

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.

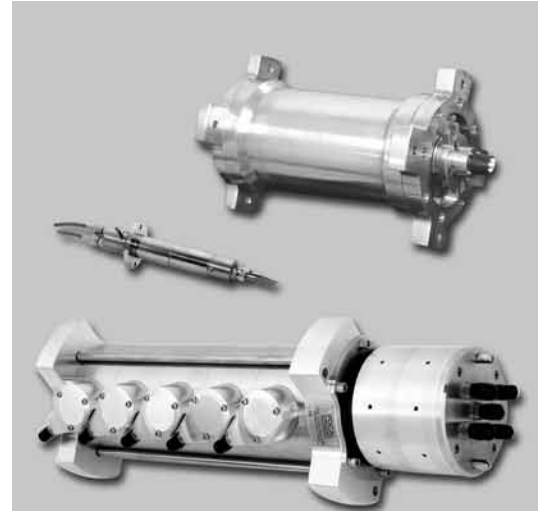
Singlemode or Multimode

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

FO300

Fiber optic rotary joint

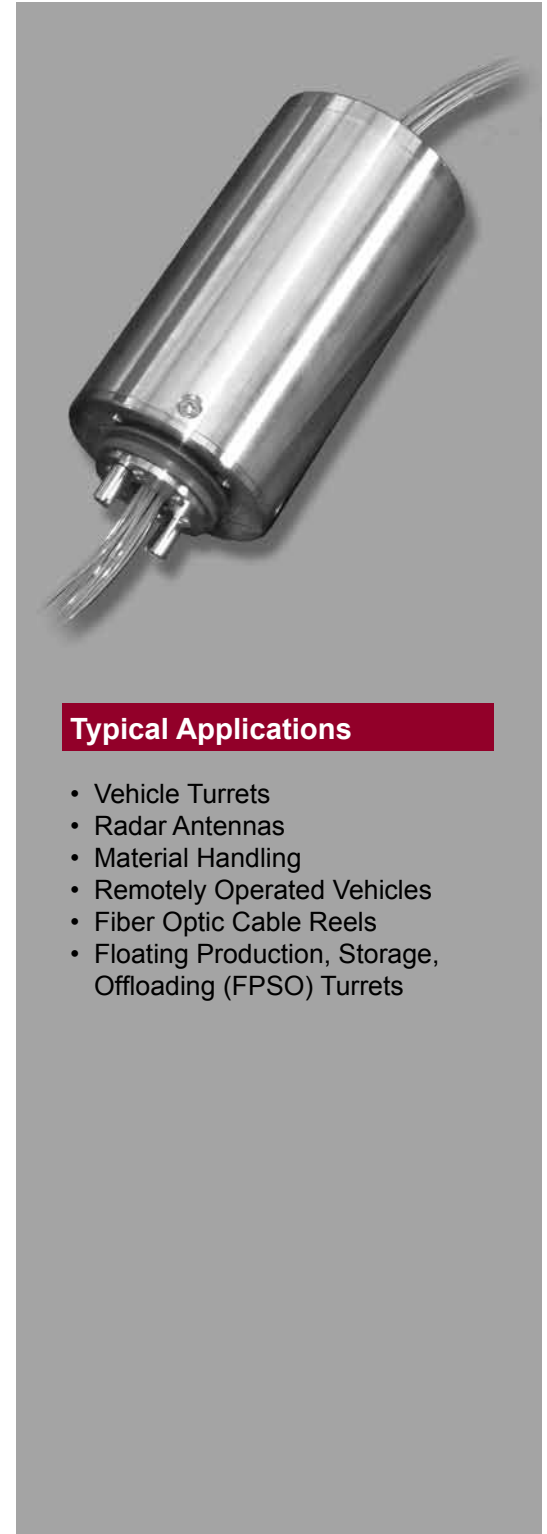
Description

The FO300 is a multi-pass fiber optic rotary joint (FORJ). It allows the transfer of optical signals across a rotational interface and is passive and bidirectional. The smaller version "A" accommodates up to 17 separate singlemode or multimode optical fibers. Version "B" supports up to 31 separate channels. The largest version "C" supports up to 52 separate channels. Pressure compensation is available for use in subsea applications, with slightly increased length and diameter.

The FO300 can be combined with electrical and / or fluid slip rings, providing a single package for optical signals, electrical power and fluid transfer.

Features

- Up to 52 fiber optic channels in a very small form factor
- The smaller version "A" accommodates up to 17 separate singlemode or multimode optical fibers, version "B" accommodates up to 31 separate channels and the largest version "C" supports up to 52 separate channels
- Can be combined with electrical slip rings and fluid rotary unions
- Stainless steel construction
- Rugged design



Typical Applications

- Vehicle Turrets
- Radar Antennas
- Material Handling
- Remotely Operated Vehicles
- Fiber Optic Cable Reels
- Floating Production, Storage, Offloading (FPSO) Turrets

Fiber Optic Rotary Joints (FORJ)

FO300 Specifications			
Fiber Type	9 / 125 Singlemode		50 / 125 or 62.5 / 125 Multimode
Wavelength	1310 nm or 1550 nm	1310 nm and 1550 nm	850 nm and 1300 nm
Version "A" (≤ 17 Channels)			
Maximum Insertion Loss Over Rotation	< 4.0 dB		< 4.0 dB
Insertion Loss Variation Over Rotation	< 1.5 dB	< 2.5 dB	< 1.5 dB
Version "B" (≤ 31 Channels)			
Maximum Insertion Loss Over Rotation	< 4.5 dB		< 5.0 dB
Insertion Loss Variation Over Rotation	< 1.5 dB	< 2.5 dB	< 1.5 dB
Version "C" (≤ 52 Channels)			
Maximum Insertion Loss Over Rotation	< 5.0 dB		NA
Insertion Loss Variation Over Rotation	< 2.0 dB	< 3.0 dB	NA
All Versions			
Minimum Return Loss Over Rotation	18 dB, consult factory for higher return loss		
Rotation Speed	To 100 rpm, consult factory for extended range		
Temperature	-40° C to +60° C, consult factory for extended range		
Exterior Surfaces	Stainless steel		
Vibration	Tested to MIL-STD-167-1 (ships) / MIL-STD-810G 514.6		
Shock	Tested to MIL-STD-810G 514.6		
Connectors	As requested		
Pigtail Length	As requested		

- Consult factory for higher channel count
- Consult factory for different fiber types
- Pigtailed FORJ; measured from outside ends of FORJ flanges, does not include shaft torque pins, strain relief, or pigtails
- Mounting holes for Version "C" are 8X #10-24 UNC-2B, .31 [7.9] minimum thread depth

Dimensions Inches [mm]	Version "A"	Version "B"	Version "C"
DIM "1"	Ø2.35 [59.7]	Ø2.72 [69.1]	Ø3.72 [94.5]
DIM "2"	4.22 [107.2]	5.76 [146.2]	6.79 [172.5]
DIM "3"	Ø1.800 [45.72]	Ø2.100 [53.34]	Ø3.100 [78.74]
DIM "4"	Ø.90 [22.9]	Ø1.06 [26.92]	Ø1.56 [39.6]
DIM "5"	Ø1.30 [33]	Ø1.55 [39.4]	Ø2.05 [52.1]
DIM "6"	.31 [8.1]	.32 [8.1]	.32 [8.1]
DIM "7"	Ø.90 [22.9]	Ø1.24 [31.5]	Ø1.48 [37.6]
DIM "8"	.38 [9.6]	.38 [9.6]	.38 [9.6]
DIM "9"	Ø1.650 [41.91]	Ø1.800 [45.72]	Ø2.720 [69.09]

FO300 Dimensions

