FBG CO-WINDING ASSEMBLY

CS CoWind

Helical & Circular · 3 FBG

CS CoWind is a plug-and-play FBG-based co-winding assembly designed for seamless embedding of fiber optic strain sensors into filament-wound composites, ensuring accurate monitoring of their structural behavior.

Delivered on a compact spool and mounted directly on the head of a filament winding machine, it lets multiple FBG sensing points be embedded within any layer, in the same pass as the reinforcement fiber itself.

Plug-and-play | > 5% strain at breakage | −180°C to +200°C | Ø ~80mm spool | LC/APC

Co-wound, not bonded

The FBG line runs alongside the tow during winding, so the sensor becomes part of the laminate itself, with a direct strain-transfer path from composite to fiber.

Mounts on the machine head

The spool clips directly onto the filament winding head using the CS CoWind kit (with or without magnets), adding no separate process step.

Built for the laminate, not just the surface

High mechanical strength (>5% strain at breakage), insensitive to bending, with a primary coating chosen for good bonding to composite matrices and epoxies.

Configurable to the vessel

Fiber length, lead-in, tubing length, connector type, number of sensing points, FBG wavelength and coating material are all adjustable to customer needs.

HOW IT WORKS

1. **Mount** the CS CoWind spool on the winding head with the CS CoWind kit.
2. **Wind** the FBG line co-wound with the tow, embedding each sensing point within the target layer.
3. **Connect** the LC/APC pigtail and interrogate the sensing points once the part is cured.
4. **Monitor** strain in the direction the CoWind was wound in, for the life of the structure.

TWO WINDING DIRECTIONS

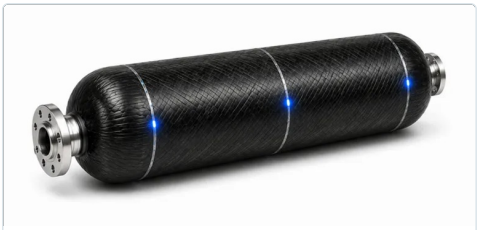
Helical, or circular, on the same platform

Both configurations share the same spool format, kit, and installation method. The choice is about which strain direction you need to see in the finished part.

CS CoWind | HELICAL

Strain measurement in the helical direction, suited for low and/or high angle windings.

FBGs per line	**3**
Lead time	**5–10 days**



CS CoWind | CIRCULAR

Strain measurement in the circular / hoop direction.

FBGs per line	**3**
Availability	**7 SKUs in stock**

HELICAL · WAVELENGTH SETS

CONFIGURATION	CENTRE WAVELENGTHS	PHYSICAL SPACING
Helical #1	1515 / 1522.5 / 1530 nm	0.5 m
Helical #2	1537.5 / 1545 / 1552.5 nm	0.5 m

Available in two separate wavelength bands (#1 and #2), so two helical CoWind lines can be embedded and interrogated together on one fiber network without wavelength clash. Made to order, other wavelengths possible upon request. Typical lead time 5–10 days.

CIRCULAR · IN STOCK CONFIGURATIONS

REFERENCE	FBG SPACING	FIBER LEAD-IN	CENTRE WAVELENGTHS	
CIR#1_s	0.2 m	4 m	1515 / 1522.5 / 1530 nm	● **In stock**
CIR#1_L	0.2 m	8 m	1537.5 / 1545 / 1552.5 nm	● **In stock**
CIR#2_s	0.3 m	4 m	1515 / 1522.5 / 1530 nm	● **In stock**
CIR#2_L	0.3 m	8 m	1537.5 / 1545 / 1552.5 nm	● **In stock**
CIR#3_s	0.5 m	4 m	1515 / 1522.5 / 1530 nm	● **In stock**
CIR#3_L	0.5 m	8 m	1537.5 / 1545 / 1552.5 nm	● **In stock**
CIR#4	0.75 m	8 m	1537.5 / 1545 / 1552.5 nm	● **In stock**

7 references held in stock, ready to ship. Spacing of 0.75 m is only available with the 8 m lead-in. Other spacings, lead-ins or wavelengths on request.

CS CoWind kit

Co-winding tool, with or without magnets, to mount the CS CoWind spool directly on the winding head.

View the kit →

SPECIFICATIONS, ESTABLISHED

Common to Helical and Circular

Core fiber and sensing parameters are shared across all CS CoWind configurations. Wavelength sets and spacing differ as shown on the previous page.

PARAMETER	VALUE
FBG length	3 mm
Number of FBGs / line	3
Cladding diameter	125 µm ± 1 µm
Coating type	ORMOCER®
Coated fiber diameter	195 µm
Strain at breakage	> 5% strain
Temperature sensitivity ($\Delta\lambda/(\lambda\times T)$)	6.5×10^{-6} K^{-1}
Strain sensitivity ($\Delta\lambda/(\lambda\times\varepsilon)$)	7.8×10^{-7} µε
Operational temperature range	−180°C … 200°C
Tubing material	FEP
Tubing diameter	0.9 mm
Tubing length (customized)	Typical 0.5–1 m
Strain resolution[1]	0.85 µε
Strain precision[1]	1.7 µε
Strain range	1% (long term) · 5% (short term)
Connector type	LC/APC
Spool diameter	Ø ~80 mm

[1] Using a depolarized measurement device with a 1 pm wavelength resolution and precision. Operating temperature range applies to the fiber; connector-rated range is lower.

CUSTOMIZABLE

ADJUSTABLE ON REQUEST
Fiber length, lead-in, tubing length

ADJUSTABLE ON REQUEST
Connector type

ADJUSTABLE ON REQUEST
Number of sensing points

ALSO ADJUSTABLE

ON REQUEST
FBG wavelength

ON REQUEST
Coating material

ORDERING

CIRCULAR
7 SKUs in stock, ready to ship

HELICAL
#1 / #2, made to order, 5–10 days