



ZIGZAG

Experience



+



- This "Product Experience" document is a supplement to the Instructions For Use, which provides feedback from field experience and tips for using your product
- It is inseparable from the Instructions for use



Important / remember

- Read the instructions for use carefully before looking at the following techniques
- You must have already read and understood the information in the Instructions for use to be able to understand this supplementary information
- Mastering these techniques requires specific training
- Work with a professional to confirm your ability to perform these techniques safely and independently before attempting them unsupervised



Failure to heed any of these warnings may result in severe injury or death.

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Each piece of information is listed according to the technical level required for its application. Respect your own level when choosing your techniques.

FOR BEGINNER **Beginner technique**
Technique usable by a trained practitioner of the activity.

NOT FOR BEGINNER **Technique for a certified practitioner**
Technique for a person trained and certified in the activity.

EXPERT ONLY **Expert technique**
Technique only for experts in the activity.

Légende des pictos

	user		user-mass
	climber		hand
	victim		anchor
	rappel		mass
	victim + rescuer		small mass
	fall		harness

1. Reminders

1.1. Basic tree care concepts necessary for understanding this document

Belay system

A belay system includes at least an anchor and its potential accessories (false crotch, etc.), a belay support (rope, lanyard, etc.), a rope adjuster and its connection to the harness. When two belay systems are required, each element of the first system must be independent of the elements of the second system.

Tree access

The access phase begins on arriving at the base of the tree and ends when the work rope is installed on a primary anchor. Generally, the arborist begins by throwing a line over a high branch. This line is used to install the access rope used for the ascent.

Aligning the ends

The ends of the throw line must be "aligned" to install a double access rope: the arborist makes sure that the two ends slide side by side and are not separated by one or more branches.

Work phase

The work phase includes movement within the tree, to get to the cutting points, and cutting time.

Movement

While moving around, the arborist can use a single belay system installed on a primary anchor. Depending on national legislation, a second belay system is recommended, or obligatory, when the rope of the primary system is inclined at more than 45°.

Cutting

When using any cutting tool, the arborist must use two independent belay systems.

Friction hitches

Friction hitches are the traditional arborist tools. Numerous types exist for different usages. The hitches must be learned through training and always tied with the utmost care. The primary characteristic of a friction hitch is to be "living":

- The same knot grabs and slides differently depending on the situation and how it is tied
- The same knot grabs and slides differently depending on the ropes used

False crotch

A false crotch is an anchoring device installed around the trunk or a branch. It allows better rope glide and avoids damaging the branch itself.

Tree anchor

The concept of the tree anchor must be understood through specific arborist training.

Primary or definitive anchor

Passing around the trunk (axis 1) or around the largest branches in certain situations (axis 2). During the work phases, the arborist must have at least one belay system installed on a primary anchor.

Supplementary anchor

Passing around any branch that can hold the arborist's weight. A supplementary anchor can be used to install a second (supplementary) belay system or a positioning lanyard.

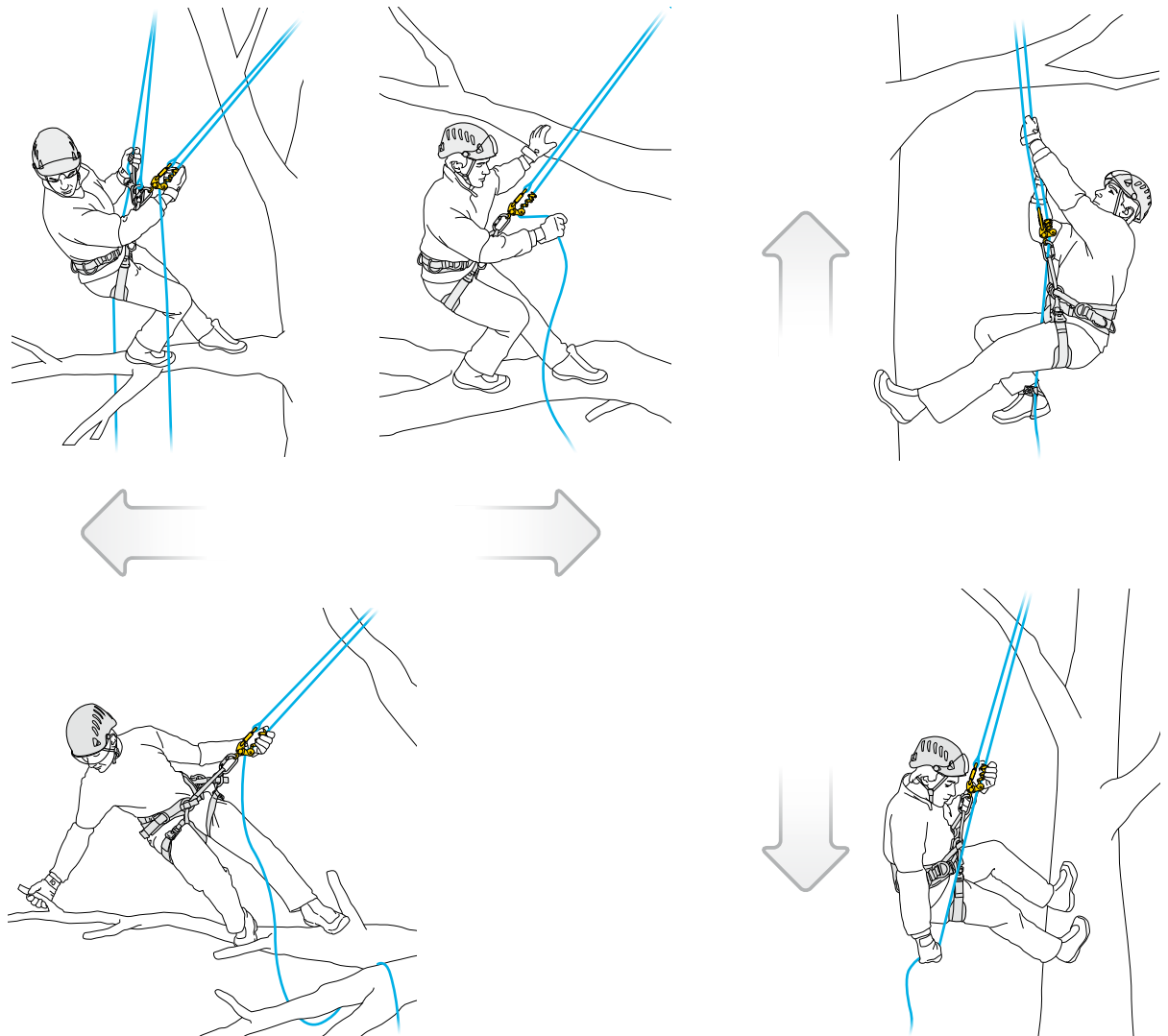
Connectors

Depending on national legislation, it is recommended, or obligatory, to use double auto-locking connectors (TRIACT-LOCK, BALL-LOCK...) in tree care work. In the various situations of cantilever loading, such as blocking around a branch, use steel connectors.

1.2. Principal uses of the ZIGZAG

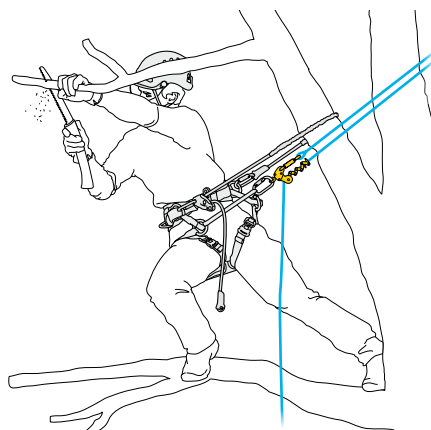
Double rope progression device

The ZIGZAG is essentially designed for movement within the tree during the work phase: moving to the end of a branch from a principal anchor, returning to the trunk, ascents and descents.



Securing oneself at the work station

When cutting, the ZIGZAG can be used to secure and stabilize the arborist, without changing the setup that is used for movement within the tree. A second independent system must be used.



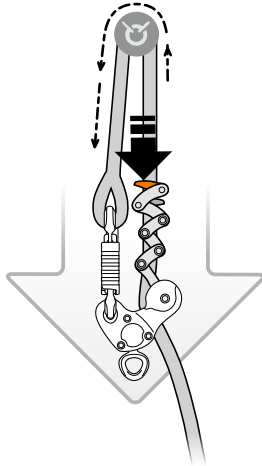
Emergency evacuation system

Installed on a rope of sufficient length, the ZIGZAG can function as an emergency evacuation system, e.g. during access phases or when dismantling on the trunk.

1.3. Precautions when using the ZIGZAG

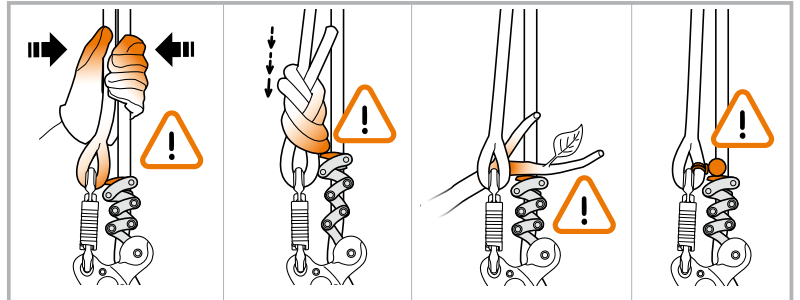
Release lever

Any accidental pressure on the ZIGZAG's release lever can cause a fall.



Verification during use

Beware of foreign bodies, or system elements, which can impede the operation of the friction chain, or press on the release lever: branches, retrieval balls, rope terminations, etc..



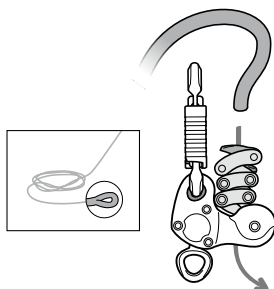
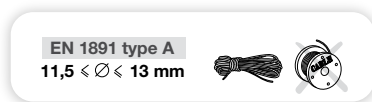
Rope

The ZIGZAG is for use with EN 1891 rope, 11.5 -13 mm in diameter.

It must be threaded onto the end of the rope and moved to its work position, beside the manufactured termination (spliced or sewn).

Beware of thin splices that can pass through the ZIGZAG.

Storage: Depending on the techniques used, the ZIGZAG can be left in place on the rope to save time on the next use.



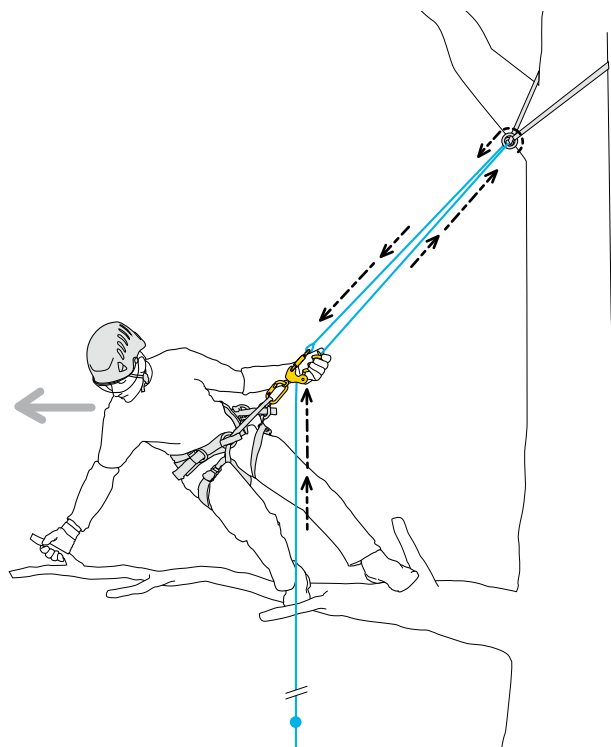
Rope glide

The ZIGZAG works on double rope. When the rope slides through the ZIGZAG (ascent or descent), the rope also slides around the anchor. If rope glide is slowed by friction in the anchor, or on branches, movement will be less fluid.

Rope length

Using double rope makes it difficult to evaluate rope length.

It is essential to make a stopper knot in the end of the rope to prevent a fall.



1.4 ZIGZAG certification

The ZIGZAG bears the CE mark as it has been certified to meet the European PPE directive 89/686/CEE, taking into account the pertinent articles of EN 12841: 2006 "Personal fall protection equipment. Rope access systems. Rope adjustment devices".

There is no reference standard exactly suited to a device like the ZIGZAG.

The standard that comes the closest is EN 12841, which treats mechanical devices used on rope in the professional sector. It distinguishes three types of rope adjustment devices: type A for back-up devices, type B for rope clamps, type C for descenders.

The ZIGZAG's functions correspond simultaneously to types B (rope clamps) and C (descenders), described in the EN 12841 standard. The certifying body has selected the most relevant tests in this standard to validate the ZIGZAG.

Function and strength tests from the EN 12841: 2006 standard that were used to certify the ZIGZAG:

- All of the tests were done in doubled configuration, in conformance with the usage recommended in the instructions for use, on two different ropes of the minimum and maximum diameters authorized for use, as indicated on the device (EN 1891 type A rope, 11.5 mm and 13 mm diameters).

- Function tests after conditioning with moisture, heat (+50° C) and cold (-30° C) (requirement: device slippage on rope less than 1 m).
- Locking test on rope for 3 minutes under a load of 3 kN (requirement: device slippage on rope less than 1 m).
- Static strength test (12 kN strength requirement, raised to 15 kN for the ZIGZAG).
- Dynamic performance test for type C devices: 1 m fall of a 140 kg mass on 1 m of rope + 1 m dynamic lanyard (requirement: mass does not release + test of residual strength under 3 kN for 3 minutes).
- Testing the ability to keep the speed of descent at less than 2 m/s without damaging the rope; test conducted with 100 kg and 140 kg.
- Measuring the heating of the metal parts while lowering a mass (no parts in contact with the user heated to more than 48° C – see the instructions for use for more information).

(Note: the certification tests are conducted by the independent laboratory of a notified body, which issued a CE type exam certificate. During the development of the device, Petzl conducted numerous additional internal tests.)

2. Tree access

There are many access techniques suitable for different work objectives in the tree. The access technique includes a choice of rope installation, and the ascent technique itself.

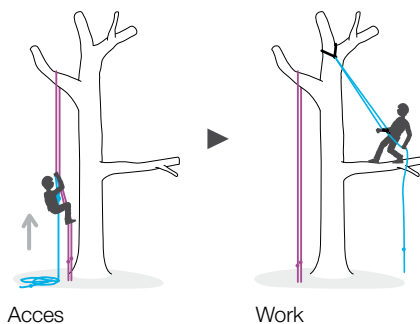
Two precautions are recommended during access:

- When ascending using a frame-loaded rope clamp, the user must not fall if one or both of the cams on the rope clamp opens. The cams should be backed up, for example, by friction hitches

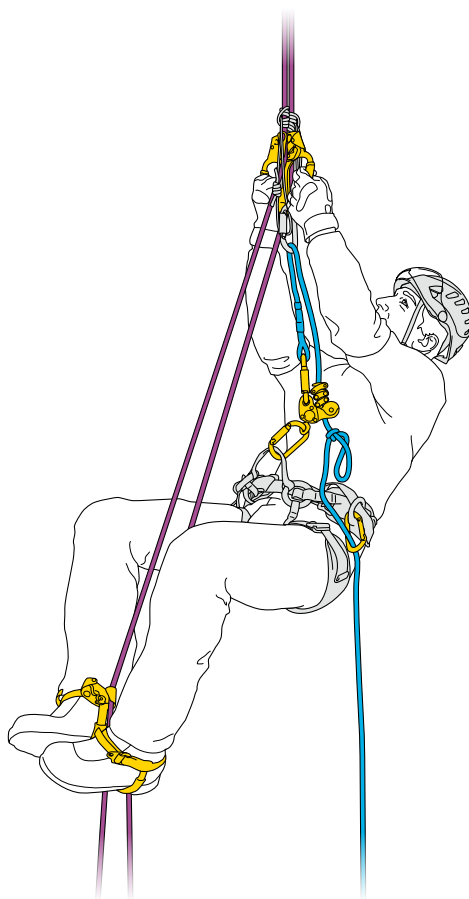
The user must be able to descend in an emergency, without significant modification to the equipment setup.

FOR BEGINNER **DDD** 2.1. Access on double rope

This classic technique allows the access rope to be left in place, while working in the tree on a second rope. It is suitable for major, long-term projects.



- + The access rope can be used by multiple arborists to ascend into the same tree, for aid and rescue, and eventually for descending.
- + The ground person can pass equipment up via the access rope.
- + The arborist goes to the top of the tree to install his work rope on a definitive anchor. He is then certain of the primary anchor's quality.
- Aligning the strands is necessary before access.
- On long ascents, the rope can slip through the ZIGZAG, changing the ergonomics of the ascent.

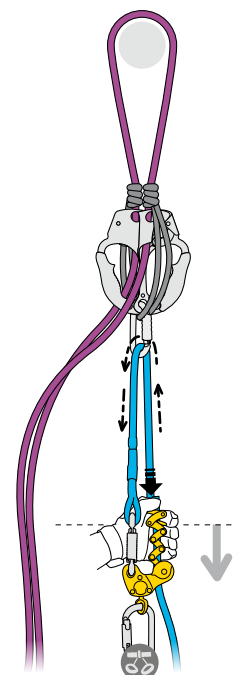


Precautions

The work rope must be long enough to return to the ground (doubled) from the top of the access rope and/or the chosen primary anchor point.

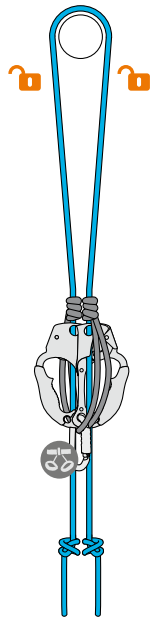
Emergency descent

To descend just undo the mule knot and control the ZIGZAG normally. The ASCENTREE stays in place on the rope.



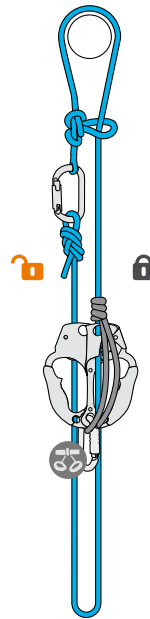
Backing up the ASCENTREE with friction hitches

The type of backup depends on whether the rope is installed with the ends blocked, or not.



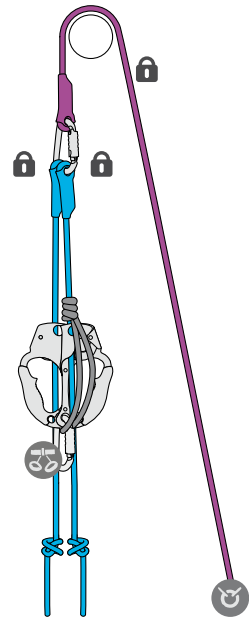
a. Double rope, ends not blocked

Complete backup with a friction hitch on each strand.
The branch isn't choked: the rope can slide on the branch.
Warning: approaching the top on a large-diameter branch, the separation of the rope strands can disable the cams, or impede progression.



b. Double rope with one strand blocked at the level of the branch

A friction hitch on the blocked strand is enough for a complete backup.

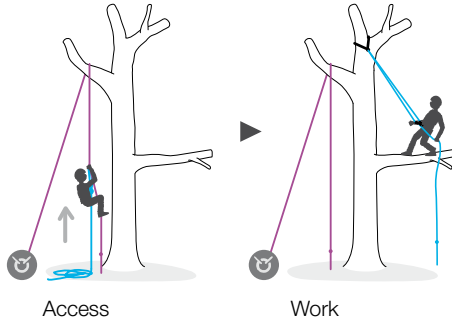


c. Double rope with both ends blocked at the foot of the tree

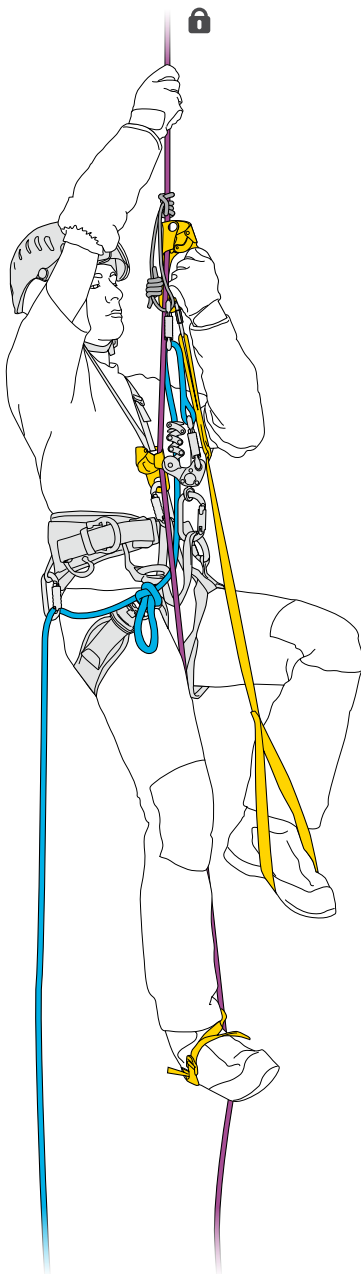
A friction hitch on one blocked strand is enough for a complete backup.
Warning: the branch supports twice the climber's weight (pulley effect).
A releasable anchor may be installed at the base to allow an emergency evacuation by the ground person.

NOT FOR BEGINNER **DDD** 2.2. Access on a single rope

This technique, very close to the double rope access technique, saves time on aligning the rope ends. The alternating ascent technique on single rope is especially efficient for long ascents.



- + Rapid installation without aligning the rope ends.
- + A releasable anchor may be installed at the base of the tree.
- + The access rope stays in place and can be used by multiple arborists.
- Specific ascending equipment is used.
- Load on the branch is doubled (during access) by the pulley effect.
- Access rope exposed during the work phase.

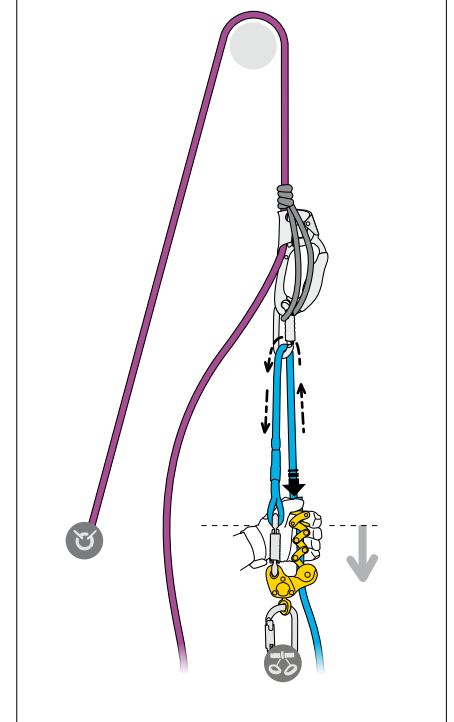


Precautions

- The work rope must be long enough to reach the ground (doubled) from the top of the access rope and/or the chosen primary anchor point

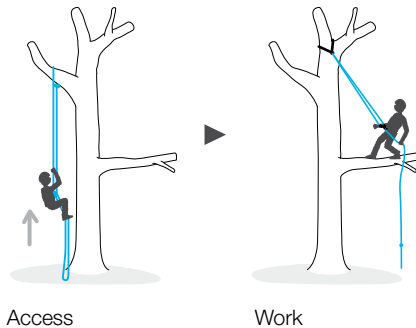
Emergency descent

To descend, disengage the CROLL, undo the mule knot and control the ZIGZAG normally. The ASCENSION stays in place on the rope.



EXPERT ONLY DDD 2.3. Securing the ASCENTREE with the ZIGZAG -
Technique for access and work on a single rope.

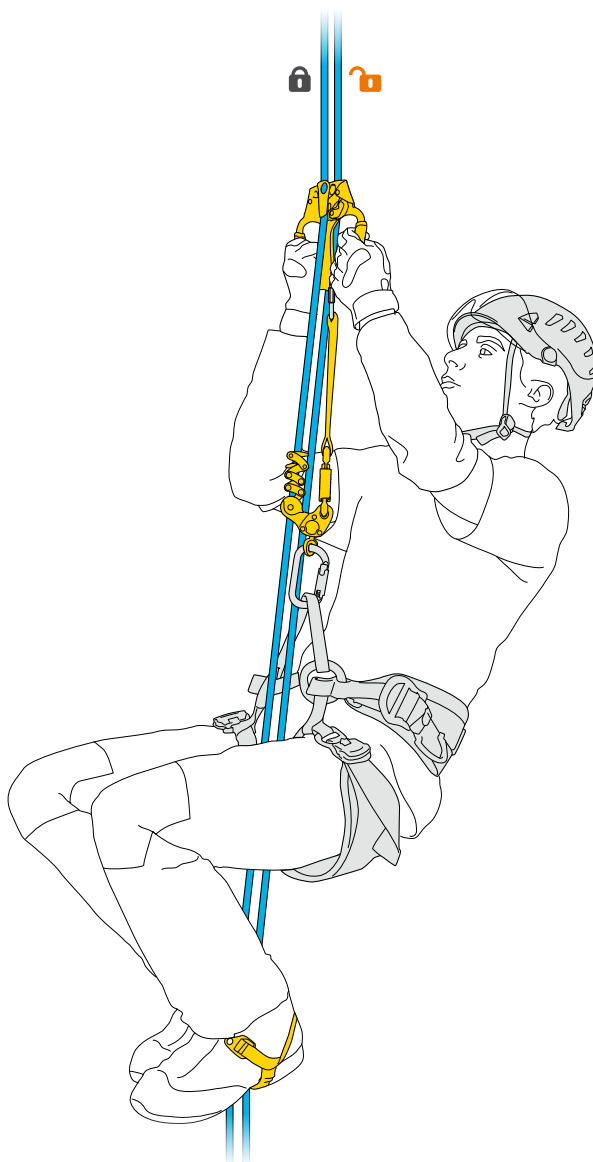
Arriving at the top, the ZIGZAG is on the splice side, ready to be set up for the normal work configuration.



- + Uses little equipment.
- + The work rope is not carried by the arborist while climbing.
- + The rope length, necessary for the work phase and the descent, is verified during access setup.
- + The rope joining knots, placed at the top, ensure no knot passing in case of emergency descent, or rescue.
- + The choice of EXPRESS sling allows ergonomic adjustment for the ascent.
- Work is not possible during the access phase .
- Without an access rope left in place during the work phase, the possibilities of aid or rescue by the ground person are reduced.

Precautions

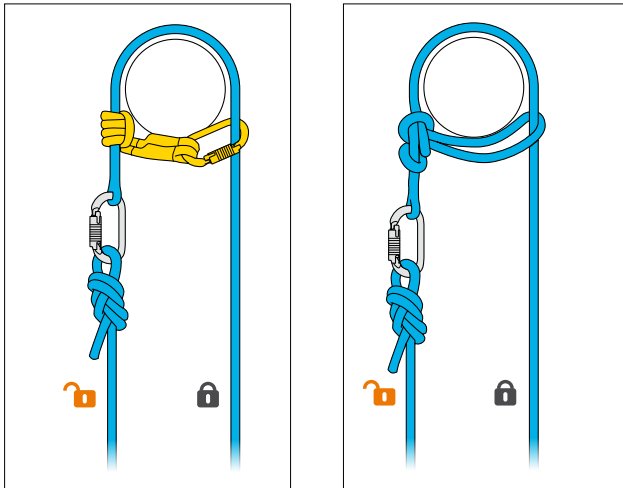
The ZIGZAG must be installed on the blocked rope strand.
The maillon on the ASCENTREE must be tightened with a wrench.
The knots must be moved up as close as possible to the branch for the strand to be correctly blocked.



Remarks on the ZIGZAG backup

- If the cam on the blocked strand opens, the ZIGZAG normally works in double mode
- If the cam on the other strand opens, the climber is held by the cam on the blocked strand (the rope must be tightened around the branch)
- Warning: if both cams open simultaneously, the arborist will be hanging from the ZIGZAG in single mode. This situation is acceptable in this special case, on the condition that the arborist does not move. It is recommended to quickly make a backup knot on the rope, below the ZIGZAG, before re-engaging the cams to continue the ascent

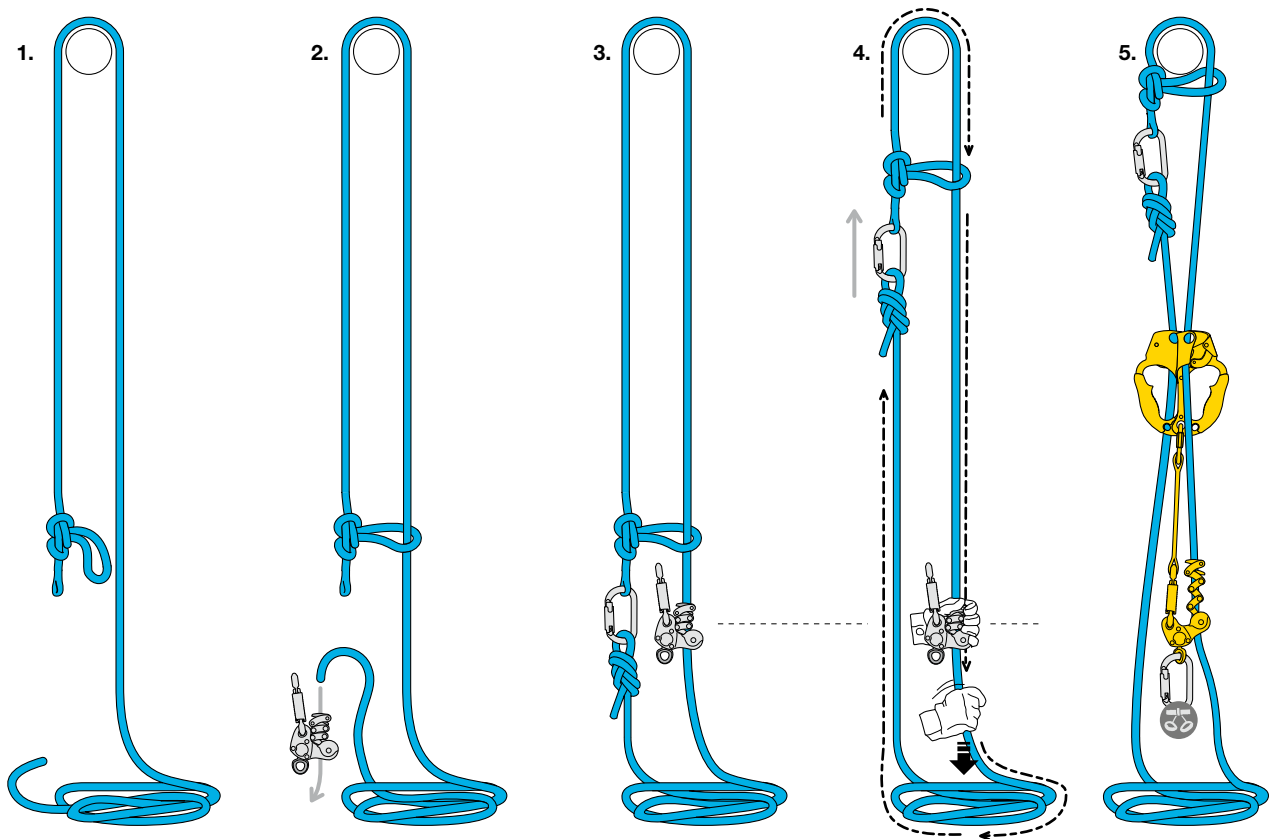
Variations for blocking the ends



Blocking one of the rope ends allows use of the ZIGZAG backup.

- A butterfly knot is very secure, but can be difficult to untie once you've arrived at the top
- Blocking with a friction hitch will be easy to disconnect in all situations. Beware of cantilever loading on the connector

Installing the access system

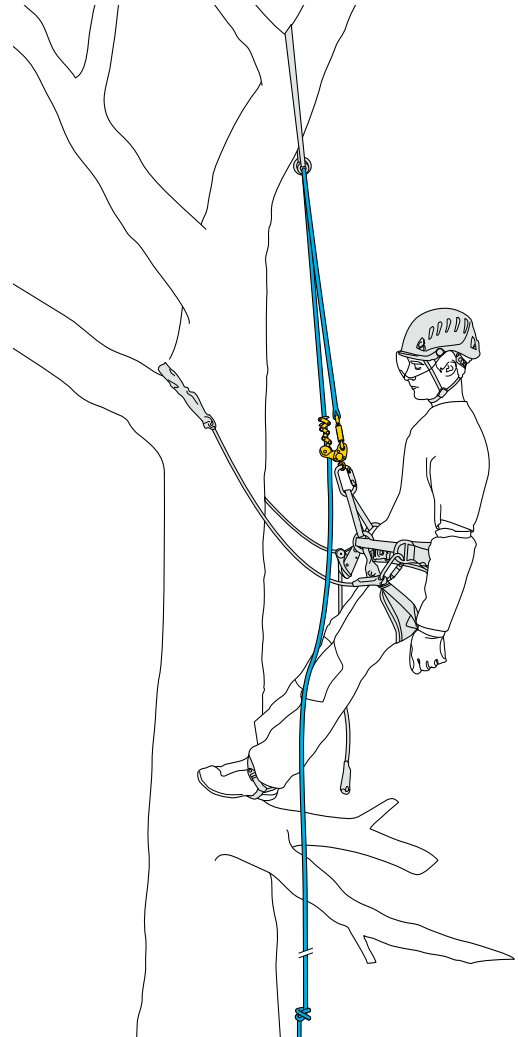
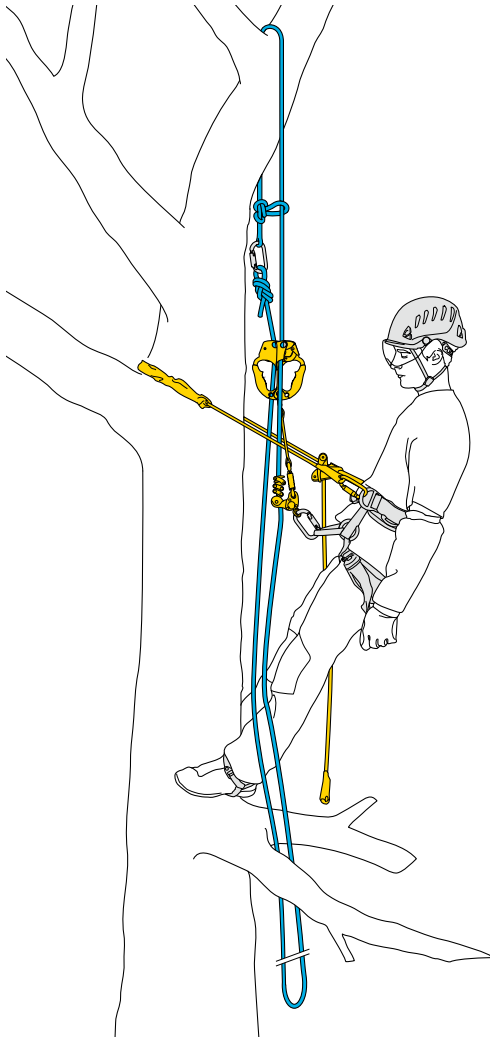


Arriving at the top

Once at the top and anchored in, the arborist can dismantle the access system and disconnect the ends of the access rope.

Work position

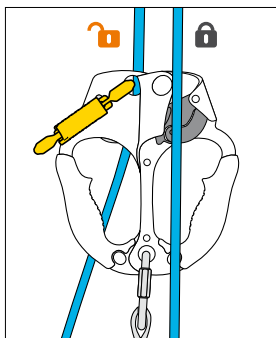
The ZIGZAG is close to the splice, in the normal work configuration.



Emergency descent (during the access phase)

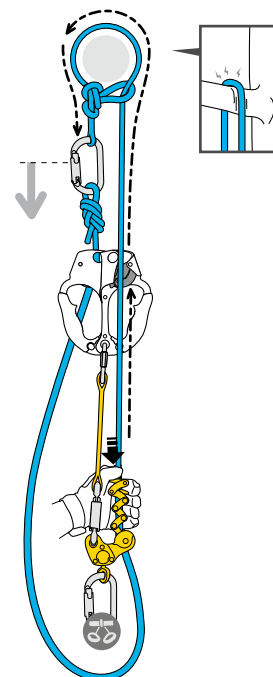
Disengage the cam on the blocked strand and remove the rope from that side of the ASCENTREE. Close the cam. Use the ZIGZAG normally in double mode.

Warning: do not disengage the two cams to attempt to descend with the ZIGZAG in single mode.



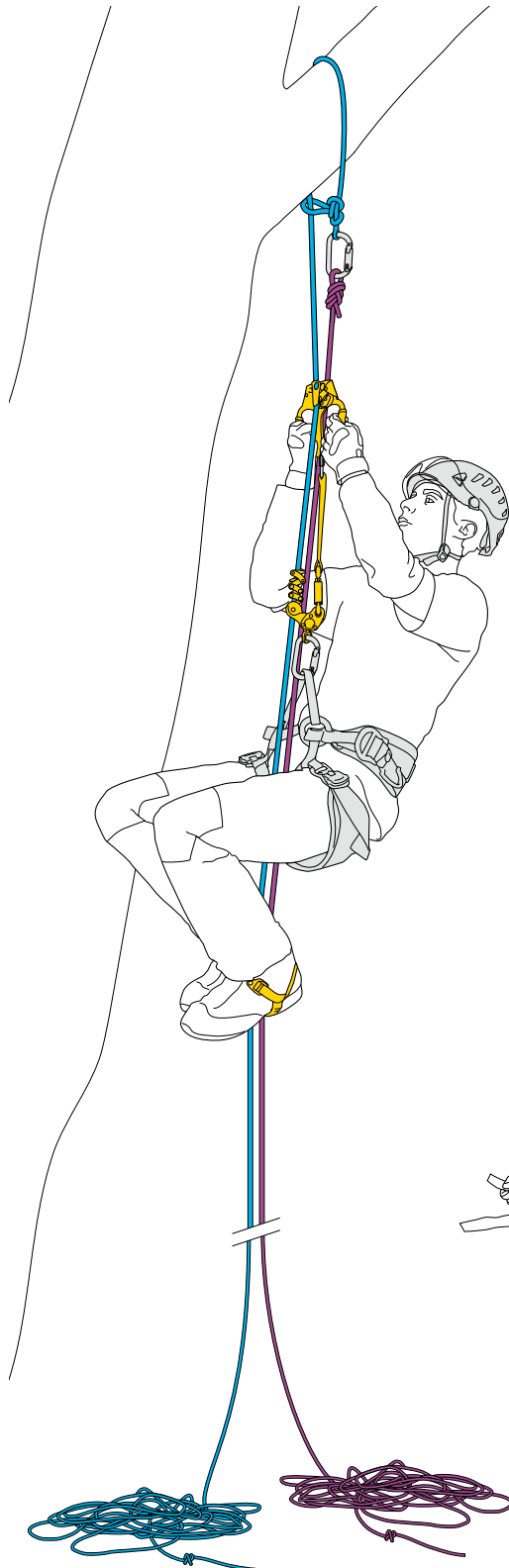
Tip

To identify which cam should be disengaged, install a carabiner in the upper attachment hole of the ASCENTREE, on the side of the strand that is not blocked. This carabiner does not affect system function.



EXPERT ONLY DDD 2.4. Securing the ASCENTREE with the ZIGZAG -
Variant of 2.3 with the installation of an aid and rescue rope

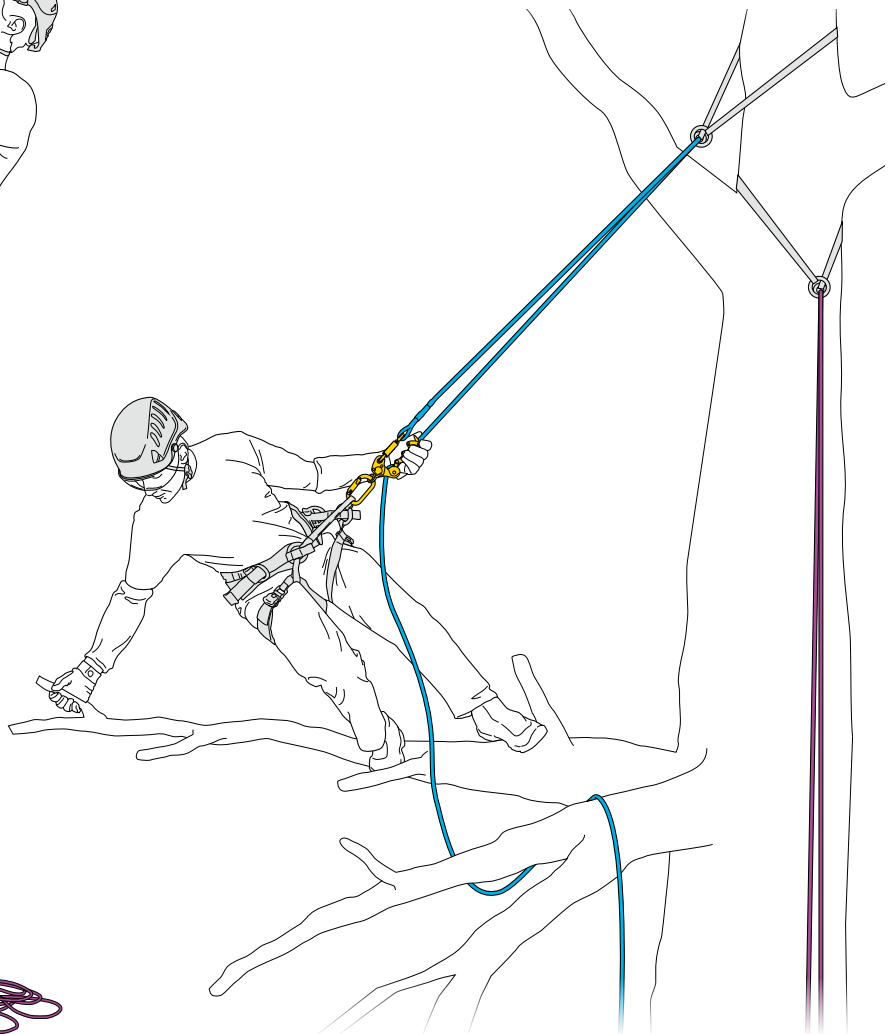
The supplementary rope is installed on a different anchor from the work anchor.
In normal use, this rope allows aid from the ground and provides access for other arborists.
In rescue situations, this rope will be a valuable aid in accessing the victim.



- + The ropes are not carried by the arborist while climbing.
- + Possibilities of aid from the ground, and access for rescue, are optimized.
- Two long ropes are required.
- Work is not possible during the access phase .

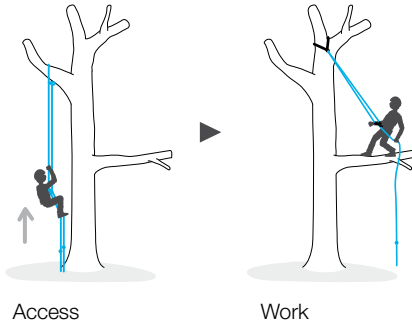
Precautions

- All precautions detailed in chapter 2.3 must be followed
- To be able to effect an emergency descent at any time, the work rope must be long enough to reach the ground from the anchor point, when doubled

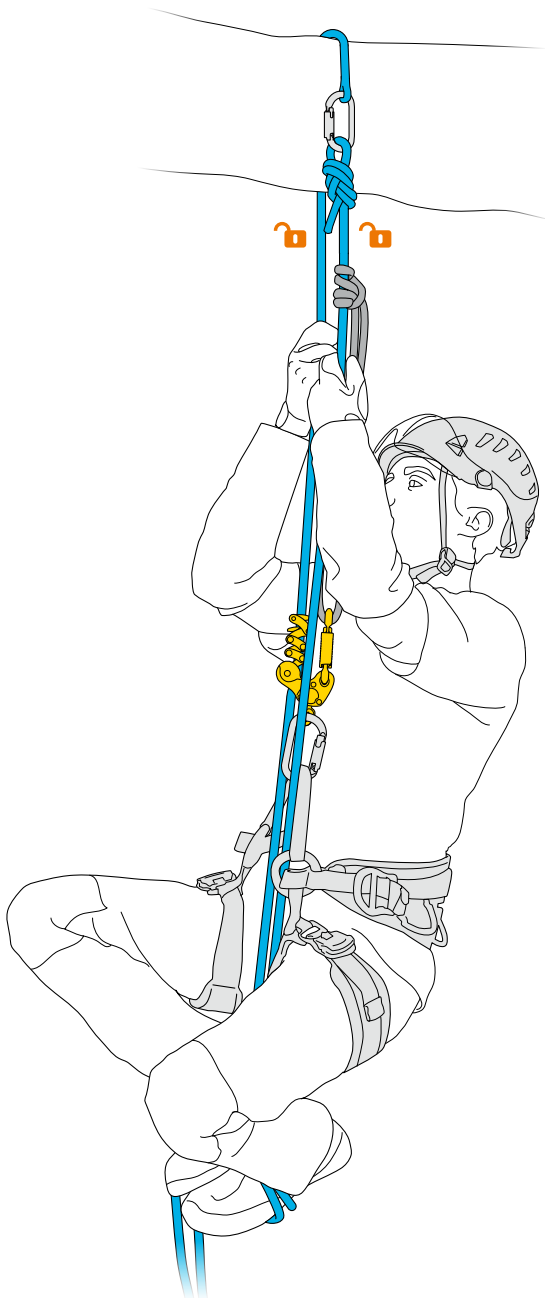


NOT FOR BEGINNER DDD 2.5. Double Prusik access with the ZIGZAG

This technique allows access to the tree with very little equipment. Arriving at the top, the ZIGZAG is on the splice side, ready to be set up for the normal work configuration.



- + Using only one rope and the same equipment for access and work.
- + The work rope is not carried by the arborist while climbing.
- + The cord length used for the friction hitch allows ergonomic adjustment for the ascent.
- + The rope joining knots, placed at the top, ensure no knot passing in case of emergency descent, or rescue.
- Aligning the ends when installing the access rope.
- Installation planned with the rope ends joined at the top.
- The access rope does not stay in place.



Precautions

The ZIGZAG should not be manipulated during ascent. The hands push the friction hitch and this pulls the ZIGZAG.

Do not hold the two ropes together as the Prusik cord can push against the release lever and cause a fall.

Emergency descent
To descent, control the ZIGZAG.

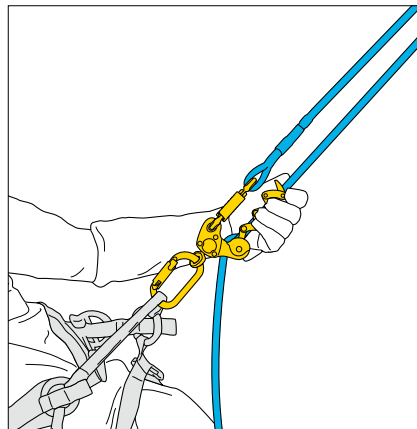
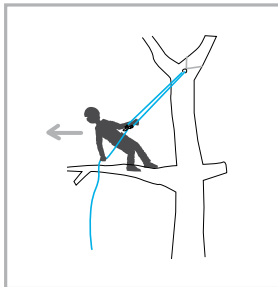
3. Supplementary information on movement within the tree

To go to the end of the branch, the arborist can move along one single work rope.

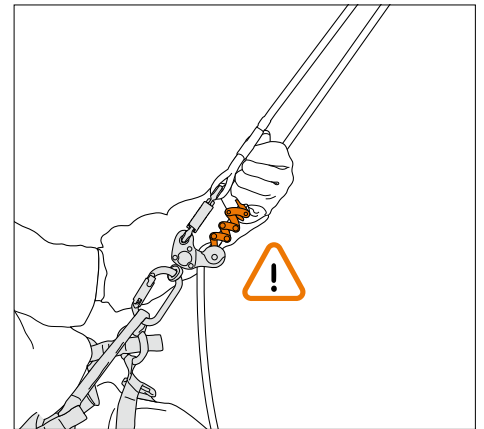
When returning to the trunk, the rope must be taken up as the arborist moves: there should never be any slack between the anchor and the arborist.

3.1. Examples of ZIGZAG handling in normal work configuration

Moving away from the trunk.

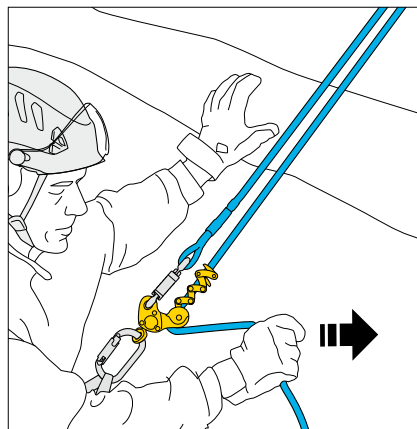
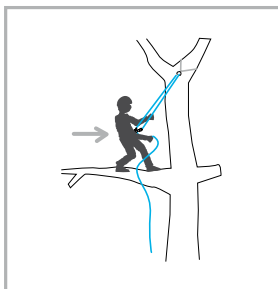


Normal handling

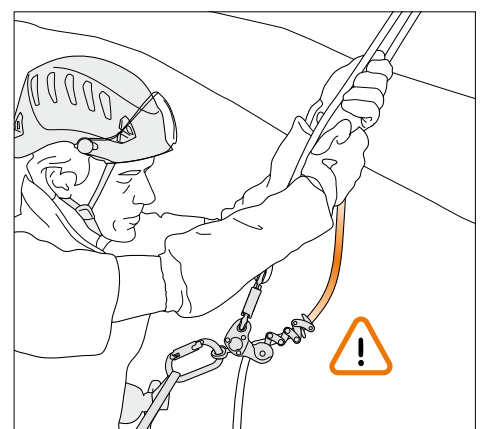


In case of a fall, there is a risk of clenching the hand on the rope and not being able to stop the fall

Moving back toward the trunk



Normal handling

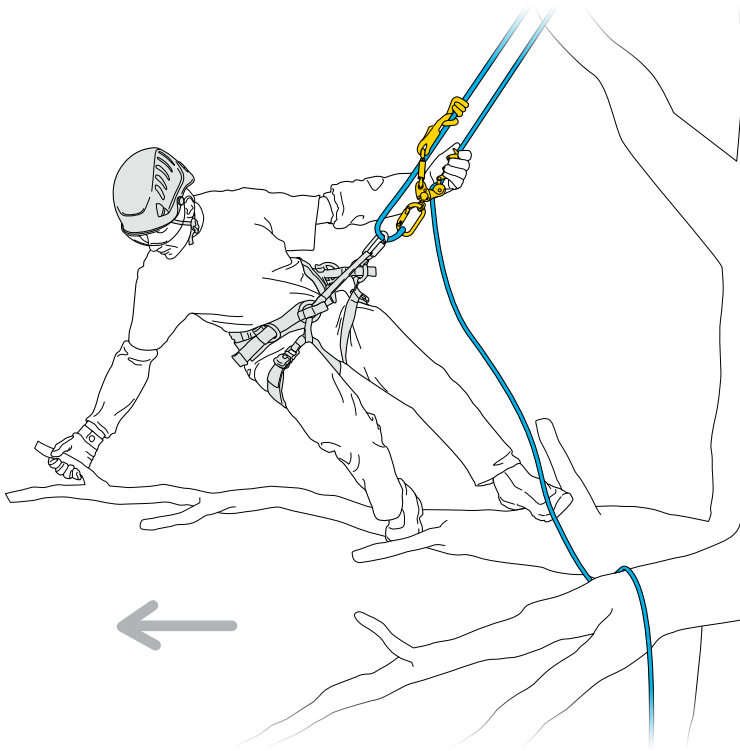


Warning: risk of creating a loop of slack between your hands and the device, increasing the potential fall distance.

In case of a fall, there is a risk of clenching the hand on the rope and not being able to stop the fall

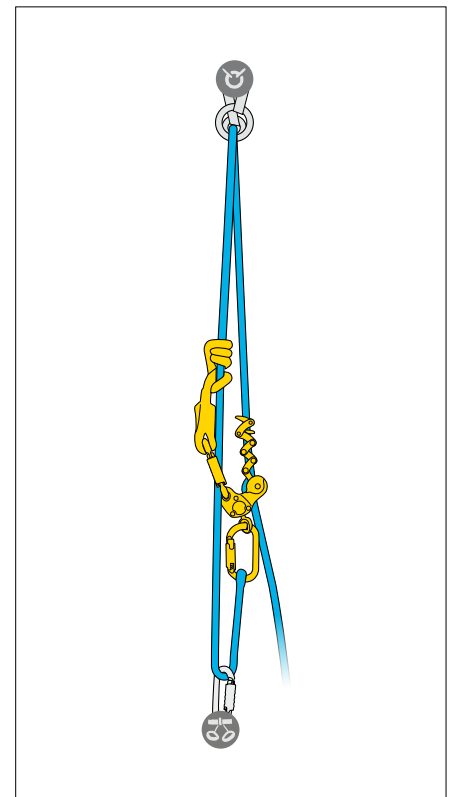
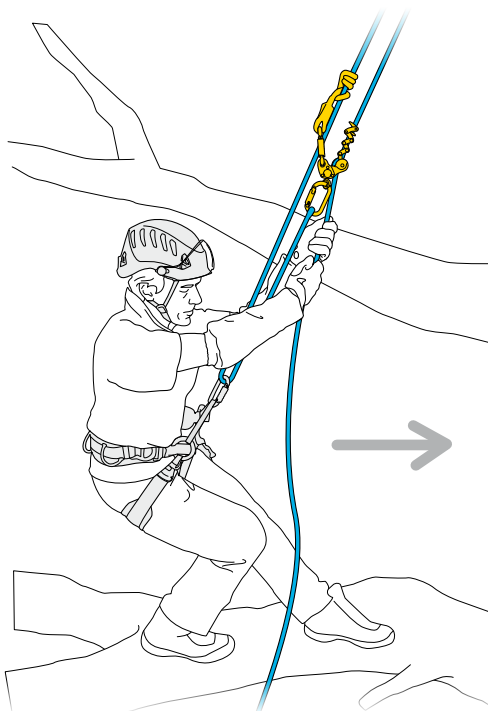
NOT FOR BEGINNER **DD** 3.2. Adjusting the ZIGZAG's position in "rope loop" technique

The rope loop technique allows improved ergonomics in returning to the trunk. The space created between the ZIGZAG and the harness allows pulling with both hands on the free end of the rope.



Precautions

It is recommended to always keep your weight on the system.
 Take care that you do not push the devices out of reach.
 Moving from the "short" configuration (ZIGZAG close to you) to the "long" configuration (ZIGZAG distanced) can be done while keeping your weight on the system.
 Beware of ropes with long or rigid splices as they do not allow a comfortable short configuration.



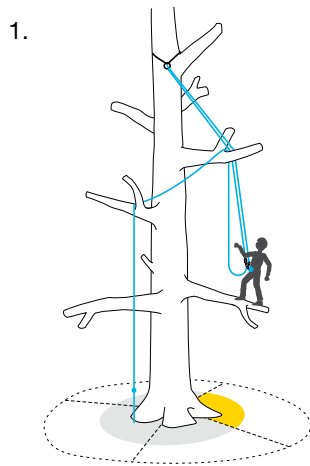
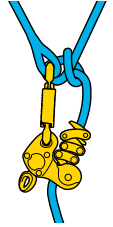
EXPERT ONLY **DDD** 3.3. Ghost technique

This technique allows working in multiple areas of the tree, without re-ascending to higher branches.

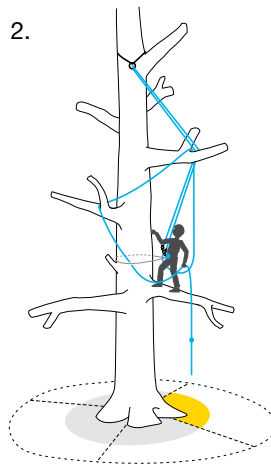
While moving around in the tree, the free rope must have been managed so that it stays hanging in the area to which the arborist wants to return. The excellent efficiency of the ZIGZAG allows work in the second area, even if the path of the free rope is complex.

The arborist must disconnect himself from his ZIGZAG to effect the deviation. He must take precautions to avoid "losing" it high in the tree as the ZIGZAG tends to slide on the rope, pulled by the weight of the free end.

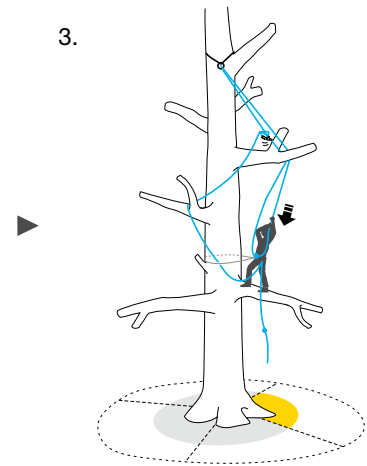
- Always tie the ZIGZAG off on the rope, **before** disconnecting from it
- Always reconnect to the ZIGZAG **before** undoing the tie-off



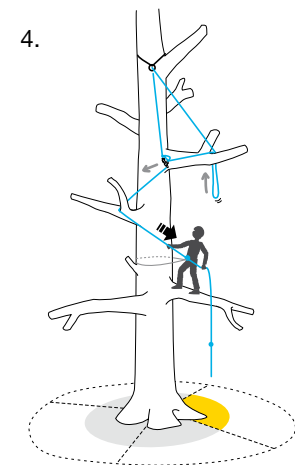
1. Managing the free rope



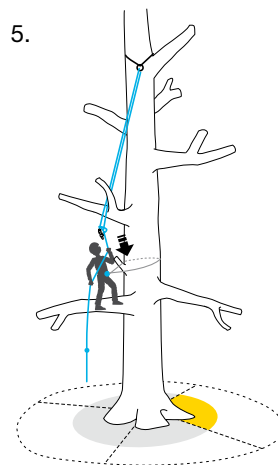
2. Arborist anchored to the trunk



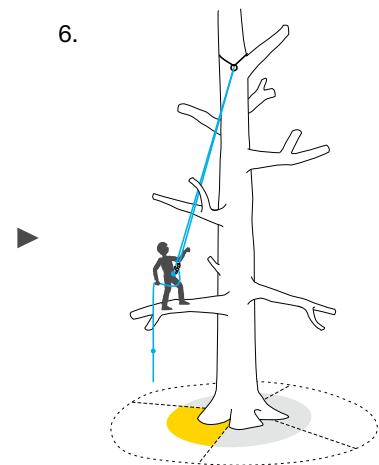
3. ZIGZAG, tied off
Pull rope through the false crotch to raise the ZIGZAG



4. When the ZIGZAG is close to the top, pull on the free rope



5. Recover the ZIGZAG and reconnect it to the harness



6. Undo the tie-off and the lanyard to work in the new area

4. Dismantling on the trunk

During cutting operations, the arborist must use two belay systems.

The positioning lanyard is the first system.

The ZIGZAG, installed on a choked anchor, serves as the belay system as well as the evacuation system.

NOT FOR
BEGINNER **DD**

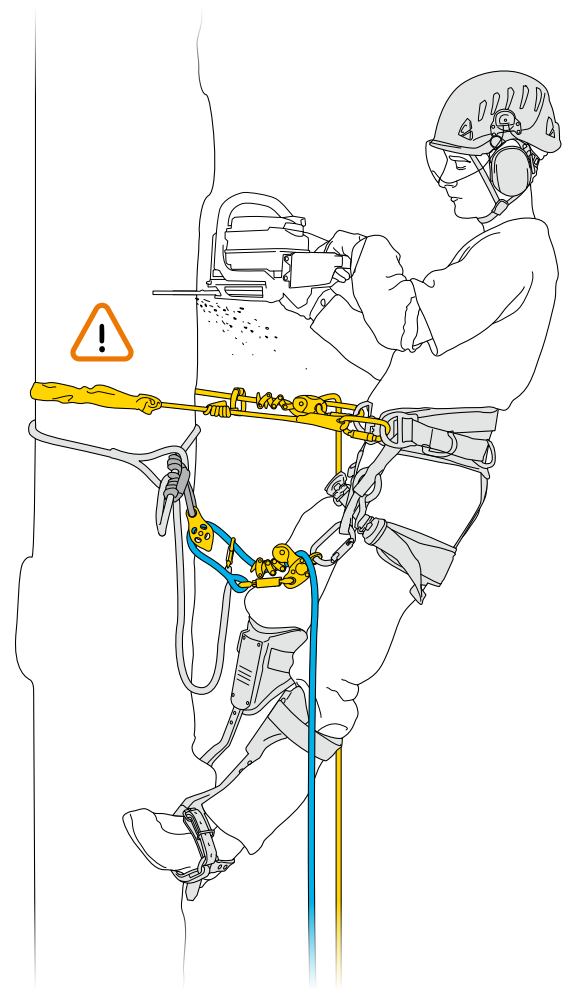
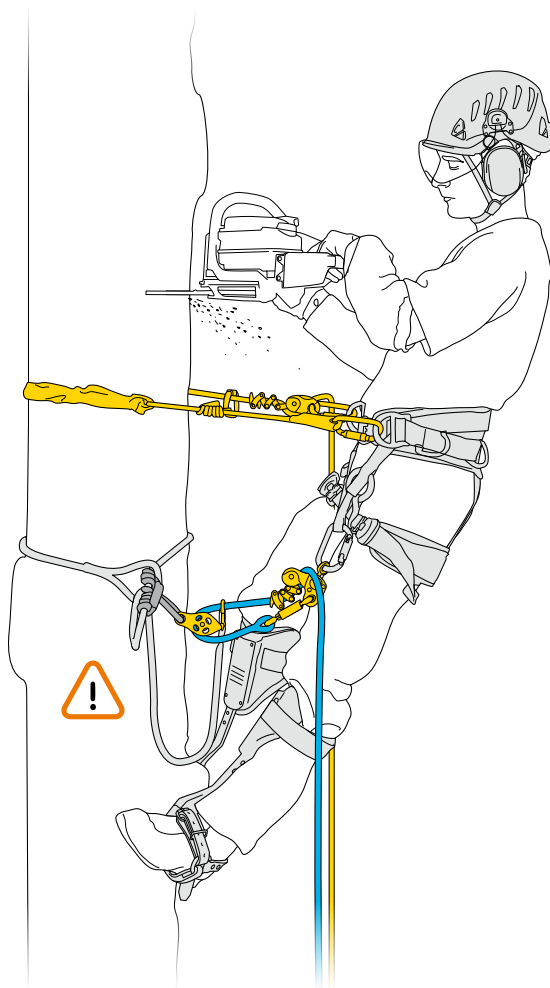
4.1. Second belay point on the trunk and evacuation system with the ZIGZAG

The ZIGZAG is installed normally (double mode) on a choked false crotch.

Quite simple in appearance, this configuration requires the arborist to choose between two dangers when positioning his ZIGZAG.

- Low ZIGZAG installation (knee level):
If the positioning lanyard breaks, risk of a significant fall (impact force greater than 6 kN).

- High ZIGZAG installation (close to the positioning lanyard):
Risk of simultaneously cutting the two belay systems.



EXPERT ONLY **DDD**

4.2. Second belay point on the trunk, without false crotch, evacuation system with the ZIGZAG in single mode with added friction

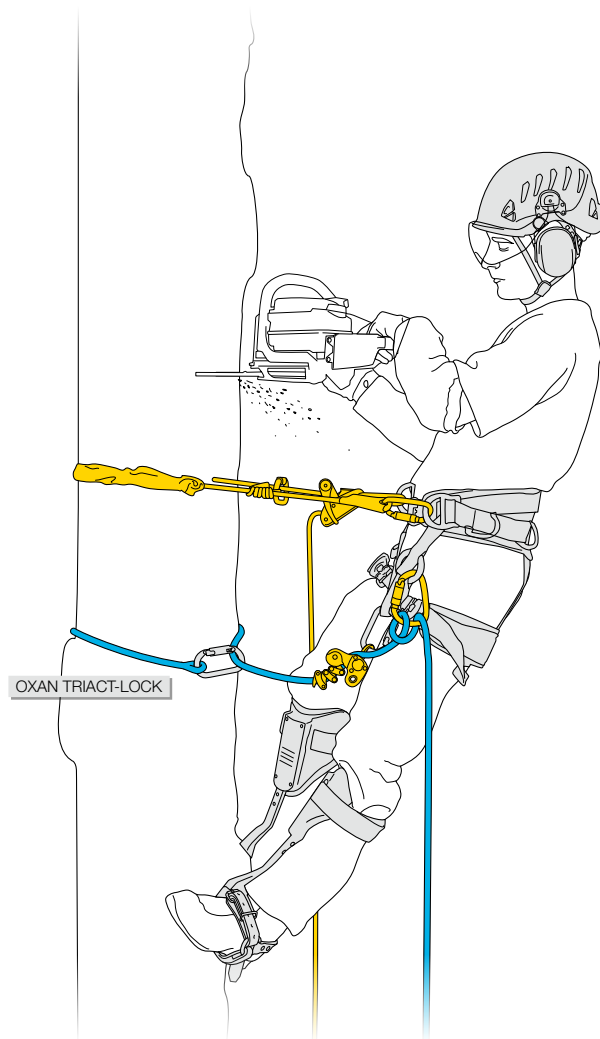
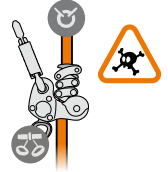
The ZIGZAG rope can be cinched around the trunk, or be choked with a friction hitch. The ZIGZAG is thus in simple mode: supplementary friction must be added.

- + Uses little equipment.
- Regularly monitor the Munter hitch.

Precautions

The ZIGZAG is not designed for working in single mode. In this configuration, adding a braking system is essential.

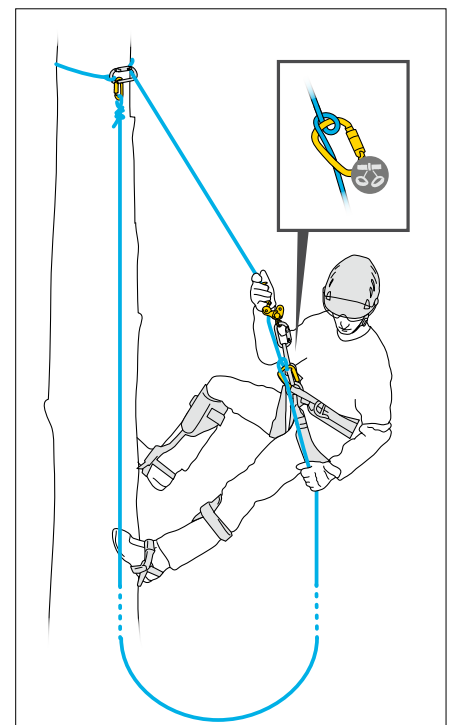
Remember



Descent

The descent is done with the Munter hitch, in addition to the ZIGZAG. One hand controls the ZIGZAG, the other hand holds the rope under the Munter hitch.

To recover your equipment, connect the other end of the rope to the "cinch" carabiner.



5. Rescue

In case of a fall where the worker loses consciousness or is incapacitated, inert suspension in the harness presents a mortal danger requiring urgent treatment. The arborist must be capable of quickly evacuating an injured team-mate, without assistance.

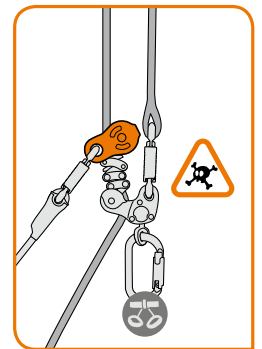
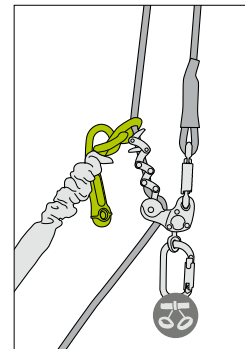
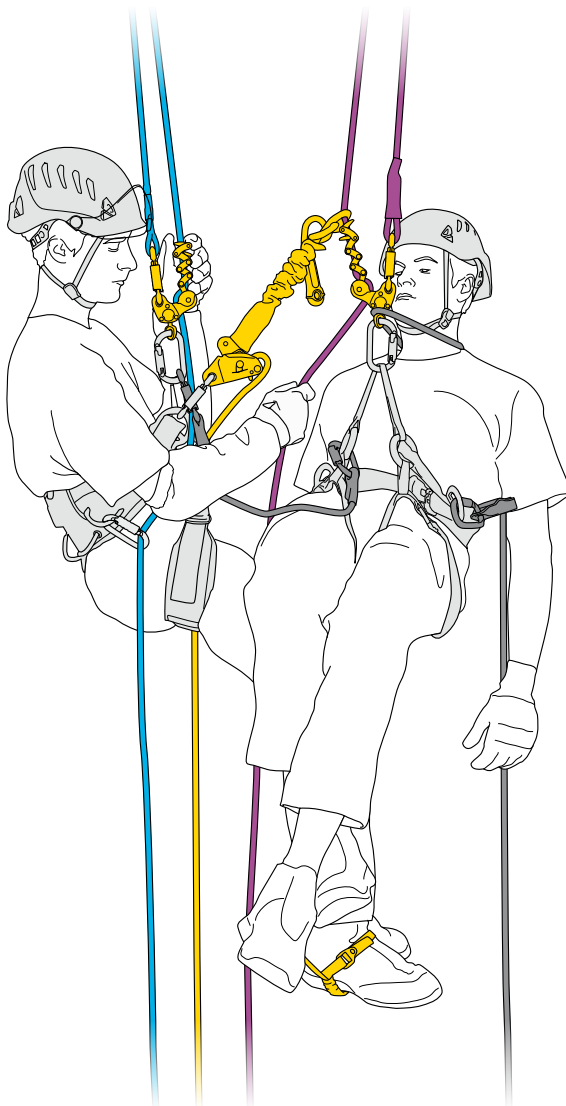
The goal of this document is not to cover rescue techniques that must be practiced at a training center. Only several precautions specific to the ZIGZAG are presented here.

5.1. Controlling the victim's ZIGZAG from a distance

Many evacuation techniques involve controlling the victim's device to lower him down the work rope.

If the victim is hanging from a friction hitch, the hitch is normally controlled with the help of a pulley.

Warning: using a pulley is dangerous with the ZIGZAG: risk of jamming the release lever and causing the victim to fall. Control with a simple knot in a rope is recommended.



Example of accompanied descent

The rescuer is connected "short" to the victim.
 The victim is held upright with the help of a lanyard.
 The rescuer controls his own ZIGZAG, on a different rope that is in good condition.
 The victim's ZIGZAG is controlled by a simple knot made with the rescuer's lanyard.
 Warning: this technique requires that the condition and length of the victim's rope has been verified sufficient for the descent.