

# ALL ABOUT SAILCLOTH



Technical Innovation and Service - The Fabric of Our Business

## 1 All About Sailcloth

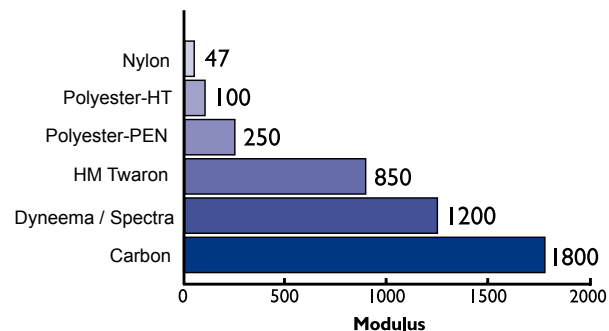


### Q Nylon in spinnakers, polyester replacing cotton, what about Kevlar, Twaron and Carbon?

**A** Polyester is still the best all round fibre for most woven and laminated cruising fabrics, as it is durable, strong and good value. However, since the introduction of Polyester many new and exciting fibres have become available including Kevlar, PEN, Dyneema / Spectra, HM Twaron, Technora aramids and Carbon. In more demanding applications, such as racing and offshore cruising, the strength of these fibres can create a far superior fabric.

Look how HM Twaron has 8.5 times the modulus of Polyester while Dyneema / Spectra and Carbon are half as strong again! Use of these exotic fibres in laminated sailcloth has led to progressively stronger and lighter sails. However, the downside of this incredible performance is higher cost and potentially, reduced sail life.

To reduce this problem many of our high performance laminates use a mix of up to 3 different fibres, each of which contributes its own attributes to the finished fabric. For example, our DIAX-OS-HMT styles use HM Twaron warp and fill yarns for excellent stretch resistance and alternate Polyester fill yarns to provide support and flex strength. This leading edge technology has allowed us to produce race winning high performance laminates with extended competitive life.



### Q So, sailcloth really does make a difference?

**A** Quality cloth is always a good investment in terms of performance and durability and it is usually worth buying the best you can within your budget. We would recommend you ask your Sailmaker for details of what he is using for your sails and why, so when comparing quotes you can make sure they are like for like. Our product leaflets offer further information on the Bainbridge range of cloth and are available with samples from your sailmaker. For more information visit [www.sailcloth.com](http://www.sailcloth.com)

- AIRX: Bainbridge's brand name for a superior range of performance spinnaker nylons.
- Bias: A diagonal across a piece of fabric at 45-degrees to the warp and fill.
- Carbon: An extreme performance fibre used extensively in composite engineering and recently introduced to the sailcloth market.
- Creep: The property of fibres to gradually stretch under a constant load.
- Crimp: Length or waviness added to a yarn when it is woven over-and-under in a piece of fabric. Crimp can contribute to the elongation of a fabric under load.
- Dacron: DuPont's trade name for polyester fibre.
- Denier: A system for coding filament yarns and fibres, with low numbers representing finer sizes and higher numbers representing heavier yarns.
- DIAX: Bainbridge's brand name for laminates with a 45-degree diagonal scrim.
- DIAX2: Bainbridge's new brand of double DIAX reinforced cross cut race and cruise laminates.
- Dyneema: Super strong polyethylene fibre made by DSM, up to 40% stronger than aramid fibres. Also resistant to UV and moisture.
- Elongation: The difference between the length of a stretched sample and its initial length; expressed in 1/100ths of an inch.
- Fibre: Strand of material used to spin into a yarn.
- Fill: The yarn or fibre running across the width of the fabric at right angles to the warp.
- Gsm: Weight in grams of a square metre of cloth.
- Hand: Softness or firmness of a fabric.
- Kevlar: DuPont's trade name for a family of high-strength aramid fibres.
- Laminate: A layered fabric made by bonding scrim and/or taffetas to one or two plies of film.
- LP: DIAX2 Load Path - The new sail assembly technology that combining DIAX2 laminates and full length Load Path bearing fibres.
- LSP: Name for DIAX laminates using Pentex fibres.
- Modulus: The measure of stretch or elasticity of a fabric. High Modulus = low stretch.
- MP: Bainbridge's brand name for a range of multi - purpose spinnaker fabrics.
- PEN: Modified polyester with 60% less stretch. Sometimes called Pentex.
- Polyester: A strong, reliable and inexpensive fibre ideal for cruising and low-tech racing laminates, and woven sailcloth.
- Primary Yarn Direction: The orientation (warp or fill) in which a fabric is the most stretch resistant.
- Sailmakers Ounces (smoz): Weight of a 36" x 28.5" piece of cloth.
- Scrim: Non woven, formed sheet of yarns held together with resin.
- Spectra: A highly modified polyethylene fibre developed by Allied Corp.
- Taffeta: A light woven fabric used on laminates to add durability and abrasion resistance.
- Tenacity: The breaking strength of a yarn or fabric stated in force per unit of the cross-sectional area.
- Tensile Strength: The ability of a fibre, yarn or fabric to resist breaking under tension.
- Threadline: The direction of the yarns.
- Technora: Aramid fibres with lower modulus but higher durability than Twaron.
- Twaron: Family of aramid fibres made by Akzo and used in Bainbridge DIAX-HMT racing laminates.
- Warp: The yarn or fibre running the length of a fabric.

With a full range of sailcloth, sailmakers hardware and a global sales and support network, Bainbridge is uniquely qualified and committed to supplying the world with the finest quality materials. Founded in 1917, Bainbridge International is one of the longest established sailcloth manufacturers in the world with almost a century's experience in developing and supplying the highest quality, highest performance materials to the marine industry.

Bainbridge has always been at the forefront of technical developments within the world of sailcloth. Through the skills of the technical team, we have developed a number of products including AIRX Performance Spinnaker Fabrics, MP Multi-Purpose Spinnaker Fabrics, DIAX Laminated Sailcloth and SAILMAN Full Batten Systems. These have been used by many high profile campaigns including America's Cup, Vendee Globe, Volvo 60 and BT Global Challenge.

#### Leaflets in the Range

There are other leaflets in the range that offer advice on our other sailcloth ranges and our SAILMAN Full Batten Systems. These are available from your Sailmaker.

#### [www.sailcloth.com](http://www.sailcloth.com) - 5 simple steps to better sails

We have developed an easy to use website that offers advice and recommendations about the correct sailcloth for your needs. With 5 simple steps to follow, you can develop an understanding for the benefits of the sailcloth styles we offer and comprehend which one meets your needs.

#### Partnership

Your Sailmaker is the essential link between our fabric technology and your boat. They offer Bainbridge fabrics because of the inherent trust that the excellence of their workmanship, combined with the quality of our products, will provide you, the Customer, with the best possible value and performance.

Bainbridge® is a registered trademark of Bainbridge International Ltd. AIRX™, DIAX™, MP™, and SAILMAN™ are trademarks of Bainbridge International Ltd.



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## A GUIDE TO SAILCLOTH



# ALL ABOUT SAILCLOTH

## A GUIDE TO SAILCLOTH

Frequently asked questions about fabrics, design and manufacture

### Understanding Sailcloth

When you talk to your Sailmaker about your sails how much time do you spend discussing the sailcloth he is going to use? We hope this guide will give you an insight into sailcloth design and manufacture, and answer a few questions you may have about the fabrics your Sailmaker has selected for your sails.

### Q Why do I need a new sail?

**A** Your Sailmaker designed the ideal shape for your boat, the type of sailing you enjoy and your local conditions. Over time your cloth has deteriorated, reducing its ability to resist the stretching forces on your sail and so losing the shape your Sailmaker intended. The effects of this can seriously affect your sailing enjoyment.

### Q What difference does the sailcloth make to me?

**A** Obviously good shape retention is important for racing but increasingly, cruising sailors are realising the benefits: less heeling, better pointing and easier boat handling. Quality cloth also lasts longer, making spending a little extra for better laminated or woven fabric a sound investment.

### Q Laminated or woven? What's the difference?

**A** Although today Bainbridge International uses leading edge technology, the basic principals of weaving sailcloth have not changed since sailing began, with warp yarns being rocked up and down around fill yarns. Most wovens are made from polyester (also called Dacron) that was introduced by Bainbridge as a replacement for cotton in the 50's. Wovens are very durable making them ideal for cruising sails.

Laminates are made by bonding together layers of different materials to form a sandwich. A simple laminate will consist of an open scrim of fibres with a layer of film bonded to each side. The film stops air blowing through the laminate while the load is taken by the scrim. Laminates are far more efficient than wovens as the fibres have no crimp.

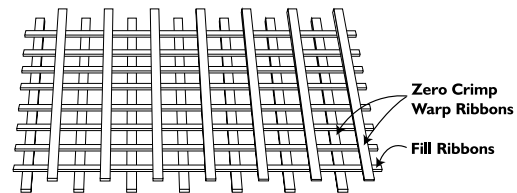
### Q What's Crimp?



Crimp in a yarn after weaving

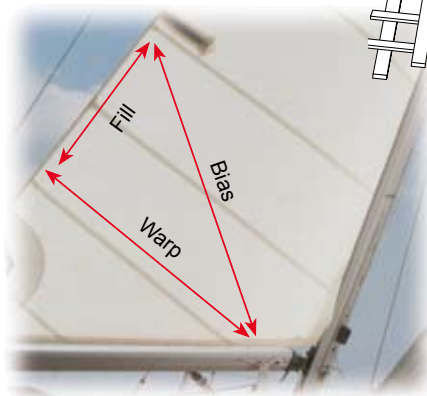
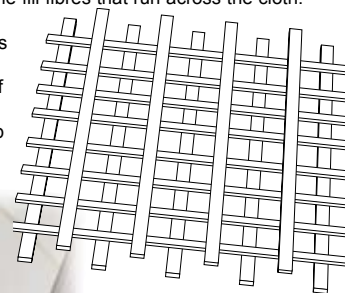
**A** When we weave a cloth the yarns have to snake over-and-under each other, this is called crimp. When the cloth is loaded these yarns straighten resulting in 'initial stretch'.

The scrim in our laminates is 'formed' and not woven. This process bonds flat ribbons of fibre into a lattice. No weaving, no crimp, less stretch on the threadline.

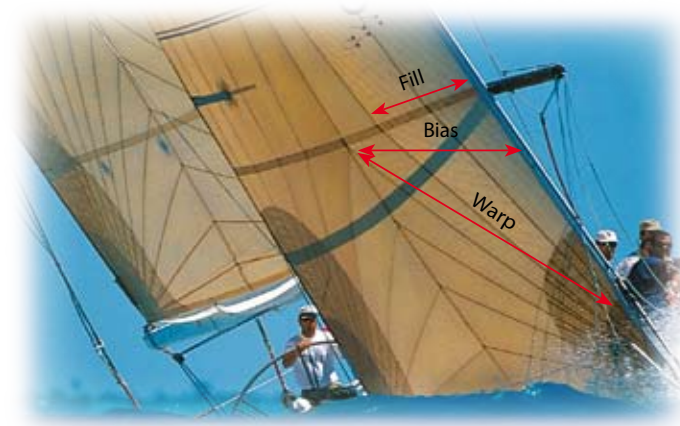


### Q Should my sail be crosscut or radial?

**A** This depends on the cloth. In the weaving process warp fibres running along the cloth are bent round the fill fibres that run across the cloth. Fill fibres therefore have less crimp so a woven cloth stretches less across its width than along its length. We take advantage of this by using larger (sometimes 400% larger) fill yarns than warp yarns.



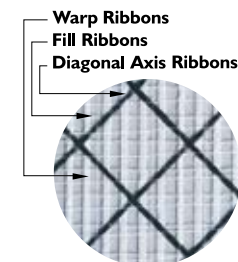
So woven cloth should be used in crosscut sails where most of the load is across the width of the cloth. Some Sailmakers will offer radial woven sails using cloth with large warp yarns. This works well for smaller sails but read on to find out about the ultimate radial cruising cloth!



In a laminate, the scrim is fed into the laminator under tension so further reducing initial stretch on the warp. Again we take advantage of this by using more fibre in the warp than the fill. So laminates should always be used for radial cut sails where the load travels along the length of the cloth.

### Q Sounds good, but not all the load can exactly follow the yarns!

**A** Generally your Sailmaker will know how the loads in your sail radiate out from the corners but with so many variables a fair percentage of the stress is 'off threadline'. To reduce the effects of this, we try to minimise bias (diagonal) stretch. In a woven cloth we do this by locking the warp and fill yarns together, so bias loads cannot move the weave. This is achieved by making the weave as tight as possible by compacting and heat shrinking. Hold your handkerchief up to the window and compare the weave to a 100X magnified piece of our cloth. To further stabilise the bias we then impregnate our cloth with a resin finish that chemically bonds the warp and fill together.



Our latest DIAX laminates use a 45-degree diagonal scrim to resist bias loads and, just like a road bridge, form a truss that locks together the warp and fill yarns. In most other laminates bias load is born by the film which easily becomes over stressed and then deforms. Using a diagonal fibre helps our laminates to last longer and lock in sail shape.

### Q So, its cross cut woven for cruising and radial laminates for racing, right?

**A** Wrong! One of the fastest growing markets for us is cruising laminates. These are based on our race products so are just as strong, but have a light woven fabric bonded to both sides to give them the durability of a woven. We have made over 250,000 meters of this cloth and firmly believe it is the best cruising cloth available today. Unfortunately many people still only associate laminates with high-end race sails with limited durability. For more information ask your Sailmaker for our Cruising Laminates leaflet, No. 5 in the series. Also ask your sailmaker about DIAX2, our new range of cross cut laminates for club race applications and DIAX2 LP, our unique new

### Q What about my spinnaker?

**A** Most spinnakers are made from woven nylon because it has good tear strength. Nylons come in different generic families ranging from 2.2oz down to 0.4oz but be careful, these numbers do not directly relate to the cloth weight.

Nylons can also be coated or impregnated and warp or fill orientated, but the important thing is the relationship between stretch, tear strength and weight. Heavier nylons do not always have lower stretch and better tear strength as a high quality light fabric can easily out perform heavy, low quality products. Our AIRX performance products prove this with lighter fabrics having similar properties to many of our competitors heavier styles, while our MP multi-purpose fabric provides outstanding durability and value.

