FUSION M® CRUISING

PHOTO CREDITS: Billy Black (cover)

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888.773.4889
WWW.QUANTUMSAILS.COM

Membrane Sails

Sail Shape
Define geometry of the sail and create mold shape using 3D design program and extensive database of boat and sail types.

Aerodynamic Analysis
Compute and visualize aerodynamic forces, wind angles and velocities, and the distribution of air pressure using computational fluid dynamic (CFD) calculations.

Structural Analysis and Fiber Mapping
Evaluate stresses and strains on the sail, rig, and rigging with finite element analysis (FEA) and materials data to determine optimal flying shape and fiber layout.

Output Design
Adjust and refine all elements of the sail design and structure to achieve optimal shape, structure, fiber type, and layout for the finished product. Transfer precise construction specifications to the manufacturing team.

Manufacturing
Build sails following stringent and precise manufacturing standards and proprietary procedures for optimal quality.

Verification
Validate advancements in design technology and the iQ process through on-the-water testing.

Quantum Sail Design Group

MEMBRANE SAILS
Quantum is the first sailmaker to offer a complete range of composite sails with membrane construction specifically for cruising sailors. Quantum’s cruising Fusion M® sails are developed using the most technically advanced design, laminating, and shaping methods in the industry—a proprietary and integrated process known as iQ Technology®. Fusion M® cruising sails are fast, easy to handle, efficient, and capable of taking you across the bay or around the world.

More Fiber in More Directions
Fusion M® sails are engineered as full-size membranes and are designed with a fully-integrated, custom fiber network that addresses sail loading equally in all directions rather than along primary load paths only. This fiber map is developed using highly sophisticated finite element analysis (FEA), which recognizes the ever-changing nature of sail loads and the need for adaptability. The resulting fiber network is complex and very dense, creating a structural system that supports the entire sail because there is consistent stretch in all directions (referred to as “isotropic”). The Fusion M® isotropic fiber matrix prevents any one part of the sail from becoming overloaded or distorted. The net result is a sail shape that lasts longer and is easy to trim through a wide range of conditions because it changes evenly and uniformly.

Superior Lamination
Our two-step lamination process uses vacuum bagging to lock fibers in place between film layers. Infrared heat is then applied with six-to-eight tons of pressure (12,000psi – 16,000psi) to thermo-set the adhesives and produce a membrane four to five times stronger than other laminates. Films are coated with UV inhibitors to insure protection, longevity, and performance.

Post-cured Shaping
Unlike single-step lamination and shaping methods used by other sailmakers, Quantum’s sail panels are completely cured before the shaping process begins. Fully-cured lamination eliminates the effects of shrinkage and guarantees repeatability. Quantum’s Fusion M® sails have the best initial shape and the longest shape life of any sail built today, without sacrificing durability and reliability that is the fundamental performance requirement of a good cruising sail.

Fiber Options to Fit Your Needs
Fusion M® cruising sails are available with different types of fiber, providing a range of options for different size boats and sailing requirements. As illustrated by this chart, fiber properties like initial modulus, tenacity, and UV resistance are key in determining the right fiber for your sail. Quantum’s sailing pros can help you make the right selection.

**FIBER SELECTION CHART**

<table>
<thead>
<tr>
<th>Initial Modulus</th>
<th>Tenacity</th>
<th>Flex Life</th>
<th>UV Resistance</th>
<th>Elongation to Break</th>
</tr>
</thead>
<tbody>
<tr>
<td>The fiber’s ability to resist stretch. This indicates how well the fiber will perform in terms of holding sail shape. The higher the rating the better the fiber will stretch.</td>
<td>A measure of strength lost due to bending, folding, or flogging. The higher the rating the more the material will resist this form of stress.</td>
<td>A measure of the fiber’s ability to resist shock load, elastic stretch resistance.</td>
<td>A measure of the fiber’s ability to resist UV exposure.</td>
<td>A measure of the fiber's ability to resist shock loads, elastic stress resistance.</td>
</tr>
<tr>
<td>High Tenacity Carbon Fiber</td>
<td>100% Carbon, 100% Technora®</td>
<td>50% Carbon, 50% Technora with Mylar® film and taffeta exterior on both sides</td>
<td>Black and gold fibers with protective outer layers of white taffeta</td>
<td>All black fiber with protective outer layers of white taffeta</td>
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**Superior Technology for Unsurpassed Sails**
Fusion M® sails have the best initial shape and the longest shape life of any sail built today, without sacrificing durability and reliability that is the fundamental performance requirement of a good cruising sail. Quantum’s Fusion M® sails are developed using the most technically advanced design, laminating, and shaping methods in the industry—a proprietary and integrated process known as iQ Technology®. Fusion M® sailing sails are fast, easy to handle, efficient, and capable of taking you across the bay or around the world.

These Grand Prix sails feature a blend of 50% Carbon, 50% Technora® to deliver superior control over heel and weather helm while maintaining upwind performance.

For added durability, these sails feature taffetas on both sides.

**FIBER SELECTION CHART**

<table>
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<tr>
<th>Fiber</th>
<th>Description</th>
<th>Sails in Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Tenacity Carbon Fiber</td>
<td>50% Carbon, 50% Technora with Mylar® film and taffeta exterior on both sides</td>
<td>MC 6500 Boat Length: 60' - 100'</td>
</tr>
<tr>
<td>Technora®</td>
<td>Black and gold fibers with protective outer layers of white taffeta</td>
<td>All black fiber with protective outer layers of white taffeta</td>
</tr>
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**SAIL SELECTION CHART**

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<th>6000 Series</th>
<th>4000 Series</th>
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<tr>
<td>8000 Series</td>
<td>60% Polyester, 40% Carbon</td>
<td>35% Carbon, 65% Technora®</td>
<td>70% Carbon, 30% Technora®</td>
</tr>
<tr>
<td>6000 Series</td>
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<td>All black fiber with protective outer layers of white taffeta</td>
<td>100% Polyester with protective outer layers of white taffeta</td>
</tr>
<tr>
<td>4000 Series</td>
<td>100% Carbon fiber with protective outer layers of white taffeta</td>
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**CRUISING FIBERS**

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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>MC8500</strong></td>
</tr>
<tr>
<td><strong>Technora®</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>$555</strong></td>
<td><strong>MC6700</strong></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
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<td><strong>$555</strong></td>
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<tr>
<td><strong>High Tenacity Polyester</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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**CORRUGATED COATING**

**INHALED HEAT**

**INFRARED PRESSURE**

**CROSS-LINKED MOLECULAR STRUCTURE**

**POST-CURED SHAPING**

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**FIBER KEY**

- **VECTRAN**
- **CARBON**
- **TECHNORA**
- **POLYESTER**

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**Superior Technology for Unsurpassed Sails**

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**FIBER SELECTION CHART**

- **8000 Series**
  - **Description**: These Grand Prix sails feature a blend of 50% Carbon, 50% Technora® to deliver superior control over heel and weather helm while maximizing upwind performance. For added durability, these sails feature taffetas on both sides.
  - **Boat Size**: 60’ - 100’
  - **Construction**: Membrane
  - **Material/Fiber**: 50% Carbon, 50% VECTRAN® with Mylar® film and taffeta exterior on both sides
  - **Sail Color**: Black and gold fibers with protective outer layers of white taffetas
  - **Strength/Weight Ratio**: *****
  - **Ease of Trim**: ****
  - **Control of Heat**: ****
  - **Upwind Performance**: ****
  - **Wind Range Versatility**: ****
  - **UV Resistance**: ****
  - **Roofting**: ****
  - **Furling**: ****
  - **Durability**: ****
  - **Optimal Shape Retention**: **$5,555**
  - **Cost**: **$5,555**
  - **Sails in Series**: **MC8500**

- **6000 Series**
  - **Description**: These Evolution Series sails offer a blend of 70% Carbon, 30% Technora®/Carbon blend. The fiber composition varies primarily by boat size. In all cases, what you get is a lightweight Fusion M® sail with superior, all-around performance in a range of wind conditions. Versatility is key; with excellent ease of trim, roothing, furling, and durability, for added durability, these sails feature taffetas on both sides.
  - **Boat Size**: 25’ - 45’
  - **Construction**: Membrane
  - **Material/Fiber**: 70% Carbon, 30% Technora®/Carbon blend with Mylar® film and taffeta exterior on both sides
  - **Wind Range Versatility**: ****
  - **UV Resistance**: ****
  - **Roofting**: ****
  - **Furling**: ****
  - **Durability**: ****
  - **Optimal Shape Retention**: **$5,555**
  - **Cost**: **$5,555**
  - **Sails in Series**: **MC6700**

- **4000 Series**
  - **Description**: Designed for small to mid-size cruisers, the 4000 combines the rugged, reliable performance of polyester fiber with state-of-the-art Fusion M® construction. For added durability, these sails feature taffetas on both sides.
  - **Boat Size**: 25’ - 45’
  - **Construction**: Membrane
  - **Material/Fiber**: 100% Polyester fiber with Mylar® film and taffeta exterior on one or both sides
  - **Wind Range Versatility**: ****
  - **UV Resistance**: ****
  - **Roofting**: ****
  - **Furling**: ****
  - **Durable**: ****
  - **Optimal Shape Retention**: **$55**
  - **Cost**: **$55**
  - **Sails in Series**: **MC4000**
Sail Shape
Define geometry of the sail and create mold shape using 3D design program and extensive database of boat and sail types.

Aerodynamic Analysis
Compute and visualize aerodynamic forces, wind angles and velocities, and the distribution of air pressure using computational fluid dynamic (CFD) calculations.

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