

Fiber Optic Rotary Joints

Description

Fiber Optic Rotary Joints (FORJs) are to optical signals what electrical slip rings are to electrical signals, a means to pass signals across rotating interfaces, particularly when transmitting large amounts of data. FORJs maintain the intrinsic advantages of fiber end to end. Moog Components Group has been producing fiber optic rotary joints for over 20 years.

Single or Multi-channel

FORJs are available in single and multi-channel options. The most cost and size efficient options are the single and dual channel designs. If more than two fibers are present in a system, multiplexing solutions are available to combine multiple channels onto one or two fibers to allow the use of a one or two channel FORJ.

In cases where more than two fibers are required, Moog has three designs; FO190, FO242 and FO291 where single channels are stacked to achieve the desired number of channels. The FO300 uses a common de-rotating optical element for all fiber channels.

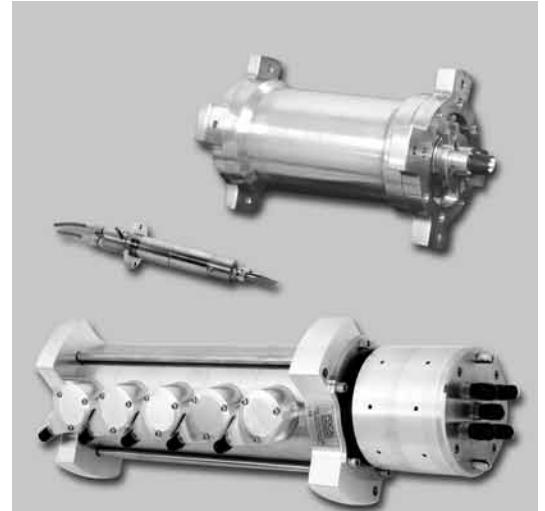
Singlemode or Multimode

Singlemode fibers allow the propagation of a singlemode of optical energy due to their small core size and small numerical aperture and for this reason they exhibit very high bandwidths. Most singlemode fiber systems operate at 1300 nm and 1550 nm wavelengths because of lower fiber attenuation at these wavelengths. Because of these smaller core sizes and numerical aperture, singlemode FORJs must be designed with very precise mechanical alignments.

Multimode fibers have large cores and large numerical apertures allowing the propagation of multiple modes of optical energy. These features allow larger amounts of light to be transmitted from sources such as LEDs and VCSELs, but result in higher attenuation and dispersion. Because of these attenuation and dispersion features, multimode fiber systems are typically used for shorter datacom links. Most multimode systems operate at 850 nm and 1300 nm.

Features

- Ruggedized for harsh environments
- Compact sizes
- Variety of configuration options
- Custom designs available



Typical Applications

- Robotics
- Vehicle turrets
- Radar antennas
- Medical systems
- Security systems
- Sensor platforms
- Material handling systems
- Remotely operated vehicles
- Fiber optic cable reels
- Video surveillance systems
- Marine propulsion systems
- Wind energy turbines

Fiber Optic Rotary Joints (FORJ)

FORJ Performance Data

Product	Performance							Physical					
	Fiber Type		Channels	Insertion Loss - Maximum dB MM = 5.5 dB		Maximum Rotational Speed	Operating Temperature	Size Inches (mm)			Standard Interface		
-	SM	MM	-	SM	MM	RPM	-	Minimum Length	Flange Diameter	Drum Diameter	Pigtail / Adaptor	Connector Type	Pigtail Length
FO228	N	Y	1	NA	4.0	100	-40 to +75°C	1.75 (44.45)	1.50 (38.10)	0.73 (18.54)	Adaptor	FC or ST	NA
FO197	N	Y	1	NA	3	1000	-40 to +60°C	2.38 (60.45)	1.50 (38.10)	0.62 (15.74)	Pigtail or Adaptor	FC, ST for Adaptors; As Required on Pigtails	As Required
FO206	Y	Y	1	3.5	NA	1000	-40 to +60°C	2.36 (59.94)	1.50 (38.10)	0.77 (19.55)	Pigtail or Adaptor	FC / PC Standard Alternates Available	As Required
FO285 *	Y	Y	1	3.5	NA	500 +	-55 to +75°C	1.02 (25.90)	0.75 (19.05)	0.037 (.93)	Pigtail	As Required	As Required
FO286 *	N	Y	1	NA	2.5	500 +	-55 to +75°C	0.75 (19.05)	0.75 (19.05)	0.037 (.93)	Pigtail	As Required	As Required
FO310	Y	Y	1	1.5	1.5	100	-40 to +85°C	3.41 (86.6)	1.5 (38.1)	0.63 (15.9)	Pigtail	As Required	As Required
FO300A **	Y	Y	2 to 17	< 4.0 dB	< 4.0 dB	100	-40 to +60°C	4.22 (107.18)	1.8 (45.72)	2.35 (59.69)	Pigtail	As Required	As Required
FO300B **	Y	Y	2 to 31	< 4.5 dB	< 5.0 dB	100	-40 to +60°C	5.76 (146.2)	2.1 (53.34)	2.72 (69.1)	Pigtail	As Required	As Required
FO300C **	Y	N	2 to 52	< 5.0 dB	NA	100	-40 to +60°C	6.79 (172.5)	3.1 (78.74)	3.72 (94.5)	Pigtail	As Required	As Required
FO215 *	N	Y	2	NA	5.5	500 +	-40 to +60°C	P: 3.30 (83.82)	P: 1.50 (38.10)	P: 0.75 (19.05)	Pigtail or Adaptor	ST, FC, SC, LC	As Required
FO257	Plastic		2	8 ***		500 +	-40 to +60°C	3.47 (88.13)	1.85 (46.99)	1.24 (31.49)	Pigtail	ST or SMA	As Required
FO292 *	N	Y	2	NA	5.5	500 +	-40 to +60°C	2.25 (57.15)	1.25 (31.75)	0.50 (12.7)	Pigtail	ST, FC, SC, LC	As Required
FO242 *	Y	N	2 to 5	5.5	NA	100 +	-40 to +60°C	See Data Sheet	5.02 (127.50)	5.00 (127.00)	Adaptor	FC / PC Standard; ST Optional	NA
FO291 ***	Y	Y	2 to 9	6	5.5	100 +	-40 to +60°C	See Data Sheet	See Data Sheet	See Data Sheet	Adaptor	FC / PC Standard; ST Optional	NA
FO190 *	N	Y	2 to 21**	NA	5.5	100	-40 to +60°C	See Data Sheet	5.02 (127.50)	5.00 (127.0)	Adaptor	FC / PC, ST	NA
Hybrid Units													
H18	Y	Y	1 Optic 18 Elec.	3.5	2.5	500	-20 to +60°C	3.4 (86.36) MM, 3.64 (92.45) SM	1.75 (44.45)	0.87 (22.0)	Pigtail	As Required	As Required
H24	Y	Y	1 Optic 24 Elec.	3.5	2.5	500	-20 to +60°C	3.7 (93.98) MM, 3.94 (100.07) SM	1.75 (44.45)	0.87 (22.0)	Pigtail	As Required	As Required

* The FO242 and FO190 can be combined to offer a hybrid multimode and singlemode solution
SM = Singlemode MM = Multimode
** More passes are available with a custom design
*** 1 MM pass can be accommodated on the FO291

* Right angle options available
** Consult factory for number of passes available for SM and MM combination applications
*** Pigtail length effect with plastic fiber

Note: Optical values for all listed multimode FORJs are based on use with LED sources.

Shock and Vibration

Moog Component Group FORJs support high shock and vibration environments, long life requirements of more than 200,000 hours and long data links over 100 km of fiber. Units are available that are tested to MIL-STD-167-1, MIL-STD-202, MIL-STD-204 for vibration and MIL-STD-810D / E and MIL-STD-901D for shock.

Options

- Supply and installation of customer specific connectors and fibers
- Customization of mounting configurations, housing materials and drive couplers
- Fluid filling and pressure compensation for underwater use

FO310

Sealed high performance fiber optic rotary joint

Description

The FO310 is a sealed single-pass fiber optic rotary joint (FORJ) which is factory configured to transfer optical signals over either singlemode or multimode fiber. The FO310 supports both analog and digital optical signals, and is especially suited for sensitive single-pass optical sensing applications where optical insertion loss and back reflection must be minimized.

The FO310 FORJ has a stainless steel housing and is environmentally sealed to an ingress protection rating of IP67. It can be combined with Moog electrical and / or fluid slip rings, providing a single, complete package for optical signals, electrical power, and fluid transfer over a rotating interface.

This FORJ is assembled with either bulkhead connectors or fiber pigtails and connectors to suit the application. Housing, mounting flange, and drive features can be customized to meet specific customer requirements.

Features

- Passive bidirectional optical transmission
- Low optical insertion loss for common sensor wavelengths
- High return loss (i.e. low back reflection) available
- Provides rotary coupling for either a singlemode or multimode fiber link with the same footprint
- Can be combined with Moog electrical slip rings and fluid unions
- Can be integrated into existing slip ring designs
- Rugged design with IP 67 rating, MIL-STD-167-1 Ships vibration and MIL-STD-810 functional shock (40g)
- Bulkhead connector and Pigtailed versions available

Benefits

- Low back reflection and insertion losses allow for FORJ integration with very sensitive optical sensor measurement systems
- Environmentally sealed design allows for long-life in rugged installations and reduces maintenance costs
- Supports either singlemode or multimode fiber, allowing future upgrade without modifying the surrounding mechanical infrastructure



Typical Applications

- Winches and cable reels for optical sensor systems
 - Distributed Temperature Sensing (DTS)
 - Temperature Point Sensor Arrays (TPSA) using Fiber Bragg Gratings (FBG)
- Distributed Acoustic Sensing (DAS)
- Pitch control data and/or fiber-optic blade sensing for wind turbines
- Sensor systems for helicopter rotor blades
- Optical Coherence Tomography (OCT)

Fiber Optic Rotary Joints (FORJ)

FO310 Specifications		
	Singlemode	Multimode
Fiber Size	9 / 125 Single Mode	50 / 125 or 62.5 / 125 Multimode
Insertion Loss	Maximum 1.5 dB (Typical 1.0 dB)	Maximum 1.5 dB (Typical 1.0 dB)
Rotation Variation	Maximum 1.0 dB (Typical 0.5 dB)	Maximum 1.0 dB (Typical 0.5 dB)
Back Reflection	Minimum 55 dB	Minimum 30 dB (Typical 32 dB)
Wavelength Options	Optimized for: <ul style="list-style-type: none"> • 1310 / 1550 nm WDM and CWDM communication bands, and; • 900-1100 nm sensor band (point-source tested at 1060 nm) 	Optimized for: <ul style="list-style-type: none"> • 850 / 1300 nm WDM communication bands, and; • 900-1100 nm sensor band (point-source tested at 1060 nm)
Rotational Speeds	100 rpm. For other requirements contact factory.	100 rpm. For other requirements contact factory
Temperature	-40°C to +85°C	-40°C to +85°C
Exterior Surfaces	Stainless Steel	Stainless Steel
Ingress Protection	IP67	IP67
Vibration	Tested to MIL-STD-167-1 (Ships)	Tested to MIL-STD-167-1 (Ships)
Shock	Tested to MIL-STD-810D	Tested to MIL-STD-810D
Terminations	Bulkhead or Pigtailed with ST, FC / PC, or FC / APC connectors to meet customer requirements. FC / APC required to achieve extended back reflection specification	Bulkhead or Pigtailed with ST, FC / PC, or FC / APC connectors to meet customer requirements. FC / APC required to achieve extended back reflection specification.
Pigtail Length	As required	As required

FO310 Dimensions

