



**State-of-the-art crown bracing must meet the following criteria:**

- Freedom from injuries
- Flexible adaptability to individual safety requirements
- Softly attenuating limitation of natural crown movements
- Low-load swinging range for low perceptibility by the tree in gentle breeze
- Support of compensation growth at weak points
- Automatic growing with the tree
- Easy inspection
- Long life and reasonable prices
- Recyclable
- Easy handling

**Cobra is the answer:**

1. Cobra winds around the parts of the trees to be braced without injuring them.
2. Cobra installed as a dynamic breaking-bracing allows natural crown movements.
3. The Cobra shock absorber softens catching shocks and softly cushions strong movements. The so-called "karate effect" as it occurs with a steel rope is excluded.
4. Independent from the rope length, the soft Cobra shock absorber offers an additional play of 20 cm already under very slight loads. That way, a Cobra crown bracing does not restrict crown movements in gentle summer breezes, but fully acts under heavy loads and avoids strong catching shocks and breakage.
5. The dynamic Cobra crown bracing gives trees room for movement, which allows them to feel weak points and compensate for them.
6. Cobra installed as a static load-bracing avoids the falling down of branches in danger of breakage.
7. The specific design of Cobra allows the crown-bracing system to grow with the increase in diameter of the tree.
8. Cobra can be easily inspected from the ground and the year of installation can be quickly determined by means of the coloured end caps.
9. The black Cobra hollow rope is braided of polypropylene monofilaments and is the rope fibre that is best suited for a long-term use in trees. The degradation of strength is clearly less than 2% per year and allows a service life of 12 years of the Cobra crown bracing system.
10. Except for the shock absorber, Cobra crown bracing systems are uniformly made of polypropylene and can be simply disposed of for recycling.
11. Cobra crown bracing can be easily installed on the tree without any tools.

**Areas of Application:**

Cobra crown bracing systems can be used for the following fields of application:

1. Dynamic breaking-bracing
  - Bracing of defective spots
  - Bracing of weak embranchments
  - Bracing of V-embranchments

- Bracing of a competing secondary crown
- Increase of the static stability by limitation of crown movements
- Sewing of an unsafe tree together with its neighbour trees for avoiding a "domino effect" in alleys or groups of trees
- Bracing of heavily curved/angled branches

## 2. Static breaking-bracing

- Bracing and immobilisation of torn embranchments
- Replacement of old steel-rope style bracing

## 3. Load-bracing

- Securing of parts of trees in danger of breaking

## 4. Bracing after planting

- Dynamic bracing of newly planted young trees
- Dynamic bracing of newly planted large trees

## Components:

<p style="text-align: center;"><b>Shock Absorber</b></p> <p>Allows for a defined branch oscillation in gentle breeze and thus supports compensation growth.</p> 	<p style="text-align: center;"><b>Anti-abrasion Cover</b></p> <p>In the area of winding around the branch.</p> 
<p style="text-align: center;"><b>Expansion Insert</b></p> <p>For broadening the rope in the area of winding around the branch.</p> 	<p style="text-align: center;"><b>Rope</b></p> <p>Long-term stable PP hollow rope allows for quick splice without tools; thermal end cap in annually changing colours.</p> 

## Installation Instructions:

### 1. Install the expansion insert

Choose the appropriate length. Compress the rope at a distance of the branch circumference plus 20cm from the end of the rope and insert the expansion insert through the braids into the rope.

### 2. Cut the anti-friction hose to length and pull it over the rope.

Length = at least the circumference of the branch.

### 3. Create quick splice

After slinging the rope around the branch, feed the end of the rope about 30cm through the inside of the rope (distance from the stem about 1/2 of the stem diameter) and lead it out again.

### 4. Create a compression loop

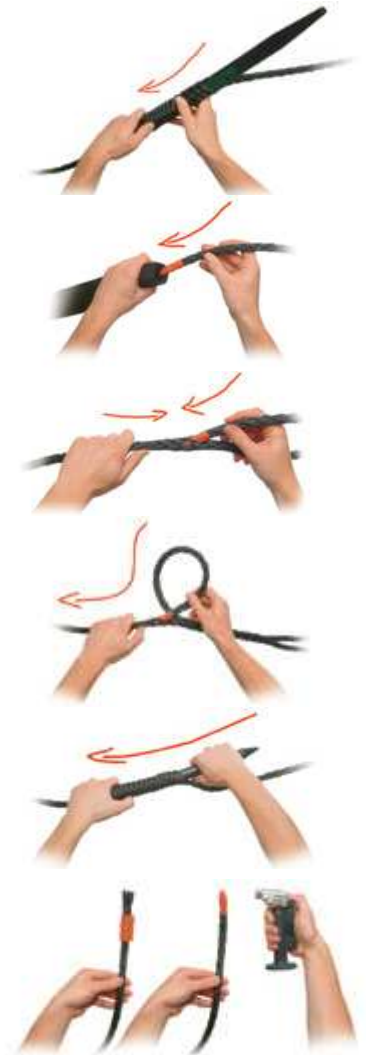
Form a loop with a diameter of about 10cm. then feed the end of the rope again about 10cm through the inside of the rope and lead it out. This loop will serve for tensioning, as growth reserve and for inspection.

### 5. Insert the shock absorber

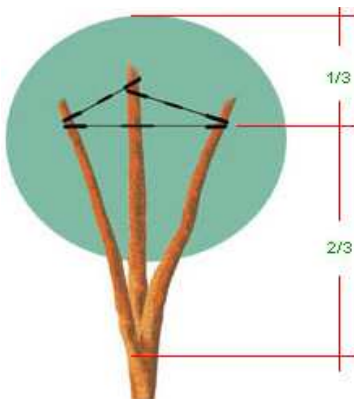
Compress the rope at a convenient spot and insert the shock absorber into the rope through the braids.

### 6. Cut the rope to length and shrink on the end caps

Pull the end cap at least 10 cm over the end of the rope. Heat the end of the rope with a torch until slight crimping occurs. Then push the end cap back to the end and shrink it on there.

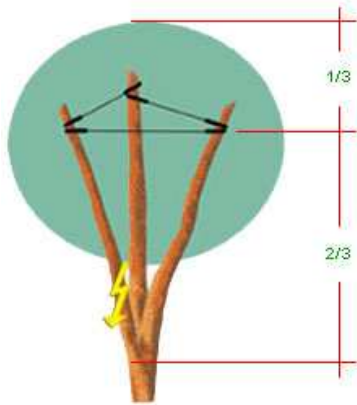


## Installation Rules:



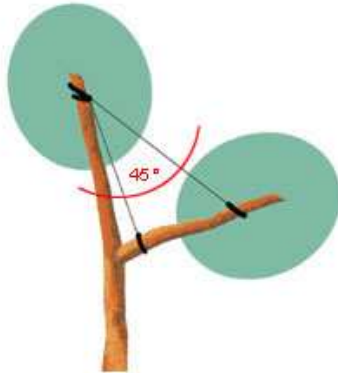
### Dynamic breaking-bracing:

- Installation at 2/3 of the stem height
- Install as horizontally as possible
- Do not impede the natural oscillation behaviour, but softly cushion strong deflections
- No over-dimensioning so as to avoid increased stress by too rigid systems



#### Static breaking-bracing:

- Installation at 2/3 of the stem height
- Install as horizontally as possible
- Lowest-possible rope elongation is most important, therefore the tensile strength should correspond to at least twice the tensile strength of a dynamic breaking-bracing



#### Load/Support-bracing:

- Use static systems
- Do not install shock absorbers
- Install as vertically as possible
- Dimension the system according to the expected branch weight and maximum holding force of the crown

## Long-term Stability

Scientific inspections have confirmed the durability of the cobra system. Its loss of strength of less than 2% per year is a recognized top value. Therefore - provided it has been properly installed - a cobra system needs to be replaced only after 12 years.

### Polypropylene vs. Polyester

The choice of material for crown bracing has been subject to controversial discussion among experts. From laboratory tests, the properties of both materials were theoretically known; their use and long-term strength in the practice of tree care under natural conditions, however, were unknown because that does not depend on the material alone, but also on the size of the surface exposed to weather.

Untreated polypropylene has a moderate UV stability and a very good acid and lye resistance. In order to compensate for the low UV resistance of polypropylene, the monofil (thick-fibre) ropes used in the cobra system were blackened according to DIN 83305.

According to general manufacturers' specifications, polyester has a good UV stability, a moderate acid and in part poor lye resistance. Examinations performed by SCHRÖDER 1997 showed that in polyester multifil ropes used for tree care, despite their UV and acid resistance first rated as good, the decrease of tensile strength was between 40 and 50% within five years.

## Inspection

Crown bracing systems should be checked within the scope of the regular inspection of the trees. According to the Tree Inspection Guidelines, a visual inspection from the ground by qualified staff is sufficient for that purpose. Only if the regular inspection raises doubts about traffic safety or after extreme weather conditions, e.g. storms, more detailed examinations (additional inspections) are required. The intervals of regular inspection depend on the age and condition of a tree and such inspection is performed accordingly every 1 - 3 years.