

# COMPOSIFLEX SPRINGS

## HIGH PERFORMANCE COMPOSITE SPRINGS

Composiflex designs and manufactures a variety of E-glass/epoxy, carbon/epoxy and high temperature glass/epoxy FlexPLY™ springs for numerous industrial equipment applications such as vibratory conveyors. Both cross-ply and unidirectional constructions are available. FlexPLY™ springs can be used as direct replacements for 3M springs.

**FlexPLY™**  
SUPERIOR PERFORMANCE COMPOSITE SPRINGS

*FlexPLY™ springs have been proven under demanding fatigue test conditions and have performed to our customers' highest standards.*



Composite springs can also be an effective replacement for steel springs, offering advantages such as:

- Increased fatigue life
- High strength to weight ratio
- Tensile strength
- "Customizable" spring rates by varying material construction (fiber/orientation/volume, etc.)
- Corrosion resistance (both chemical & moisture)
- Customizable shapes
- Low notch & scratch sensitivity (toughness)
- Variable modulus of elasticity
- Damping characteristics
- Consistent spring rate (from part-to-part and over cycle life) Noise reduction



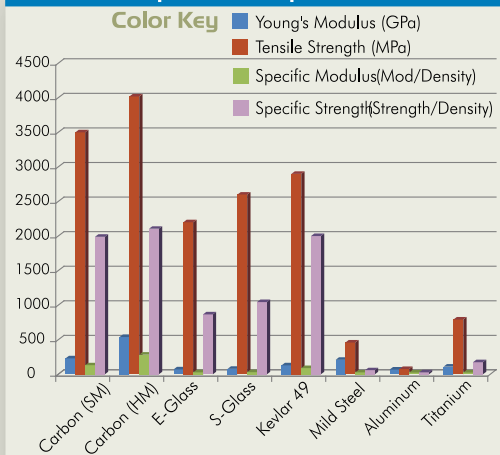
Photos courtesy of Webster Industries and Valley Welding & Machine Works © 2009

### Stress Test

FlexPLY™ carbon/epoxy springs perform extremely well in high stress and start/stop conditions. Our success results in part from our use of a high performance epoxy resin. This tough, high elongation resin demonstrates excellent fatigue properties. Although it is a 250° F resin system, the material is able to withstand non-operating temperatures as high as 300° F for short periods. No permanent change in material properties will result from this exposure when normal operating temperatures (up to 150° F) resume. E-glass fibers and carbon fibers, pre-impregnated with resin, can be conveniently layed up into a variety of constructions.

High temperature FlexPLY™ glass/epoxy springs are available to meet requirements up to 300°F in some cases. (Check with Composiflex.) These high temperature springs maintain their physical properties to much higher temperatures than the standard glass/epoxy or carbon/epoxy designs.

### Material Properties Comparison Chart



**COMPOSIFLEX**

is fully integrated to include lay-up, process, machining, finish, and assembly of advanced composite products.

# COMPOSITE SPRINGS

## Strength Test

Composiflex's stringent test program reliably quantifies the properties and performance of our spring material. The standard E-glass springs have been formally tested by an independent laboratory. Results of a bending test for flexural strength and modulus (ASTM D790-A) are presented in the table to the right. Interlaminar shear properties (ASTM D-2344) were also tested.

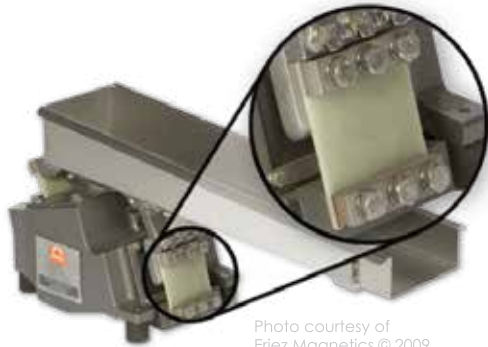


Photo courtesy of  
Eriez Magnetics © 2009

### Flexural strength and shear test

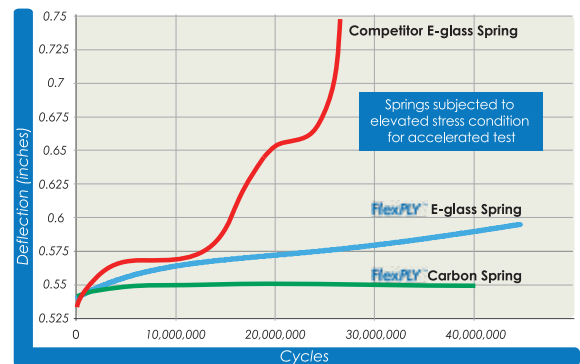
# of Plies	Flexural Modulus (Msi/GPa)*	Flexural Strength (ksi/MPa)*
9	3.8/26.1	123/850
19	4.2/29.2	130/896
25	4.5/31.3	135/931
31	4.6/31.6	129/886
44	4.8/33.3	115/789
1 ply =.01"	Based on 16:1 span to depth ratio	

Carbon/epoxy data available. Contact Composiflex.  
\* based on unidirectional spring orientation lay-ups only

## Fatigue Test

Spring stiffness is an important design parameter in a vibrating system. Although a small amount of variation is generally taken into account at the design stage, consistency of stiffness over a spring's cycle life translates to optimal system performance. And longer cycle life translates into less maintenance downtime - and lower total cost over the life of the equipment. The chart shows two important characteristics of FlexPLY® springs:

- 1 FlexPLY® E-glass springs offer a significant advantage over competitive E-glass springs with regard to consistency of stiffness after cycling. FlexPLY® carbon springs are the ultimate choice for minimizing change in spring stiffness over cycle life.
- 2 FlexPLY® springs last longer!



## Production Processes

The optimal production process choice is based upon final part specifications and production volume. Standard production options include:



**Curing (Autoclave, Press and Oven):** Cured computer-controlled and recorded heat and pressure.



**Resin Transfer Molding (RTM)/VARTM and Light RTM:** Mold process that combines fibers and resin.



**Filament Winding:** Resin coated fibers wound on rotating mandrel.



**Engineering:** Analysis and testing to support your project.



**Press Molding:** Compression molded parts or flat panels.



**Tooling/Prototype:** Production and prototype tooling options available.



**Machining:** In-house CNC machining controls costs and lead time.



**Finishing & Other:** Surface prep, painting/coating, and other processes including final assemblies, sub-assemblies, and kits can be created.

Visit [composiflex.com](http://composiflex.com) for more detailed information. Our experienced engineering staff is available for your technical assistance. Please call 800-673-2544 or e-mail us at [info@composiflex.com](mailto:info@composiflex.com).



**Nadcap Accredited Composites**  
**ISO 9001 Certified**  
**AS9100 Certified**

For more than 40 years, Composiflex has been an innovator in the design and manufacture of advanced high-performance composites. Specializing in custom designs, Composiflex currently serves the medical, military, aerospace, ballistic protection, industrial and recreational markets. Composiflex conducts operations in Erie, PA, USA.

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