# Defining V-Belt Lengths

Belt Length Terminology:

1. **Outside Belt Length**: The industry standard for accurately measuring belt length is with standard measure pulleys of equal diameter, at a specified tension. This is rarely, if ever possible in the field, and outside length is often used. The outside length of a belt is typically measured with a tape measure, either directly on the belt drive, or around the outside of the belt as it lays on a flat surface. It is not 100% accurate, and should only be used as an approximation.

2. **Inside Belt Length**: The inside length can be measured on flat pulleys, or with a tape measure. As with outside length, the inside length varies with the manufacturer. This length should not be used.

3. **Belt Pitch Length**: The pitch length of a belt is the length at the pitch diameter of the sheaves being used. The pulley pitch diameter corresponds to the pitch line of the belt, which is generally the location of the tensile cord inside the belt.

4. **Belt Effective Length**: The effective length of the belt is the length about the effective outside diameter of a sheave at a specified tension. The effective length is obtained by adding the effective outside circumference of one sheave to twice the center distance between the two standard measuring sheaves at the standard measuring tension. In most cases, the effective length and the pitch length of a belt are equivalent, since belts are typically designed so that the cord line rides right at the outer diameter of the pulley.

5. **Nominal Belt Length**: The nominal length is used to refer to the length and cross section of a specific belt. (e.g. B90 = B-section, 90" Inside Length; 3V500 = 3V-section, 50" Effective Length)

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Calculating V-Belt Lengths

Given the following two-pulley systems:

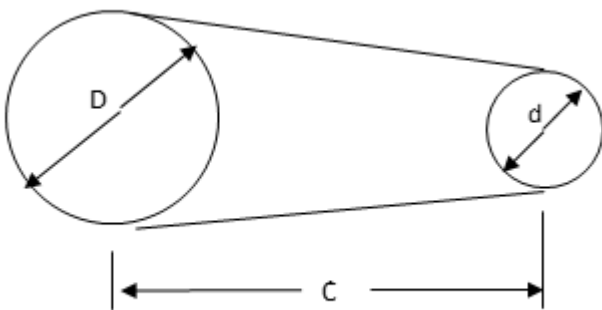If the Pulleys are the same diameter
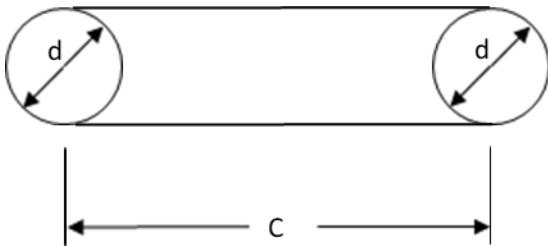
Effective Belt Length is calculated as:

$$L = 2C + \pi D$$

L=Belt Length
C=Average shaft center distance
D= Sheave diameter

If the Pulleys have different diameters

Effective Belt Length is calculated as:

$$L_E = 2C \cos\Theta + \frac{\pi(D+d)}{2} + \frac{\pi\Theta(D-d)}{180}$$

where L_E = effective belt length (in)

C = pulley center-to-center distance (in)
D = diameter of larger pulley (in)
d = diameter of smaller pulley (in)

$$\Theta = \sin^{-1}\left(\frac{D-d}{2C}\right)$$