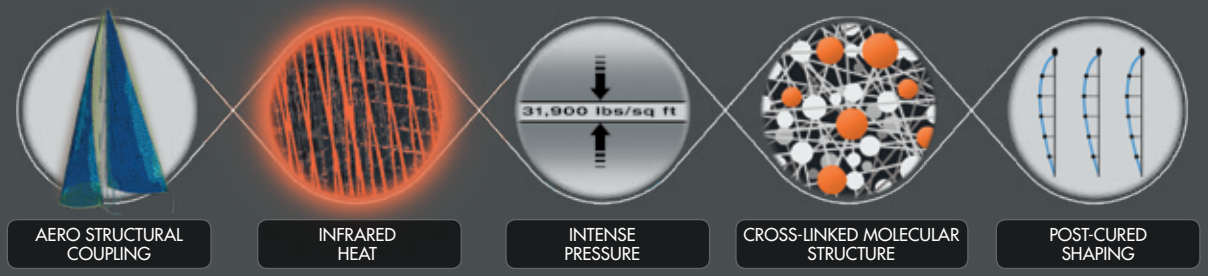
FUSION M® CRUISING MEMBRANE SAILS

QUANTUM®
SAIL DESIGN GROUP

What Makes Fusion M® Membrane Sails So Great?



Quantum is the first sail maker 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, lamination, 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 the durability and reliability that is the fundamental performance requirement of a good cruising sail.

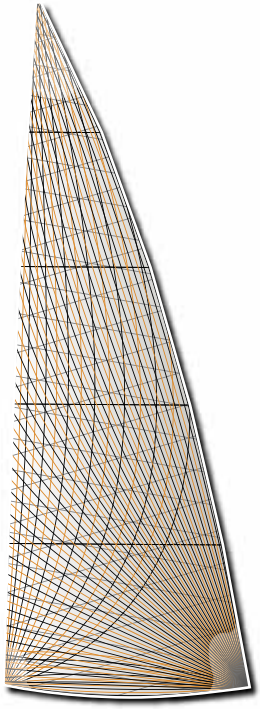
Fiber Options to Fit Your Needs

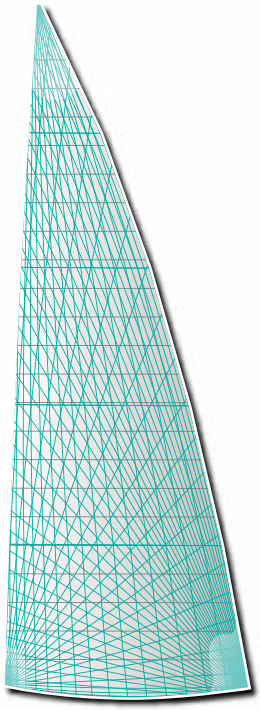
Fusion M® cruising sails are available with different types of fiber, providing a range of options for different size boats and sailing requirements. As illustrated by this chart, fiber properties like initial moldulus, tenacity, and UV resistance are key in determining the right fiber for your sail.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

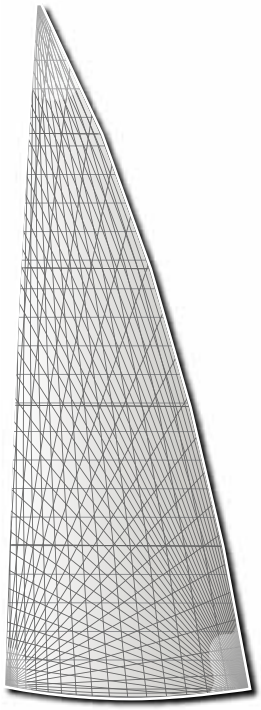
FIBER SELECTION CHART

	Initial Modulus	Tenacity	Flex Life	UV Resistance	Elongation to Break
	The measure of a 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 less the fiber will stretch.	The fiber's initial breaking strength. A good measure of a fiber's ultimate tensile strength. The higher the rating the more load it takes to break the fiber.	A measure of strength lost due to bending, folding, or flogging. The fiber's ability to retain its strength after being folded back and forth over several cycles. The lower the rating the better the flex life.	Strength loss from exposure to the sun's UV rays. This is a measure of the effect of sunlight on the modulus (strength) of the fiber. The higher the rating the better the UV resistance.	A measure of the fiber's ability to resist shock loads; elastic stretch resistance. Analogous to the stiffness in a spring. Higher ratings mean more stretch and resistance to breakage.
	CRUISING FIBERS				
High Tenacity Carbon Fiber	★★★★★	★★★★★	★★★	★★★★★	★★★
Technora®	★★★★	★★★	★★★★	★★★★★	★★★★
Vectran®	★★★★★	★★★★★	★★	★★	★★★
High Tenacity Polyester	★★	★★	★★★	★★★	★★★

SAIL SELECTION CHART







	8000 Series	6000 Series	4000 Series
Description	These Grand Prix sails feature a blend of 50% Carbon 50% Vectran® to deliver superior control over heel and weather helm while maximizing upwind performance. For added durability, these sails feature taffeta on both sides.	The sails in this series feature all Technora® fiber or a Technora®/Carbon blend. The fiber composition is driven 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, reefing, furling, and durability. For added durability, these sails feature taffeta on both sides.	Designed for small to mid-size cruisers, the 4000 combines the rugged, reliable perfomance of polyester fiber with state-of-the-art Fusion M® construction. For added durability, these sails feature taffeta on both sides.
Boat Size	60' +	30' - 100'	25' - 45'
Construction	Membrane	Membrane	Membrane
Material/Fiber	50% Carbon, 50% Vectran with Mylar® film and taffeta exterior on both sides.	70% Carbon, 30% Technora with Mylar® film and taffeta exterior on one or both sides.	100% Polyester fiber with Mylar® film and taffeta exterior on one or both sides.
Sail Color	Black and gold fibers with protective outer layers of white taffeta	All black fiber with with protective outer layers of white taffeta	All black fiber with with protective outer layers of white taffeta
Strength/Weight Ratio	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★
Ease of Trim	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★ ★ ★
Control of Heel	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★
Upwind Performance	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ★
Wind Range Versatility	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★
UV Resistance	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★
Reefing	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★
Furling	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★
Durability	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★
Optimal Shape Retention	◷ ◷ ◷ ◷ ◷	◷ ◷ ◷ ◷ ◷	◷ ◷ ◷
Cost	$$$$$	$$$$$	$$$
Sails in Series	**MC8500** Boat Length: 60+ Fiber: 50% Carbon/50% Vectran	**MC 6700** Boat Length: 60' - 100' Fiber 70% Carbon/30% Technora® **MC 6500** Boat Length: 40' - 70' Fiber: 50% Carbon/50% Technora® **MC 6000** Boat Length: 30' - 60' Fiber: 100% Technora®	**MC 4000** Boat Length: 25' - 45' Fiber: 100% Polyester

FIBER KEY

- VECTRAN
- CARBON
- TECHNORA
- POLYESTER

iQ® technology

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 propietary procedures for optimal quality.

Verification

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

Extended Warranty

Quantum stands behind its sails with one of the best warranties in the business.

Here's how it works:

All new Quantum® cruising sails sold in the United States come with a complete one-year warranty. To extend your existing warranty beyond this initial coverage, simply take your sails in for service to any authorized Quantum® loft. You will be charged for routine annual maintenance. The Quantum service technician will examine the sail and, assuming it has not been abused and suffered unusual wear, the technician will re-certify the sail for another one-year period. This procedure may be repeated at the end of year two, for a maximum of three years coverage.

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