



CONTINUOUS BELAY SYSTEM

INSTRUCTIONS FOR USE, INSTALLATION, INSPECTION AND MAINTENANCE

April 2023 - N°2023-04

2023 modifications:

Page 6 & 7 : Length of the zip line

Page 19 : Wire rope position above the platform between the activities

2022 modifications :

Page 18 : wire rope laying

Page 20 : Wire rope position above the platforms between the activities

Page 35 : switch station inspection

Page 36 : Y swapper inspection

Page 40 : switch shuttle maintenance



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1. WARNING

The owners, installers and operators should read and keep this manual which includes instructions for the installation, operating, inspection and maintenance of the product and compatible materials and equipment. Only those techniques presented and not crossed out are allowed. Any other installation and/or use is to be excluded. Some examples of misuse are shown. A multitude of other bad applications exist and it is impossible for us to enumerate them all, nor even imagine them. If you have any doubts or problems, please contact Koala Equipment. The installation and operating must conform to the following recommendations and to the relevant standards (EN 15-567, ACCT, PRECA, ASTM).

Activities at height are potentially hazardous and may result in serious injury or death. This risk concerns installers, operating staff and users.

The installation should only be carried out by competent and responsible people. They assume all risks and responsibilities for any damage, injury or death that may arise due to improper installation of the products in any manner whatsoever.

If you are not able to assume this responsibility or to take this risk, do not install this equipment.

Operating should only be carried out by competent and responsible people.

They assume all risks and responsibilities for any damage, injury or death that may occur due to improper use of our products in any manner whatsoever.

If you are not able to assume this responsibility or take this risk, do not use this equipment.

It should be noted that no safety system can prevent deliberate misuse.

Koala continuous belay system and its components are designed as a protection against falls at height for sports and leisure activities such as high ropes courses, zip lines ...

The use of Koala continuous belay system and its components for any other purpose is prohibited without written consent from Koala Equipment.

Failure by the operator to respect any and all instructions, warnings and cautions in this manual for the correct installation, operating, care and maintenance of Koala continuous belay system and its components may result in serious injury and/or death. PPE user notices must be available for the users.

Symbols used in these instructions

The following safety symbols are used to highlight good practice and potential hazards to the installation and operating of the equipment.

Be sure to read and understand all procedures regarding assembling and installation, the way the product is to be used, inspection and care of the Koala continuous belay system and its components.



PROHIBITED - Indicates a hazardous situation which, if not avoided, may result in serious injury and/or death.



CAUTION - Indicates a potentially hazardous situation that requires a risk analysis to determine one or more precautions to be taken.

OK

GOOD PRACTICE - Indicates proper installation or use of materials/equipment.



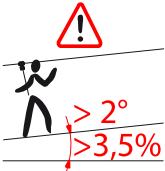
RECOMMENDATION - Round symbol, blue background, indicates proper use of materials/equipment

2. FUNCTION OF THE DEVICE

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Koala continuous belay system enables users to avoid falls at height.



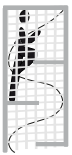
It is designed for activities/obstacles with no more than a 2° or 3.5% slope. For activities with a greater slope such as net bridges, stairs with handrails...., users' safety must be ensured by the activity itself (net, handrail....) or with a fall arrester. In these cases, the continuous lifeline does not ensure safety but simply allows for continuity of the lifeline.



OK



OK



OK

Some examples of vertical sloping activities where the activity itself protects against a fall.



On vertical activities, ascending or descending, either a Climb-up or a Switch must be installed. The Switch must be associated with a fall arrester or a descender. It is your responsibility to check that these devices are compatible. For pendulum jumps (Tarzan swings) the Switch must be associated with the wire rope/ jump rope.

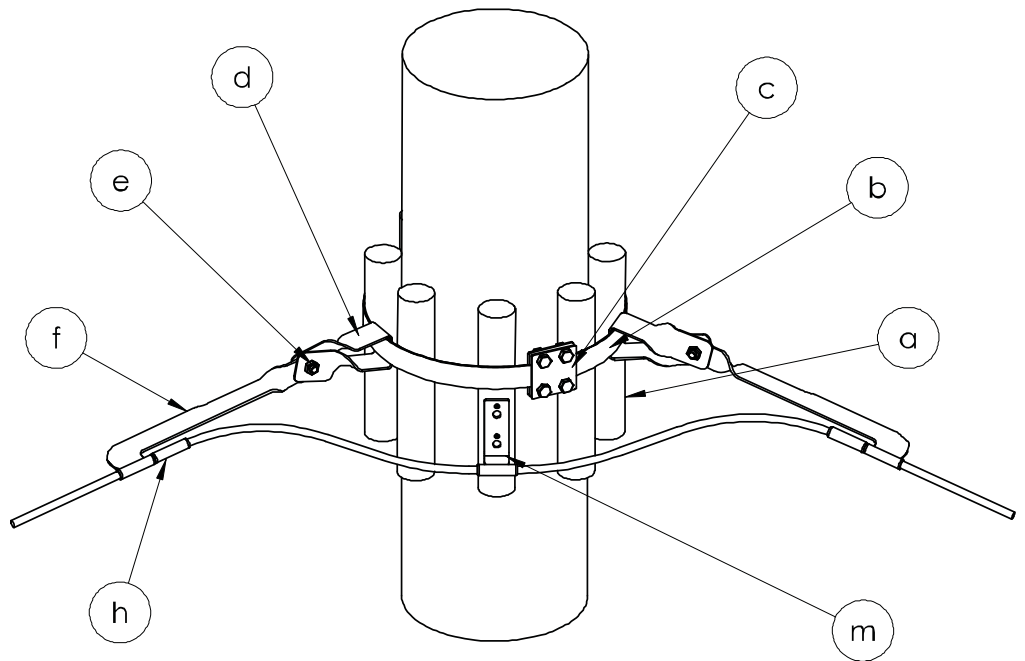


On zip lines, the slope, the speed and the landing zone must be correctly adapted to ensure user safety.

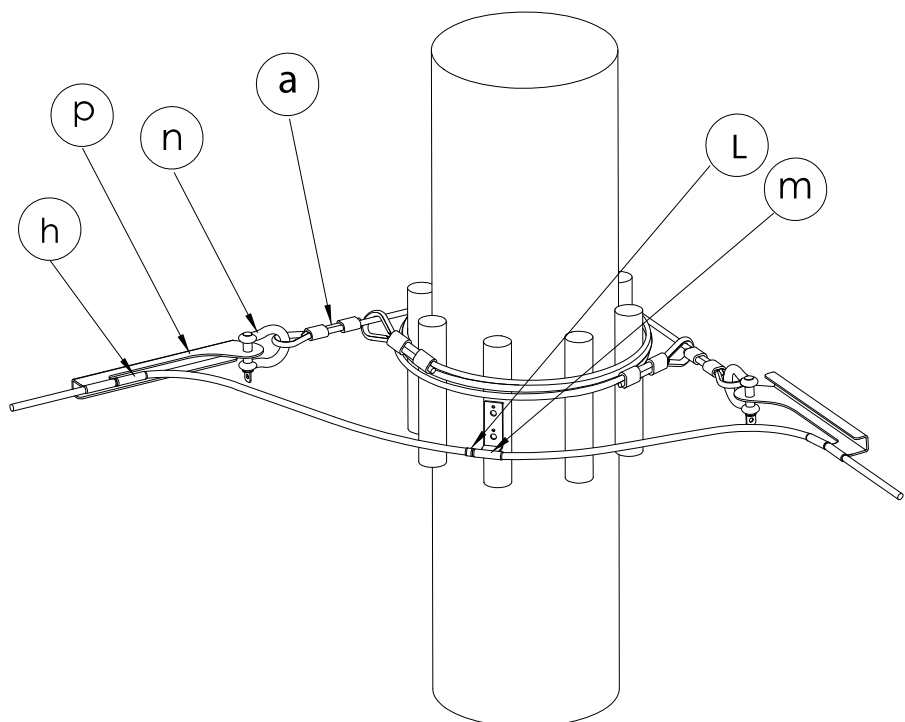
Koala continuous belay system and its components are compatible only with Koala Pouliz trolleys/pulleys.

2.1 Diagrams and list of parts when installing on trees

Fixing arms with metal strap and U-parts:

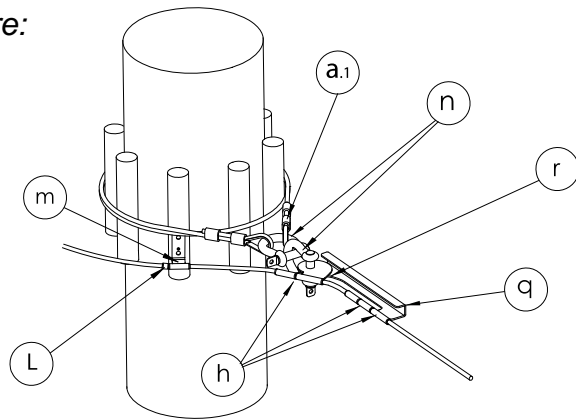


Fixing arms with wire rope and bow shackle:

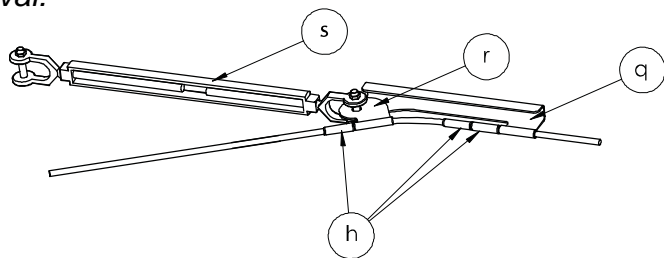


Assembling method for zip lines up to 150m / 492ft with a turnbuckle:

Departure:

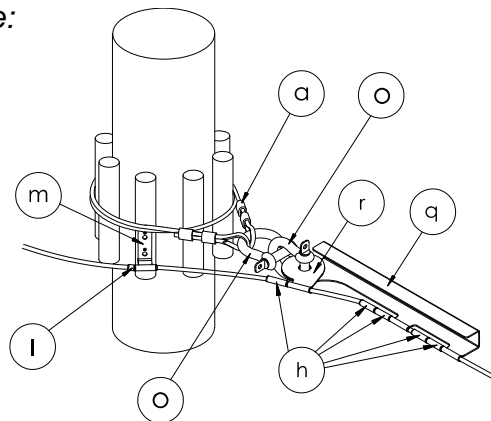


Arrival:

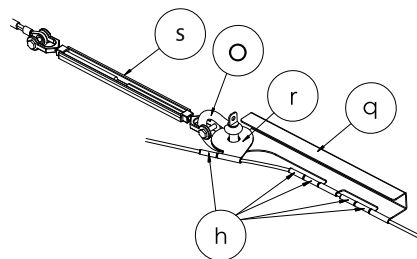


Assembling method for zip lines beyond 150m / 492ft with a turnbuckle:

Departure:

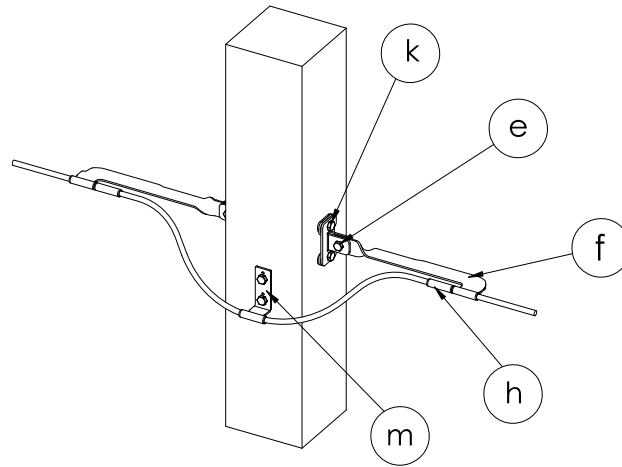


Arrival:

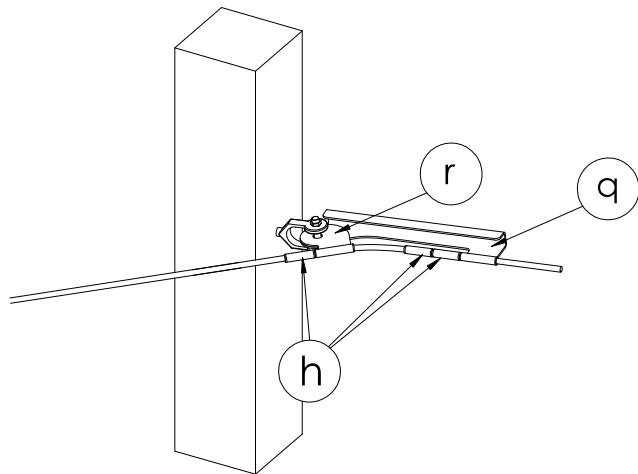


2.2 Diagrams and list of parts when installing on artificial supports

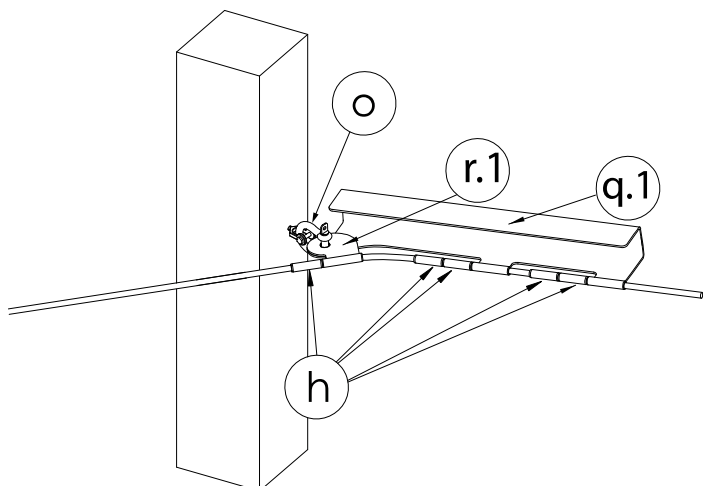
Arms installed with brackets (k) for the lifeline :



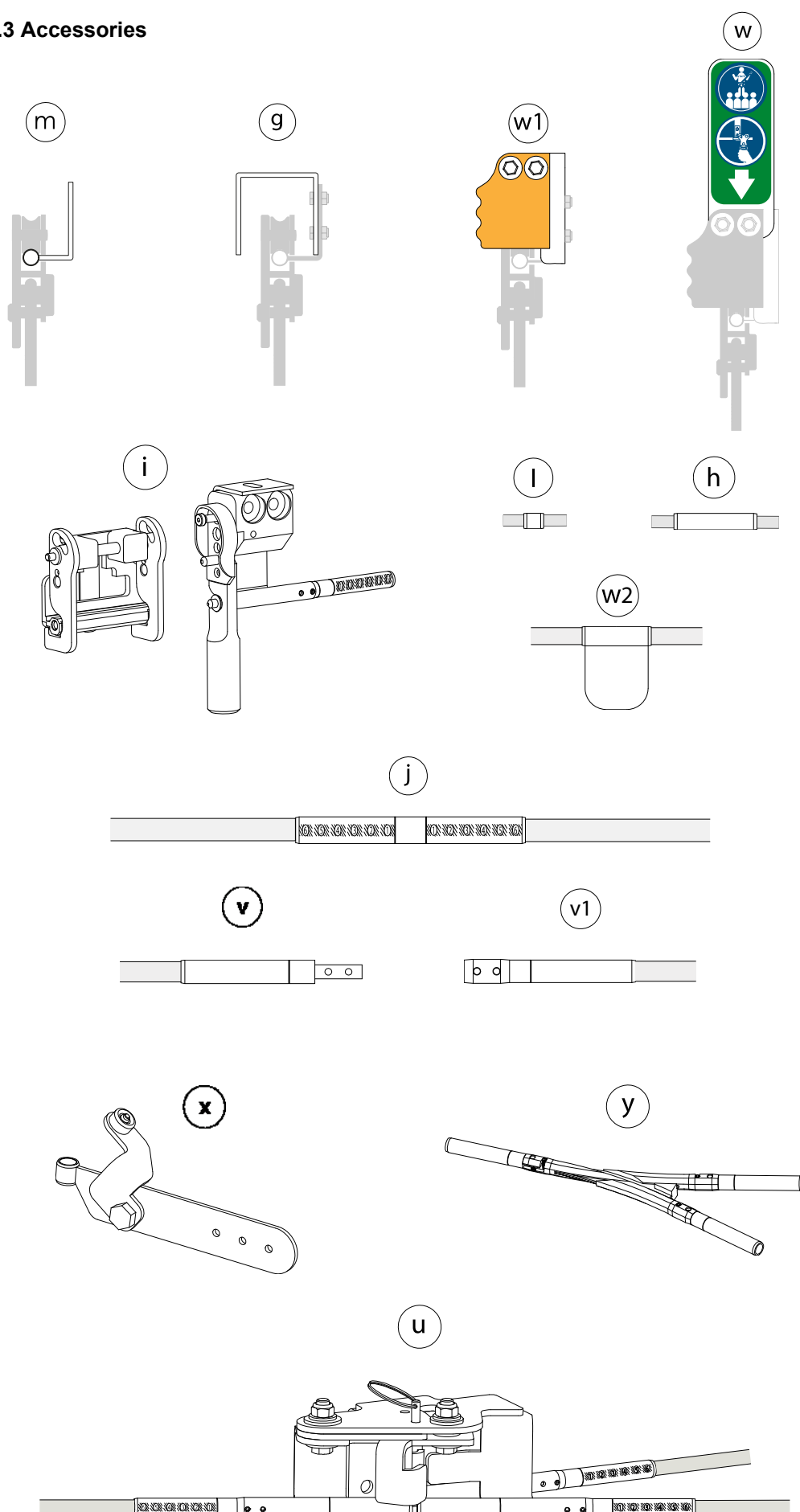
Installing a zip line up to 150m / 492ft:



Installing a zip line beyond 150m / 492ft:



2.3 Accessories



2.4 List of components and references

	ITEMS	REFERENCE for wire rope Ø12MM	REFERENCE for wire rope Ø1/2 INCH
a	PROTECTING LOG Ø60x330	BO23-330	
b	METAL STRAP 1x40	QU73	
c	COMPLETE CLAMP FOR METAL STRAP	AC44	
d	U-PART FOR FIXING ARMS	AC64	
e	TH BOLT 12x30 + INSERT BOLT NYLSTOP Ø12MM	QU65-30 + QU15-12	
f	FLAT ARM FOR HORIZONTAL ACTIVITY	QU35-1	QU35-1US
g	SCREW-ON METAL BRACKET INVERTER	ME49-F	
h	FERRULE - 65 MM	ME10	ME10-US
i	SWITCH STATION & SHUTTLE	ME87-FD/G + ME86-F	ME87-FD/GUS + ME86-F
j	CONNECTING FERRULE - 185 MM	QU129	QU129-US
k	DOUBLE BRACKET FOR FIXING ARMS	ME08	
L	SMALL FERRULE - 18MM	ME14	
m	SCREW ON METAL BRACKET	AC60	AC60-US
n	BOW SHACKLE B +G 5/8 – WLL 3.25 TONS	QU112-325	
o	BOW SHACKLE B+G – WLL 6.50 TONS	QU112-650	
p	ARM FOR ACTIVITY	ME75-F	ME75-FUS
q	ARM FOR ZIP LINE	ME76-F	ME76-FUS
q1	ARM FOR LONG ZIP LINE	ME201-F	ME201-FUS
r	BACK-UP FOR ZIP LINE	ME78-F	ME78-FUS
r1	BACK-UP FOR LONG ZIP LINE	ME202-F	ME202-FUS
s	2 CLEVIS TURNBUCKLE - 305 MM	QU55-305	
s	2 CLEVIS TURNBUCKLE - 457 MM	QU55-457	
t	FLAT ARM FOR ZIP LINE ON U-PART OR DOUBLE BRACKET	QU35-2	QU35-2US
u	MANUAL SWAPPER	ME09-1/3	ME09-1/3US
v	MALE REMOVABLE FERRULE	ME06-MA	ME06-MAUS
v1	FEMALE REMOVABLE FERRULE	ME06-FE JON	ME06-FE JONUS
w	CONTINUOUS BELAY STEEL PLATE ENTRY INSTRUCTIONS	ME103-V2F AR	
w1	BACK-STOP	ME114-F	
w2	BACK-STOP FERRULE	ME11-FUS	
x	CLIMB-UP FOR A VERTICAL LADDER	ME208-F	
y	Y SWAPPER 2.0	ME108-V2F	ME108-V2FUS
z	POULIZ 2.1 & UNLOCKING TOOL	PO12-1 ME17	
z1	POULIZ 3.0, 3.1 & UNLOCKING TOOL	PO13 / PO13-1 ME184	

3. ASSEMBLING AND INSTALLING

Koala continuous belay lifeline is designed to be installed with the following wire ropes:

- Galvanized steel wire ropes, 6x7, textile core, Lang Forming,
- Galvanized steel wire ropes, 19x7 metallic core, anti-rotating,
- Swaged galvanized steel wire ropes, 6x26, metallic core.

It can be installed with Ø12 mm wire rope or ½ " depending on the materials you have chosen.

NO!

Never install materials designed for Ø ½" wire rope on Ø12 mm wire rope or vice versa.

3.1 Instructions

The platforms and activities must be in place prior to installing the continuous belay system.

To avoid premature wear and tear of the wire rope due to fatigue, ensure that the platforms are big enough to avoid the users from hanging between 2 arms (grey zone on the drawing), attached on the same tree.

Take time to read the instructions carefully as once the wire rope has been swaged it cannot be dismantled.

If you wish to install the continuous belay system arms differently to the description in this manual, you must ensure that your system is strong enough to take on the efforts required by the safety factors. To do so, refer to the standards in force for the sizing. In case of doubt, we advise you to add a back-up.

The recommended height for the lifeline is 1.6m / 5'3" relative to the users' feet.

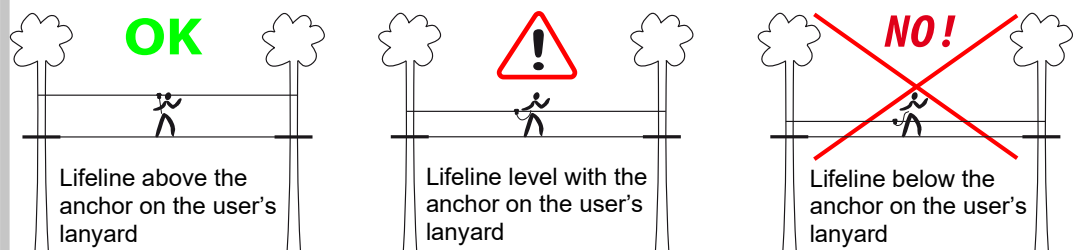
Recommended length of the lanyard for this height :

- Participants who weigh more than 35kg / 75 lbs with a sit harness = 75cm / 29,53 inches.
- Participants who weigh less than 40kg / 85 lbs with a full body harness = 92cm / 36,22 inches.

If you wish to place the lifeline at any other height or change the length of the lanyard, you must take the two following elements into consideration :

1°) The fall factor : the position of the lifeline relative to the lanyard's anchor point on the user. It determines the sustained efforts in case of a fall.

(Fall factor = height of the fall / length of the lanyard) The result must be as low as possible and never above 1.



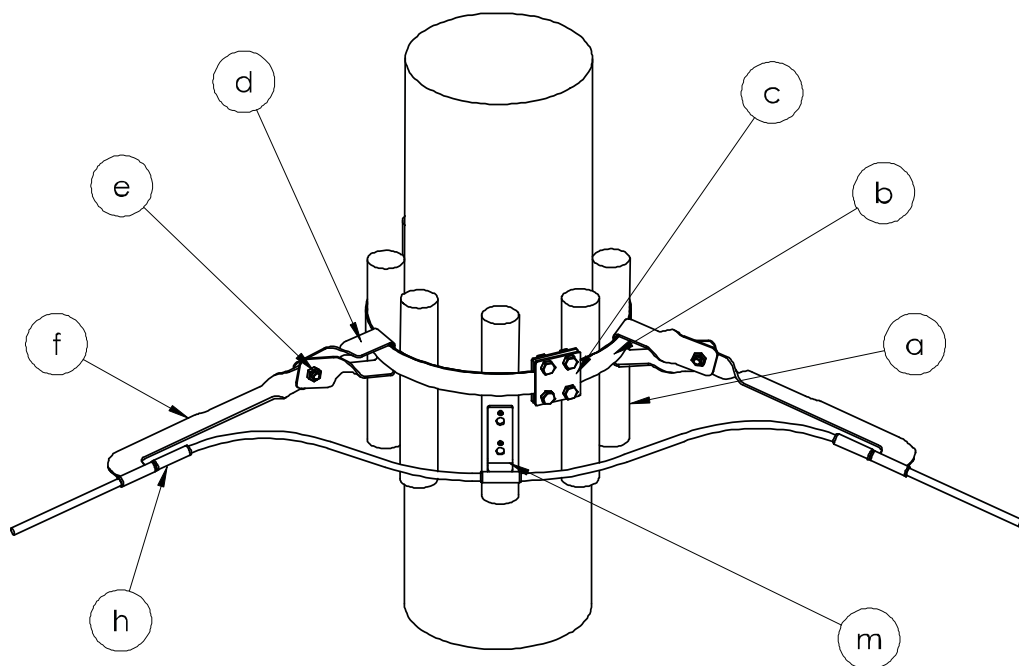
2°) The air draft: the distance to the first obstacle a user could hit, from his lanyard anchor point, in case of a fall.

Air draft = length of the lanyard + height of the user from his lanyard's anchor point to his feet + distance due to the wire rope sag due to the elasticity of the supports + the safety margin.

Different assembling configurations for the materials / equipment are detailed below. You may imagine others but it is your responsibility to ensure that any other configuration does not diminish the solidity of the lifeline, does not create additional fatigue and not induce new risks.



3.2 Installing flat arms for obstacles with U-parts and metal strap



Place the protection logs (a) so as to avoid any contact between the metal band (b) and the tree.

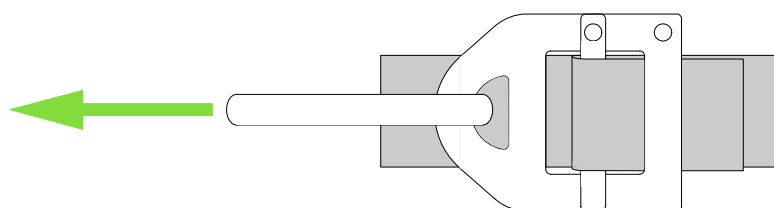
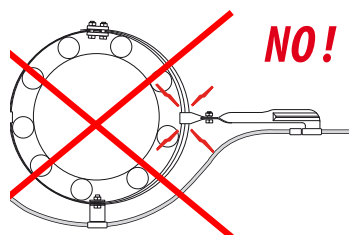
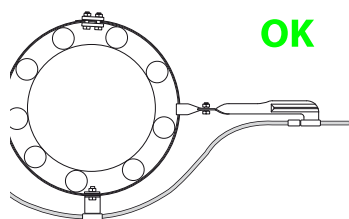
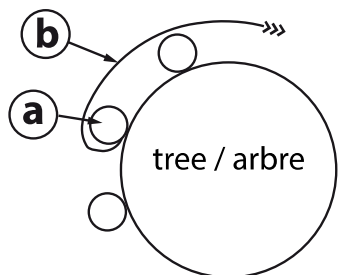
When the protective logs are installed around the tree, measure the perimeter around the protection logs. Multiply this figure by 3 and add 0,20 m / 0,65 ft (example : perimeter = 1,25 m / 4,10 ft X 3 = 3,75 m / 12,30 ft + 0,20 m / 0,65 ft = 3,95 m / 12,95 ft).

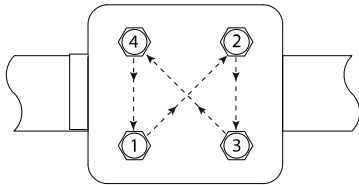
Cut the metal strap (b) to this size and take care to file down the extremities.

Install the metal strap (b) by sliding one extremity behind a protective log (a) (refer to the diagram) go round the tree at least three times.

Ensure that there are at least 4 strips of metal strap clamped between the two plates of the metal strap clamp (c).

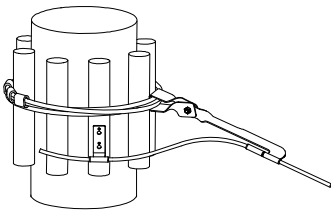
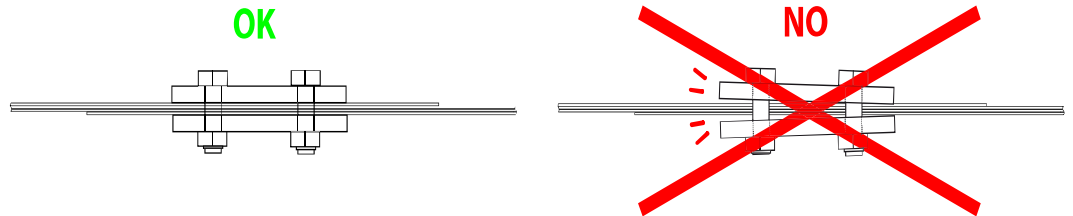
Tighten the metal strap by hand or with the ratchet straps provided with the adapted system (see below) and ensure each time you go around the tree that you apply the same tension (see diagram).





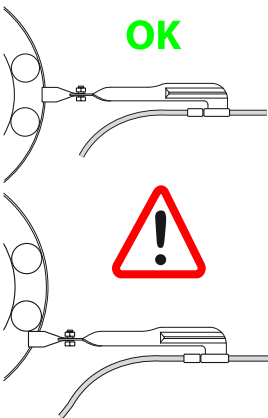
Fix the metal strap with both of the clamp plates (c); 1cm or 4/10" of the metal strap must stick out of the clamp. Tighten the bolts on both plates as follows : each of the 4 bolts must be partially tightened in the order indicated on the diagram. Each bolt must be tightened at least 3 times until you reach tightening torque measurement 100 N/m.

Ensure that both plates are parallel.

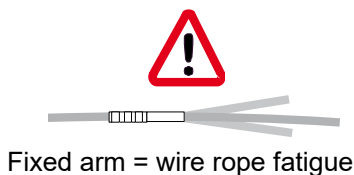
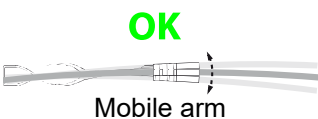


The metal strap can be replaced with wire rope wrapped around 3 times.

The objective is a resistance superior to that of the arms as well as a flat broad surface under the U-part.



When fixing the U-part, take care to install it in the axis of the activity. The U-parts must move freely on the metal strap. Beware not to block the U-parts between the protection logs and the metal strap.



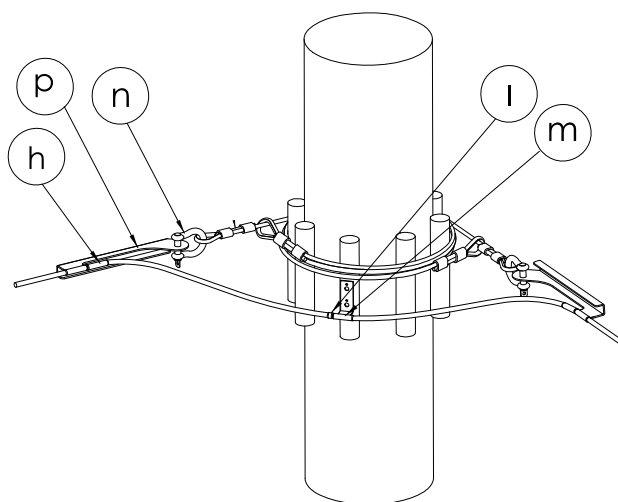
Assemble the arm (f) and the U-part (d) with the bolt (e). Tighten the bolt until the thread sticks out of the nyloc nut without blocking. Leave the articulation between the arm (f) and the U-part (d) free.

We recommend no more than 3 U-parts per metal strap. In case you have to add another U-part, also add a metal strap.

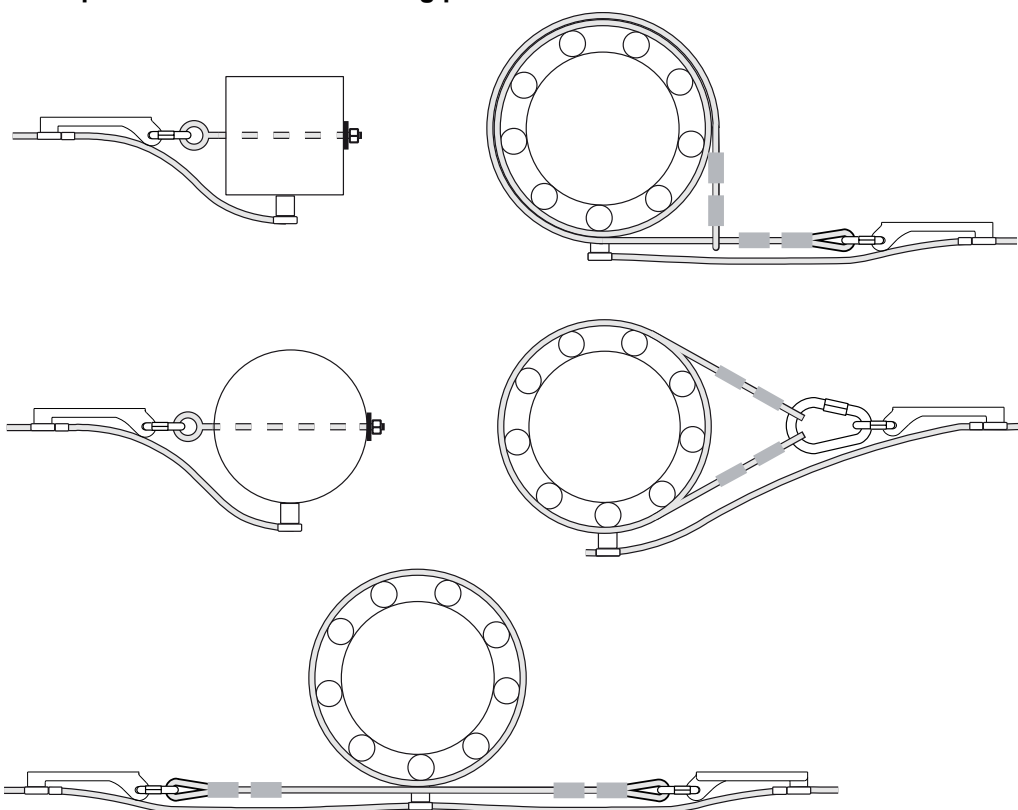
3.3 Installing activity arms

Arms can be fitted to supports with wire rope, chain or eye bolts. Wire rope sling endings must be compliant with the existing standards and must be equipped with thimbles.

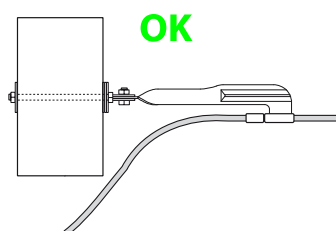
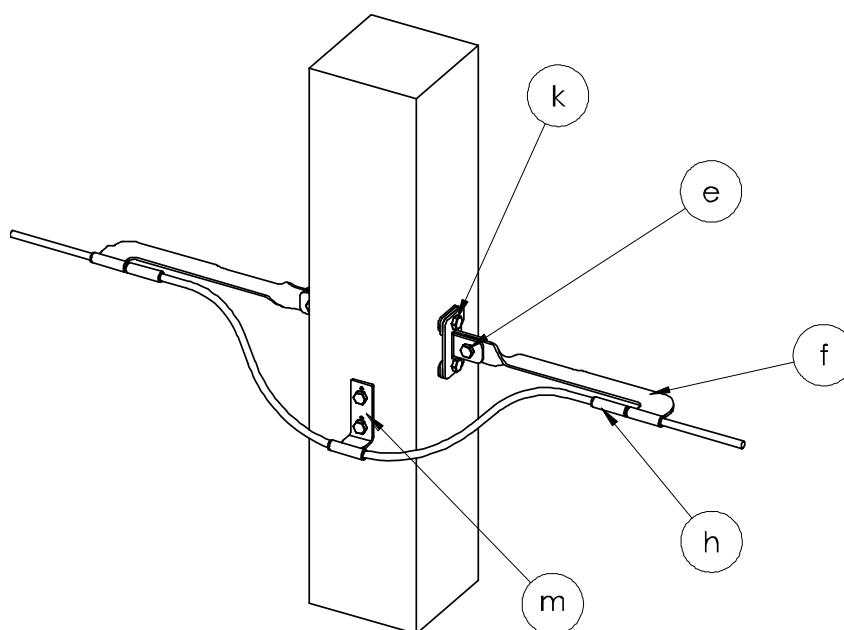
It is your responsibility to ensure that your devices provide a resistance superior to that of the arms. To do so, refer to the standard in force for sizing.



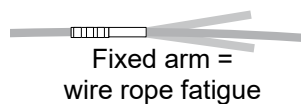
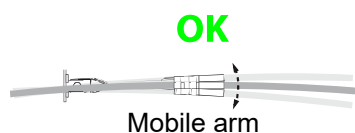
Examples of different assembling possibilities



3.4 Installing arms with brackets



Install the brackets (k) with the appropriate bolts which are not provided. You must choose fixtures (bolts, screws, threaded rods) that are strong enough to withstand the forces required with the safety factors. The objective is a pull-off resistance superior to the resistance of the arms.



Assemble the arm (f) and the double bracket (k) with the bolt (e). Tighten the bolt until the thread sticks out of the nyloc nut without blocking. The articulation between the arm (f) and the double bracket (k) must remain mobile.

3.5 Installing zip lines

Use zip line arms if your activity only has one wire rope, even if it is short. Efforts spread over one single wire rope are greater it is therefore highly recommended that you use reinforced arms (q) and back up (r) for this type of activity.

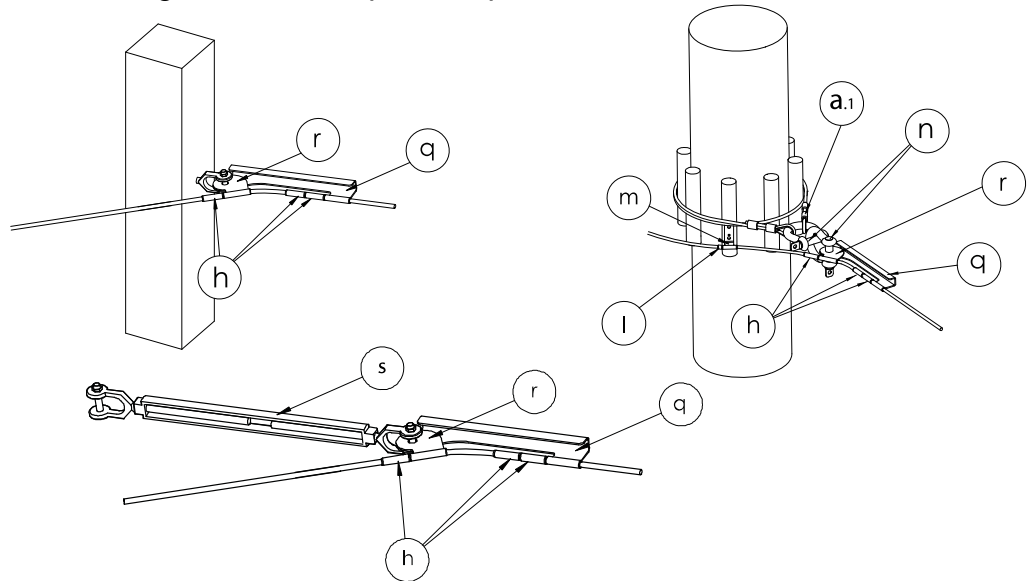
For zip lines beyond 200 metres / 656 ft long, zip line arms (q1) and back up (r1) are recommended.

Zip line arms can be fitted to the supports with wire rope, chain or eye bolts.

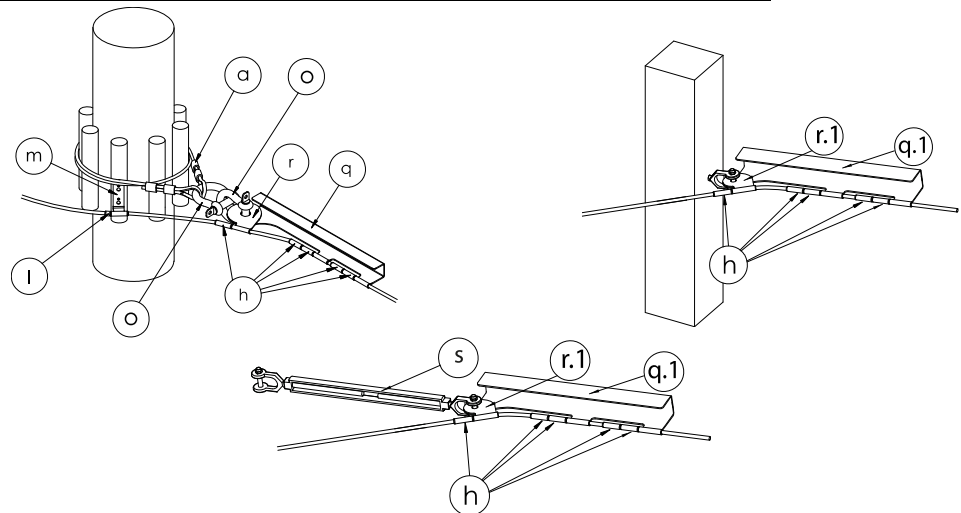
Wire rope sling endings must be compliant with the existing standards and must be equipped with thimbles.

It is your responsibility to ensure that your devices provide a resistance superior to that of the arms. To do so, refer to the standard in force for sizing.

Assembling method for zip lines up to 200m / 656ft :



Assembling method for zip lines beyond 200m / 656ft :



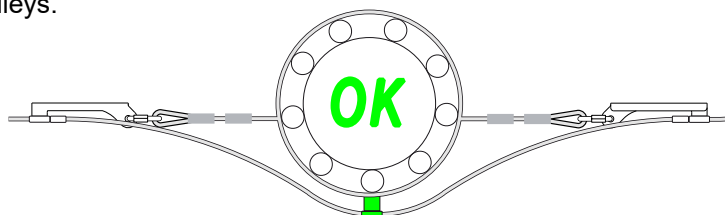
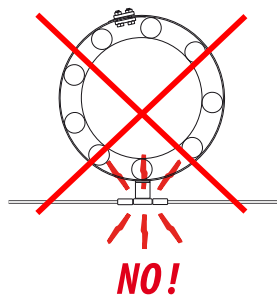
To increase the life-span of zip line wire rope, we recommend using swaged galvanized steel wire rope - 6x26, metallic core, which can be joined to the lifeline with connecting ferrules. (refer to chapter 3.13).



It is your responsibility to match up the zip line's speed, slope and the landing zone to ensure the users' safety.

3.6 Installing metal brackets

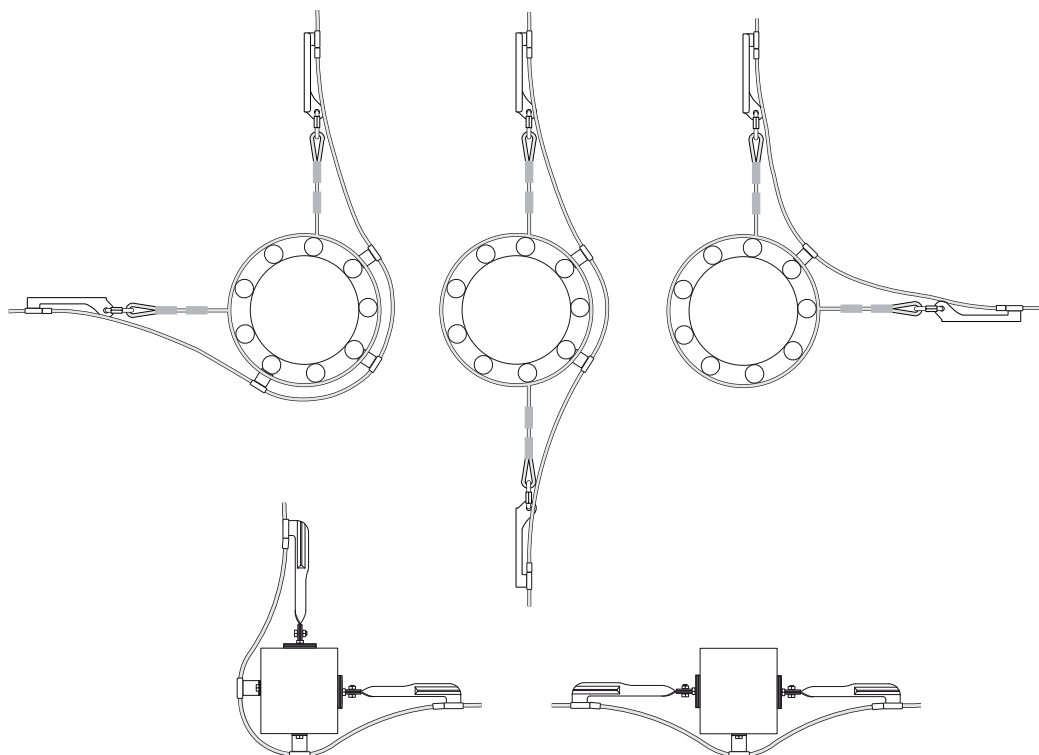
The screw-on metal brackets (m) serve to keep the wire rope away from the supports and limit fatigue on the wire rope between the arms, they also provide a smoother run for the pulleys.



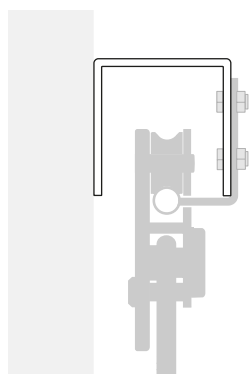
The metal brackets are not safety devices and cannot replace the arms. It is therefore essential that they are only installed between the arms of the same support.

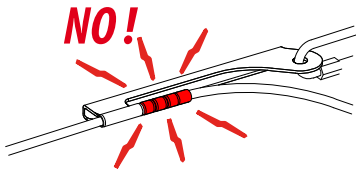
The number of metal brackets is based on the shape and diameter of the supports as well as the direction of the activities.

Examples of good practice:



In some cases the metal brackets (m) will be fixed on bracket inverters (g) depending on which way the lifeline is installed around the support.



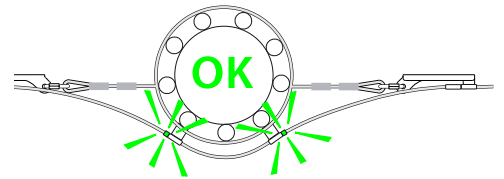
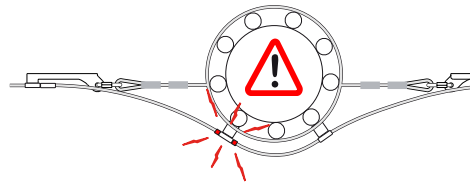


3.7 Installing small 18mm / 0.7in ferrules

The objective of the 18mm / 0.7in ferrules is to fix the wire rope onto the metal brackets.

Small 18mm ferrules can never replace a 65mm / 2.56" ferrule, even if there are many of them.

Do not install a small 18mm ferrule on either side of the metal bracket as this would render the annual wire rope inspection impossible.

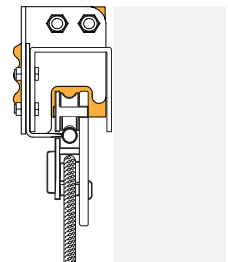
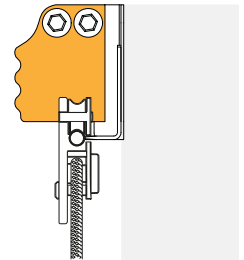
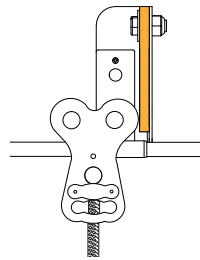


3.8 Installing back-stops

The back-stop, combined with a metal bracket, blocks the pulleys on sloping activities such as stairs.



Back stops are not fall arrester devices

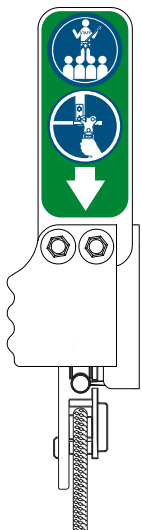


According to the direction of the lifeline around the support, the screw-on metal brackets(m) and back-stops (w1) will be installed on bracket inverters(g).

3.9 Installing steel plate entry instructions

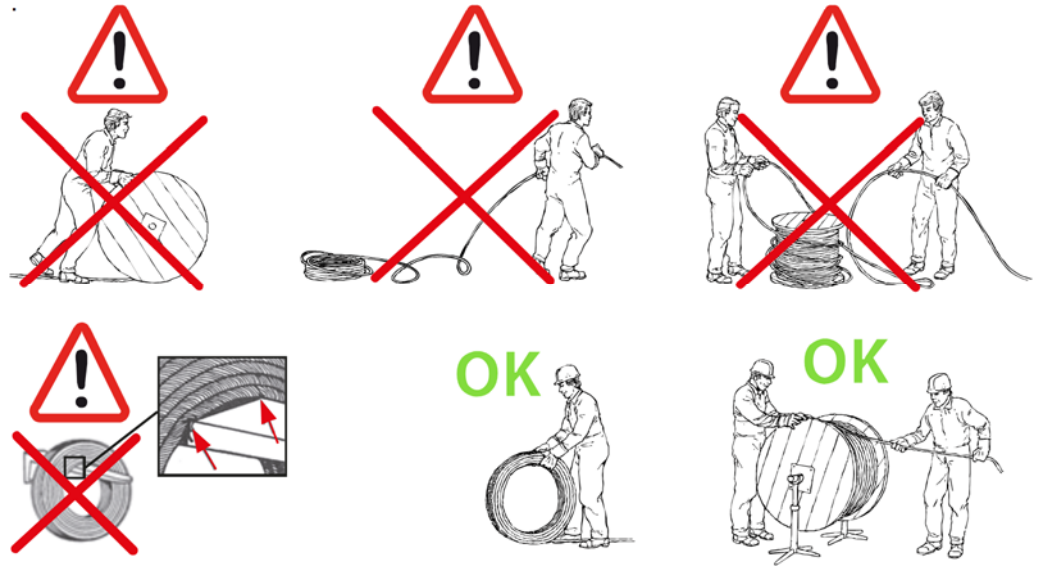
Entry instructions, combined with a metal bracket, show users where to connect on the continuous belay system at the start.

The shape of the steel plate obliges the user to place the pulley correctly.



3.10 Unwinding wire rope

Wire rope must be unwound carefully so as to avoid twisting.

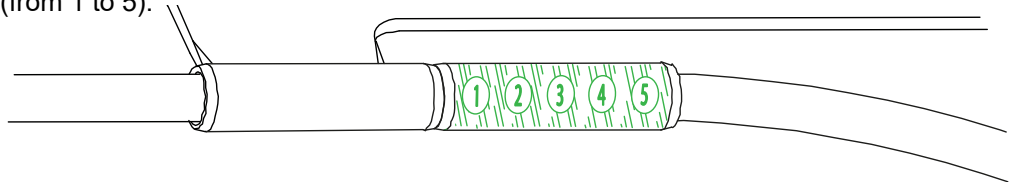


3.10.1 Wire rope laying

When installing, be careful not to constrain the wire rope to avoid untwisting it. Be careful, any untwisting, even minimal, could under certain conditions allow the pulley to come out.

3.11 Swaging 65mm / 2.56in ferrules

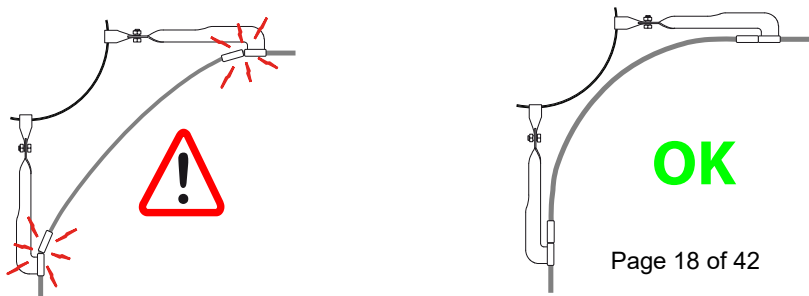
Once the wire rope is installed you can start swaging. Each 65mm / 2.56in ferrule must be swaged 5 times. Start on the side closest to the arm and follow the example below (from 1 to 5).

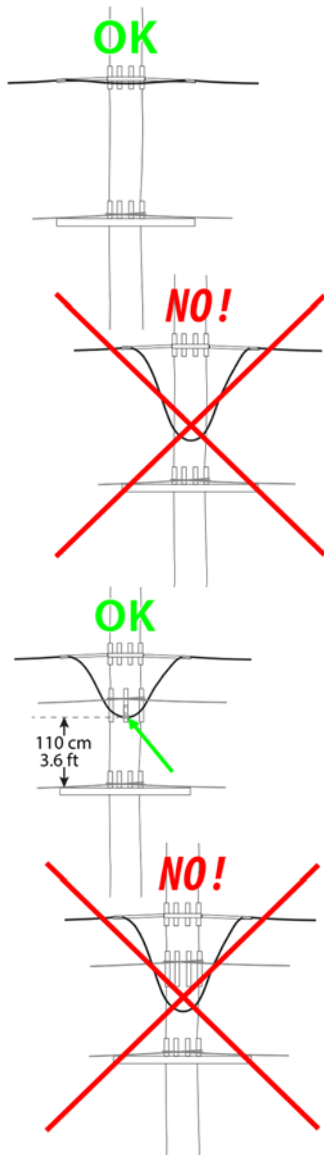


Only use those dies recommended by Koala Equipment with a crimping tool exerting a force of at least 120 kN. For optimal swaging and to avoid the wire rope from slipping, we recommend that you change the die after 500 crimps.

Before swaging, we recommend that you place a Pouliz pulley on the lifeline in order to ensure that there are no obstacles on the lifeline.

To avoid damaging the wire rope through fatigue and premature wear and tear avoid sharp curves in the wire rope.





3.12 Wire rope position above the platforms between the activities

Maintain the wire rope as close as possible from the lifelines height of the previous and following activities.

To pass under handrail wire ropes, for example, it is possible to make lower loops. In this case, the height must be at least 110 cm (3.6ft) above the platform. However, this height can go down to 90cm (2,95ft) when 6x26 wire rope is used. It is also necessary to block the wire rope with metal brackets and small 18mm ferrules.

3.13 Lifeline wire rope tension

The wire rope must be tightened so as to follow the angle of the obstacle.



Table of maximal tensions when installing (wire rope free of load)		
Activity lifeline	All lengths	500 daN
Zip line	less than 150m / 492,126 ft	1 500 daN
Zip line	more than 150m / 492,126 ft	2 500 daN

Supports undergo considerable pressure due to the wind, which causes tension on the lifeline. For activities with no other wire rope than that of the lifeline, it is recommended to install zip line arms.

3.14 Installing connecting ferrules and removable ferrules

Function of the device

The purpose of connecting ferrules is to join 2 lifeline wire ropes, or a lifeline wire rope to a zip line wire rope.

Assembling and installing

The connecting ferrule is designed to be installed with the following wire ropes:

- Galvanized steel wire ropes, 6x7, textile core, Lang Forming,
- Galvanized steel wire ropes, 19x7 metallic core, anti-rotating,
- Swaged galvanized steel wire ropes, 6x26, metallic core.

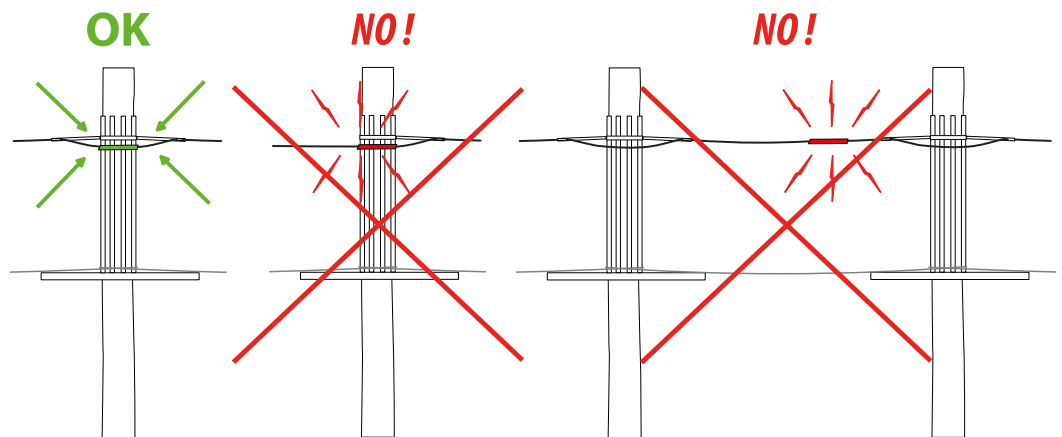
It can be installed with Ø12 mm wire rope or ½" depending on the materials you have chosen.

NO!

Never install material designed for Ø ½" wire rope on Ø12 mm wire rope or vice versa.

Warning : The connections can only be made between 2 arms above a platform where the wire rope is slack (see diagram below).

Do not carry out mid-span.



Instructions

1 - Insert the male ferrule (1) into the female ends of the swapper (2) then stagger, tighten and glue the 2 STHC Ø5mm screws (3) for each ferrule.

2 - Cut the wire rope so as to have straight, clean cut ends.

3 - Insert the first wire rope into the male ferrule and the second wire rope into the female ferrule all the way to the end and swage each ferrule 6 times following the order as indicated below.



Only use those dies recommended by Koala Equipment with a crimping tool exerting a force of at least 120 kN. For optimal swaging and to avoid the wire rope from slipping, we recommend that you change the die after 500 crimps.

3.15 Installing and operating the Climb-up

Function of the device

The Climb-up device facilitates ascending vertical obstacles with a continuous belay system. It is particularly suitable for rigid vertical obstacles such as wooden ladders. It requires a rigid structure, which either already exists and if not must be installed, all the way up the activity.

In case of a fall, an energy absorber is installed at the top of the obstacle to absorb the impact force.

Installing the Climb-up

The Climb-up is designed to be installed with the following wire ropes:

- Galvanized steel wire ropes, 6x7, textile core, Lang Forming,
- Galvanized steel wire ropes, 19x7 metallic core, anti-rotating,
- Swaged galvanized steel wire ropes, 6x26, metallic core.

It can be installed with Ø12 mm wire rope or ½" depending on the materials you have chosen.

Never install material adapted to Ø ½" wire rope on Ø12 mm wire rope or vice versa.

Installing the Climb-up

1 – Tightly install the ladder and avoid a slope beyond 10 °.

2 – Place a sling at the top of the obstacle approximately 3m/9,84' from the arrival platform. To avoid fatigue on the wire rope it is important to maintain the same slope as that of the ladder.

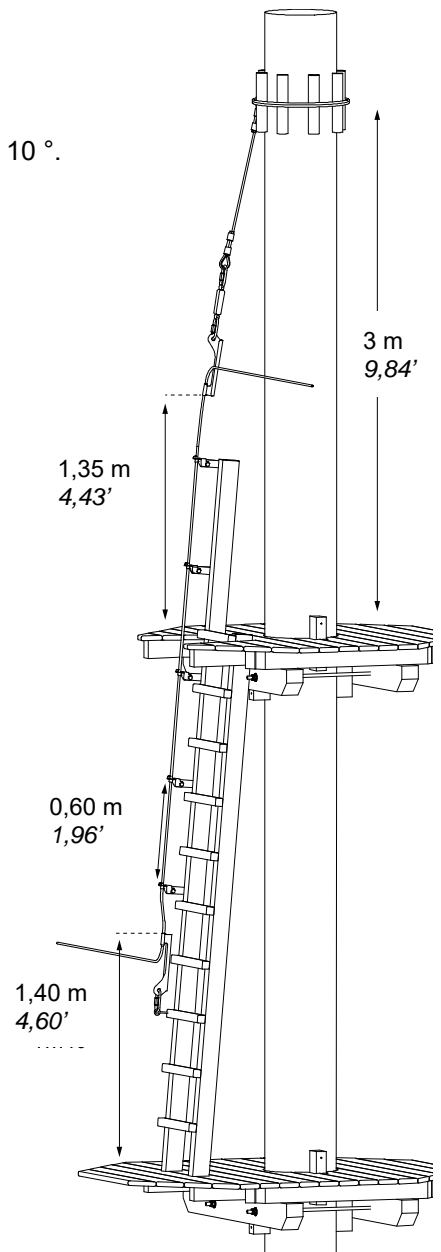
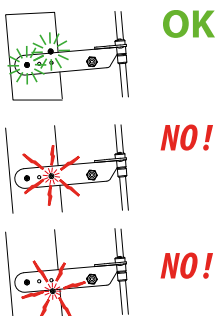
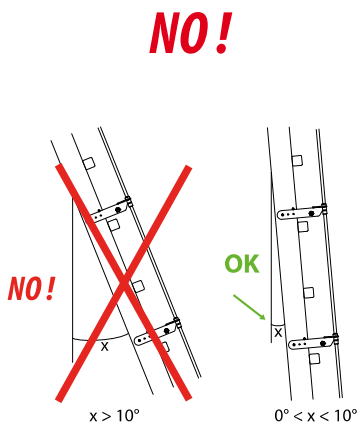
3 – Apply the following when installing onto the sling: one 12mm stainless steel Maillon rapide, the energy absorber, one 12mm stainless steel Maillon rapide, 1 arm for activity. The bottom of the arm must be 1,35m/4,43' from the arrival platform.

4 – At the bottom of the ladder fix a screw eye bolt onto the rail and attach a 12mm stainless steel Maillon rapide and an arm for activity. The top of the arm must be 1m40 from the ground when under tension.

5 – Screw the Climb-ups onto the rail of the ladder with 0,6m/1,96' between them and start at 1,60m/5,24' from the ground.

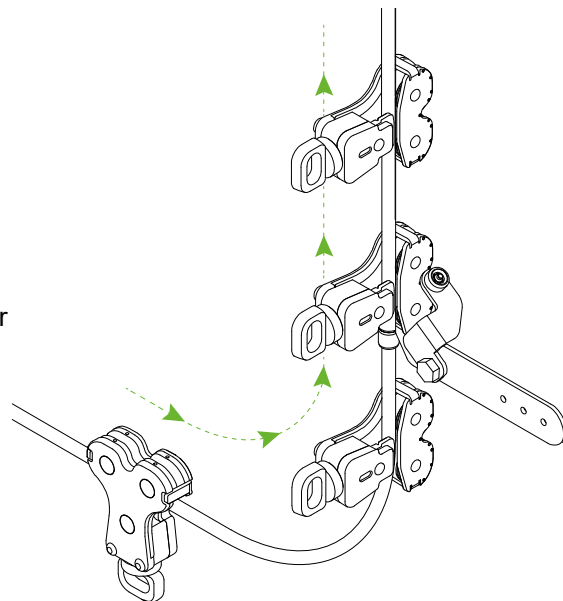
Use 2 Ø 6X60 mm screws (1 in the hole on the plate and one above the plate to maintain the Climb-up at a horizontal level between 0 et 10°).

6 – Pass the wire rope into the arm for activity and the Climb-ups with a small 18mm ferrule under each Climb-up and a 65mm ferrule at the extremity of each arm. Swage the small 18mm /0.7in ferrules and the two 65mm /2.56 in ferrules once the wire rope is under tension.

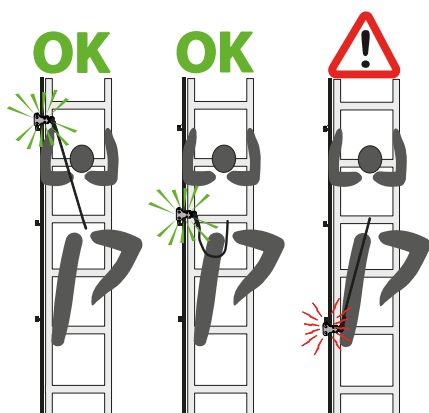


Operating the Climb-up

Users evolve vertically on the activity by passing their pulley via the Climb-ups.



With a 0,6m/1,96' lanyard and the Climb-ups installed 0,6m/1,96' apart, the highest fall factor is 3. Tests have been carried out with a maximum weight of 140 kg / 308 lbs / 22 stones and a minimum weight of 30kg / 66 lbs / 4.72 stones so as to ensure that the maximum deceleration is inferior to 6G.



However, for more comfort and in order to preserve the material, users must be informed to pass their pulley through the Climb-up flaps as soon as possible and to always keep their pulley above their harness attachment point.

3.16 Installing and operating the Switch

Function of the device

The Switch is a device composed of stations and a shuttle which guarantee Koala continuous belay system continuity on:

- Vertical obstacles such as ladders, climbing walls, jumps into the void ... requiring the use of fall arresters or descenders.
- Swinging activities or pendulum jumps such as Tarzan swings.
- Any other obstacles requiring the use of a mobile anchor point.

Installing the Switch

The Switch is designed to be installed with the following wire ropes:

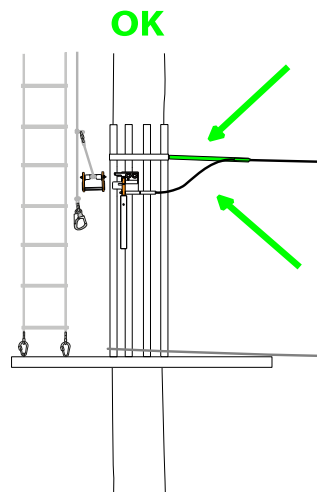
- Galvanized steel wire ropes, 6x7, textile core, Lang Forming,
- Galvanized steel wire ropes, 19x7 metallic core, anti-rotating,
- Swaged galvanized steel wire ropes, 6x26, metallic core.

It can be installed with Ø12 mm wire rope or ½" depending on the materials you have chosen.

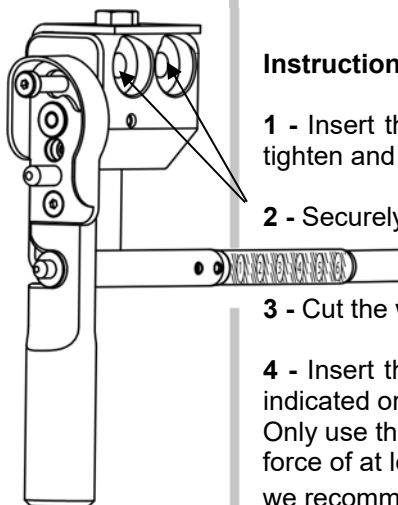
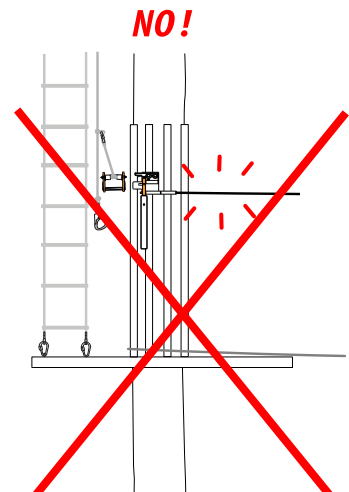
Never install material adapted to Ø ½" wire rope on Ø12 mm wire rope or vice versa.

The Switch station can only be positioned after an arm above a platform, where the wire rope is not taut.

NO!



Never install directly on an obstacle's life line.



Instructions

1 - Insert the male ferrule (1) into the female ends of the swapper (2) then stagger, tighten and glue the 2 STHC Ø5mm screws (3) for each ferrule.

2 - Securely fix the body to the support with screws or bolts..

3 - Cut the wire rope so as to have straight, clean cuts.

4 - Insert the wire rope into the ferrule all the way to the end and swage as per the indicated order.

Only use those dies recommended by Koala Equipment with a crimping tool exerting a force of at least 120 kN. For optimal swaging and to avoid the wire rope from slipping, we recommend that you change the die after 500 crimps.

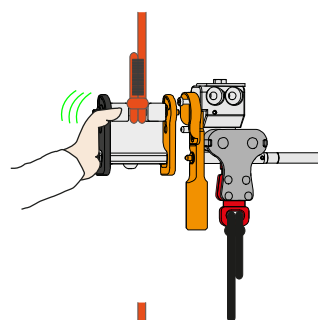
5 - Connect the shuttle to the mobile anchor point (e.g : fall arrester, jump rope, ...) only with the lanyard provided.

Operating the switch

Entering the pulley into the shuttle from the left.

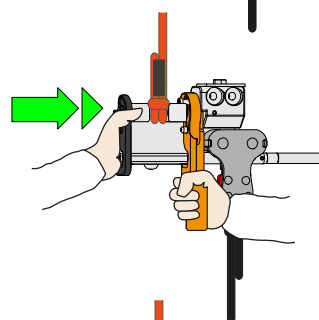
1

Place the shuttle against the station



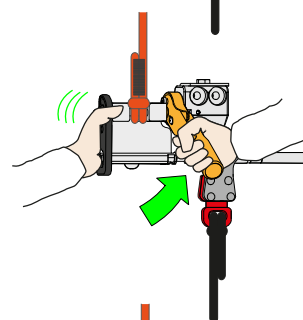
2

Press hard on the shuttle against the station to release the handle



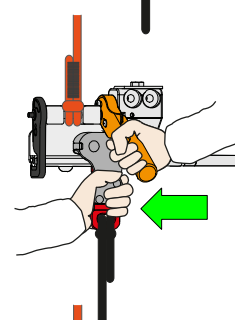
3

Hold the shuttle in place and lift the handle



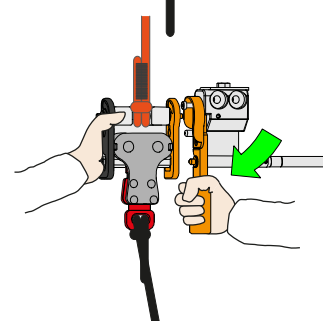
4

While lifting the handle slide the pulley into the shuttle



5

Lower the handle and hold the shuttle



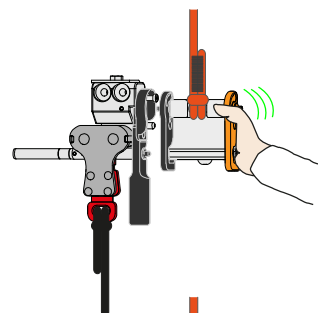
KOALA-EQUIPMENT.COM

Operating the switch

Entering the pulley into the shuttle from the right.

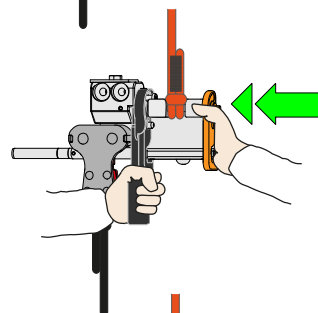
1

Place the shuttle against the station



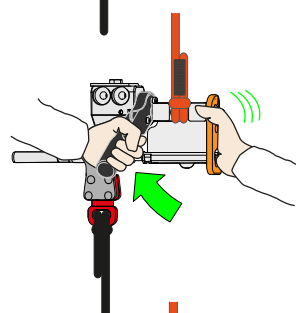
2

Press hard on the shuttle against the station to release the handle



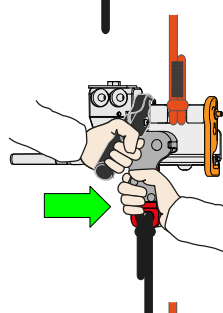
3

Hold the shuttle in place and lift the handle



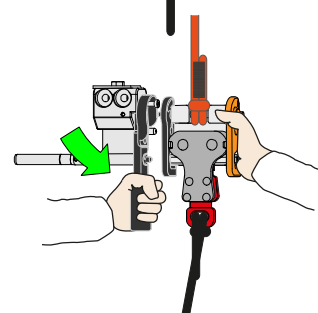
4

While lifting the handle slide the pulley into the shuttle



5

Lower the handle and hold the shuttle



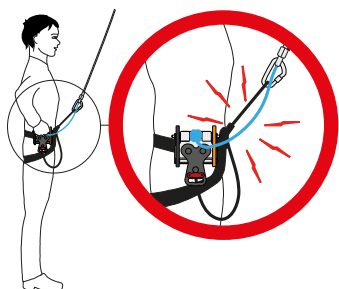
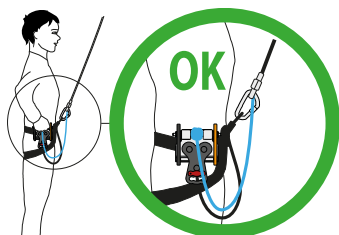
KOALA EQUIPMENT.COM

Using the Switch

There must be at least a second connector, in addition to the shuttle, to enable the user to fix the shuttle to his/her harness as per the diagram.

Ideal solution:

Connect the mobile anchor point directly to the harness together with the shuttle.



Make sure the lanyard is short enough so that it cannot remove the shuttle from the harness when the system is taut.



Never use the shuttle as the only attachment point to the mobile anchor point.

3.17 Installing and operating manual swappers

Function of the device

The manual swapper allows users to choose between 2 directions without disconnecting from the continuous belay system. This device is exclusively compatible with Koala Equipment Pouliz pulleys.

Installing the swapper

The swapper is designed to be installed on the following wire rope :

- Galvanized steel wire ropes, 6x7, textile core, Lang Forming,
- Galvanized steel wire ropes, 19x7 metallic core, anti-rotating,
- Swaged galvanized steel wire ropes, 6x26, metallic core.

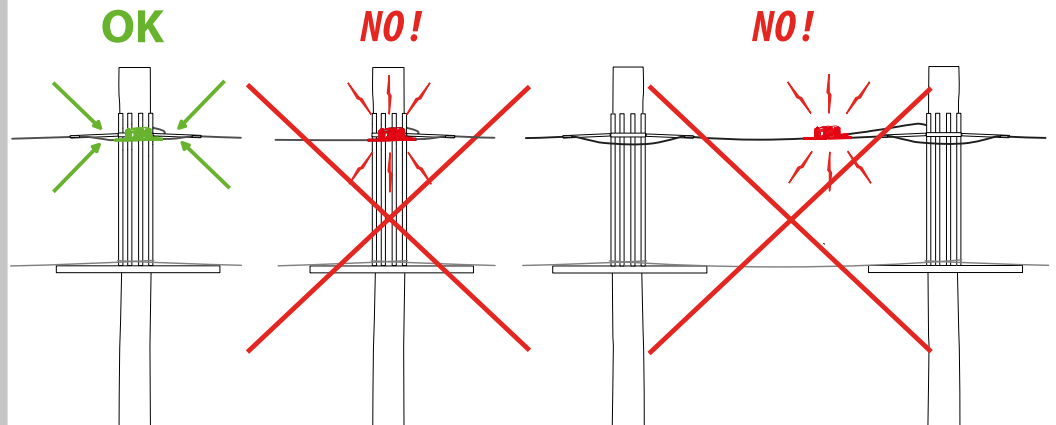
It can be installed with Ø12 mm wire rope or ½" depending on the materials you have chosen.

NO!

Never install material adapted to Ø ½" wire rope on Ø12 mm wire rope or vice versa.

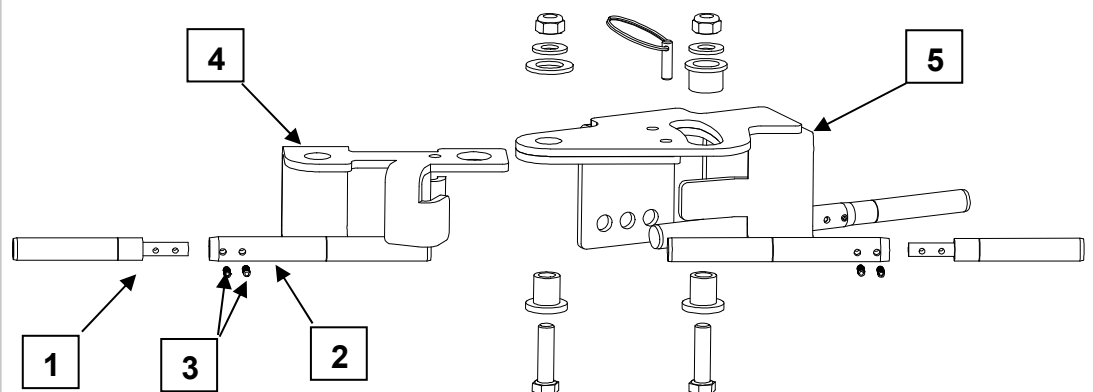
Manual swappers can only be positioned between 2 arms above the platforms, where the wire rope is not taut.

Must never be installed mid-range.

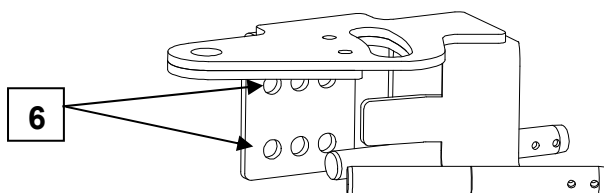


Instructions

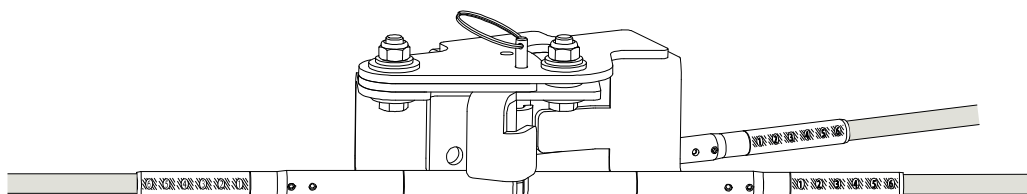
1 – Insert the 3 male ferrules (1) into the female ends of the swapper (2) then stagger, tighten and glue the 2 STHC Ø5mm screws (3) for each ferrule (3) for each ferrule and dismantle the mobile part (4) from the body of the swapper (5).



2 - Fit the body onto the support with screws, bolts or champ plates. Use the holes (6) to do so.



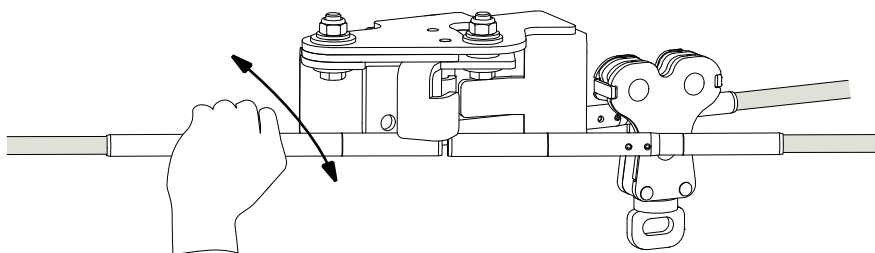
3 - Fit the mobile part onto the swapper, cut the wire ropes so as to have clean cuts and insert the wire ropes into the ferrules all the way to the end. Account for some slack in the wire ropes to ensure fluid movement of the mobile part and then test it.



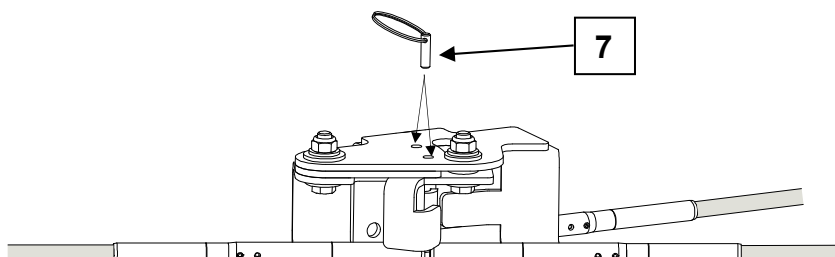
4 - Ensure that the wire ropes are inserted all the way to the end then swage the swapper tubes as per the indicated order (from 1 to 6). Only use those dies recommended by Koala Equipment with a crimping tool exerting a force of at least 120 kN. For optimal swaging and to avoid the wire rope from slipping, we recommend that you change the die after 500 crimps.

Operating the manual swapper

The user selects his/her preferred activity by activating the mobile part of the swapper.



The instructor can condemn the crossing or oblige users to use a chosen crossing by blocking the mobile part with the pin (7). A bolt can replace the pin.



3.18 Installing and operating Y swappers

Function of the device

The Y swapper allows users to choose between 2 directions without disconnecting from the continuous belay system. This device is exclusively compatible with Koala Pouliz pulleys 1.1, 2.0, 2.1 and 3.0 .

This device is not compatible with Koala Pouliz 1.0 nor with any other connectors.

Installing the Y swapper

The Y swapper is designed to be installed on the following wire rope :

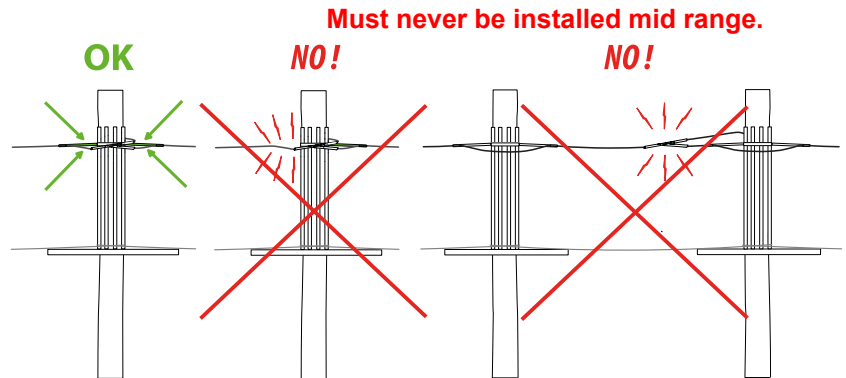
- Galvanized steel wire ropes, 6x7, textile core, Lang Forming,
- Galvanized steel wire ropes, 19x7 metallic core, anti-rotating,
- Swaged galvanized steel wire ropes, 6x26, metallic core.

It can be installed with Ø12 mm wire rope or ½" depending on the materials you have chosen.

NO!

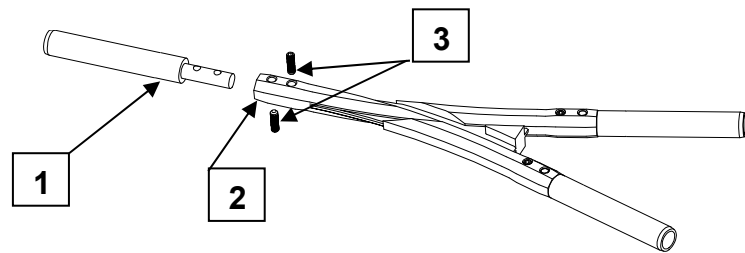
Never install materials adapted to Ø ½" wire rope on Ø12 mm wire rope or vice versa.

Y swappers can only be positioned between 2 arms above the platforms, where the wire rope is not taut.

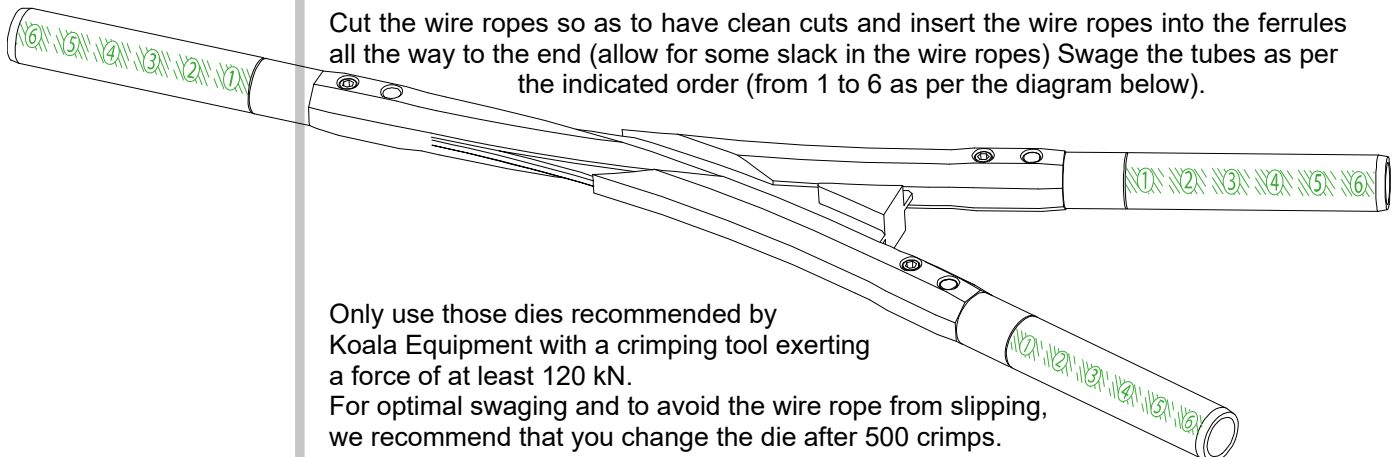


Instructions

Insert the 3 male ferrules (1) into the female ends of the swapper (2) then stagger, tighten and glue the 2 STHC Ø5mm screws (3) for each ferrule.



Cut the wire ropes so as to have clean cuts and insert the wire ropes into the ferrules all the way to the end (allow for some slack in the wire ropes) Swage the tubes as per the indicated order (from 1 to 6 as per the diagram below).

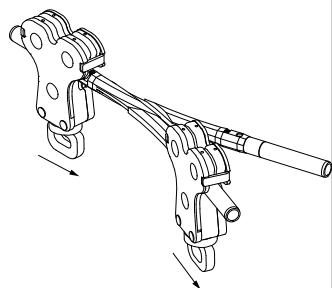


Only use those dies recommended by Koala Equipment with a crimping tool exerting a force of at least 120 kN.

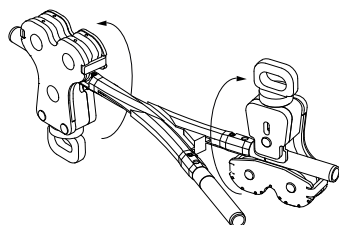
For optimal swaging and to avoid the wire rope from slipping, we recommend that you change the die after 500 crimps.

Operating the Y swapper

There are 2 ways of operating this type of swapper:



- 1- The user chooses to follow the way ahead in alignment with the swapper, so he/she just pushes the pulley along normally as per the diagram.



- 2- The user chooses to go the other way and therefore has to tilt the pulley so that it is upside down, then passes the pulley into the swapper and tilts it back the right way up once he/she is on the right path (see the diagram opposite)

3.19 Recommendations when installing and operating the pneumatic brake

Function of the device

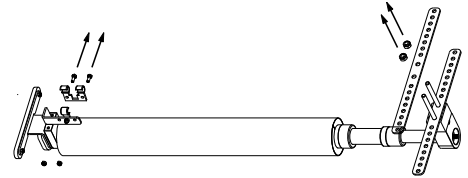
The pneumatic brake stops users at the end of a zip line. It can be used as the main brake or as the backup brake.

Installing the pneumatic brake

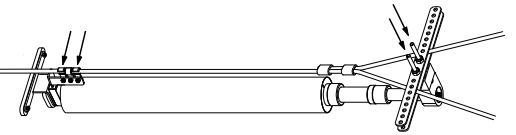
The brake can be installed on Ø12 mm wire rope or ½" depending on the materials you have chosen.

Instructions

1 - Dismantle one of the two half tubes on the front fitting as well as one of the two back plates.

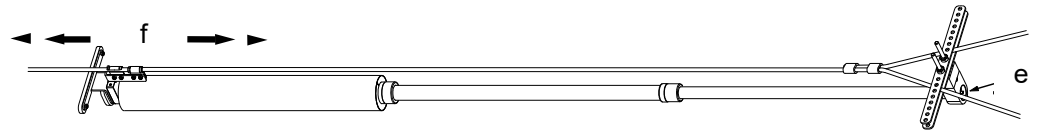


2 - Install the brake onto the wire rope. Start by fitting the rear without tightening. Then fit the second half tube on the front and tighten the 2 screws.



Finally, tighten the rear fitting and check that the front part slides smoothly on the wire rope and that the rear fitting is blocked and doesn't move.

3 - Unscrew the valve cap (e) screw on the inflator and inflate until the pressure gauge indicates 2 bars. The brake will extend forwards. Check that the front part of the brake still slides smoothly on the wire rope (f).



Using the pneumatic brake

User's maximum weight: 140 kg - 308 lbs -22 stones.

Maximum speed: 35 km/h - 21,75 m/h.

Do not brake with your hands on the wire rope

Pressure: 2 bars / 29 psi.

Do not put your hands on the pulley.

Put your hands on the lanyards.



3.20 Recommendations when installing and operating the lower attachment brake

Function of the device

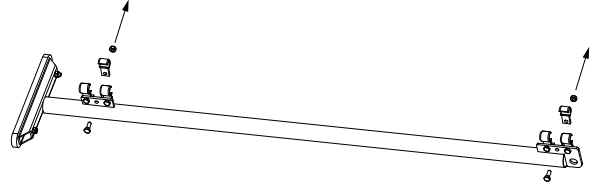
The brake stops users at the end of a zip line. It can be used as the main brake or as the secondary, back up brake.

Installing the brake

The brake can be installed on Ø12 mm wire rope or 1/2" depending on the materials you have chosen.

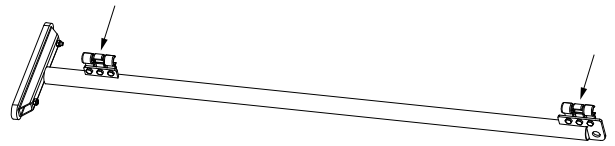
Instructions

1 - Dismantle one of the two half tubes on the front fitting as well as one of the two on the rear fitting.



2 - Install the brake onto the wire rope.

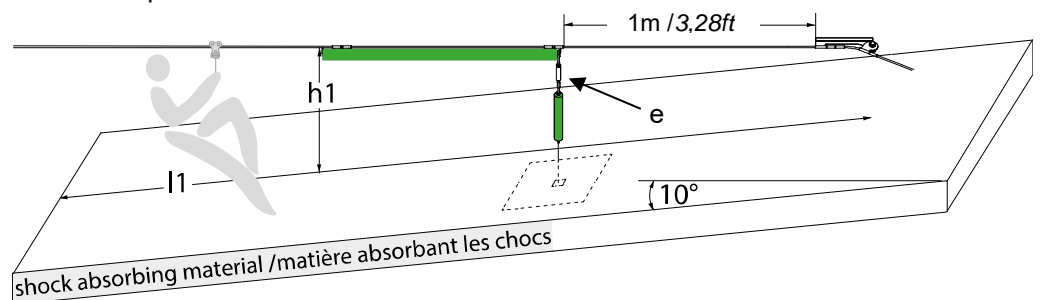
Start by fitting the rear half tube, then the one at the front. Finally check that the system slides freely on the wire rope.



3 - Install the rope and the energy absorber (e) in the landing zone, ensure that the attachment point to the ground withstands at least 800 daN. You can use the plate (f) to help. The brake must be 1m from the arm.

The height h1 must be based on the length on the lanyards, the type of harness and whether it is a main or secondary, back up brake. For example: a sit harness with 60cm lanyards and a secondary/back up brake, h1= 1.4m when the wire rope is free of a load (without a user) . In this case the part of the landing zone below the brake must serve as a shock absorber (shock absorbing material, padding....)

The length l1 must be adapted to the speed and the users' weight. Fit the foam buffer onto the brake tube and onto the vertical rope. Check that the brake slides smoothly on the wire rope.



Using the device

Do not brake with your hands on the wire rope.



Do not put your hands on the pulley.



Put your hands on the lanyards.



3.21 Recommendations when installing and operating the upper attachment brake

Function of the device

The brake stops users at the end of a tree to tree zip line. It can be used as the main brake or as the secondary, back up brake.

Installing the brake

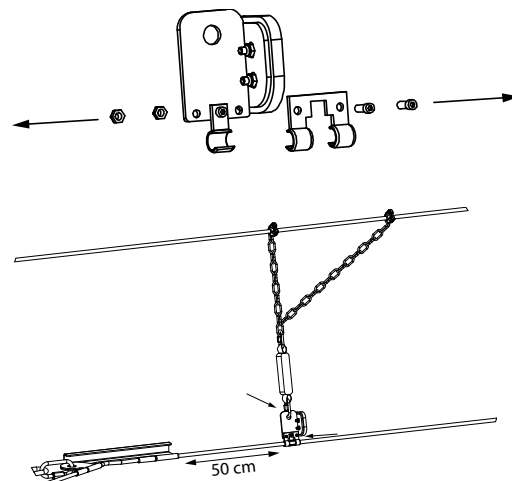
The brake can be installed on Ø12 mm wire rope or ½" depending on the materials you have chosen.

Instructions

1 - Dismantle the half tube plate.

2 - Install the brake onto the wire rope and fit both half tube plates, then check that the system slides freely on the wire rope.

3 - Fit the chain onto the upper wire rope with 2 wire rope clips. Connect the chain and the energy absorber to the brake with 2 stainless steel Ø7mm Maillons rapide. The brake must be 0,5m /1,64ft from the extremity of the zip line arm.



Using the device

Do not brake with your hands on the wire rope.

Do not put your hands on the pulley.

Put your hands on the lanyards.



4. LIMITS OF USE

4.1 Number of people per activity

Adults should normally progress through the activities one by one but can accompany 1 child less than 1,4m /3,2ft tall.

Under exceptional circumstances (emergency manoeuvres) 3 people may be on one activity simultaneously (1 trained rescue instructor, 1 adult user, 1 child user less than 1,4m /3,2ft tall).

4.2 Number of people per platform

Normally, there should be no more than 3 people per platform.

Under exceptional circumstances (emergency manoeuvres) 4 people are tolerated simultaneously.

4.3 User's maximum weight

Maximum weight = 140 kg / 308lbs / 22 stones.

5. INSPECTION CHECKS

The point of these inspections is to detect any deterioration of the lifeline components which could cause dangerous situations for the users. In case of doubt, please refer to Koala Equipment or your fitter before opening the activity to the public.

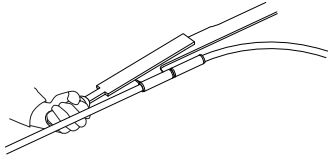
5.1 Before every opening to the public

The instructor must do the course in order to carry out a visual inspection referring to the initial state of the course. The instructor must then record the findings on a daily log sheet.

The following points must be monitored:

a. Lifeline wire ropes

- State (loose strands, breaks, etc.) pay particular attention to the wire ropes around the arms and ferrules.
- Tension (visual check with reference to the original condition).
- Overload (ice, frost, branches, etc...).

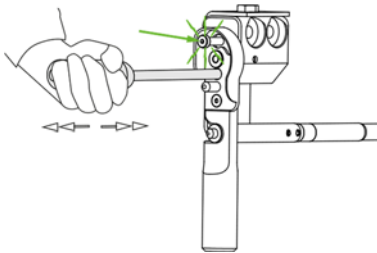


b. Arm sets : Check the state of the arms, the U-parts and the bolts. In case of any sharp edges, file them down.

c. Condition of the arm supports (metal strap, wire rope, double brackets.....) and complete clamps, check the bolts and make sure they are tightened.

d. Connecting ferrule: check the overall state, the state of the wire rope at the swaging point and ensure that the ferrule is not bent. Check the screws on male and female removable ferrules to ensure they don't protrude.

e. Climb-up : check the slope and ensure that they close automatically. Check the overall state of the wire rope and make sure the wire rope hasn't slipped. Make sure the energy absorber has no tears and is not worn.

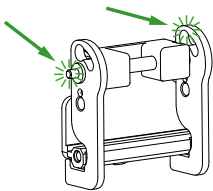


f. Switch Station

- Check the general state of the station and do a test run.
- Check that the station is fixed properly and that the mounting screws are in place.
- Inspect the state of the wire rope around the swaged area
- Ensure the screws are present on the removable ferrule.
- Check that the gate cannot open as long as the shuttle is not connected.
- With a screwdriver, check that the lock works properly (that there is no resistance when you push it and that it slides back).
- Check that the retaining screw (in green in the diagram) is not bended.

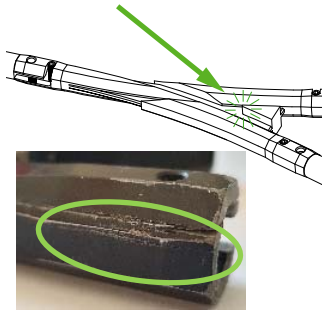
g. Switch Shuttle

- Check the general state of the shuttle and do a test run.
- Inspect the lanyard.
- Check that the gates cannot open without the shuttle being connected to the station.
- Check for wear and tear on the gates as indicated in the diagram.



h. Manual swapper

- Check the general state of the swapper and do a test run.
- Check that it is fixed properly and that the tube on the mobile part is aligned with those on the stationary body.
- Inspect the state of the wire rope around the swaged area and check the screws.



i. Y Swapper

- Check the general state of the Y swapper and test it to ensure that the pulley passes smoothly in both directions without disconnecting (check for wear and tear on the central ridge as indicated in the diagram).
- Check that the swapper is not cracked due to corrosion (as shown on the picture).
- Inspect the state of the wire rope around the swaged area and check the screws.

j. Pneumatic brake

- Check that the rear part of the brake is correctly fitted on the wire rope and do a test run.
- Check that the pressure is correct.
- Check that the rubber parts at the front of the brake and the protection paddings are in a good state and well adjusted.
- Check the half tubes at the front for wear and tear and inspect the friction area on the wire rope.

k. Brake (upper and lower attachment types)

- Check that the rope or the chain that holds the brake is not damaged and that it is correctly connected.
- Check that the energy absorber has not become unstitched.
- Check that the rubber parts at the front of the brake and the protection paddings are in a good state and well adjusted.
- Check the half tubes for wear and tear and inspect the friction area on the wire rope.

Those sites showing damage or deterioration that could compromise user safety must be closed or sealed off until they have been repaired. Repairs must be noted in a maintenance task report.

5.2 Functional inspection

Every 3 months a thorough inspection must be carried out covering all the points of the inspections carried out before opening to the public as well as an inspection of all of the wire ropes.

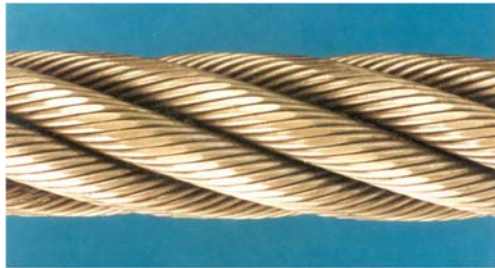
Below some examples of defects which require changing the wire rope. All wire rope inspection and discarding criteria can be found in appendix C of the EN15567-1 standard.



Localised increase in the wire rope diameter due to the core extruding



Twist in the wire rope



Outer wear



Broken wires on the surface



Localised reduction in the wire rope diameter (hollow strands)



Broken wires in the grooves

Those sites showing damage or deterioration that could compromise user safety must be closed or sealed off until they have been repaired. Repairs must be noted in a maintenance task report.

5.3 Detailed inspection and annual inspection of the installations

Annually or after any vandalism, when the forces exerted are too important or exceptional weather conditions, the installations as well as the supporting trees must undergo a detailed inspection.

The following points must be monitored:

Lifeline wire rope: the wire rope must be inspected along its entire length. All wire rope inspection and discarding criteria can be found in appendix C of the EN15567-1 standard.

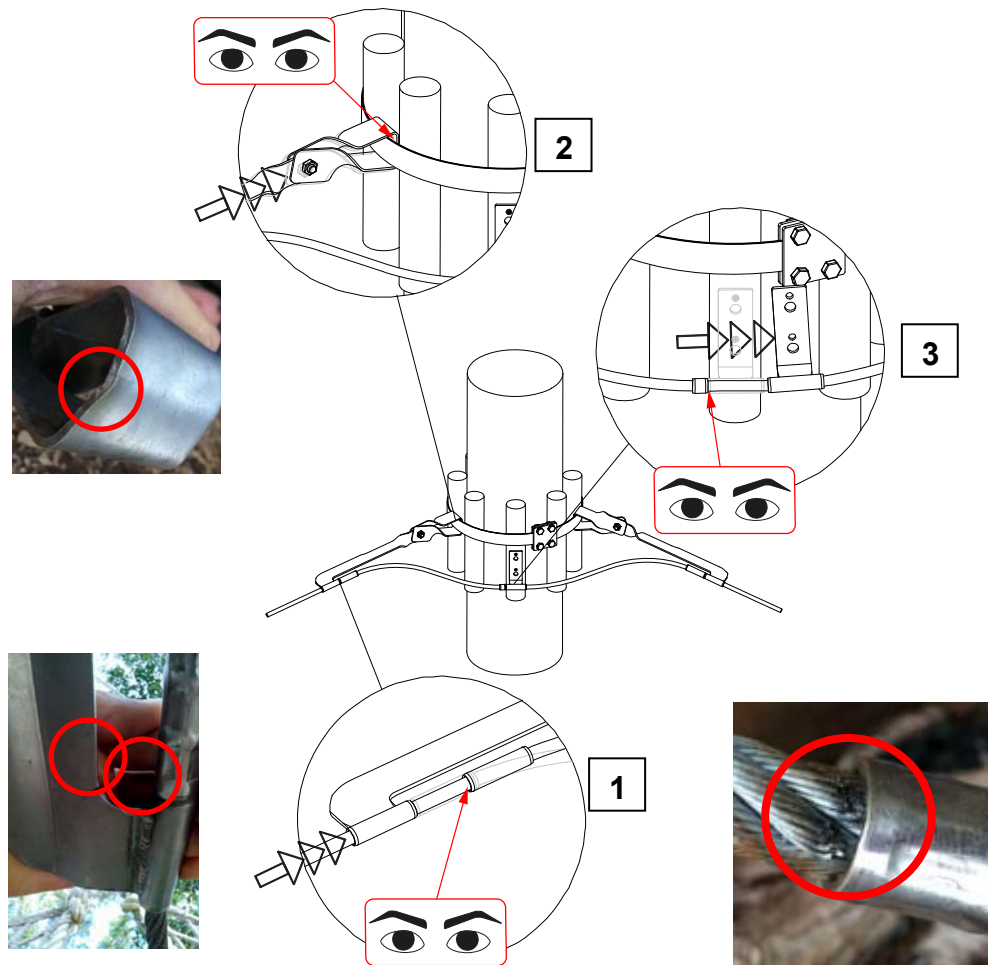
Particular attention must be paid to the part of the wire rope where the ferrules are swaged:

- Slide the wire rope in the arms in order to inspect the wire rope inside the arms as well as at the 2 extremities of the swaged ferrule (as per diagram 1 below).
- If the wire rope doesn't slide smoothly in the metal brackets, 1 metal bracket must be dismantled so as to slide it along the wire rope and inspect the wire rope underneath (as per diagram 2 below).

Wire rope tension (visual inspection referring back to its initial state).

Arm sets: Check the state of the arms, the U-parts and the bolts. Particular attention must be paid to the U-parts where they are in contact with the metal strap, to do so, push the U-part back (as per diagram 3 below).

Arm supports: Check the state of the arm supports (metal strap, wire rope, double bracket, Maillons Rapide....) Particular attention must be paid to the metal strap under the U-parts to do so, push the U-part back (as per diagram 2 below).

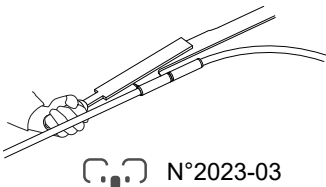


Those sites showing damage or deterioration that could compromise user safety must be closed or sealed off until they have been repaired. Repairs must be noted in a maintenance task report.

6. MAINTENANCE

6.1 Maintenance on the arms

In some cases, a sharp edge can appear at the front of some arms caused by repeated impacts made by the pulleys. It must be removed by filing it smooth. Always pay attention not to damage the ferrule and the wire rope.



6.2 Switch station maintenance

The stations must be greased regularly. To do so, press the lock with a screwdriver and while you press the lock, spray with white lithium grease as per the diagram opposite.

Once a year, or in case the greasing is not sufficient, you must completely dismantle the station to clean it and grease it. To do so, follow the procedure:

a - First dismantle the station cylinder by undoing the screw on top (1), then unscrew the 2 screws, at the front (2).

b - Remove the station cylinder (3) then undo the 2 screws (4) on both sides with an Allen key N°4.

c - Remove the handle (5) and the handle axis (8).

d - Loosen the locking system by inserting an Allen key N°4 in the front (6) and a socket wrench 8 at the back (7).

e - Remove the axes and be careful not to lose the spring. Clean the 2 axes, the spring and inside the bores of the body with a clean cloth.

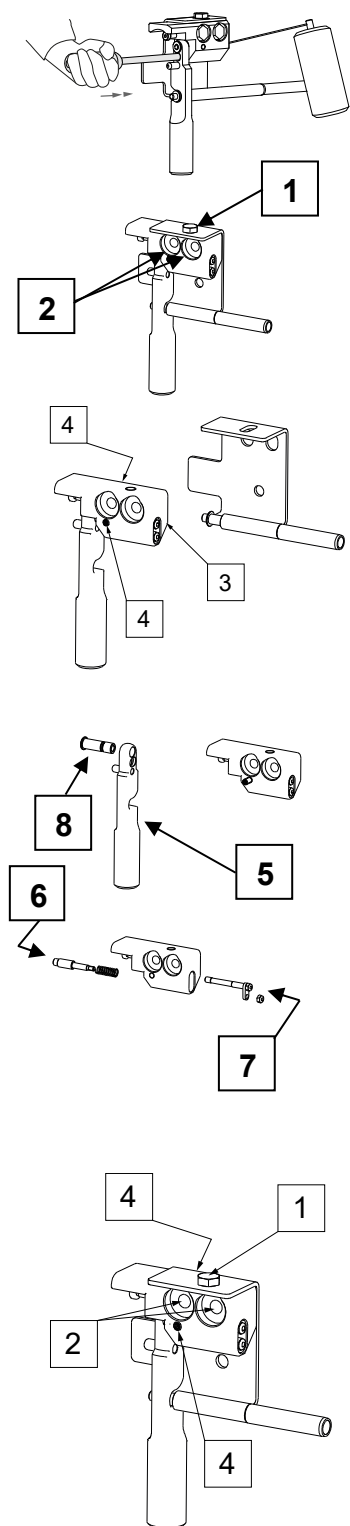
f - Grease both axes and the bores and reassemble.

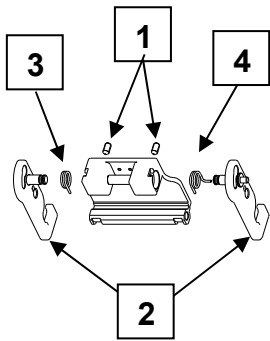
g - Dismantle, grease and reassemble the handle axis (8).

h - Reassemble the handle onto the station cylinder and tighten both screws (4). These screws must be glued with Loctite Thread locker medium strength. Warning: the screws must be in contact with the handle axis without being too tight.

i - Reassemble the station cylinder onto the body by first putting the screw on top (1) without tightening it, then put both screws back onto the front (2) and tighten them, then tighten the screw on top.

j - Carry out an inspection as described in **5.1 – f**.





6.3 Switch shuttle maintenance

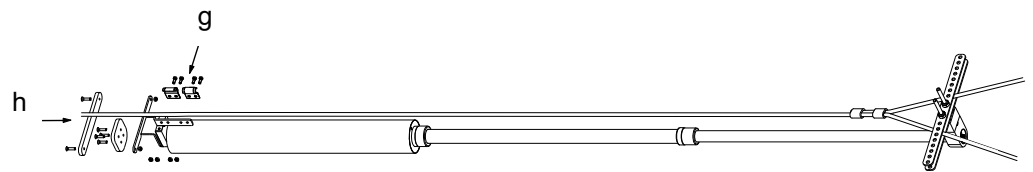
Once a year or in case they are broken, the shuttle gate springs must be replaced. To do so, first remove the screws (1) with an Allen key N°4, withdraw the gates (2) and the springs (3 and 4). Beware as there are left and right hand springs. Install the new springs and the gates, tighten the screws (1) and glue them with Loctite Thread locker medium strength.

Carry out an inspection as described in **5.1 – g**.

6.4 Pneumatic brake maintenance

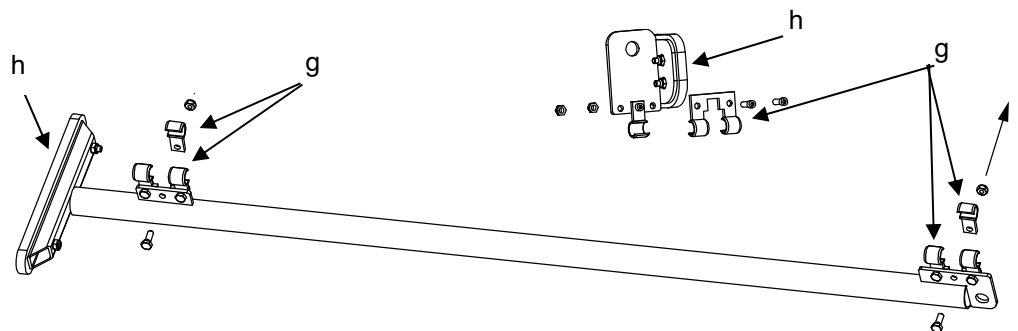
If you notice important oil leaks or if the brake doesn't hold the pressure, please dismantle and return to Koala Equipment.

In case of wear and tear or deterioration, change the half tubes (g) and the rubber endings (h).



6.5 Brake (lower and upper attachment types)

In case of wear and tear or deterioration, change the half tubes (g) and the rubber endings (h).



7. USER SAFETY BRIEF

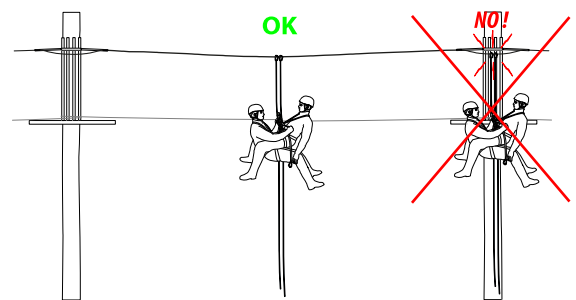
The continuous belay system considerably improves user safety particularly with regard to the risk of falling from a height. However, many other risks related to this activity remain. It is therefore essential that all users are informed, before going on the course, of the proper use of the equipment and installations and the safety instructions that must be complied with during the activity.

8. EVACUATION

Emergency manoeuvres which imply disconnecting a user from the continuous belay system to evacuate them from the course must be carried out in life threatening situations only. It is your responsibility to establish a specific evacuation procedure with properly adapted equipment to guarantee users' and staff safety.

NO!

The evacuation system can only be connected to the lifeline wire rope above the obstacle not above platforms.



9. WIRE ROPE LIFECYCLE

The continuous belay wire rope lifecycle is 4 years on average. This duration is an indication only, as numerous points must be taken into consideration such as: the number of users, the different types of installations and their condition, vandalism, wire rope fatigue depending on the activities and also weather conditions...Only regular inspections allow to detect signs of wear and tear or fatigue which may require replacing the wire rope. In some situations, the wire rope lifecycle can be as short as 1 day. All wire rope inspection and discarding criteria can be found in appendix C of the EN15567-1 standard.


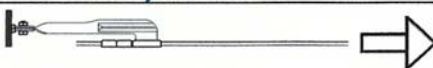

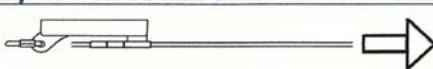

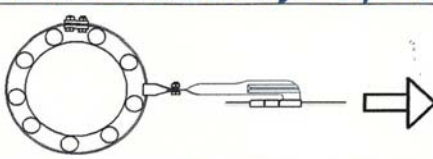
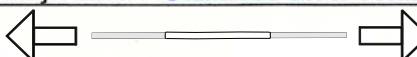
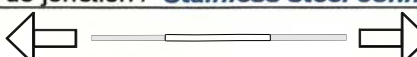
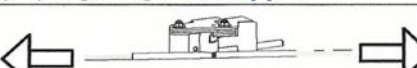


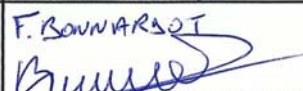
10. COMPLIANCY WITH THE EN 15567-1 STANDARD

In order for the course to be compliant with the EN 15567-1 standard, it is the owner's responsibility to ensure that all the installations are checked by an independent control agency.

11. PPE INSPECTION AND FOLLOW-UP

All P.P.E. must be checked regularly to detect any deterioration of equipment likely to be a source of dangerous situations, please therefore refer to the notices or leaflets provided by the manufacturers. If you require further information or have any doubts, please contact the equipment manufacturer.

12. TEST REPORT

ASSEMBLAGES TESTES / ASSEMBLED PARTS TESTED		RESULTATS
(k + e + f + h) Bras d'activité horizontale sur platine <i>Arm for horizontal activity on double bracket</i>		7 300 daN
		
(k + e + t + h) Bras pour tyrolienne sur platine <i>Arm for zip line on double bracket</i>		8 200 daN
		
(n + p + h) Bras d'activité horizontale sur maillon rapide inox 12mm <i>Arm for horizontal activity on 12 mm stainless steel maillon rapide</i>		7 100 daN
		
(n + q + h) Bras pour tyrolienne sur maillon rapide inox 12mm <i>Arm for zip line on 12 mm stainless steel maillon rapide</i>		7 200 daN
		
(n+ q + r + h) Bras pour tyrolienne sur maillon rapide Inox 12mm avec back up / <i>Arm for zip line on 12 mm stainless steel maillon rapide with back up</i>		10 060 daN
		
(b + c + d + e + f + h) Bras d'activité horizontale sur cavalier et feuillard / <i>Arm for horizontal activity on U-part on metal strap</i>		7 200 daN
		
(j) Olive inox de jonction / <i>Stainless steel connecting ferrule</i>		Câble Ø12 mm 7 X 19 - AM 3 300 daN
		
(j) Olive inox de jonction / <i>Stainless steel connecting ferrule</i>		Câble Ø12 mm 6 X 7 - AT 4 200 daN
		
(u) Aiguillage / <i>Swapper</i>		Câble Ø12 mm 7 X 19 - AM 1 400 daN
		
(i) Navette de Switch / <i>Switch shuttle</i>		2 500 daN
		
Fait par / <i>Made by</i> DOS SANTOS Jonathan	Contrôlé par / <i>Checked by</i> BONNARDOT François	Date : Février 2015 / <i>February 2015</i> Format : A3
 Koala Equipment 1191 Rte de Bidaïlle 74 930 SCIENRIER (France) Tél: 0033 (0)4 50 97 50 10 Fax: 0033 (0)4 50 97 50 11 E-mail: info@koala-equipment.com	 F. BONNARDOT VERTIC ALPS EXPERTISE SAS au capital de 10 000 Euros Buisson Rond - 73160 VIMINES Tél : 0033 688462240 E-Mail: francois.bonnardot@vertic-alps.com SIRET : 539 474 924 0001352 69 88 RCS CHAMBERY 539 474 924	RAPPORT D'ESSAIS TESTS REPORT