

## CARABINERS

are not all the same. Some are built heavier and stronger to meet multipurpose demands. Others are lightweight, less strong and designed for special use. Modern carabiners are designed, tested and manufactured to ensure adequate strength for their intended use, but any of them can break and/or open accidentally if used improperly. Climbers who understand the design, use, and limitations of carabiners can select and use them properly and reduce the risks associated with climbing.

### CARABINER DESIGN



**Oval carabiners** are the original style. Their large interior space holds lots of gear and their symmetrical curve minimizes shifting when aid climbing. They work well in improvisational situations, such as creating a carabiner-brake rappel. Two ovals in a "gates opposed" configuration can also be used as a substitute for locking carabiners. However, ovals are by design the weakest of all carabiners.



**"D" shaped carabiners** are very popular due to their high strength-to-weight ratio. This feature is the result of their design, which places the majority of the load onto the spine of the carabiner, its strongest part.



**Asymmetrical "D" carabiners** are smaller at one end than the other to reduce weight. They generally have larger gate openings, which makes clipping them easier. Many are also available with bent gates.



**Bent gate carabiners** have concave gates which makes them the easiest to clip into, but if not used properly they can also easily unclip from the rope. The bent gate on the carabiner does not significantly affect the strength or weight of the carabiner.

Bent gate carabiners should only be used on the end of the quick draw or runner which the rope clips into. Never clip them

directly to the protection. The correct way to clip a bent gate carabiner is with the rope from the belay coming to the carabiner from the back and the rope leading to the climber exiting out the bent gate to the front (fig. 1). Clipping opposite to this can cause the rope to unclip from the carabiner if the rope tracks back across the outside of the gate when it is loaded, as in a fall (fig. 2).



fig. 1

Several companies are now using wire gates on carabiners in an effort to improve performance and decrease cost. Wire gate carabiners employ a loop of stainless steel wire that creates its own spring mechanism without added parts and that allows for larger gate openings.

While these gates may not appear as strong as conventional styles, they are in fact just as strong and are less likely to open during a fall due to the decreased mass of the gate. Wire gate style carabiners should not be used for carabiner brakes.



fig. 2

**Locking carabiners** have mechanisms for locking the gate closed; this lock can vary from a simple threaded collar that screws down over the body to intricate spring-loaded "automatic-locking" mechanisms.

Locking carabiners can be oval, D-shaped, or HMS (pear-shaped); HMS carabiners allow several ropes to be clipped in at one time.

They are the preferred style for Munter hitch belay/rappels and work well for use with belay plates and rappel devices. Use a locking carabiner anytime you depend on a single carabiner, such as during a rappel, while belaying, or at your first piece of protection. (If you do not have a locking carabiner, two non-locking carabiners with their gates opposed can be used as a substitute. The gates of the carabiners should form an "X" when they are opened by hand.)

Always be sure to double check that locking carabiners are indeed locked before you begin climbing, belaying or rappelling.



### PROPER USE OF CARABINERS

When a fall is caught by a rope through a carabiner, many dynamics take place that can cause "gate lash." This momentary opening of the carabiner's gate may be due to the gate's inertia overcoming the spring tension, collision of the carabiner against another object, or simply the vibration of the rope over the carabiner.

If the load comes onto the carabiner at the instant the gate is open, carabiner failure may occur. (A carabiner with its gate open typically has less than 50% of its rated, gate-closed strength.) Using carabiners with high gate-open strengths or locking gates helps to eliminate the chances of this type of carabiner failure. Gate design and stiff spring tensions may also decrease gate lash. Keep clothing, equipment, and natural objects from interfering with gate closure.

It is best to use a quickdraw or runner when clipping protection. This reduces rope drag and decreases the chance of the rope's upward travel dislodging your protection. Make sure the carabiner clipped to the protection has a straight-gate design. This reduces the chance of cross loading or of having the rope flip across the gate and unclip itself. Never clip the rope into fixed equipment with a single non-locking carabiner.

Modern sport climbing often involves taking numerous short falls before achieving success. Although impact loads generated in these

falls aren't necessarily high, repeated falls cause equipment to wear out quickly. Check your carabiners (and all your gear, for that matter) frequently for signs of wear. This wear is particularly visible in climbing gyms that use aluminum, vs. steel, carabiners. These softer metal carabiners can be worn severely by repeated lowerings in a small amount of time.

A modern, "super light" carabiner is strong along the main axis, but its narrow diameter rod stock has less ability to handle cross loading, it has a reduced gate-open strength, and generally has a shorter life span. Its narrow spine works as an "edge" to fray ropes. Use a super light carabiner only when weight is absolutely critical.

Use standard sized carabiners and 11 millimeter ropes when "working a climb." The larger diameter of these carabiners is gentler on your rope than that of lightweight, smaller diameter carabiners.

Retire a carabiner if it is dropped a long distance onto a hard surface. Non-visible damage may have weakened it.

### MAINTENANCE OF CARABINERS

Keep carabiners dry and clean. Protect carabiners from corrosion. Do not store in humid or salty air, with damp equipment or clothing, or near corrosive chemicals. Do not file carabiners for any reason. Sand any burrs with 220-400 grade sandpaper. If this does not remove the burr, destroy the carabiner. If a carabiner gate sticks, wash it in warm soapy water, rinse thoroughly and lubricate with dry graphite around the hinge area, inside the spring hole and locking mechanism. Perform the 3-step inspection process outlined below before each use.

### INSPECTION OF CARABINERS

Falling onto bolts and pitons is particularly hard on carabiners. Made of aluminum, carabiners are easily grooved and nicked by bolt hangers and pitons, which have narrow edges and are made of a harder material, steel. Environmental effects (such as salt water) can also shorten the life of your carabiner.

There are 3 simple steps for inspecting carabiners before each use:

1. All surfaces of the carabiner should be free of cracks, sharp edges, corrosion, burrs, or excessive wear.
2. Gate opening and closing should be quick and easy. Be sure the gate and any locking mechanism closes freely and completely.
3. Rivets should not be bent, loose or missing.

If your carabiner does not pass the above inspection, remove it from service and destroy it.

### LIMITATIONS OF CARABINERS

Carabiners are generally rated to 18-28 kN (4046 to 6294 pounds of force, not weight), making them strong enough to handle loads found in normal climbing situations. However, there are many ways to use a carabiner incorrectly that can result in failure at loads well below a carabiner's rated strength.

Carabiners are designed to be loaded along their major axis (end to end) with the gate closed. Loading the carabiner in any other manner will reduce its strength to the point where it may fail under normal climbing loads.



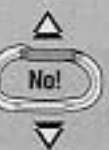
### DANGEROUS CARABINER LOADING CONDITIONS



A carabiner with its gate open can fail at less than half its major axis strength. Always avoid situations where the gate could open accidentally.



Cross-loading a carabiner along its minor axis (gate to spine) should always be avoided, as carabiner strength in this direction is usually less than half its major axis strength.



Carabiners loaded over an edge (a potential problem when placing protection in horizontal cracks) can break at a very low load.



Do not load carabiners from more than 2 directions.



### THE CLIMBER'S CREDO

Climbing and mountaineering activities which include technical rock, snow, and ice climbing, back country skiing, and general mountaineering, combine many unique opportunities and choices to experience individual freedom and self-determination in our natural environment. An essential element of this expression of freedom through climbing and mountaineering is the acceptance of the many risks and dangers that are inherent in and integral to these activities.

The exercise of good judgment and common sense can help reduce the risks. The proper use of climbing equipment can also help reduce these risks. However, such risks and dangers cannot be totally eliminated, even with the proper use of climbing equipment. By the purchase and use of climbing equipment and your participation in climbing and mountaineering activities, you are personally accepting full responsibility for all of the inherent risks of these activities, including without limitation the risk of injury or death.

We recommend that you take the time to learn the proper use and limitations of each individual piece of climbing equipment. Obtain personal instruction from a qualified person well versed in the appropriate techniques that may help reduce the risks of these activities.

Retailer's Stamp



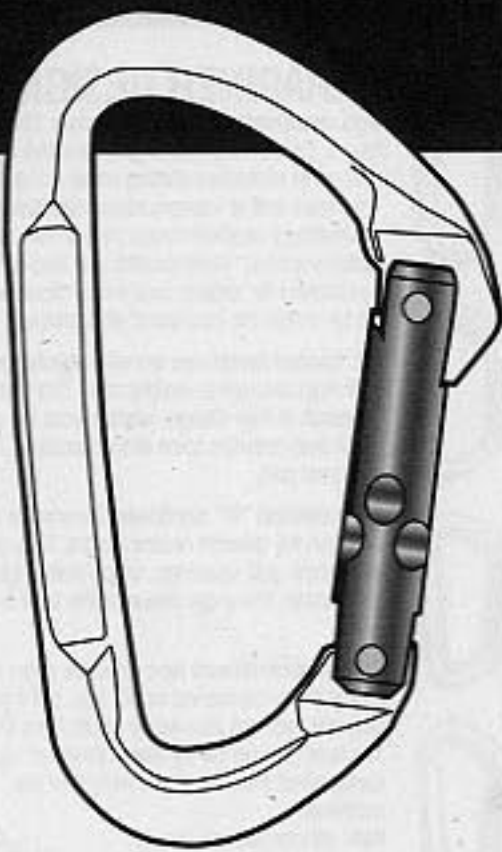
— REMEMBER —  
YOUR SAFETY IS YOUR RESPONSIBILITY.



Climb Smart! is a public information program of the Climbing Sports Group, the trade association of the climbing industry (303) 444-3353.

# Carabiners

Information for consumers on the design, use, maintenance and limitations of carabiners.



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