



FIBER OPTIC COILS FOR GYROSCOPES

PRELIMINARY

Features:

- High performance for tactical grade, navigation grade and strategic grade Fiber Optic Gyroscopes (FOGs)
- Fully customized design and manufacturing capability
- High symmetry
- High stability and reliability
- Low polarization crosstalk (PM only)
- Low temperature sensitivity / low Shupe error
- Low vibration sensitivity
- Design, testing and integration service available

Applications:

- Fiber optic gyroscopes
- Autonomous vehicles
- Fiber optic delay lines
- Fiber optic current sensing

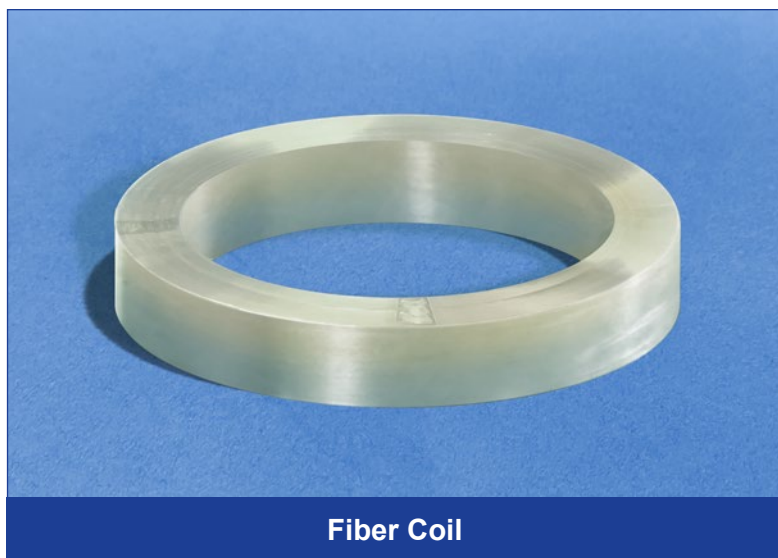
Product Description:

Fiber coils form the heart of fiber optic gyroscopes. Two counter-propagating optical signals generate a phase difference inside the fiber coil proportional to the rotation rate that the coil experiences, a phenomena known as the Sagnac effect. The Sagnac effect is dependent on the length and diameter of the fiber coil. As the length or the diameter of the fiber coil is increased, the sensitivity of the FOG also increases.

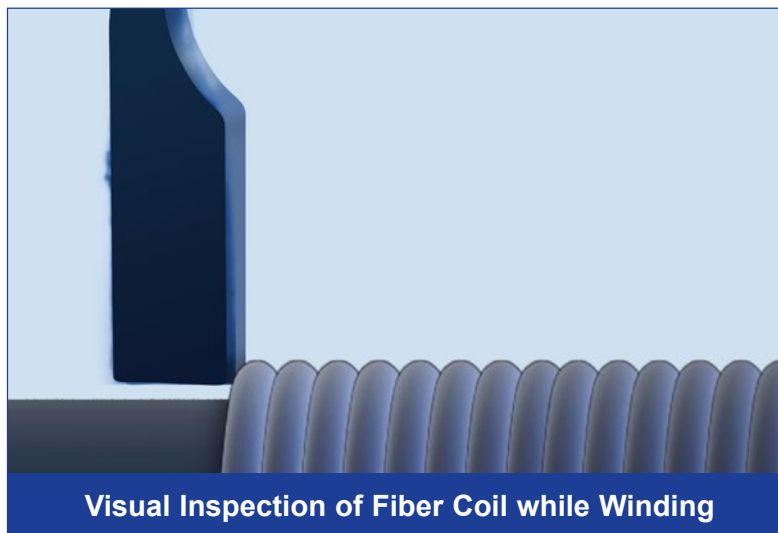
Fiber coils made of stress-induced high-birefringence polarization-maintaining (PM) single-mode fiber give the best performance in FOGs. In PM fiber, most of the power is maintained polarized along the fiber polarization axis, avoiding signal fading. Fiber coils should be carefully wound by special winding machines to minimize thermal and stress gradients and asymmetries. The performance of FOGs is mostly limited by thermally induced bias errors known as the Shupe effect, caused by time-dependent temperature gradients along the fiber coil.

OZ Optics has the capability to design, manufacture and test fully customized fiber coils. OZ Optics uses symmetrical winding methods such as quadrupole winding in order to reduce the Shupe effect. Customers can also request octupole or hexadecapole winding patterns to obtain more sensitive fiber coils. Depending on customer requirements, fiber coils can be manufactured in a wide range of lengths and in different sizes. OZ Optics offers the most optimum solution by using different adhesives suitable for the mechanical properties of different fiber types.

Today, fiber optic gyroscopes are widely used in civilian applications such as autonomous vehicles as well as military applications. OZ Optics offers low-dimensional fiber coils for gyroscopes of autonomous vehicles. Fiber with coating diameters of 100 μm and 135 μm can also be requested. Moreover, OZ Optics' winding machines wind fiber coils with high accuracy and low tension to minimize coil stress.



Fiber Coil



Visual Inspection of Fiber Coil while Winding

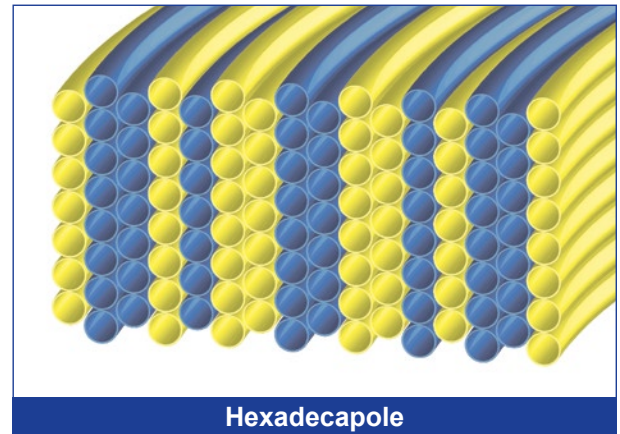
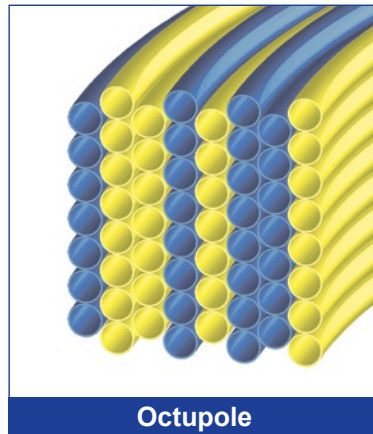
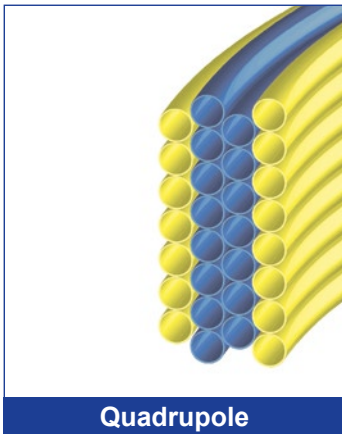
Performance Specifications:

Parameter	Typical Value
Coil types¹	Wet or Dry, Framed or Freestanding
Fiber types	PM or SM
Operating wavelength	840 nm, 1060 nm, 1310 nm, 1550 nm
Fiber length	10 m to 5 km
Fiber diameters	100 μm, 135 μm, 165 μm, 250 μm
Coil inner diameter	15 mm to 120 mm

Note: ¹ Freestanding available for only Wet Coil types

Parameter	Typical Value
Coil height	5 mm to 75 mm
Winding patterns	Monopole, Quadrupole, Octupole, Hexadecapole or Customized
Winding induced IL	< 0.2 dB/km
PER (for PM only)	> 20 dB
Operating Temperature	-40 °C to +80 °C
Storage Temperature	-55 °C to +100 °C

Winding Patterns:



Part Number:

COIL-C-T-P-ID-H-W-F-a/b-JD-L-XY

C = Coil Package
 F: Framed
 N: Freestanding
 (only available with wet option)

T = Coil Type
 W: Wet
 D: Dry

P = Winding Pattern
 M: Monopole
 Q: Quadrupole
 O: Octupole
 H: Hexadecapole
 C: customized

ID = Coil Inner Diameter (in mm)

H = Coil Height (in mm)

XY = Input and Output Connector Types
 X: No Connector
 3A: FC/APC
 3S: FC/SPC
 3U: FC/UPC

L = Length of the Fiber Coil
 (in meters)

JD = Fiber Coating/Jacket Diameter
 (in microns) 100, 135, 165, 250

a/b = Fiber Core/Cladding Diameters
 (in microns)

F = Fiber Type
 P: PM fiber
 S: SM fiber

W = Wavelength (in nm)
 840, 1060, 1310, 1550