Background Information on Circumference Dendrometers

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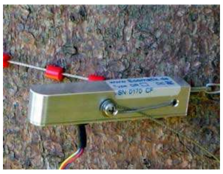
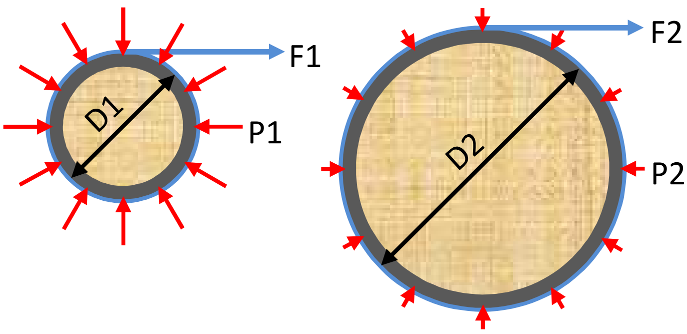
To measure the changes of tree circumference, the sensor of the dendrometers must be pressed against the tree surface. The pressure at the tree must be as low as possible, so that the fine variations can be recorded. The pressure must also be independent of tree species and tree size. These are two important requirements to obtain meaningful data.

There are a number of circumference dendrometers. In general they can be classified into two groups: Dendrometers mounted with tangential pulling force (TF Dendrometers) and dendrometers mounted with radial pressing force (RF Dendrometers). The pressure of dendrometers with tangential traction at the tree decreases with tree size. The larger the tree, the smaller the pressure. Their data are therefore dependent on tree size and are not comparable between different trees.

Mounted with tangential pulling force (TF)



DC1 **D6** **DRL26,DBL60**



Force diagram of TF Dendrometers

Diameter	:	D1<D2
Applied Pulling Force:		F1=F2
Pressure at tree	:	P1>P2

As the force diagram of the TF Dendrometers shows the pressure at the tree decreases with increasing tree size. Theoretically it can vary from 0 to 2 times of F1 (applied pulling force) (for details see: http://en.wikipedia.org/wiki/Barlow%27s_formula). The pressure difference causes two problems:

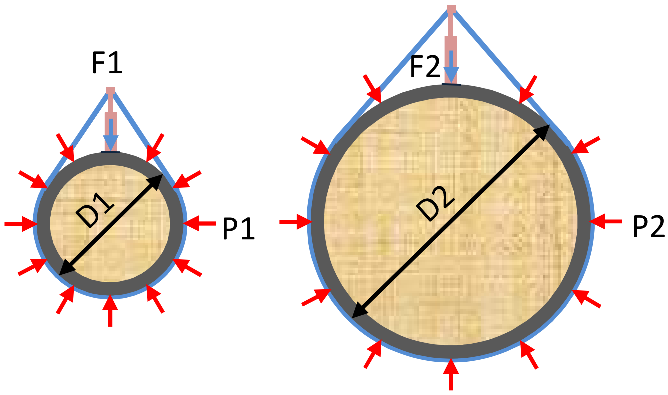
1. Systematic measurement error in the data, because they are measured under different pressures.
2. Sliding down of the band for large trees due to low pressure.

The reason for this difference in pressure is due to the different curvature. Small circle has a greater curvature than large circle. With the same tangential traction greater curvature leads to higher radial pressure. An example of this effect we experience when inflating balloon. Although smaller balloon has a lower tangential traction as a large air balloon, when inflated you need much more power than at a large balloon.

Small balloon, high pressure (F1>F2)

Mounted with radial pressing force (RF)


DC2 **DC3**



Force diagram of RF Dendrometers

Diameter	:	D1<D2
Applied Pressing Force:		F1=F2
Pressure at tree	:	P1=P2

It is obvious that the pressure of RF dendrometers at trees is independent of tree size. This ensures error-free data comparison between different trees. The band will sit tight even for very large trees.