



Carbon Sculls

Dreher Models: Oars are offered to cover the full range of scullers from top elite athletes to entry level recreational scullers and serious open water enthusiasts. The complete Dreher Sculling System is designed to optimize performance. Dreher oars are all carbon, light-weight, rigid, and built to last. The sculls come in four broad categories combining shaft type, blade shape, stiffness, handle / grip type and sleeve/lock types:

- Aerodynamic – EH, EHX and in '14 the EA & EAX
- High Modulus – ApexX (See Below), REX (See Below), BBX



- Hybrid Modulus – Alpha
- Standard Modulus – Apex, BB, LBB, RE and LS19
- Club, Recreational & Youth – ApexR, LBB, Macon I 7, I 8 & LS1999

Why Dreher? Dreher is an innovative leader in integrated modular oar design. We were the innovator of the adjustable length oar in 1991, wooden veneer over carbon sweep oar handles in the mid. 1990's, higher aspect ratio (wider blades) in '00. The first aerodynamic oar shape blade/shaft '09, EH combo in '13 and the EA in '14 and the Alpha with tool-free adjustment in '15.

Our latest innovation is a lock/sleeve combination that allows for easy inboard and outboard adjustment, without tools when using conventional oar locks.

Another innovation allows you to row with the lock facing in the normal forward direction or in the reverse position (behind the pin).

Rick Horan's Roller Lock™ is a carbon swivel with centered shaft rotation and a cam action, which when used in the reverse position provides a virtual variable spread. Both lock/sleeve systems share the same carbon "rail" which replaces the current plastic sleeve.

All Dreher oar shafts are autoclave cured at high temperature and pressure for maximum strength, durability and longevity. All blades, locks and other small components are "match metal" molded using a unique bilateral composite molding process. The completely adjustable system allows for custom tuning of length, handle size, blade type and blade pitch. They provide you and your crews with versatility and high performance. Only the best construction materials are used to make Dreher Oars and Sculls. All the major components are made using prepreg carbon. Blades are uniquely manufactured using a sandwich core construction of prepreg carbon and specially formulated syntactic foam.

The transition point between the blade stem and shaft is nearly

seamless, as compared with competitors shaft to blade stem transition, which is abrupt and catches water creating drag resistance at the finish of every stroke. As a result, the overall performance of Dreher oars are superior, where less effort makes blade extraction easier creating less drag and allowing more energy to be available during the drive. This translates into more speed on the recovery and greater average boat speed.

Adjustable Length Feature: The adjustable "carbon on carbon" design eliminates the possibility of movement because the handle is precisely constructed to tightly fit into the straight part of the shaft. All adjustable oars have measurement decals that show total length and outboard settings, which easily derive the inboard setting. All adjustable sculls and sweeps have a total of 10 cm of adjustment. (+/- 5cm from the midpoint setting)

Why An Aerodynamic Shaft/Blade Combo?

When the boat and the angular velocity of the blade tip are each going the fastest, during the recovery the combined velocity make an aerodynamic shape attractive. An elliptical shape with aerodynamic transition from shaft to blade end is desirable as well as a hydrodynamic shape though the water. All these speed enhancing issues must be addressed to make the most efficient high performance oar design. See the chart on the last page that shows that the elliptical shaft results in less drag than the circular shaft: (Bottom Right)

Why EH/EHX or EA/EAX? Both the Dreher Aerodynamic Sculls share one main features: The elliptical shaft/blade slices through the air during the fastest part of the stroke with less drag. The improved overall efficiency is most noticeable at race pace, in boats with higher boat speed and with highly skilled scullers. The "X" denotes high modulus carbon sculls. The use of high modulus carbon on the inside of the shaft with the twill on the outer surface looks and performs exceptionally well. Both the standard and high modulus adjustable "X" sculls feature the choice of three handle sizes, three levels of shaft stiffness, choice of average oar length/inboard, multiple grip and color options as well as several sleeve options.

See comparison of the EH (Yellow/orange) versus the EA blade shape (red).



The EA or EAX sculls seem to be the choice of those people who liked the Apex shape and the original Aero shape, whereas the EH or EHX appears to interest the people that grew up on Macon and then may have migrated to the ApexR, RE, or the high modulus version of either.

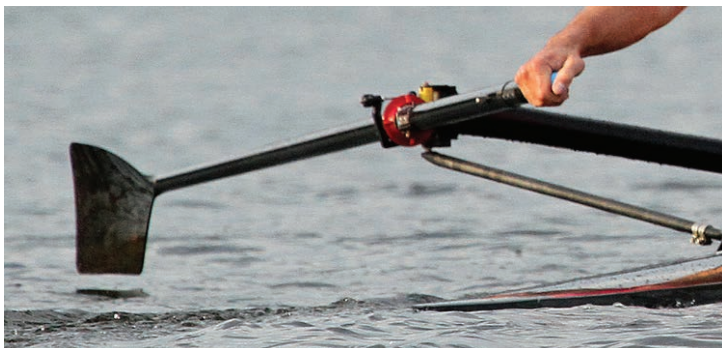
Tool Free Adjustable Collar/Sleeve Design:

Durham Boat Company is proud to announce an innovative collar, sleeve, combination designed by Micheal Dreher. This innovation allows a movable bearing surface coupled to collar to be adjusted along a underlying sleeve. The collar can be adjusted anywhere including on-the-water without the use of a separate tool such as a screw driver. This adjustment mechanism is self-contained, continuously adjustable throughout the range of the sleeve, and becomes a permanent structural part of the oar. There is 10 cm of adjustment. For each 360 degree turn of the collar, there is one cm of lateral change in collar position. It is available in a symmetrical version (see below) and asymmetrical version (further below).



The new sculls and oars also have an attached light-weight wrench lever to change the total oar length without and an external tool. Therefore, you can maintain your inboard setting, while adjusting the outboard setting on the water and then you can say good-bye to CLAMS forever! These new features will be phased on other Dreher Oars going forward starting with new EAX, EHx, Apex-X, REX and BBX.

New Dreher Alpha Blade: This **Alpha** blade shape will be the first available with the Adjustable Tool Free Design. This blade has more scoop than previous Dreher Oars and elite rowers that tested and/or raced with it attributed this blade shape to setting personal bests. The blade's "snappy" lock-on at the catch has the same easy and clean release that all Dreher Oars have. The shape of the blade is hatchet shaped, but different than Apex or the EA. Be the first person in your location to have this new oar. See below for a close-up and on the top of the next column show the entire set in action.



The new **Dreher Alpha** blade and tool-free adjustable sculls raced at the '14 HOCR and other Head races last fall. (Shown below is Mike Sivigny and below that is the back side of the oar)



The Integrated System: We have introduced an integrated system that consists of a very lightweight, but torsional rigid wing rigger (that does not require a back-stay), allowing the use of a reversible lock system. At the present time the system may not work on all makes of boats without special boat attachment pieces. However, with the recent addition of a 3-D printer we are confident that we can quickly design and produce rigger attachment pieces for most popular make of rowing shells. We use an FEA program to achieve the optimum design and layout schedule with the best strength to weight ratio, lightest weight, and minimal static deflection and dynamic twisting characteristic.



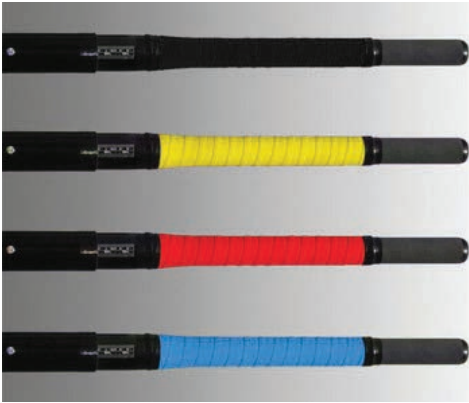
For both sweep and sculling a "Roller Lock"™ (as shown in pictures above {carbon lock} and below {3D Printed Prototypes}) can be used in the reverse position to provide an extra 6 to 8 degree angle at the catch and thereby improve the mechanical advantage at the finish resulting in a slightly longer effective arc and increased handle acceleration. The centroid focused rotation of the oar shaft improves the set of the boat by eliminating unresolved side to side forces inherent with present locks. Pictured below system was raced at the '14 HOCR.



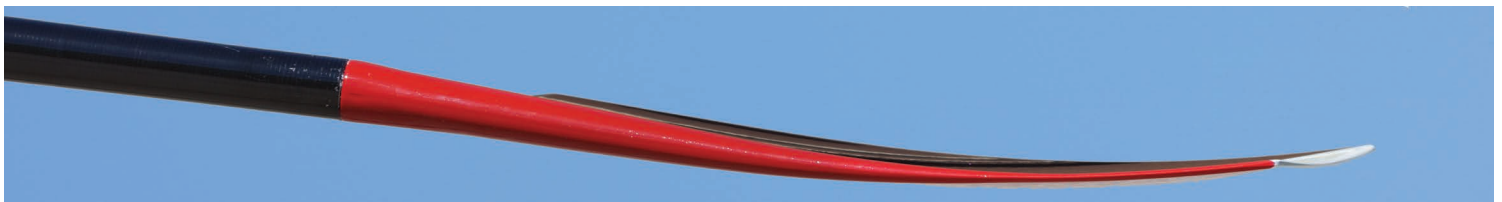
Carbon Sweep Oars

Sweep Design and Features: Dreher was the first manufacturer to design a sweep oar with a carbon adjustable handle (+/-5 cm) in 1991. This carbon handle resulted in a weight savings of about one pound per oar over a wood handle. The BB52, traditional hatchet shape and the Apex55 and Apex52 have been the most popular sweep blades offered. All sweep oar shafts are roll wrapped and autoclaved and have high modulus carbon strategically added for greater strength and longevity.

We also offer two standard sleeve color options, plus the latest "rail" system, two handle sizes and four colors of Row-Wik grip wrap: Bright red, royal blue, yellow and black. Rubber grips, wooden veneer and a wood veneer Row-Wik hybrid are also offered as handle treatment options.



Sweep Successes: Dreher Sweeps for the past four years have been used at Junior World Rowing Championships. In those four years the Junior Women have won 8 medals out of a possible 12 medals. They will be rowing with them in Brazil as well.

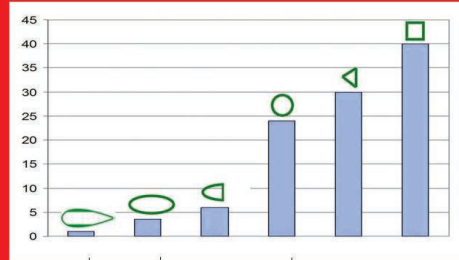


With our sculling oars we have the EH/EHX and the EA/EAX with an elliptical profile aerodynamic oar shaft. Under the correct conditions these oars can provide superior performance as compared to a circular shaft. Faster and more technically proficient scullers will perform at higher speeds. Faster boats rowing with athletes with better technique, who row with a "later square-up" and a quick vertical speed of entry can benefit from the elliptical shaft and slower boats and with less technically proficient rowers, will not benefit from this shape. The sum of the angular velocity of the shaft during the recovery combined with the maximum speed of the boat on the recovery just before the "square-up" can reduce drag by using an elliptical shaped shaft. The reason is that the drag is a squared function of the velocity of the shaft and blade moving through the air. With less proficient scullers a poor release, hitting the water with blade on the recovery or squaring up too early especially with a blade that is too big will counteract the potential beneficial effect of the aerodynamic elliptical shaft. All of these observations were confirmed with the help of on-the-water force measurement data.

The same principles apply to sweep. Our EH sweep will benefit the better rowers, especially when using faster boats like an 8+. The aerodynamic benefit of the elliptical shape is most beneficial toward the blade end where the oar's angular velocity is the greatest. The elliptical shape trumps a "skinny" round shaft in regard to aerodynamic drag.

Referenced: Cervelo Bicycle Engineering / Aerodynamics:

Relative Drag of Shaft Shapes With the Same Frontal Area



Original '09
Dreher Aero
Dreher Slim Ellipse
C2 Skinny

Note: The above graph shows how different shapes of the same frontal area result in different drag, where the C2 *Skinny* "circular" shaft design has about 6 times the drag than the Dreher Ellipse Sweep. See the following link for more details:

<http://www.cervelo.com/en/engineering/thinking-and-processes/aerodynamics.html>

For more information, see <http://www.durhamboat.com/oars.php> or email at sales@durhamboat.com or cfuerst@durhamboat.com