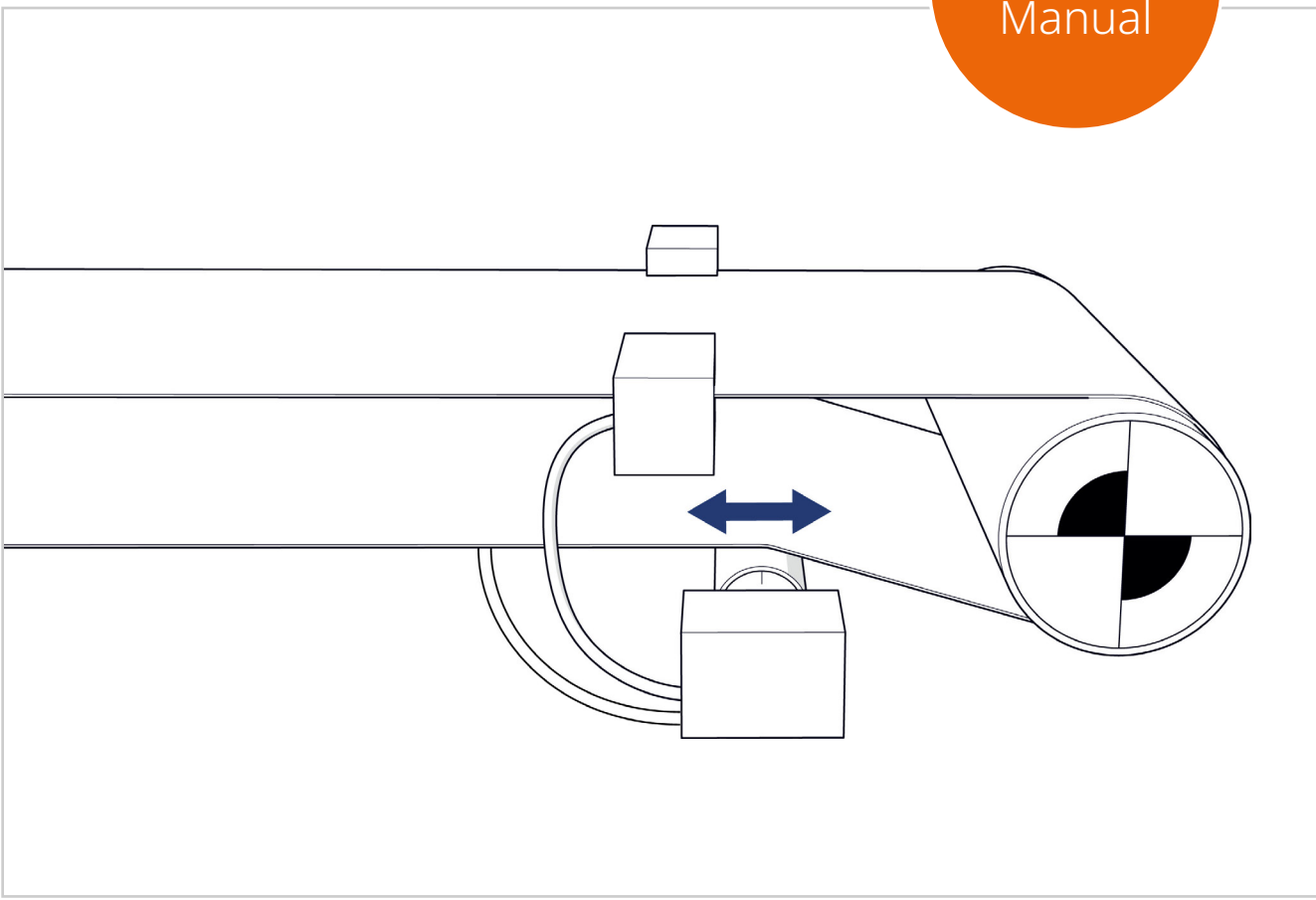
Ammeraal Beltech

EN

Technical Manual



Self-Tracking Belts

Innovation and Service in Belting

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1. Introduction

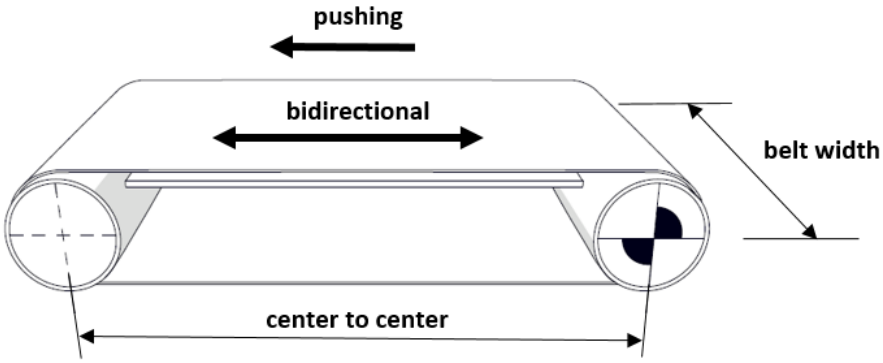
1.1 Typical applications for self-tracking belts

Self-tracking belts (STB) are an innovation from Ammeraal Beltech to make belting-life easier. STB are a great help in applications that are known to give operators and maintenance people headaches simply trying to keep the belt on track.

But even a self-tracking belt from Ammeraal Beltech cannot solve all belt tracking problems. It does not solve flaws in the design of the conveyor. Or if an application is polluting the belt and pulleys; in which case one simply has to clean it to prevent mistracking. Mistracking will shorten the service life of a conveyor belt.

Self-tracking belts are specially designed for use in situations that are known to give problems with belt tracking, for instance:

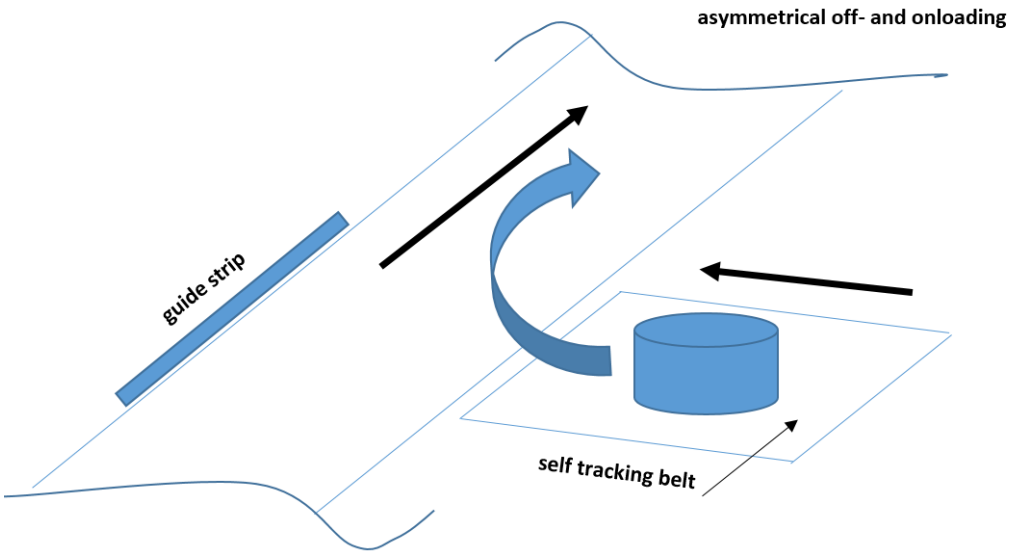
- Square and over-square conveyors
- Bi-directional conveyors
- Conveyors with a belt-push configuration
- Applications with an asymmetrical on-or off-loading of product
- Applications with strong variations in belt temperature
- Conveyors with a fixed end-to-end length
- BOR (belt on roller) conveyors



belt width / center-to-center = 1 => square

belt width / center-to-center > 1 => over square

Applications with an asymmetrical on- or off-loading of products:



2. Belt construction and belt range

Self-tracking belts have been developed, designed and manufactured by Ammeraal Beltech. They are produced as open end belt material at a belt width of two meters. The belt composition consist of a special one-ply elastic fabric and a thermoplastic top cover.

2.1 Belt carcass

Self-tracking belts are one-ply belts. The bottom side of the belt is a bare fabric. It is a special elastic fabric allowing a strong crowning of pulleys. A much stronger crowing than any regular conveyor belt would be able to deal with. The stronger crowning causes higher tracking forces in the belt keeping it aligned.

2.2 Belt covers

For the thermoplastic top covers on self-tracking belts we use two different types of poly vinyl chloride (PVC): Flexam and Nonex.

Flexam is tough and flexible, it is an excellent belt cover material for the parcel and logistic industries and for general conveying applications.
Nonex is our food grade oil and fat resistant PVC, making the belt suitable for the most challenging food applications.

2.3 Surface finish

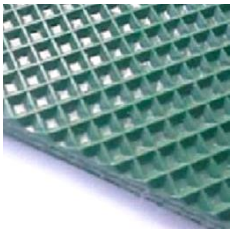
To make the belt even more suitable for a specific application, Ammeraal Beltech offers different types of surface finishes.

A matt finish (M2) for horizontal, standard conveying applications.

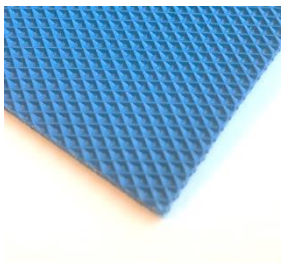
A18 and A21, fine diamond imprints to improve product release.

A32, a fine longitudinal rib and A42, a wave super grip, both for inclined conveyors.

A18
fine pyramid

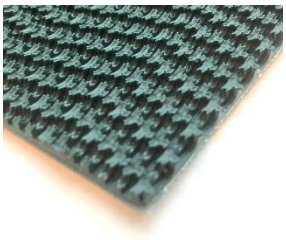


A21
fine diamond



A32
fine rib

A42
rough top



Our self-tracking belt range consists of the following belt types:

General technical data Self Tracking Belts								
item number	item description	minimum diameter flexing	minimum diameter back-flexing	finish bottom side	finish top side	hardness top side	overall belt thickness	standard belt width
		mm	mm			Shore	mm	mm
SBFL585011	Flexam EE/1 0+05 black M2 AS FR	40	50	bare fabric	M2 matt finish	80A	1.60	2000
SBFL585021	Flexam EE/1 0+A21 black AS FR	40	50	bare fabric	A21 fine diamond	45A	2.00	2000
SBFL585022	Flexam EE/1 0+A32 black AS FR	40	50	bare fabric	A32 fine rib (small)	55A	2.10	2000
SBFL585018	Flexam EE/1 0+A42 black AS FR	40	50	bare fabric	A42 super grip (wave)	35A	4.00	1700
SBFL585061	Nonex EE/1 0+05 light blue M2 AS FG AM	40	50	bare fabric	M2 matt finish	66A	1.60	2080
SBFL585065	Nonex EE/1 0+A18 light blue AS FG AM	40	50	bare fabric	A18 fine square	66A	2.00	2080

We do not support additional coating and/or post profiling of standard self-tracking belts. Additional top covers and additional heat treatments will influence the self-tracking properties of the belt.

3. Fabrication and accessories

3.1 Endlessing

Splicing: Please consult the standard splice instructions from Infonet for the finger geometry and the advised settings of the splice equipment.

Please mind the standard length tolerance for endless spliced self tracking belts is -1%/+0% on the ordered belt length. Anything different should be agreed upon with the belt fabricator (EuroFAB) before accepting the order.

3.2 Accessories

We do not advise the use of accessories on self-tracking belts. Do not use:

- Amseal
- belt fasteners
- guide ropes
- cleats
- Bordoflex
- additional coating of belt covers
- post profiling / embossing
- belt scrapers

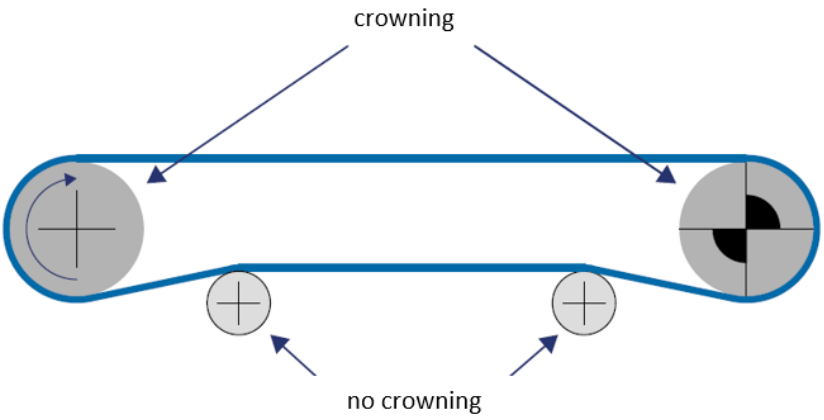
We do not advise the use of accessories in combination with self-tracking belts.

4. Basic conveyor design

4.1 Different types of conveyors

Please check the data sheet of the belts at hand for the minimum pulley diameter for flexing and back flexing. The use of pulleys with a diameter smaller than the advised minimum pulley diameter will reduce the belt life.

Straight forward flat conveyors, head or tail drive
In a straight forward conveyor design such as below, one can crown of the pulleys at one or both ends. Do not crown snub pulleys and/or a take up pulleys.



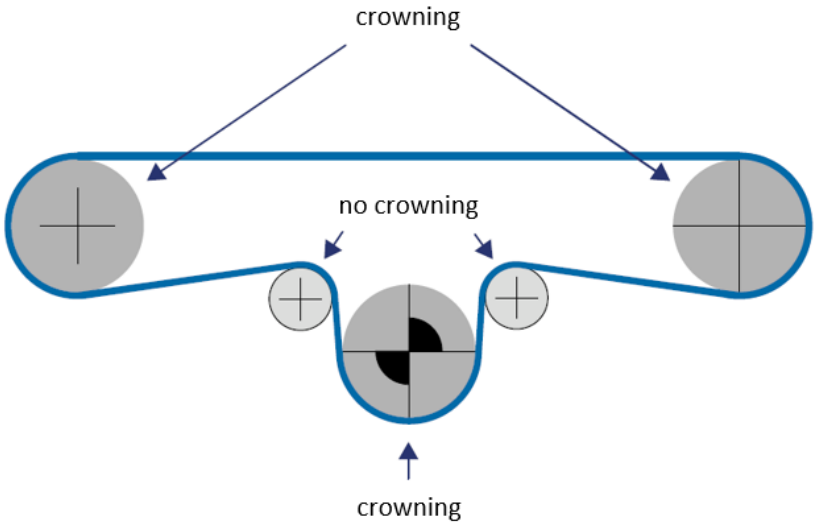
Inclined conveyors
The fine longitudinal rib A32 and super grip A42 profiles are both suitable for inclined/declined conveying of products. These profiles together with a relative soft PVC cover prevent the products from sliding back.

The maximum angle of inclination depends on factors like the coefficient of friction between the belt top surface and the product and the smoothness of the belt run.

Knife edge conveyor
Self-tracking belts are not suitable to run on a conveyor with a knife edge. The belt data sheets of self-tracking belts indicate a minimum advised pulley diameter for flexing of 40 mm and for back flexing 50 mm. If a self-tracking belt is used in combination with pulley diameters smaller than recommended, the belt life will be shortened.

Center - or Omega drive conveyors
Center- or Omega drives are often used for conveyors that are bi-directional. Using a self-tracking belt, both tail pulleys can have a strong crowning. If both tail pulleys are small, crowning will have little effect. In that case we advise to crown the drive pulley. Do not use crowning on snub- or take up pulleys.

Do not use crowning on back flexing pulleys, like snub pulleys or take up pulleys.

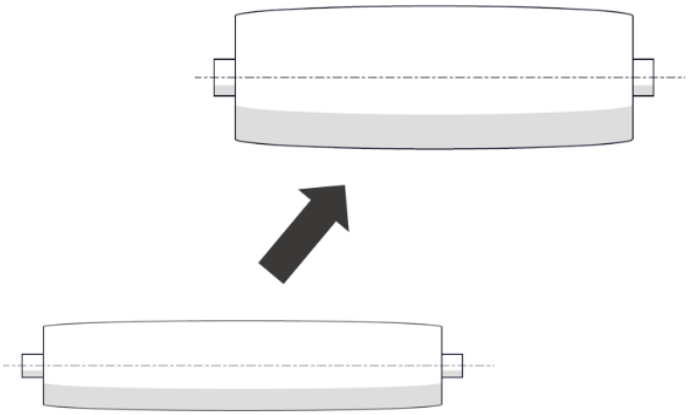


Ammeraal Beltech does not advice to use self-tracking belts on the following type of conveyors:

- Swan neck conveyors
- Wide belt merge conveyors (45 degrees)
- Troughed conveyors
- Knife edge conveyors
- Long conveyors
- High-load conveyors
- Accumulation conveyors

4.2 Pulley diameter

As mentioned above, flexing and back-flexing pulleys should not have a smaller diameter than the minimum pulleys stated in the data sheet of the belt. Note that when using a pulley with a larger diameter, the surface pressure between the belt and the pulley is reduced. A lower surface pressure allows the belt to move more freely across the pulley. For this reason, a crowned pulley with a larger pulley diameter will give better tracking result than a smaller crowned pulley.



A larger pulley diameter better supports self-tracking properties.

4.3 Belt support

Upper part, slider bed

In the upper part of a conveyor a self-tracking belt can be supported by a flat slider bed. The fabric bottom side has a low friction to bare steel or galvanized slider beds. We do not advise to paint or coat a slider bed. This will increase the friction and reduce the maximum belt load. Paint or coatings will wear down and pollute the fabric of the belt. Paint or coatings will increase the risk build-up of static charges in the belt.

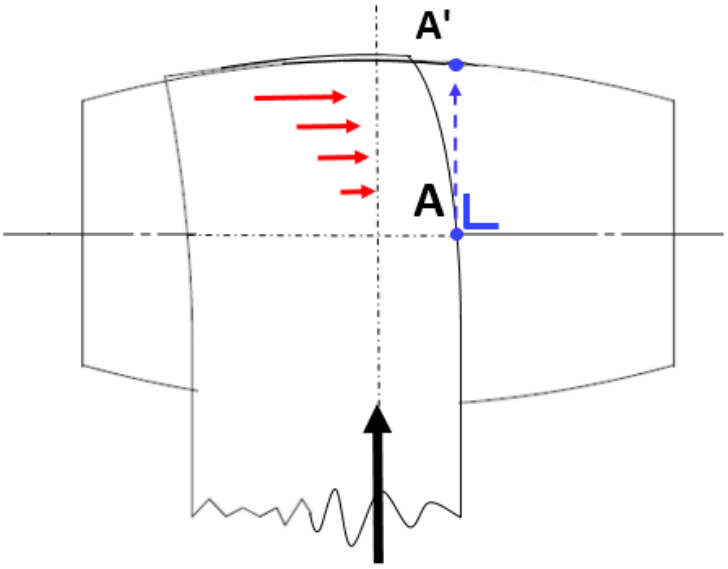
Return part, roller support
In the return part of a conveyor, a self-tracking belt can be supported by flat rollers. (We do not advise the use of self-tracking belts on troughed conveyors)

5. Tracking a self-tracking belt

What makes a self-tracking belt track so well is the combination of special elastic fabric and the crowning of pulleys? The fabric of a self-tracking belt allows for a much stronger crowing than any regular conveyor belt would be able to deal with. The stronger crowning causes higher tracking forces in the belt, keeping it on track.

5.1 How does crowning work?

If a more or less elastic belt runs off center to the left side of a crowned pulley, it will take on a slight left-curve shape due to the difference in pulley diameter.



While rotating, point A on the surface of the pulley will transfer at a straight angle to the axis of the pulley to point A'. This creates a relative lateral movement between belt and pulley.

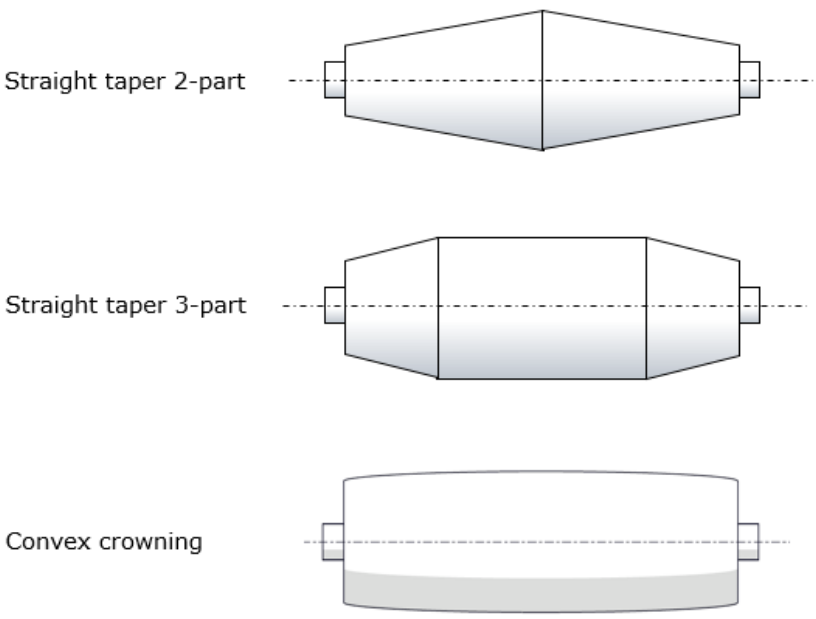
The friction force between the surface of the pulley and bottom side of the belt will push the belt towards the center of the crowned pulley.

Once the belt is running in the center of the crowned pulley the curve shape will have disappeared. Consequently, the related lateral friction forces will have disappeared as well. The advised amount of crowning is 2% - 4 % with a minimum of 1 mm and a maximum of 4 mm difference between minimum and maximum diameter of the pulley.

The advised angle of wrap on a crowned pulley is 180 degrees. A smaller angle of wrap will reduce the self-tracking properties.

5.2 Different executions of crowned pulleys

Three types of crowning can be used.



straight taper 3-part	
drum length [mm]	**proportion of the drum length**
< 400	1/4 - 2/4 - 1/4
400 < 800	1/5 - 3/5 - 1/5
800 < 1200	1/6 - 4/6 - 1/6
1200 < 1600	conical parts 200 mm
> 1600	conical parts 300 mm

It is advised to use bare steel drums/pulleys without any drum lagging. The roughness of the surface of the steel drum/pulley must be according to below table.

Roughness of the drive drum/pulley surface	Drive drum/ pulley in contact with:	
	the top cover of a belt	the fabric bottom side of a belt
Light indoor conveying applications (e.g. food industry)	1.6 µm Ra	1.6 µm Ra
Medium indoor conveying applications (e.g. airport, logistics etc.)	3.2 µm Ra	3.2 µm Ra

5.3 The number of crowned pulleys

How many pulleys must be crowned depends on the mis-tracking forces specific to the application. For example, if many heavy products are asymmetrically on- or off-loaded, it might be necessary to have more than one crowned pulley.

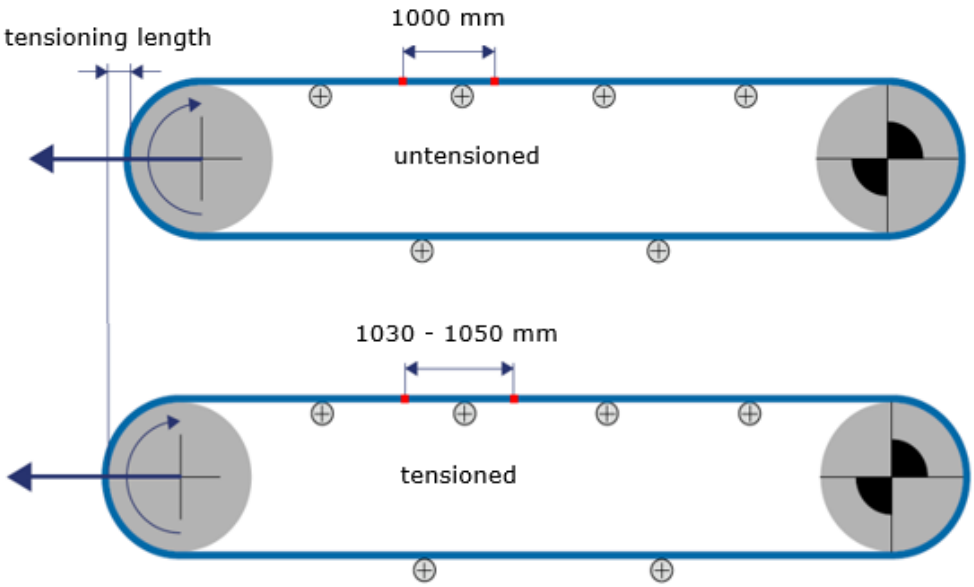
See chapter 'Conveyor design' for what pulleys of a conveyor can be crowned.

5.4 Belt travel over a crowned pulley

To benefit from the self-tracking properties of this type of belt, the belt should travel a certain distance in one direction over a crowned pulley(s). If a self-tracking belt travels only short distance over a crowned pulley the corrective belt travel in the lateral direction will be limited.

6. Tensioning a self tracking belt

For crowning to have the maximum effect, the belt needs pretension. Min. 3% – Max. 5%. This seems like a high pretension, but one must keep in mind that STB's have an elastic fabric with a permanent relaxation of 1%.



7. Trouble shooting

To get the maximum benefit from a self-tracking belt in a certain application one should vary the pretension of the belt and crowning of the pulley(s) to find the optimum. There are three main issues that one might encounter when installing a self-tracking belt.

1: Mis-tracking

The STB is installed but it still mis-tracks: Apart from minimizing the source of mis-tracking, one can increase the crowning and

2: Slip

The STB suffers from slippage on the drive pulley: We do not advise to use drum lagging in combination with self-tracking belts. To prevent slippage, one must increase the belt tension and/or the angle of wrap.

3: Wrinkles

If a self-tracking belt shows wrinkles, one has to reduce the crowning and/or the belt tension to make the wrinkles disappear.

STB decision matrix

	Crowning	Belt tension
Belt does not track	⇑	⇑
Belt slippage	--	⇑
Wrinkles in the belt	⇓	⇓

⇑ increase
⇓ decrease

8. Running conditions and ambient factors

Belt speed
The STB travels a certain distance laterally over a crowned pulley with at a certain longitudinal belt travel. This means how quickly a self-tracking belt tracks depends on the belt speed. At a higher belt speed the adjustment of the self-tracking we be quick. At low belt speeds, the self-tracking action will be slower.

Pollution:
One application is more prone to pollution than another. Pollution often leads to mis-tracking. As mentioned earlier, a self-tracking belt will not solve the problem of mis-tracking due to pollution.

In that case, cleaning the conveyor is the only remedy. Further, pollution of the fabric bottom side of a STB will reduce the elasticity of the fabric and thus also reduce the self-tracking properties.

Static charge:
Self-tracking belts are antistatic. This means that the belt is less prone to static build up. It is able to discharge its static electricity to a metal grounded slider belt and/or support rollers.

Operating temperature:
Please check the data sheet of the specific self-tracking belt at hand for the continuous operating temperature.

Cleaning & disinfection:
Self-tracking belts with a Nonex PVC top cover are food grade approved. They are resistant to oils and fat. Note that, the fabric bottom side is not impregnated and is prone to pick up dirt. As for cleaning and disinfection the same rules apply as for our standard Nonex synthetic belts.

Specific belt properties of self-tracking belts:

	Flexam	Nonex
Food grade FDA	no	yes
Food grade EC	no	yes
Oil and fat resistant	no	yes
Flame retardant acc. ISO340	no	no
Flame retardant ASTM D-378	yes	no
Antistatic	yes	yes
High conductive	no	no
ATEX approved	no	no

The information in the most recent version of a technical data sheet is leading.

9. Summary of do’s and don’ts

- Self-tracking belts are specially designed for:
  - Square and over-square conveyors
  - Bi-directional conveyors
  - Conveyors with a belt-push configuration
  - Applications with an asymmetrical on- or off-loading of product
  - Applications with strong variations in belt temperature
  - Conveyors with a fixed end-to-end length

- Cleaning of the conveyor and belt are still needed.
- Self-racking belts are one ply PVC belts, with an elastic fabric.
- Do not use accessories like ropes or cleats etc.
- Do not crown back flex pulleys.
- Mind the minimum advised pulley diameters on the belt datasheet.
- Bigger pulleys are better.
- Advised crowning: between 2% and 4%, with a minimum of 1 mm and a maximum of 4 mm.
- Advised belt tension: between 3% and 5%.
- Standard length tolerance for endless spliced self-tracking belts is -1%/+0%.
- Recommended angle of wrap around a crowned pulley is 180.
- Do not use drum lagging on a crowned (drive) pulley.
- Mind the advised surface roughness of a crowned pulley.
- High belt speed for quick self-tracking

STB decision matrix

	Crowning	Belt tension
Belt does not track	⇑	⇑
Belt slippage	--	⇑
Wrinkles in the belt	⇓	⇓

⇑ increase
⇓ decrease