

# 500 RR

MODULAR BELT



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# 500 RR

## MODULAR BELT



A lot of beverage and food products are processed inside their containers after being filled. The most common method is a wide tunnel, where the containers are carried through the machine on a wide belt. In these tunnels, water sprays or showers with controlled temperatures are used to process the product. These Tunnel Machines can be Pasteurizers, Warmers or Coolers, depending on the product requirements. This engineering manual provides information for materials and temperature of use, installation and maintenance as well as calculation formulas for temperature expansion.

### PASTEURIZERS, WARMERS & COOLERS

Tunnel Pasteurizers, Warmers and Coolers are very demanding product handling applications due to the high temperature range, high load and chemicals used to treat the water and clean these machines. The Movex 500 Raised Rib series is the right choice for high performance and long durability.

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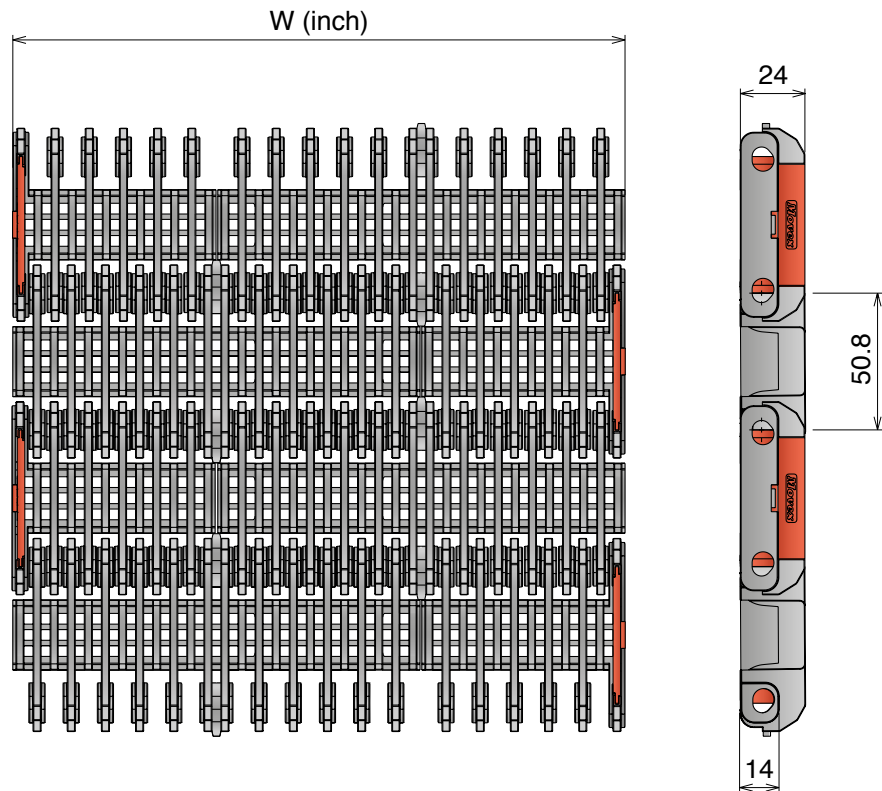
CODE STRUCTURE GUIDE (Example)		
1348	02	0060
Series	*Material	Width



*Material	
<b>PP - Code 02</b> Polypropylene	<b>PPX - Code 11</b> Polypropylene
<b>Max w. load:</b> 30000 N/m	<b>Max w. load:</b> 30000 N/m
<b>Weight:</b> 10,65 kg/m <sup>2</sup>	<b>Weight:</b> 10,65 kg/m <sup>2</sup>
<b>Temp. range:</b> 4÷104 °C	<b>Temp. range:</b> 4÷104 °C
<b>Pin material:</b> PP grey	<b>Pin material:</b> PP grey

IMPROVED HEAT STABILITY

Series	Material	Width
1348	*	0060
1348	*	0063
1348	*	0066
1348	*	0069
1348	*	0072
1348	*	0075
1348	*	0078
1348	*	0081
1348	*	0084
1348	*	0087
1348	*	0090
1348	*	0093
1348	*	0096
1348	*	0099
1348	*	0102
1348	*	0105
1348	*	0108
1348	*	0111
1348	*	0114
1348	*	0117
1348	*	0120



CODE STRUCTURE GUIDE (Example)			
1348	02	0060	C
Series	*Material	Width	Version



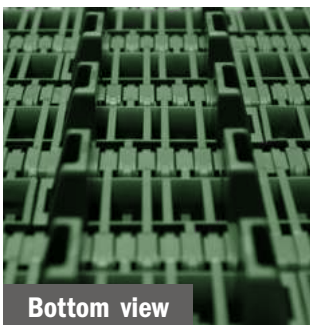
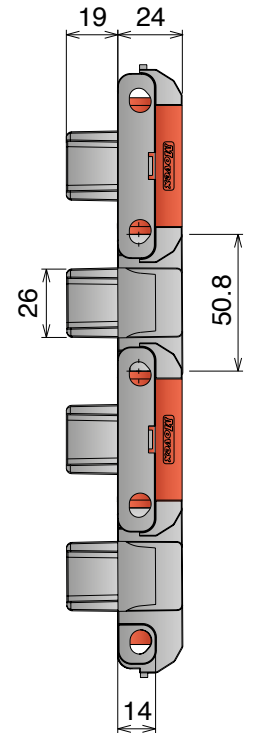
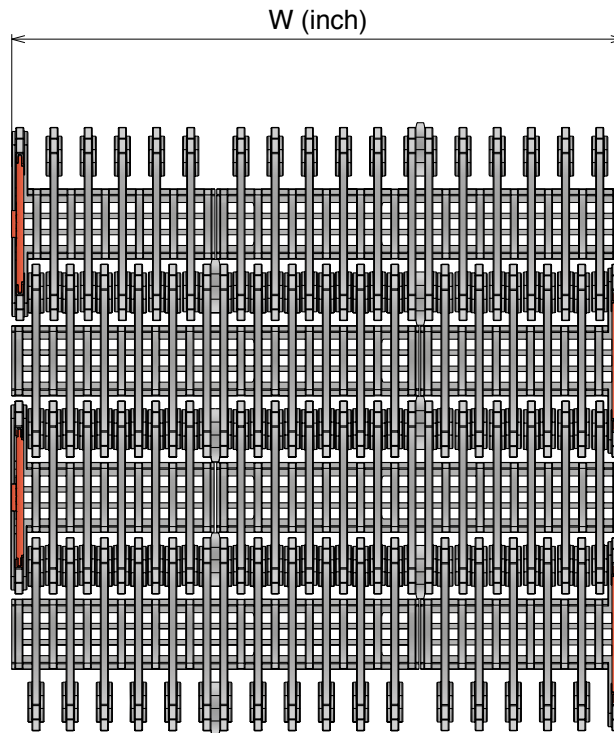
*Material	
<b>PP - Code 02</b> <i>Polypropylene</i>	<b>PPX - Code 11</b> <i>Polypropylene</i>

<b>Max w. load:</b> 30000 N/m	<b>Max w. load:</b> 30000 N/m
<b>Weight:</b> 10,65 kg/m <sup>2</sup>	<b>Weight:</b> 10,65 kg/m <sup>2</sup>
<b>Temp. range:</b> 4±104 °C	<b>Temp. range:</b> 4±104 °C

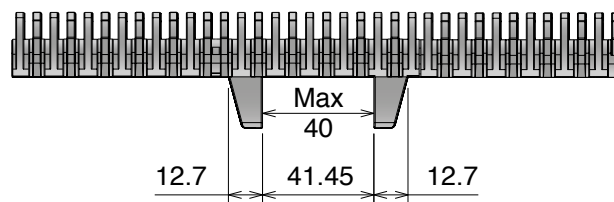
<b>Pin material:</b> PP grey	<b>Pin material:</b> PP grey
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**IMPROVED HEAT STABILITY**

Series	Material	Width	Version
1348	*	0060	C
1348	*	0063	C
1348	*	0066	C
1348	*	0069	C
1348	*	0072	C
1348	*	0075	C
1348	*	0078	C
1348	*	0081	C
1348	*	0084	C
1348	*	0087	C
1348	*	0090	C
1348	*	0093	C
1348	*	0096	C
1348	*	0099	C
1348	*	0102	C
1348	*	0105	C
1348	*	0108	C
1348	*	0111	C
1348	*	0114	C
1348	*	0117	C
1348	*	0120	C



**Bottom view**



For belt widths multiple of 3", positioners are centered (e.g. 63,69,75,81 inches).  
 For belt widths multiple of 6", positioners are 1,5" offset (e.g. 60,66,72,78 inches).

# PP

Materials



## Description

Polypropylene for better chemical resistance and higher temperatures.

Primary Component: PP

## General information

Material	Chemical abbreviation	Allowable application temperatures						FDA Approval
		Fahrenheit			Celsius			
		Min	Max		Min	Max		
			Dry	Wet		Dry	Wet	
Polypropylene	PP	40	220	220	4	104	104	YES

## Friction factors between material and product

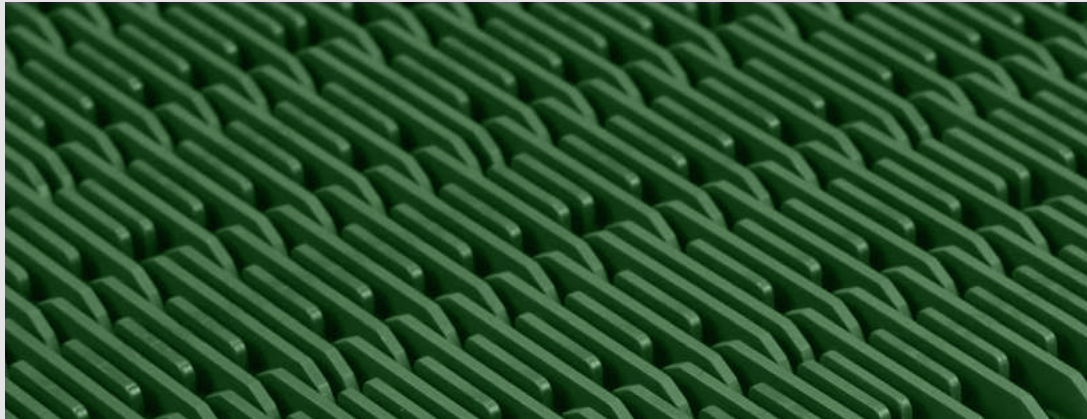
Lubrication	Product Material					
	Paper & carton	Metal (steel)	Aluminium	Plastics & PET	Glass (returnable)	Glass (new)
Dry	0,40	0,30	0,32	0,28	0,29	0,26
Water	n.a.	0,24	0,26	0,22	0,23	0,21
W&s & Dry lube	n.a.	0,20	0,20	0,18	0,19	0,18
Oil	n.a.	0,10	n.a.	n.a.	n.a.	n.a.

Lubrication	Wearstrip Material		
	Stainless steel	UHMW-PE & PA	<i>BluLub</i> ®
Dry	0,29	0,24	0,21
Water	0,23	0,19	0,17
W&s & Dry lube	0,19	0,13	0,13
Oil	0,10	0,10	0,10

### Note

Material properties and performance of final product are subject to variation according to operating conditions, e.g. environmental conditions, chemicals, cleanliness.

# PPX



Materials

## Description

Reinforced Polypropylene  
for improved heat stability and chemical resistance.

Primary Component: PP

## General information

Material	Chemical abbreviation	Allowable application temperatures						FDA Approval
		Fahrenheit			Celsius			
		Min	Max		Min	Max		
			Dry	Wet		Dry	Wet	
Reinforced Polypropylene	PP	40	220	220	4	104	104	YES

## Friction factors between material and product

Lubrication	Product Material					
	Paper & carton	Metal (steel)	Aluminium	Plastics & PET	Glass (returnable)	Glass (new)
Dry	0,40	0,30	0,32	0,28	0,29	0,26
Water	n.a.	0,24	0,26	0,22	0,23	0,21
W&s & Dry lube	n.a.	0,20	0,20	0,18	0,19	0,18
Oil	n.a.	0,10	n.a.	n.a.	n.a.	n.a.

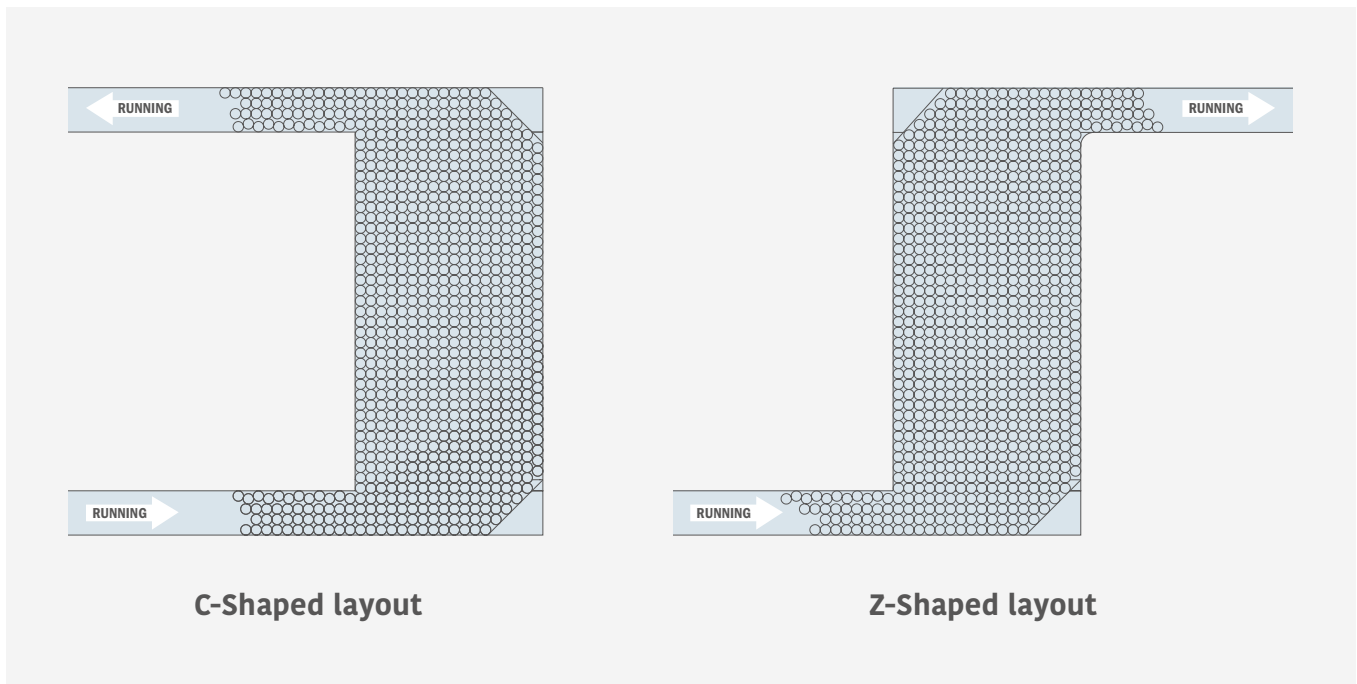
Lubrication	Wearstrip Material		
	Stainless steel	UHMW-PE & PA	<i>BluLub</i> ®
Dry	0,29	0,24	0,21
Water	0,23	0,19	0,17
W&s & Dry lube	0,19	0,13	0,13
Oil	0,10	0,10	0,10

### Note

Material properties and performance of final product are subject to variation according to operating conditions, e.g. environmental conditions, chemicals, cleanliness.

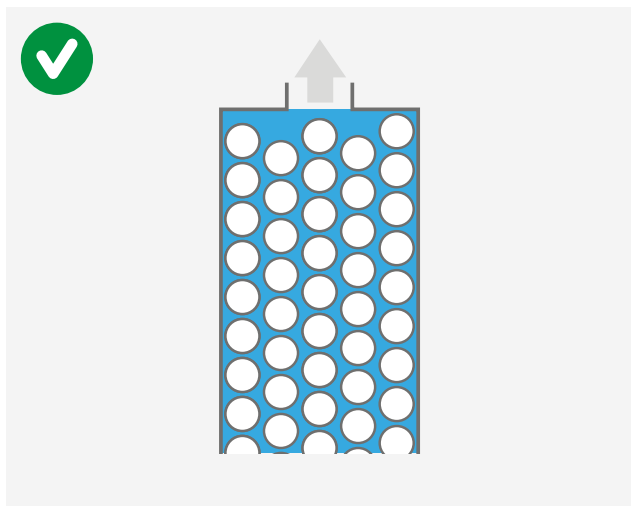


Typical layout and safe product handling

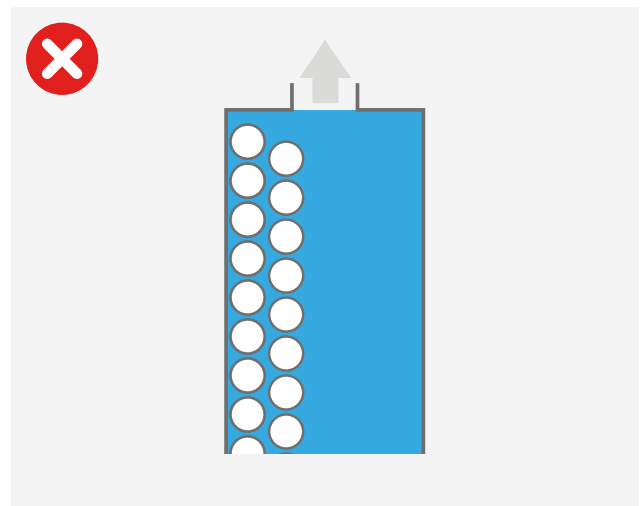


**⚠ Important!**

- Process control as well as feeding and exit construction must allow for even product/load distribution over the entire width of the belt.



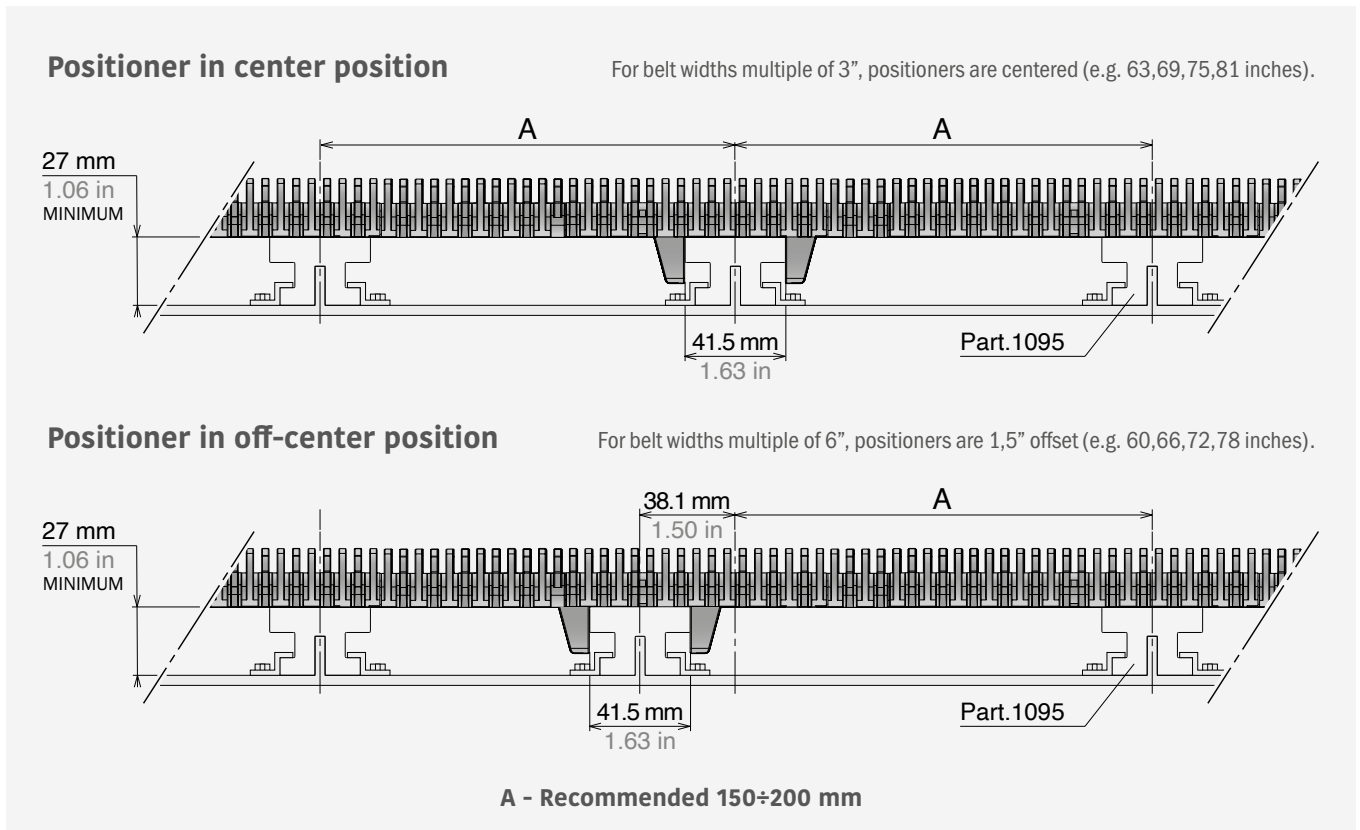
Even product distribution/full product bulk arrangement offers best product handling.



Uneven product/load distribution can lead to premature belt failure and/or shaft failure

## Carry way

The positioner can be located in the center of the belt or 1.50 (38.1 mm) offset depending on the width of the belt.



### UHMW-PE Profile

Made in *Ti-White*

- Temperature range: 4÷80°C
- Linear expansion coefficient:  $20 \times 10^{-5}$
- Other available strips: Part. 109 / Part. 1059

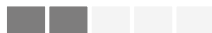
#### Corrosion resistance



#### Abrasion resistance



#### Temperature resistance



#### Reduced coefficient of friction



#### Energy saving



#### Cost saving



### Stainless steel Profile

Preferably Austenitic SS

#### Corrosion resistance



#### Abrasion resistance



#### Temperature resistance



#### Reduced coefficient of friction



#### Energy saving

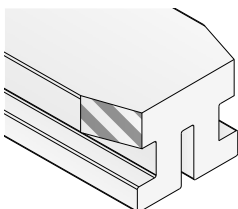


#### Cost saving



## Product guide rail

- Product guide rail profiles and spacing must prevent containers from falling over the outer edges of the tunnel belt and getting trapped in the return belt.



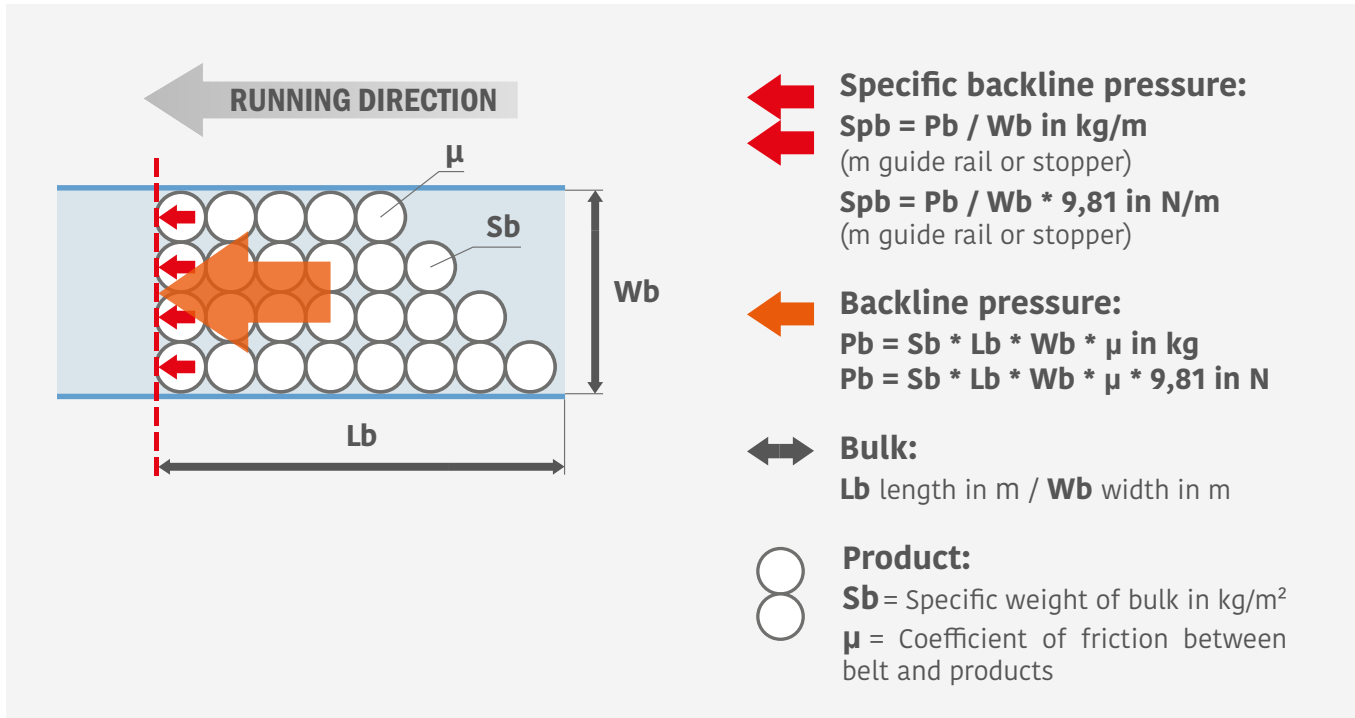
### Chamfer positioner tracking guide

- Positioners tracking guides should be chamfered at idler side.

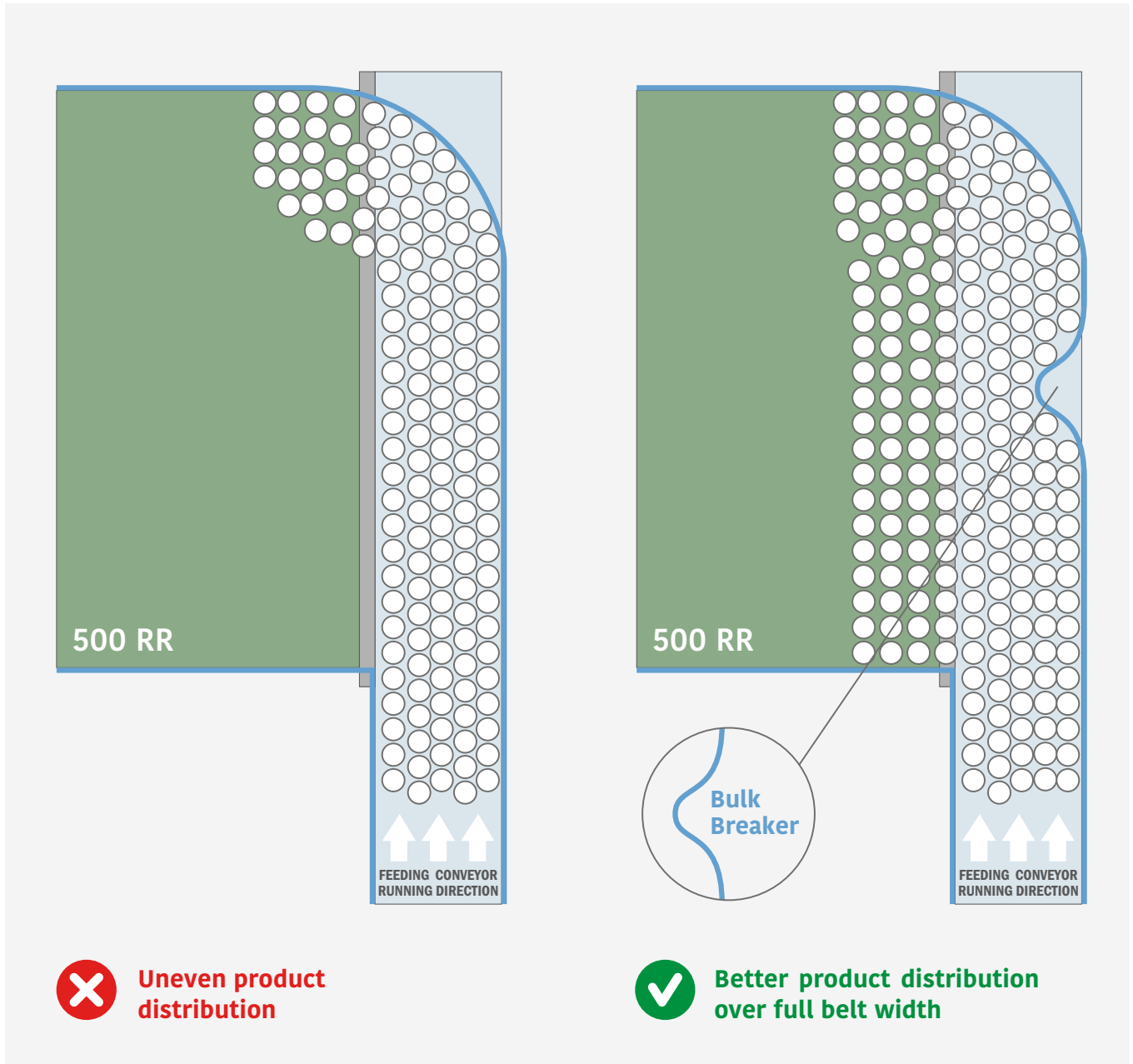
### Pressure of accumulating products or backline pressure

When products accumulate (e.g. against a stopper or guide) the belt running underneath the product creates a force on the product equal to the weight of the product multiplied by the coefficient of friction between belt and product.

Each following product is pushing with the same force against the next product, so the resulting force is proportional to the total weight of products upstream.



### Bulk breaker



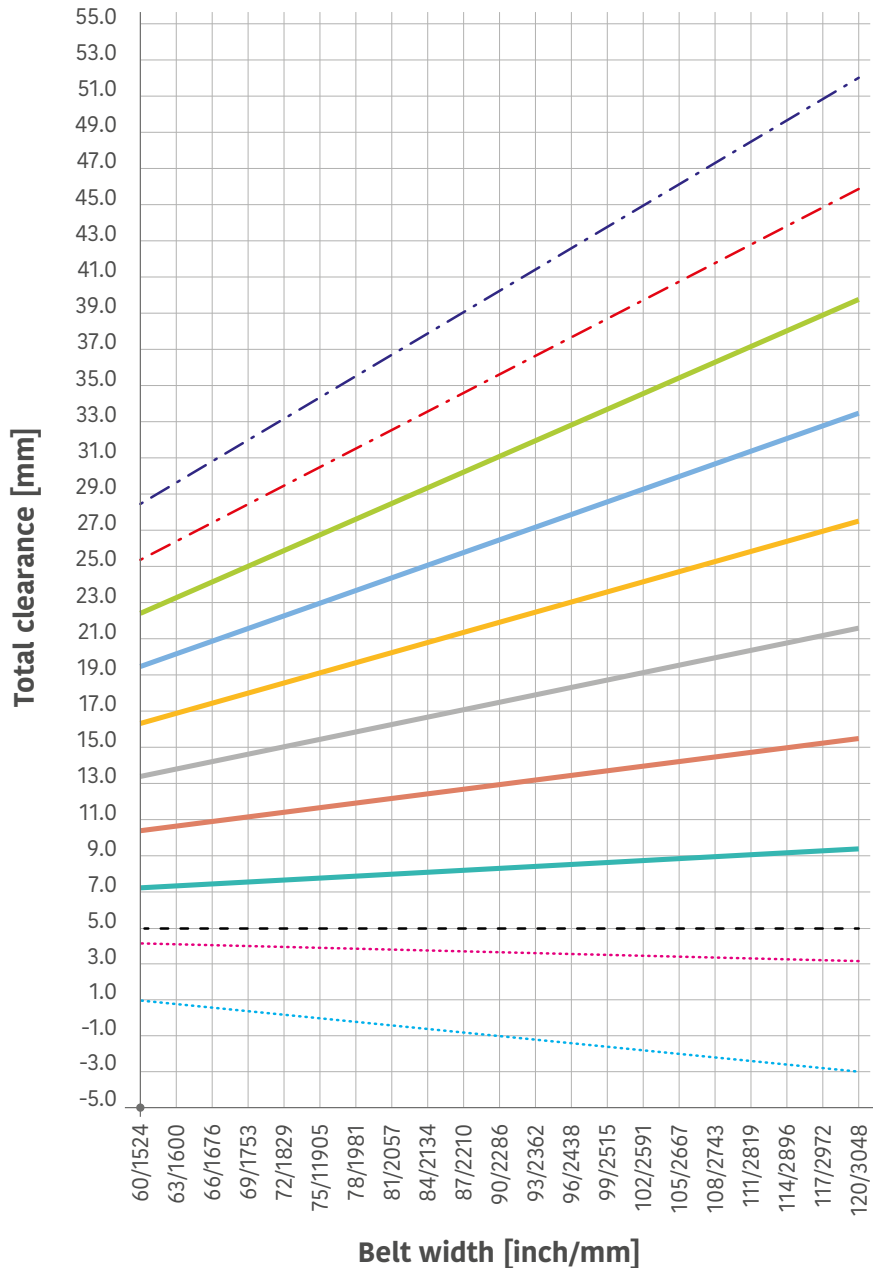
Uneven product distribution on the 500RR belt leads to uneven load and uneven wear of the belt. Belt stretch is higher at the side where there are more products. Belt starts drifting aside. Sprocket interaction can get affected, belt edge sliding against guide rails can get worn, locking clips can get damaged. Side drift of the belt can damage transfer combs.

A bulk breaker can help to distribute products more equally on the 500RR belt. This helps to avoid damage at belt and related components and to increase service life. Bulk breakers can be installed in existing applications, after commissioning, if it turns out that product distribution is not equal. Bulk breakers can be constructed like existing product guide rails. Another common design is based on machined UHMW-PE plates.

## 500 RR | Belt width heat expansion

Since 500RR belts are frequently running at higher temperatures, all temperature related aspects must be considered.

### Recommended total clearance between belt/guides based on belt width heat expansion



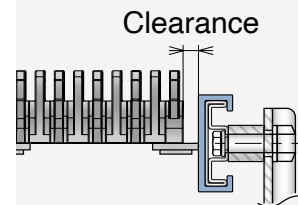
#### LEGEND:

- ..... 10 [°C]      ..... 20 [°C]
- 23 [°C]    ——— 30 [°C]
- 40 [°C]    ——— 50 [°C]
- 60 [°C]    ——— 70 [°C]
- 80 [°C]    - - - 90 [°C]
- - - - 100 [°C]

At 23°C (ambient temperature) heat expansion = 0 and total clearance = 5 mm (basic recommended design clearance).

Below 23°C belt is shrinking. However, it's not recommended to reduce basic recommended design clearance.

Temperatures above 80°C are not recommended.



**Total clearance:**  
 $\Sigma$  Clearance LEFT +  
 Clearance RIGHT

Calculate expected heat expansion of plastic products according to the formula:

$$\text{Delta length [mm]} = \text{original length [m]} * (\text{actual temperature} - 21)[^{\circ}\text{C}] * \text{heat expansion factor}$$

#### Heat expansion factor [mm/m/°C] - approx. values

PBT	POM	PP	UHMW-PE	PE	PA	Stainless steel	Aluminium
0.130	0.110	0.200	0.150	0.180	0.100	0.016	0.023

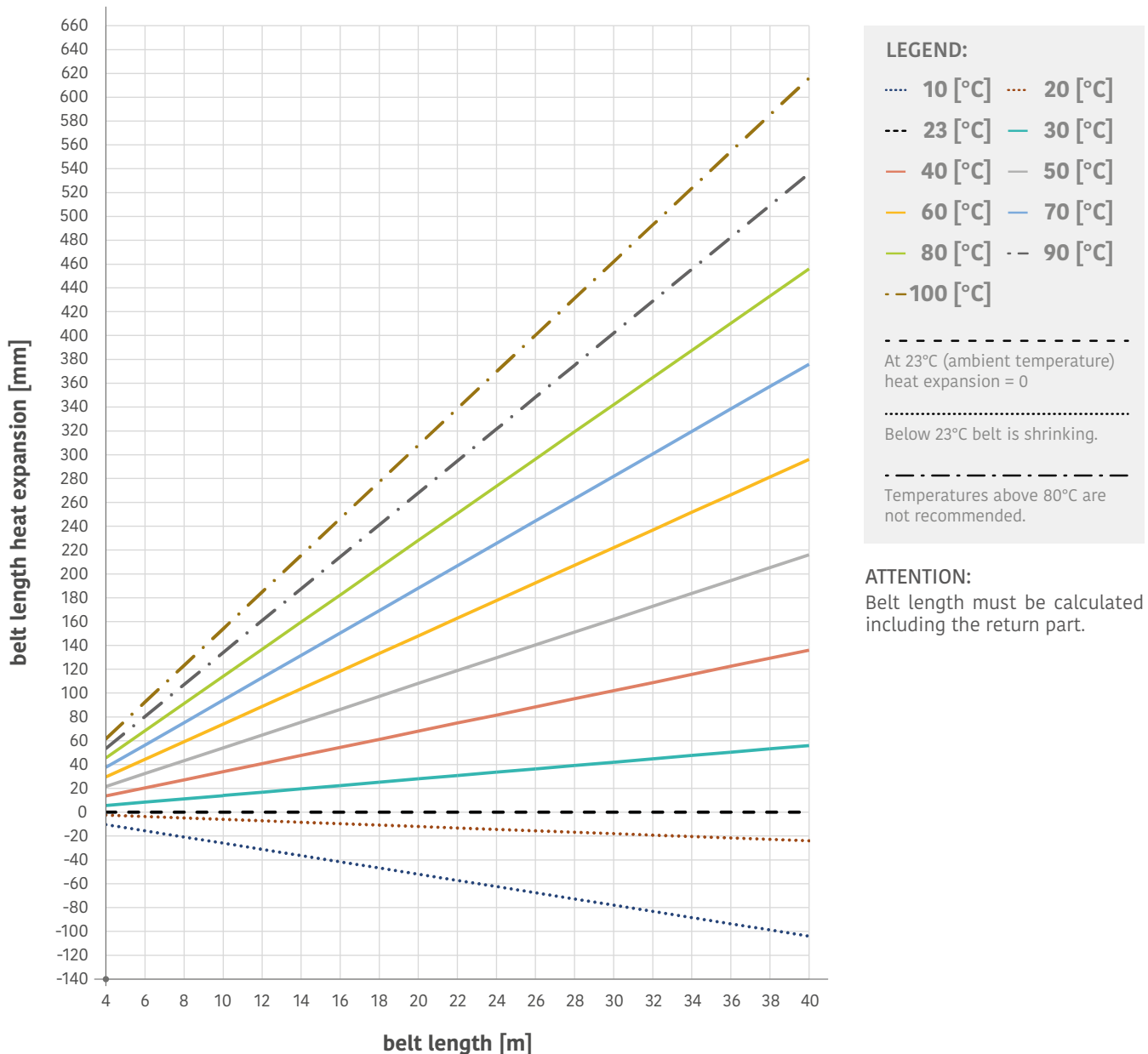
Example: 90" (2286mm) wide belt made of PP is heated through in the application to 80°C

Delta width:  $2,286\text{m} * (80-23)^{\circ}\text{C} * 0,2\text{mm/m}/^{\circ}\text{C} = 26\text{mm}$

Total clearance: delta width + basic recommended design clearance =  $26 + 5 = 31\text{mm}$

## 500 RR | Belt length heat expansion

Belt length heat expansion is particularly relevant for the design of the return part of the conveyor. Belt length expansion leads to increasing catenary depth. There must be enough room underneath the return part to prevent the belt from sliding on the ground/bottom of the base tub.



### Thermal belt elongation - $\Delta EL$ .

Example for a warmer-tunnel, with a 16 m shaft-distance, standard conveyor design with head drive, belt made of PP, and three temperature areas.

Area 1: 4 m long, 30°C / Area 2: 8 m long, 80°C / Area 3: 4 m long, 50°C

Note. Don't forget to count also the amount of belt of the return part, where the belt is also exposed to the same temperatures. This leads to double the elongation of the belt in each zone.

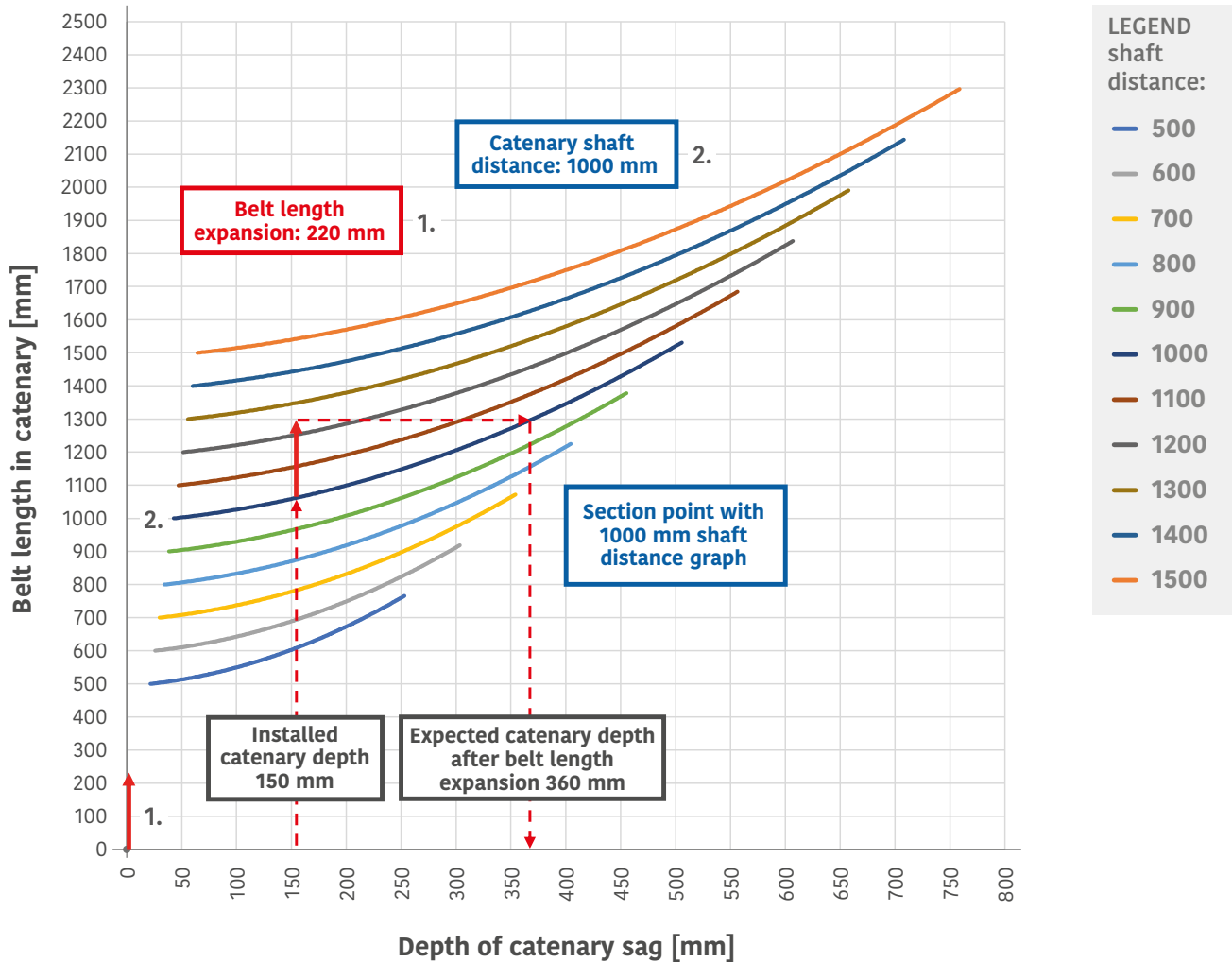
**Delta L1:**  $4\text{ m} * (30-23)^{\circ}\text{C} * 0,2\text{ mm/m}^{\circ}\text{C} = 5,6\text{ mm} * 2$  (carry & return part) = 11,2mm

**Delta L2:**  $8\text{ m} * (80-23)^{\circ}\text{C} * 0,2\text{ mm/m}^{\circ}\text{C} = 91,2\text{ mm} * 2$  (carry & return part) = 182,4mm

**Delta L3:**  $4\text{ m} * (50-23)^{\circ}\text{C} * 0,2\text{ mm/m}^{\circ}\text{C} = 21,6\text{ mm} * 2$  (carry & return part) = 43,2mm

**Delta length:** Delta L1 + Delta L2 + Delta L3 = 11,2 + 182,4 + 43,2 = 236,8mm

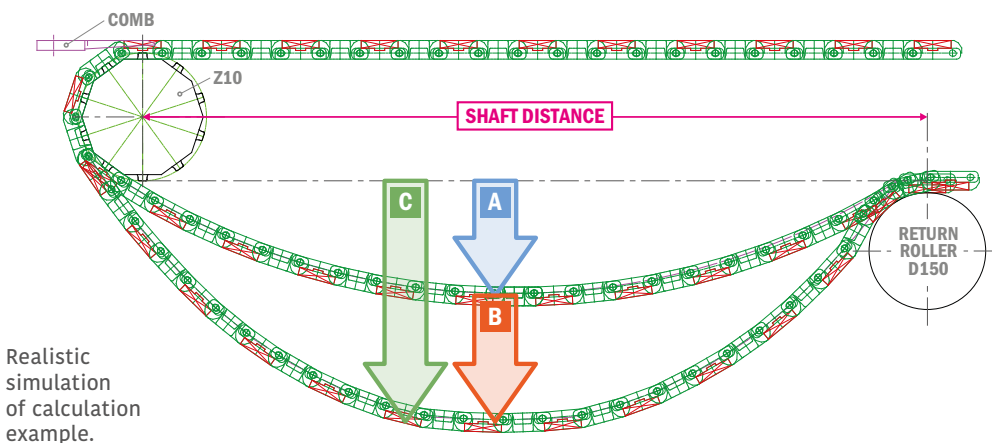
Increase of catenary sag depth at increasing belt elongation for different horizontal catenary shaft distances



Example: catenary depth increase due to belt length heat expansion

Belt length=30m (15m shaft-to-shaft),  $\Delta T=60^{\circ}C$ , Catenary shaft distance=1000mm, installed catenary depth=150mm

1. Determine belt length heat expansion  $\Delta EL \rightarrow$  result:  $\Delta EL=220mm$  (calculate or read from previous diagram)
2. Find in the x-axis the 150mm mark (installed catenary depth) and draw a vertical help line to the top
3. Find the intersection between your help line and graph 1000 (catenary shaft distance)
4. Add on top  $\Delta EL=220mm$  to the intersection point
5. Draw a horizontal help line and find the new intersection with the same graph 1000
6. Draw a vertical help line down to the x-axis  $\rightarrow$  result: catenary depth is increasing from 150 to 360mm



Realistic simulation of calculation example.

## 500 RR | Increase of catenary sag depth

### Return roller diameter

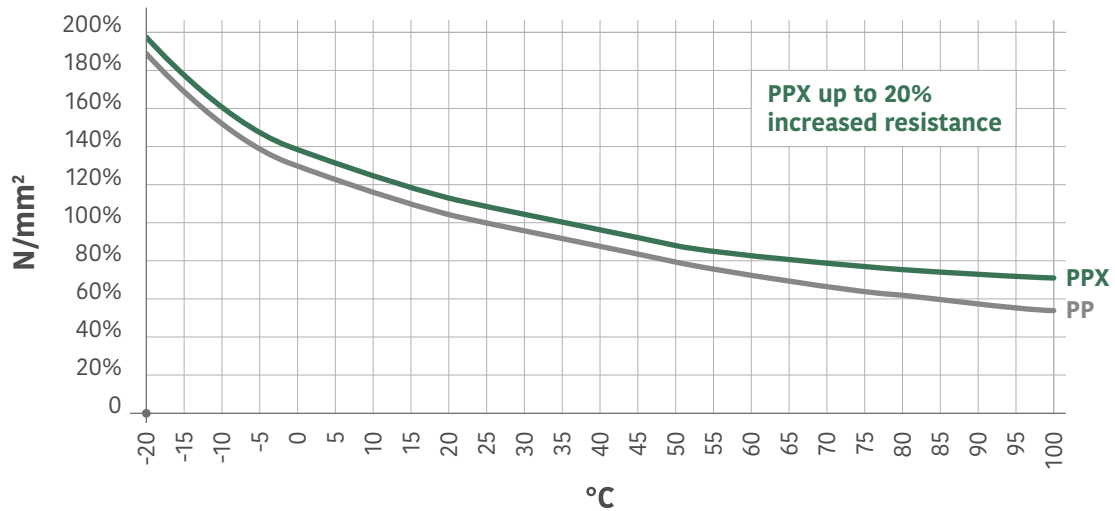
Achieve a smoothest and continuous run of the belt with return roller diameters bigger than 150 mm.

## 500 RR | Tensile strength

### Temperature related strength aspect

Consider belt strength being a function of temperature for your calculations.

### Tensile modulus depending on temperature - PP and PPX material





# 500 RR | Sprockets position

Belt width (in/mm)	Recommended n° of sprockets*
3 / 76.2	1
6 / 152.4	2
9 / 228.6	3
12 / 304.5	4
15 / 381.0	5
18 / 457.2	6
21 / 533.4	7
24 / 609.6	8
27 / 685.8	9
30 / 762.0	10
33 / 838.2	11
36 / 914.4	12

\*If more sprockets are required contact application engineering.

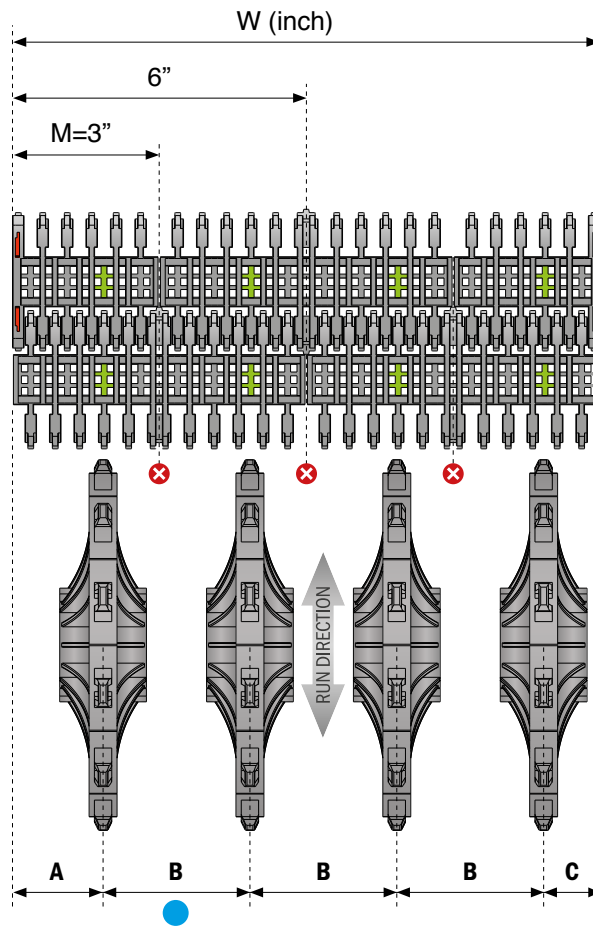
## IMPORTANT

● Add sprocket positions every 76,2 mm according to 76,2 mm width increments of the belt corresponding with 76,2 mm conveyor track pitch system.

⊗ It's **NOT** possible to place the sprockets in this position.

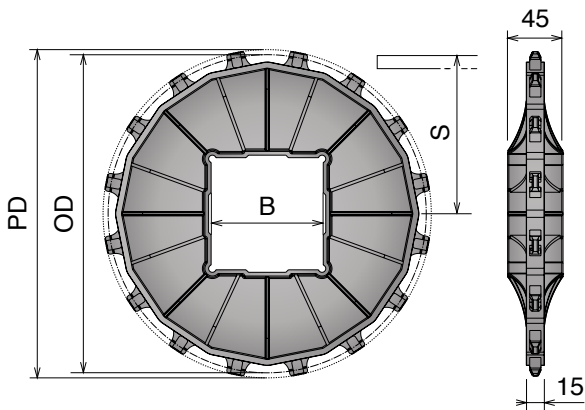
SPROCKETS POSITION FOR:  
500 RR and 500 RR with positioner

👁️ BOTTOM VIEW  
● Contact point



**A:** 1,85" (47 mm)    **B:** 3" (76,2 mm)    **C:** 1,15" (29,2 mm)

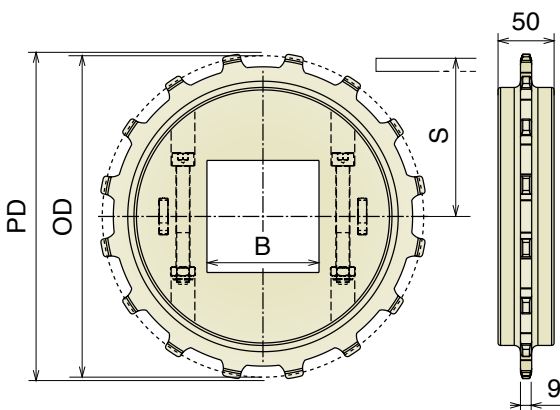
## Drive sprockets, molded



Article-Nr.	Z-	Bore	PD	OD	S
155104	10	Ø40	164,4	163,1	74,2
155105		Ø50			
155106		40x40			
155107		60x60			
155108		65x65			
155204	12	Ø40	196,3	196,3	90,1
155206		40x40			
155207		60x60			
155208		65x65			
155311	13	Ø65	212,3	213,6	98,1
155310		Ø90			
155306		40x40			
155307		60x60			
155308		65x65			
155309		90x90			
155910	16	Ø90	260,4	262,0	122,3
155908		65x65			
155909		90x90			
155912		120x120			

**Materiale:**  
Acetal resin/ Screws: Stainless steel/ Nuts: Stainless steel

## Drive sprockets, machined



Article-Nr.	Z-	Bore	PD	OD	S
160704	10	Ø40	164,4	163,1	74,2
160705		Ø50			
160706		40x40			
160707		60x60			
160708		65x65			
160804	12	Ø40	196,3	196,3	90,1
160806		40x40			
160807		60x60			
160808		65x65			
160911	13	Ø65	212,3	209,0	98,1
160910		Ø90			
160906		40x40			
160907		60x60			
160908		65x65			
160909		90x90			
161010	16	Ø90	260,4	262,0	122,3
161005		Ø2,5"			
161008		65x65			
161009		90x90			
161012E		120x120			

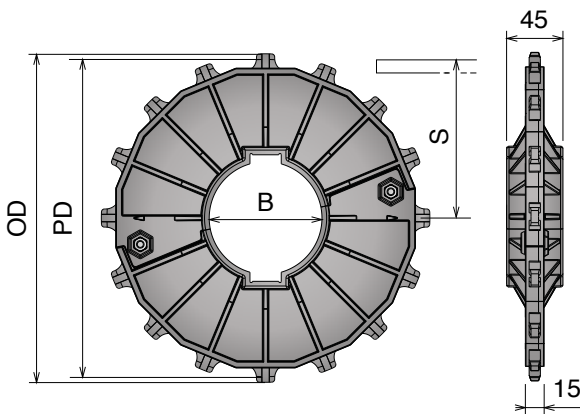
**Materiale:**  
Acetal resin/ Screws: Stainless steel/ Nuts: Stainless steel

## Split Drive sprockets, molded

Article-Nr.	Z-	Bore	PD	OD	S
<b>155810</b>	16	Ø 90 with double keyway	260,4	262,0	122,3

**Materiale:**

Acetal resin/ Screws: Stainless steel/ Nuts: Stainless steel

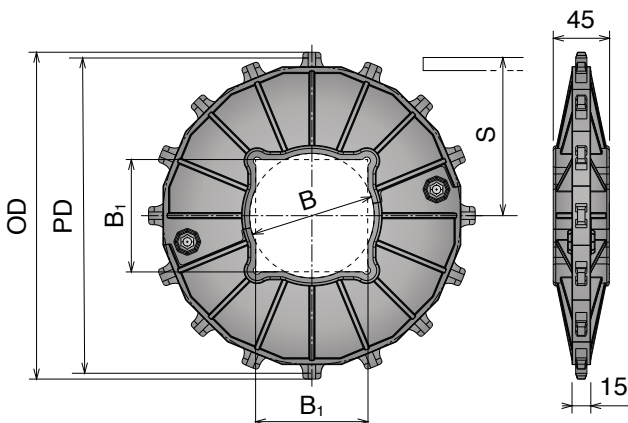


## Split Idler sprockets, molded

Article-Nr.	Z-	Bore (B)	Bore (B <sub>1</sub> x B <sub>1</sub> )	PD	OD	S
<b>155809</b>	16	Ø 100	90 x 90	260,4	262,0	122,3

**Materiale:**

Acetal resin/ Screws: Stainless steel/ Nuts: Stainless steel



**Molded sprocket:**

PLUS TOLERANCE (floating)

Machined sprocket-round bore:

bore P9 (tight)

Machined sprocket-square bore:

PLUS TOLERANCE (floating)

Sprockets and idlers floating on the shaft with plus bore tolerance “X-version” are recommended. Due to thermal expansion of the belt sprockets and idlers must be able to self-adjust their position. Free floating on the shaft is required to compensate thermal belt expansion.

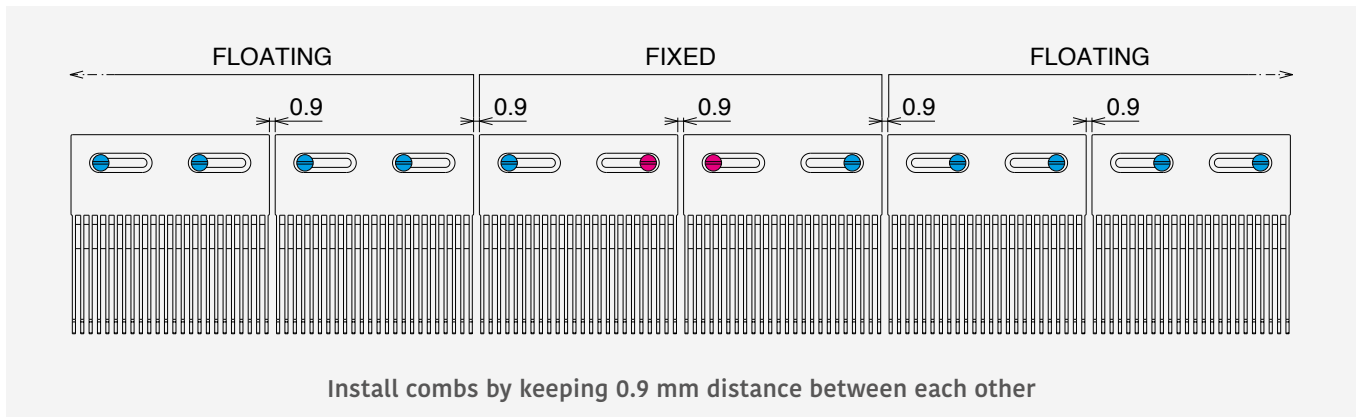
In order to limit side movement of the belt dedicated sprockets can be fixed respectively floating can be limited by means of shaft collars.

If 500RR belts are used for applications in rather constant and rather cold/ambient temperature, fixed sprockets can be used.

### Follow these steps:

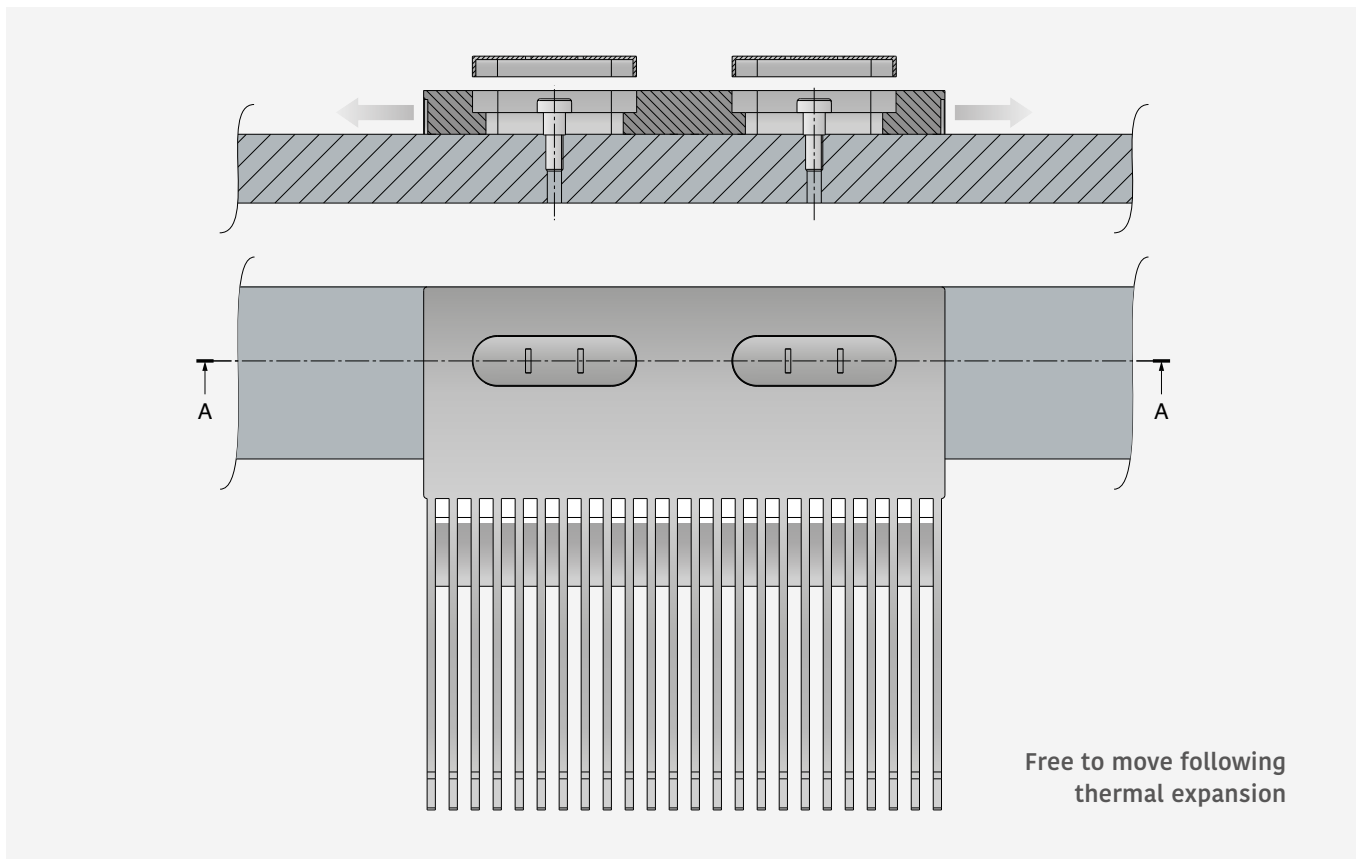
1. Ensure that the mounting holes are located properly per the recommendations shown below. Install combs by keeping 0.9 mm distance between other.
2. Mount the transfer combs onto the mounting plates making sure that all the transfer comb fingers are engaged between belt ribs.
3. Secure the two center combs to track the belt as shown below.
4. Position the fasteners in the remaining transfer plates. Make sure that combs are free floating - just as sprockets/idlers.
5. Make sure that combs are free floating - just as sprockets/idlers.

### Screw locations for high temperature application (Recommended)



6. Test the transfer combs to ensure they are mounted properly.
7. Test the level of the transfer combs with all the products. Adjust height, if required.

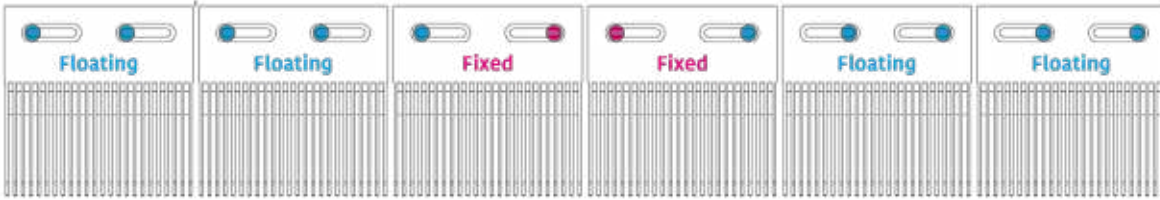
### Combs fixation



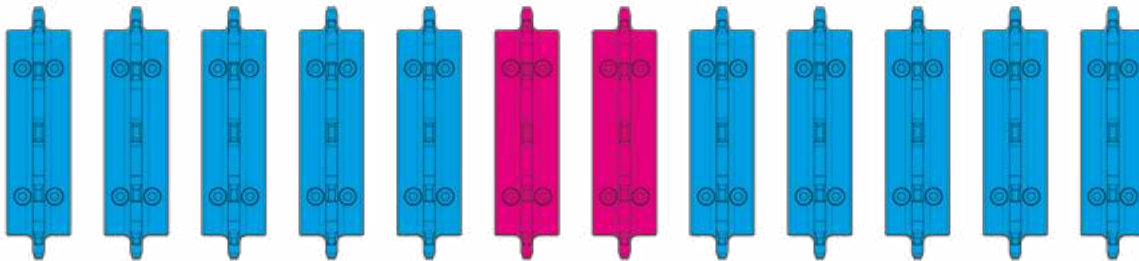
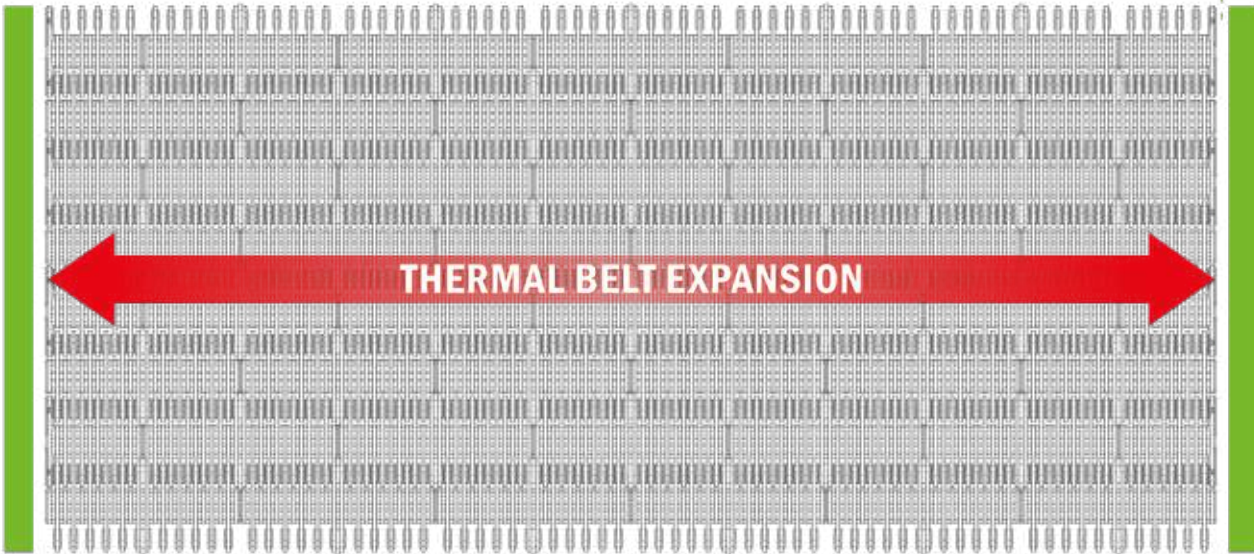
Belt guided at centre

Floating way according to length of slot hole.

Clearance between belt and side guide according to thermal expansion, half dimension of total expansion at each side.

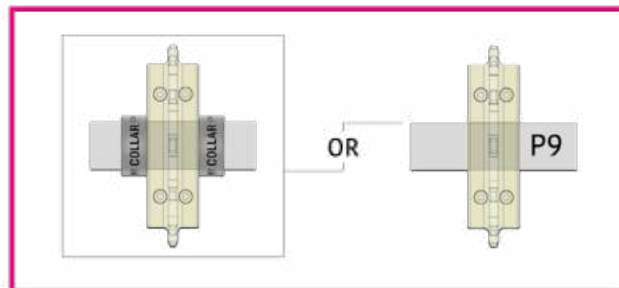


Positioners underneath the belt can only be used, if the wear strip construction allows for.

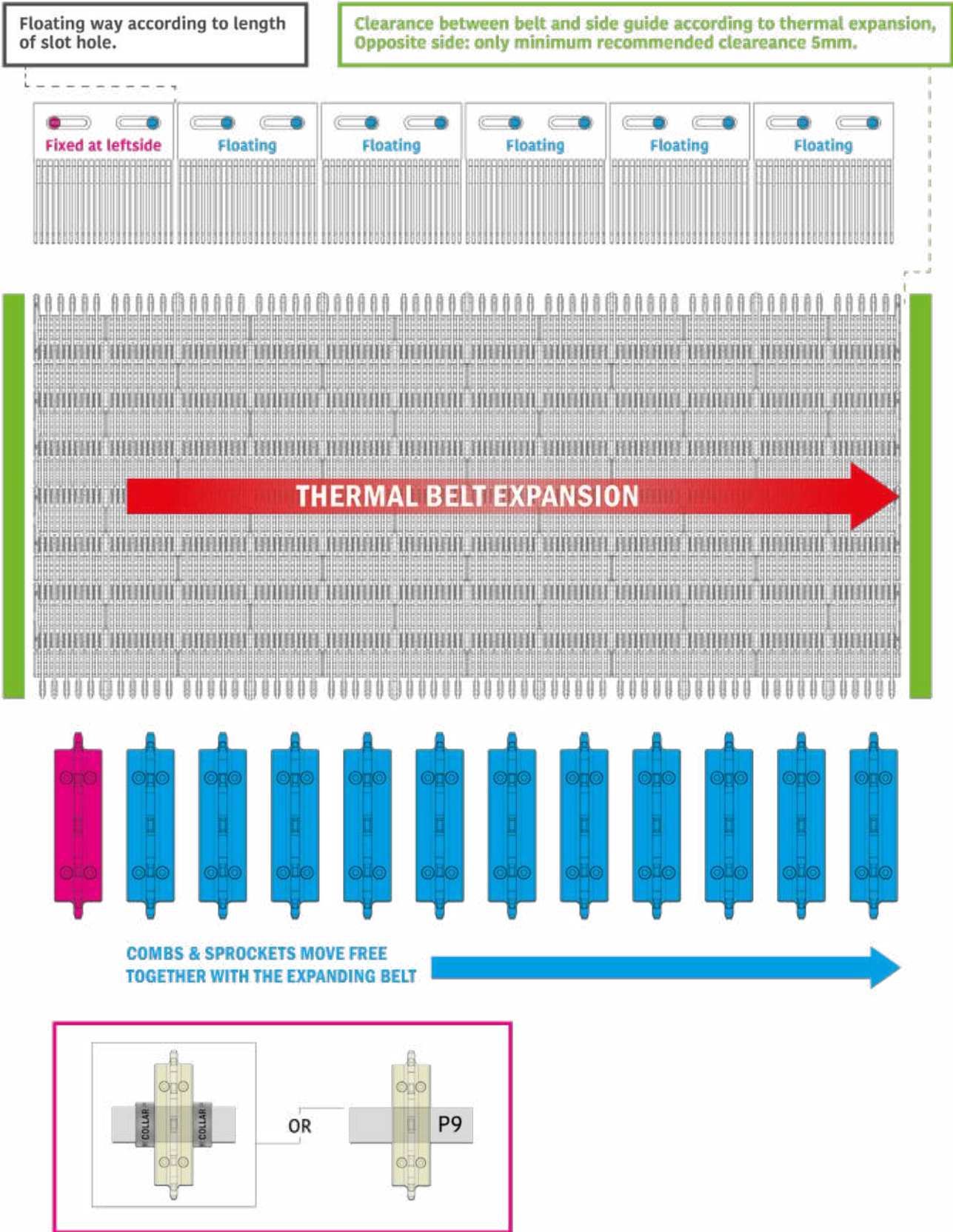


COMBS & SPROCKETS MOVE FREE TOGETHER WITH THE EXPANDING BELT

COMBS & SPROCKETS MOVE FREE TOGETHER WITH THE EXPANDING BELT

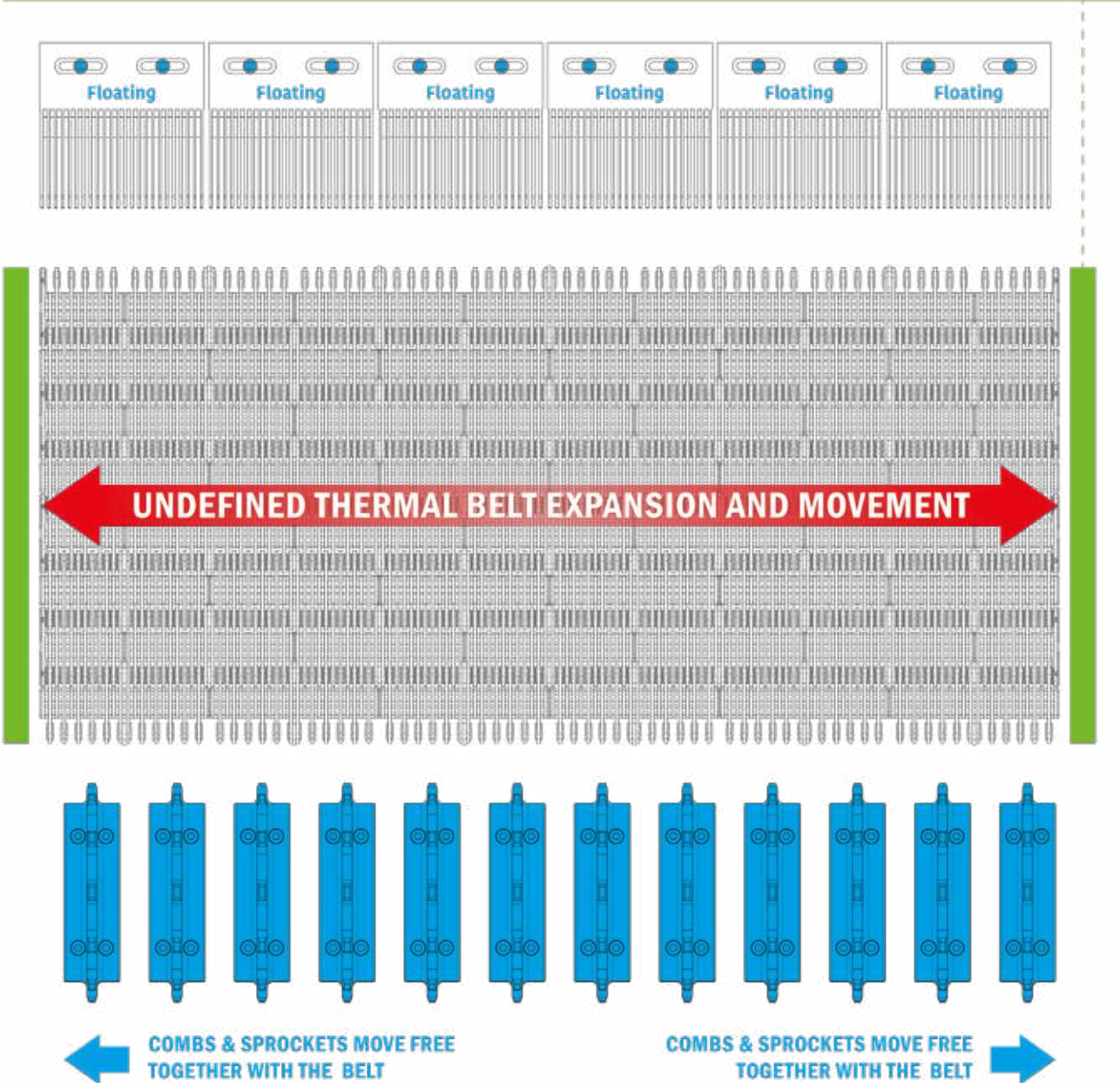


## Belt guided at one side



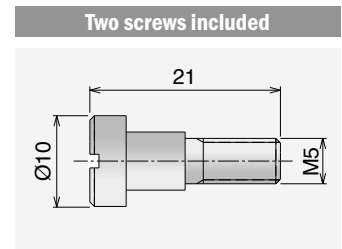
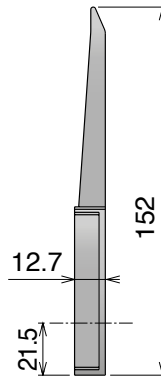
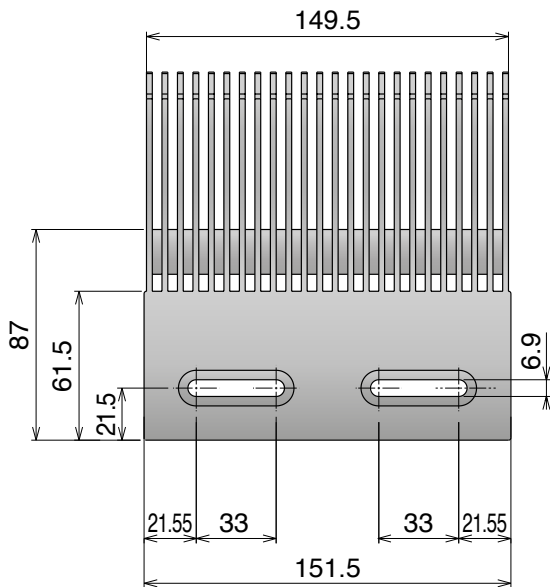
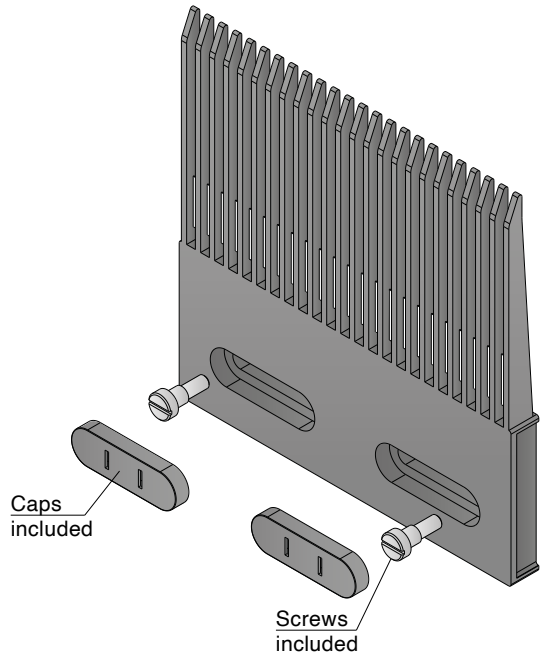
Belt not guided (floating)

Belt should at least be guided by means of side guides in order to limit floating/side movement. Total thermal expansion must be considered for the clearance between belt and side guides.



### Comb Type A

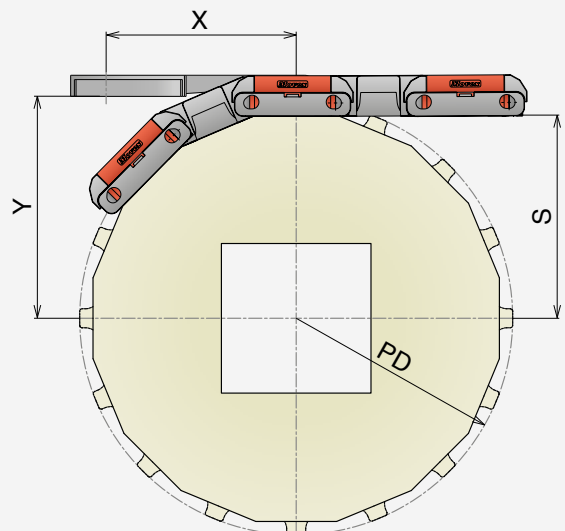
Article-Nr. 38901



### Combs integration with sprockets

see table below for dimensions

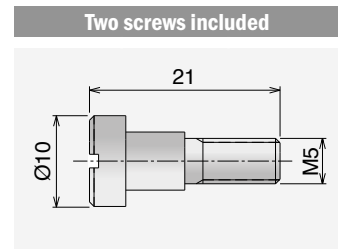
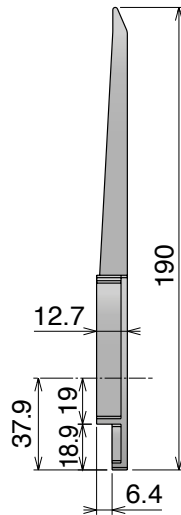
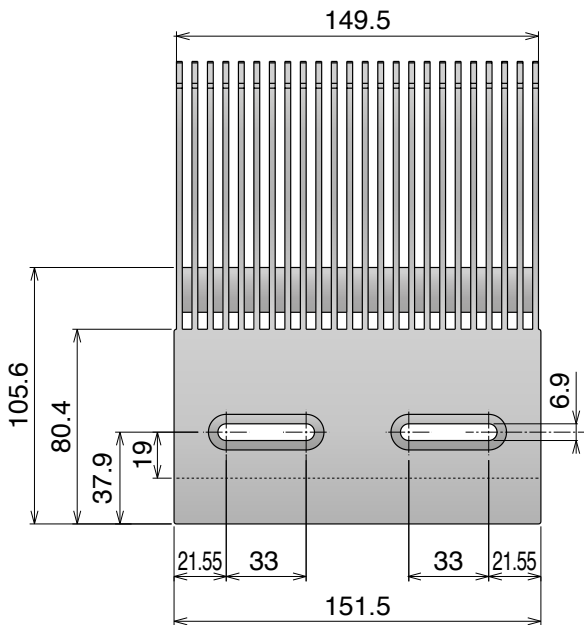
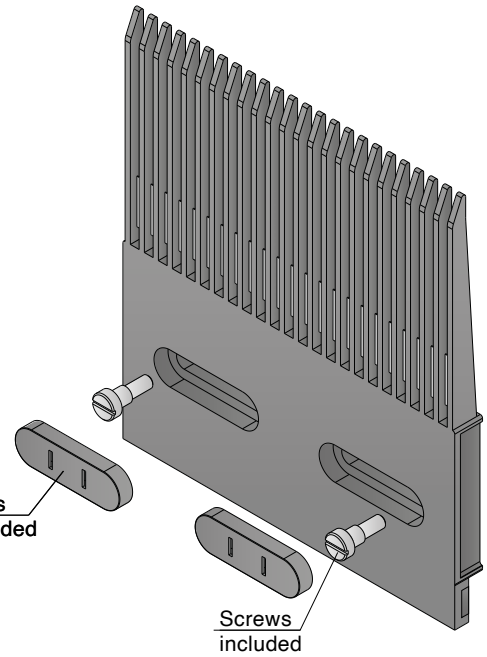
Z	PD (mm)	S (mm)	X (mm)	Y (mm)
10	164,4	74,2	114,3	85,5
12	196,3	90,1	114,3	101,4
13	212,3	98,1	114,3	109,4
16	260,4	122,2	114,3	133,5





### Comb Type B

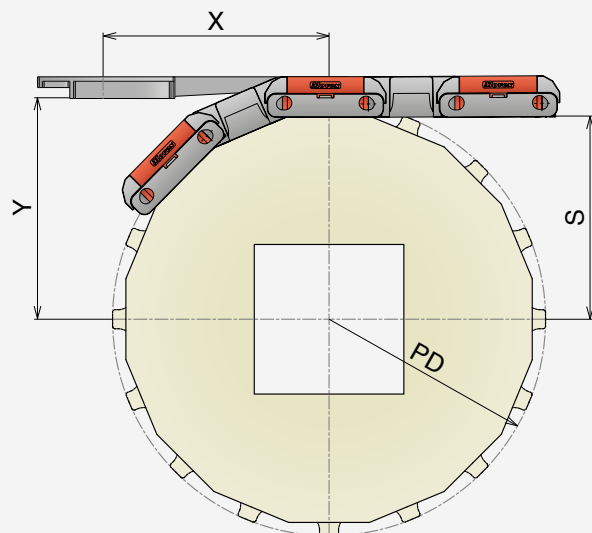
Article-Nr. 38902



#### Combs integration with sprockets

see table below for dimensions

Z	PD (mm)	S (mm)	X (mm)	Y (mm)
10	164,4	74,2	135,9	85,5
12	196,3	90,1	135,9	101,4
13	212,3	98,1	135,9	109,4
16	260,4	122,2	135,9	133,5



### Belt pin access

Provide sufficient access openings in the sidewalks of the machine so the pins of the 500 RR in each deck can be inserted and removed. The production line layout must also provide sufficient space on either side of the machine for this purpose.

### Assembly/Disassembly



- Put the screwdriver in the pin clip and rotate (clockwise) as the picture above [1].
- The pin clip is pushed off after screwdriver rotation. Repeat same operations for the opposite side [2].
- Push out the pin by using a screw driver (or pin punch) [3] and pull out the pin on the other side [4]. Use only original rods, bent or deformed rods may affect the performance.
- Now the belt is completely open and can be removed from the conveyor for maintenance, inspection or other purposes.

For 550 RR, the set of tools required are a flat screwdriver and a pin puncher.

**Maintenance guidelines**

Periodic maintenance is essential to ensure belt reliability and increased lifetime. A general recommended maintenance schedule is shown below that applies to Movex® belts in any tunnel equipment. It is always recommended to replace or repair damaged product as soon as it is detected.

Maintenance frequency	Components	Maintenance procedure	Additional notes
Every two weeks or during routine cleaning schedule	Infeed belt	Check infeed chsin for any visual damage or product hanling issue.	-
Every two weeks or during product change outs	Transfer combs	Inspect transfer combs at the infeed and discharge for any damage and ensure proper positioning as well as free floating.	-
Every six months	Pin retention clips or plugs	Check if all the pin retention clips or plugs are in place and in the closed position	Missing clips or plugs could allow the pins to walk and cause a belt failure
	Belt / catenary sag	Check the catenary sag while the belt is warm or running. Remove links if the sag become excessive.	General sag dimension guidelines are shown on page XXX. If links are removed inspect the pins.
	Belt	Inspect the belt for visual damage and discoloration	Contact Application engineering for info.
Every six months after the first two years	Belt	Measure the belt elongation. Belts should be replaced when it does no longer engage easily with the sprockets. Consider 3% stretch limit.	Use the belt elongation measurement tool.
Every twelve months	Belt pins	Ensure pins are not protruding from the belt and have not become damaged.	-
	Drive sprockets	Inspect position of the drive sprockets, tooth damage and alignment.	-
	Idler wheels	Inspect position of the idler wheels and inspect for any damage.	-
	Modular belt	Measure belt pitch and check belt stretch Check for correct belt-sprocket interaction	-

### Inspection - Carry way

Prior to installation inspect the existing carry way and ensure the following:

- Carry way wearstrips are level using string level, transit or laser level in all directions.
- Wearstrips have rounded lead in edges, are the same height, and contain no sharp edges.
- Wearstrip surfaces are smooth per recommendations on page 10
- Belt guide clearance are set per recommendations on page 13
- Positioner guides are flat on top and sides to ensure proper fit (i.e. no weld lines)

**Replace, adjust or repair wearstrips as required**

### Inspection - Return way

Prior to installation inspect the existing return way and ensure the following:

- Return shoes or rollers are not damaged
- All return shoes or rollers are level and positioned properly (i.e. parallel and square to the direction of belt travel)
- Return shoes or rollers are smooth per recommendations on page 15
- Belt guide clearance are set per recommendations on page 13
- Return rollers spin freely.

**Replace, adjust or repair return components as required**

### Inspection - Shafts and bearings

Prior to installation inspect the shaft, bearings and ensure the following:

- Conditions of the shafts, bearings is satisfactory per manufacturer recommendations.
- Shafts are aligned correctly
- Center support bearings are aligned and positioned correctly

**Replace, adjust or repair components as required**

### Inspection - Modular belt

- Make sure all pin locks are correctly installed.

**Replace, adjust or repair belt parts as required**

### Inspection - Combs

- Damaged comb fingers
- Proper alignment with belt ribs
- Blocked combs
- Remove embedded debris

**Replace, adjust or repair combs as required**

## **Important!**

- Ensure that there is a sprocket engaged in every available sprocket pocket both on the drive and idler end.
- Prior to use, always check chemical compatibility of cleaning, disinfection and water treatment agents. Consider not only compatibility of the belt, also include all conveyor components in your consideration, e.g. wear strips, sprockets, combs.  
Find related material info in our catalogue and/or general Engineering Manual.



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