

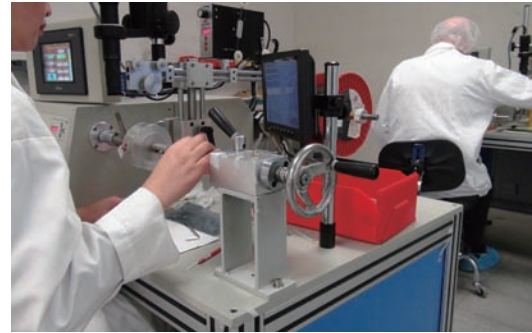
Most Comprehensive winding and testing solutions to ensure the highest quality fiber coils

Start with a proprietary winding system

Our specially designed winding machine and specially formulated potting adhesives, combined with our proven winding process, enable the production of fiber coils of the highest quality.



Automatic Winding Machine

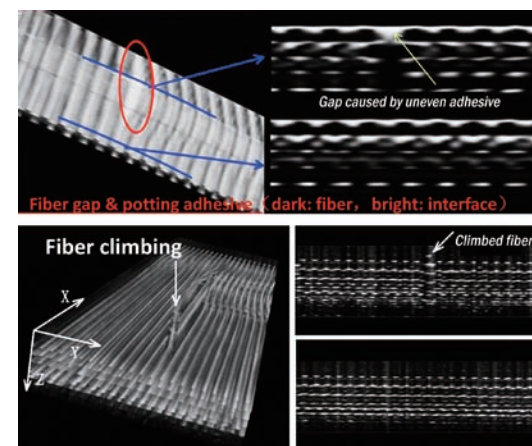


GP's winding machine enables winding with exceptionally stable tension, from the moment it starts to the moment it stops. It is also capable of video monitoring, recording, and fiber axis orientation adjustment, ensuring consistent high quality fiber coil production.



Tension feedback system

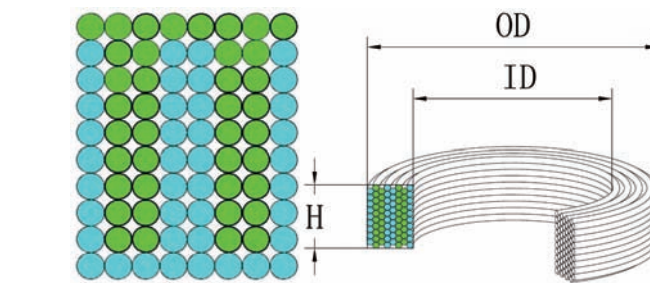
On-line tension regulation—with a tension reading resolution of 0.1 grams, our proprietary tension regulator is able to precisely control the winding tension down to 1 gram, even at the start and stop points of fiber winding, minimizing the lowest polarization crosstalk of the resulting coils.



3D tomographic coil analysis, to ensure highest winding quality, pioneered by General Photonics



Proprietary potting adhesives— By refining our process over thousands of fiber coils, we formulated this special adhesive that balances the temperature and vibration performances of the fiber coils while maintaining manufacturability.

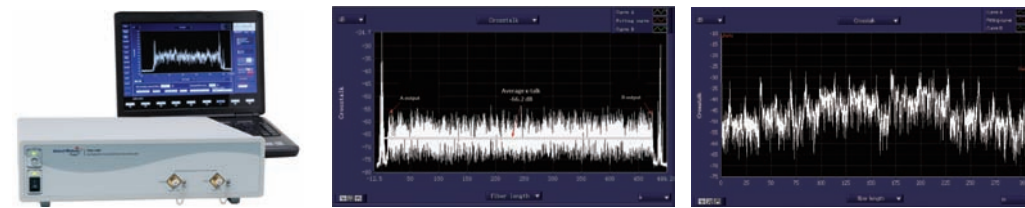


Superb coil production process—Integrating winding techniques with configuration modeling, testing, potting, trimming, and quality assurance. With this process, the performance of the resulting coils generally agrees well with our theoretical analysis, enabling us to continue to improve our quality and make high performance coils at low cost.

Backed by comprehensive testing capabilities

Our comprehensive testing capabilities, combined with our in depth understanding of polarization and the Shupe effect, enable us to turn the making of fiber coils from art to science, ensuring that every coil produced meets our high quality standards and comes with a test data set that fully characterizes the coil.

Distributed polarization crosstalk analyzer (DPXA)



Good coil

Bad coil

This patented instrument can accurately measure the space resolved polarization crosstalk induced by winding stress with a resolution of 6 cm, revealing much more information about the winding quality of the coil than can be obtained from a PER measurement.

Other General Photonics Polarization Measurement Instruments



PSGA Polarization Measurement System

Polarization Extinction Ratio Meter

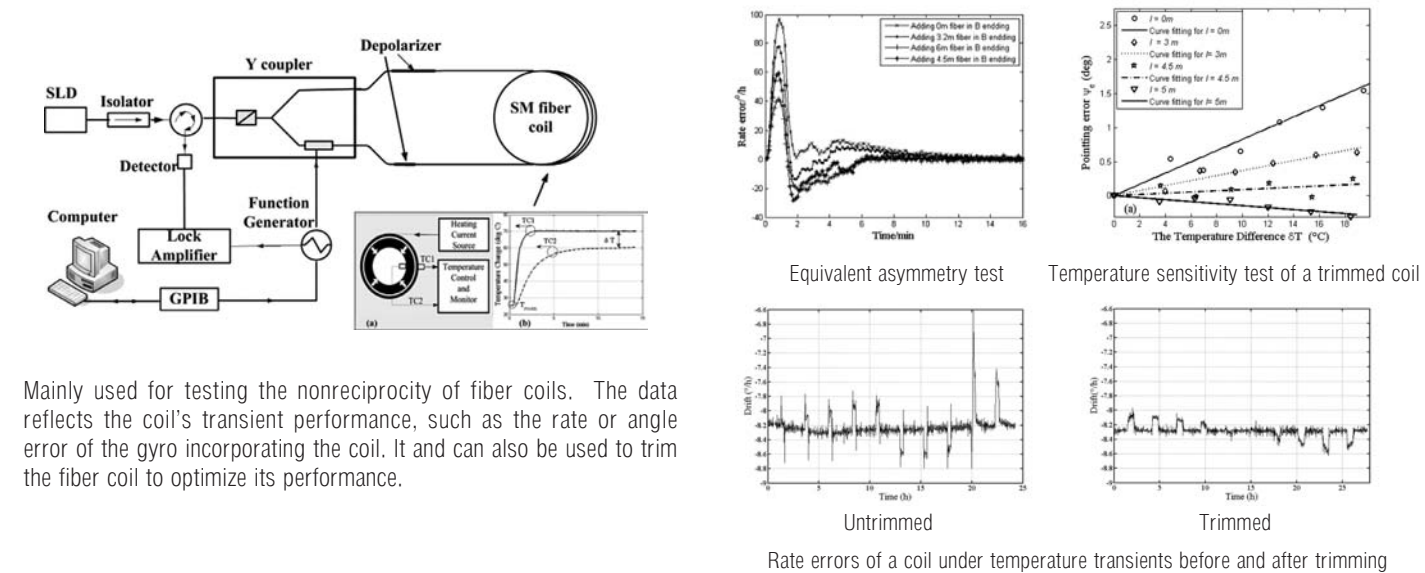
Polarization Dependent Loss Meter

Degree of Polarization Meter

High PER Broadband Source

The polarization performance of the components used in a fiber gyro, whether it is based on a PM or SM fiber coil, directly affects the gyro's performance. General Photonics provides the most complete test suite of instruments for characterizing components, including the coils, to ensure high performance of the resulting fiber optic gyros and current sensors incorporating such components.

Fiber Coil Transient Effect Analysis System (FCTEAS)



Mainly used for testing the nonreciprocity of fiber coils. The data reflects the coil's transient performance, such as the rate or angle error of the gyro incorporating the coil. It can also be used to trim the fiber coil to optimize its performance.

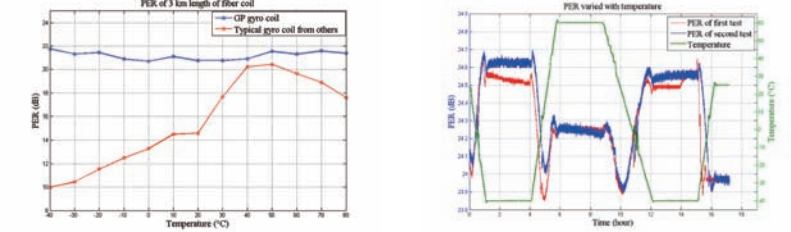
Rate errors of a coil under temperature transients before and after trimming

Result in the highest quality coils

High quality fiber coils require low polarization crosstalk, high environmental stability and superb reciprocity. These three requirements essentially determine the performance of the resulting fiber optic gyro.

High stability

GP's coil production system, including winding machine, potting adhesives, and production process, assures from the start that the various performance data have the lowest fluctuation with the temperature variations, a prerequisite for a high quality coil.

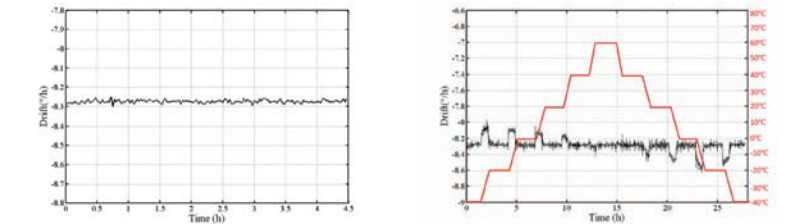


PER vs. temperature of a 3 km coil from GP (blue) and another vendor (Red). PER variation over a 120°C temperature range: <2dB (GP) vs. >10 dB (others)

Typical PER vs. temperature data (Red: 1st test, blue: 2nd test) of a 1.2km coil with PER>24dB and a PER variation of <1dB over a 120 °C temperature range

Superb optical reciprocity

Optical reciprocity is a key performance parameter of a FOG coil and it determines the final accuracy of the resulting gyro. High quality coils must have low bias drift at stable and varying temperatures.



Bias stability of a coil at a fixed temperature: 0.007°/h

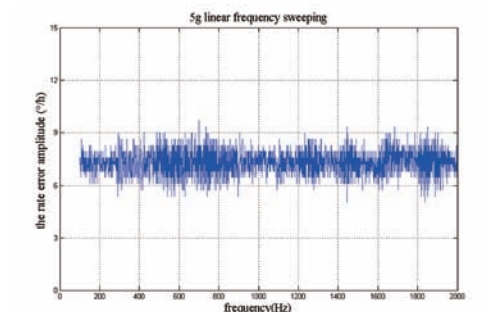
Bias stability subject to step temperature variations at 1 °C/min

Reliability test



General Photonics can also perform the following reliability tests for the coils:

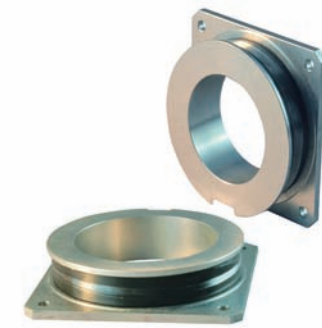
- Swept and random frequency vibration
- Shock test
- High/low temperature
- Temperature shock
- Humidity
- Long term storage



20-2kHz sinusoidal frequency sweep test

INTERNATIONAL DISTRIBUTORS

Types of fiber coils

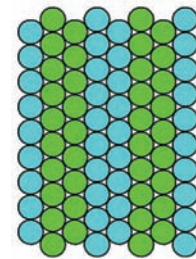


Coils with frame

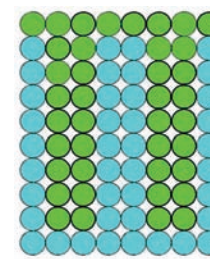


Coils without frame

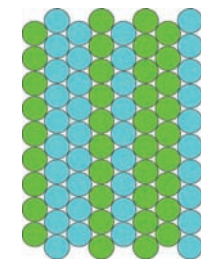
Typical winding patterns



Quadrupole



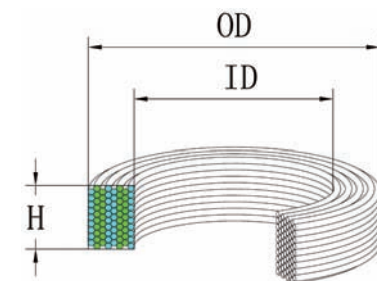
Modified quadrupole



Hexapole

Geometrical parameters

Fiber length L: 6km max.
Outer diameter (OD): >20mm
Inner diameter (ID): <220mm
Coil height (H): <100mm
Number of turns (Z): 300 max.
Number of layers (C): 150 max.



Performance parameters

Static parameters

PM fiber coil:
PER: >20dB/km typical
PER variation over a 120°C temperature range: <3dB
Distributed polarization crosstalk
Winding IL: <0.3dB/km
(Values depend on fiber type and length)

SM fiber coil:
PMD
PDL
DOP

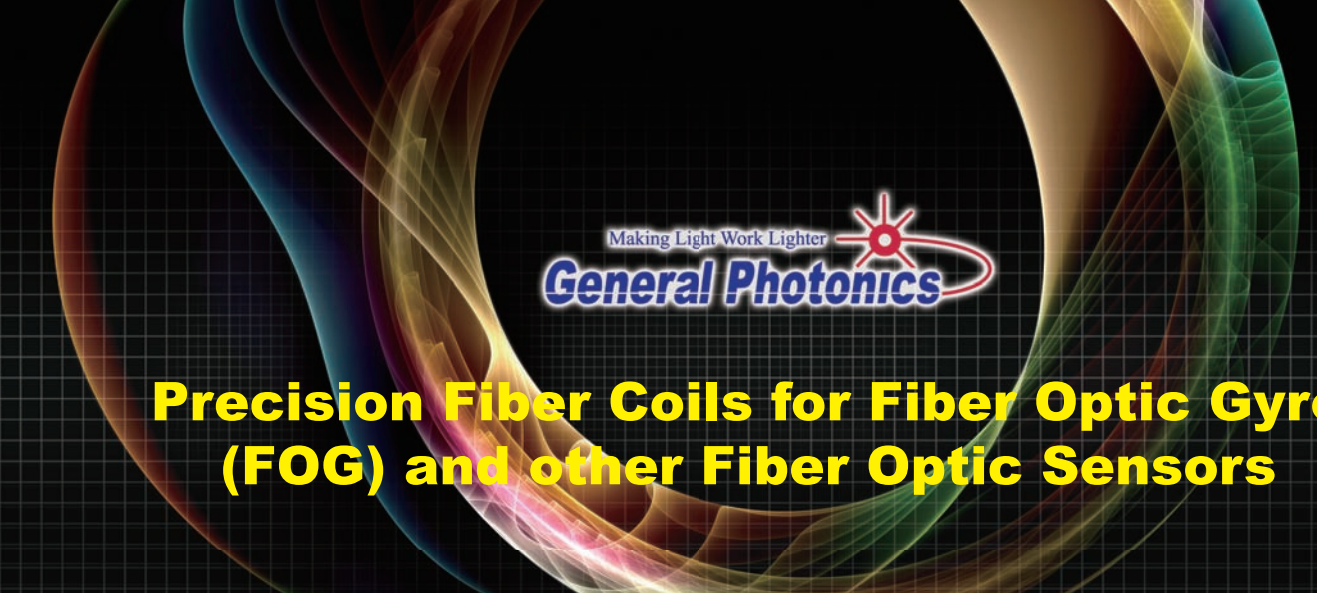
Dynamic parameters

Shupe effect related:
Equivalent asymmetry length
Coefficient of temperature sensitivity
Coefficient of vibration sensitivity

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Precision Fiber Coils for Fiber Optic Gyro (FOG) and other Fiber Optic Sensors

Polarization is a critical parameter for many fiber optic sensing systems, such as fiber optic gyroscope (FOG) and fiber optic current sensors. A fiber coil is a key component in such sensing systems, and its quality directly limits the performances of the sensing systems. Until now, winding fiber coils has been an art, relying on the magical hands of a few skilled technicians.



Minimal tests exist for the characterization of the quality of a coil, making it extremely difficult to ensure the performance of the coils when delivered to the customers.

As the world leader in polarization management, General Photonics is uniquely positioned to solve such a problem. We have devoted significant effort over the past 10 years to finding solutions for complete characterization of the fiber coils. Aided by these testing capabilities, we further developed a coil production system, including the proprietary fiber winding machines, specially formulated adhesives, and proven winding processes to ensure high quality coil production. We are proud to announce that coil winding is no longer

an art, but a science, and that customers can be assured that every coil they purchase meets the demanding performance requirements of their FOG or current sensors.

Visit our website to see the list of our off-the-shelf coils. Feel free to contact us if you have other requirements as to the length, OD, ID, and height of the coils. No particular specification or other information is required. We are confident that the coils we provide with our specifications will meet or exceed your performance requirements.

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