

battens

recommended skill level for this guide **advanced**

A blokart® is a highly efficient way of transforming sail power into moving speed. Most blokart® sailors are quite satisfied with the power available from their rigs in even moderate winds. In heavy winds many sailors find that power quite difficult to keep under control. However, there are always those times when we try to find a bit more power and a bit more speed. If you sail in light winds, or if you just like the speed of a blokart®, then you are probably looking for another place to crank on a bit more power. Your sail trim is the most obvious place to look.

The most dynamic controls over sail trim when in the blokart® are mainsheet and downhaul. However, when you set the battens into your sail each day you are already making the first adjustment for sail power, even before you get into the kart. Does the conditions today look like you need mild batten load, or wild batten load? Batten tapering adds control over another aspect of sail trim.

The blokart® battens are a heavy design profile, probably reflecting the desire to be durable. Because the blokart® battens are a class standard nobody has any say in what they get with the blokart®. They are not the best design for racing, but if you want to race in production blokart® events you are stuck with their battens.

Batten design has become very high tech over the years. Since the blokart® was designed, batten materials are lighter, have different ratios of resin to glass, different types of resin, and different profiles for different applications.

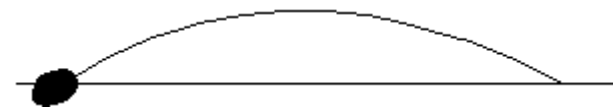


The stock blokart® batten shape at left, and examples of other profiles commonly used in sail battens.

The control of the sail which full length battens give is quite significant and the greater use of battens in sail design should be seen as indicative of their potential for performance tuning. On your blokart® varying the batten taper and load has a profound effect on the power of the sail, even with the old stock blokart® battens.

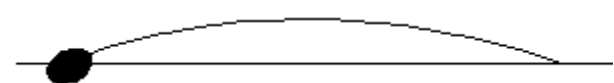
so how do battens make so much difference?

Sail curvature, or camber, produces the power in a sail. The camber is designed into the sail by the sail maker according to the type of boat, expected wind range, and mast bend characteristics. The point of maximum camber is called the drive point and is expressed as a percentage of sail width fore to aft. Whether the sail is trimmed full or flat the drive point of the sail will remain in approximately the same relative fore/aft position for similar wind conditions.



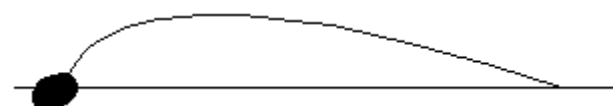
Batten 1a. *Circular shape, full trim. Drive point*

centred in sail.



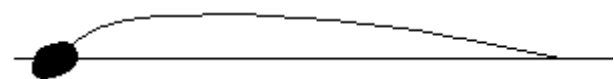
Batten 1b. *Circular shape, flat trim. Drive point*

remains centred.



Batten 2a. *Airfoil shape, full trim. Drive point well*

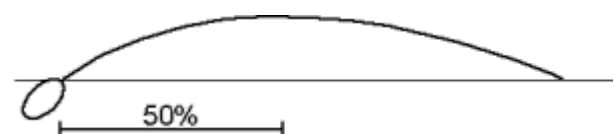
forward of centre.



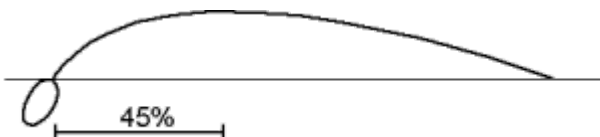
Batten 2b. *Airfoil shape, flat trim. Drive point*

remains forward.

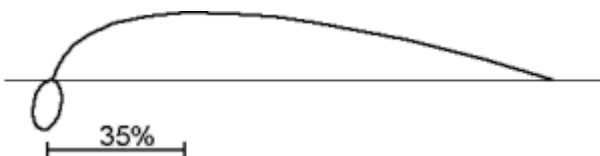
The goal of sail design and trim is to have the airstreams attached to the leeward side of the sail for the greatest distance possible. When the airstreams has to turn too sharply around the bend in the sail it loses contact with the sail (delaminates), causes turbulence, and stalls. The wind will attach best to a sail which curves smoothly at a constant radius, a circular arc. However, more lift comes from a true airfoil shape which is not circular but elliptical and having varying radius. A circular arc will hold the wind better but gives less lift. An airfoil shape gives more lift but loses the attached airstreams (stalls) more easily under varying wind conditions.



Untapered Batten. *The drive point is centred. Actual trim under wind load will depend on the cut of the sail.*



Lightly Tapered Batten. *The drive point is pushed forward close to where it matches the design of the sail.*



Heavily Tapered Batten. *The drive point is further forward and now overrides the original cut of the sail.*

Although an airfoil shape gives more power it can stall more easily. When an aircraft stalls it has the advantage of being able to increase engine power. But a blokart® only has the power of the wind across the sail and in a stall that is nil. This means that the sailor has to be watchful when approaching the stall zone. A sail which has inappropriate batten taper or tension will stall more readily.

When a sail is under wind load the drive point is mostly forced aft. The cut of the sail might put the maximum camber at 40% but the wind load can force it to 50% or beyond. This means that the power of the sail is reduced.

The airflow will always try to control the shape of the sail. However, the sailor wants the shape of the sail to control the airflow, that's where power comes from. The battens extend the range of control over the shape of the sail beyond what is possible by sail cut alone. Efficient trim allows the sail to fall into a shape suitable for holding the airstreams yet still giving maximum power to the blokart®.

The wind in the sail tries to move the drive point closer to the rear of the sail, ie 50% or more aft. By having the battens tapered closer to 35% or 40% they counteract this influence and return the sail to the shape the sail maker wanted.

let's look at tapered battens

Tapered battens have the forward end thinner than the aft end. Where a batten starts to taper, and how quickly it varies in thickness, is up to the designer. When the batten is loaded it bends more at the forward end and the aft end stays almost straight.

Battens are measured in: 1) length, 2) material stiffness, 3) profile, 4) deflection load, 5) drive point.

Length

This is as you imagine it, a little longer than the pocket.

Material stiffness

Some resin/glass combinations are stiffer than others. Bigger yachts generally use stiffer sections, even if they are smaller profiles. They can have different percentages of glass (65% is high glass content), or be made of polyester resin, vinyl ester resin, plastic, or something else.

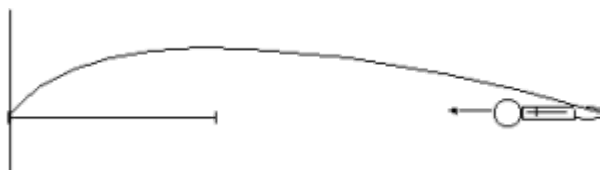
Profile

This is the cross section shape/size of the batten. The blokart® batten profile is circular. Others can be thin or fat, round, oval, rectangular, like an extended plus sign, or a similar variety of hollow sections.

Deflection load

The deflection load is the pressure required so that an increase in curve requires no increase in pounds pressure when supported on a horizontal surface.

When a load is put on the end of a batten it bends. You already know that. But how do you measure that bend?



Batten under load. The deflection load is read from the fishing scale. The drive point is indicated by the T-line.

Drive Point

Drive point is expressed as a percentage figure. The percentage refers to the distance from the forward end of the batten to the point of maximum camber when compressed to the deflection load, relative to the batten length.

To measure the drive point of the batten drag it with the fishing scale as before until the batten bends and gives you the deflection load. Now let out the scale until the batten is almost straight. Now drag it in slowly until the earliest point where the deflection load is reached. Measure the distance from the wall (forward end of batten) to the point of maximum camber. This is the nominal drive point. Calculate that as a percentage of compressed batten length.

The batten therefore has a drive point of 35% and a deflection load of 3 pounds.

doing the work

A non-tapered batten will have a 50% drive point because its maximum bend will be in the very middle. When a batten is tapered at the forward end, the drive point will move forward because the thinner material bends more easily. If it bends really easily then the deflection load will be low. If it bends very close to the front then the drive point will have a low percentage figure.

The tapering of a batten will control the drive point and the deflection load. Good batten design matches these two values with the blokart® and the type of sailing. Batten suppliers will taper new battens to suit any application. But you can taper your own battens to suit these two controls just by sanding it fairly evenly on each side with an orbital sander. Wear a good dust mask! A dose of resin dust in the lungs is quite painful for a day or two.

When you taper the battens you only need to sand the front two thirds of the batten. Start by sanding the forward half then increase the sanded area aft as necessary. You will be measuring the deflection load as you work so finding how far aft to sand is no problem. The upper battens might require a longer sanded area than the lower battens as their shorter length means they are harder to bend, therefore they are a thinner section overall.

Battens in different parts of the sail have different drive points and different deflection loads. Lower battens have the drive point slightly more forward than upper battens. Lower battens have a lighter deflection load.

getting out on the track

When you prepare to sail you give the battens a certain pre-load when you set each batten's webbing lock. Different wind conditions require different loads. To be able to look at the conditions and set the battens is an important skill to learn. No matter how much time you have put into preparing them, your battens will respond significantly to how you use them on the track.

Generally, in light air put heavier pre-load on the battens. In heavy air, light pre-load. The amount of pre-load will depend also on your body weight and sailing skill. Lighter or less skilled sailors use lighter pre-load, heavier sailors need the extra power of a heavier pre-load.

Although the battens influence the drive point at their own locations, the downhaul, outhaul, and mainsheet settings have control of the drive point when sailing. Heavy downhaul moves the drive point forward quite significantly, just as mainsheet tension varies the flatness of the sail. This range of adjustment on the track builds upon the in the pits decisions which you have already made concerning batten taper and pre-load.

The control of the sail on the track is a broader issue altogether. You have done enough reading, go sailing!