**FC**
SC	**APC, UPC**	**PC**	**SC**
ST	**UPC, PC**	**PC**	**ST**
LC	**APC, UPC**	**PC**	**LC**
LSA	**APC, UPC**	**PC**	**LS**
LuxCis	**APC, UPC**	**PC**	**LX**
Molex/LC	**PC**	**PC**	**ML**
Stratos S900	**N/A**	**N/A**	**S9**

Polish

PC	**P**
APC	**A**
UPC	**U**

Length L1

Length in 1/10 meter [0.2 … 4 m] longer fiber length on request

Length L2

Length in 1/10 meter [0.2 … 4 m] longer fiber length on request

Extra Feature

Blank if not applicable

Fiber protective tube, standard: 3mm (bending radius 60mm)	**P**
Fiber protective tube, standard: 1.9mm with itv G.652 (bending radius 15mm)	**T**
250µm base fiber with itu G.652 (bending radius 7.5mm)	**H**
900µm buffer, (bending radius 30mm)	**K**
Premium packaging (always with UID)	**R**
Pressure compensated / oil filled (housing type x.65)	**O**

Consumer Specific UID

Filled in by SPINNER

Customer specific unique identifier

SPINNER FORJ Multi-Channel

SPINNER FORJ Multi-Channel Specification with Discrete Lens Technology for Single-Mode (SM) and Multi-Mode (MM) Fiber

SPINNER FORJ	2.28	x.40	x.60	x.65
Channel count	2	3-8	9-20	
Insertion loss max.	4.5 dB (SM) / 6.0 dB (MM)	3.5 dB (SM) / 3.5 dB (MM)	3.5 dB (SM) / 5.5 dB (MM)	
Insertion loss variation over rotation max.	1.5 dB	1.5 dB	1.5 dB	
Return loss	50 dB (SM)*	50 dB (SM)*	50 dB (SM)*	
Wavelength	1310 nm / 1550 nm (SM) or 850 nm / 1300 nm (MM)			
Fiber type	Single-mode E9/125 or multi-mode 50/125 or multi-mode 62.5/125			
Rotation speed	150 rpm	1000 rpm	150 rpm	30 rpm
Weight (excl. connectors)	250 g	700 g	1500 g	
Torque	0.08 Nm	0.15 Nm	0.15 Nm	
Degree of protection	IP54	IP54, IP65	IP54, IP65	IP65, seawater resistant
Recommended temperature range	-40 °C to +85 °C (buffered fiber) / -40 °C to +71 °C (protective tube)			

* not applicable for MM

SPINNER FORJ x.65, IP65 and seawater resistant, designed for Tether Management Systems in offshore application

Airborne and Military Radar Systems

The low-profile, extremely lightweight SPINNER FORJ 1.14 is designed for environments characterized by strong vibrations and shocks. This FORJ is typically integrated in airborne targeting systems of UAVs, aircrafts or helicopters.

In ground-based, naval and mobile military radar systems, it copes with the massive data volumes sent between the rotating antenna and the processing unit in the control shelter. For these applications, SPINNER has combined a multi-channel FORJ with RF rotary joints, slip rings and rotary unions to deliver power and coolant to the antenna.

SPINNER 2 channel FORJ 2.28 with slipring for electro-optical sensor systems

SPINNER FORJ 1.14 for UAVs

SPINNER 12 channel FORJ x.60 with X band waveguide and slipring for radar applications

Weather Radars

For weather radar systems, SPINNER combines FORJs typically with single and dual channel RF rotary joints for frequency ranges in S-, C- and X-band. Where in current weather radar systems a slip ring transfers data to the antenna, the SPINNER FORJ brings data rates of several Gbit/s with highest reliability to weather radar systems around the globe.

SPINNER FORJ 1.14L for helicopters

SPINNER FORJ 1.14 with waveguides and slipring for weather radars

360° Sight Systems

This is a completely contactless rotary joint system comprising a DC power transmission module and a fiber optic channel. The fiber optic channel is tightly integrated in the DC power module, resulting in an extremely compact form factor and permitting rotational speeds up to 3,000 rpm.

The rotary joint has already been integrated and tested in the Rotating Image Generator (RIG™), which consists of a device and special software for generating 360° spherical moving pictures in real time. Its core components include a sensor and a lens that continuously rotate at high speed. The device captures a 360-degree array of images in a fraction of a second.

The software renders the sequence of images as spherical moving pictures that can be managed, recorded and transmitted in standard digital video or other formats. The spherical movies can be displayed on multiple screens (such as LCDs) or special displays (e.g. an immersive fulldome environment or goggles) for real-time viewing.

SPINNER single-channel FORJ with contactless power for 360° sight systems

Wind Power Stations

In wind power stations, SPINNER FORJ 1.22 with IP65 rating increases the reliability in 24/7 operations. Where in current designs slip rings for data transmission can increase down-times and maintenance cost, the SPINNER FORJ 1.22 enables highest reliablity for data transmission up to data rates of several Gbit/s. As an additional feature we provide SPINNER FORJ 1.22 in combination with digital contactless transmission systems.

Ethernet with SPINNER FORJ 1.22

SPINNER FORJ 1.22 for wind power stations

4K / 8K Video Transmission over 360°

SPINNER's miniature slip ring/FORJ combinations with diameters as small as 22 mm enable interference-free video data transmission in 4K and 8K quality, also with fast-moving images.

They are ideal for low-profile applications, since they ensure the critical minimum fiber bending radius and unit length. This is why manufacturers of leading-edge cable-suspended camera systems rely on SPINNER.

SPINNER FORJ 1.14 with slipring: The perfect match for cable-suspended camera system

Revolving Stages

Single- and multi-mode fiber optic rotary joints with between two and 20 channels are used whenever it isn‘t feasible to multiplex digital signals. This is the case in radar applications requiring high-performance transmission of multiple phased signals, in which A/D conversion errors would be unacceptable.

The SPINNER FORJ 2.28 also offers excellent value for money since it separately transmits each channel, thus eliminating the need for complex active multiplexing technology. A good example is revolving stages with power slip rings on ocean liners.

SPINNER FORJ 2.28 with slipring for revolving stages in theatres on ocean liners

Industrial Automation

For long-term continuous applications that require DC power and high data throughput, SPINNER supplies a completely contactless rotary joint system. It achieves a very small form factor by integrating the fiber optic channels into the DC power module at rotational speeds up to 3000 rpms. This hybrid rotary joint is typically implemented in high-end imaging systems and industrial machining applications.

Thanks to wavelength division multiplexing (WDM) technologies, the fiber-optic channels provide maximum flexibility for communications protocols and data channels. SPINNER supplies contactless DC/DC converters together with fiber optic rotary joints, e.g. the right-angled FORJ 1.14L, as a single unit.

SPINNER can also adapt the assembly for harsh environments by using FC/PC adapters instead of flying cables and ordinary FC/PC connectors. The nominal output voltage of this system is 24 V DC, but the technology used also lets it be flexibly modified for a higher or lower voltage or current.

SPINNER single-channel FORJ 1.14L

SPINNER 100 W contacless DC/DC converter with free inner diameter for FORJ

SPINNER 300 W contacless DC/DC converter with free inner diameter for FORJ

Fiber Optic Channel Characteristics:

Interface type / material	FC/APC
Fiber type	E9/125 single-mode
Wavelength [nm]	1310 / 1550
Min. / typical return loss	50 dB / 55 dB
Max. insertion loss / typical	3.0 dB / 2.0 dB
Max. WOW insertion loss	1 dB
Max. optical power	200 mW / 23 dBm

DC Power Transmission Channel Characteristics:

Input voltage	21.6 to 27.6 V DC
Output voltage	24 V DC ± 3%
Continuous output power	100 Watts / 300 Watts

Photo: © ABB AG

HIGH FREQUENCY PERFORMANCE WORLDWIDE

SPINNER designs and builds cutting-edge radio frequency systems, setting performance and longevity standards for others to follow. The company's track record of innovation dates back to 1946, and many of today's mainstream products are rooted in SPINNER inventions.
Industry leaders continue to count on SPINNER's engineering excellence to drive down their costs of service and ownership with premium-quality, off-the-shelf products and custom solutions.
Headquartered in Munich, Germany, the global frontrunner in RF components remains the first choice in simple-yet-smart RF solutions.

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