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PRECISION FIBER OPTIC COILS FOR GYROSCOPES, DELAY LINES, AND SENSORS

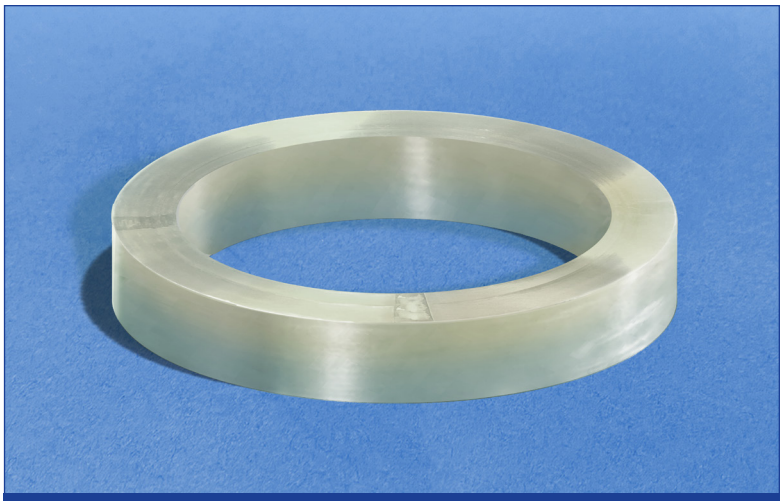
PRELIMINARY

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



Fiber Coil

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.



Visual Inspection of Fiber Coil while Winding

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.

OZ Optics reserves the right to change any specifications without prior notice.

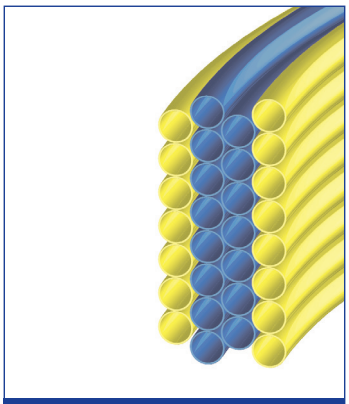
Performance Specifications:

Parameter	Typical Value
Coil types[1]	Wet or Dry, Framed or Freestanding
Fiber types	PM or SM
Operating wavelength	840 nm, 1060 nm, 1310 nm, 1550 nm
Fiber length[2]	10 m to 5 km
Fiber diameters	100 µm, 135 µm, 165 µm, 250 µm
Coil inner diameter	15 mm to 120 mm

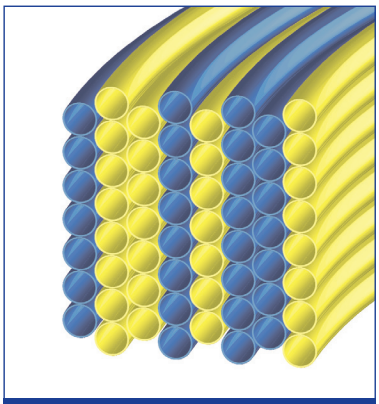
Parameter	Typical Value
Coil height[3]	5 mm to 75 mm
Winding patterns	Monopole, Quadrupole, Octupole, Hexadecapole or Customized
Winding induced IL	< 0.2 dB/km
PER (for PM only)	> 20 dB
Operating Temperature	-40 °C to +80 °C
Storage Temperature	-55 °C to +100 °C

Note: [1] Freestanding available for only Wet Coil types.
[2] Length > 1 km only available in monopole winding.
[3] With 5 mm (small height) length will be limited to less < 50 m.

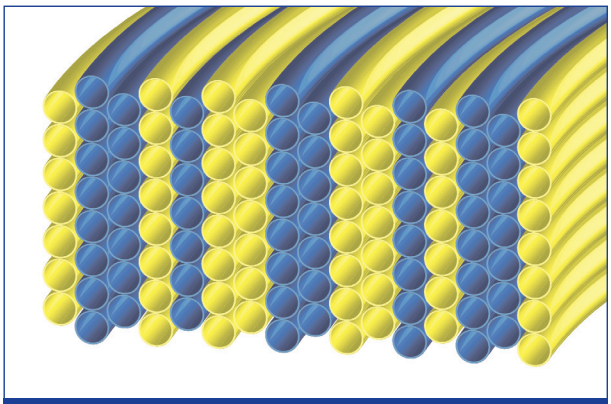
Winding Patterns:



Quadrupole



Octupole



Hexadecapole

Part Number: ***COIL-C-T-P-ID-H-W-F-a/b-JD-L-XY-UL***

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)

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

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

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

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

L = Length of the Fiber Coil (in meters) excluding the tails

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

UL = Uncoiled Length of the Fiber Coil (in meters) on each side