Food Engineering Manual

Rexnord

2005

Index & Introduction

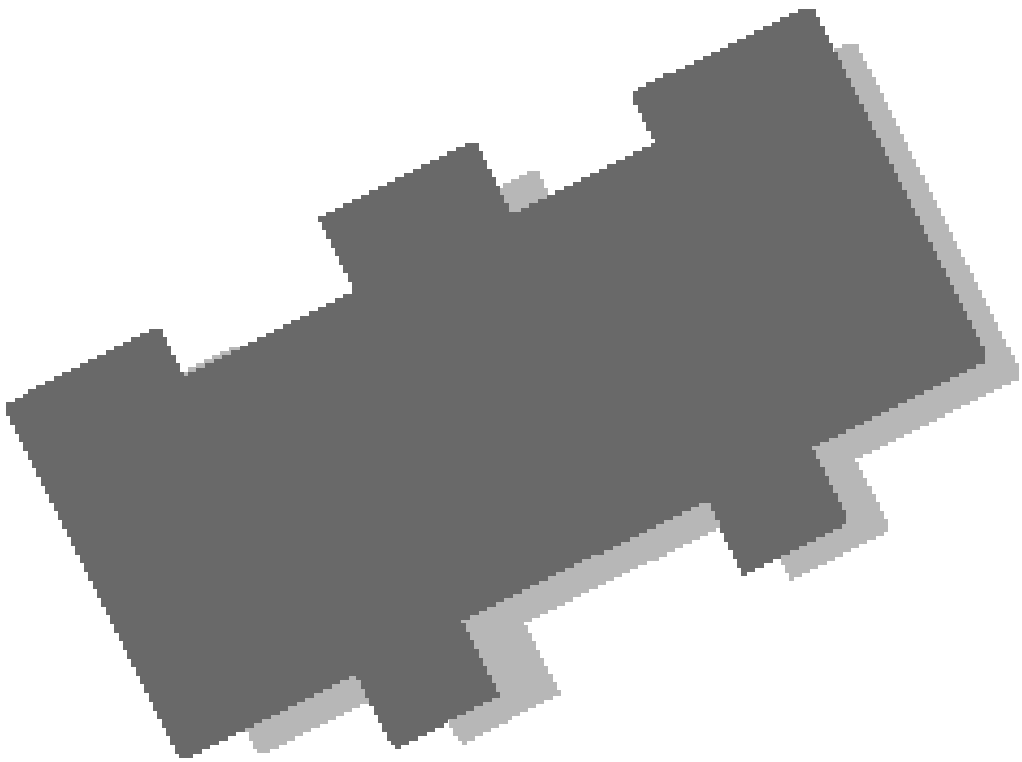
Rexnord FlatTop Engineering Manual
This Engineering Manual has been developed to help you with the need for specific engineering information. It can be a source of information when a new conveyor has to be designed. This Manual can also be used as a reference book when a conveyor is going to be modified, during an overhaul or for troubleshooting.

All guidelines in this booklet are given to our best knowledge and are believed to be reliable, based on experience. As circumstances vary from case to case, we will always be glad to answer your questions, when you are not sure if the information given applies to your situation. When you need more information about a specific subject, please don't hesitate to contact Rexnord or your nearest Rexnord distributor.

MCC cannot take responsibility for imperfections, damage or injuries due to wrong conveyor design, poor installation or improper use of our products made with or without reference to the information in this manual. We do not pretend to be complete. We appreciate suggestions from your side which can be helpful to improve this Engineering Manual.

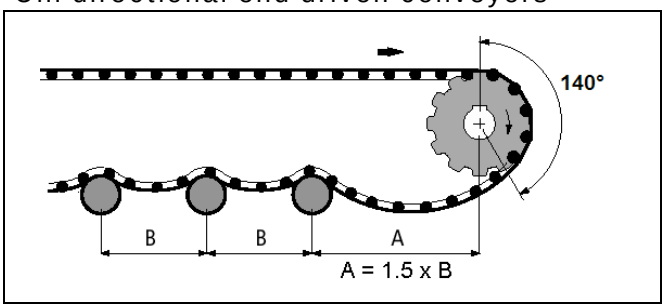
Rexnord FlatTop Europe.

MCC Slatband Chains Engineering



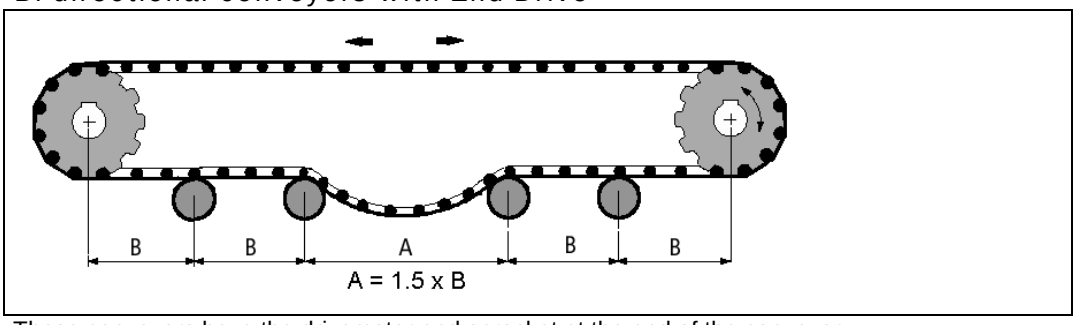
Conveyor Design

Uni-directional end driven conveyors



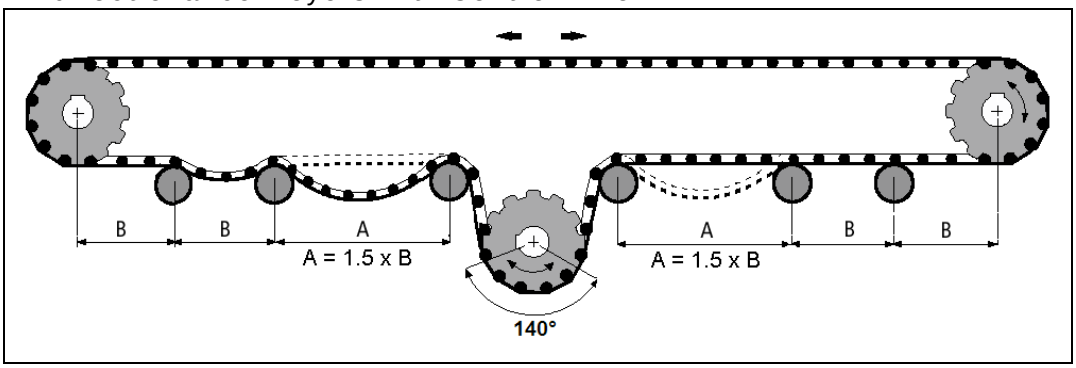
These conveyors have the drivemotor and sprocket at the end of the conveyor

Bi-directional conveyors with End Drive



These conveyors have the drivemotor and sprocket at the end of the conveyor

Bi-directional conveyors with Centre Drive



These conveyor can have a small end roller to reduce the transfer area

Most MCC chains have a preferred running direction, which is shown on the underside.

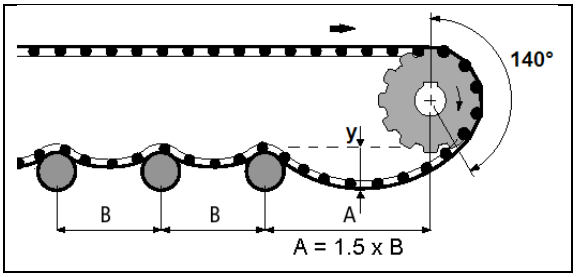
Wrap around angle

Recommended wrap angle on sprockets is: **140° +/- 10°.**
When the wrap angle is too small, the sprocket will not be able to transfer the load to the chain anymore causing the chain/belt to jump on the sprockets. When the wrap angle is too big, the chain/belt can stick to the sprocket.

Conveyor Design

Catenary sag

It is recommended to create a catenary sag just behind the sprocket which provides a complete discharge of the chainload and ensures proper running.

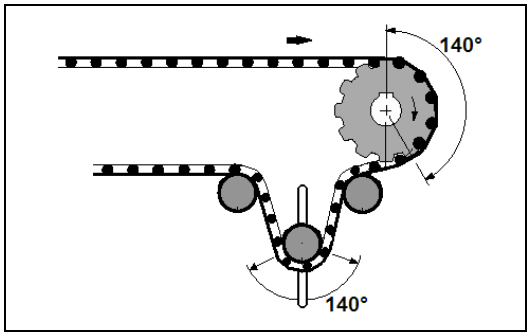


type	A (mm)	B (mm)	Vertical sag Y(mm)
Slatband	700	500	50-125
Crate chains	700	N/A[1)]	100-300
LBP-chains	700	400[2)]	50-100

[1)] Use flat returnpart for CC-series chains
[2)] Use guide shoes/flat return for LBP chains

The right vertical catenary sag can usually be obtained automatically by just pulling both ends together and mounting them together. Note the chain can elongate due to strain and wear of the pins and hinge eyes. Therefore it is important to check and adjust the catenary regularly.

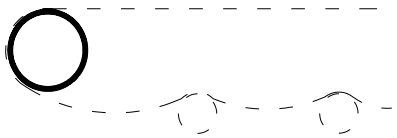
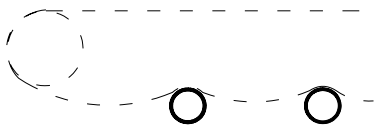
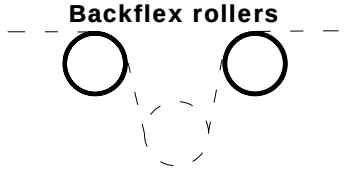
Tensioner construction



A tensioner construction is only necessary if the conveyor design does not allow for a proper catenary sag. A tensioner can also be used with declined conveyors, but in all other cases it is not recommend to tension the chain/belt.

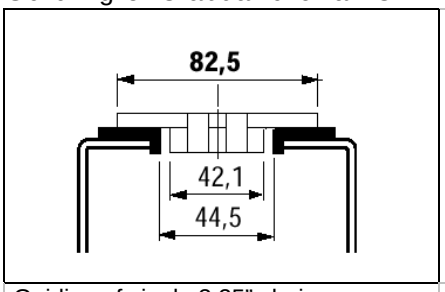
The tensioner roller/sprocket can be fixed on an arm or move up and down in slots in the conveyor sideplates. This will bring constant tension, independent of length differences in the chain.

Roller diameter for slatband chains

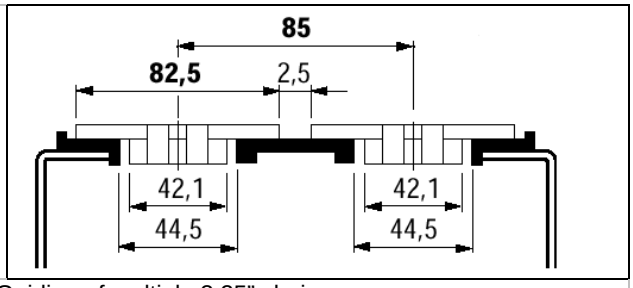
Chaintype	Slatband chains	LBP chains	CC chains
Idler rollers 	> 100mm	>100mm	100mm
Return rollers 	60-100mm	Guideshoes are recommended	60-100mm
Backflex rollers 	300mm	Not recommended	120mm

The recommended roller diameters in the table are an indication. The width of the conveyor is not taken into account. The diameter of the shaft should be large enough to avoid deflection of the roller. At the same time it is recommended not to exceed the maximum diameter, because the roller friction may be too high to be set in motion by the belt.

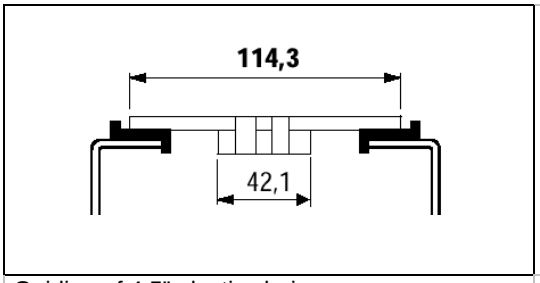
Guiding of slatband chains



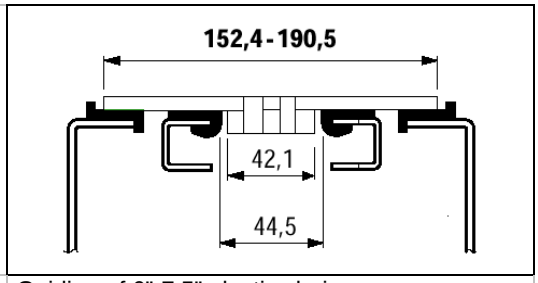
Guiding of single 3.25” chains



Guiding of multiple 3.25” chains

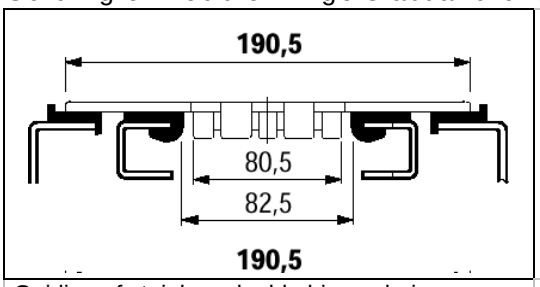


Guiding of 4.5” plastic chains

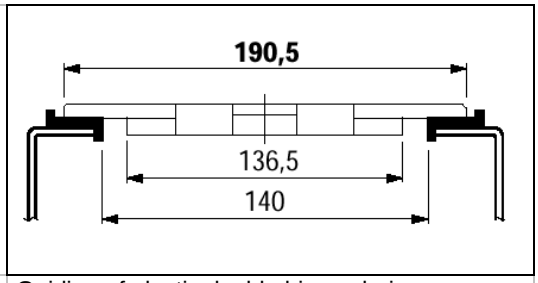


Guiding of 6”-7.5” plastic chains

Guiding of Double Hinge slatband chains

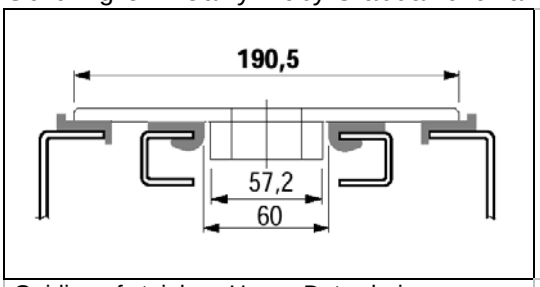


Guiding of stainless double hinge chains

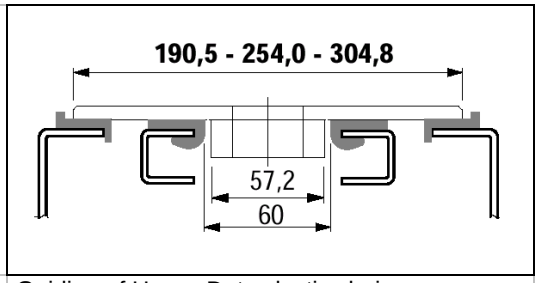


Guiding of plastic double hinge chains

Guiding of Heavy Duty slatband chains



Guiding of stainless Heavy Duty chains



Guiding of Heavy Duty plastic chains

Conveyor Design

Wearstrip Materials

Metal wearstrips

Metal wearstrips can be used in most situations using plastic chains and are strongly recommended in abrasive environments.

Stainless steel:

- Recommended for abrasive conditions due to avoiding of dirt embedding in the wearstrips;
- Recommended for plastic chains/belts in dry environments with speeds > 60m/min;
- Cold rolled stainless steel with a hardness of at least 25 Rc and a surface finish of maximum 1.6 µm is recommended;
- Best results can be achieved by using stainless steel AISI 431 (Werkstoff-Nr. 1.4057 material;
- AISI 304 (Werkstoff-Nr. 1.4301) is not recommended as wearstrip material.

Plastic wearstrips

Friction is low compared to steel wearstrips. Two types of plastic are suitable to be used as a wearstrip material.

UHMWPE:

- Most common used wearstrip material with extreme low friction;
- Excellent resistance against many chemicals;
- Virtually no moisture absorption, therefore very suitable for lubricated lines;
- Good dimension stability;
- Reduces some of the noise conveyors produce;
- Suitable for dry running conveyors with speeds up to 60 m/min;
- Extruded quality 1000 grade UHMWPE is recommended.

Polyamide:

- Relatively high moisture absorption which makes the material expand;
- Polyamide is also used with additives to reduce the coefficient of friction;
- Suitable for dry running high speed conveyors.

Recommended wearstrip materials

Wearstrip material	Steel chains		Plastic chains	
	Dry	Lubr.	Dry	Lubr.
UHMWPE	+	+	+ [1)]	+ [2)]
Polyamide	+/-	-	+/-	-
Stainless steel	-	-	+	+

\+ Recommended
+/- Satisfactory
\- Not recommended
[1)] Up to 60 m/min in non abrasive conditions
[2)] Only in non abrasive conditions

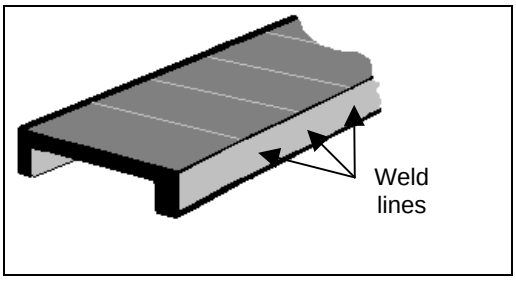
It is not recommended to use the same material for the wearstrip and chain.

UHMWPE Wearstrip Installation

RAM-extruded wearstrips

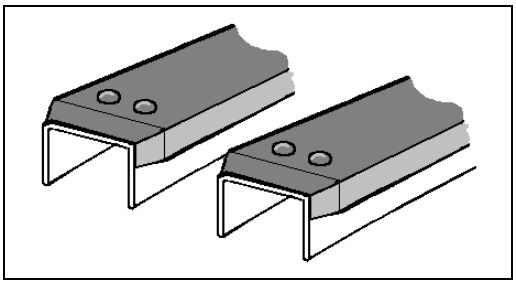
We recommend to use RAM-extruded wearstrips. Main benefits of RAM-extruded UHMWPE wearstrips is that less debris will embed in the material in comparison to worm extruded or machined UHWMPE. This will results in less chain/beltwear.

Ram-extruded wearstrips can be recognized by weld lines which occur with each ram stroke, see drawing.



Chamfering of wearstrips

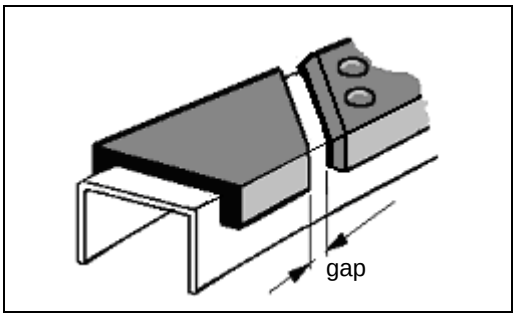
Wearstrips should always be chamfered at the beginning of the strip where they are fixed. Chamfering reduces the risk of chain-obstruction resulting in a smooth operation.The wearstrips should be chamfered at the sides and at the top.



Splitting the wearstrips

On straight sections with a length of more than 3 metres, or for high (40º - 70ºC) application temperatures, we recommend to divide the wearstrip into several sections, because of the thermal expansion of the strips.

It is recommended to cut the wearstrips at 45º angles to provides smooth chain/ belt transfers. Make sure only the infeed side of the wearstrip is fixed to the conveyor frame to avoid bulging of the wearstrips.



The gap depends on the expected elongation due to e.g. thermal expansion, see drawing.

Calculation example

For MCC 1000 UHMWPE material the expansion coefficient is 0.2 mm/m/ºC. A temperature increase of 20ºC would elongate a 3 meter wearstrip with:

20ºC * 3mtr * 0.2=12 mm

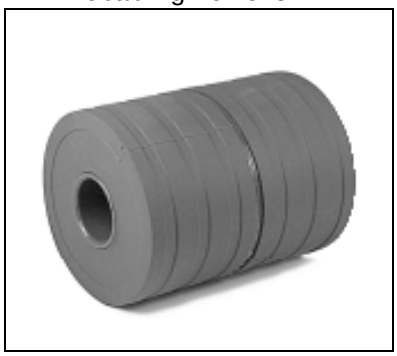
In this case, the gap between the wearstrips should be a bit larger than 12 mm.

We recommend a maximum wearstrip length of 6mtr. with UHWMPE wearstrips.

Conveyor Design

Chain return construction

Rotating rollers



- ✓ Reduced wear
- ✓ Simple construction.
- ✓ Good accessibility
- ✓ Ejection of debris in the returnpart by the movement of the chain.

- ✓ Only point contact between chain and roller.
- ✓ Small rollers may cause a rattling sound.

Rollers should rotate freely therefore, rollers with rubber cover are recommended

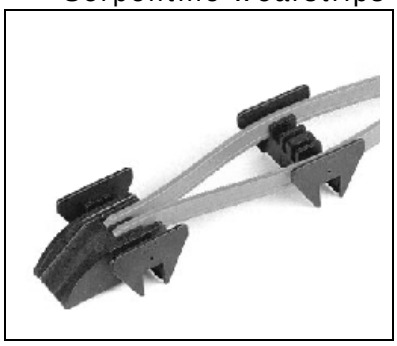
Fixed guideshoes

- ✓ Good accessibility
- ✓ Simple construction.
- ✓ Ejection of debris in the returnpart by the movement of the chain.
- ✓ Suitable for LBP chains/belts.

- ✓ Risk of uneven wear chainsurface
- ✓ Only point contact between chain and guide shoe.
- ✓ High friction.

Minimum guide shoe radius is 200 mm.

Serpentine wearstrips



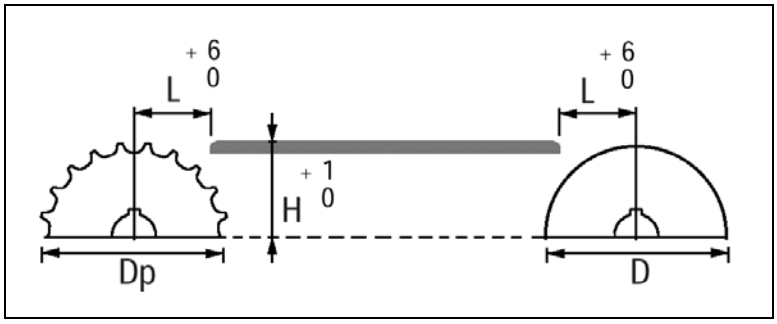
- ✓ Full support of the chain over the length of the conveyor.
- ✓ Reduced noise in returnpart.
- ✓ Recommended in high speed lines with slatband chains

- ✓ Less favourable accessibility for maintenance.
- ✓ Less possibility to absorb elongation.
- ✓ Uneven wear of the chain/belt when not supported over entire width.
- ✓ Higher friction.

Material used for wearstrips should be UHMWPE.
A roller can be used for the infeed onto the serpentine wearstrips

Position sprocket - wearstrips

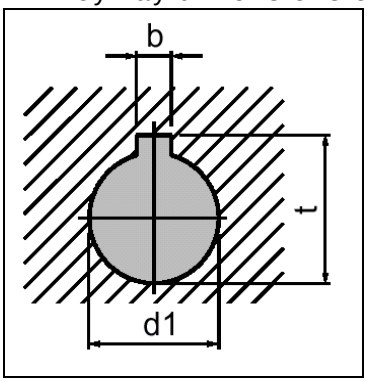
When the chain enters the sprocket, it tends to raise and fall slightly (chordal action). For this reason the sprockets should be mounted in such a way that its highest point is no higher than the top of the wearstrips. The frond edges of the wearstrips should be bevelled to allow smooth and free running of the chain. The distance from the end of the wearstrip to the sprocket shaft centerline should equal dimension L, otherwise the wearstrip will interfere with the free articulation of the chain as it enters the sprockets.



Chain type	Drive sprocket H (mm)	L mm
Steel chains, SH, SWH	$\frac{Dp}{2}$ + 3.2	38.1
SHD	$\frac{Dp}{2}$ + 2.4	38.1
SHP, SRH, RH(D), RHM(D)	$\frac{Dp}{2}$ + 3.5	38.1
HDS, HDF, HDFM	$\frac{Dp}{2}$ + 4.7	38.1
PR	$\frac{Dp}{2}$ - 12.0	50.0
CC-600	$\frac{Dp}{2}$ - 14.3	63.5
CC-1400	$\frac{Dp}{2}$ - 19.0	82.5

Idler Drum H (mm)	L mm
$\frac{Dp}{2}$	38.1
$\frac{Dp}{2}$	38.1
$\frac{Dp}{2}$	38.1
$\frac{Dp}{2}$	38.1
$\frac{Dp}{2}$	50.0
$\frac{Dp}{2}$	63.5
$\frac{Dp}{2}$	82.5

Keyway dimensions of MCC sprockets



d1 (mm)	b (mm)	t (mm)
25mm	8	28.3
30mm	8	33.3
35mm	10	38.3
40mm	12	43.3
45mm	14	48.8
50mm	14	53.8
60mm	18	64.4

d1 (inch)	b (inch)	t (inch)
1"	1/4	1 1/8
1 1/4"	1/4	1 3/8
1 1/2"	3/8	1 9/16
1 3/4"	3/8	1 15/16
2"	1/2	2 1/4

Conveyor Design

Shafts

In all situations stainless steel is recommended for shaft material. Metaloxydes that come from a rusty shaft are extremely abrasive and would therefore reduce the wearlife of the conveyor components. It is also important to use shafts with a sufficient hardness and a smooth surface. The shaft diameter depends on the conveyor load and its width. For slatband chain sprockets round shafts are used.

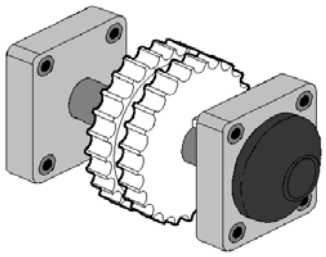
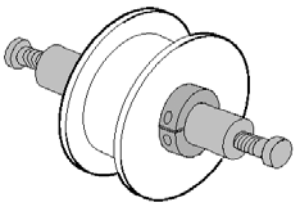
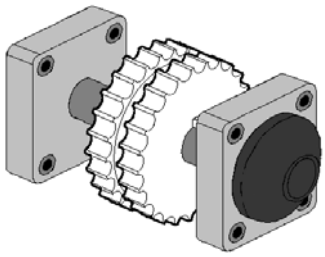
Maximum deflection of the shaft must not exceed 2 mm. Depending on the load and shaftlength, it can be necessary to use a larger diameter shaft or an extra bearing in the middle of the shaft to reduce the shaft deflection.

Shaft tolerances

It is important that the tolerance of the shaft meets the specifications of the sprocket, so the sprocket can slide over the shaft at all times. In combination with all MCC sprockets the following shaft specifications are required, depending on the shaft diameter.

Dimension (mm)	Shaft tolerance (mm)	Idler shaft surface finish (µm)
Round shaft		
< Ø 90	max h 9 (ISO)	0.8
> Ø 90	Max h 11 (ISO)	1.2

Bearings

Drive sprocket	Idler	
	drum	sprocket
		
Shaft with keyway equipped with bearings	Fixed idler shaft without keyway. The idler drum rotates freely on the shaft. Suitable for lower speed < 30mtr/min dry run < 60mtr/min well lubricated	Idler shaft with keyway equipped with bearings for higher conveyor speed > 30mtr/min dry run > 60mtr/min well lubricated In poluted area's an idler shaft with bearings is recommended.

Before selecting bearings, check which chemicals will be present. Also check if dust and water are present. Sealed bearings have a better protection against dust. Also use bearings with high mechanical and heat resistance for a longer wearlife of the construction.

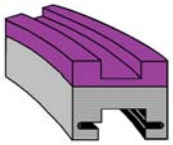
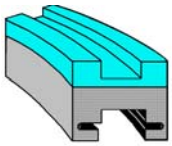
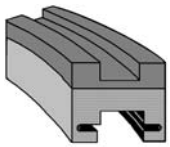
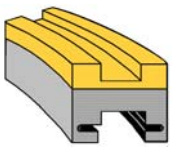
Make sure the edges of the shaft are rounded off to ease assembly and to avoid damage to the rubber parts of the bearing sealing units.

Fix sprockets with lowest speed

When the speed of the idler sprockets on the same shaft is different, we recommend fixing the sprocket with the lowest speed to the shaft. This way the relative speed difference which occurs between the shaft and the other idler sprockets is as low as possible and the fixed idlers will not drive the slower moving idlers. This case all other idler sprockets must be able to rotate independently.

Magnetflex® curve materials

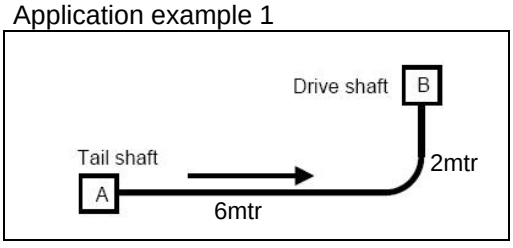
Magnetflex® curves are available in several materials, each for specific applications, see below.

Curve	Colour	Properties & Applications	Notes
Combi A		High grade UHMWPE for good wear and abrasion resistance. Suitable for most applications with steel and plastic chains.	Lubricated or dry running
Combi L		High grade special UHMWPE for improved wear and abrasion resistance and very low noise Suitable for medium to high speed conveyors for steel and plastic chains	Lubricated or dry running
Combi S		Special polyamide for high PV limits and optimum wear resistance. Suitable for dry running high speed conveyors equipped with plastic chains. Also suitable for abrasive conditions.	Dry running only
Combi G		Special UHMWPE with ceramic additives for superior abrasion resistance For abrasive conditions with stainless steel chains	Lubricated or dry running
Return part material is MCC 1001 UHMWPE, return guide shoe material is MCC 1000 UHMWPE			

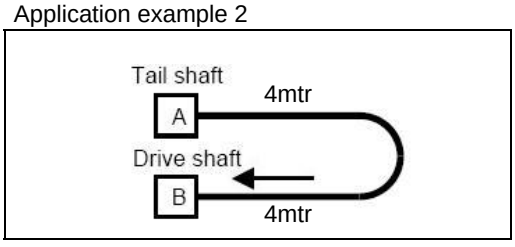
Curve material selection example

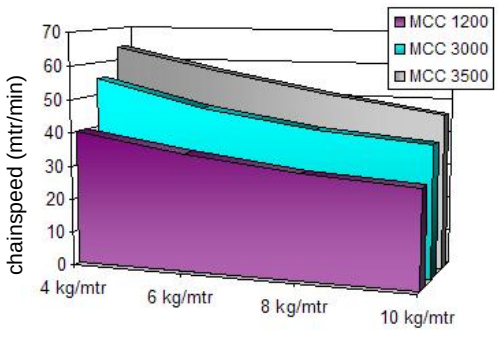
- ✓ RHM 325 XL chain
- ✓ Conveying cans
- ✓ UHMPWE wearstrips & return rollers
- ✓ 12 tooth sprocket
- ✓ Single track conveyor
- ✓ Dry running
- ✓ Running completely full
- ✓ 100% accumulation possible

Application example 1

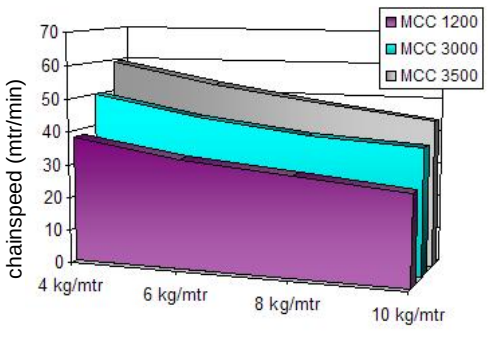


Application example 2





Productweight per metre



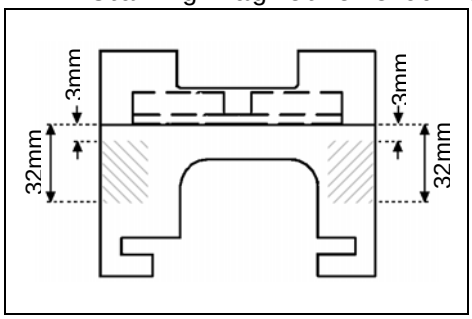
Productweight per metre

Conveyor Design

Curve installation

For Magnetflex® curves, the following installation recommendations should be taken into account.

Installing Magnetflex® curves

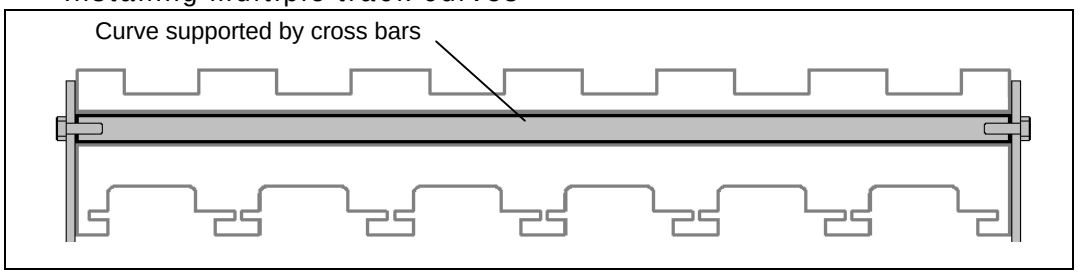


Magnetflex® curves are mounted to the conveyor frame using inserts in the curve returnpart. The upperpart is fixed to the returnpart with screws.

It is important to take care of the position of the inserts. Magnetflex® curves should only be drilled in the underpart, taking the dimensions into account shown in the drawing.

Note: Always check returnpart for protruding bolts, which could obstruct the chain.

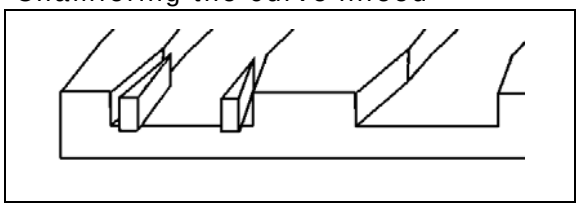
Installing multiple track curves



For multiple track curves (>500mm) we recommend to support the curve upperpart and the curve returnpart with cross bars.

Note: make sure the curve is mounted level, and the conveyor frame is positioned level

Chamfering the curve infeed

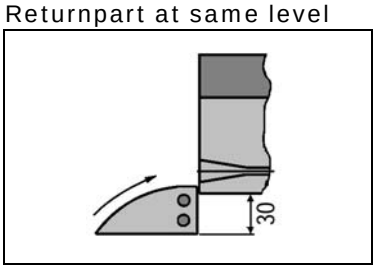


All upperpart infeed sides should be chamfered to ensure a smooth running of the chains. Make sure the chamered parts stay vertical. The chamfering of the curves has to be done only at the infeed sides.

Magnetflex® guide shoe installation

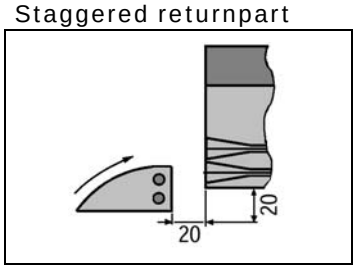
The MCC return guideshoes helps the chain run into the returnpart. The return guideshoe has to be mounted at the infeed side of the return part of the curve.

Returnpart at same level



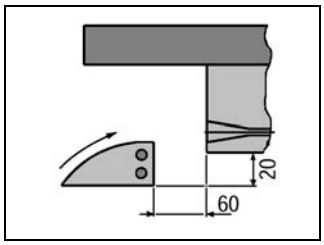
Returnpart guideshoe should be mounted against infeed of underpart, with underside of the guideshoe 30 mm lower than the curve underside.

Staggered returnpart



Curves with a track pitch of less than 89 mm, feature a staggered returnpart. Returnpart should be mounted 20 mm off the curve infeed.

1050/1055 chainbelts



The infeed shoe should be positioned 20 mm below the curve infeed, at distance of 60 mm.

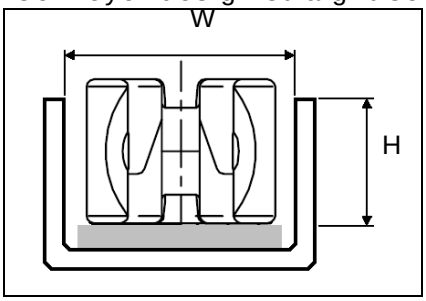
Case Conveyor chains

Case conveyor chains are available in different types. Plastic Case Conveyor chains have been designed to convey heavy crates, boxes and kegs and the open design is very suitable for dirty conditions and easy cleaning.

Properties	**CC600**	**CC631**	**CC1400**	**CC1431**
Pitch [mm]	63.5	63.5	83	83
Max. working load [N]	3950	3950	6500	6500
Tabs	with/without	with	with/without	with
Height of links [mm]	28.6	31.8	38	43

Note: CC-chains have a preferred running direction, which is indicated on the chains. The pins can be mounted only in one direction (“in”) and dismounted only one direction (”out”). CC-chains should not be tensioned in the returnpart.

Conveyor design straight sections

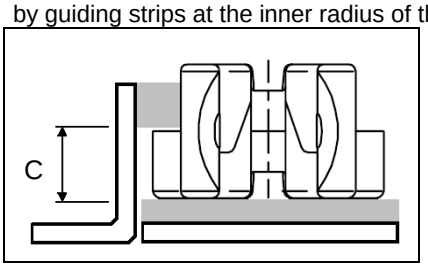


Chaintype	W (mm)	H (mm)
CC600	45	20
CC600TAB	58	20
CC631TAB	58	20
CC1400	53	24
CC1400TAB	69	24
CC1431	69	24

Please check wearstrip recommdations for best wearstrip choice

Conveyor design corners

Curves for CC chains should be made open to allow debris to fall down. The chains can be secured by guiding strips at the inner radius of the curve.



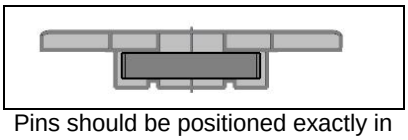
Chaintype	C
CC600TAB	19.5
CC631TAB	19.5
CC1400TAB	21
CC1431TAB	21

Please check wearstrip recommdations for best wearstrip choice

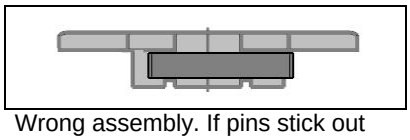
Conveyor Design

Installation of slatband chains

- Chains can be installed using a hammer and a punch.



Pins should be positioned exactly in the middle of the hinge eyes.



Wrong assembly. If pins stick out the chain can jam.

- Pins in plastic chains should have the knurl on the same side, and this knurled side should be put in the chain last. D-style pins have no direction preference.
- Check running direction, since the chain should always be driven at the fixed hinge eyes. Running direction is shown at the underside of the chain.
- Do not tension the chain when installing. Tensioning will result in a higher chainlaod and more wear of components. During installation the proper tension is manually achieved.

Chain inspection & maintenance

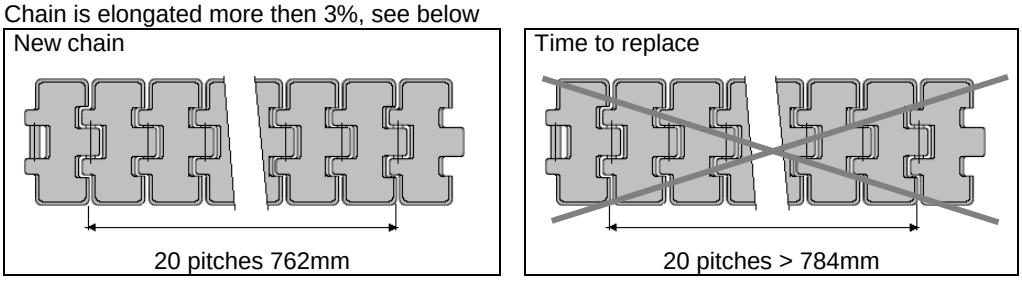
A good condition of the line can be maintained when people recognise signs of initial wear/ failure and react accordingly. Following aspects are of importance during regular check-up.

- Check the condition of the chain regularly, and replace links which are damaged. Important in this matter is to try to find the cause of the damaged links. Wear patterns or damage on a chain can often lead you to a problem area elsewhere in the conveyor.
- Check the amount of catenary sag and remove links or modules when the catenary of the chains exceeds prescriptions. Remember catenary grows during full load.
- Check if the returnrollers turn freely, repair or replace if not.
- In case of lubrication check if the lubrication system operates properly.
- Check carryways and wear strips for excessive wear or peculiar wear patterns.
- Check positions of transfer plates and check the fingerplates for broken/ worn parts and repair or replace if necessary.

Chain replacement

We recommend to replace slatband chains, if the following is the case:

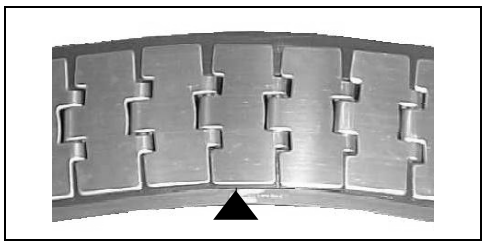
- ✓ Chain is elongated more then 3%, see below



- ✓ The thickness of the topplate of the slatband chain is reduced to 2.0 mm
- ✓ The surface becomes unflat or very rough due to (uneven) wear, especially in applications where product handling is critical. Also replace if the side of the hinge of sideflexing chains wears away and exposes the pin.
- ✓ The chain jumps on the sprocket
- ✓ It is also important to look at the position of the chain in the productionline. Chains that run on a pressureless inliner, have to be replaced all at once. If only one chain is replaced there will be a chance of unacceptable height differences, which could result in products topping over

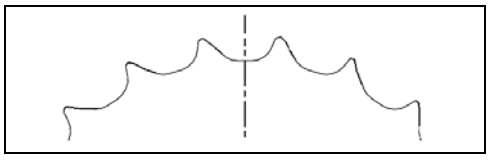
Magnetflex® replacement

- ✓ Replacement is recommended if uneven wear patterns, and unacceptable wear of the track are found. The chain can easily be lifted out of the curve for inspection.
- ✓ The chain reaches the inside of the curve, see picture. In multiple track curves, check if the wearrate is similar in all tracks. It is also important that the wear of the curve groove still shows a straight angle of 90º with the horizontal surface



Sprocket & idler replacement

- ✓ The teeth show a hookshape, which obstructs the chain. Also replace sprockets when teeth are damaged or when chain jumps on the sprocket.

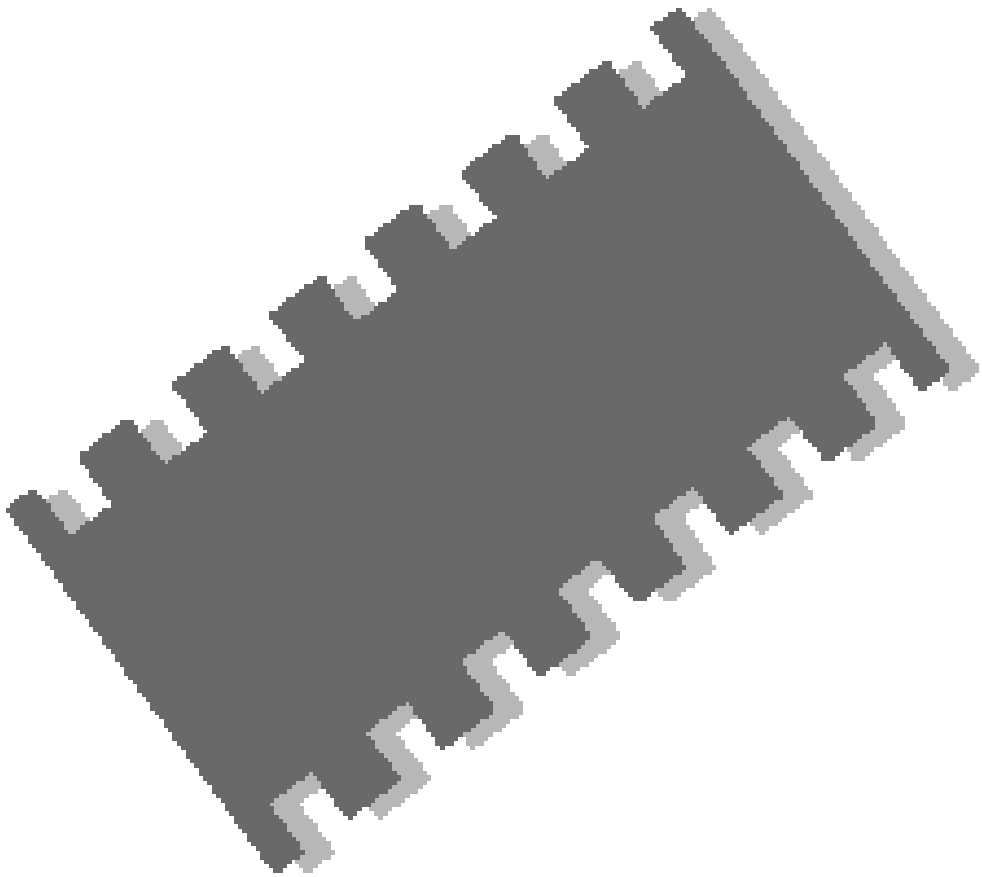


- ✓ The idler is oscillating on the shaft, because of a worn bore
- ✓ If chain is replaced due to elongation, always install new sprockets!

Wearstrip replacement

- ✓ When chains are replaced always replace the wearstrips.
- ✓ Dirt or debris is embedded in the wearstrip material in unacceptable amounts

MCC Straight Running Belts Engineering



Conveyor Design

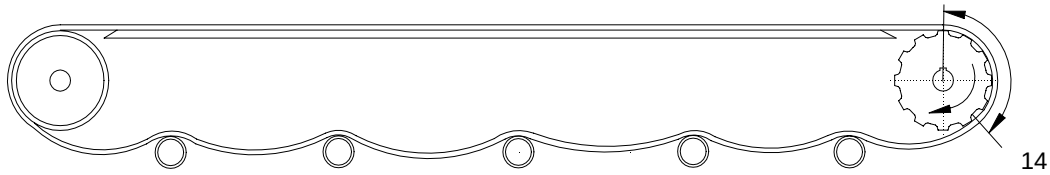
Introduction

In this chapter we supply engineering details for conveyors for straight running belts. The guidelines in this chapter are based upon many years of experience. If you got have any remarks or additions, please feel free to contact us.

Drive Construction

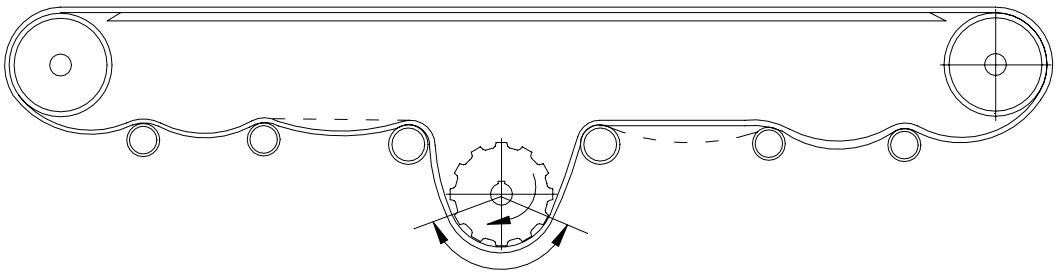
The drive unit of a conveyor can be placed in several positions and conveyors can be uni-or bi-directional.

END DRIVEN CONVEYOR



These conveyors have the drive construction on one end of the conveyor, which is the most common drive construction.

CENTRE DRIVEN CONVEYORS



140°

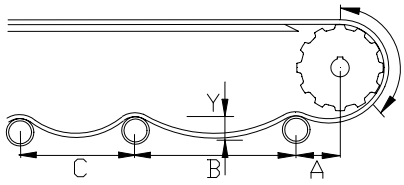
This construction is mainly used for bi-directional conveyors. Also centre-drive conveyors are used when space is not sufficient for the drive construction or the catenary sag at the end of the conveyor. Centre drive constructions are also being used to obtain small rollers transfers.

Note: *most belts have a preferred running direction, which is shown on the underside. See chapter six for an indication.*

Catenary sag

It is recommended to create a catenary sag just behind the sprocket which provides a complete discharge of the belt load.

140º ±10º



belt type	A (mm)	B (mm)	C (mm)	Vertical sag Y (mm)
505	250	600	500-600	50-125
1255	250	600	500-600	50-125
1505 / 1506	250	600	500-600	50-125
1000	250	750	500-600	50-125
6391 / 6392	500	1250	1000-1250	100-200
2010	500	1250	1000-1250	100-200
5998	500	1250	1000-1250	100-200

Conveyor Design

The right vertical catenary sag can usually be obtained automatically by just pulling both ends together and mounting them together. The catenary sag will increase due to elevated temperatures. Furthermore, the chain or belt can elongate due to strain and wear of the pins and hinge eyes. Therefore it is important to check and adjust the catenary regularly.

Wrap Around Angle

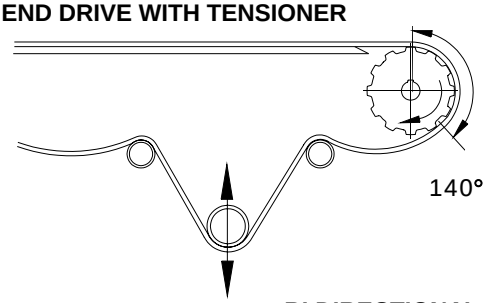
Recommended wrap angle on sprockets is **140º +/- 10º.**

When the wrap angle is too small, the sprocket will not be able to transfer all the load to the belt, which causes the belt to jump on the sprockets. When the wrap angle is too big, the belt can stick to the sprocket and not release properly.

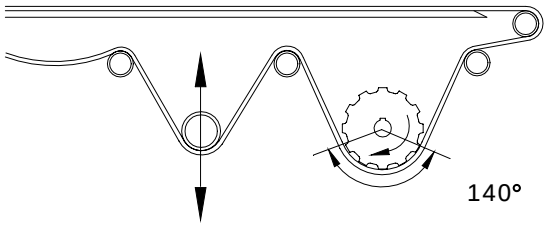
Tensioner Construction

If the catenary sag does not bring enough tension in the return part the belt will not be driven properly. Irregular belt movement can be an indication for too low tension. We prefer using a standard catenary sag in the return part of the conveyor to provide sufficient tension. However, installing a tensioner in the return part can introduce more tensioning in the return part, to ensure a proper engagement between the belt and the sprockets.

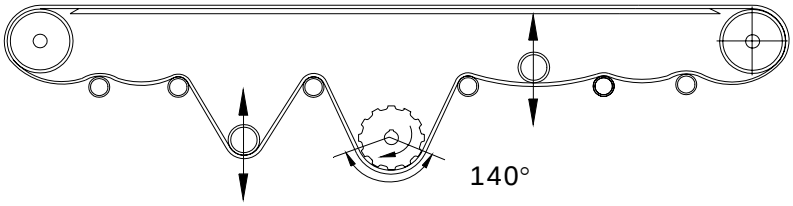
END DRIVE WITH TENSIONER



CENTER DRIVE WITH TENSIONER



BI DIRECTIONAL CENTRE DRIVE WITH TENSIONER



Weight indication for tensioner construction:

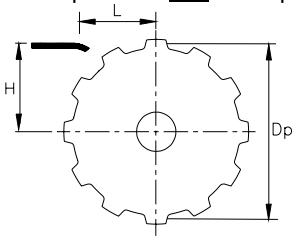
Pitch: 1 inch (25.4 mm) -> 5 Kg/m

Pitch: 2 inch (50.8 mm) -> 10 Kg/m

***Note**: for belts a roller can be used, which should be able to rotate freely and move up and down. A tensioner roller/sprocket can be fixed on an arm or move up and down vertically in slots in the conveyor sideplates.*

Sprockets / Wearstrip Construction

To ensure a proper interaction between the belt and the sprocket, it is important to position the sprockets at the right height and distance from the wearstrips. The sprocket position is valid for the drive sprockets and idler sprockets.

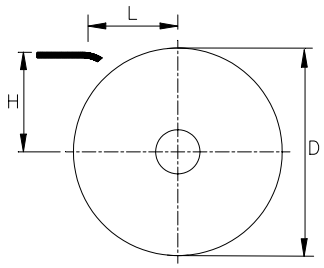


DP: PITCH DIAMETER

Belttype	$H^{-0/+1mm}$ mm	L mm
505-series	(Dp/2) – 6.35	12.7
1255-series	(Dp/2) – 6.35	32.0
1505 / 1506-series	(Dp/2) – 4.95	15.0
1000-series	(Dp/2) – 4.35	25.4
6391 / 6392- series	(Dp/2) – 7.0	50.0
2010-series	(Dp/2) – 8.0	50.8
5998-series	(Dp/2) – 9.1	57.0

Idler Drum Position

Instead of a sprocket, on the idler shaft also a drum/roller can be used. Like drive and idler sprockets, the position of the idler drum is also important. Idlers should be installed with a specific distance between the centerline of the idler and the top of the wearstrips, which depends on the diameter of the idler drum.



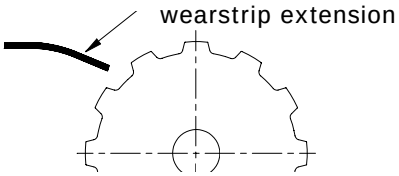
D: Diameter idler/ roller.

H: ½ x D. (Tolerance $H^{-0/+1mm)}$

L: 1 x pitch of belt

Chamfering of Wearstrips

At the idler position we recommend to chamfer or bent down the wearstrips. At this side of the conveyor this is very important in order to assure a troublefree infeed of the belt into the upperpart.



Shafts & Bearings

In all situations stainless steel is recommended for shaft material. Metaloxydes that come from a carbon steel are extremely abrasive and would therefore reduce the wearlife of the conveyor components and affect the cleanability of the conveyor. It is also important to use shafts with a sufficient hardness and a smooth surface. The recommended shaft diameter depends on the conveyor load and its width. We recommend to use a shaft with a hardness of > 25 HRC.

In the food processing environment mostly square shafts being used. Square shafts are being considerd to be more hygienic because of the absence of keys and keyways.

Note: *Maximum deflection of the shaft must not exceed 2 mm. Depending on the load and shaftlength, it can be necessary to use an extra bearing in the middle of the shaft to reduce the shaft deflection*.

SQUARE SHAFTS
- More rigid than round shafts of the same size.
- No keyway preparation is required.
- Larger drive surface results in a better load transfer.
- More hygienic.

ROUND SHAFTS
- More readily available.
- Usually straighter than square shafts.
- Easier to install.
- Shafts are ready to accommodate bearings.

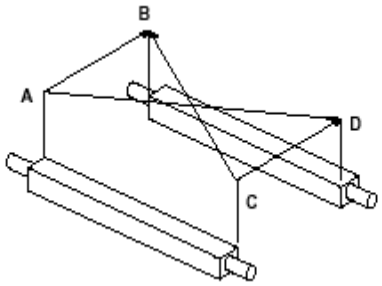
Conveyor Design

Shaft Tolerances

It is important that the tolerance of the shaft meets the specifications of the sprocket, so the sprocket can slide over the shaft at all times. The following shaft specifications are required, depending on the shaft diameter.

Shaft type	Dimension (mm)	Shaft tolerance (mm)	Idler shaft surface finish (µm)
Square	40 x 40	+ 0 / - 0.16	0.8
	90 x 90	+ 0 / - 0.5	1.6
	120 x 120	+ 0 / - 0.5	1.6
Round	< Ø 90	h 9 (ISO)	0.8
	> Ø 90	h 11 (ISO)	1.2

Parallelism



Idler and drive shaft must be (perfectly) parallel to ensure correct belt movement. Badly alligned shafts can cause overloading on one side of the belt, pins comming off and failure after a few weeks of operation.

The picture shows a practical method to check if shafts are parallel.

WITH BOTH SHAFTS HORIZONTAL:
IF AB = CD AND BC = AD
THAN SHAFTS ARE PARALLEL

Bearings

Drive shafts always require bearings. However, idler drums/sprockets can also rotate freely on a static round idler shaft at speeds up to 30 m/min. At higher speeds the use of a shaft with bearings is recommended.

Before selecting bearings, check which chemicals will be present. Also check if dust and/or water are present. Sealed bearings have a better protection against water and other environmental conditions.

Also use bearings with high mechanical and heat resistance for a longer wearlife of the construction. In our product programme we can offer a large number of bearings. See our catalogue MB BEARINGS for more details.

Note: Make sure the edges of the shaft are rounded off to ease assembly and to avoid damage to the rubber parts of the bearing sealing units.

Drum drives

It is possible to use drum drives in combination with a large number of our belts. The following drum drive manufactors are able to provide drum drives *(±∅110 mm and ±∅130 mm*) with interfaces for our 1255 / 1000 / 1500 / 2010 and 5998 belt series.

INTERROLL ***Van der Graaf*** ***BDL*** ***PROCON***

NOTE: *If you require an interface for another type of drum-drive, please contact our Technical Support Department.*

Belt Support Upper Part

In our product programme we offer a large number of belt support parts. Like different wearstrip in different materials and executions.

Parallel Wearstrips

This is the most common used construction in the industry. We recommend this construction due to the easy and cost effective installation and good cleanability.

The **maximum** parallel wearstrip spacing is recommended in table below

Belt type	Upper part (Kg/m2)			Return part
	<50	50 –100	> 100	
505	250 mm	170 mm	85 mm	600 mm
1255	250 mm	170 mm	85 mm	600 mm
1500	250 mm	170 mm	85 mm	600 mm
1000	250 mm	170 mm	85 mm	600 mm
6390	300 mm	200 mm	85 mm	600 mm
2010	300 mm	200 mm	85 mm	600 mm
5998	300 mm	200 mm	85 mm	600 mm
1221	**N.A.**			

Note: *The mentioned dimensions in the table above are based on equally divided loads. In combination with concentrated loads (point) the minimum spacing (85 mm) is always recommended.*

Full Bed Support

We recommend this kind of belt support only in applications where products cause a high impact on the belt. The full bed construction is needed to prevent the belt from being damaged. The construction is only used in the position where the impact is applied to the belt, in the other part of the conveyor the standard construction has to be used.

Wearstrip Material

The best suitable wearstrip material depends on the application and the production environment where it is being used.

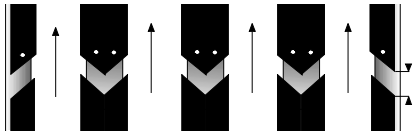
The most common wearstrip material is ***UHMWPE***. This material has an extreme low friction, good dimensional stability and excellent resistance against many chemicals. It reduces noise and avoids blackening of the belt.

The second possible material is ***stainless steel***. We recommend this material in abrasive environments and/or high temperature. Direct contact of stainless steel with white plastic belts can leave grey marks (blackening). We recommend to use a cold rolled quality with a hardness > 25 Rc and a surface finish of minimum 1.6 μm.

Conveyor Design

Wearstrips Sections

On straight sections, with a length of more than 3 metres or for high (40º - 70ºC) application temperatures, we recommend to divide the wearstrip into several sections because of the thermal expansion of the strips. The size of the clearance depends on the expected elongation due to thermal expansion, see drawing.



Clearance

For UHMWPE material the expansion coefficient is 0.2 mm/m/ºC.

A temperature increase of 40ºC would elongate a 2 meter wearstrip with:

40ºC*2mtr*0.2=16 mm

In this case, the gap between the wearstrips should be larger than 16 mm, e.g. 17 – 20 mm.

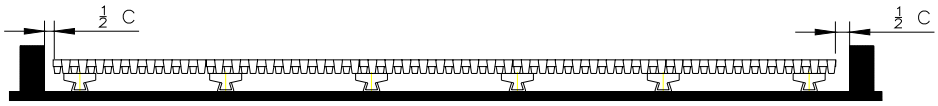
Note: *It is recommended to cut the wearstrips at double 45º angles to provide smooth chain/ belt transfers. Make sure only the infeed side of the wearstrip is fixed to the conveyor frame to avoid bulging of the wearstrips.*

Chamfering of Wearstrips

Wearstrips should always be chamfered at the beginning of the strip where they are fixed. Chamfering reduces the risk of chain-obstruction resulting in a smooth operation.The wearstrips should be chamfered at the sides and at the top.

Belt Guidance

The minimum clearance (C) between the sides of the belt and guides at **<u>maximum operation or cleaning temperature!</u>**



belt width (mm)	C (mm)
< 500	1
500 - 1500	2
1500 - 3000	3
> 3000	5

Note: *Thermal expansion details can be found in chapter 8.1*

Note: *If lugs or bevels guide flex belts, belt guidance at the side of the belt is not necessary.*

Belt Support Return Part

For the return part we recommend to use drums / rollers.

- The drum / roller construction reduces wear on the belt.
- It is a simple construction and has a good accessibility for maintenance and cleaning.

Note: it is important that the drums / rollers are able to rotate freely at all times

ROLLER diameter

Roller type:	505-series (mm)	1255-series (mm)	1500-series (mm)	1000-series (mm)	6390-series (mm)	2010-series (mm)	5998-series (mm)	1221-series (mm)
Idler rollers 	Min. 30	Min. 60	Min. 19	Min. 50	Min. 100	Min. 100	Min. 100	Consult Rexnord
Return rollers 	60-100	60-100	60-100	60-100	50-120	50-120	50-120	Consult Rexnord
Backflex rollers 	Min. 30	Min. 60	Min. 30	Min. 60 RR. Min 100	Min. 100	Min. 100	Min. 100	Consult Rexnord

The recommended roller diameters in the table above are an indication. The width of the conveyor is not taken into account. The diameter of the shaft should be large enough to avoid deflection of the roller. At the same time it is recommended not to exceed the maximum diameter, because the roller friction may be too high to be set in motion by the belt.

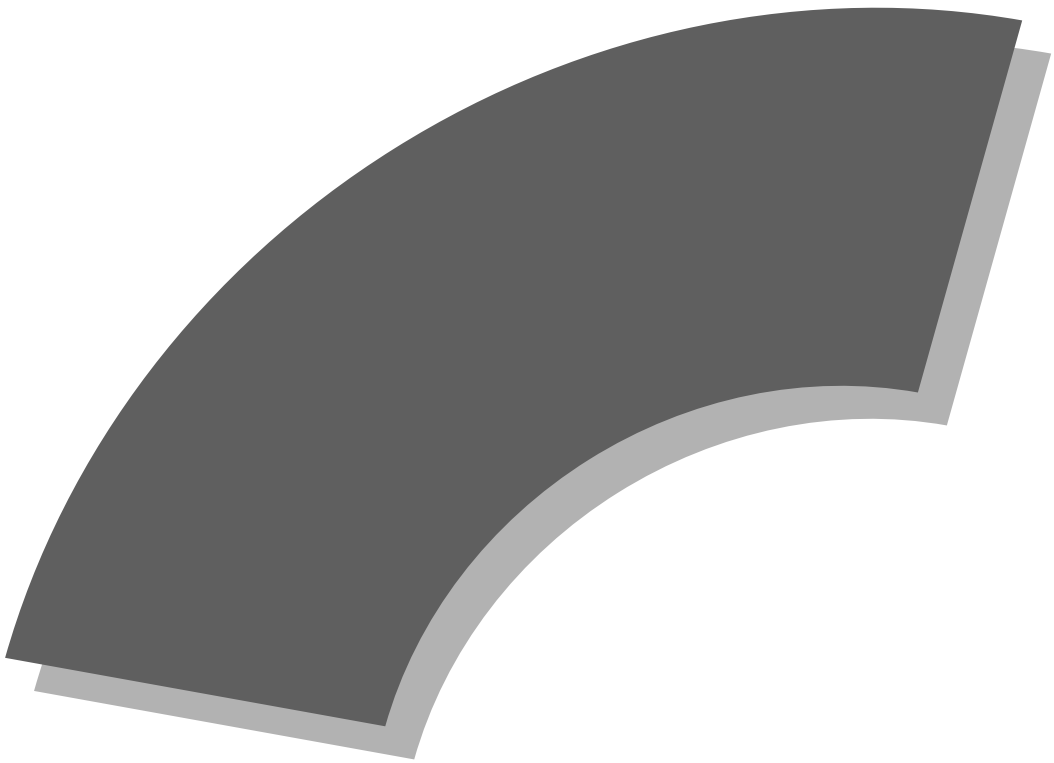
In combination with wide conveyors and elevated temperatures (pasteurizers, blanchers, etc.), metal rollers are recommended. In applications with products, which tend to adhere (e.g. sugar, dirt), frequent checking of the condition of the rollers is advised.

Wearstrip Return

Besides a return support with rollers, also wearstrips can be used in the return part. This provides a smooth operation of the belt. Wearstrips are used in the return part mainly in combination with flighted belts. The maximum spacing of the wearstrips can be found in chapter (3.3.1).

Using wearstrips in the return part there must be a sufficient distance in between the sprockets and the infeed of the wearstrip return part to allow for a proper catenary. This distance must be similar to distance ‘B’ as mentioned in the figure shown in the catenary sag (paragraph 3.2.1). In case of a big variation in the size of the catenary, the use of a roller directly after the drive sprocket is recommended to ensure the 140-degree wrap around the sprocket, as shown in the up mentioned figure (see chapter 3.2).

MCC Sideflexing Belts Engineering

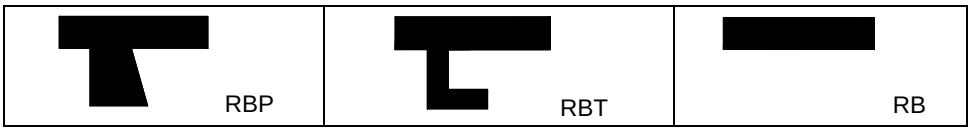


Conveyor Design

Introduction

In a variety of applications sideflexing belts are being used to transport the product through a curve. In this manual we supply general side-flexing engineering information and construction/ design guidelines. Based on our:

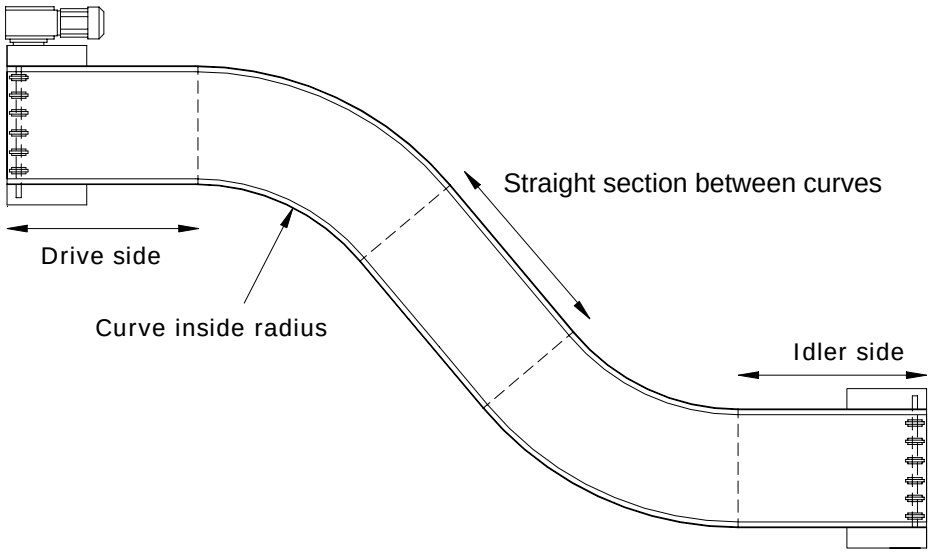
- RBP -> *Radius Belt Positrack*
- *RBT -> Radius Belt Tab*
- *RB -> Radius Belt*



Naturally side-flexing belts can be used also for straight running applications. Check our Modular Belts Engineering Manual for construction and design guidelines.

Lay-out guidelines

The layout guidelines apply to all sideflexing belt series.



Drive side:

- Recommended minimum length with tensioner is 500 mm.
- Recommended minimum length without tensioner is 600 mm.
- Recommended length for centre drive without tensioner is 800mm.

Idler side:

- Recommended minimum length 500mm.

Curve inside radius:

- Minimum curve radius is 2 times the belt width.

Straight section between curves:

- S-bends have a minimum straight section of 1.5 times the belt width.
- Curves in same direction do need a minimum required straight section.

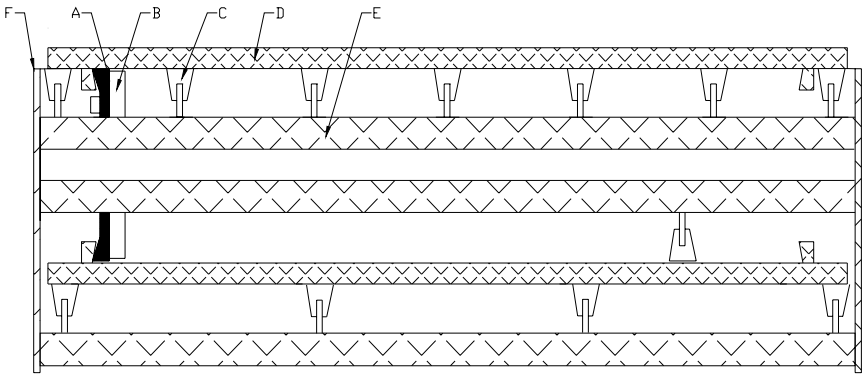
Conveyor Design

CURVE CONSTRUCTION RBP BELTS

RBP belt series can be built using cross bars and wearstrips, similar to straight running conveyor designs.

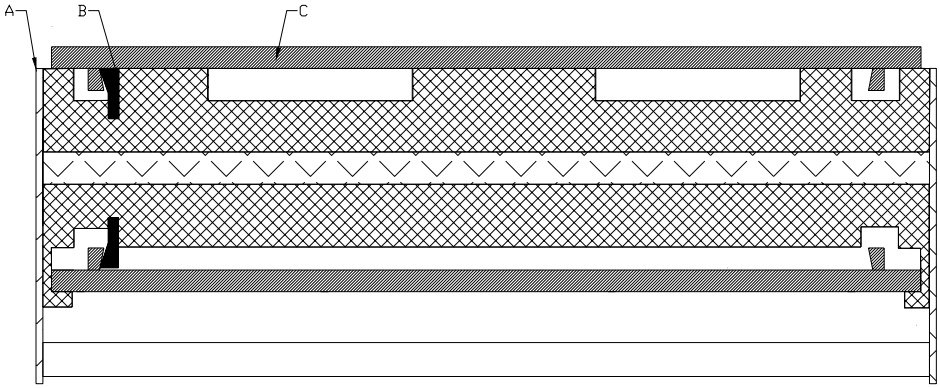
The ***MCC*** RBP guiding profile should be used to guide the belt through the curve. This concept allows an optimum conveyor design with respect to cleanability, hygiene and belt operation. This concept is highly recommended for food processing environments.

OUTSIDE INSIDE



A) Guiding profile
B) Steel support strip
C) Chain guide profile (part 643-Rexnord conveyor components)
D) RBP Sideflexing belt
E) Cross bar
F) Conveyor side frame

For packed food & beverage handling applications machined curve sections can be used. In this section the special guiding strip is integrated. Standard machined or customer made curve sections can be find in our product catalogue.



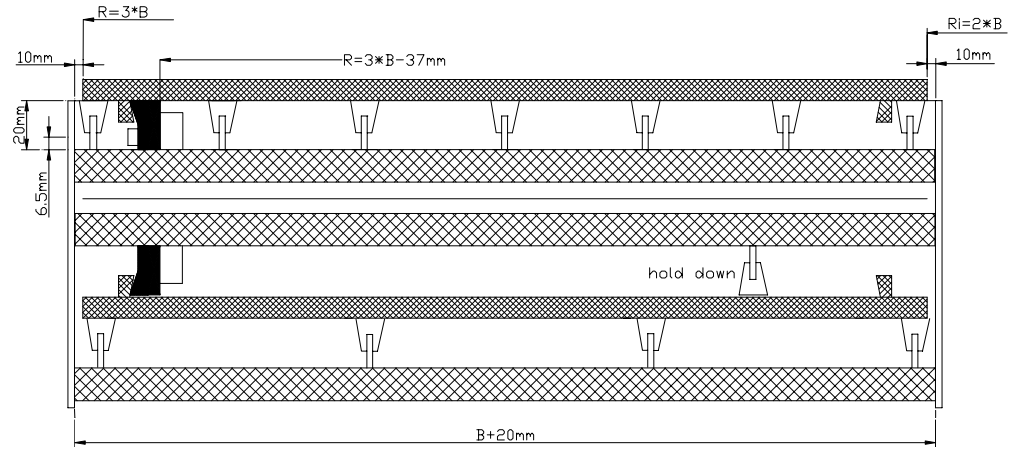
OUTSIDE INSIDE

A) Conveyor frame
B) Machined curve with guiding profile
C) RBP sideflexing belt

RBP guiding lugs on both sides of the belt prevent movement in the curve and also lateral movement in the straight sections. Therefore additional profiles locking the belt from above at the side of the belt are not necessary.

The only way to guide RBP sideflexing belts through the curve is the use of the MCC special machined guiding profile.

Construction dimensions 505 RBP curve



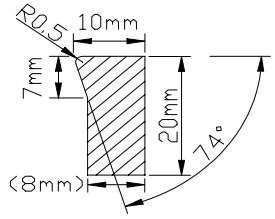
Inside belt radius
Two times the belt width is applicable for our 505 series sideflexing belts. This mean that a 340mm wide belt have an inside belt radius of 680mm.

Spacing between belt and conveyor frame
We recommend a spacing of 10mm between the belt and conveyor frame. In case the operating temperature is higher than ambient, be aware of the thermal expansion of the belt. (0.12mm/m/°C). The belt space between the belt and conveyor frame will be reduced. This can cause additional wear/damage to the belt and production loss.

Position guiding profile
The position of the guiding profile is three times the belt width minus 37mm and outside of the belt positioned . For example:

*WSA 505 RBP KM340 -> (3 * 340) –37 = 983 mm*

Guiding profile dimensions

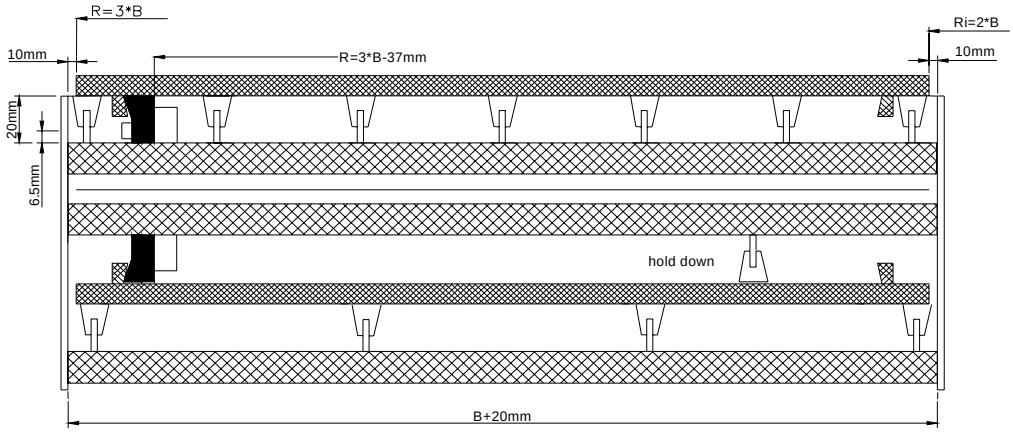


The RBP guiding profile can be easily mounted on the conveyor frame. We recommend to mount this on the conveyor frame at a height of approximately 6.5mm from the bottom.

Belt Support
In the upper part the positrack lugs support the belt in the curve and hold the belt down. In the return section an additional hold down must be applied to prevent the belt lift up in the inside curve.

Conveyor Design

Construction dimensions 1255 RBP curve



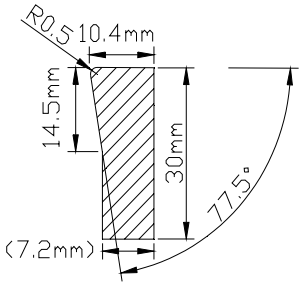
Inside belt radius.
Two times the belt width is applicable for our 1255 series sideflexing belts. This mean that a 510mm wide belt have an inside belt radius of 1020mm.

Spacing between belt and conveyor frame.
We recommend a spacing of 10mm between the belt and conveyor frame. In case the operating temperature is higher than ambient, be aware of the thermal expansion of the belt. (0.15mm/m/°C for PP/PE). The belt space between the belt and conveyor frame will be reduced. This can cause additional wear/damage to the belt and production loss.

Position guiding profile
The position of the guiding profile is three times the belt width minus 37mm and outside of the belt positioned . For example:

*WSA 1255 RBP KM510 -> (3 * 510) –39 = 1491 mm*

Guiding profile dimensions



The RBP guiding profile can be easily mounted on the conveyor frame. We recommend to mount this on the conveyor frame at a height of approximately 7.5mm from the bottom.

Belt Support
In the upper part the positrack lugs support the belt in the curve and hold the belt down. In the return section an additional hold down must be applied to prevent the belt lift up in the inside curve.

Belt support RBP

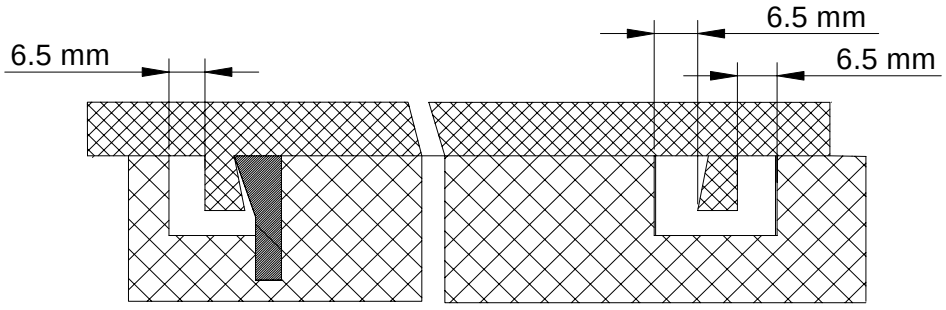
We recommend using the RBP guiding lugs to support the belt in the curve and the straight part of the conveyor.

Curved part
The chamfered positrack lugs hold down the belt in the curve by means of a special machined profile.

Straight part
In the straight sections the belt can be guided using the outside of the positrack guiding lugs. This allows the belt to be lifted easily from the curve and straight section for cleaning and maintenance purposes.

RBP guiding lugs on both sides of the belt prevent movement in the curve and also lateral movement in the straight sections. Therefore additional profiles locking the belt from above at the side of the belt are not necessary.

In curves, the RBP belt should be guided by the positrack lug in the outer radius only. The positrack lugs at the inside radius should **not** be used for guiding in the curves. For recommended clearance of positrack lugs, please see drawings below.



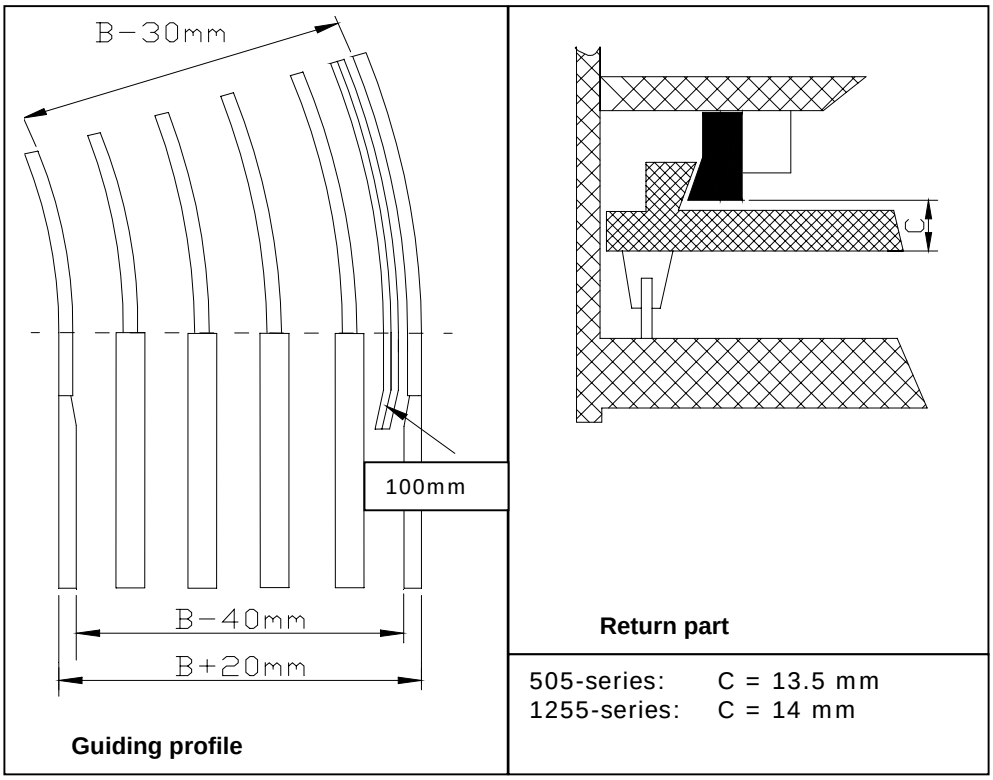
outside inside

The only way to guide sideflexing belts through the curve is the use of the MCC special machined guiding profile. These profiles are available in two different materials.

MCC 3600 (800.00.01)
This *FDA approved* (PETP) profile is recommended to be used for direct food contact applications.

MCC 3500 (800.00.13)
This profile material *(internally lubricated nylon - not FDA approved)* is recommended for applications with high speeds and loads. Not recommended for direct food contact.

Conveyor Design



Guiding profile

Return part

505-series: C = 13.5 mm
1255-series: C = 14 mm

Guiding profile
The guiding profile should extend 100mm into the straight section. Make sure the guiding profile ends are bent inwards to ensure smooth in- and outfeed of the belt.

Support the guiding strip by a metal profile over the complete length.

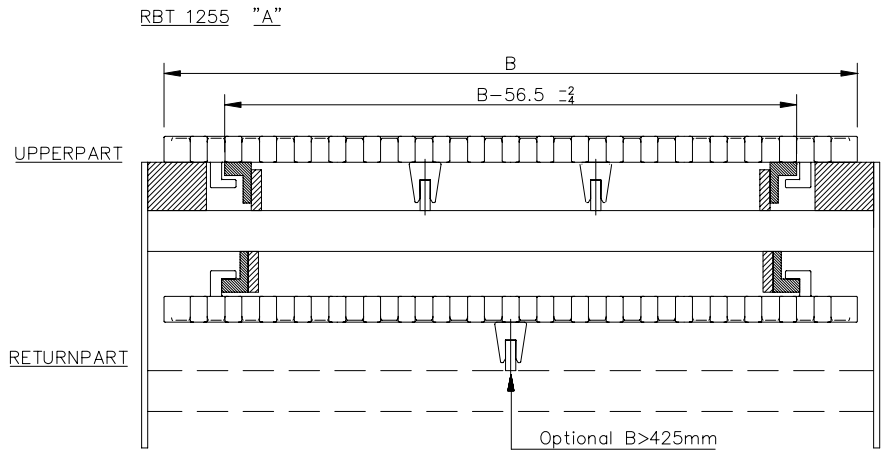
Dimensions for the internal conveyor width

Internal conveyor width	Belt width +20mm
Curve wearstrips	Belt width -30mm
Wearstrips straight section	Belt width -40 mm

Return part
For the return part we recommend to build an open structure returnpart, e.g. parallel wearstrip construction. This way dirt and debris cannot get stuck between the belt and its support, and the returnpart has a more favourable accesibility.

When clearance C is too little, the belt will not run smoothly through the returnpart. When the play is too big, only a small area of the positrack lugs is used for guiding the belt, which results in wear of the lugs

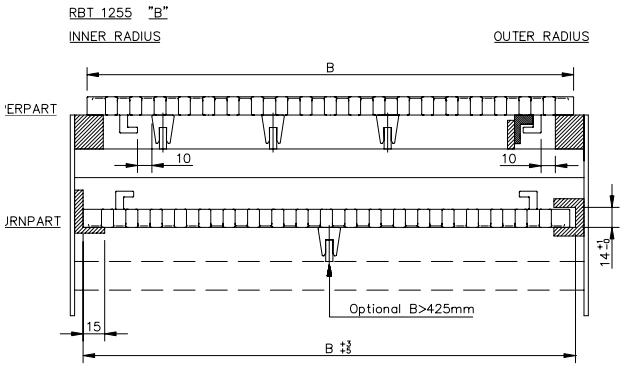
Curve Construction RBT belts



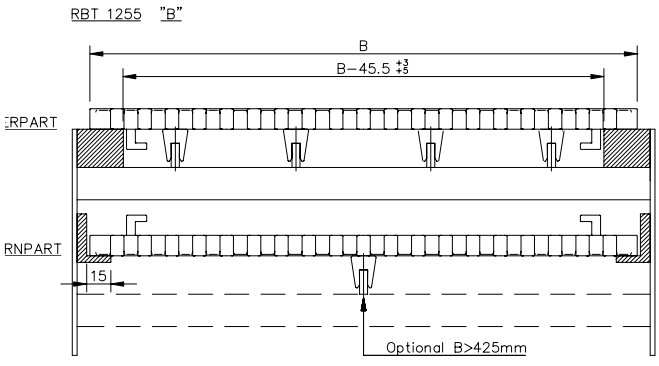
Curve construction for curve and straight sections
The figure above shows the most common way to guide RBT 1255 belts in upper- and the lower part the belt. This construction is suitable for both the curve- and straight sections. Obviously at the drive-end one must take the required catenary construction into account.

The figures below show alternative supports for a RBT guiding in a curve and straight section. This construction allows the belt to lift easily from the curve for cleaning and maintenance purposes.

Curve Section

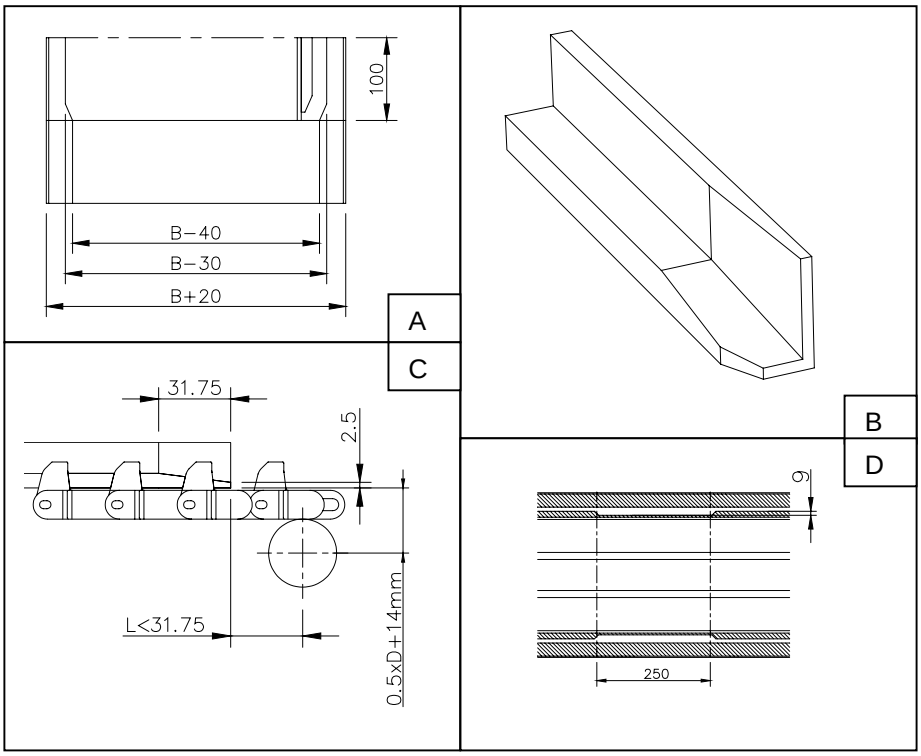


Straight section



Conveyor Design

Belt Support 1255 RBT



Guiding profile upper part- fig A.
The guiding profile should extend 100mm into the straight section. Make sure the guiding profile ends are bent inwards to ensure smooth in- and outfeed of the belt.

Support the guiding strip by a metal profile over the complete length.

Internal conveyor width: belt width +20 mm
Curve wearstrips: belt width –30 mm
Wearstrips straight section: belt width –40 mm

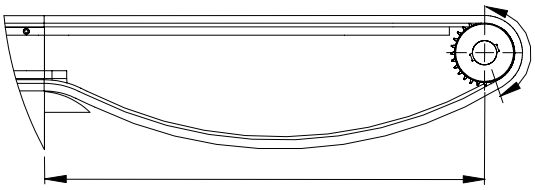
Guiding profile upper part- fig B.
We advise to chamfer the guiding profile, see figure, to ensure smoothly infeed.

Guiding profile upper part- fig C.
We recommend to position the support roller not more than 31.75 mm from the start of the return infeed profile. Also it is important to install the support roller on the right height. We recommend the distance between belt and infeed profile of 2.5 mm.

Guiding profile upper part- fig D.
We recommend the conveyor contruction (in the straight upper section) an area in which the belt can be easily removed. See drawing for contruction details.
We We recommend t

Drive Constructions & Catenary Sag

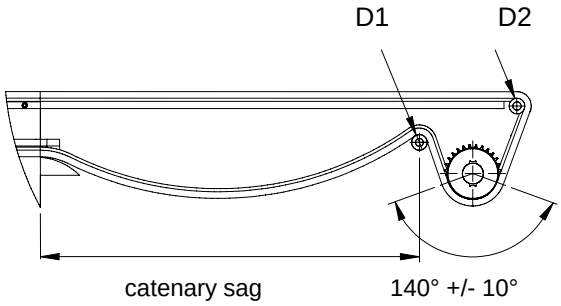
The drive constructions described below are the most compact possibilities, designed to minimise the straight section after the curves. Greater lengths are usually possible.



END DRIVE CONSTRUCTION

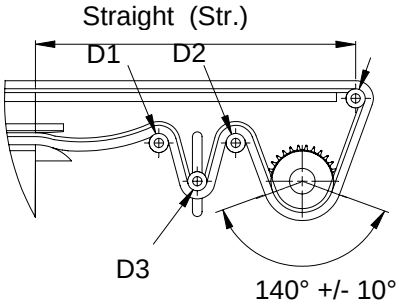
140° +/- 10°

RBP 505	**RBP 1255**
Sag = 600m	Sag = 600m



CENTRE DRIVE WITHOUT TENSIONER

RBP 505	**RBP 1255**
Sag = 600m	Sag = 600m
D1 = 30mm	D1 = 60mm
D2 = 30mm	D2 = 60mm



CENTRE DRIVE WITH TENSIONER

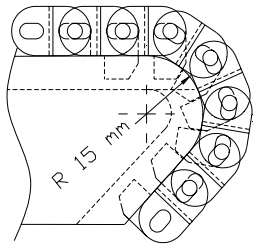
RBP 505	**RBP 1255**
Str. = 500mm	Str. = 500m
D1 = 60mm	D1 = 60mm
D2 = 50mm	D2 = 60mm
D3 = 60mm	D3 = 60mm
Tensioner	**tensioner**
5 kg/mtr	5 kg/mtr
belt width	belt width

Note: *It is recommended to avoid that the catenary sag hangs below the frame. If this can not be avoided, the below edges of the frame should be prepared so the belt cannot catch them.*

Conveyor Design

Nose Bar Profiles (505 & 1255)

Although we prefer rotating rollers, there are situations where nose bars are used at head to tail transfers instead of rotating rollers. In this case the belt turns on a static, nose shaped bar.



Nose bar for 505 series

Roller with bearings
+ Longer life
+ No heating up
+ Less belt tension

Nosebar
+ Stability
+ Less Complex
+ No deflection

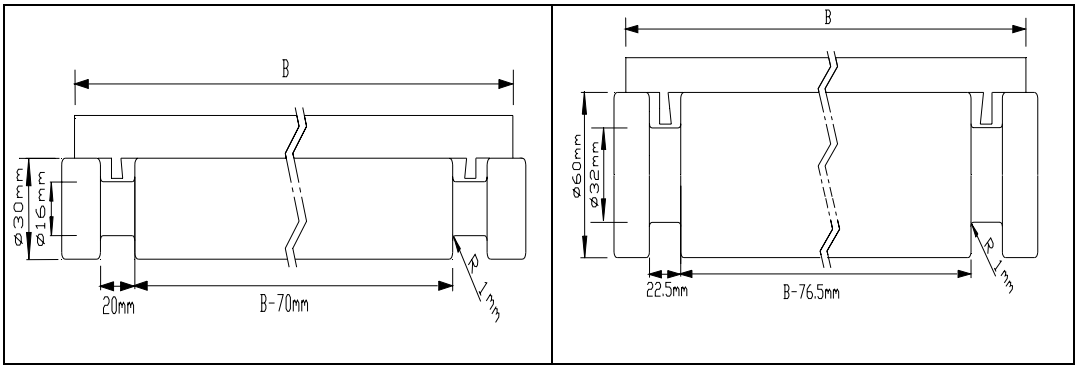
Roller Dimensions & Transfers

Optimum solution for roller construction for flex-belts is using a stainless steel roller. Rollers must have 2 grooves to accommodate the Positrack Lugs or Positrack Tabs and also support the belt at the outsides of the guiding system. See drawing below for roller dimensions

Note: *The 1255 RB belt series do not require any grooves in the rollers.*

The grooves are not used for tracking the belt, therefore sufficient space for the guiding system is important. Using these grooves for tracking the belt can result in lifting the belt lugs or tabs on the outside of the roller and seriously damaging the belt. Make sure all shaft edges are rounded off**.**

505 SERIES **1255 SERIES**

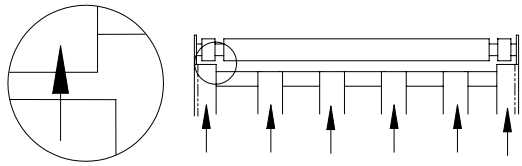
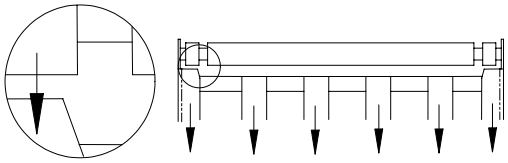


For high loads (>500 N) or wide belts (>510 mm) use bigger shaft diameter and/ or support the shaft in the centre

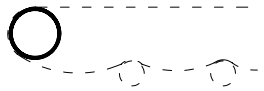
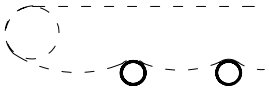
Note: *Rollers must be equipped with bearings for smooth running. For roller material, stainless steel is recommended*

Roller / wearstrip transfer (RBP & RBT)

The construction of the transfers between the wearstrips and the rollers, we refer to the drawing below, to achieve the right tracking of the belt. Only the wearstrips are used for tracking the belt on the rollers, not the roller grooves.

DRIVE SIDE 	The wearstrips should prevent the guiding system from climbing upon the edge of the roller. The wearstrip must guide the belt onto the roller and the lugs or taps into the roller grooves.
IDLER SIDE 	The wearstrips should be chamfered to prevent the lug or tab to catch at the wearstrips.

The minimum radius of the nose bars is similar to the minimum roller diameter as recommended in the table below.

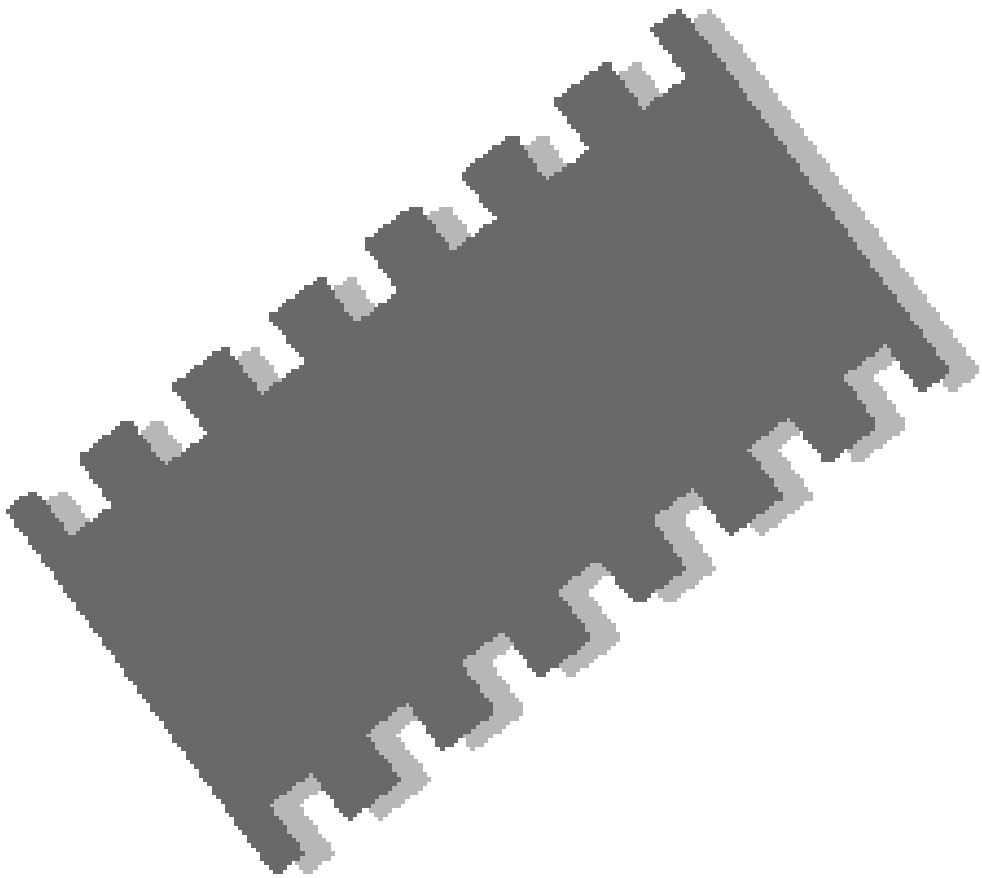
Roller type:	505-series (mm)	1255-series (mm)
IDLER ROLLERS 	Min. 30	Min. 60
RETURN ROLLERS 	60-100	60-100
BACKFLEX ROLLERS 	Min. 30	Min. 60

For the 505-series the minimum diameter is this 30 mm, for the 1255-series the minimum possible diameter is 60 mm.

Polyamide with self-lubricating additives is strongly recommended as nose bar material. This material has a high PV-limit and optimum wear resistance. This is of importance when 505-series flexbelts are operating in dry running lines.

Note: *Make sure the nosebar has grooves to accommodate the guiding system and these grooves should not be used for tracking the belt. The dimensions and positions of the grooves are identical to those in the rollers.*

MCC Inclined & Declined Belts Engineering



Conveyor Design

Introduction

Belts can be used on inclined and declined conveyors. These conveyors are basically constructed in the same way as level (horizontal) conveyors. In order to keep products from sliding down either SuperGrip belts or belts with flights (and sideguards) can be used. For both belt types the construction guidelines are similar and therefore they will be described only once.

There are several ways to build an inclined or declined conveyor. Main differences, besides the orientation (going up or down) are the presence or absence of horizontal infeed and / or outfeed sections.

Below the different situations for inclined and declined conveyors are described. Wearstrip dimensions and spacing, as well as recommended roller diameters can be found in the chapter 3 "straight running conveyors".

Inclined Conveyors

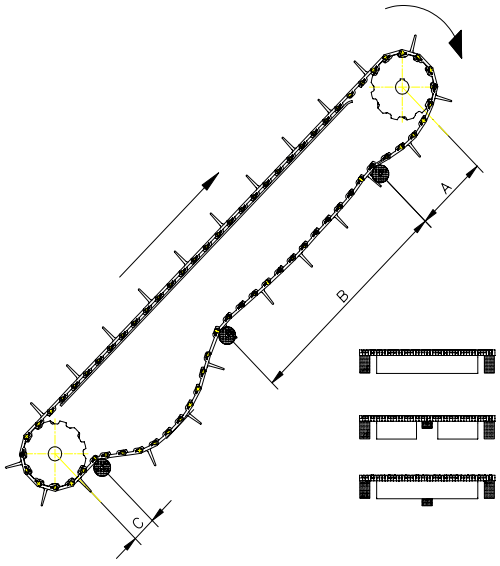
Position of the drive

We strongly recommend the drive on the top-end of the conveyor for inclined conveyors. This automatically results in a correct wrap-angle around the sprocket and a proper catenary sag. It must be avoided "pushing" the belt up the incline.

Classic Inclined Conveyors

The most simple conveyor construction is the set-up without horizontal in- or outfeed. This conveyor is build like a horizontal conveyor. In the return part the belt is guided at the side indents besides the flights or SuperGrip pattern.

In case of flat wearstrips at the side of the belt or steep conveyors (> 20-degrees), the catenary sag will tend to develop at the position of the idler sprocket. Therefore the position of the last support position before the idler sprocket requires extra attention. The general set-up of this type of conveyors can be found in the drawing below.



Cross sections return part

Support using the indent.

Support using centre notch and indent

Support using indent and flight top (this kind of support marks the top of the flight!)

Pitch	Support dimensions		
	A (mm)	B (mm)	C (mm)
15mm	250	600	250
1.0"	250	750	250
> 2.0"	500	1250-1500	500

Conveyor Design

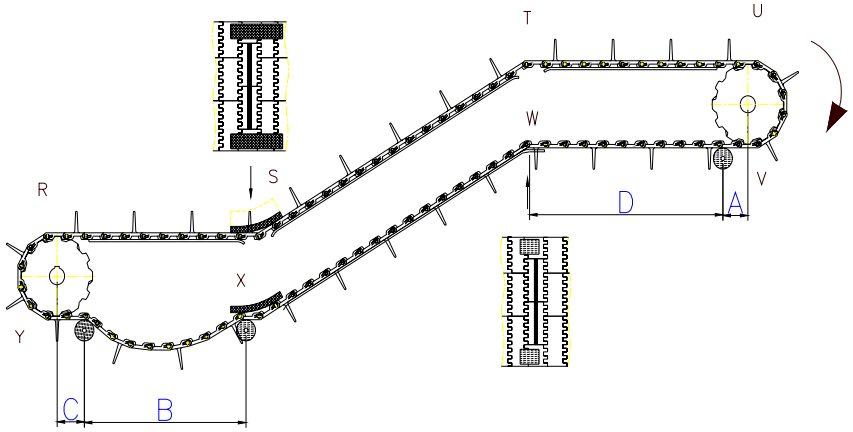
Inclined Conveyors with Horizontal In- and Outfeed

In the **upper part** the belt is supported by wearstrips as in a horizontal conveyor. There is no need to apply a radius in the wearstrips in position "S" (see drawing [II]), a radius does need to be applied in either the hold down shoe or the roller on top of the belt, keeping the belt down in this position. In position "T" a radius is recommended in the support wearstrips as well. If the conveyor is being built with static guides, in case of a flighted belt, these can be used as hold down profiles.

In the **return part** either rollers or a combination of rollers and wearstrips can be used. In section V-W, rollers are recommended. Section W-X can be equipped with sliding wearstrips, this makes the operation of the belt smoother. In position "X" an internal shoe or roller must be used to prevent the belt from moving upwards. In section X-Y rollers are required as well, because in this position the catenary tends to develop, especially in combination with long or steep inclines.

Tightening the belt by hand normally results in a proper catenary. However, with long conveyors an adjustable idler shaft can help in getting the catenary sag right. To help the catenary develop in a single position, distance D should be chosen smaller than B.

Drawing II (inclined conveyor with horizontal in- and outfeed)

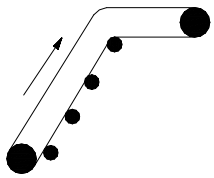
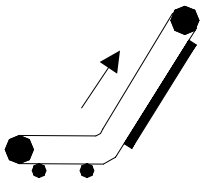


	Support dimensions						
Pitch	**A [mm]**	**B [mm]**	**C [mm]**	**D*1) [mm]**	**Radius S*2) [mm]**	**Radius T [mm]**	**Radius X [mm]**
15mm	250	600	250	<600	35	40	30
1.0"	250	750	250	<750	55	75	50
>2.0"	500	1250	500	<1250	115	140	115

*1) ***Note:*** *It is recommended to choose distance D < distance B to force the catenary sag in position B.*

*2) ***Note:*** *Using a larger radius or diameter will extend the lifetime of the belt surface and optimise the belt performance.*

Conveyor Design

	**Outfeed / No infeed** In case the conveyor has got a horizontal outfeed but no horizontal infeed we strongly recommend using roller supports in section W-X.
	**Infeed / no outfeed** In case there is a horizontal infeed but no horizontal outfeed, guidelines are the same as for conveyors with horizontal in- and outfeed.

Vertical Inclined Conveyors

Conveyors with an incline steeper than 60-degrees, are being referred to as "vertical". These conveyors often require belts with bent or scooped flights. The conveyor set-up is similar as described above. If it is a classic conveyor set-up, without horizontal in- or outfeed, the idler shaft needs to be adjustable to provide the right tension in the return part. The tension of the belt at the position of the idler shaft must be checked regularly.

Declined Conveyors

Also in combination with declined conveyors several executions are found. The return support system is very similar to incline conveyors, however the drive construction can require extra attention.

Position of the Drive

In this type of conveyor the drive can be at the lower or at the upper side of the conveyor. The best position can be determined by calculating the "critical angle" and comparing it with the decline angle of your conveyor. The "critical angle" depends on the friction between the belt and wearstrips in the upper part:

Tan (∠critical) = Static friction between belts and wearstrips

Typical belt material and wearstrip combinations are found below:

	Dry		Wet	
Belt material	**Wearstrip PE**	**Wearstrip SS**	**Wearstrip PE**	**Wearstrip SS**
WSA / BSA	0.18	0.20	0.13	0.15
WHA	0.23	0.30	0.15	0.25
WLA / BLA	0.23	0.28	0.20	0.22

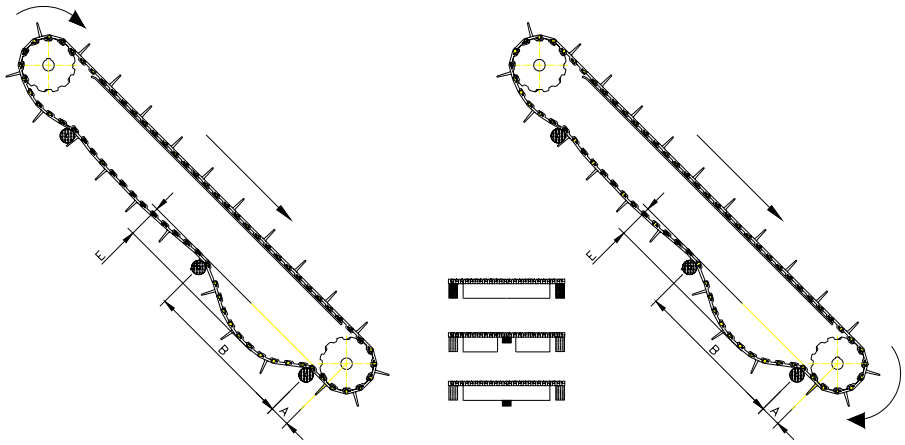
If your angle is steeper than the calculated "critical angle", theoretically the belt will slide down by itself when loaded with product and the drive can best be positioned at the top-end of the conveyor.

Conveyor Design

Classic Decline Conveyor

The set up of this conveyor is similar to the inclined classic conveyor. To create a proper catenary the position of the first and the second roller after the shaft at the lower end are very important. It is recommended to choose distance B at least 3 times as large as distance A. The "vertical" position of the first roller should be higher compared to the position of the second and other rollers. In this type of declined conveyor the use of flat sliding wearstrips in the return part is not recommended! In this conveyor set-up the idler shaft does not need to be adjustable.

Drawing III. (Declined conveyor)



Pitch	Support dimensions		
	A (mm)	B (mm)	E (mm)
15 mm	250	750	50-100
1.0"	250	750	50-100
> 2.0"	500	1500	50-100

When it is necessary to position the drive at the lower end of the conveyor in combination with a steep decline (>20 degrees) the use of a tensioner (gravity roller) is recommended. The gravity take-up ensures sufficient tension in the return part to ensure a proper engagement between the belt and the sprockets.

Declined Conveyors with Horizontal In –and Outfeed

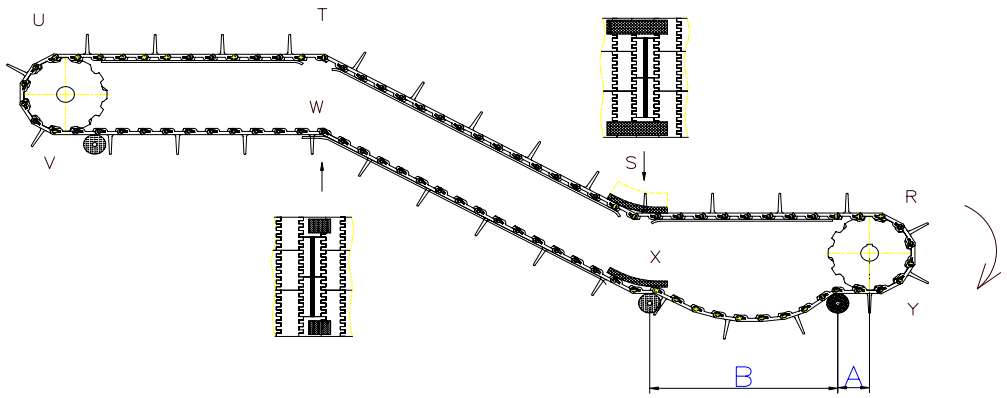
In this conveyor set-up the **drive** can always be positioned at the lower-end of the conveyor. Important is that the horizontal outfeed section is long enough (min. A+B) to accommodate the catenary sag in the return part. If not gravity takes up must be used to provide the correct return part tension.

In the **upper part** at position "S" the belt needs to be held down by means of a radius shoe or roller. If static guides are being used besides the flights these can be used to hold down the belt. The wearstrips support in this position does not require a radius. In position "T" it is recommended to use support wearstrips with a radius.

In the **return part** either rollers or a combination of rollers and sliding wearstrips can be used. In section Y-X rollers should be used to accommodate the catenary sag (see remarks above). In section X-W flat sliding wearstrips can be used, they provide a smoother belt operation compared to rollers in this section. In section W-V, either rollers or flat sliding wearstrips or rollers can be used. When W-V is a long section (>2000mm), rollers are preferred.

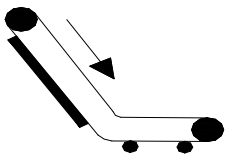
In this conveyor set-up the idler shaft does not need to be adjustable. Tightening the belt by hand will provide a sufficient tension in the return part.

Drawing IV (declined conveyor horizontal in- and outfeed)



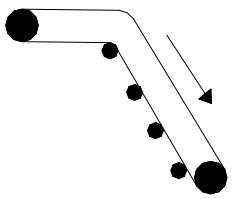
	Conveyor position				
Pitch	**A [mm]**	**B [mm]**	**Radius S*1) [mm]**	**Radius T [mm]**	**Radius X [mm]**
15mm	250	600	35	40	30
1.0"	250	750	55	75	50
>2.0"	500	1250	115	140	115

*1) ***Note:*** *Using a larger radius or diameter will extend the lifetime of the belt surface and optimise the belt performance.*



Outfeed / no infeed

In case the conveyor has got a horizontal outfeed but no horizontal infeed guidelines are the same as for conveyors with horizontal in- and outfeed



Infeed / no outfeed

In case there is a horizontal infeed but no horizontal outfeed, we strongly recommend use a roller support in the return part of section X-W. The guidelines for the set-up of the drive remain the same.

Conveyor Design

Vertical Declined Conveyors

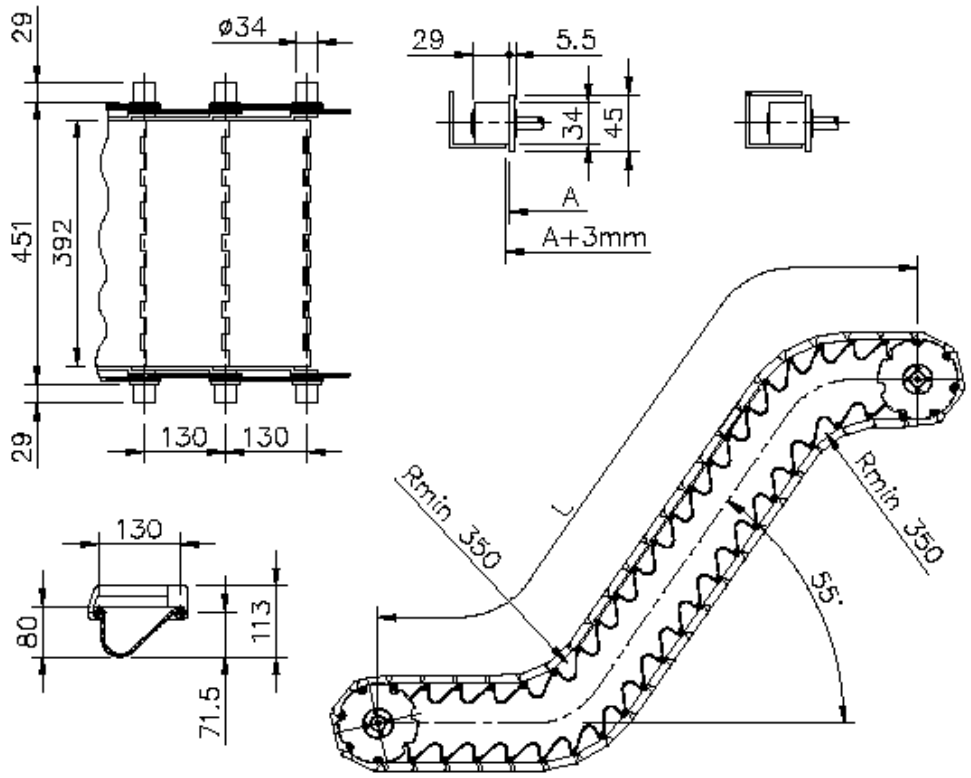
Conveyors with a decline steeper than 60-degrees, are being referred to as "vertical". These conveyors often require belts with bent flights. The recommended position for the drive is the top end of the conveyor. The conveyor set-up of a conveyor like is similar as the conveyors described above. If it is a classic conveyor set-up, without horizontal in- or outfeeds, the idler shaft needs to be adjustable to provide the right tension in the return part. The tension of the belt at the position of the idler shaft must be checked regularly.

Other Incline and Decline Combinations

In case of combinations of inclined and declined sections, or in case of extreme long horizontal in- or outfeeds, please consult our Technical Support department for recommendations for your specific conveyor set-up.

1221 Application

The construction for this application is different than the other applications.



To ensure the right tension in the belt at all times the return shaft needs to be adjustable.

The rollers, which guide the belt, must be running in a special **L** or **U** profile. See drawing above. The U-profile is used in the position where the first incline starts in the upper part and in the same position in the return part to prevent the belt from lifting. In the other part of the construction the L-profile can be used, if desirable. The maximum angle is 55-degrees for this kind of application in combination with a minimum radius of 350 mm of the belt.

Appendix

Cleaning Instructions

Introduction

For each application in each industry daily cleaning is important to achieve good hygiene and prevent or reduce:

- Contamination;
- Decrease of product safety;
- Dec rease of product shelf life;
- Build up of Biofilm.

Nevertheless daily cleaning increases belt life and performance and prevents:

- Additional load on the belt and motor;
- Accelerated wear on the sprocket teeth;
- Jerky running of the conveyor and additional wear;
- Increased wear on the modules and in the belt hinge;
- Rapid wear of the wear strips.

Also a clean work environment motivates a higher personal hygiene and results in a higher productivity and quality. The company objective reflects more in case of a clean work environment.

All *Rexnord MCC* belts are designed for good cleanability. In general no closed or hidden pockets but large open areas and smooth surfaces; rod retention area have no rims or hidden areas but are open and accessible and a general good accessibility for cleaning.

Note: *The main objective is to clean the belt carrying surface and underside of the belt as well as the wearstrips, rollers, sprockets and all other belt contact areas.*

Note: Rexnord MCC sideflexing belts are provided with positracks guiding lugs. This allows the belt to be easily lifted from the curve (and other conveyor sections) for cleaning purposes.

Note: *Inspect conveyors often. Remove spillage or other not wanted residues as soon as they are detected. Use cleaning solutions to clean excessive spillage.*

General guidelines for cleaning solutions

1. Acceptable PH 4-10. Recommended PH 7.
2. Avoid chorine (bleach), ammonia and lodine in all cases.
3. With plastic belts, avoid phosphoric acid (found in many stainless steel cleaners).
4. Refer to the enclosed corrosion resistance guide to determine compatibility or check with your supplier of cleaning agents.

HOW TO CLEAN

Below are typical phases in a food surface-cleaning programme. Each industry must determine which cleaning programme will result in the best hygiene and most economic cleaning operation in their specific situation. *Rexnord MCC* does not specify cleaning instructions. Based on experience, *Rexnord MCC* points out general guidelines. Use these as a supplement for your own cleaning programme.

1. PRE-CLEAN

Remove excess food, dirt or other residues. If large quantities of foreign materials and/or spilled products have accumulated, the conveyor should be cleaned. Minimise the risk of trapped micro organism into the belt surface, therefore do not damage the belt surface by sweeping, wiping with sharp tools. Cleaning tools as soft sweeping-brush and warm water generally used for this purpose.

Recommended water temperature: 55 – 60 Degrees Celsius.
Most common water pressure: 70 - 80 bar.

Recommended pre-clean procedure: (running conveyor)

1. Conveyor Rinse every sprocket and belt contact area separately. (**)
2. Upper part Start rinsing opposite to the running direction of the belt. (*)
3. Return part Rinse opposite to the running direction of the belt. (*)
4. *Make sure that all food, dirt and other residues are removed.*

2. MAIN CLEAN

Removes more firmly adhering food residue, grease or dirt. Usually detergents (foam or gel) are used to emulsify food particles and reduce surface tension. Detergents or other chemical cleaners may be used if they not damage or discolour the belt material. Carefully follow the instructions provided by the detergent supplier to determine proper concentration of solutions, necessary time, and proper, safe use and disposal. In case of doubt, please contact your cleaning agent supplier for recommendations.

Recommended main clean procedure: (stationary or running conveyor)

1. Upper part Apply the detergent opposite to the running direction of the belt. (*)
2. Conveyor Apply the detergent every sprocket and belt contact area separately. (**)

Cleaning Instructions

3. Return part Apply the detergent opposite to the running direction of the belt. (*)
4. Make sure the detergent is covering the belt and each contact area completely.

3. RINSE

Removes detergents and emulsified / dissolved dirt and grease. High-pressure hot water should prove satisfactory.

Recommended water temperature: 55 – 60 Degrees Celsius.
Most common water pressure: 70 - 80 bar.

Recommended rinse procedure: (stationary or running conveyor)
1. Conveyor Rinse every sprocket and belt contact area separately. (**)
2. Upper part Start rinsing opposite to the running direction of the belt. (*)
3. Return part Rinse opposite to the running direction of the belt. (*)
4. *Make sure that all detergent and emulsified / dissolved dirt and grease is removed.*

4. DESINFECT

Further reduction in the number of micro-organisms. To minimise the risk of cross contamination a disinfectant or sanitation agent is used to increase product life and shelf life. Carefully follow the instructions provided by the manufacturer to determine proper concentration of solutions, necessary time, and proper, safe use and disposal. In case of doubt, please contact your supplier for recommendations.

Recommended disinfecting procedure: (running or stationary conveyor)
1. Upper part Start disinfecting opposite to the running direction of the belt. (*)
2. Conveyor Disinfect every sprocket and belt contact area separately. (**)
3. Return part Disinfect opposite to the running direction of the belt. (*)
4. Make sure that the disinfectant covering the belt and contact area completely.

***5.* FINAL RINSE**

Removed traces of disinfectant. Tap water should prove satisfactory.

Recommended water temperature: ambient temperature.
Most common water pressure: tap water pressure

Recommended rinse procedure: (running or stationary conveyor).
1. Conveyor Rinse every sprocket and belt contact area separately. (**)
2. Upper part Start rinsing opposite to the running direction of the belt. (*)
3. Return part Rinse opposite to the running direction of the belt. (*)
4. *Make sure that all disinfectant residues are removed completely.*

***6.* DRY**

Dry the conveyor belt. Dry conveyor belts and surfaces reduce the possibility for micro-organisms to develop on the clean surface. Use disposable materials to minimise recontamination or use the open air.

7. TEST

Frequently swap or contact plate tests must be performed done to make sure the applied cleaning procedures achieve a good hygiene-level.

*) Be aware that the belt must run minimum one cycle.
*) The best possible position for cleaning the hinge eyes is at he idler side of the belt.
**) *Sprockets must be cleaned separately in each possible direction with a running conveyor.*
**) *Other belt contact area (wearstrips, support, frame, etc.) must be also cleaned separately in each possible direction.*

Note: *Belts equipped with Microban must be cleaned normally as belts without. Microban is no substitute for detergents-, disinfectants-, sanitation agents and cleaning.*

Note: *Be aware that temperature changes can influence the mechanical properties and thermal expansion.*

Note: *Be aware that the used cleaning agents are compatible with all materials used in the conveyor. In case of doubt please, contact your supplier for recommendations.*

Note*: Keep water, steam and chemicals away from electrical disconnects motors, photo cells etc.*

Note: *If conveyors are going to sit idle for a long time before start-up, they must be covered with plastic or drop cloth to minimise dirt and debris than can settle into the belt and tracks.*
Note: *Before start-up, remove any tools, fasteners, or other items that may have been left behind. Thoroughly clean belt, wear strip and tracks (carry and return) with air hose or high pressure water spray*.

Fire-, Cleaning- and Safety Hazards

FIRE HAZARD

PLEASE ALWAYS REMEMBER THAT PLASTIC MATERIALS ARE GENERALLY GOING TO BURN WHEN IN CONTACT WITH FLAME.

SPECIFICALLY ACETAL MATERIALS WILL BURN ALSO WHEN IN CONTACT WITH VERY HIGH TEMPERATURE PARTICLES, LIKE HOT WELDING DRIPS OR METAL DEBRIS.

IF ANY FLAME CUTTING, WELDING, ETC. IS DONE NEAR CONVEYORS, PROTECT THE CHAIN. AND OTHER COMPONENTS OR REMOVE THEM AND STORE THEM IN A SAFE LOCATION.

NEVER WELD OR CUT METAL WITH HIGH SPEED TOOLS IN PROXIMITY OF CONVEYORS WHEN ACETAL BELTS ARE ALREADY IN PLACE!

THERMOPLASTICS BURN AND GIVE OFF TOXIC FUMES.

CLEANING HAZARD

ALL CLEANING AGENTS AND LUBRICANTS MUST BE COMPATIBLE WITH THE BELT, WEARSTRIPS AND SPROCKET MATERIALS.

IN CASE OF DOUBT, PLEASE CONTACT YOUR CLEANING- / LUBRICANT MANUFACTURER FOR ASSISTANCE.

IT IS RECOMMENDED THAT STEAM NOT BE HELD ON THE BELT FOR PROLONGED PERIODS.
THE BELT MAY DEFORM OR BECOME PERMANENTLY DAMAGED.

STRONG CAUSTIC AGENTS SHOULD NOT BE USED WITH PLASTIC BELTS.

ALWAYS THOROUGHLY RINSE ALL CLEANING AGENTS COMPLETELY OFF THE BELT AND CONVEYOR FRAME. THIS APPLIES ALSO FOR THE UNDERSIDE OF THE BELT.

SAFETY HAZARD

NEVER WALK ON CONVEYORS. IF IT IS ABSOLUTELY NECESSARY FIRST COVER THE BELT AND TRACKS WITH CLEAN CARDBOARD AND THEN CLEAN-UP AFTERWARDS.

BEFORE WORKING INSIDE CONVEYOR FRAMES OR COMING IN CONTACT WITH CONVEYOR COMPONENTS, ALWAYS MAKE SURE ALL DRIVES ARE LOCKED OUT AND TAGGED.

TO AVOID PERSONAL INJURY, ALL MACHINERY MUST BE TURNED OFF AND LOCKED OUT, PRIOR TO BELT INSTALLATION, INSPECTION, MAINTENANCE AND REMOVAL.

ALLWAYS WEAR SAFETY GLASSES.

DO NOT ATEMPT TO CONNECT OR DISCONNECT THE BELT UNLESS THE BELT CONSTRUCTION IS CLEARLY KNOWN AND UNDERSTOOD.

Responsibility

INFORMATION IN THIS MANUAL IS GIVEN AS HELP AND SERVICE FOR OUR CUSTOMERS. REXNORD DOES NOT GUARANTEE PRECISION, UPDATING AND SPECIFIC APPLICABILITY OF THE INFORMATION AND REJECTS ANY RESPONSIBILITY ON DAMAGES TO PROPERTY OR INJUIRIES TO PERSON(S) DIRECTLY COMING FROM WRONG CONVEYOR DESIGN, INSTALLATION OR IMPROPER USE OF OUR PRODUCTS MADE WITH OR WITHOUT REFERENCE TO THE INFORMATION HEREWITH REPORTED.

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Rexnord FlatTop Europe b.v.
P. O. Box 112
2690 AC 's-Gravenzande
The Netherlands
Phone: +31 (0)174 445 111
Fax: +31 (0)174 445 222
Service: +31 (0)174 445 112
(only for urgent deliveries, 24 hours a day)
flattopeurope@rexnord.com

RMCC Deutschland Kette GmbH
P. O. Box 10
D 35610 Aßlar-Werdorf
Germany
Phone: +49 (0)6443 8314 0
Fax +49 (0)6443 8314 20
rmcc@rexnord.com

Rexnord Marbett S.r.L.
Via delle Costituzione, 45
42015 Correggio (RE)
Italy
Phone: +39 0522 63 9333
Fax: +39 0522 63 7778
info@rexnordmarbett.it

Rexnord France
12, Rue de Lances
94667 Orly Cedex
France
Phone: +33 (0)1 417 34220
Fax: +33 (0)1 417 34229
rex.orly@wanadoo.fr

In United Kingdom:
Phone: 00800 13528867 (toll-free)

www.rexnordflattop.com