# Fiber Optic Coils For Gyroscopes

DATASHEET

Return to the Webpage

## 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 coils are the core sensing element in fiber optic gyroscopes (FOGs). Two optical signals propagate in opposite directions through the coil, and when the coil rotates, a phase difference develops between the counter-propagating waves due to the Sagnac effect. This phase shift is proportional to the rotation rate and depends on both the length and diameter of the fiber coil; increasing either parameter improves the sensitivity of the gyroscope. High-performance FOGs typically use stress-induced high-birefringence polarization-maintaining (PM) single-mode fiber for the coil. PM fiber preserves the polarization state of the optical signal along its principal axis, preventing polarization fluctuations that can cause signal fading and degrade measurement accuracy. To achieve optimal performance, the fiber must be wound with specialized equipment that carefully controls tension and geometry to minimize thermal gradients, mechanical stress, and structural asymmetries. One of the principal limitations in FOG accuracy is the thermally induced bias drift known as the Shupe effect, which arises from time-varying temperature gradients along the fiber coil. Agiltron designs, manufactures, and tests fully customized fiber coils for gyroscope applications. To reduce thermally induced errors, the company employs symmetrical winding techniques such as quadrupole winding. For applications requiring even higher sensitivity, octupole or hexadecapole winding patterns can also be implemented. Fiber coils can be produced in a wide range of lengths and diameters according to system requirements, and different adhesives are selected to match the mechanical characteristics of specific fiber types.

Fiber optic gyroscopes are now widely used in both civilian and defense systems, including navigation for autonomous vehicles. For compact navigation systems, Agiltron provides low-dimension fiber coils suitable for space-constrained platforms. Fibers with coating diameters of 100 μm and 135 μm are available upon request, and precision winding machines ensure high accuracy and low-tension winding to minimize internal stress within the coil.

## Specifications

| Parameter | Min | Typical | Max | Unit |
|---|---|---|---|---|
| Coil Types [1] | | Wet or Dry, Framed or Freestanding | | |
| Fiber Types | | PM or SM | | |
| Operating Wavelength | | 840, 1060, 1310, 1550 | | nm |
| Fiber Length | 10 | | 5000 | m |
| Fiber Diameters | | 100, 135, 165, 250 | | μm |
| Coil Inner Diameter | 15 | | 120 | mm |
| Coil Height | 5 | | 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 | | +80 | °C |
| Storage Temperature | -55 | | +100 | °C |

**Notes**:
[1]. Freestanding available for only Wet Coil types

RoHS COMPLIANT

**Legal notices:** All product information is believed to be accurate and is subject to change without notice. Information contained herein shall legally bind Agiltron only if it is specifically incorporated into the terms and conditions of a sales agreement. Some specific combinations of options may not be available. The user assumes all risks and liability whatsoever in connection with the use of a product or its application.

Rev 09/22/26

P +1 781-935-1200 E sales@agiltron.com W www.agiltron.com

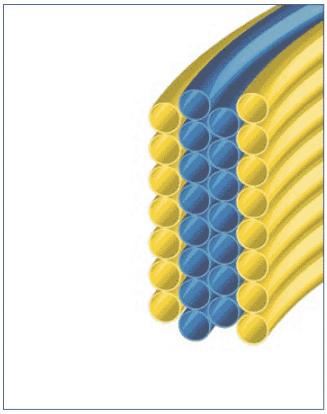
Information contained herein is deemed to be reliable and accurate as of the issue date. We reserve the right to change the design or specifications at any time without notice.
Agiltron is a registered trademark of Optowares Corporation in the U.S. and other countries.

# Fiber Optic Coils For Gyroscopes

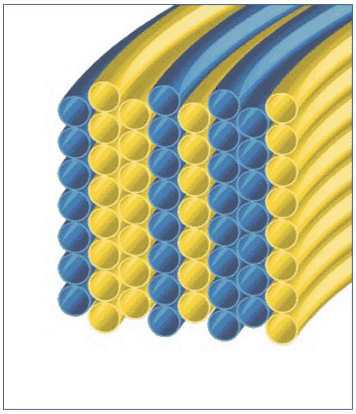
DATASHEET

## Winding Patterns

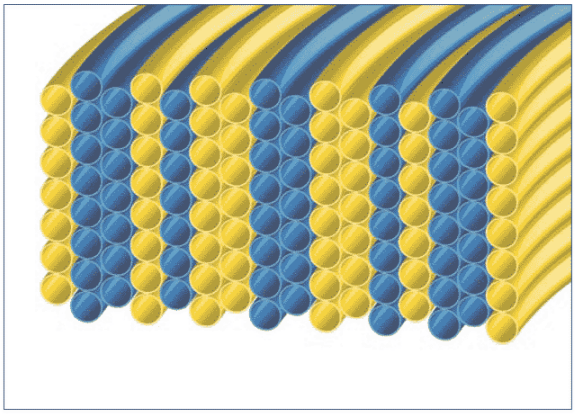
***Quadrupole***



***Octupole***



***Hexadecapole***



## Ordering Information (Part Number)

| | ☐ | ☐ | ☐☐☐ | ☐ | ☐ | ☐☐☐ | ☐☐ | ☐ | ☐ |
|---|---|---|---|---|---|---|---|---|---|
| **Prefix** | **Wavelength** | **Type** | **Length** | **Fiber Type** | **Fiber Outer Diameter** | **Coil Inner Diameter** | **Coil Height** | **Winding Pattern** | **Connector** |
| **FGYC-** | 1550nm = 5<br>1310nm = 3<br>1060nm = 1<br>840nm = 8<br>Special = 0 | Freestanding = 1<br>Framed Dry = 2<br>Framed Wet = 3<br>Special = 0 | 50 m = 005<br>100 m = 010<br>1000 m = 100<br>2500 m = 250<br>5000 m = 500 | SM = S<br>PM = P | 100 µm = 1<br>135 µm = 2<br>165 µm = 3<br>250 µm = 4<br>Special = 0 | 15 mm = 015<br>100 mm = 100<br>120 mm = 120 | 5 mm = 05<br>50 mm = 50<br>Special = 00 | Monopole = M<br>Quadrupole = Q<br>Octupole = O<br>Hexadecapole = H<br>Special = 0 | None = 1 |



Information contained herein is deemed to be reliable and accurate as of the issue date. We reserve the right to change the design or specifications at any time without notice.
Agiltron is a registered trademark of Optowares Corporation in the U.S. and other countries.