

# CLIMBING FACTORY

攀岩工厂

## 先锋攀爬与保护 基础课程

Lead climbing and belay foundation course



## 先锋攀爬与保护 基础课程

Lead climbing and belay foundation course



# 免责声明 / Disclaimer

一般来说，攀岩和登山是一种危险的项目，可能导致严重伤害甚至更严重后果。未经适当的培训及合格的装备，请不要轻易去承担这类风险。本课程仅是个人经验分享和交流，不能视为权威标准操作规范，一切实际操作必须根据个人判断，并对个人行为负责。

Rock climbing and mountaineering in general is a dangerous pastime that can lead to serious injury or worse. You should not undertake these without proper training or equipment. This course is only for personal experience sharing and exchange, and cannot be regarded as an authoritative standard operating specification. All actual operations must be based on personal judgment and be responsible for personal behavior.

您可以自由共享此PDF仅供个人使用 / You are free to share this PDF for personal use.

上海攀岩工厂 / Climbing Factory Shanghai

上海市宝山区长江西路855号，博绣荟文创园E区

Changjiang West road 735-5, Baoshan District, Shanghai

电话 / Phone: +86 135-1212-3354

微信 / Wechat ID: factoryclimb

Facebook: factoryclimbing

www.factoryclimbing.com



# Content

1. 风险分析 Risk Analysis
2. 装备概述 Equipment
3. 绳结基础 Basic Knots
4. 先锋基础 Basics of Lead Climbing
5. 保护技术 Belay techniques
6. 冲坠处理 Lead Fall
7. 保护站 Anchors
8. 绳降 Abseiling



Lead climbing is exhilarating and challenging. It allows you to push yourself physically and mentally in ways that you can't when top roping.

In order to lead climb, at a minimum, you must be proficient and comfortable with clipping quickdraws, lead belaying and building and cleaning anchors.

1

风险分析 Risk



## 了解并降低风险

## Understand and reduce risks

通过这次学习，首先了解各类风险的存在，并且通过安全的操作，经验的借鉴，来降低各种已知风险的发生，享受安全并快乐的攀岩。

Its important to realize, that you face more inherent risk in lead climbing than top roping. Lead climbing presents the real possibility for taking a fall. Some falls can be harmless, but a bad one can also result in scrapes, rope burn, broken bones or worse.

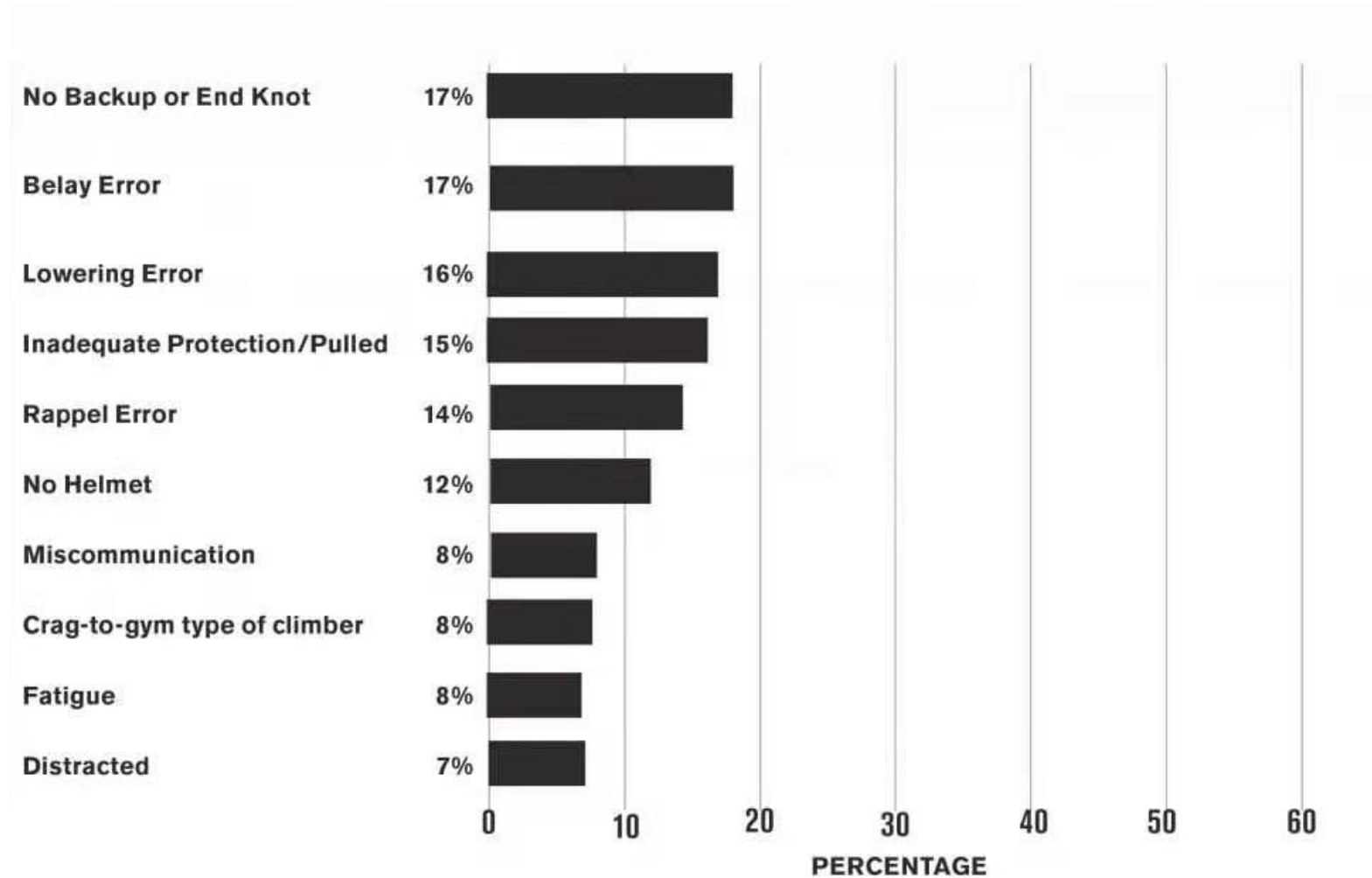
It's impossible to remove all risk from lead climbing, but you can take steps to manage it by seeking proper training.



Brad Gobright Dies in a Climbing Accident  
On November 27, Brad Gobright died in Potrero Chico, Mexico. He was 31.

## 先锋最常见错误:

The most common mistakes in lead climbing leading to injuries:





# Managing Risk

- **Join proper training:** Both the climber and belayer should be properly trained in lead climbing.
- **Find a partner:** Person you are climbing with is very important in lead climbing. Only climb with someone you trust and know is skilled in lead-belaying technique.
- **Think about the consequences:** Both the climber and belayer need to think about the consequences of a fall at every point along the route.
- **Learning to fall:** Taking controlled falls in low-consequence spots can be perfectly harmless and a good way to improve your confidence and skill. It's very common for sport climbers to take repeated leader falls while figuring out the moves on a challenging route. Being comfortable with taking a fall means that you trust the gear and your belayer, which will allow you to climb harder.





攀岩工厂是很好的先锋训练场地  
Climbing Factory is a very good  
place to train lead climbing

2

装备概述 Equipment



# Gear for Lead Climbing

In addition to top-rope climbing equipment, which in minimum is:

- Climbing harness
- Climbing Shoes
- Chalk bag
- Belay Device
- Locking carabiner

You will also need to equip yourself with extra equipment for lead climbing:

- Dynamic rope
- Quickdraws
- Personal Anchor System
- Helmet



Belay glasses are very good addition to standard lead climbing equipment. They allow you to watch your partner climbing without keeping your head lifted.

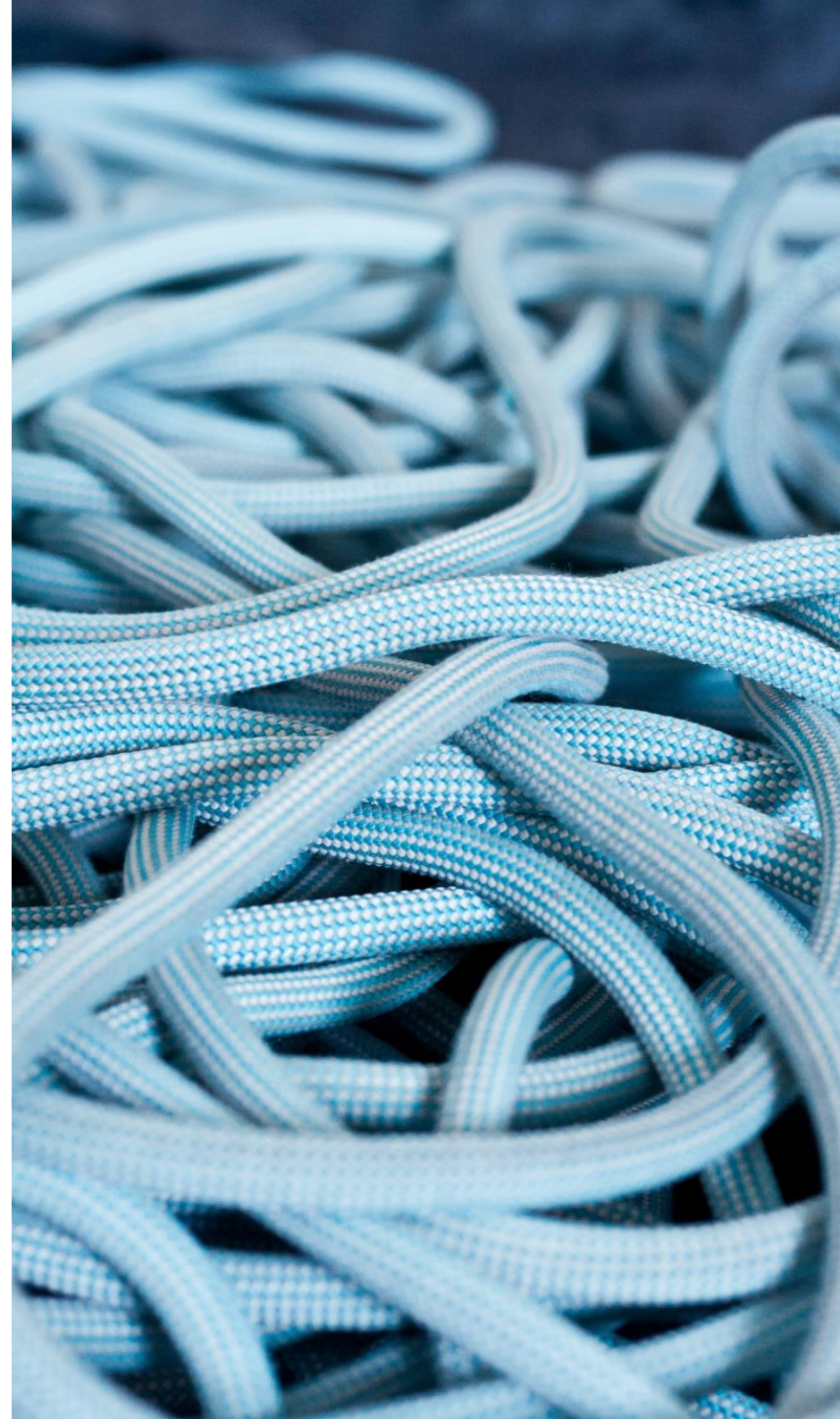
# 动力绳子/ Dynamic Rope

For sport lead climbing we are using **single dynamic ropes**.

As opposed to a static rope, a dynamic rope provides some stretch in the event of a fall. This makes the catch or fall “soft”—the force of the fall is dispelled by that stretch instead of being transferred directly to your harness. This not only saves your back but prevents a lot of force being put on both the quickdraws and the bolts in the rock. Static ropes are primarily used by people who are not lead climbing but rather using the rope for rappelling.

You can rent lead climbing rope in Climbing Factory but if you are considering to buy your own, the standard would be:

- 60-70m long, 9.2 – 10.0 diameter single dynamic rope





Dynamic ropes are also used in top-rope climbing.

# 主锁 / Carabiners

主锁有多种类型，具有不同的形状，锁定系统，并由不同的材料制成。

There are many types of carabiners, with different shapes, locking systems, and made of different materials. A good choice of carabiner shape can increase ergonomics and security for certain uses. For belaying or attaching yourself to the rope, always use the locking carabiner.



D shape

D-shaped carabiners are the most versatile and are efficient in any situation



Pear Shape

These carabiners have large capacity and are recommended when using Munter hitch or for storing gear

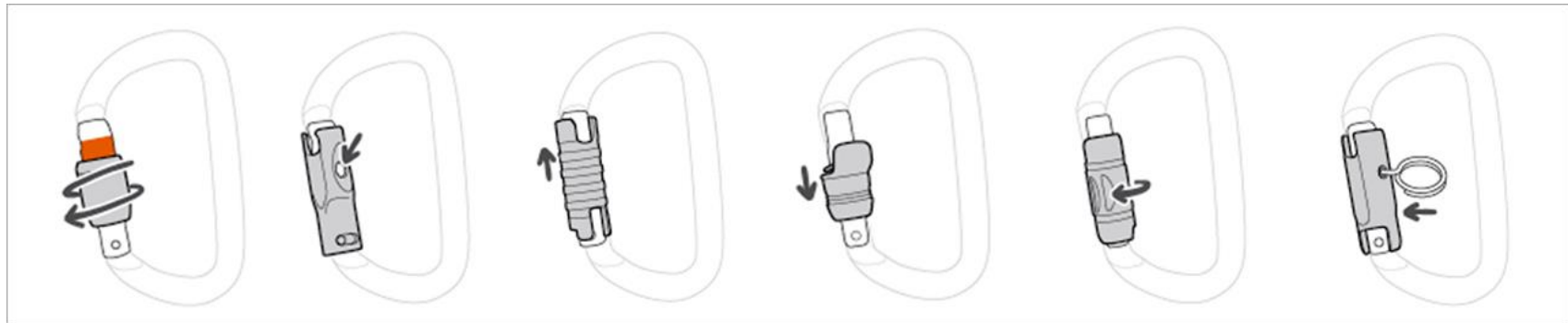


Oval Shape

Its symmetric shape for even loading. Those carabiners are designed for use with pulleys.

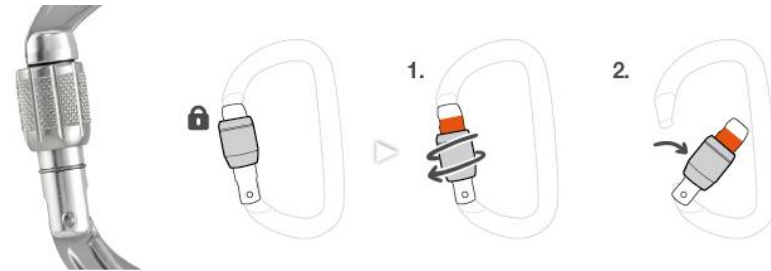
# Locking systems

The various systems meet different needs for each application, for a precise balance between ergonomics and safety.



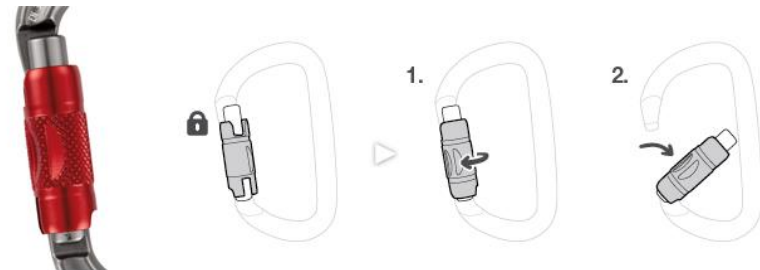
## SCREW-LOCK (SL)

Classic manual system, versatile and universal. This system is suitable for harsh environments where mud/ice could cause other systems to jam.



## TWIST-LOCK (RL)

Auto-locking and double action opening system. Easy and fast system with added safety of rapid auto-lock.

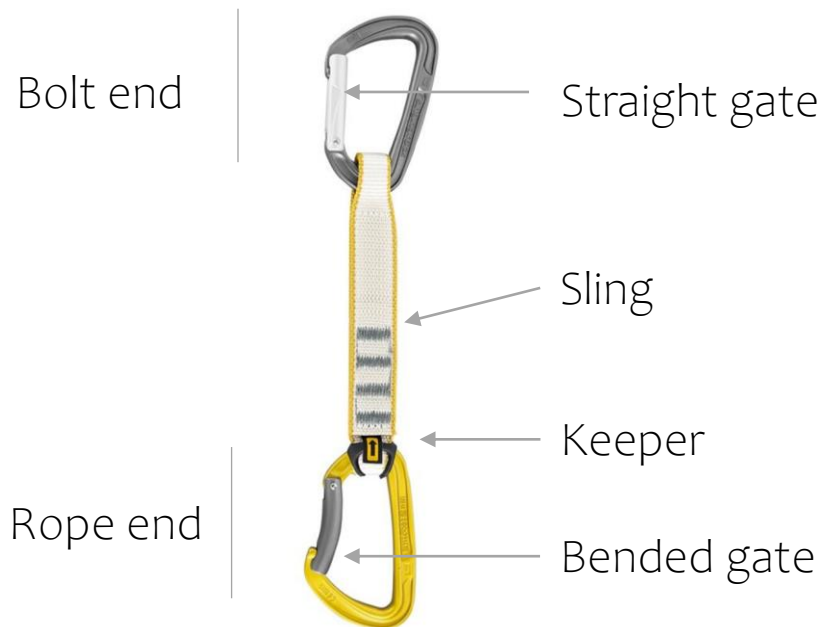




# 快挂 / Quickdraws

Climbers use quickdraws to attach their rope to pieces of protection when lead climbing. A quickdraw consists of two non locking karabiners connected by a textile sling.

Quickdraws come in different shapes and sizes but most of them uses similar designs to help climber to clip the rope in as fast as possible.



Quickdraws in Climbing Factory are attached to the bolt with locking steel carabiner called mailon. Quickdraws like that are called *fixed quickdraws*.

# 保护器 / Belay Device

保护器是您连接在安全带上并控制绳索的设备，有两种主要类型的保护器：

- 中空管道式设备，摩擦制动，例如ATC，设备没有可活动部件，结构简单可靠且便宜，需要手动制动。
- 辅助制动式设备，挤压制动，例如 GriGri/SMART，通过机械结构运动来挤压绳索以实现锁定并止坠。

Belay device connect to your harness and control the rope which goes through. As a standard, we distinguish two types of belay devices:

- tubular belay devices/ friction braking/unassisted breaking, such as ATC. The equipment has no movable parts, the structure is simple, reliable, and cheap. Manual braking is required.
- assisted braking equipment/squeeze braking, such as GriGri or SMART. Those devices squeeze the rope by the movement of the mechanical structure to lock it and catch falling.



无辅助制动  
Unassisted braking



辅助制动  
Assisted braking

# 攀岩头盔 / Climbing Helmet

Climbing helmets are a wise purchase. The most common head injuries are those caused by incidents of falling objects, such as rocks – something a climber has little influence over. In the gym, climbers very rarely use helmets, that is because of the risk of objects falling down is really small.

Generally, it is more important for the belayer to be equipped with helmet, than for the person that climbs. Always have a helmet if you climbing outdoors on newly developed routes or the routes that loose rock may occur.

There are three main types of climbing helmets. Expanded foam, hardshell, and hybrid.



Hardshell helmet  
Durable, inexpensive but  
heavier than foam helmets.



Expanded foam helmet



Hybrid helmet

3

绳结基础  
Basic Knots



# 8字结 / Figure 8 knot

这个绳结，对于攀岩安全至关重要。

花些时间练习它，从单8字形结开始，然后是双8字形结（您将用它来将自己/您的安全带绑到绳子上），甚至在闭眼的情况下进行练习-仅用于练习！

**优点：**高强度，简单且可靠，易于学习和检查。

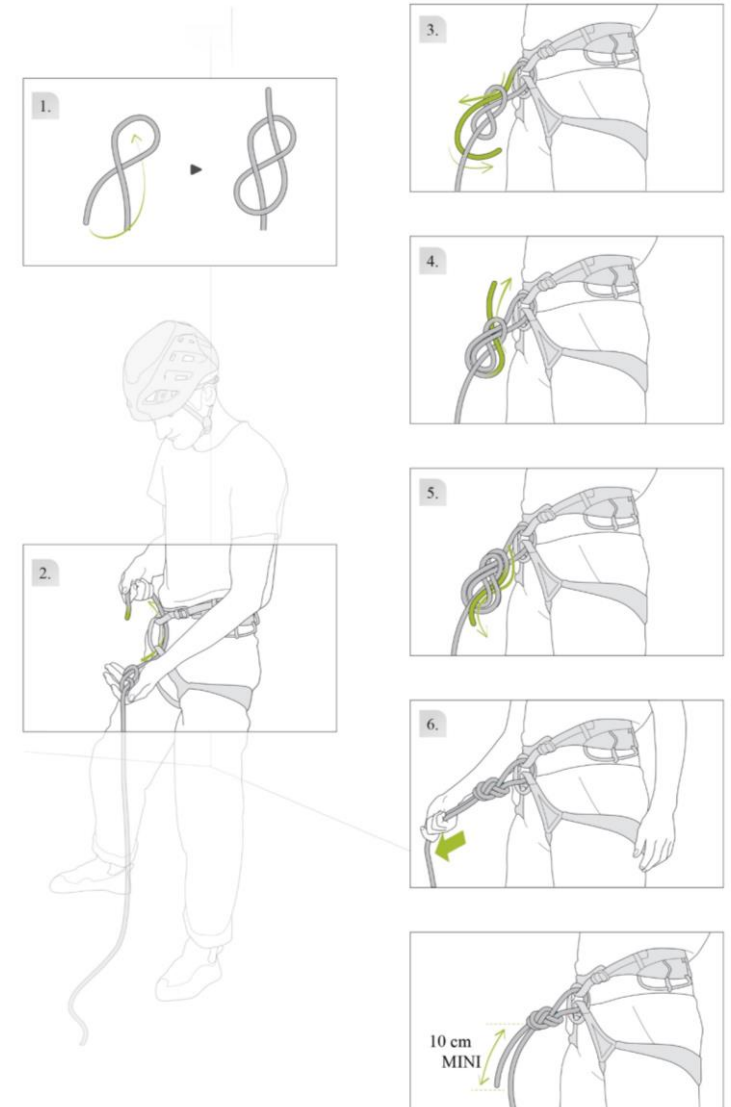
**缺点：**冲坠后难以解开，必须双手操作，相对费时间。

This knot, together with couple of easy rope skills is fundamental to climbing safety.

Take time to practice it, starting from single figure 8 knot, then double figure 8 knot (that you will use to attach yourself/your harness to rope) and even practice it with your eyes closed – only for practice!

**Advantages:** high strength, simple and reliable, easy to learn and check.

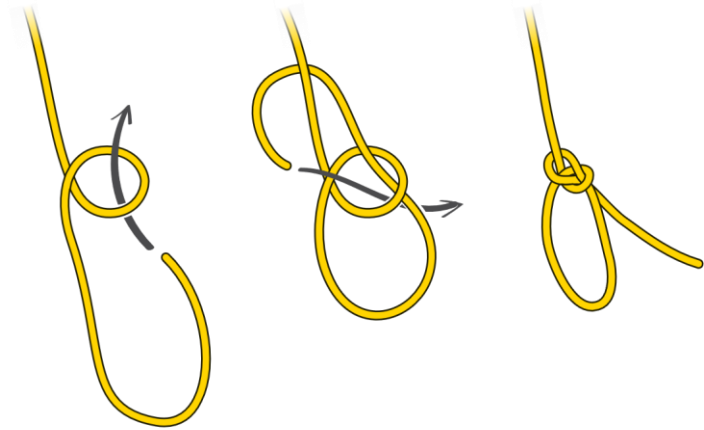
**Disadvantages:** It is difficult to untie after falling, must be operated with both hands, relatively time-consuming.



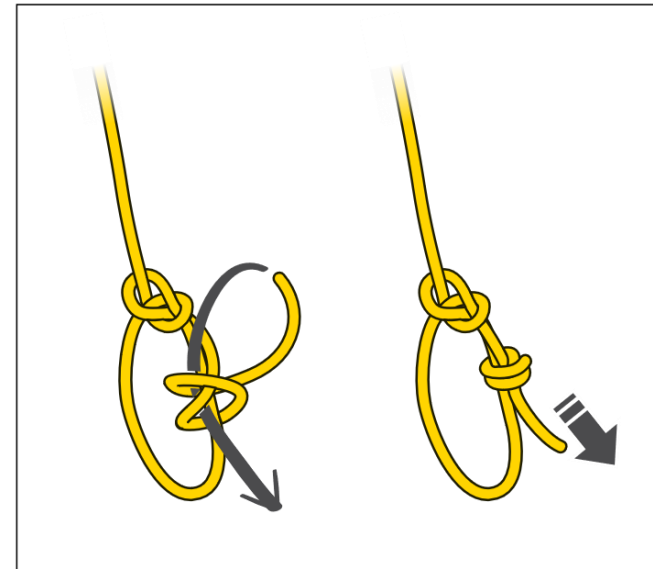
## 布林结 / Bowline knot

所知道的最有用的结之一。形成了一个不会卡死的安全环，并且易于打结和解开。经过数百年的尝试和测试，布林结是可靠，坚固而稳定的。即使施加了很大的张力，也很容易解开。但是，由于它很容易解开，因此必须固定绳索的尾部，它保持绳索强度的60-70%。

One of the most useful knots you can know. The Bowline forms a secure loop that will not jam and is easy to tie and untie. Tried and tested over centuries, this knot is reliable, strong and stable. Even after severe tension is applied it is easy to untie. However, because it does untie so easily it must fix the rope tail, It retain 60-70% of the strength of the line in which it is tied.



+

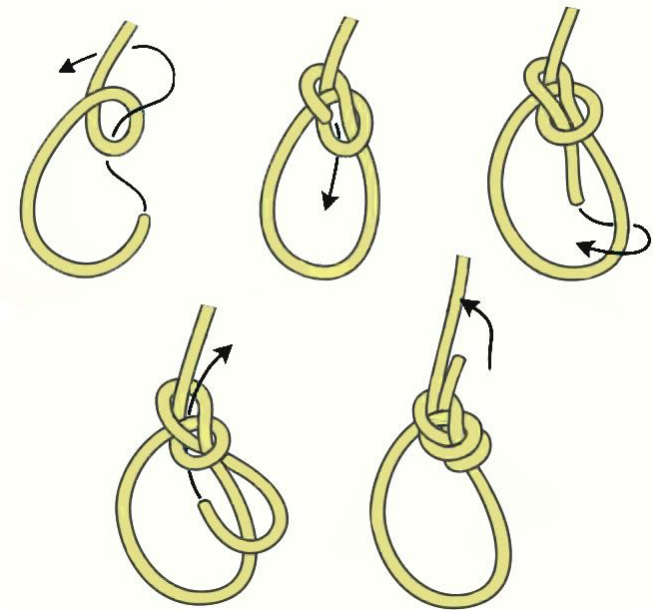


**优点：** 高强度且可靠， 受力后易以解开， 可单手操作， 快速。

**缺点：** 不受力时容易松开， 难于学习和检查。

**Advantages:** high strength and reliable, It is easy to untie after tension, cloud be operated with one hand quickly.

**Disadvantages:** easy to release without tesion, hard to learn and check.



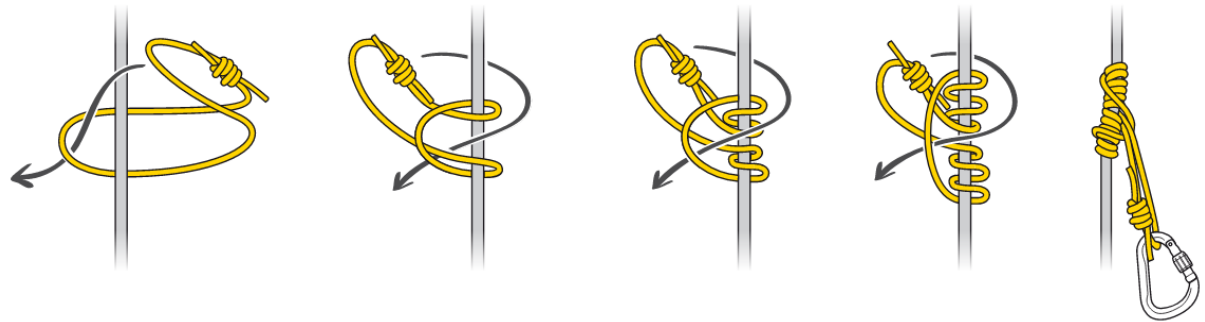
# /Prusik

A prusik (also known as a friction hitch) is a short piece of cord which can be wrapped around your climbing rope to add friction. They can slide up and down easily, but lock around the rope when weighted.

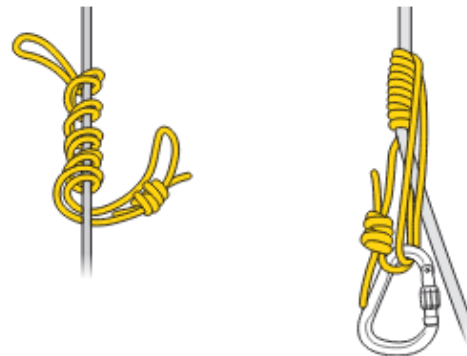
They are most commonly used for abseiling but are also incredibly useful in a variety of emergency situations such as ascending a rope or escaping the system.

There is couple different prusik knots, but the most popular ones are: Classic Prusik and French Hith.

Classic Prusik:



French Hith:





4

先锋基础

Basics of Lead Climbing



## 先锋攀岩/Lead Climbing

With lead climbing, the rope runs directly from the belayer to the climber. As the climber goes up the cliff, he or she clips the rope into bolts that are fixed to the wall. This differs from top-rope climbing where the rope initially runs up the wall to a top anchor and back down to the climber.

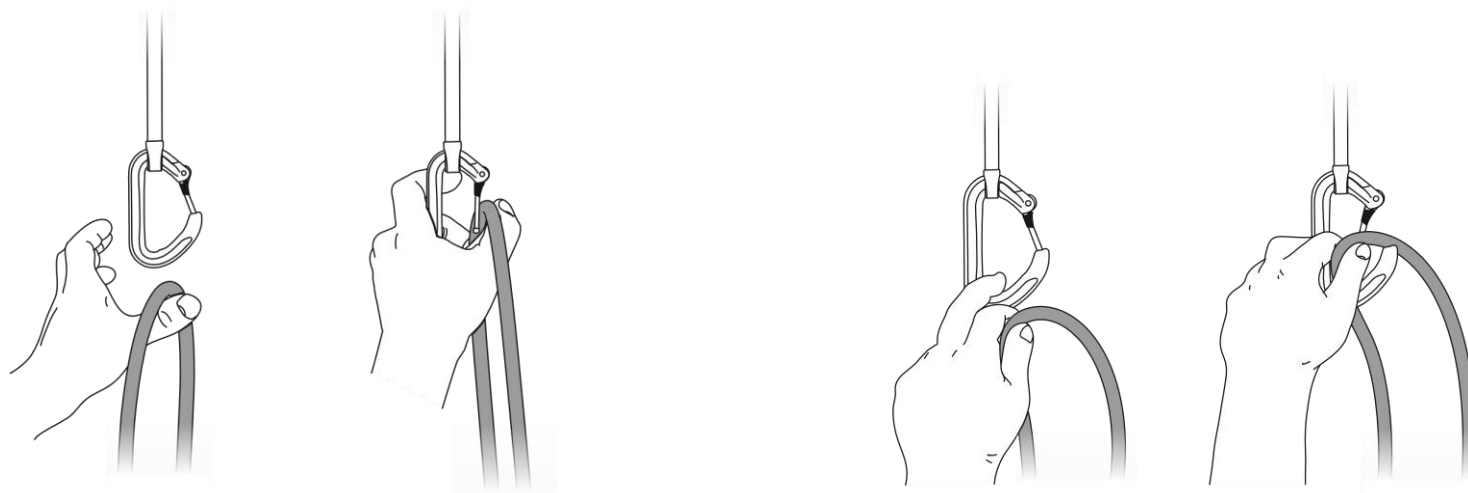
## 挂绳 / Clipping

Clipping rope into carabiner is the most dangerous moment during lead climbing because of the possible big fall. Rope clipped incorrectly can cause the rope to self unclip which can also create a safety risk. It is very important, to be able to do it fast and correctly.

Before going on your first lead climb, practice clipping rope into quickdraws on the ground using different hands and different quickdraws positions.

首先，稳定住快挂，然后快速入绳，记得把手指放在锁外侧。

Stabilize the quickdraw carabiner and put the rope through it, keep the fingers on the outside.



最常用两种手法：指捏手法（左一和二），虎口手法（右一）

The two most commonly used techniques: finger pinch technique and tiger's mouth (between the thumb and index) technique.

Bolt end

Rope end



Reminder: always clip-in the rope to the rope side of the quickdraw.

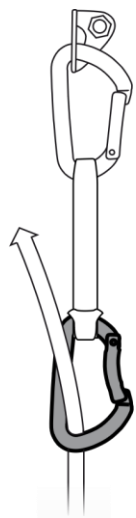
# 必须避免的先锋攀常见错误

## Common Lead Climbing Mistakes to Avoid

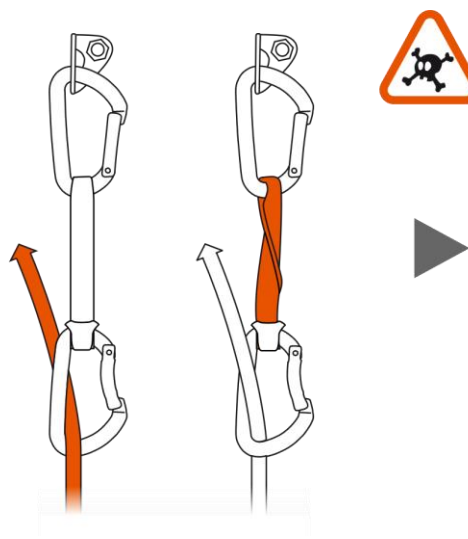
### 1. 挂反绳 / Back Clipping

非常危险，因为一旦你冲坠，挂反的绳子很可能从快挂中脱出来。

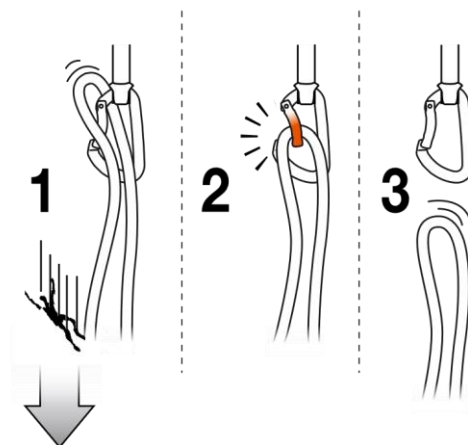
The carabiner gate must always face away from the climber's direction of travel. The rope in the carabiner must pass through it from the cliff side to the outside. Incorrect positioning of the quickdraw or the rope could cause the rope to unclip, either due to rope movement or to the carabiner flipping on the bolt during a fall.



CORRECT



NOT CORRECT



## 2. 抽错绳 / Z-Clipping

抽错绳是指当你从下方快挂的下面抽绳来挂入面前上方的快挂，解决方法是把下方快挂中的绳子解除出来，绳子释放后回到正确状态，然后重新正确扣入下方快挂即可。

Z-clipping is when you clip the rope to your next bolt from below your last bolt. To fix the problem, down-climb to the incorrectly clipped quickdraw and unclip it. Re-clip the quickdraw using the rope hanging from the top quickdraw closest to your belayer. Your belayer can then take in the slack.



I will take some pictures in Climbing Factory to replace those

GOOD



BAD

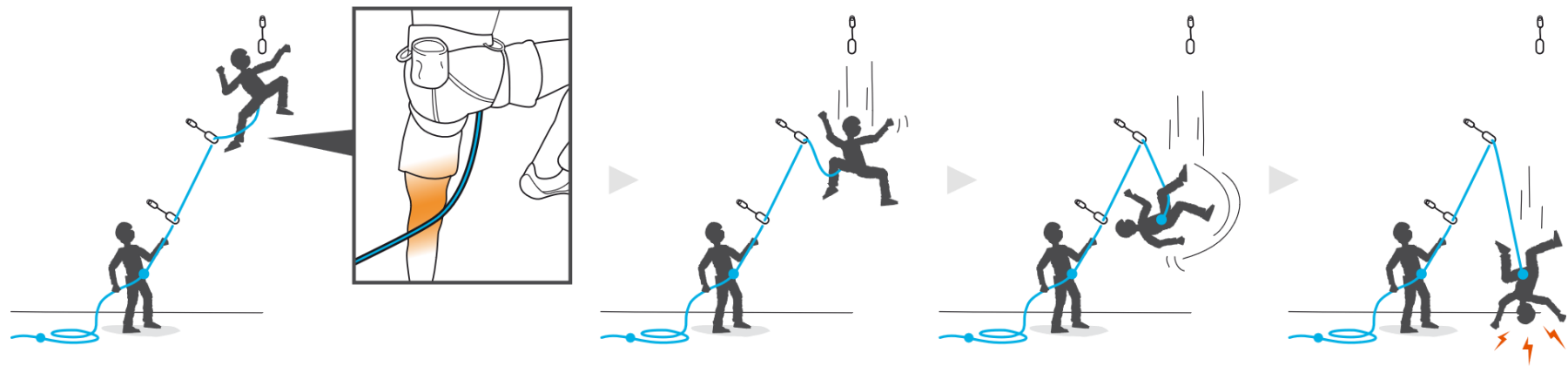


FIX

### 3. 腿绕绳 / Leg Behind Rope

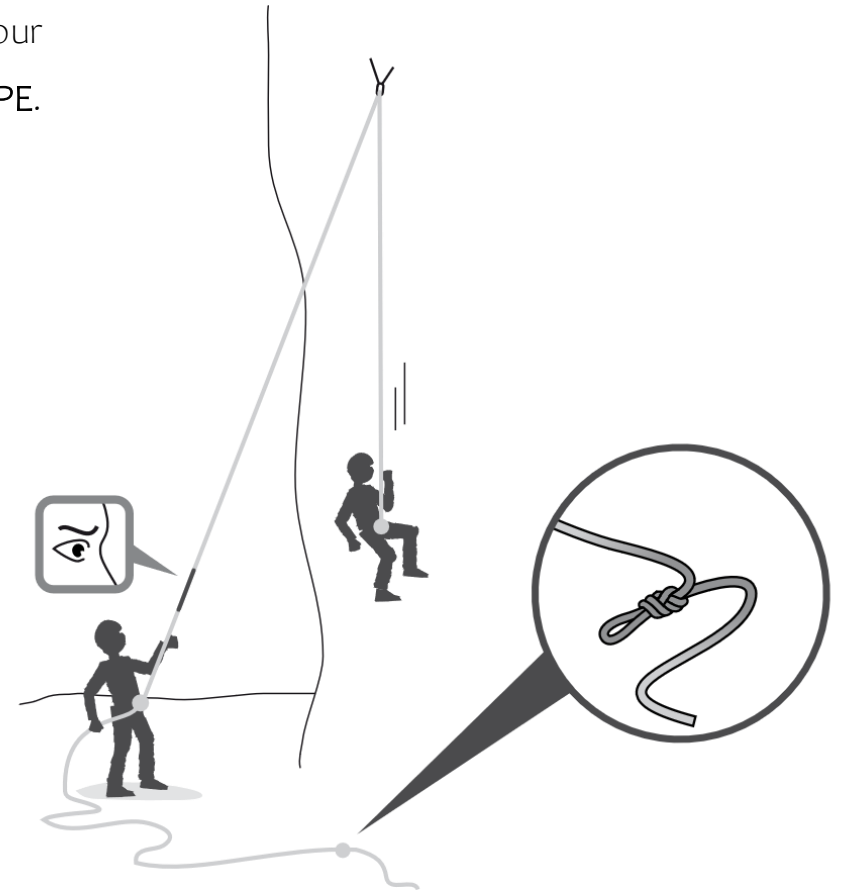
- 脱落时容易导致身体翻转，头朝下。
- 在较低位置，下落造成头部撞击地面。
- 在较高位置，摆荡导致头部撞击墙面。
- 若安全带未系紧，甚至会脱出安全带！

- When falling, it will easily cause the body to turn over, head down.
- In a lower position, the falling causes the head to hit the ground.
- At a higher position, the swing causes the head to hit the wall.
- If the harness is not fastened, climber may even come out!



## 4. 绳子太短了 / Rope too short

It could come as a surprise, but 'rope too short' mistake is very common and causing many accidents every year. To avoid it, check the length of the route you about to climb and the length of your rope as well as **ALWAYS TIE A KNOT AT THE END OF THE ROPE.**



5

保护技术  
Belay technique





# 攀登前互相检查 / Partner check before climbing

选择路线后，请确保：

- 绳子是正确的长度
- 您拥有所有必要的设备
- 线束是否正确安装以及带扣是否合上
- 保护者的重量差异不大

After choosing a route, make sure that:

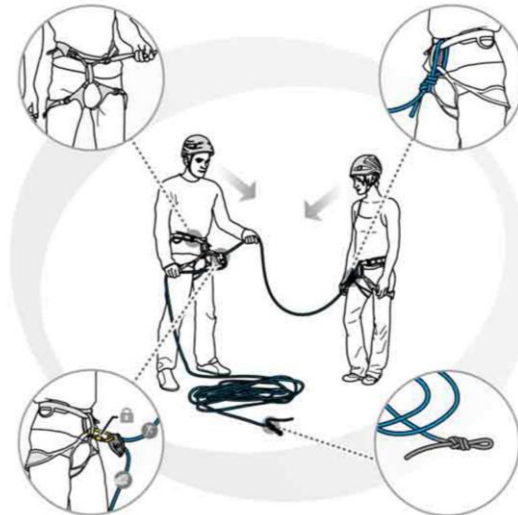
- The rope is the right length
- You have all necessary equipment
- Your harness is putted-on correctly and if the buckles are closed
- There is no great weight difference with belayer

踏上地面之前，登山者和保护者都要检查：

- 八字结
- 安全保护装置是否设置正确
- 保护装置上的登山扣是否被锁定
- 没有其他人沿您的路线攀登

Before stepping off the ground, both climber and belayer check:

- The figure eight knot
- If the belay device is set-up properly
- If the locking carabiner at the belay device is locked
- If there is no one else climbing in the line of your route



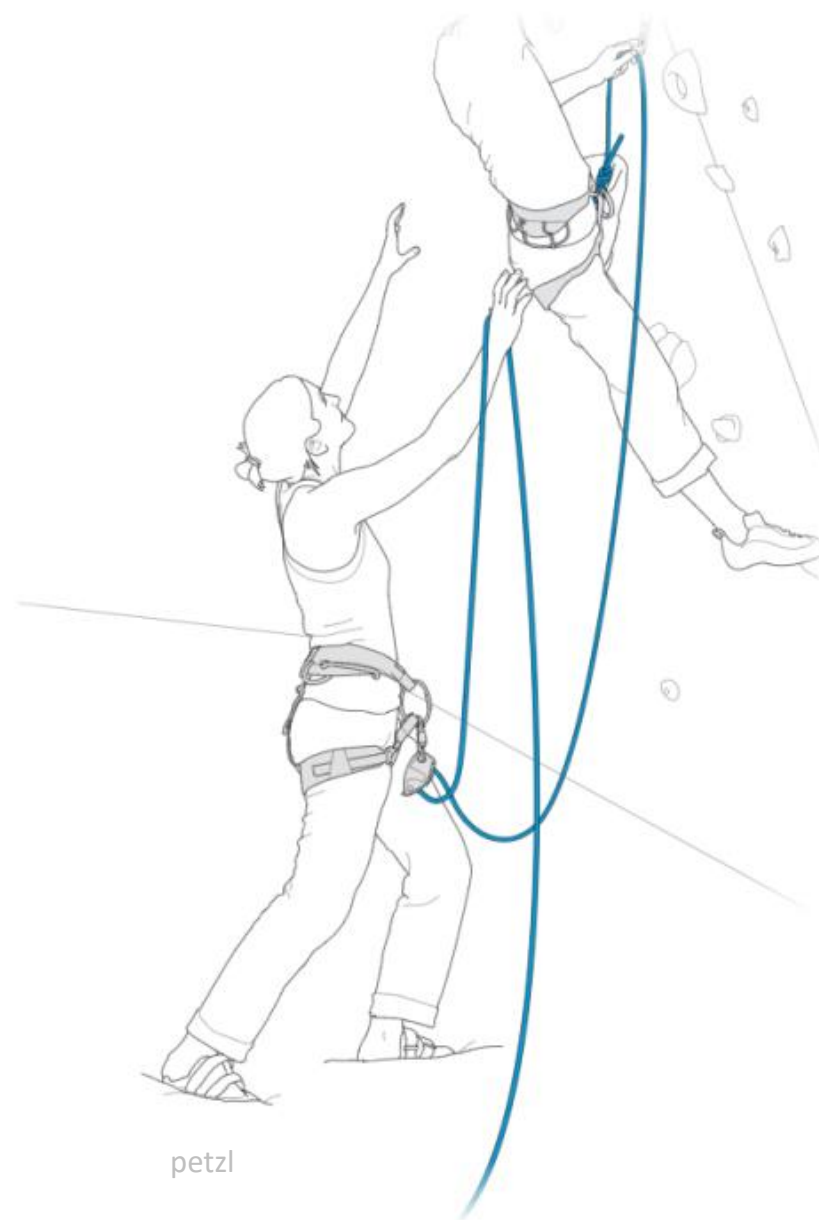
## 起步阶段 / Getting Started

- 预留好第一段绳子长度
- 进行抱石保护
- 快速转换保护状态

The first few meters of climbing require special attention and belaying.

Spotting (bouldering kind o belaying) can help reduce the consequences of a fall in the first few meters of a climb, before the climber has clipped the first quickdraw.

- Reserve the length of rope for first clip
- Use bouldering protection before the first clip
- Quickly switch to rope belay after clip in



## 前三把快挂 / The First Three Quick Draws

- 保护者站位避免干扰攀爬者，但尽量靠近第一把快挂下方。
- 严格控制余绳长度，避免攀爬者脱落落地，或撞到保护者。
- 快速顺畅给绳，但避免给过多。

- The belayer must correctly visualize the trajectory of the route to avoid being below the climber. Position the rope so that it doesn't hinder the climber. Because the belayer is close to the wall and to the climber, the rope often gets caught in the climber's feet or interferes with the next clip. By being mobile and engaged, the belayer can make things go a lot easier in that moment.
- Strictly control the length of the remaining rope to prevent the climber from falling off the ground or hitting the belayer.
- Give the rope quickly and smoothly, but avoid giving too much.



## 给绳 / Feeding Slack

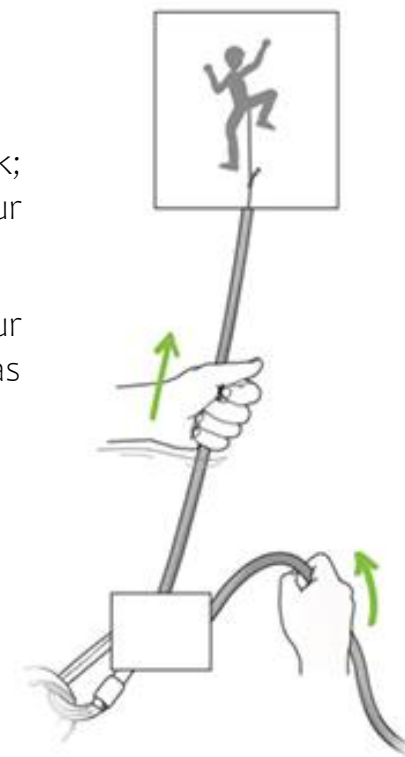
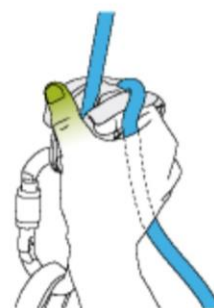
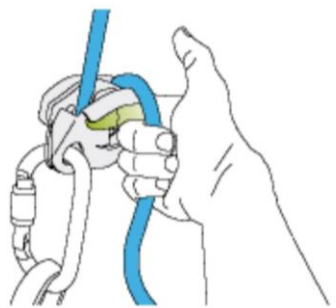
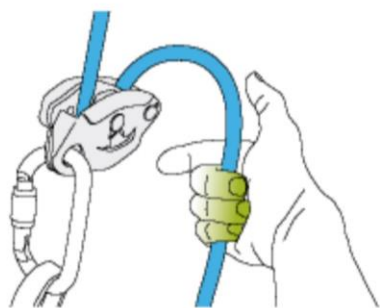
在先锋攀爬中，通常会给攀岩者一定松弛的绳索，在此过程中，制动手永远不会离开绳索。

有时，您可能必须非常快速地给绳，如果使用GRIGRI，则可能导致锁死。在这种情况下，您应该将拇指放在设备上以停用其凸轮/辅助制动操作，如下所示。

Giving out slack is common in lead climbing.

To give slack, your brake-side hand pushes the rope towards the device, creating slack; your other hand pulls the rope through the device. To repeat this movement, slide your brake-side hand along the rope, without ever letting it go.

If using GRIGRI, feeding slack, may cause it to lock. In that case, you should put your thumb onto the device to deactivate its camming/assisted-breaking action, as demonstrated below.



# 口令和沟通 / Commands and Communication

使用在整个攀岩文化中相对普遍的标准化攀岩命令可以显著减少有时在攀岩派对中发生的混乱。 至关重要的是，新的登山者必须迅速学习并利用登山命令，以免造成混乱。

重要的是要确保每个人都对聚会将要使用的攀爬命令及其每个命令的含义有深刻的理解。

Using standardized rock climbing commands, which are relatively universal throughout climbing cultures can significantly decrease confusion that sometimes occurs within a climbing party. It is essential that new climbers quickly learn and utilize climbing commands to avoid confusion.

It's is important to make sure that everyone has a solid understanding of the climbing commands that will be used by the party and the meaning behind each of these commands.

Climber	Belayer	Meaning
On belay		Is the belay ready
	Belay on	Your belay is ready
Climbing		Here I come
	Climb / Climb on	Come ahead
Slack		In need some slack in the rope
Up rope		Take in the loose rope
Falling		I'm falling! Brake the belay rope!
Tension		Hold the rope tightly in case I fall
	Got you	There's tension on the rope
Ready to lower		Lower me
	Lowering	I'm letting you down now
Rock	Rock!	Look out for falling objects
Rope	Rope!	Rope being thrown down
Off belay		I'm in a safe place and no longer need a belay
	Off belay	I'm no longer belaying you

6

冲坠处理  
Falling catch

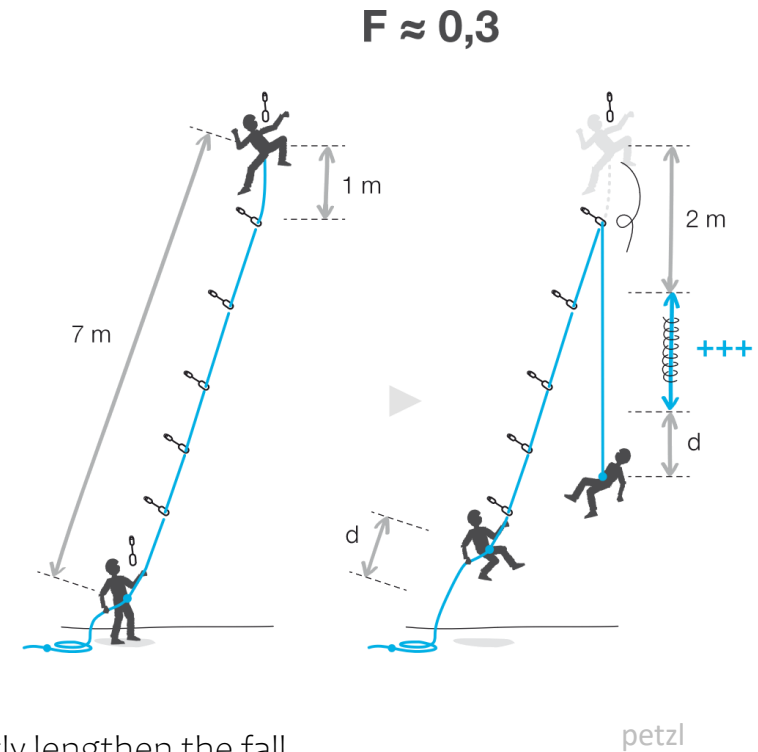


攀岩工厂

---

# 缓冲保护 / Dynamic belay

- 在安全合理的高度情况下
- 脱落时当系统内绳子走完的那一刻
- 保护员感受到攀爬者下落力量拉扯时
- 迎合这股力量轻轻跃起或跑向第一把快挂下方
- 给予攀爬者下落止坠时有一个减速缓停
- 既减少攀爬者止坠冲击力和快速撞墙风险
- 也提高保护员的自身安全
- 当两者体重差距大于15kg时需要做额外安全处理



Dynamic belaying refers to a method of belaying where you slightly lengthen the fall to soften the impact. In this case, the belayer moves just as the climber hits the end of the rope, preventing the leader from the forceful swing back into the wall.

Use dynamic belay:

- When climber reached safe and reasonable height
- The belayer feels the pull of the climber's falling force
- By moving slightly towards the first quickdraw
- To give climber a 'soft' fall
- To reduces the impact of the climber's fall

When the weight difference between the two is greater than 15kg, additional safe handling is required!

7

保护站

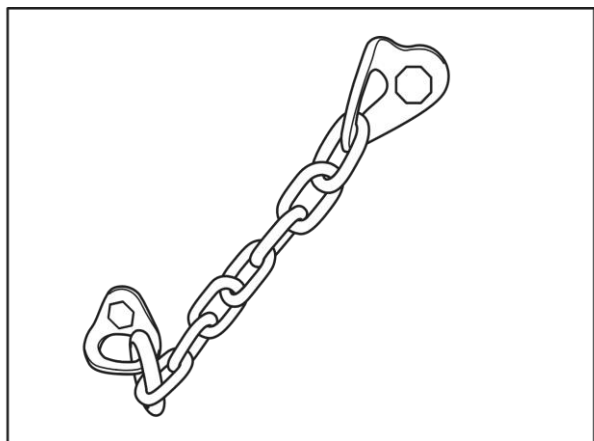
Anchors



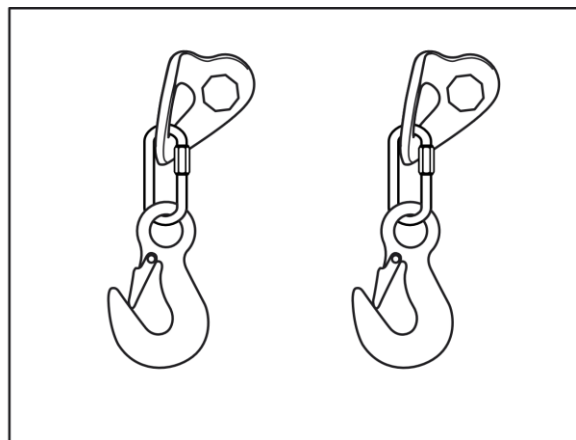
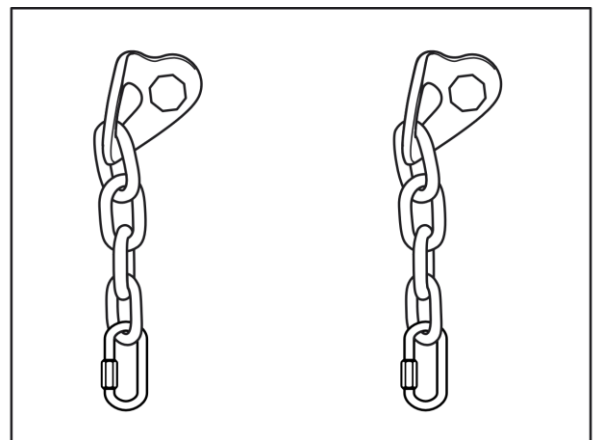


# 最常见的顶部锚点 / Most common anchors

A safe climbing anchor is composed of a minimum of two points (bolts). When the climber reaches the top or when top-roping off the anchor, the rope should be clipped to both points. Lowering off one anchor point is considered dangerous!



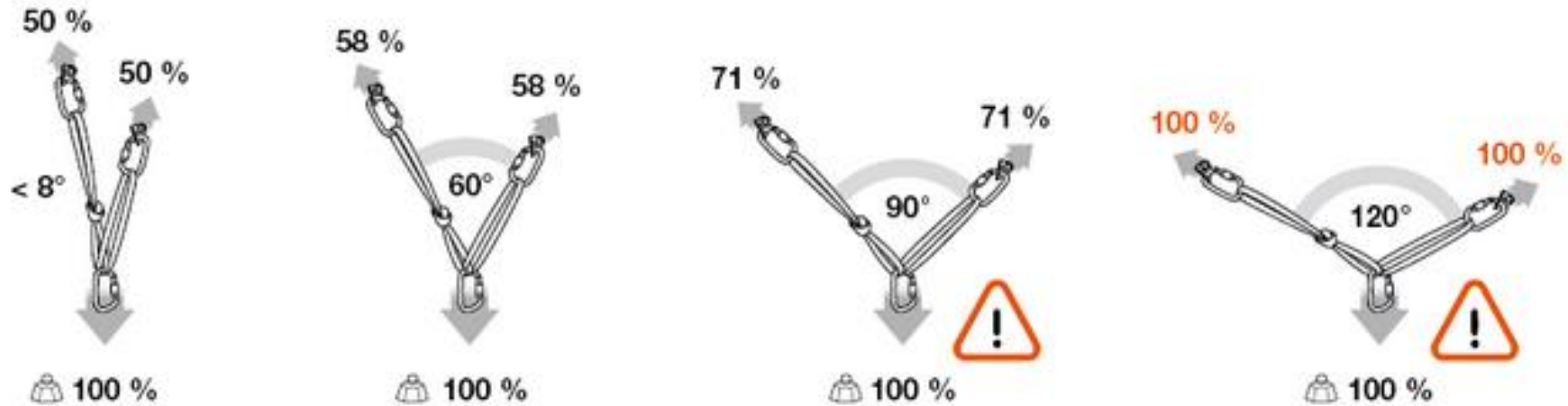
Belay station with points connected by a chain



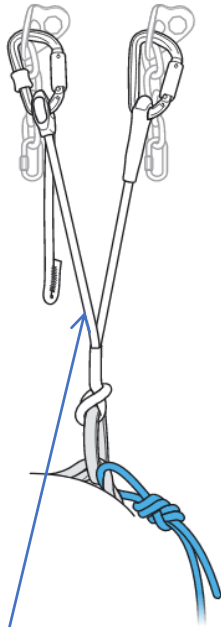
Belay with unconnected points

## 均衡 / Balance

When climbing in outdoors, you may have to set up your own anchor. In that case, it is important to know, that the distance of two anchor points and the length of the slings used to build anchor can dramatically change the strength of the whole anchor system. Make sure that both anchor points are equally loaded (same amount of weight on both points) and that the angle between both points is as small as possible.



# Lowering with cleaning the anchor step by step



DUAL CONNECT ADJUST

Adjustable double lanyard for climbing and mountaineering



确保自身  
Anchor yourself



建立保护站  
Installing belay station



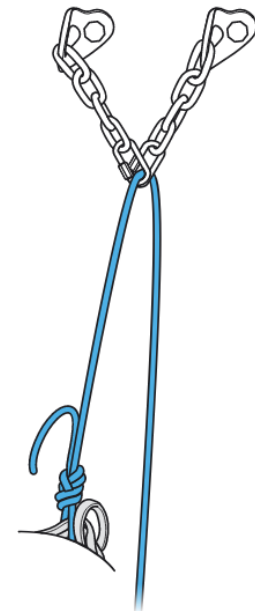
拆除保护站  
Cleaning belay station



确保下降  
Lower by belayer

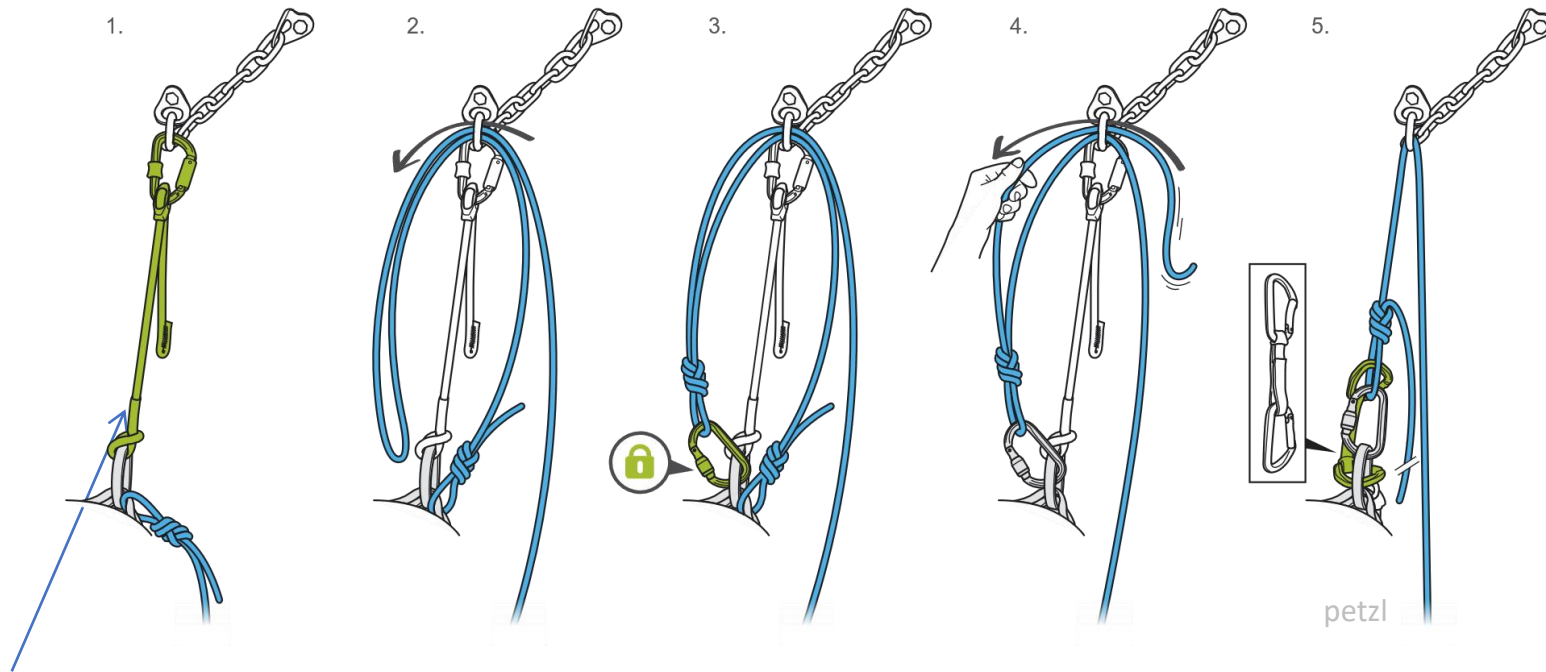


petzl



# 绳子过顶 (用于下降) / Installing top-rope (for lowering)

Installing a top-rope is one of the basic techniques first learned in rock climbing. Even if it eventually becomes routine, it is important to keep in mind that 30 to 40 m above the ground an error can quickly have serious consequences. So remain focused when climbing and belaying!



CONNECT ADJUST

Adjustable single lanyard for climbing and mountaineering

**Attention:** Regardless of the technique used, the belayer must continue to belay the climber throughout the entire sequence, never letting go of the brake-side rope.

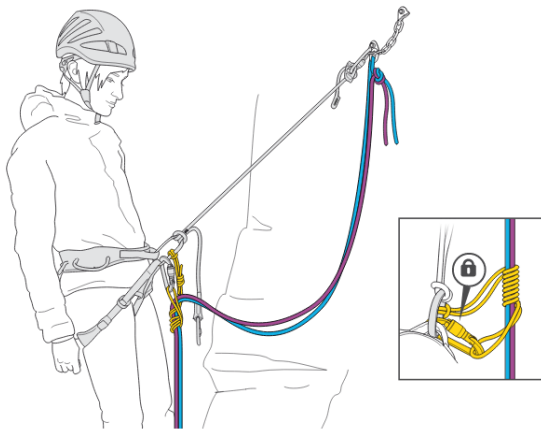
8

绳 降  
Abseiling



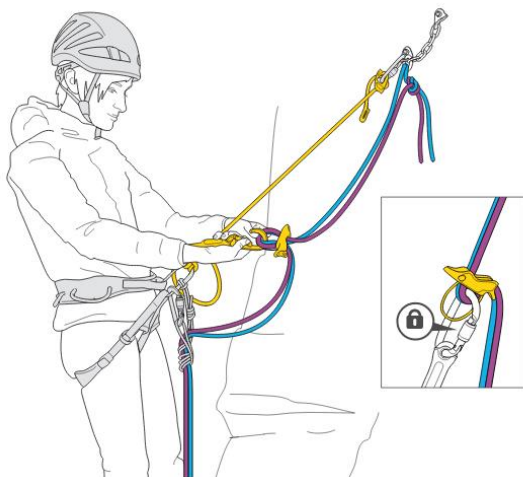
# 双绳下降 / Rappel down

While all climbers aspire to reach the top of a pitch, getting back down is every bit as important. Lowering on belay is what most of us do when we start climbing.



**Lowering** - requires belay partner

**Rappelling** - climber is setting up rappeling system and self lower



Rappelling comes in handy in a number of scenarios, but most commonly it is used to minimize wear and tear on an anchor system (like one that has rappel rings) after you've cleaned the anchor and need to get down.



攀岩工厂