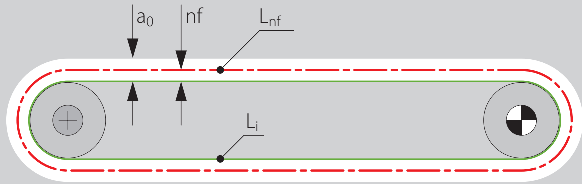
Establishing the lengths of endless belts

siegling
belting

All lengths of spliced conveyor belts on orders and spare parts cards refer to what's known as the inside length (L_i) when the belt has not been tensioned. This dimension is not the same as the length of the neutral axis. Only L_i is used as the length for orders. (See fig. 1 for an illustration of these two figures)

The inner length (L_i) is either established based on the conveyor's dimensions or a belt sample. When measuring a belt sample, the inner lengths of both belt edges are established. If not otherwise agreed with Forbo Movement Systems, L_i is calculated as a mean of these two measurements. Depending on the size of the conveyor and belt, various methods can be used to establish the inner length (L_i):



a_0 = belt thickness
nf = height of the neutral axis
L_{nF} = length of the neutral axis = flat length (red)
The layer that isn't subjected to elongation or compression
L_i = inner length of the belt (green)

The following applies:
Inner length (L_i) + thickness allowance = length of the neutral axis (L_{nF})

In dual-pulley drives with a 360° arc of contact, the **thickness allowance** is calculated as follows: Thickness allowance = 2 x nf x π
The height of the neutral axis (nf) can usually be assumed as half of the belt thickness a_0. Or, in more simple terms: Thickness allowance = a_0 x π

With respect to general tolerances, the thickness allowance for belt lengths as of 3 m is virtually immaterial. However, in the case of shorter belts and tighter length tolerances, it does have to be taken into account when checking measurements.

Fig. 1

1 Carrying out measurements on the conveyor

Insert a thin and accurate tape measure into the path of the belt and measure the spliced inner length (L_i). In order to ensure there are no problems with fitting the belt later on, do not fully retract tension drums if there are any. The allowance for belt elongation should be at least 0.2% of the belt length. In a CAD layout, L_i is the length of the thin line that is placed tangentially around the rollers and drums. As the tape measure (or the drawn line), for example on an Ω drive, is sometimes on the top face or the underside of rollers, there will be a small but acceptable measurement error. (Fig. 2)

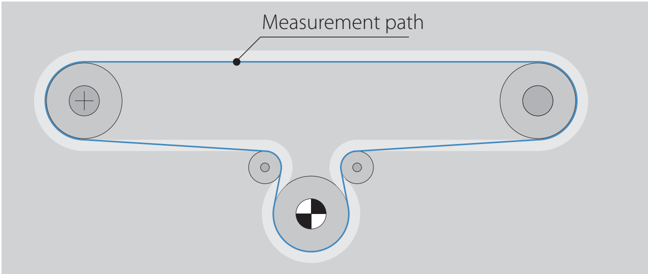


Fig. 2

2 Measuring the inner length directly (for thicker, relatively narrow belts)

If the belt length is easy to handle, the inner length (L_i) can be measured with a tape measure placed on the inside. (Fig. 3)

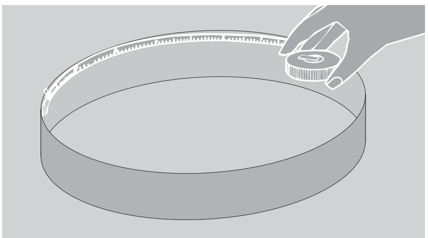


Fig. 3

When smaller belt sizes are produced in series, it might be worthwhile setting up a measurement device with two returns, one of which can be moved. A thin tape measure must be used to calibrate the measurement device beforehand. In order to measure it, tension the belt with very little force, the level of which might have to be agreed with Forbo Movement Systems. In order to pretension the belt, the weight of a return pulley can be used if the device is mounted vertically. (Fig. 4)

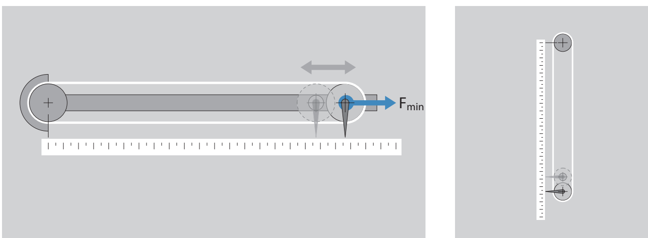


Fig. 4

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3 Calculating the inner length (L_i) from the flat length after pressing the belt flat (for thin, single-ply belts up to approx. 2 mm thick)

Press the belt flat (prevent any undulations from forming) and measure from the inside edge of one fold to the inside edge of the second fold.

As a small radius always remains on the folds, deduct 2 mm.

Flat length = (2 x length measured) + 2 mm
(in the example: (2 x 528 mm) + 2 mm = 1058 mm

Inner length (L_i) = flat length – thickness allowance*

* Thickness allowance see explanation of fig. 1

If you use this method, please discuss with Forbo Movement Systems beforehand.

Caution: **Never** use this method for belts with **aramid or polyamide tension members.**

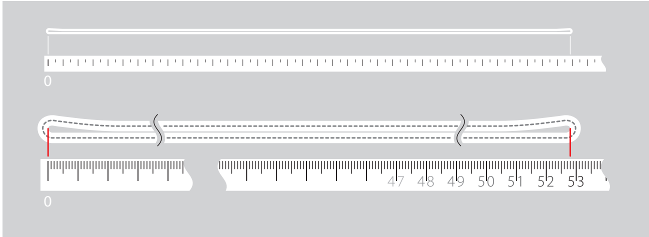

Fig. 5

4 Measuring the flat length by moving the belt and calculating the inner length (L_i) (where larger belt sizes apply)

In this case, the belt is rotated and measured in sections and each of the sections are marked exactly on the belt. Adding each of the measured sections produces the flat length (= length of the neutral axis). (Fig. 6)

In the case of narrow belts, it's often sufficient to apply just one marking to the belt and to rotate the belt once next to a tape measure. The flat length can then be established directly. In order to prevent the belt from slipping and undulations from forming in the material, the belt must be pressed really flat onto the surface that it touches. (Fig. 7)

In an flat state, belts with mechanical fasteners are very easy to measure (from the middle of one eyelet to the middle of the next). (Fig. 8)

In all three cases, the inner length (L_i) is then calculated as follows:

Inner length (L_i) = flat length – thickness allowance*

* Thickness allowance see explanation of fig. 1

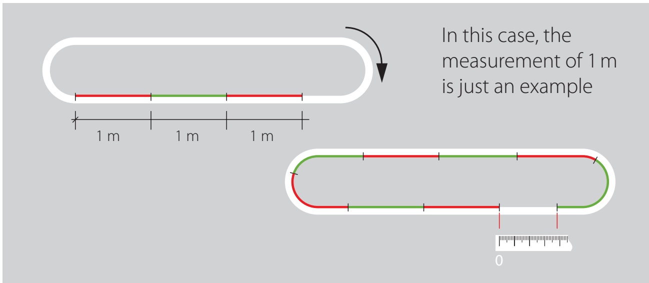

Fig. 6

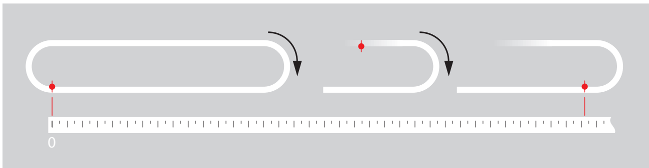

Fig. 7

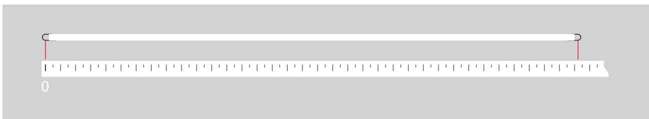

Fig. 8

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Forbo Siegling GmbH
Lilienthalstrasse 6/8, D-30179 Hannover
Phone +49 511 6704 0
www.forbo-siegling.com, siegling@forbo.com