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Conveyor Engineering Manual

REGINA CHAIN

PERFORMANCE IN MOTION







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Introduction

Over the years Regina has acquired significant knowledge & experience of the conveyor industry in glass making, can making, industrial & beverage industry.

With our wide product program of FliteTop® chains & Matveyor® belts we can offer the optimal product series & material for your specific application requirements together with the related components (Sprocket, wearstrips, etc.).

Please note that the recommendations in this manual are general recommendations. We have an experienced Application Engineering team that is available to assist you with:

- More detailed recommendations
- Optimal chain / belt & material selection
- General conveyor design
- Conveyor calculation
- Problem solving
- Lubrication reduction / optimization
- Plant surveys
- Etc.

GENERAL MATERIAL AND CONVEYOR INFORMATION

Section I

GENERAL MATERIAL AND CONVEYOR INFORMATION

GENERAL MATERIAL AND CONVEYOR INFORMATION

1.1 FLITETOP® CHAINS & MATVEYOR® ULTOP® BELTS MATERIALS

Carbon Steel (S)
- Through hardened carbon steel
- Surface and core hardness of 43 HRC. Excellent strength and wear resistance
- Not suitable in presence of water

Ferritic Stainless Steel (SS-4)
- Cold rolled ferritic stainless steel
- Good wear, mechanical and corrosion resistance
- For food & beverage applications

Prima Superior Grade Ferritic Stainless Steel (P)
- Superior grade of cold rolled special ferritic stainless steel
- Special Cr-Ni alloy offering very good wear and mechanical properties
- Particularly suitable for high productivity lines (combiners and inliners)

Austenitic Stainless Steel (SS)
- Cr-Ni austenitic cold rolled stainless steel
- It guarantees the best corrosion resistance to withstand chemical attack
- It offers very good wear resistance, due to work hardening and homogeneous chemical structure

White Acetal (WA)
- DuPont™ Delrin® homopolymer acetal resin

Ultra Performance Homopolymer Delrin® (UP)
- DuPont™ Delrin® Ultra Performance special homopolymer acetal resin
- Particularly suitable for applications where low coefficient of friction and contained dusting are needed

Special Delrin® Reinforced with Kevlar® (DK²)
- DuPont™ Delrin® acetal resin reinforced with Kevlar®, able to reach the lowest coefficient of friction with maximum wear resistance
- Thanks to the superior properties of DK², the usage of lubricants can be drastically reduced or even eliminated without losing performance in conveyor applications

Antistatic Acetal Resin (AS)
- Conductive acetal resin particularly suitable for all applications where static charge on the chain must be avoided

Abrasion Resistant Polyamide (AR)
- Reinforced polyamide with excellent wear resistance and low dusting.
- Only for dry running applications
- Suitable for glass manufacturing applications

Polypropylene (P, PP)
- Guarantees the best corrosion resistance to withstand chemical attack and an optimum high temperature resistance

Ultra Low Friction Polyester Resin (ULF)
- Polyester resin that offers good mechanical strength in combination with low coefficient of friction

Ecological Friction Abating Thermoplastic e-F.A.S.T.
- Ultimate dry running homopolymer acetal resin developed combining Regina field expertise with DuPont™
- Lowest coefficient of friction in the Industry without external lubrification
- Achieved stable-full dry running in on-going high-speed PET field tests (optimized for sustainable low friction)

GENERAL MATERIAL AND CONVEYOR INFORMATION

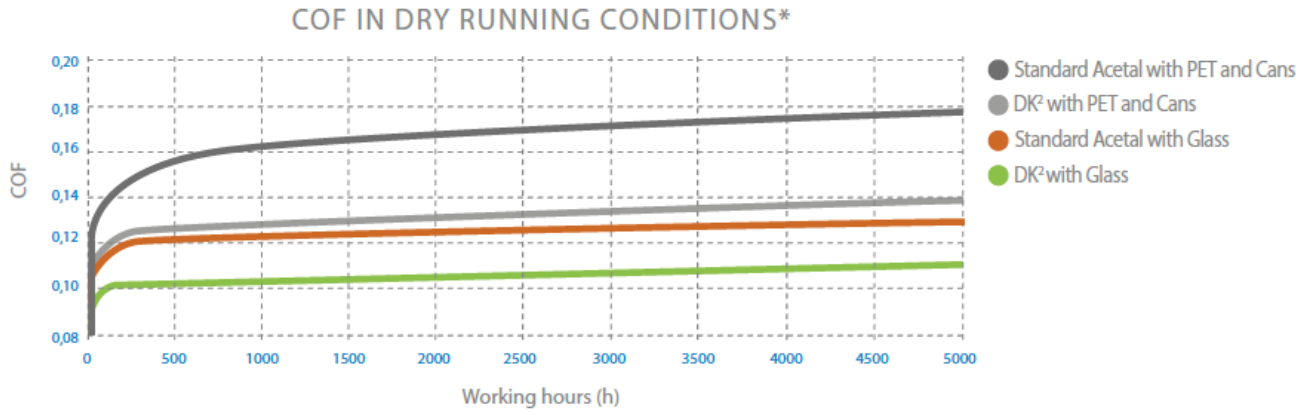
1.1.1 MATERIALS CHARACTERISTICS

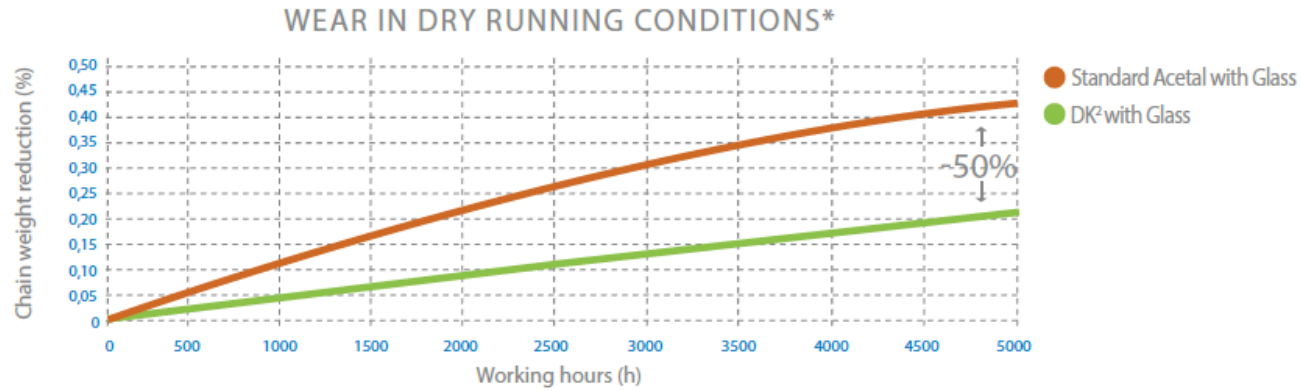
APPLICATION REQUIREMENT	CHAIN MATERIAL RECOMMENDATION								
	METAL			THERMOPLASTIC					
	S	SS	SS-4, Prima	WA, UP	DK² e-F.A.S.T.	AS	AR	P, PP	ULF
Impact loading resistance	x	x	x				x	x	
Wear Resistant	x	x	x	x	x		x		x
Corrosive environment		x	x					x	
Long length / High strength	x	x	x	x	x		x	x	x
Low Friction				x	x				x
Dry running	x				x		x		x
Wet Environments		x	x	x	x			x	x
Low Temperature (to -40 °F / -40 °C)		x	x	x	x		x		
High Temperature (to 220 °F / 104 °C)	x	x	x				x	x	
Ultra Violet resistance	x	x	x				x	x	
Suitability for Class II (nuisance static)	x	x	x			x			
Suitability for Class I (explosive static)		x	x						
Non-magnetic		x		x	x	x	x	x	x
Flame Retardance	x	x	x						
Capability to Convey Hot Products (to +375°F)	x	x	x						
Abrasion resistance	x	x	x				x		
High speed		x	x		x				x

GENERAL MATERIAL AND CONVEYOR INFORMATION

1.1.2 DK² MATERIAL

Developed with DUPONT and on the market for 20 ye DK² is a lubricated acetal resin reinforced with Kevlar® that combines a low coefficient of friction with a very high wear resistance, resulting in longer chain life and running-cost savings.





*source: actual field test in high speed line section

FEATURES

- The lowest coefficient of friction
- 15% to 40% superior wear resistance in dry running conditions
- Superior features vs. all other plastic materials used as conveyor chains and belts in the beverage industry

BENEFITS

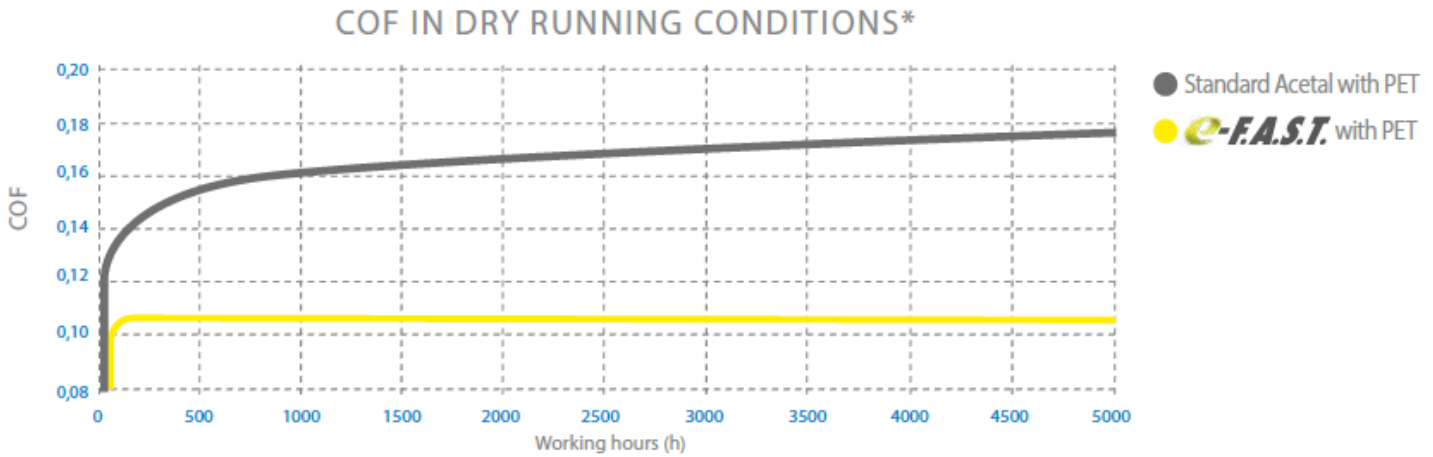
- Minimization/elimination of lubrication in the different sections of the line, according to needs:
  - consequent reduction of the line pollution related to deposit of debris from chain wear coupled with lubricant leftovers
  - reduction of motor power requirement
  - longer center to center distances

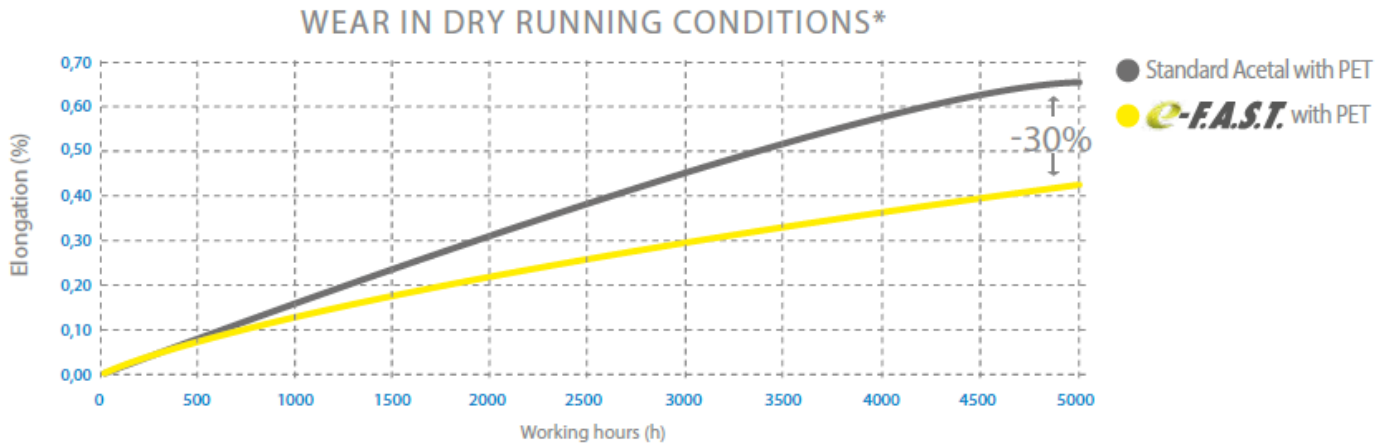
- Chain life increase up to 3 times vs. other plastic material solutions
- Lower running and maintenance costs vs. other plastic material solutions

GENERAL MATERIAL AND CONVEYOR INFORMATION

1.1.3 e-F.A.S.T. MATERIAL

Developed with DUPONT, e-F.A.S.T. the ultimate dry running acetal resin compounded with specific lubricants for PET bottling applications, able to deliver a much lower and constant coefficient of friction and minimal elongation over time in dry running conditions vs. other plastic chains.





*source: actual field test in high speed line section

FEATURES

- Extremely reduced and constant coefficient of friction in high speed dry running bottling applications (PET)
- Maximized wear resistance and low dusting in dry running conditions
- 15-40% superior wear resistance in dry running conditions vs. standard acetal resin
- Bright yellow color

BENEFITS

- Minimization or complete elimination of lubrication
- Reduced chain pull and energy savings
- Increased chain life-time and reduced maintenance costs
- Easy identification of the need of conveyor cleaning

GENERAL MATERIAL AND CONVEYOR INFORMATION

1.2 RUBBER MATERIALS

NBR Rubber (NBR)

- For stainless steel chains
- Nitrile rubber with hardness of 70 ShA guarantees an excellent product grip on inclined/declined conveyors, high wear resistance and superior resistance against sanitizers ordinary used in bottling industries

Thermoplastic Rubber (TPE)

- Special Thermoplastic rubber with hardness from 50 ShA up to 70 ShA and optimum wear resistance that guarantees exceptional product grip in inclined/declined conveyors and elevators/lowerators, extending life without losing elasticity.

Heat Stabilized Thermoplastic Rubber (HS)

- For gripper chain series.
- Special Thermoplastic rubber resistant to high temperatures, with hardness from 45 ShA to 70 ShA, for rinser and cap sterilizer applications.

EPDM Rubber

- For gripper chain series.
- Rubber with hardness of 60 ShA that guarantees an excellent grip and high temperatures resistance

1.3 SPROCKET MATERIALS

Reinforced Polyamide (Molded)

- Made of reinforced polyamide with glass fibers, provide excellent wear resistant properties
- Split sprocket design for easy assembly and disassembly
- Solid sprocket design for best value (OE)
- Excellent corrosion resistance

Polyamide (Machined)

- Provide excellent wear resistant properties
- Split sprocket design for easy assembly and disassembly
- Solid sprocket design for best value (OE)
- Excellent corrosion resistance

Acetal (WA)

- For sprockets 3000 series
- Good corrosion and wear resistant properties
- Available in split or one-piece sprockets

1.4 WEARSTRIP AND CORNER MATERIALS

General Considerations

- It is important to choose the correct material based of the chain material. The goal is to have the lowest possible coefficient of friction and the highest possible wear resistance.
- It is recommended not to run identical plastics together → wear and squeaking
- Metal Vs plastic:
    - Higher hardness → less embedding of abrasive particles
    - Higher resistance to high temperature
    - Higher COF when not lubricated → higher chain pull
    - More difficult to install and remove

Carbon Steel

- Recommended to be cold rolled, with a minimum hardness of 25 HRC and a Surface finish of 0,8 ÷ 1.6 µm Ra (32 ÷ 63 RMS)
- Recommended for dry, non-corrosive, abrasive or high temperature applications

GENERAL MATERIAL AND CONVEYOR INFORMATION

- Dry or oil/grease lubricants with rust inhibitors

Stainless Steel

- Recommended to be cold rolled austenitic, ferritic or martensitic, with a minimum hardness of 25 HRC and a Surface finish of 0,8 ÷ 1,6 µm Ra (32 ÷ 63 RMS)
- Recommended for wet, corrosive, abrasive or high temperature applications
- Austenitic grade offers the best corrosion resistance
- Hardness is more critical than grade for better wear resistance
- Do not use softer annealed grades of austenitic stainless steel. The interaction between the chain material and the soft stainless steel may generate black debris, consistent of entirely of finely divided stainless steel particles. The wearstrips will wear faster than the thermoplastic chain. At some point, the worn/irregular wearstrip surface will also deteriorate the chain wear surface

UHMWPE (Ultra High Molecular Weight Polyethylene)

- For wear strips
- Recommended to be virgin and with minimum molecular weight of ≈ 4 million: recycled UHMWPE contains abrasive particles and will increase chain wear
- Recommended for dry or wet applications, on both straight and side-flexing conveyors
- Recommended surface finish: 3,2 µm Ra (125 RMS)
- Does not absorb moisture and more chemical resistant than nylon
- For high speed, dry running side-flexing applications with high **pV** ($\boldsymbol{p}^{ressure}$ x $\boldsymbol{V}^{elocity}$) limits, use UHMWPE self-lubricating materials

SUPREME-A (Ultra High Molecular Weight Polyethylene)

- For corner tracks
- Virgin material with molecular weight of ≈ 7 million
- Good wear resistance and low coefficient of friction
- Ideal for low/medium speed applications in dry or lubricated conditions

SUPREME-L (Self-Lubricating Ultra High Molecular Weight Polyethylene)

- For static nosebar
- Superior grade with molecular weight of ≈ 7-9 million
- Optimum wear and abrasion resistance, combined with advanced lubricant for excellent sliding properties
- Suitable for medium/high speed applications in dry or reduced lubricated conditions

SUPREME-S (Oil filled Polyamide)

- Particularly indicated for dry running side-flexing chain, due to its high **pV** ($\boldsymbol{p}^{ressure}$ x $\boldsymbol{V}^{elocity}$) limits
- Not recommended in corrosive environments, due to low chemical resistance
- Very limited moisture absorption in wet applications (allow clearance for expansion and movement of fasteners)
- Better than UHMW in slightly abrasive environment, because harder

e-SLIDE (New Special Ultra High Molecular Weight Polyethylene)

- For corner tracks and wear strips
- 9.000.000 g/mol molecular weight
- Best wear resistance and lowest coefficient of friction
- Ideal for medium/high speed applications in dry or lubricated conditions

1.5 CONVEYOR COMPONENTS MATERIALS

Acetal (DG)

- For combs and modular transfer plates
- Good corrosion and wear resistant properties

HDPE (High Density Polyethylene)

- For return rollers (body), product side guides and shoe guide
- Low coefficient of friction and good wear resistance

GENERAL MATERIAL AND CONVEYOR INFORMATION

PP (Polypropylene)

- For combs and guide flanges
- Lightweight material with optimum corrosion and high temperature resistance

TPE (Thermoplastic rubber)

- For return rollers (rubber)

UHMWPE

- For wearstrips

1.6 WORKING TEMPERATURES

The materials used by Regina can be applied in the range of temperatures stated in the follow tables.

	MATERIAL	USED FOR	MIN. TEMPERATURE		MAX. TEMPERATURE			
					DRY ENVIRONMENT		WET ENVIRONMENT	
			°C	°F	°C	°F	°C	°F
METAL	CARBON STEEL (S)	CHAINS	-30	-22	371	700	NR	NR
	FERRITIC STAINLESS STEEL (SS-4, Prima)	CHAINS	-40	-40	427	800	427	800
	AUSTENITIC STAINLESS STEEL (SS)	CHAINS	-40	-40	538	1000	538	1000
PLASTIC	ACETAL RESIN (UP, DLF², e-F.A.S.T.)	CHAINS/BELTS SPORCKETS COMBS	-40	-40	80	176	65	149
	POLYPROPYLENE (P, PP)	CHAINS/BELTS COMPONENTS	0	32	104	220	104	220
	ABRASION RESISTANT POLYAMIDE* (AR)	CHAINS/BELTS	-40	-40	100	212	NR	NR
	POLYESTER RESIN (ULF)	CHAINS/BELTS	4	39	80	176	80	176
	POLYAMIDE (PA, PGF)	SPROCKETS TURNING DISCS	-20	-4	120	248	120	248
	POLYETHYLENE (UHMWPE, SUPREME-A, SUPREME-L, e-SLIDE, HDPE)	CURVES NOSEBAR COMPONENTS	-40	-40	80	176	80	176
	POLYAMIDE (SUPREME-S)	CURVES	-40	-40	100	212	NR	NR

** For dry running only*
NR = Not recommend

RUBBER MATERIAL	COLOR	AVARAGE HARDNESS	MIN. TEMPERATURE		MAX. TEMPERATURE			
					DRY ENVIRONMENT		WET ENVIRONMENT	
		ShA	°C	°F	°C	°F	°C	°F
NBR	BLACK	70	-10	14	110	230	80	176
EPDM	BLACK	60	-30	-22	120	248	120	248
THERMOPLASTIC (TPE)	GREEN/GREY	50-70	-40	-40	80	176	80	176
HEAT STABILIZED THERMOPLASTIC (HS)	GREY	45-70	-30	-22	130	266	130	266

GENERAL MATERIAL AND CONVEYOR INFORMATION

1.7 CHEMICAL RESISTANCE

For applications, where chemicals are involved, it is important to select the optimal material to prevent / minimize chemical degradation. The table below is a general guideline for the performance of FliteTop®, Matveyor® and ULTOP® materials with various chemicals. For chemicals not listed in table below, please contact our Application Engineering department for assistance.

CHEMICAL AGENT	CARBON STEEL (S)	AUSTENITIC STEEL (SS)	FERRITIC STAINLESS STEEL (SS-4, P)	ACETAL RESIN AS, UP, WA, e-F.A.S.T.	POLYPROPYLENE (P, PP)	ABRASION RESISTANT POLYAMIDE (AR)	POLYESTER RESIN (ULF)
ACETIC ACID 5%	-	*	-	-	*	+	*
ACETONE	-	*	*	+	*	*	+
ALCOHOL	*	*	*	*	*	*	*
AMMONIA CONC.	+	*	*	*	*	*	+
AMMONIA WATER SOL.	+	*	*	*	*	*	*
ANILINE 3%	/	/	/	*	*	/	+
AQUA REGIA	-	-	-	-	+	/	/
BEER	+	*	*	*	*	*	*
BENZENE	*	*	*	*	*	*	-
BENZOL	*	*	*	*	*	*	+
BRINE ACID	-	+	-	+	*	+	+
BUTYRIC ACID	*	*	*	-	*	-	/
CARBON TETRACHLORIDE	+	+	+	*	-	*	/
CHLORINE WATER	-	+	+	-	*	-	-
CHOCOLATE	+	*	*	-	+	-	+
CITRIC ACID	-	*	+	+	*	+	+
FORMALDEHYDE	*	*	*	*	*	*	*
FORMIC ACID 10%	-	-	-	-	*	-	+
FRUIT JUICE	-	*	+	*	*	*	*
GASOLINE	*	*	*	*	+	*	+
GRAPE HUSK	-	+	-	-	*	*	+
HYDROCHLORIC ACID 2%	-	-	-	-	*	-	+
HYDROCHLORIC ACID 37%	-	-	-	-	*	-	-
HYDROGEN PEROXIDE	-	*	+	-	*	-	+
IODINE	-	-	-	-	-	-	-
LACTIC ACID	-	*	+	*	*	+	*
MILK	*	*	*	*	*	*	*
MUSTAR	*	*	*	-	+	-	+
NITRIC ACID 5%	-	*	*	-	*	-	+
OIL	*	*	*	*	-	-	*
OIL (VEGETABLE & MINERAL)	*	*	*	*	*	*	*
PARAFFIN	*	*	*	*	*	*	*
PHOSPHORIC ACID ?%	-	*	+	-	*	-	-
SEA WATER	-	+	-	+	*	-	*
SOAP & WATER	+	*	*	*	*	*	*
SODIUM CHLORIDE	-	+	-	*	*	*	*
SODIUM HYDROXIDE 25%	-	*	*	-	*	/	-

GENERAL MATERIAL AND CONVEYOR INFORMATION

CHEMICAL AGENT	CARBON STEEL **(S)**	AUSTENITIC STEEL **(SS)**	FERRITIC STAINLESS STEEL **(SS-4, P)**	ACETAL RESIN AS, UP, WA, DLF2 e-F.A.S.T.	POLYPROPYLENE **(P, PP)**	ABRASION RESISTANT POLYAMIDE **(AR)**	POLYESTER RESIN **(ULF)**
SODIUM HYPOCHLORITE	-	+	-	-	*	*	+
SOFT DRINKS	+	*	*	*	*	*	*
SPIRITS	*	*	*	*	*	*	*
SULPHURIC ACID 40%	-	-	-	-	*	-	+
TOLUENE	/	/	/	+	+	/	+
TURPENTINE	*	*	*	/	*	/	*
VEGETABLE JUICE	+	*	*	*	*	*	*
WATER	-	*	*	*	*	*	*
WINE	*	*	*	*	*	*	*
XYLOL	/	/	/	/	/	/	/

LEGEND:

***= SATISFACTORY**

+=MARGINAL

-=UNSATISFACTORY

/=UNDETERMINED

Data shown in the table was taken from laboratory tests performed on unstrained samples and are merely indicative. Chemical resistance under normal working conditions can depend on various factors, such as stress and temperature, concentration of the chemical agent and duration of its effects.

GENERAL MATERIAL AND CONVEYOR INFORMATION

1.8 FRICTION FACTORS

Below & on the next page you can find the friction factors between the chain & product and chain & wearstrip. Please note these values were obtained through laboratory testing at start conditions. Actual values may be different, depending on environmental conditions, type of container, type of chain, specific lubrication conditions and other field conditions.

1.8.1 CHAIN & PRODUCT

CHAIN / BELT MATERIAL	LUBRICATION	PRODUCT MATERIAL					
		ALUMINIUM CANS	NEW GLASS BOTTLES	RETURNABLE GLASS BOTTLES	PET / PLASTIC	STEEL	PAPER / CARTON
DX²	Dry	0,14	0,11	0,16	0,14	0,15	0,21
	Water	0,12	0,10	0,15	0,13	0,14	-
	Water & Soap	0,11	0,09	0,12	0,12	0,12	-
	Oil	-	-	-	-	0,10	-
e-F.A.S.T.	Dry	-	-	-	0,12	-	-
	Water	-	-	-	0,11	-	-
	Water & Soap	-	-	-	0,10	-	-
	Oil	-	-	-	-	-	-
UP	Dry	0,17	0,13	0,16	0,17	0,18	0,24
	Water	0,14	0,12	0,15	0,15	0,16	-
	Water & Soap	0,12	0,10	0,13	0,13	0,13	-
	Oil	-	-	-	-	0,10	-
WA	Dry	0,19	0,15	0,19	0,20	0,25	0,28
	Water	0,15	0,13	0,16	0,17	0,20	-
	Water & Soap	0,12	0,10	0,14	0,14	0,15	-
	Oil	-	-	-	-	0,10	-
ULF	Dry	0,18	0,15	0,17	0,17	0,20	0,25
	Water	0,14	0,13	0,16	0,15	0,18	-
	Water & Soap	0,12	0,10	0,14	0,13	0,15	-
	Oil	-	-	-	-	0,10	-
AR	Dry	0,20	0,15	0,22	0,22	0,30	0,32
	Water	-	-	-	-	-	-
	Water & Soap	-	-	-	-	-	-
	Oil	-	-	-	-	-	-
PP	Dry	0,26	0,23	0,25	0,24	0,30	0,32
	Water	0,19	0,17	0,20	0,19	0,21	-
	Water & Soap	0,15	0,11	0,15	0,14	0,16	-
	Oil	-	-	-	-	0,10	-
Stainless Steel (SS, SS-4, Prima)	Dry	0,33	0,32	0,34	0,28	0,37	0,40
	Water	0,28	0,30	0,32	0,20	0,32	-
	Water & Soap	0,15	0,15	0,16	0,15	0,16	-
	Oil	-	-	-	-	0,10	-
S	Dry	0,33	0,32	0,34	0,30	0,40	0,40
	Water	-	-	-	-	-	-
	Water & Soap	-	-	-	-	-	-
	Oil	-	-	-	-	0,10	-

Dash = Combination not tested

NOTE: for Dry Lubricants use, please consider the "Water and Soap" condition

These values were obtained through laboratory testing at start conditions. Actual values may be different, depending on environmental conditions, type of container, type of chain, specific lubrication conditions and other field conditions.

GENERAL MATERIAL AND CONVEYOR INFORMATION

1.8.2 CHAIN & WEARSTRIPS

CHAIN / BELT MATERIAL	LUBRICATION	WEAR STRIP MATERIAL			
		UHMWPE	SELF-LUBRICATING UHMWPE	OIL FILLED POLYAMIDE	STEEL / STAINLESS STEEL
D[t]²	Dry	0,18	0,16	0,18	0,20
	Water	0,16	0,15	0,16	0,18
	Water & Soap	0,13	0,13	0,13	0,14
	Oil	0,10	0,10	0,10	0,10
e-F.A.S.T.	Dry	0,16	0,12	0,16	0,18
	Water	0,14	0,11	0,14	0,16
	Water & Soap	0,10	0,08	0,10	0,12
	Oil	-	-	-	-
UP	Dry	0,18	0,16	0,18	0,20
	Water	0,16	0,15	0,16	0,18
	Water & Soap	0,13	0,13	0,13	0,14
	Oil	0,10	0,10	0,10	0,10
WA	Dry	0,20	0,18	0,20	0,25
	Water	0,18	0,17	0,18	0,20
	Water & Soap	0,15	0,15	0,15	0,15
	Oil	0,10	0,10	0,10	0,10
ULF	Dry	0,20	0,18	0,20	0,22
	Water	0,18	0,17	0,18	0,20
	Water & Soap	0,15	0,15	0,15	0,16
	Oil	0,10	0,10	0,10	0,10
AR	Dry	0,25	0,23	0,25	0,30
	Water	-	-	-	-
	Water & Soap	-	-	-	-
	Oil	-	-	-	-
PP	Dry	0,25	0,23	0,25	0,30
	Water	0,21	0,20	0,21	0,23
	Water & Soap	0,15	0,15	0,15	0,15
	Oil	0,10	0,10	0,10	0,10
Stainless Steel (SS, SS-4, Prima)	Dry	0,30	0,28	0,30	0,40
	Water	0,25	0,24	0,25	0,35
	Water & Soap	0,15	0,15	0,15	0,15
	Oil	0,15	0,15	0,15	0,15
S	Dry	0,30	0,28	0,30	0,40
	Water	-	-	-	-
	Water & Soap	-	-	-	-
	Oil	0,15	0,15	0,15	0,15

Dash = Combination not tested

NOTE: for Dry Lubricants use, please consider the "Water and Soap" condition

These values were obtained through laboratory testing at start conditions. Actual values may be different, depending on environmental conditions, type of container, type of chain, specific lubrication conditions and other field condition.

GENERAL MATERIAL AND CONVEYOR INFORMATION

1.9 THERMAL EXPANSION

Materials expand and contract with changing temperatures, especially plastic materials, therefore thermal expansion must be considered in the conveyor design whenever operating temperatures differ from ambient temperature, for example pasteurizer applications or shrink-wrappers. Please note the minimum & maximum working temperatures in paragraph 1.6 The table below shows the coefficient of thermal expansion for different materials, which can be used as a guideline to calculate thermal expansion.

MATERIALS		USED FOR	COEFFICIENTS OF THERMAL EXPANSION	
			in/ft/°F	mm/m/°C
METAL	STEEL (S, SS, SS-4, Prima)	CHAINS	0.00008	0,012
PLASTIC	ACETAL RESIN (UP, DF², e-F.A.S.T., AS, WA,DG)	CHAINS BELTS SPROCKETS COMBS	0.00067 - 0.0008	0,10 - 0,12
	POLYPROPYLENE < 100 °F [38 °C] (PP)	BELTS COMPONENTS	0.0008 - 0.00107	0,12 - 0,16
	POLYPROPYLENE > 100 °F [38 °C] (PP)	BELTS COMPONENTS	0.00093 - 0.00127	0,14 - 0,19
	FIBERGLASS REINFORCED POLYPROPYLENE (P)	CHAINS	0.00017 - 0.0003	0,025 - 0,045
	POLYAMIDE (AR, PA)	CHAINS BELTS SPROCKETS	0.00047 - 0.0006	0,07 - 0,09
	FIBERGLASS REINFORCED POLYAMIDE (PGF)	SPROCKETS TURNING DISCS	0.00013 - 0.0002	0,02 - 0,03
	POLYESTER	CHAINS BELTS	0.00054	0,081
	POLYETHYLENE < 100 °F [38 °C] (UHMWPE, SUPREME-A, SUPREME-L, HDPE, e-SLIDE)	CURVES NOSEBAR COMPONENTS	0.00087 - 0.00113	0,13 - 0,17
	POLYETHYLENE > 100 °F [38 °C] (UHMWPE, SUPREME-A, SUPREME-L, HDPE, e-SLIDE)	CURVES NOSEBAR COMPONENTS	0.00093 - 0.00133	0,14 - 0,20
	POLYAMIDE (SUPREME-S)	CURVES NOSEBAR COMPONENTS	0.00087	0,13

The amount of expansion can be calculated using the following formula:
$\Delta = L1 \times (T2 - T1) \times e$
Where:
Δ = change in dimension, in. (mm)
L1= dimension at starting temperature, ft. (m)
T2 = operating temperature, °F (°C)
T1 = initial temperature, °F (°C)
e = Coefficient of Thermal Expansion, in/ft/°F (mm/m/°C)

GENERAL MATERIAL AND CONVEYOR INFORMATION

1.10 SHAFTING RECOMMENDATIONS

- Both round and square shafts are typically used. While round shafts are more economical, square shafts offer the following advantages:
  - provide a more positive transmission of torque without using keys and keyways
  - provide higher torque and bending resistance, especially for wider belts
  - allow lateral movement of sprockets to accommodate any belt expansion or contraction due to temperature variations (typically in warmers, pasteurizers, coolers & freezers)

- Recommended Material is steel:
  - Carbon steel: high hardness and good finish; used only in non-corrosive environments
  - Stainless steel: good finish and chemical resistance; best for wash down or wet applications
  - Specifications:
    - Hardness: 25 to 30 Rc (the harder, the lower the sprocket bore wear)
    - Surface finish: 63 µ-in (1,6 µm) Ra (the better, the lower the sprocket bore wear)
    - Straightness Tolerance: within 1/32 in. (0.8 mm) over the shaft length
    - Twist Tolerance: maximum of 1/8 in degree/ft (0.4 degree/m) of shaft length
    - TIR Tolerance (Total Indicator Run-out): maximum of 1/32 in. (0.8 mm)

  - Since it can be difficult to obtain shafts over 10 ft long that meet the above specification, two shafts can be coupled together to form the required length
  - In using split shafts, it is important to ensure that the shafts are coupled in time with respect to the sprocket keyway or the flats of the square

- Shaft tolerance recommended for diameter or square dimension is h7.
- Key seats are made according to UNI 6604 (ex ISO 773, DIN6885)
- Imperial round bore drive sprockets are supplied with setscrew. Metric round bore drive sprockets are supplied without setscrew
- Split drive sprockets with round bore allow a tight fit on the shaft with keyway.
- All the other sprockets:
  - Round bore solid sprocket
  - Square bore split sprocket
  - Square bore solid sprocket

  allow a loose fit on the shaft.
- It is not recommended to use stationary idler shafts, because of speed limitations due to **pV** (***p***^{ressure} x ***V***^{elocity}) limits with the sprocket bore. Please check the guidelines in the following table:

SPROCKET MATERIAL	MAX. RECOMMENDED CHAIN SPEED	
	[fpm]	[mpm]
Acetal	0 - 50	0 - 15
UHMWPE	0 - 50	0 - 15
Polyamide, Split	0 - 100	0 - 30
LF Bushing (Idler Wheel)	0 - 300	0 - 90
Bronze Bushing	0 - 500	0 - 150
Bearings	Recommended for Speeds > 300	Recommended for Speeds > 90

1.11 LUBRICATION

Lubrication is recommended in case the application allows lubrication in the conveyor. The main advantage of lubrication is the reduction of friction between chain / belt & wearstrip and chain / belt & product, but lubrication has also other advantages:

- Reducing friction and therefore wear of chain & wearstrips
- Lower chain pull and therefore lower power consumption & possibility of longer conveyors
- Less noise
- Lower backline pressure
- Constant cleaning effect
- Static discharge

Lubrication should contact both the chain and wearstrip

Dry Running
Advantages:

- No lubrication or lubrication system required for simplicity and cost reduction
- Leads to a safer environment with no soap or other lubricants remaining on the floor

Disadvantages:

- Increased wear rate, coefficient of friction, back-line pressure, and noise levels when used with standard materials
- No cleaning effect, therefore frequent conveyor cleaning is required
- Not recommended in application with frequent product spillage

Water
Advantages:

- A simple and cost-effective solution
- Leads to a safer environment with no soap or other lubricants on the floor
- Additional conveyor cleaning (debris, dust, etc.)
- Can be used with most plastic or stainless steel chains / belts
- Electrostatic discharge

Disadvantages:

- Only possible with corrosion resisted materials, therefore not suitable for AR or carbon steel materials
- Not the optimal reduction in friction & backline pressure
- Periodic conveyor cleaning and sanitation is required
- Not recommend with hard water

Water Soluble Lubricants and Soaps
Advantages:

- Optimal reduction of friction / wear
- Additional conveyor cleaning (debris, dust, etc.)
- No special chain / belt material required
- Can be used with most plastic or stainless steel chains
- Electrostatic discharge

Disadvantages:

- Only possible with corrosion resistant materials, therefore not suitable for AR and carbon steel materials
- Higher lubrication cost than dry or water only
- Need for waste water treatment system

Dry Lubrication
Advantages:

- Less lubrication required to achieve the desired reduction of friction
- No lubrication spillage on the floor

Disadvantages:

- Requires frequent and more rigorous cleaning to avoid build-up

GENERAL MATERIAL AND CONVEYOR INFORMATION

- Higher cost compared to dry, water and water & soap lubrication
- Not visible on the floor => slippery

Please find the features of each running method in the table below.

FEATURE	LUBRICATION SYSTEM				
	Dry running	Water	Water & Soap	Dry lubrication	
Chain wear reduction	0	1	3	3	
Product friction reduction	0	1	3	3	
Energy consumption reduction	0	1	3	3	
Cleaner action	0	1	3	1	
Bacteria growth prevention	2	0	3	3	
Not sensitive to water hardness	3	0	1	3	
Avoid deposit release	3	0	3	2	
Avoid drip trays installation	3	0	0	3	
Prevention of electrostatic charge buildup	0	3	3	2	
Powder buildup prevention	0	3	3	2	
Avoid dosing system installation	3	1	0	0	

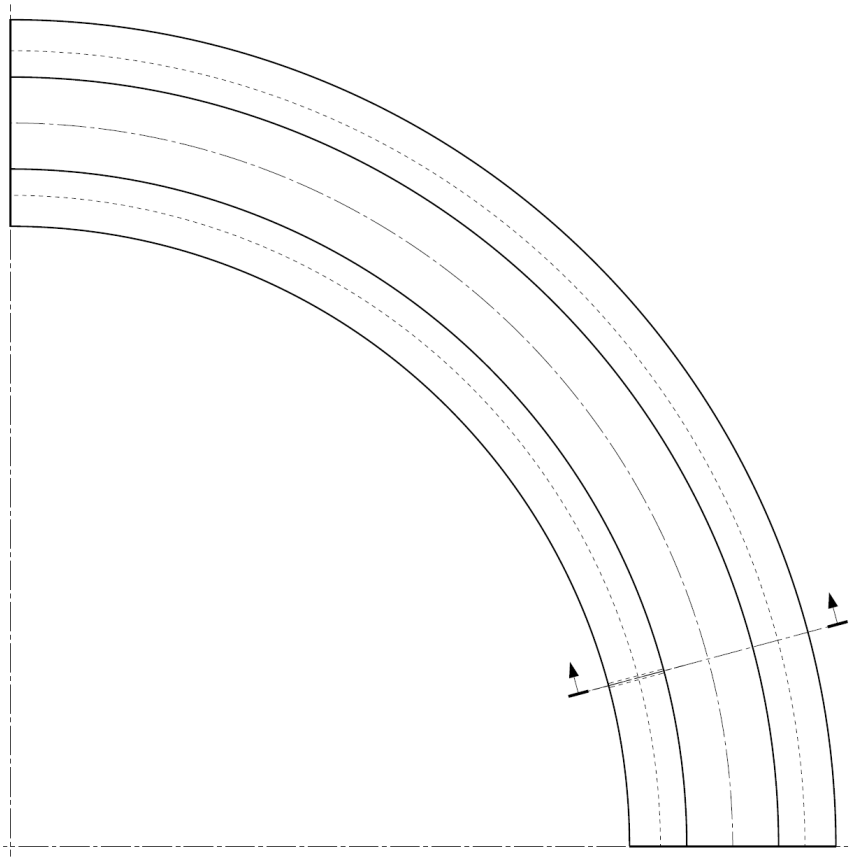
LEGEND
3 = GOOD
2= MEDIUM
1 = NOT ADVISABLE
0 = NOT SUITABLE

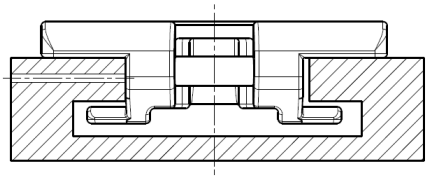
GENERAL MATERIAL AND CONVEYOR INFORMATION

Side-flexing Chain Lubrication

Chains running through a curve experience a higher **pV** (***p***^{ressure} x ***V***^{elocity}) compared to straight running chains. This leads to increased wear of the chain & wearstrip and noise levels

- An option is to use self-lubricating curve materials such as e-SLIDE or SUPREME-S (Oil filled polyamide)
- Another option is to use selective lubrication. Oil or grease is applied with the use of grease/oil fittings and channels at the beginning of the curve to the inside corner track (see picture below)
- Metal side-flexing chains should ALWAYS be lubricated in the corners





Chains factory Lubrication

- Carbon steel one-piece chains are supplied with light lubricant rust preventative to avoid corrosion during shipping and storage.
- Stainless steel one-piece chains are supplied dry from the factory.
- Both chains can be run dry; however, lubrication will greatly increase their wear life and help reduce noise
- Carbon steel base chain installed on two-piece chains is supplied with light lubricant rust preventative to avoid corrosion during shipping and storage. Recommended to be lubricated when installed but must be re-lubricated when necessary
- Stainless steel base chains installed on two-piece chains are supplied with high performance lube suitable for the food industry (USDA H1 approved).
- Stainless steel base chains can be run dry; however, lubrication is recommended in order to increase their wear life and to reduce -noise

GENERAL MATERIAL AND CONVEYOR INFORMATION

1.12 ENVIRONMENTAL CONSIDERATIONS

It is important to take into consideration what type of an environment the chain and wearstrip will be operating in when selecting materials. If not properly accounted for, certain environments can cause significant problems, like wear & degradation of chain or belt, wearstrips & other components.

Abrasive Applications

- Abrasive substances such as dirt, sand, broken glass or metal particles increase the wear of the chain, wearstrip & other components
- In these circumstances it is recommended to use wear resistant material for chain / belt, wearstrips & other components
- Minimize the amount of accumulation and backline pressure on the chain to limit product damage
- Frequent conveyor cleaning is required
- Steel materials or AR material are mostly indicated

Corrosive Applications

- Some chemicals may degrade certain plastic & steel chains / belts, wearstrips and other components resulting in reduced strength and increased wear, elongation & brittleness
- Refer to the Materials Chemical Resistance Table (Section 1.7) to determine if the chain and wearstrip materials are compatible with chemicals or cleaning agents being used on the conveyor (In case not available, please check with chemical or cleaning agent supplier)

Dry Applications

- Running without lubrication requires special attention to product backline pressure, conveyor cleanliness and conveyor pulsations.
- It is recommended to use Regina DK² and e-F.A.S.T. materials in dry applications

High Temperature Applications

- The recommended minimum and maximum operating temperatures for materials should not be exceeded as this will damage the material. Refer to the Materials Working Temperatures Table in Section 1.6
- In high temperature applications such as pasteurizers, expansion and contraction of the chain and wearstrip material must be accounted
- High temperature reduces the max. working load of the chain / belt

Impact Loading Applications

- Steel materials or AR material are ideal for impact loading applications
- A solid carry way bed is recommended in impact loading areas to support the chain or belt

High Speed Applications

- The critical aspect of the conveyor is the curve sections. The chain or curve may become damaged due to the heat generated from the high speed and/or load which exceeds **pV** (***p***^{ressure} x ***V***^{elocity}) limit
- Refer to the Side-flexing Chain Lubrication in Section 1.11 for recommendations
- High speed applications can also increase the chordal action. Special attention must be paid to having correct catenary sag, return roller diameter, and return roller spacing

Long Length Conveyors / Pulsation Applications

- Surging on long conveyors can be caused by a condition known as “slip-stick”. Slip-stick results in a jerking chain motion which can create product stability problems and also result in premature chain elongation
- A stiffer belt will be able to develop the required belt tension to overcome slip-stick with less elongation
- A lighter weight belt will have a reduced slip-stick effect since it will not have as much friction force to overcome
- Reducing oscillation in the return way with correct return roller diameter and spacing can reduce the slip-stick effect
- Refer to Advisable Conveyor Specifications Table in Section II-a for recommended maximum allowable conveyor length

GENERAL MATERIAL AND CONVEYOR INFORMATION

Static Environment Applications

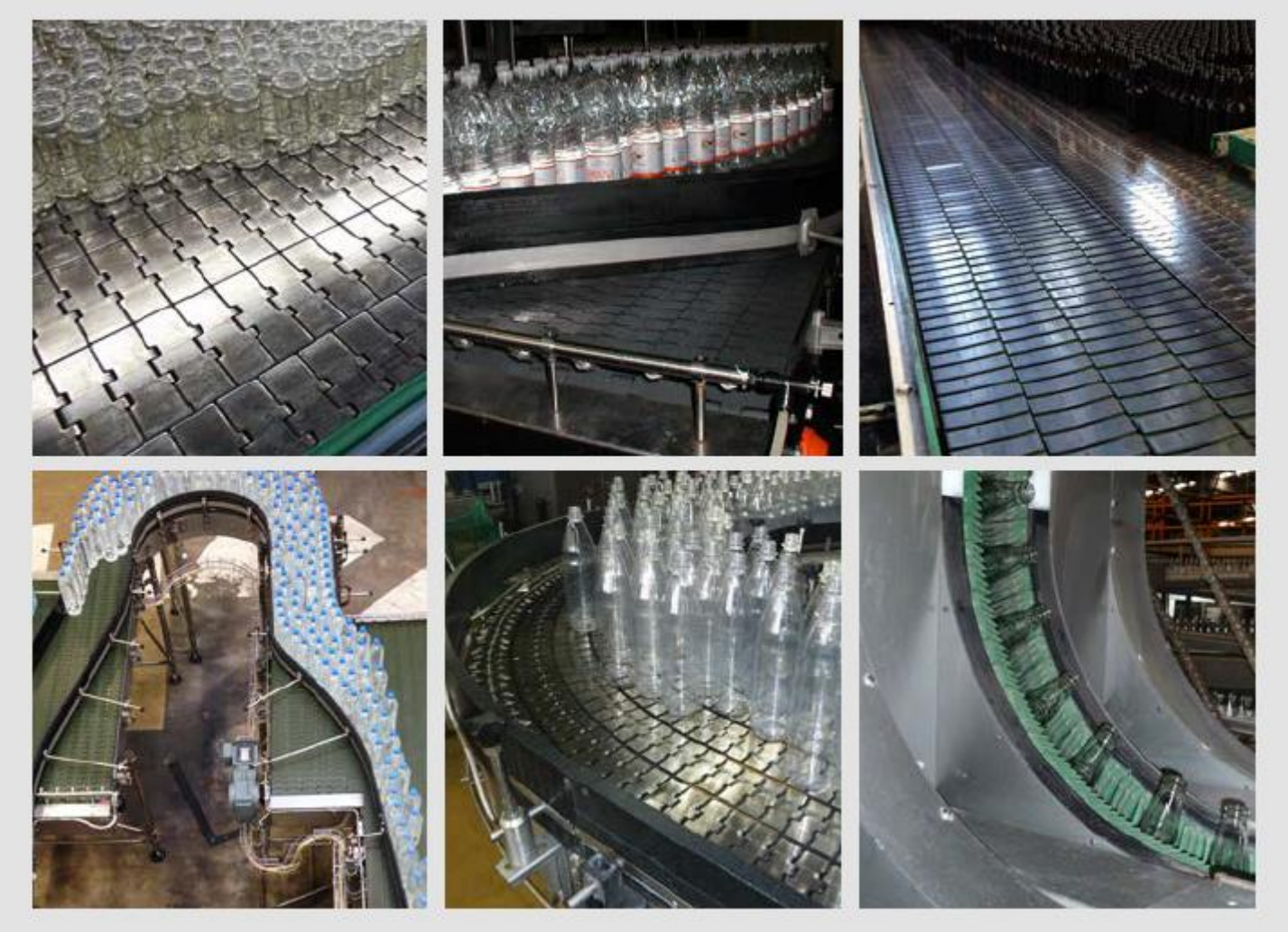
- Under certain conditions the chain or belt can build up a static charge
- Static environments are classified as:
  - Class I: Static spark causes explosion - stainless steel chains are recommended
  - Class II: Static spark is a nuisance charge - low charge will provide slight shock or possible circuit damage

- Grounding is crucial for the system to remove static charges
- Water or water & soap lubrication helps removing static charges in the conveyor

GENERAL MATERIAL AND CONVEYOR INFORMATION

Section II

FliteTop® CHAINS



2.1 CHAIN SELECTION AND APPLICATIONS

Please find below general recommendations for standard food, beverage & industrial applications:

FOOD / BEVERAGE / BOTTLING APPLICATIONS: CANS (2-3 PIECES)

Conveyed product	Steel Chains					Plastic Chains					Special Chains			
	Carbon Steel (S)	Ferritic Stainless Steel (SS-4,P)	Austenitic Stainless Steel (SS)	PHD Series	Rubberized Series (NBR)	Acetal (UP)	DF2	Abrasion Resistant (AR)	Polypropylene (P)	HFX Rubberized Series	Two Piece	Gripper	LBP	Biplanar
Depalletizer						X	X							
Inliner / Combiner						X	X							
Mass Conveyor						X	X							
Accumulation Table						X	X							
Sterilizer / Rinser / Elevator / Lowerator												X		
Infeed Packaging Machines						X	X							
Packaging Machines						X	X							
Packaged Products Convey						X	X			X	X		X	
Inclined Conveyors										X				

FOOD / BEVERAGE / BOTTLING APPLICATIONS: PET BOTTLES

Conveyed product	Steel Chains					Plastic Chains					Special Chains			
	Carbon Steel (S)	Ferritic Stainless Steel (SS-4,P)	Austenitic Stainless Steel (SS)	PHD Series	Rubberized Series (NBR)	Acetal (UP)	DF2 e-F.A.S.T.	Abrasion Resistant (AR)	Polypropylene (P)	HFX Rubberized Series	Two Piece	Gripper	LBP	Biplanar
Inliner / Combiner						X	X							
Mass Conveyor						X	X							
Accumulation Table						X	X							
Sterilizer / Rinser / Elevator / Lowerator												X		
Infeed Packaging Machines						X	X							
Packaging Machines						X	X							
Packaged Products Convey						X	X			X	X		X	
Inclined Conveyors										X				

FOOD / BEVERAGE / BOTTLING APPLICATIONS: GLASS BOTTLES

Conveyed product	Steel Chains					Plastic Chains					Special Chains			
	Carbon Steel (S)	Ferritic Stainless Steel (SS-4,P)	Austenitic Stainless Steel (SS)	PHD Series	Rubberized Series (NBR)	Acetal (UP)	DLF2	Abrasion Resistant (AR)	Polypropylene (P)	HFX Rubberized Series	Two Piece	Gripper	LBP	Biplanar
Depalletizer		X				X	X							
Inliner / Combiner		X		X		X	X							
Mass Conveyor		X		X		X	X							
Accumulation Table		X				X	X							
Sterilizer / Rinser / Elevator / Lowerator												X		
Infeed Packaging Machines		X		X		X	X							
Packaging Machines		X		X		X	X							
Packaged Products Convey		X		X		X	X				X		X	
Inclined Conveyors					X					X				

GLASS MFG: GLASS BOTTLES

Conveyed product	Steel Chains					Plastic Chains					Special Chains			
	Carbon Steel (S)	Ferritic Stainless Steel (SS-4,P)	Austenitic Stainless Steel (SS)	PHD Series	Rubberized Series (NBR)	Acetal (UP)	DLF2	Abrasion Resistant (AR)	Polypropylene (P)	HFX Rubberized Series	Two Piece	Gripper	LBP	Biplanar
Inliner / Combiner	X	X	X	X			X	X						
Mass Conveyor	X	X	X	X			X	X						
Accumulation Table	x	X	X	X			X	X						
Palletizer	X	X	X	X			X	X						
Omega / Blowing Machines												X		

SPECIAL APPLICATIONS

Conveyed product on conveyor lines	Steel Chains					Plastic Chains					Special Chains			
	Carbon Steel (S)	Ferritic Stainless Steel (SS-4,P)	Austenitic Stainless Steel (SS)	PHD Series	Rubberized Series (NBR)	Acetal (UP)	DLF2	Abrasion Resistant (AR)	Polypropylene (P)	HFX Rubberized Series	Two Piece	Gripper	LBP	Biplanar
AUTOMOTIVE/MECHANICAL IND.	X	X		X			X	X			X			
CHEMICAL, DETERGENTS			X			X			X					
PHARMACEUTICAL, COSMETICS			X			X			X					
DAIRY IND.														X

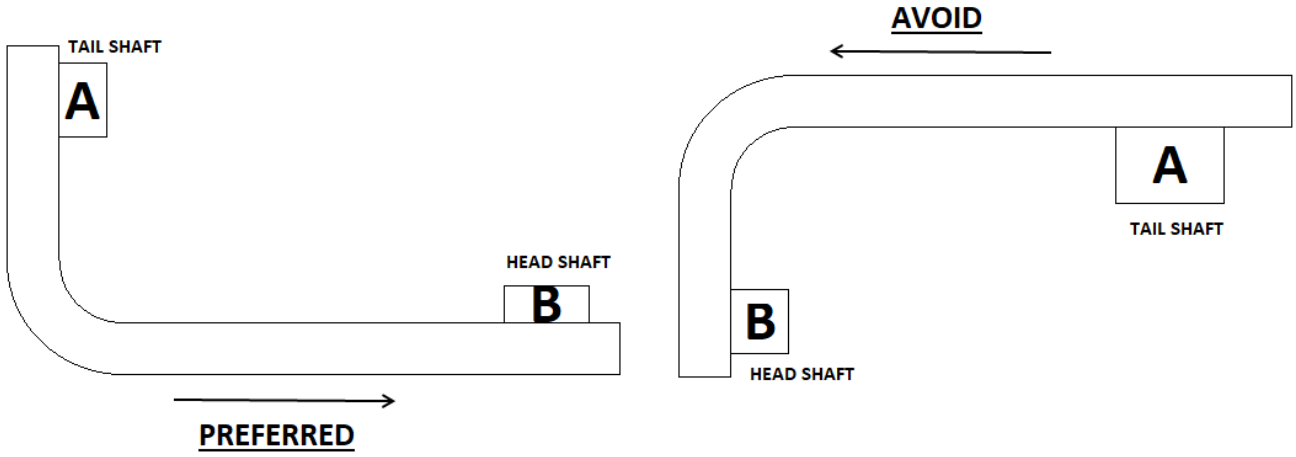
2.2 CONVEYOR DESIGN

Layout considerations
The most convenient way to convey products from A to B is in a straight line. Of course, this is not always possible, due to flow processes and obstructions in the plant. In these cases, it is necessary to consider either a sideflexing conveyor or, in case of 90° transfers, dead plates or ATM-transfers.

Sideflexing conveyors
Sideflexing chains have the intention to lift out of the curve due to a momentum generated by the interaction between chain & curve, therefore a retention system is required to guide the chain or belt:

	TAB	Bevel	Magnetic	Low Pin
Retention	High	Low	Medium	Medium
Ease of Maintenance	Low: cannot be lifted out of tracks	High: can be lifted out of straight tracks	High: can be lifted out of straight and corner tracks	High: can be lifted out of straight and corner tracks
Cost of curves	Low	Low	High	Low
Applications	High Speed Beverage lines (positive retention) Inclined/declined conveyors (TAB holds down chain)	Dairy & Glass MFG lines (low speed & cleaning needs)	High Speed Beverage lines (positive retention)	Medium Speed Beverage lines (positive retention)

The following factors should be considered:
- Minimize the number of curves
- Additional lubrication in the curves and/or special curve materials (Self-lubricating UHMWPE, Oil filled polyamide etc.) are recommended for high speed / load applications
- The straight section between the curve & drive should be at least 18” (457 mm) to allow proper catenary sag. The straight section at the idler should be at least 12” (305 mm).
- Curve sections should be positioned away for the drive section, resulting in lower chain tension and **pV** (***p***^{ressure} x ***V***^{elocity}) limit, therefore increasing chain & curve lifetime



Incline/Decline conveyors

General rules of thumb when designing incline or decline conveyors are as follows:

- Chain should not be pushed, but pulled through the conveyor
  - Catenary sag should be located close after the drive
  - The drive should be located at the end of the conveyor – at the top for inclined & bottom for declined conveyors
  - Max recommended ramp angles for chains / belts with rubberized surface:

Conveyed Product	Max Ramp Angle
Paperboard boxes	30°
6 pack / 1.5 liter PET bottles in heat-shrink film	20°
6 pack / PET bottles in heat-shrink film on paperboard tray	22°
Wax paperboard	25°
Aluminum cans in heat-shrink film on paperboard tray	22°

  - Flat top chains may be used for loose containers on mild inclines/declines with the following max recommended ramp angles:

Chain Type	Max Ramp Angle	
	Lubricated	Dry Running
Steel Chains	4°	8°
Plastic Chains	2.5°	4.5°

Note: laboratory test values - Actual in/de-cline angles in standard working conditions may vary due to product material, center point of gravity of the product, etcetera.

Advisable conveyor length and chain speed
For a proper chain functioning, see the recommendation showed in the table below:

Chain Type	Maximum Advisable Length		Maximum Speed Dry Operation		Maximum Speed Lubricated Operation	
	ft	*m*	*ft/min*	*m/min*	*ft/min*	*m/min*
Steel Straight Running						
S 915 (1)	50	15	150	45	300	90
S 2815 (1)	60	18	150	45	300	90
SS 915	40	12	150	45	366	110
SS 2815	50	15	150	45	366	110
SS 915-4	40	12	150	45	366	110
SS 2815-4	40	15	150	45	366	110
P 915 / PHD 915	40	15	150	45	400	120
P 803	20	9	100	30	200	60
P 2815	60	18	150	45	400	120
PHD 9157	60	18	150	45	400	120
S 1864 (1)	100	30	200	60	400	120
SS1864	80	24	200	60	400	120
Steel Sideflexing (2)						
S 881 (1), S 881T (1)	40	12	150	45	333	100
SS 881, SS 881T	40	12	150	45	366	110
P 981, P 981T	40	12	150	45	400	120
SS 982T	40	12	150	45	366	110
SS-4 981M	40	12	150	45	366	110
P 981M / PHD 981M	50	15	150	45	400	120
PHD 9857M	50	15	150	45	400	120
S 1874T (1), S 1874 TM (1)	100	30	200	60	366	110
SS 1874T	80	24	200	60	366	110
Thermoplastic Straight Running						
820/831/828	30	9	150-200	45-60	300	90
821 (3)	40	12	150-200	45-60	300	90
8257 (3)	40	12	150-200	45-60	300	90
843 (1)/ 845 (1)/ RR 845 (1)	80	24	200-300	60-90	400	120
843 SS / 845 SS	60	18	200-300	60-90	400	120
863 (1)	100	30	200-300	60-90	400	120
863 SS	80	24	200-300	60-90	400	120
Thermoplastic Sideflexing (2)						
879 / 879T / 878T	30	9	150-200	45-60	300	90
880M RG / 880 / 880T / 880TA	30	9	150-200	45-60	300	90
882 / 882T (3) / 882M (3)	40	12	200	60	300	90
1700 / 1701T / 1702 /1710	66	20	150	45	300	90
1843T	80	24	200-300	60-90	366	110
1843T SS	60	18	200-300	60-90	366	110
1873T / 1863T	100	30	200-300	60-90	366	110
1873T SS / 1863T SS	80	24	200-300	60-90	366	110

(1) Oil lubrication for carbon steel (S) chains / base chains.
(2) Maximum speed values depend also on the PV value (Pressure-Velocity) of the curve.
Please contact application egineering team for further support.
(3) LBP versions included

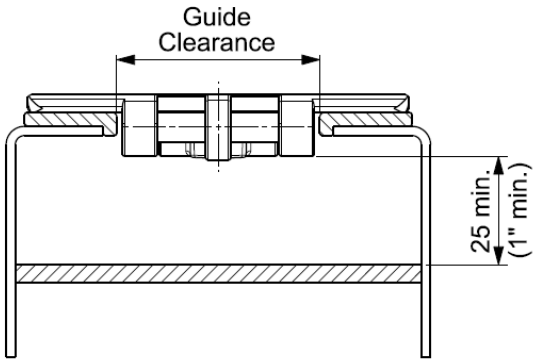
2.2.1 CONVEYOR UPPER PART

In order to guarantee proper chain guidance, it is important to:

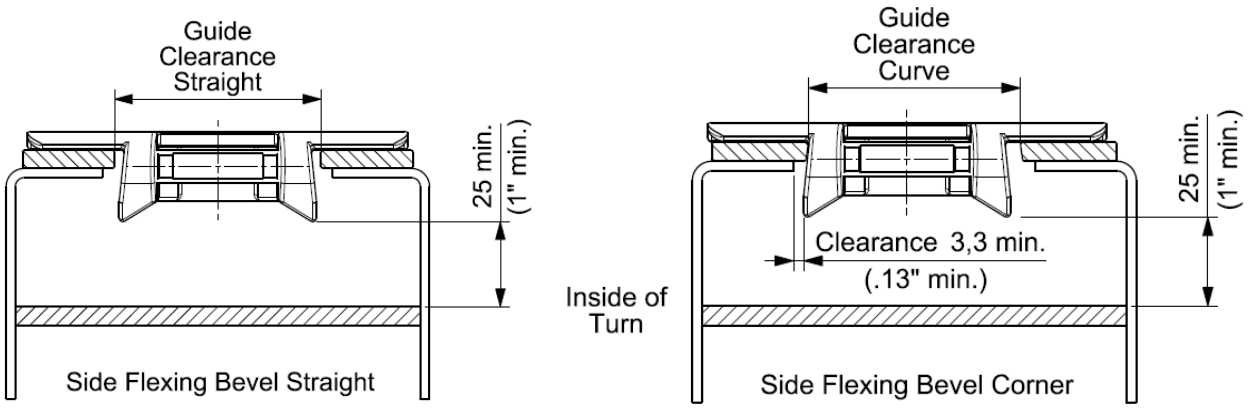
- Foresee proper clearance between chain and guides, both for straight running and sideflexing applications.
- Make sure to apply a sideflexing radius of at least the min. sideflexing radius of the chain / belt.

For guide clearance dimensions and minimum sideflexing radius of individual chains see page 32 and 33.

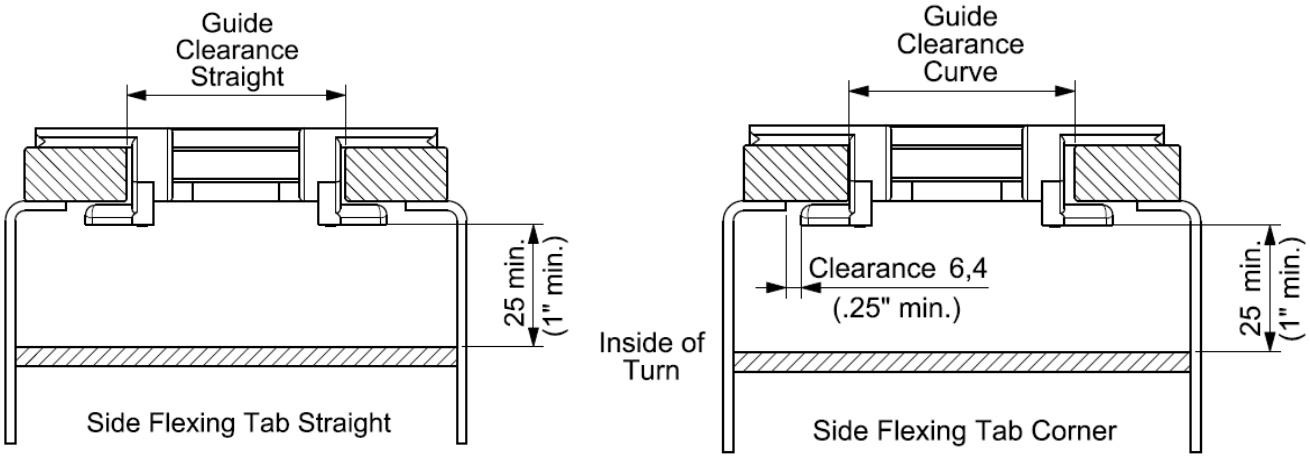
Straight Running configuration



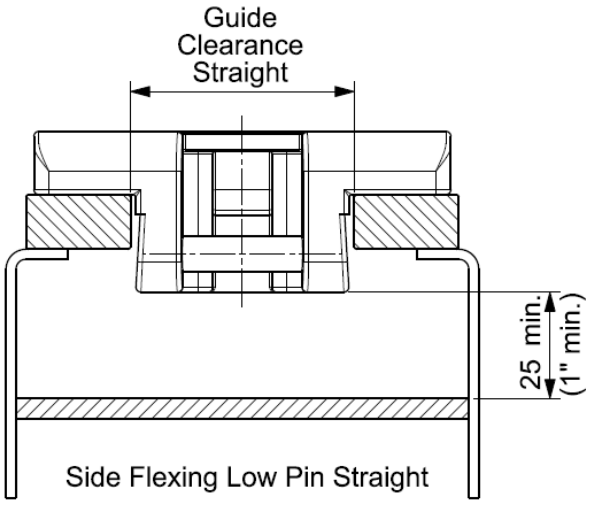
Bevel



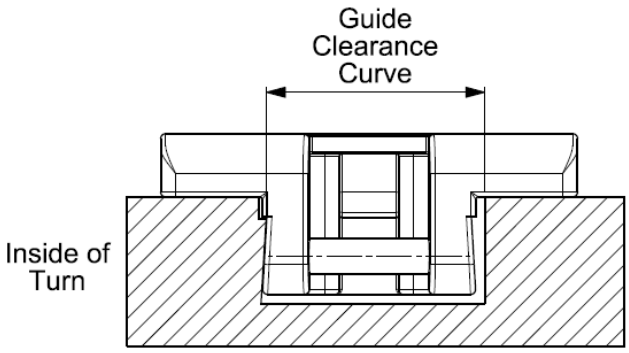
TAB



Low Pin

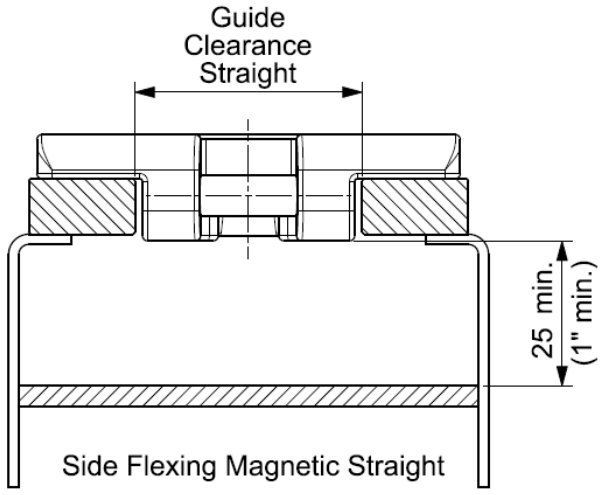


Side Flexing Low Pin Straight

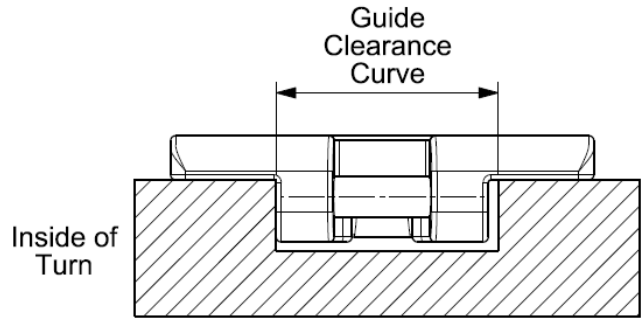


Side Flexing Low Pin Corner

Magnetic

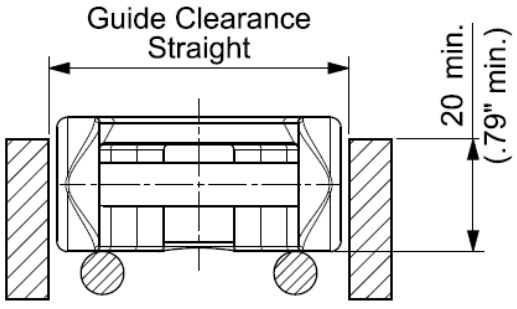


Side Flexing Magnetic Straight

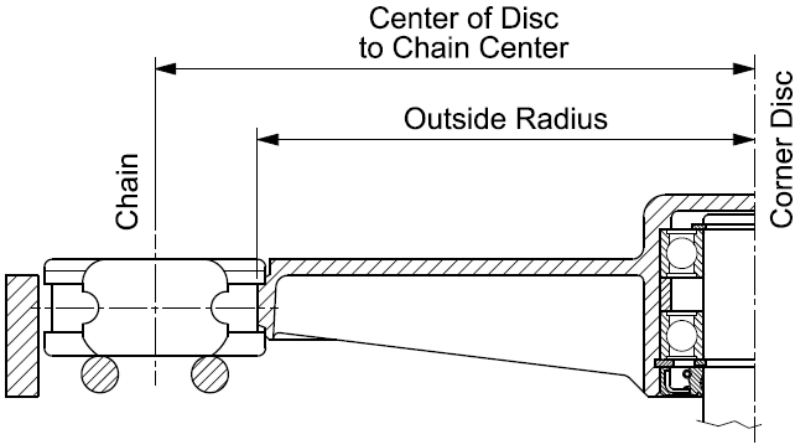


Side Flexing Magnetic Corner

Biplanar



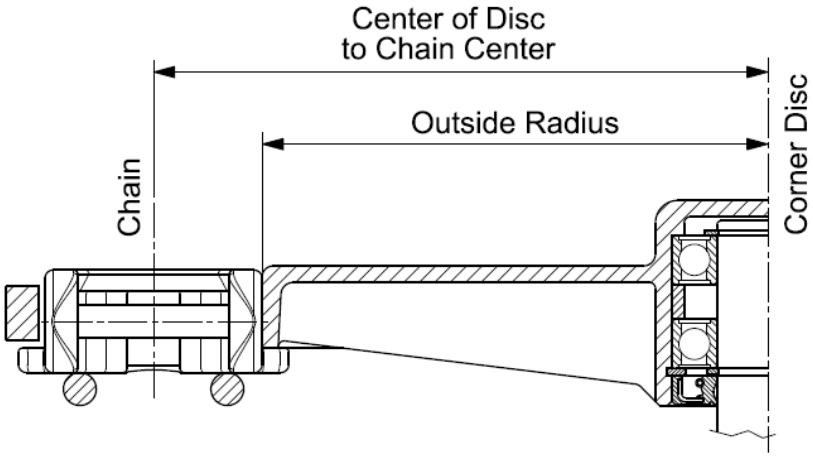
Side Flexing Biplanar Straight



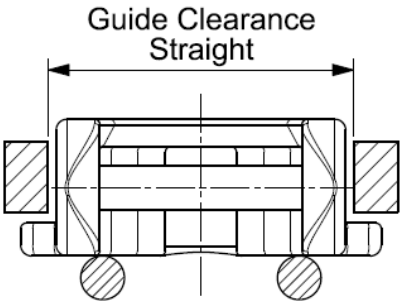
Side Flexing Biplanar - Corner Utilizing Corner Disc

- Chain can be lifted out of straight and corner sections for cleaning or inspection
- Longer conveyors can be achieved, when using corner discs in the curve sections

Biplanar TAB



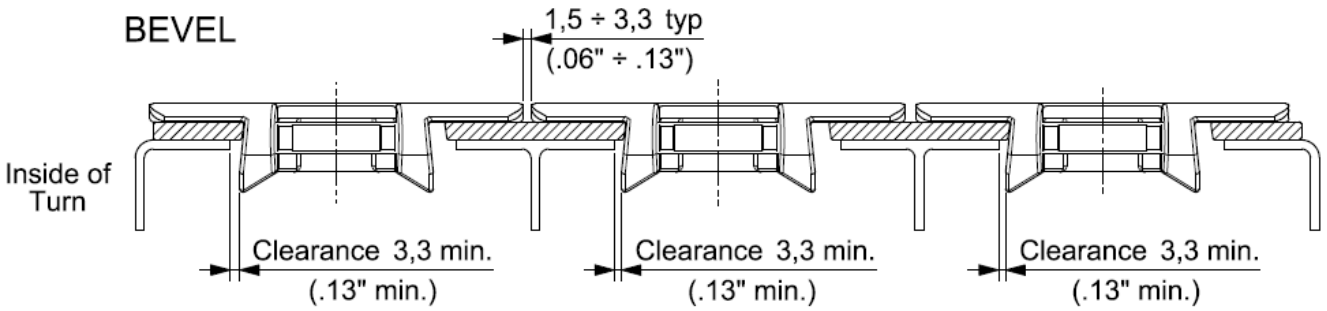
Side Flexing Biplanar TAB - Corner Utilizing Corner Disc

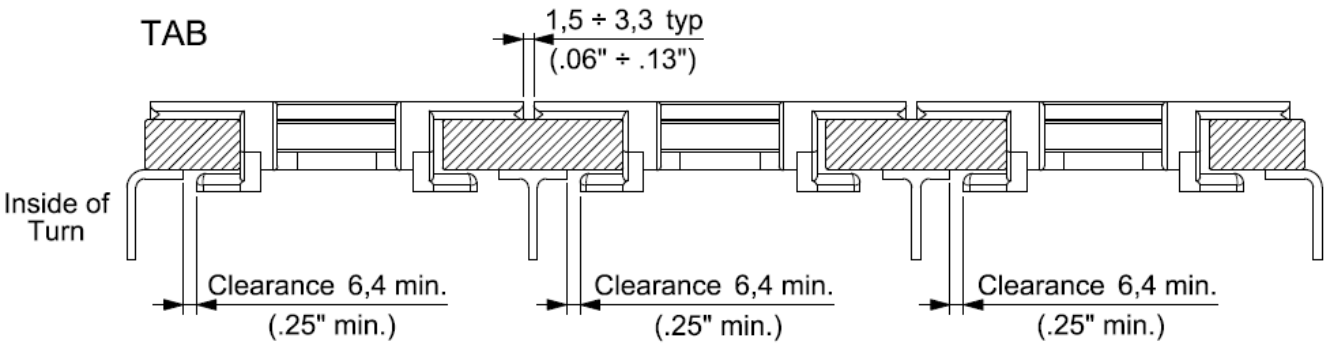


Side Flexing Biplanar TAB Straight

- Chain top surface wear is decreased if the TAB return is utilized
- Longer conveyors can be achieved, when using corner discs in the curve sections

Multiple Strands (Corner Section Shown)





- Adjacent strands should share the same wearstrips
- Key all sprockets on the drive shaft; in case of mass conveyor key only one on the idler (center, if possible)

FliteTop® Straight Running Minimum guide clearance

Chain Series	Minimum Guide Clearance	
	in	*mm*
803, 843, 845, RR 845	0.945	24,0
1864	1.378	35,0
863	1.437	36,5
820, HFX 820, 828, 831, 915, PHD 915, PHDG 915	1.732	44,0
8257, HFX 8257, LBP 8257, PHD 9157, PHDG 9157	2.362	60,0
2815, PHDG 2815	3.248	82,5
821, HFX 821, LBP 821	5.512	140,0

FliteTop® Sideflexing Minimum Guide Clearance

Chain Series	Minimum Guide Clearance Straight Section		Minimum Guide Clearance Curve Section	
	in	*mm*	*in*	*mm*
1843T, EW 1843T	0.886	22,5	0.886	22,5
1863T, 1873T, HFX 1873T, 1874T, 1874TM, GV 1874T, EV 1874T GW 1873T, EW 1873T, GD 1873T, GU 1873T, GC 1873T	1.378	35,0	1.378	35,0
881, 981	1.752	44,5	1.634	41,5
878T, 879T, 880T, 880TA, HFX 880T, 881T, 981T PHDG 981T, 982T, EW 878T, GW 878T, GD 878T, GU 878T	1.811	46,0	1.752	44,5
879, 880	1.752	44,5	1.634	41,5
880M RG, 981M, PHD 981M, PHDG 981M	1.732	44,0	1.732	44,0
882M, HFX 882M, LBP 882M, 882T, HFX 882T, LBP 882T PHD 9857M, PHDG 9857M	2.362	60,0	2.362	60,0
882	2.441	62,0	2.283	58,0
1701T, 1702	2.205	56,0	2.205	56,0
1700 1710	2.283	58,0	2.362	58,0

FliteTop® Sideflexing Minimum Radius Table

Chain Series	Chain Width		Side-flex Radius	
	in	*mm*	*in*	*mm*
878T	3.25	82,6	7.87	200,0
EW 878T, GW 878T, GD 878T, GU 878T	3.25	82,6	9.84	250,0
880, 880T, 880TA, HFX 880T, 879, 879T	3.25	82,6	18.00	457,2
	3.30	83,8	18.00	457,2
	4.50	114,3	19.69	500,0
880M RG	3.25	82,6	19.69	500,0
	3.30	83,8	19.69	500,0
	4.50	114,3	19.69	500,0
882, 882T, 882M, LBP 882T, LBP 882M, HFX 882T, HFX 882M	3.75	95,3	26.26	667,0
	4.50	114,3	24.00	609,6
	7.50	190,5	24.00	609,6
	10.00	254,0	24.00	609,6
	12.00	304,8	24.00	609,6
881, 881T, 981, 981T, PHDG 981T	3.25	82,6	18.00	457,2
	3.30	83,8	18.00	457,2
	4.50	114,3	24.00	609,6
	7.50	190,5	24.00	609,6
981M, PHD 981M, PHDG 981M	3.25	82,6	19.69	500,0
	3.30	83,8	19.69	500,0
	4.50	114,3	19.69	500,0
	7.50	190,5	19.69	500,0
PHD 9857M, PHDG 9857M	7.50	190,5	29.53	750,0
982T	3.25	82,6	7.87	200,0
1843T	1.25	31,8	10.00	254,0
EW 1843T	1.50	38,1	10.00	254,0
1863T	2.25	57,1	15.75	400,0
	3.25	82,6	15.75	400,0
	4.50	114,3	18.00	457,2
	7.50	190,5	24.00	609,6
	12.00	304,8	24.00	609,6
	16.00	406,4	29.53	750,0
1873T, HFX 1873T, EW 1873T, GW 1873T, GU 1873T	3.25	82,6	14.00	355,6
	4.50	114,3	14.00	355,6
	6.00	152,4	18.00	457,2
	7.50	190,5	18.00	457,2
	10.00	254,0	24.00	609,6
	12.00	304,8	24.00	609,6
GD 1873T, GC 1873T	3.25	82,6	14.00	355,6
	7.50	190,5	24.00	609,6
	8.00	203,2	24.00	609,6
1874T, GV 1874T, EV 1874T	3.25	82,6	15.00	381,0
	4.50	114,3	15.00	381,0
	6.00	152,4	18.00	457,2
	7.50	190,5	24.00	609,6
1700	2.17	55,0	5.51	140,0
1701T, 1702	2.09	53,0	5.51	140,0

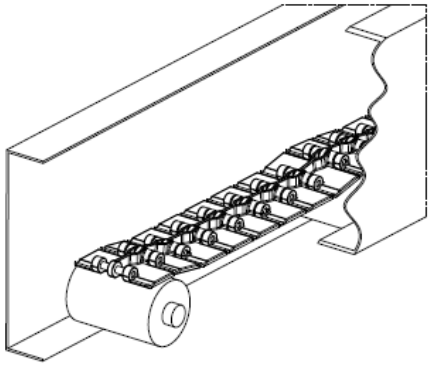
2.2.2 CONVEYOR RETURN PART

Return wearstrips design should be a reflection of the function of the conveyor.

- Open design full-width (closed) wearstrips could be a problem if there is build-up of debris on the return ways track
- Steel wear strips are preferred for dry abrasive conditions and stainless steel wear strips work best in wet abrasive conditions
- UHMWPE is recommended where no-abrasive or very low abrasive conditions prevail
- Sliding return ways are generally preferred over roller returns because they are simpler, lighter, and less costly.

There are several options to guide the chain in the return part:

Return rollers

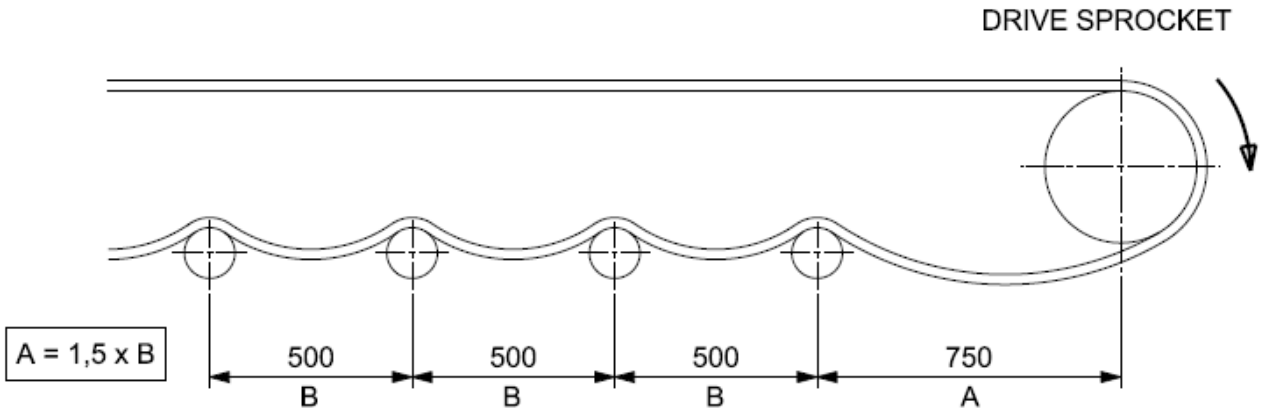


- Provide the lowest coefficient of friction (rolling friction vs. sliding friction)
- Selecting the proper roller diameter is also important, in order to avoid:
  - difficult rotation when too big
  - noise and reduced belt support when too small

- Recommended roller diameter is at least two times greater than the minimum back-flex radius of the chain (see table below).

Chain Series	Minimum Back-flex Radius		Minimum Roller Diameter	
	in	*mm*	*in*	*mm*
820, HFX 820, 821, HFX 821, 828, 831, 8257, HFX 8257, 880, 880T, HFX 880T, 880M RG 879, 879T, 882, 882T, HFX 882T, 882M, HFX 882M, 878T, 880TA	1.575	40,00	3.15	80,00
1700, 1701T, 1702, 1843T	1.969	50,00	3.938	100,00
803, 881, 881T, 981, 981T, PHDG 981T, 981M, PHD 981M, PHDG 981M, PHD 9857M, PHDG 9857M, 982T	2.953	75,00	5.906	150,00
843	3.543	90,00	7.086	180,00
863	4.528	115,00	9.056	230,00
1863T	4.724	120,00	9.448	240,00
915, PHD 915, PHDG 915, 2815, PHDG 2815, PHD 9157, PHDG 9157	5.906	150,00	11.812	300,00
1864	6.299	160,00	12.598	320,00
LBP 821, LBP 882T, LBP 882M	9.055	230,00	18.11	460,00
1874T 1874TM	9.843	250,00	19.686	500,00
LBP 8257	11.811	300,00	23.622	600,00
1873T, HFX 1873T	12.000	304,80	24.000	609,60

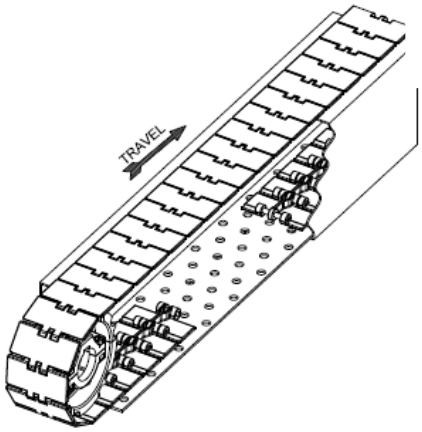
- Suitable to cover belt elongation better than other return ways
- Bending of rollers may cause belt deformation and uneven wear
- The first roller should be located far enough away from the head sprocket to allow for proper catenary sag (Dimension “A” should be 1.5 to 2 times greater than Dimension “B”).



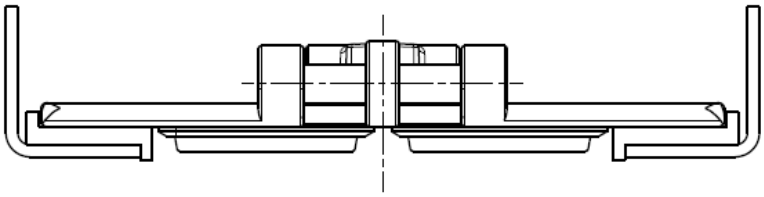
- Roller returns are not recommended for two-piece chains

Full Width Sliding Return Bed

- Even distribution of belt wear along the entire width of the chain / belt
- Bed may be perforated with slots or holes to allow for drainage and clearing of debris



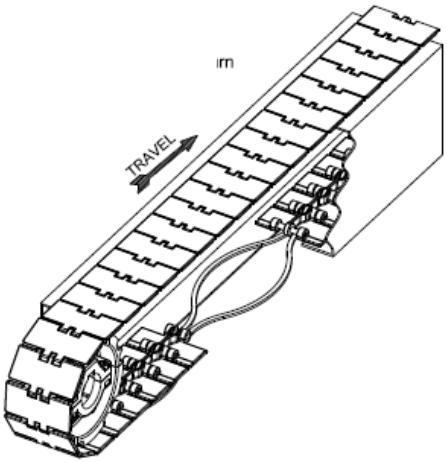
- With HFX series chains the slider bed should be limited to wearstrips on the outside of the rubberized surface to avoid wear / damaging the rubber



HFX Return

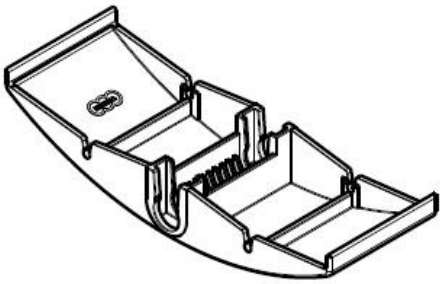
Serpentine Style Return

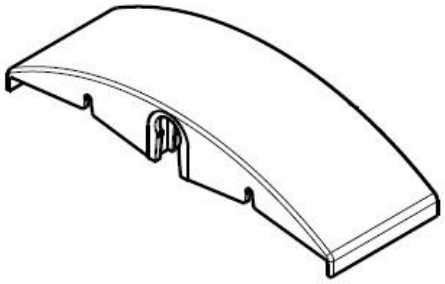
- Even distribution of wear over the entire width of the chain / belt
- Increased stability at higher speed
- Allows for drainage and clearing of debris and permits easy cleaning
- Particular attention must be paid for smooth wear strip splice points and transition areas to avoid any interference with the chain
- Min entry radius > min chain back-flex radius
- Not recommend to use with rubberized chain or belt surface



Guide shoe return

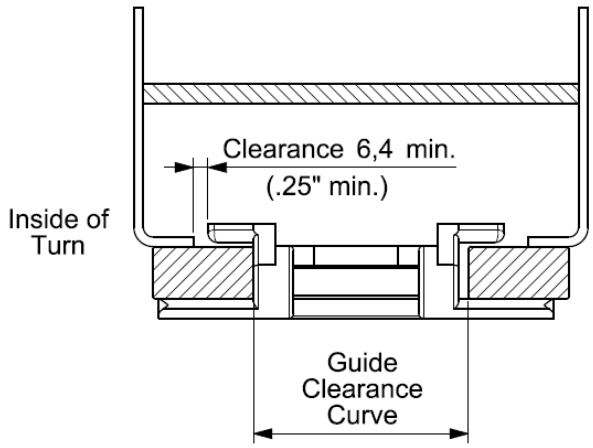
- Provide suitable support for LBP-chains & belts
- Allows for clearing of debris and permits easy cleaning



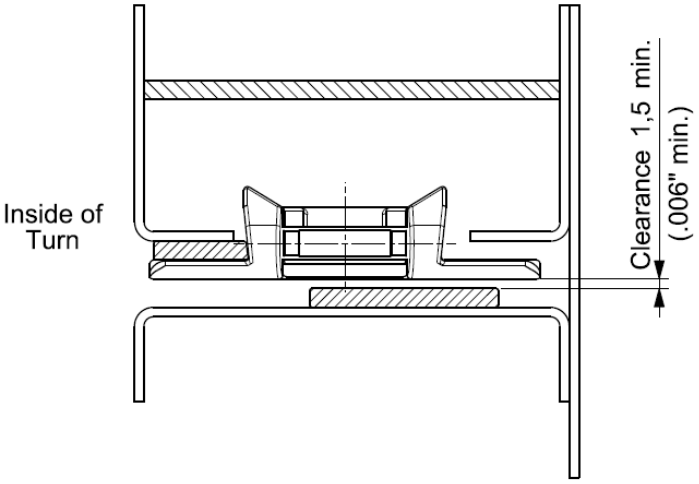


Tab style corner return

- Recommended for TAB chains, eliminate sliding wear on top surface of the chain
- Wearstrips guide clearance, infeed and discharge are critical areas

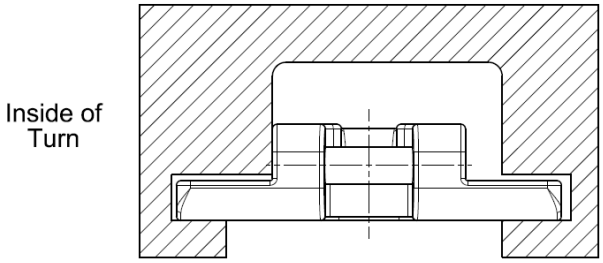


Bevel Style Corner Return



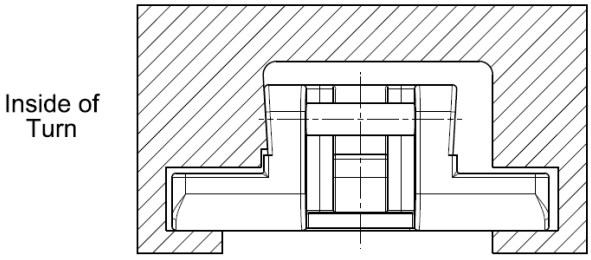
Magnetic Style Corner Return

Magnetic Corner Return

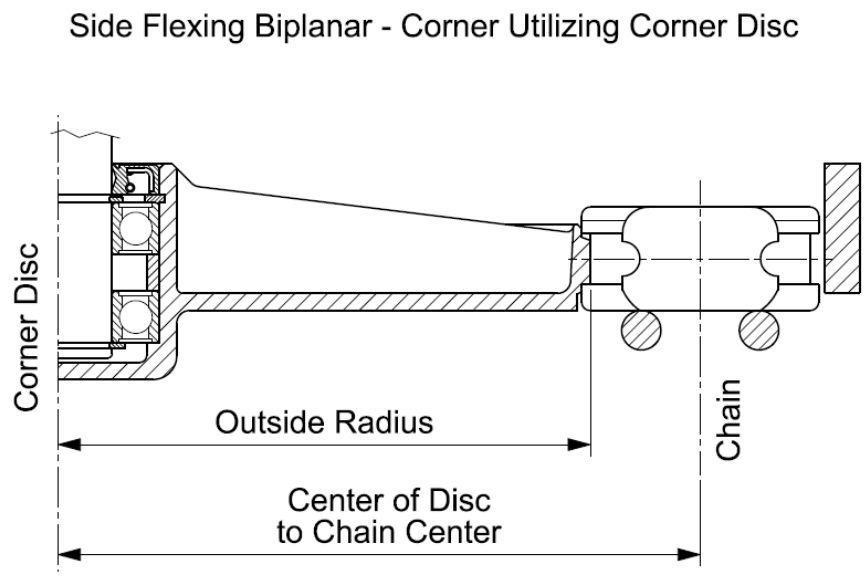


Low Pin Center Style Corner Return

Low Pin Corner Return

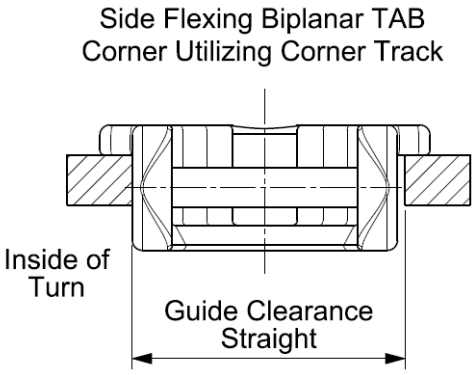


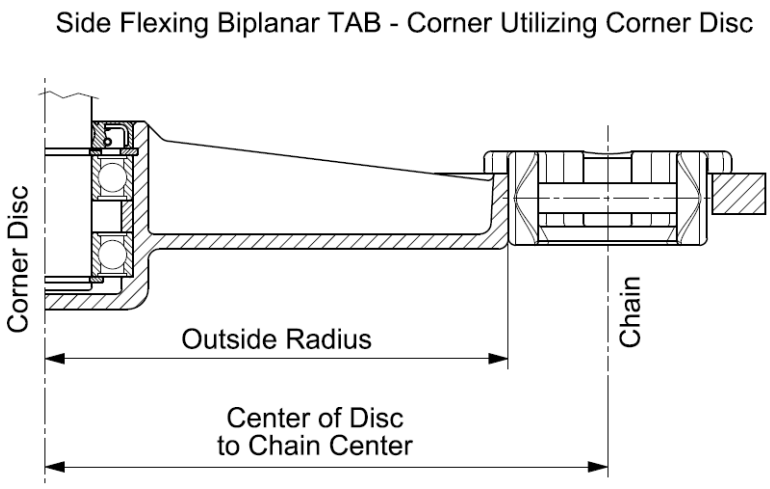
Sideflexing Biplanar Design



- The corner disc in the return section is mounted in the same manner as in the carry section
- Depending on chain design, discs may have to be mounted upside-down in the return

Sideflexing Biplanar TAB Design

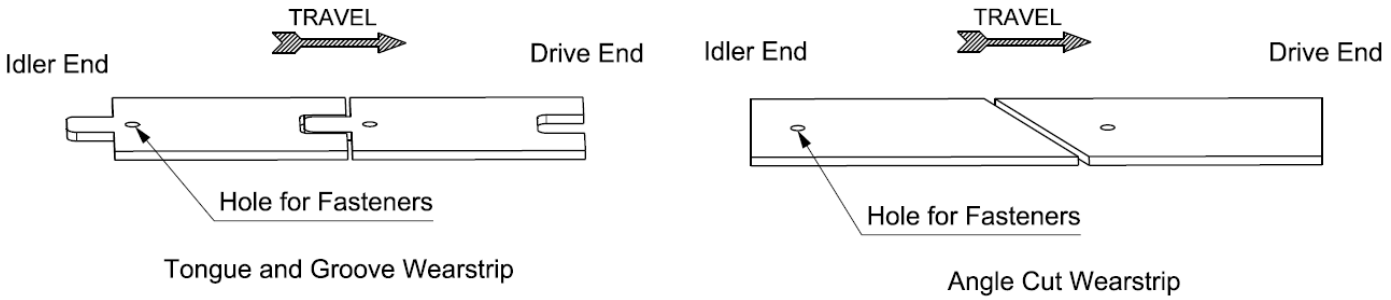




- The corner disc in the return section is mounted in the same manner as in the carry section
- Depending on chain design, discs may have to be mounted upside-down in the return

Wearstrip Considerations

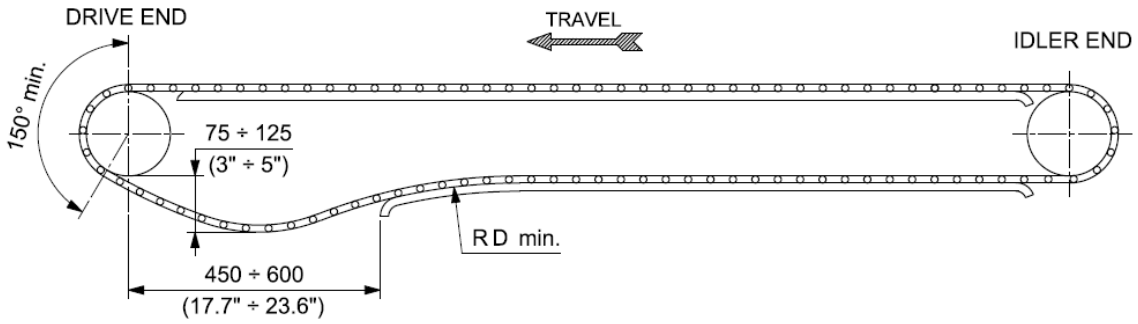
Wearstrips will contract and expand due to temperature changes and this should be taken into account in the mounting method. Suggested methods to accommodate this are shown below:



A gap between 6,4 mm (0.25”) and 9,53 mm (0.38”) is recommended gap to provide freedom for elongation caused by temperature changes.

Catenary Sag

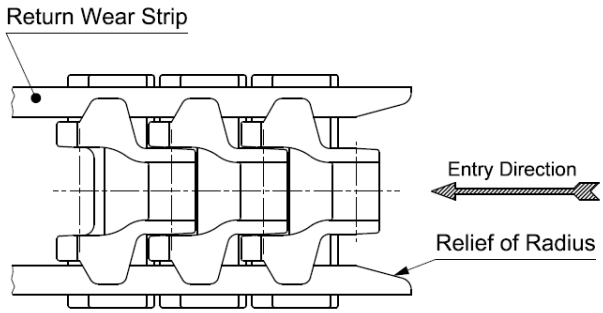
- Unsupported section of chain / belt in the return area of the conveyor, it provides:
  - mechanical balance of any tension not absorbed by the sprocket teeth
  - keep the chain wrapped around the sprocket, avoiding jumping/sliding and detach the chain from sprocket. The wrap around angle of the chain / belt should be appr. 150°.
  - Cover elongation due to wear, thermal expansion and mechanical stretching

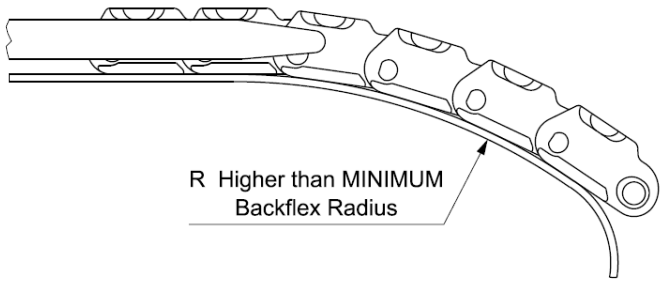


- The catenary area of a conveyor must be properly designed to accommodate the catenary sag and to avoid any obstruction / contact with the conveyor structure.
- The catenary sag should be located as close to the drive as possible and should be measured while the chain is running.
- Avoid take-up systems, unless:
  - there is not enough room for proper catenary sag (center drive conveyor)
  - small drive sprockets with high load are used
  - not enough space for a proper catenary sag

Entry Radius

- Allocation for sufficient entry radius to the return section of the conveyor must be provided in order to allow the chain to feed smoothly onto the return support.



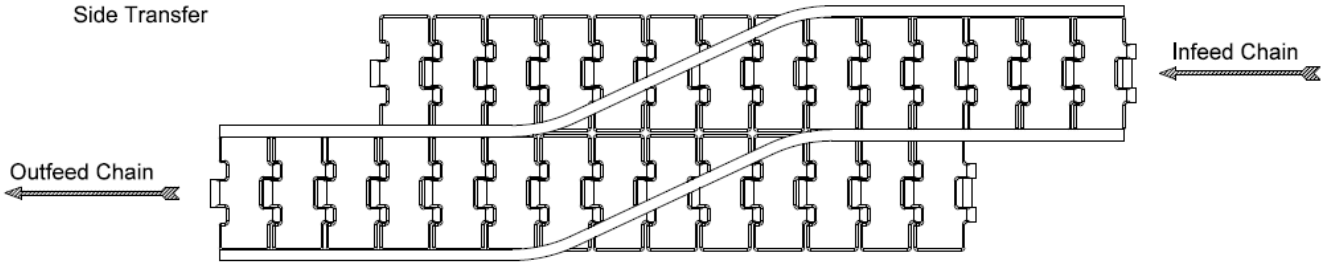


- The entry radius should be greater than the minimum backflexing radius of the chain (see table at page 34), but a minimum entry radius of 152mm (6”) is recommended to prevent non-uniform wear
- When TAB chains are support on tabs in the return part, chains should be properly guided onto return wearstrips with a guide shoe or pan
- Rounded corners should be provided at the entry of the return wearstrips to prevent catching or snagging of the chain or belt

2.2.3 TRANSFERS

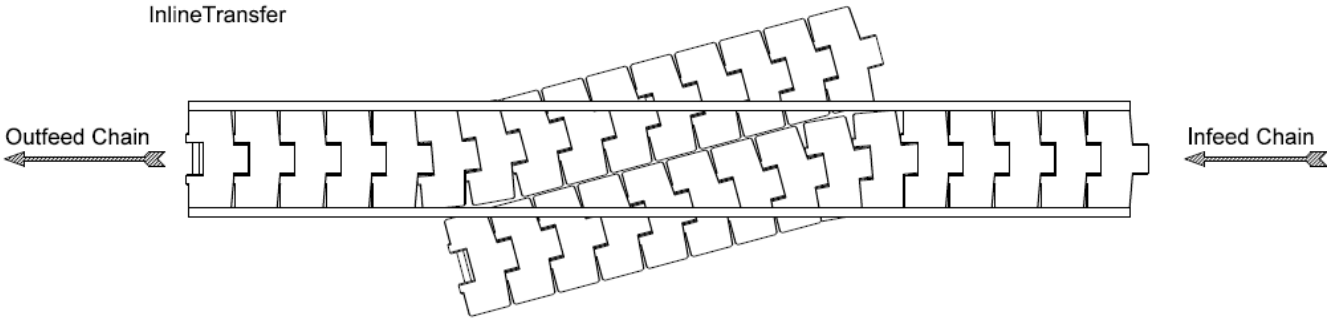
Product transfers from chain to chain are often necessary, due to both lay-out constraints and the necessity to reduce the conveyor center-to-center distance, due to chain pull limitations. It is very important to provide smooth transfers in order to avoid product handling issues. Tipping of products during transfers may cause product fall, jams and loss of productions.

Side Transfer



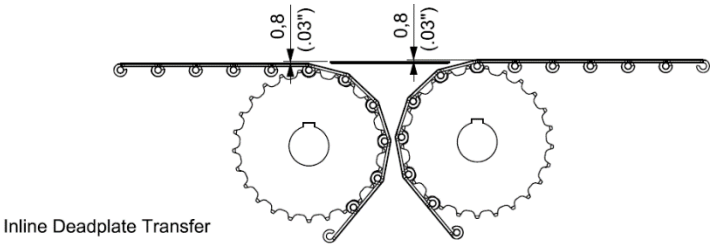
- Most common transfer system for general conveyors
- No products remain on transfer section

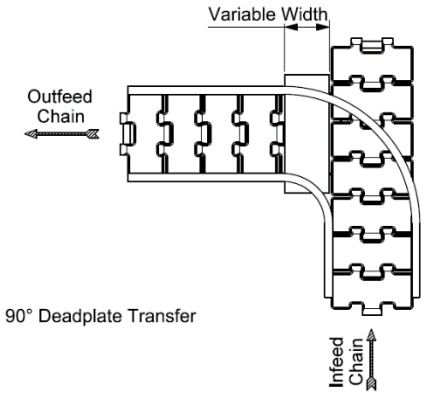
Inline Transfer

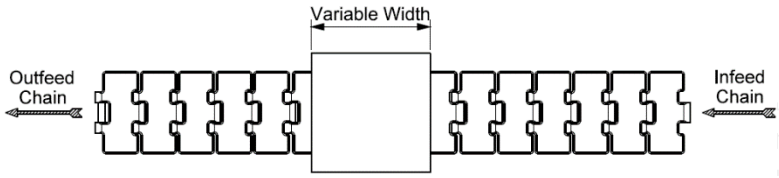


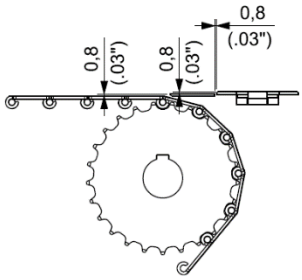
- Allows product to remain in straight line
- No products remain on transfer section
- Only possible with side-flexing chains

Deadplate Transfers





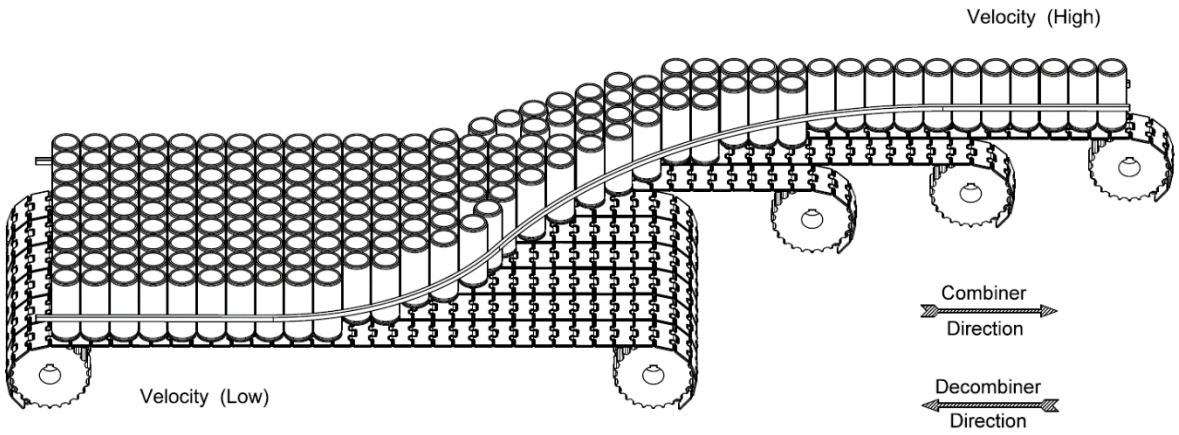




- Deadplates should be mounted slightly lower than the infeed chain / belt & slightly higher than the outfeed chains (1mm / 0,04” steps)
- Most likely products will remain on the deadplate transfer, therefore deadplates should be as short as possible: the smaller the sprocket / pitch of the belt, the shorter the deadplate can be

Combiners / Decombiners

The most efficient way to convey products is normally en mass, because of the lower speed and buffering capabilities. Nonetheless, some machines, such as rinsers, fillers, inspection stations, labelers require the products to be in a single line. The conveyors that allow these transitions, from mass flow to inline and vice-versa, are called combiners and decombiners. Chains run side by side at progressively higher or lower speed.

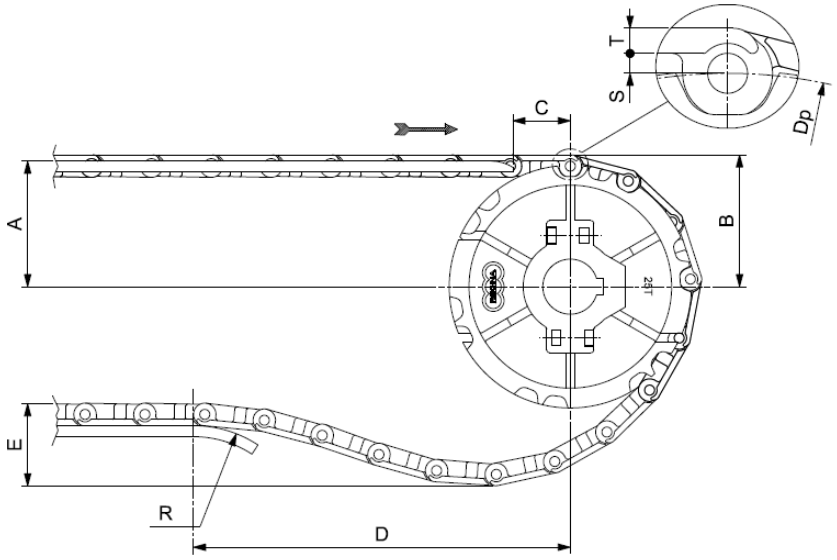


- Regina DK² and e-F.A.S.T. are the ideal materials for these applications, because they allow a smooth transfer from chain to chain, even in reduced or dry running conditions
- If space permits, use enough lanes to keep speed differentials between adjacent strands to about 50 - 75 FPM (15 - 23 MPM), depending on product material, shape & center height of gravity
- When several chains run side by side, such as on multiple width conveyors and combiners or decombiners, make sure the chains in the return do not interfere with each other (for example by using flanges in between the return rollers)

2.3 SPROCKET/WEARSTRIP POSITIONING

The drawing below shows a chain & sprocket installation with a standard catenary arrangement. To ensure a proper interaction between the chain and the sprocket, it is important to position the sprockets at the right height and distance from the wearstrips. The right position depends on the type of chain and sprocket size, see drawings & tables below.
Particular care should be taken to ensure that rail or slider bed carry ways at the drive side of the conveyor are tapered or angled downward to ensure smooth entry of the chain onto the return support.

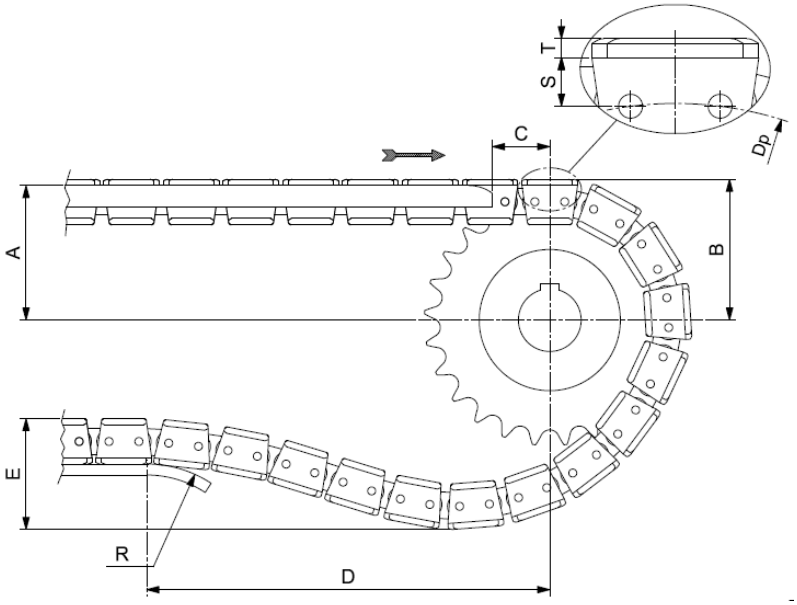
STEEL AND THERMOPLASTIC ONE-PIECE CHAINS



Chain Series	A	B	S*		T*		C		D		E		R	
			in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
915, PHD 915, 2815, PHD 9157			0.13	3,4	0.12	3	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	5.91	150
803, 881, 981, 881T, 981T, 981M, PHD 9857M, 982T			0.13	3,4	0.12	3	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	2.95	75
PHDG 915, PHDG 2815, PHDG 9157			0.13	3,4	0.12	3	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	5.91	150
PHDG 981T, PHDG 981M, PHDG 9857M			0.13	3,4	0.12	3	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	2.95	75
820, 828, HFX 820			0.13	3,2	0.16	4	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	1.57	40
831	$\frac{D_p^*}{2}+S^*$	A+T^*	0.09	2,4	0.19	4,8	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	1.57	40
821, HFX 821, LBP 821			0.13	3,2	0.19	4,8	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	1.57	40
8257, 882, 882T, 882M, HFX 8257, HFX 882T, HFX 882M, LBP 8257, LBP 882T, LBP 882M			0.19	4,7	0.19	4,8	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	1.57	40
880, 880T, 880M RG, 880TA, HFX 880T			0.14	3,6	0.16	4	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	1.57	40
879, 879T			0.11	2,8	0.19	4,8	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	1.57	40
878T, EW 878T			0.14	3,5	0.19	4,8	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	1.57	40

S* = distance from pin centerline to underside of the chain
T* = Plate thickness of the chain
D*p = Sprocket pitch diameter
For solid top chains B refers to the the top of the chain.
For rubberized and LBP chains it refers to the top of the flight and does not include the rubber or LBP thickness.

TWO-PIECE CHAINS WITH STEEL AND THERMOPLASTIC FLIGHTS



Chain Series	A	B	S*		T*		C		D		E		R	
			in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
1864	$\frac{D^*_p}{2}+S^*$	A + T^*	0.44	11,3	0.12	3	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	6.3	160
1874T, 1874TM, GV 1874T, EV 1874T			0.44	11,3	0.12	3	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	9.84	250
843, 845			0.23	5,9	0.13	3,2	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	3.54	90
RR 845, HF RR 845			0.23	5,9	0.13	3,2	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	35.43	900
863			0.41	10,3	0.16	4	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	4.53	115
1843T, EW 1843T			0.24	6	0.13	3,2	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	1.97	50
1873T, HFX 1873, EW 1873T, GD 1873T, GW 1873T, GU 1873T			0.41	10,3	0.16	4	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	12.01	305
1863T			0.41	10,3	0.16	4	1.57	40	17.7-23.6	450-600	3.00-5.00	75-125	4.72	120

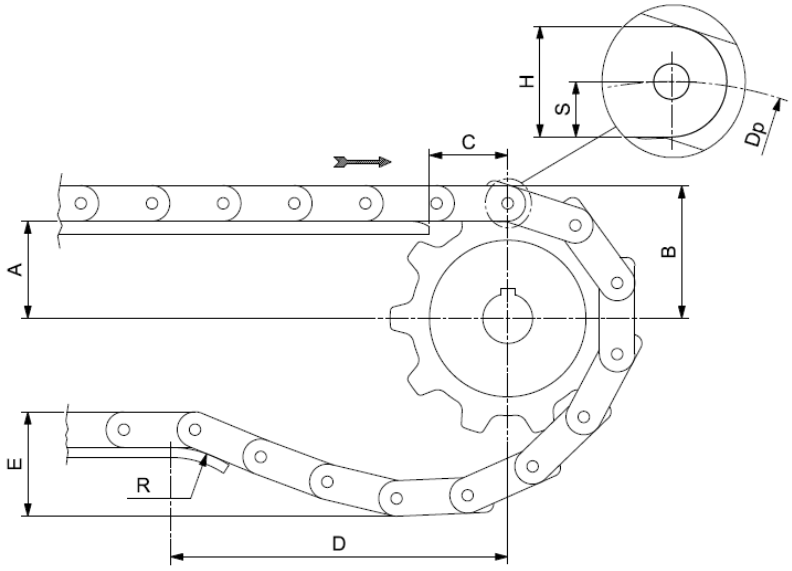
S* = distance from pin centerline to underside of the chain

T* = Plate thickness of the chain

D^*_p = Sprocket pitch diameter

For solid top chains B refers to the the top of the chain.
For rubberized and RR chains it refers to the top of the flight and does not include the rubber or RR thickness.

BIPLANAR AND CASE CONVEYOR CHAINS



Chain Series	A	B	S*		H		C		D		E		R	
			in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
1700, 1710	$\frac{D_p^*}{2} - S^*$	A + H	0.47	12	0.95	24	1.97	50	17.7-23.6	450-600	3.00-5.00	75-125	1.97	50
1701T, 1702			0.49	12,5	0.98	25	1.97	50	17.7-23.6	450-600	3.00-5.00	75-125	1.97	50

S* = distance from pin centerline to underside of the chain
H = Thickness of the chain
D^*_p = Sprocket pitch diameter

Section III

FliteTop®
GRIPPER CHAINS

3.1 CHAIN SELECTION AND APPLICATIONS

Gripper chains are typically used to vertically move products (single line). The most common applications include:

- Elevators
- Lowerators
- Pass-through conveyors
- Rinsers
- Crate washers
- Bottle tilters

The selection of the proper chain type greatly depends on application and lay-out:

Chain Type	Base Chain Material	Flight Material	Application
Two-piece	Carbon steel (S)	Carbon steel (S)	Abrasion resistant
Two-piece	Stainless steel (SS)	Stainless steel (SS)	Abrasion & corrosion resistant
Two-piece	Carbon steel (S)	Plastic	Medium/High speed elevators/lowerators
Two-piece	Stainless steel (SS)	Plastic	High speed rinsers
One-piece	-	Plastic	Low speed, shorter elevators/lowerators & rinsers

The selection of the proper gripper style greatly depends on the conveyed product:

Gripper Type	Features	Container Type
EW (Long fingers)	Minimum holding force, more forgiving	Empty or light weight, soft, irregular shape
GD (D-Shape)	Uniform contact surface, Bidirectional	Flat surface, medium weight
GW (Short fingers)	Maximum holding force	Heavy weight
GU (U-Shape)	Gentle handling force	Irregular shape

MAXIMUM ADVISABLE CONVEYOR LENGTH, CHAIN SPEED, AND WORKING LOAD

Chain Type	Maximum Advisable Length		Maximum Speed Dry Operation		Maximum Speed Lubricated Operation		Maximum Working Load	
	ft	*m*	*ft/min*	*m/min*	*ft/min*	*m/min*	*lb*	*N*
1874T	98	30	197	60	361	110	1012	4500
1874T SS	79	24	197	60	361	110	787	3500
1873T	98	30	200-300	60-90	361	110	1012	4500
1873T SS	79	24	200-300	60-90	361	110	787	3500
1873T BS	79	24	200-300	60-90	361	110	787	3500
1843T	79	24	200-300	60-90	361	110	585	2600
1843T SS	59	18	200-300	60-90	361	110	450	2000
878T UP	30	9	150-200	45-60	300	80	450	2000

Please note the max. recommended length is dependent on speed, load, lubrication, and etcetera.
Maximum speed values depend also on the **pV** (***p***^{ressure} x ***V***^{elocity}) of the curve.
Please contact application engineering team for further support.

3.2 CONVEYOR DESIGN

3.2.1 TAKE-UP

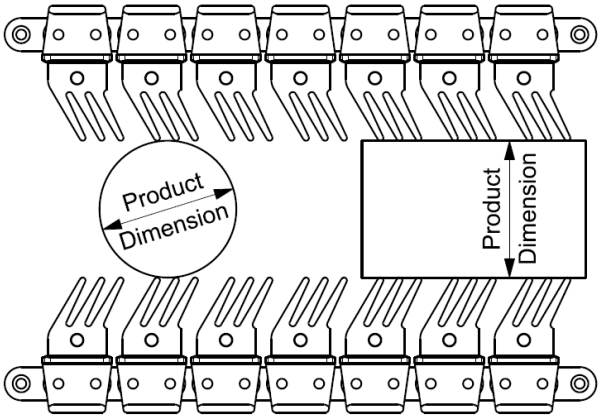
Elevating and especially lowerating conveyors cannot function properly with chain slack: the chain may jam and break. Normally take-up devices are used to tensions the chain in the conveyor and to compensate for chain elongation. Setup should follow the instructions provided by the OEM. Over-tensioning the chain, should be avoided, since this will result in rapid wear of components and increased load on the drive motor.

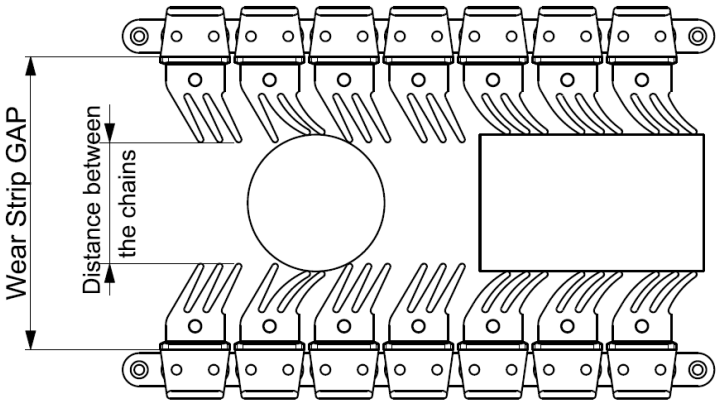
Most common take-up systems include:

- Pneumatic: to be preferred, because it provides constant force / tension
- Spring: although they can respond to load variations and cover elongation, they may not provide a constant force
- Screw: they cannot respond to load variations & elongation and require manual adjustment

3.2.2 THROAT DIMENSION

The measured gap between the two gripper sets is critical to conveyor setup, as it determines the amount force gripping the products. If the throat is too narrow, then the gripping force is unnecessarily high, leading to accelerated wear on conveyor parts, higher loads on the motor and potential damage to products. If the throat is too wide, then the products may be dropped. The difference between too narrow and too wide of a throat can easily be less than 0.1 in (2,5 mm).





Whenever the application permits, Regina strongly recommends using EW gripper style, because much more forgiving towards set-up errors than any other gripper style.
To find the appropriate spacing for your product, please use Regina Evaluation Software or contact our Application Engineering department. During conveyor setup or after performing maintenance, check the wear strip gap before installing the chain, and check the throat dimension once the chain is installed. Remember that worn flights and wearstrips

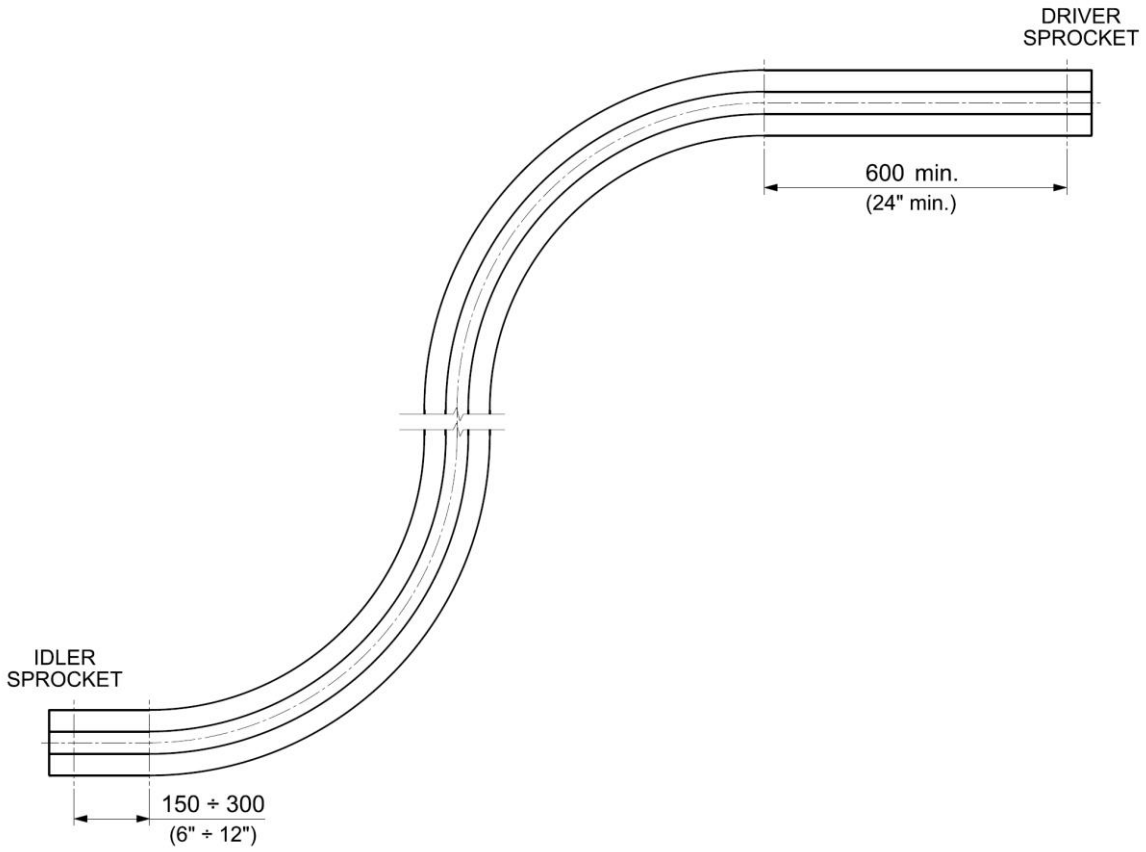
will both widen the gaps. Periodic adjustment may be needed to maintain a proper gripping force, but do NOT forget to account for those adjustments when running different products or installing new chains and wear strips.

3.2.3 SIDEFLEXING CONVEYOR OR CURVE ENTRY/EXIT

To reduce chain tension, and therefore wear, the conveyor layout should position the drive away from the curve sections in the conveyor.

Driver Sprocket: A minimum of 600 mm (24”) should be maintained between the driver sprocket center line and the nearest curve entry/exit.

Idler Sprocket: A minimum of 150 - 300mm (6”– 12”) should be maintained between the idler sprocket center line and nearest curve entry/exit.



Section IV

Matveyor® ULTOP®
BELTS AND CHAINS

4.1 BELT SELECTION AND APPLICATIONS

FOOD / BEVERAGE / BOTTLING APPLICATIONS: CANS (2-3 PIECES)

	LIGHT DUTY SHORT PITCH (½")					LIGHT DUTY (1" PITCH)					MEDIUM DUTY (¾" PITCH)		HEAVY DUTY (1" PITCH)			HEAVY DUTY UCC (1½" PITCH) ULTOP®		SIDEFLEXING CHAINS (1" PITCH)			HEAVY DUTY RAISED RIB (2" PITCH)	SIDEFLEXING BELTS (1¼" PITCH)
	600 610 300	500 200	HF 510 HF200	611 RR611	LBP610	1600	1500	RR 1600	RR 1500 1100	HF 1600 HFS16000	7300	7200	USP USPM	HF USPM HFS USPM	LBP USPM LBP XSPM	UCC	UCC 138 (¾" Pitch)	783M 783T	782M	793T 793M 793L	3125	2556HTB 2556HTB-SR
Depalletizer	X	X				X	X				X	X										
Inliner / Combiner						X	X				X	X				X		X	X			
Mass Conveyor	X	X				X	X				X	X				X		X	X			
Accumulation Table	X	X				X	X		X		X	X									X	
Warmer																					X	
Infeed Packaging Machines	X	X				X	X		X		X	X				X						
Packaging Machines		X	X	X				X									X					
Packaged Products Convey	X	X	X		X	X	X		X	X	X	X	X	X	X	X						X

FOOD / BEVERAGE / BOTTLING APPLICATIONS: PET BOTTLES

	LIGHT DUTY SHORT PITCH (½")					LIGHT DUTY (1" PITCH)					MEDIUM DUTY (¾" PITCH)		HEAVY DUTY (1" PITCH)			HEAVY DUTY UCC (1½" PITCH) ULTOP®		SIDEFLEXING CHAINS (1" PITCH)			HEAVY DUTY RAISED RIB (2" PITCH)	SIDEFLEXING BELTS (1¼" PITCH)
	600 610 300	500 200	HF 510 HF200	611 RR611	LBP610	1600	1500	RR 1600	RR 1500 1100	HF 1600 HFS16000	7300	7200	USP USPM	HF USPM HFS USPM	LBP USPM LBP XSPM	UCC	UCC 138 (¾" Pitch)	783M 783T	782M	793T 793M 793L	3125	2556HTB 2556HTB-SR
Inliner / Combiner						X					X					X		X				
Mass Conveyor	X	X				X					X					X		X				
Accumulation Table	X	X				X	X		X		X	X										
Warmer																					X	
Infeed Packaging Machines	X	X				X			X		X											
Packaging Machines	X	X	X	X				X									X					
Packaged Products Convey	X	X	X		X	X	X		X	X	X	X	X	X	X	X						X

FOOD / BEVERAGE / BOTTLING APPLICATIONS: GLASS BOTTLES

	LIGHT DUTY SHORT PITCH (½")					LIGHT DUTY (1" PITCH)					MEDIUM DUTY (¾" PITCH)		HEAVY DUTY (1" PITCH)			HEAVY DUTY UCC (1½" PITCH) ULTOP®		SIDEFLEXING CHAINS (1" PITCH)			HEAVY DUTY RAISED RIB (2" PITCH)	SIDEFLEXING BELTS (1¼" PITCH)
	600 610 300	500 200	HF 510 HF200	611 RR611	LBP610	1600	1500	RR 1600	RR 1500 1100	HF 1600 HFS16000	7300	7200	USP USPM	HF USPM HFS USPM	LBP USPM LBP XSPM	UCC	UCC 138 (¾" Pitch)	783M 783T	782M	793T 793M 793L	3125	2556HTB 2556HTB-SR
Depalletizer	X					X					X		X			X				X		
Inliner / Combiner						X					X		X			X		X		X		
Mass Conveyor	X					X					X		X			X		X				
Accumulation Table													X									
Pasteurizer																					X	
Infeed Packaging Machines	X					X					X		X			X						
Packaging Machines	X	X	X	X				X									X					
Packaged Products Convey	X		X		X	X				X	X		X	X	X	X						X

GLASS MFG: GLASS BOTTLES

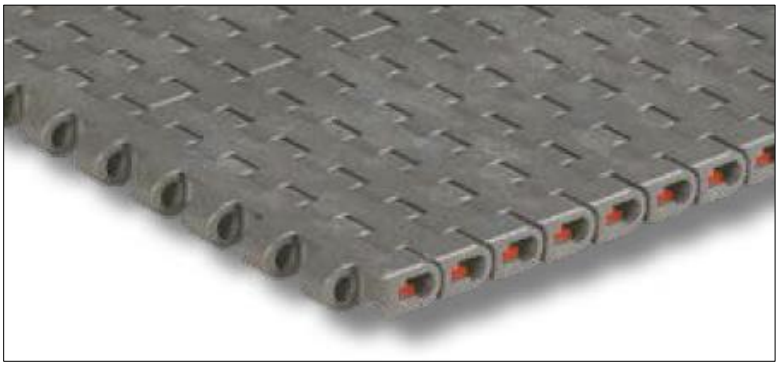
	LIGHT DUTY SHORT PITCH (½")					LIGHT DUTY (1" PITCH)					MEDIUM DUTY (¾" PITCH)		HEAVY DUTY (1" PITCH)			HEAVY DUTY UCC (1½" PITCH) ULTOP®		SIDEFLEXING CHAINS (1" PITCH)			HEAVY DUTY RAISED RIB (2" PITCH)	SIDEFLEXING BELTS (1¼" PITCH)
	600 610 300	500 200	HF 510 HF200	611 RR611	LBP610	1600	1500	RR 1600	RR 1500 1100	HF 1600 HFS16000	7300	7200	USP USPM	HF USPM HFS USPM	LBP USPM LBP XSPM	UCC	UCC 138 (¾" Pitch)	783M 783T	782M	793T 793M 793L	3125	2556HTB 2556HTB-SR
Inliner / Combiner						X					X		X			X		X		X		
Mass Conveyor	X	X				X					X		X			X		X		X		
Accumulation Table	X	X				X					X		X								X	
Palletizer	X					X					X		X									

SPECIAL APPLICATIONS

	LIGHT DUTY SHORT PITCH (½")					LIGHT DUTY (1" PITCH)					MEDIUM DUTY (¾" PITCH)		HEAVY DUTY (1" PITCH)			HEAVY DUTY UCC (1½" PITCH) ULTOP®		SIDEFLEXING CHAINS (1" PITCH)			HEAVY DUTY RAISED RIB (2" PITCH)	SIDEFLEXING BELTS (1¼" PITCH)
	600 610 300	500 200	HF 510 HF200	611 RR611	LBP610	1600	1500	RR 1600	RR 1500 1100	HF 1600 HFS16000	7300	7200	USP USPM	HF USPM HFS USPM	LBP USPM LBP XSPM	UCC	UCC 138 (¾" Pitch)	783M 783T	782M	793T 793M 793L	3125	2556HTB 2556HTB-SR
PHARMACEUTICAL DETERGENT COSMETICS CONTAINERS	X	X		X		X	X	X			X	X					X	X	X			
BAKERY	X	X				X					X		X			X		X		X		X
PAPER/CARDBOARD	X					X					X		X			X						X

4.1.1 SURFACE STYLES

Solid Top

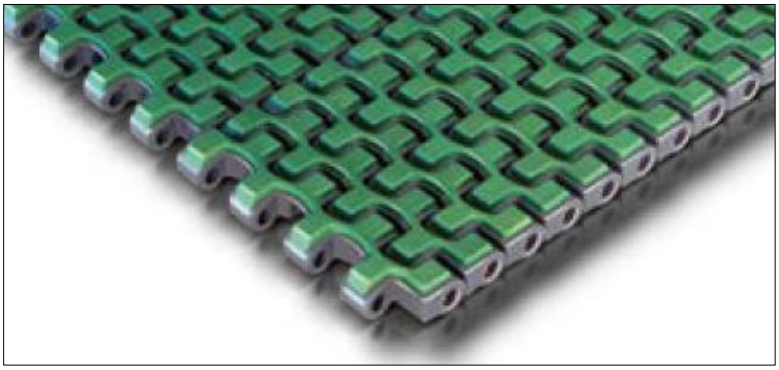


- General conveying (glass & PET bottles, boxes, etcetera)
- The extremely good flatness, manufacturing accuracy and availability of materials with low friction & high wear resistance

Flush Grid

- Conveyors where air, water or other liquid flow through the belt is required
- General can conveying
- Open area is from 20% to 31%

High Friction



- For use where additional grip is required to secure the product from movement or slippage
- Incline & decline box conveyors
- Stop, rotating & metering conveyors

Raised Rib

- Utilized with transfer combs where smooth head transfer is required
- Particularly suitable for product infeed of packaging machines, pasteurizers, warmers & coolers and accumulation tables

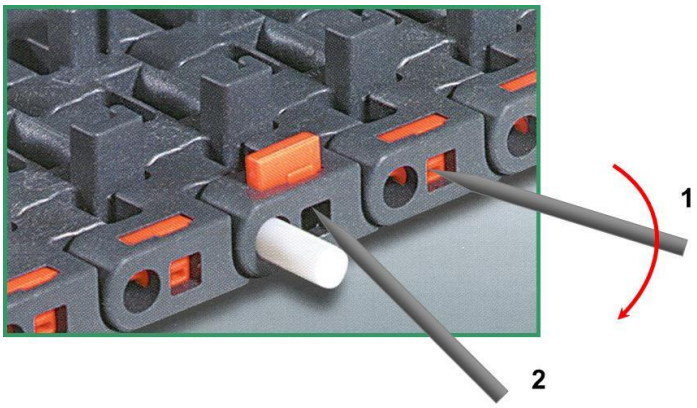
Low backline pressure (LBP)

- For general purpose conveying applications with problems of back-line pressure between packages
- Typical applications include heat shrink packs, paper and cardboard boxes

4.1.2 PIN RETENTION SYSTEM

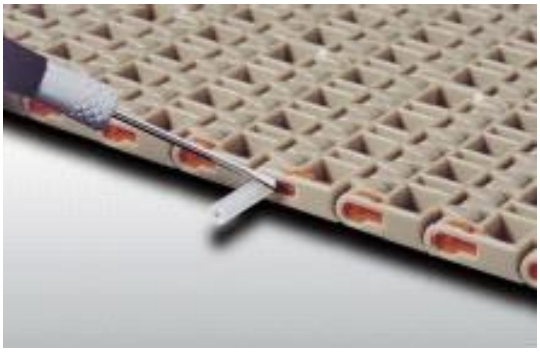
The pin retention system makes sure the pin remains in the belt. Different versions are available for different belts-series.

Lifting clip for 600/610/500/HF 510, 300/200/HF 200, USPM/USP and 2556 Series



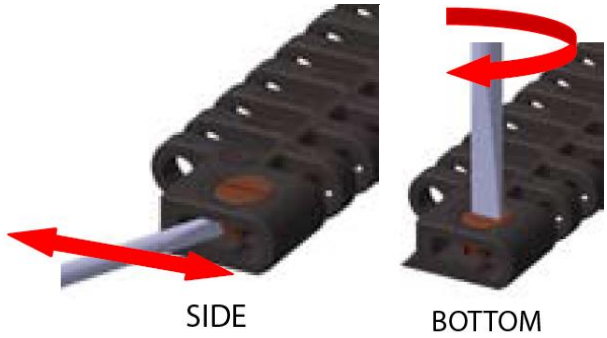
- Retention clips can easily be lifted from side of the belt, by leveraging a screwdriver in the clip slot
- Only a small movement is required & the clip remains in the pocket

Sliding clip for 1600/1500/HF 1600/HFS 1600/RR 1500 and 1110 Series



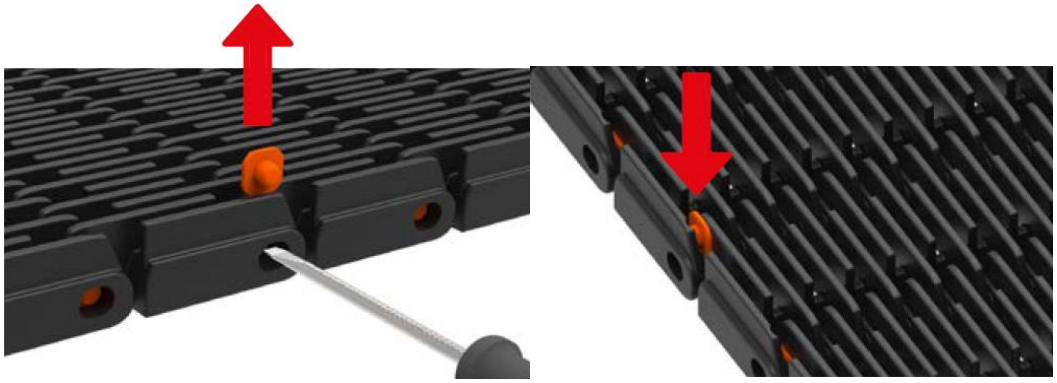
- Retention clips can easily be opened from side of the belt, by pushing it with a screwdriver in the clip slot or from the bottom of the belt
- The clip remains in the pocket

Rotating clip for 7300/7200 Series



- Optimized design and location of retention clip, which can be easily rotated from both the bottom and/or the side of belt
- The clip remains in the pocket

Lifting pin for 3125 Series



- Integrated clip, it can easily be rotated from the top of the belt
- The clip remains in the pocket

Snapsert™ clip for UCC Series

- Fully insert the tool into the access hole (the pin extractor is required)
- Push the chain down as you can until is almost flat
- Gently pry up with the tool. Repeat the process at the other end of the module
- Use the same tool to push the pin out. To assemble conveyor modules, center pin in hinge and reinstall it into the hole

4.2 CONVEYOR DESIGN RECOMMENDATIONS

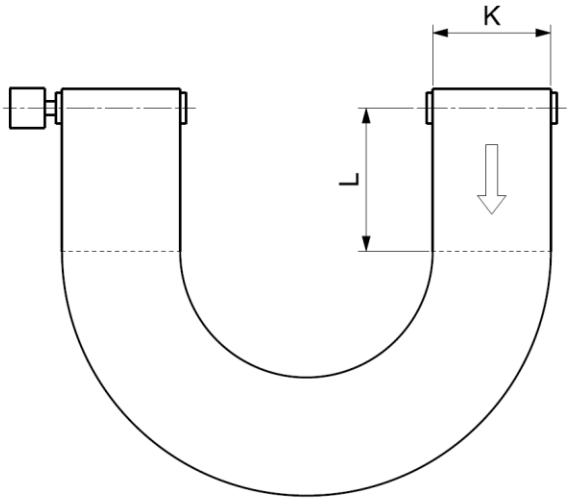
Layout Considerations

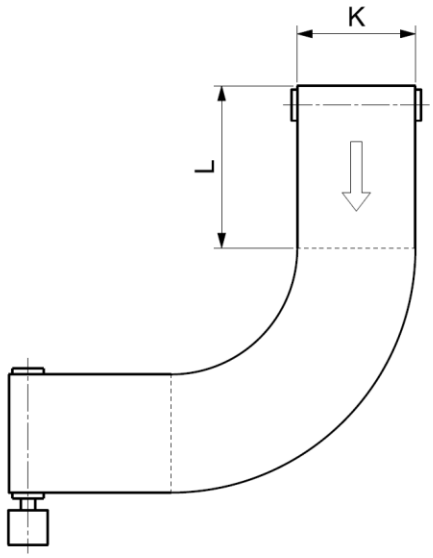
- The easiest way to convey products from A to B is a straight running design.
- This is not always possible due to flow processes and obstructions in the plant. In these cases, it is necessary to consider either a side-flexing conveyor or, in case of 90° transfer only, deadplates or ATM® transfer (Active Transfer Module).

Side-flexing conveyors

- Please see FliteTop® section II for general considerations on Matveyor® sideflexing chains.
- Matveyor® sideflexing chains are used both in single line and en-mass conveying, with the advantage of matching the same thickness of Matveyor® and ULTOP belts.
- Matveyor® sideflexing belts are typically used for case conveyors. It is important to foresee a Minimum straight section length L:

2556HTB (U and L path)





L= K (Belt width) x 1.4

Deadplates/ ATM® transfer (Active Transfer Module)

- May be used when mass conveying products 90°
- ATM chains allow to dynamically transfer the products to the take-away belt, providing self-clearing transfers

Incline/Decline Configuration

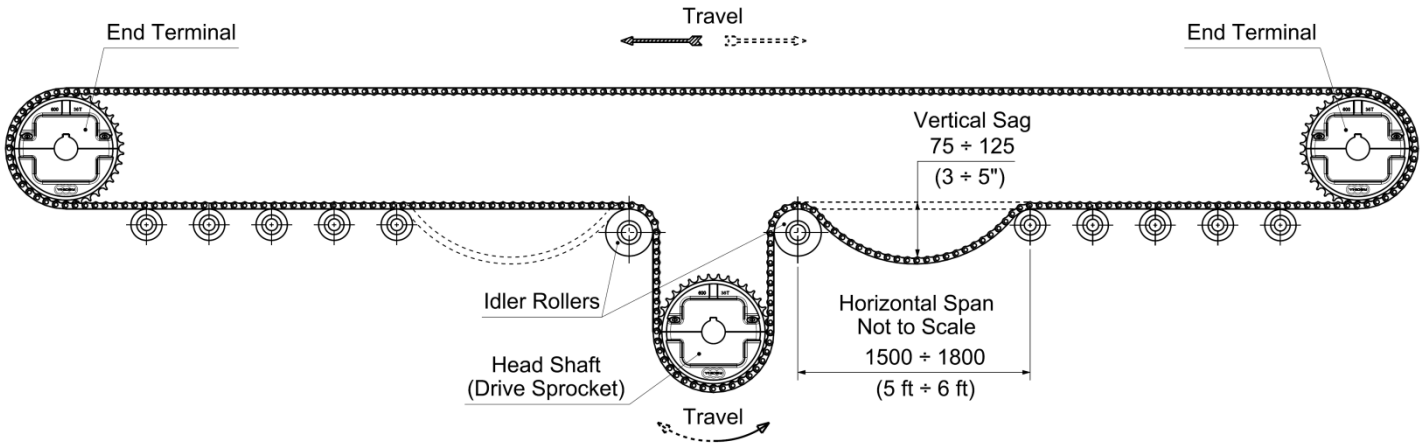
General rules of thumb when designing incline or decline conveyors are as follows:

- Belt should not be pushed
- Catenary should be located after the drive shaft
- Drive shaft should be located at the top of the conveyor for incline conveyors
- Rubberized belts need special requirements in the return section.
- Max recommended ramp angles for belts with rubberized surface:

Conveyed Product	Max Ramp Angle
Shrink wrapped PET bottles with petaloid bottom (6x1,5L)	24°
Shrink wrapped PET bottles with flat bottom (6x1,5L)	25°
Carton box	30°
Wax paperboard	28°
Crate	26°

Note: laboratory test values - Actual in/de-cline angles in standard working conditions may vary due to product material, center point of gravity of the product, etcetera.

Bi-Directional Bottom Drive Conveyor

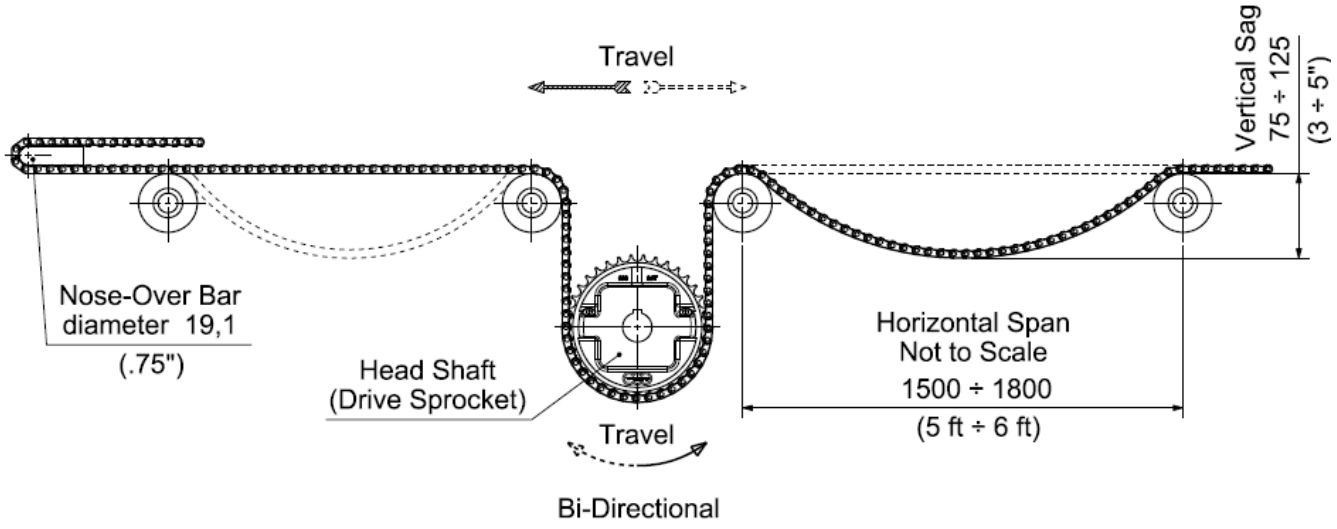


- Recommended roller spacing is 2 ft to 3 ft (0.5 m to 1 m), depending on speed and other considerations
- Idler rollers can be continuous drums or a series of individual rollers. If individual rollers are used, they should be positioned in line with the drive sprockets
- Rollers are recommended to be at least two times greater than the minimum back-flex radius of the belt

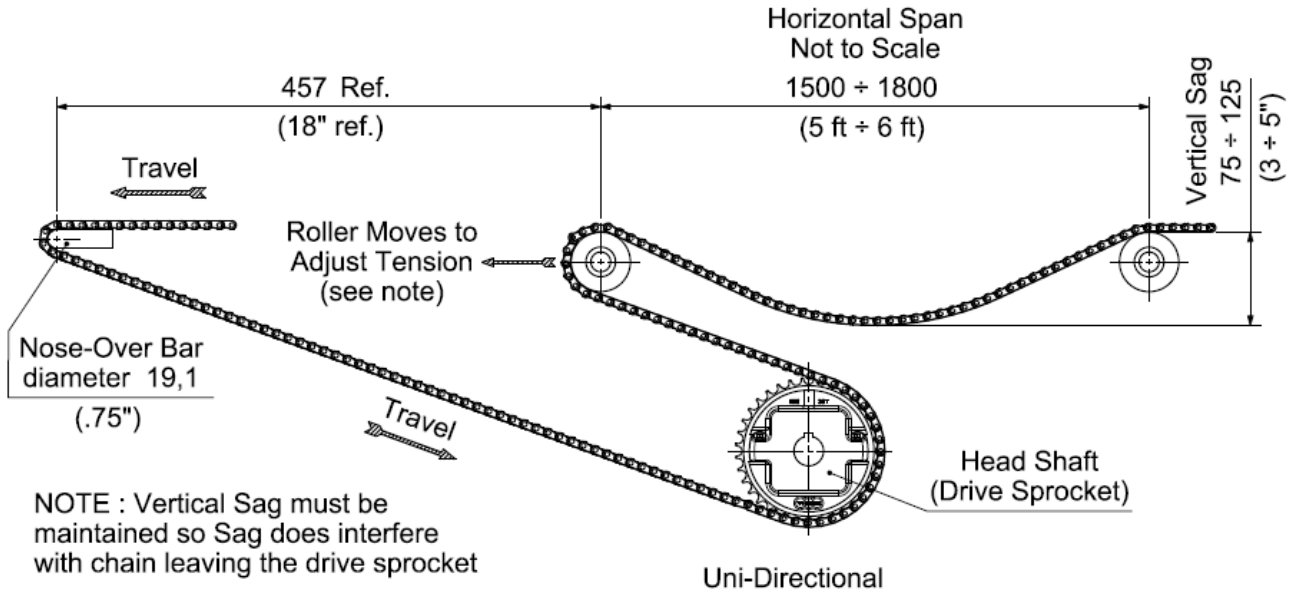
Nose-over transfer - Drive configurations

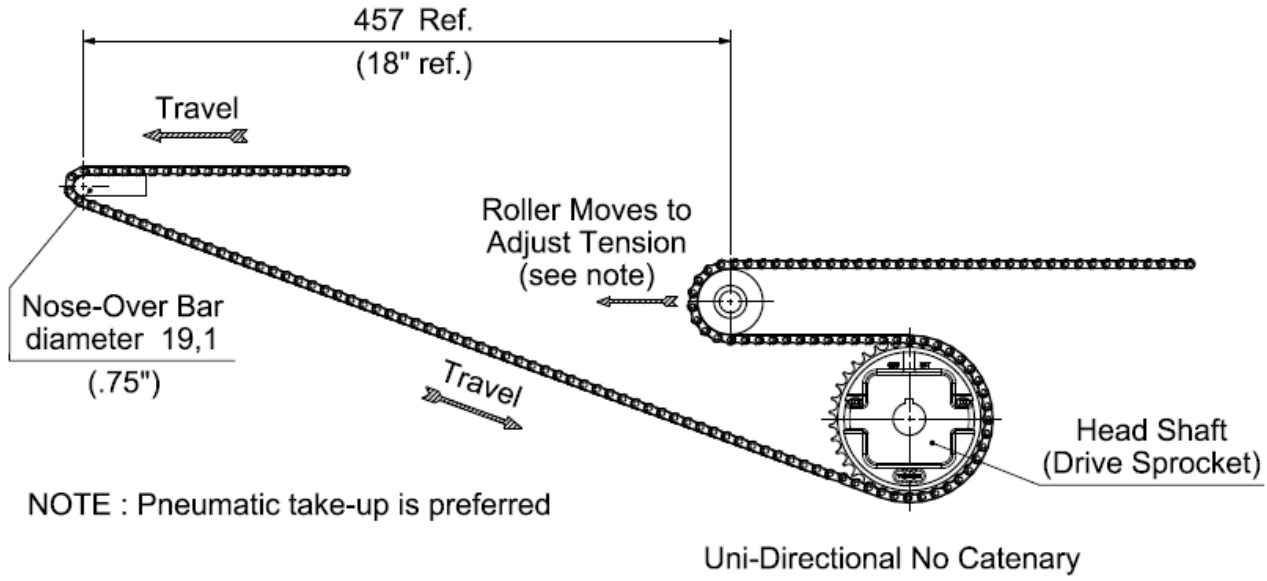
End-to end transfer requires a specific drive configuration to obtain the smoothest product transfer between conveyors

Bi-directional conveyor (Central drive)



Uni-directional conveyor





Regina recommends the following when designing and running a nose-over transfer conveyor equipped with short pitch belts:

- Use of UHMWPE wearstrips
- A horizontal span of 1,5 to 1,8 m (5 to 6 ft) and a vertical sag of 75 to 125 mm (3 to 5”)
- Use return rollers with a minimum diameter of 40mm (1,575”) to minimize backflexing. In any case, larger rollers are always recommended to decrease joint wear and extend chain life
- A drive wrap angle of 140 to 150°, to guarantee correct sprocket engagement

Other industry best practices:

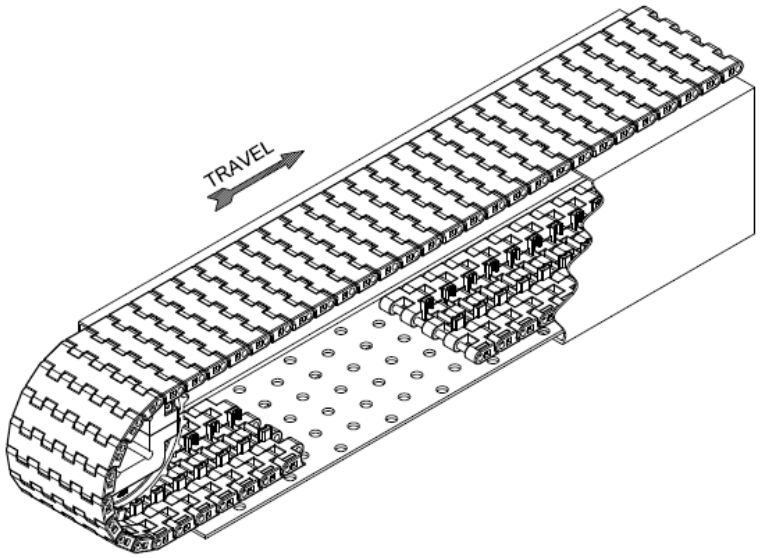
- All sharp edges of wearstrips should be rounded to ensure smooth chain movement
- The wearstrip under the belt must be levelled and even with others
- The catenary sag should always be measured when the belt is running
- Generally, tensioners are NOT recommended. If a take up must be used, install it on the catenary sag (in case of reduced space height)

4.2.1 CARRY AND RETURN WAYS

In order to guarantee the proper belt performance, it is important to:

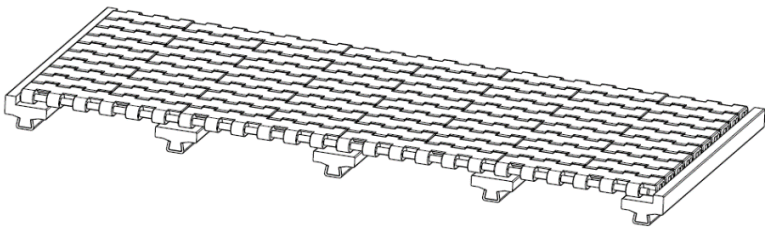
- foresee proper clearance between belt and guides, both for straight running and sideflexing applications, making sure to leave room for any expansion due to mechanical & thermal elongation. See page 65 for more details
- make sure to select the correct sideflexing radius, not less than the minimum sideflexing radius of the chain. See table on page 67.

Full Width Sliding Bed

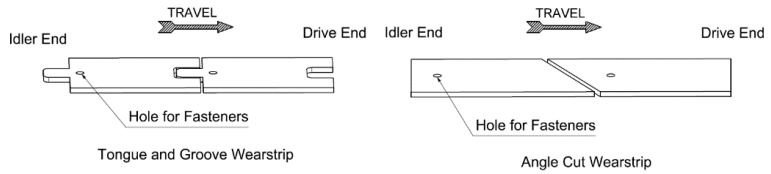


- Bed covers the entire width of the belt and almost the entire length between idler and drive sprocket(s). Typical materials include steel or UWMHPE.
- Bed may be perforated with slots or holes to allow for drainage and clearing of debris (which remains limited), as well as to avoid suction between the chain and bed in wet applications
- Recommended for applications with of high impact product loading

Parallel Wearsrips



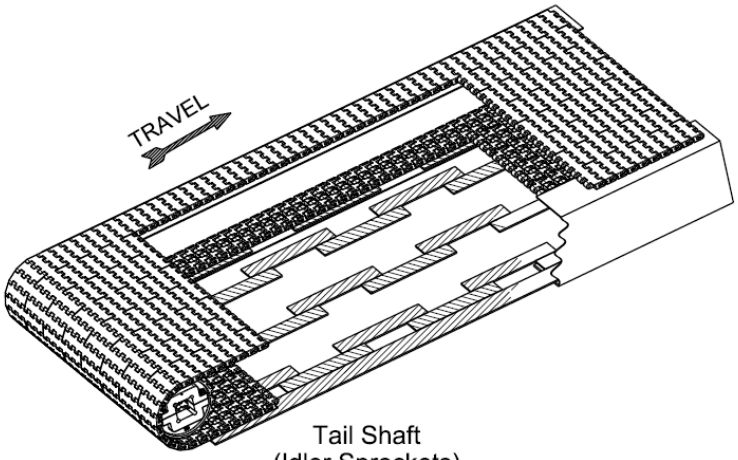
- Typically made of UHMWPE or steel
- Inexpensive and easy to install
- Belt wear is confined to the narrow areas in contact with wearstrips. Therefore, they are recommended for low-medium load applications only
- Recommended for bi-directional conveyors
- Expansion and contraction of wearstrips, due to temperature and humidity variation, must be accommodated:



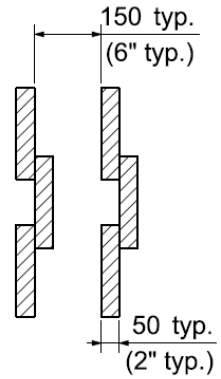
A gap between 6,4 mm (0.25”) and 9,53 mm (0.38”) is recommended to provide freedom for elongation caused by temperature changes.

Offset and Serpentine Wearstrips

Offset Rail Carry or Return Ways

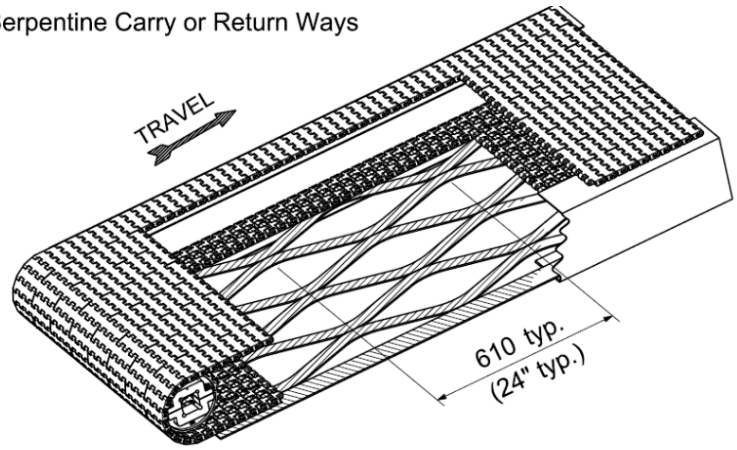


Tail Shaft
(Idler Sprockets)



Top View of
Wearstrips

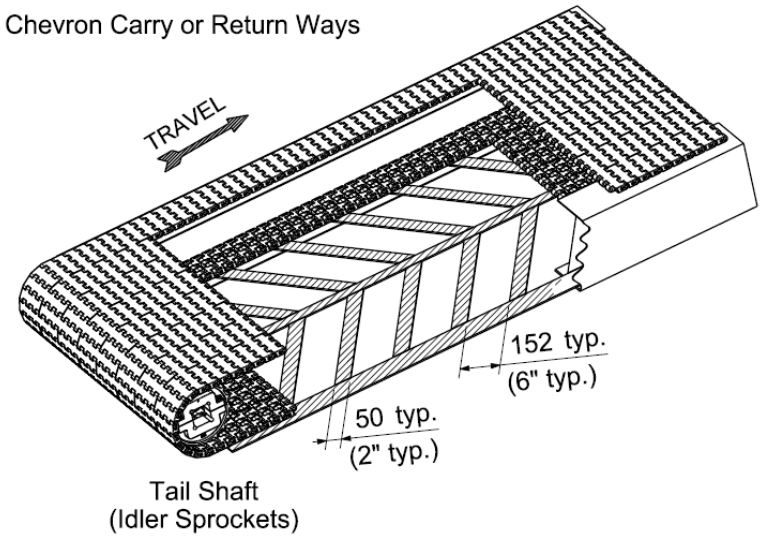
Serpentine Carry or Return Ways



Tail Shaft
(Idler Sprockets)

- The belt is fully supported across its full width of the conveyor
- Allow for drainage and clearing of debris
- Uniform wear across the full width of the belt to maximize chain lifetime
- Typical material for offset wearstrips is both steel and UHWMPE, but for serpentine only UHMWPE

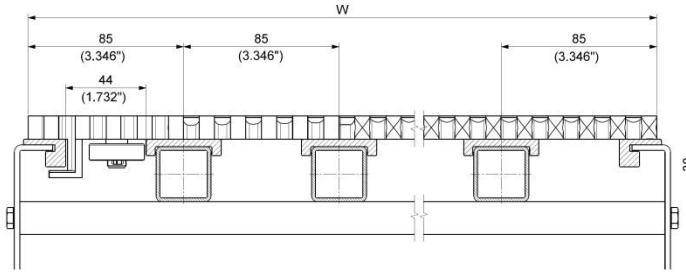
Herringbone (Chevron) Wearstrips



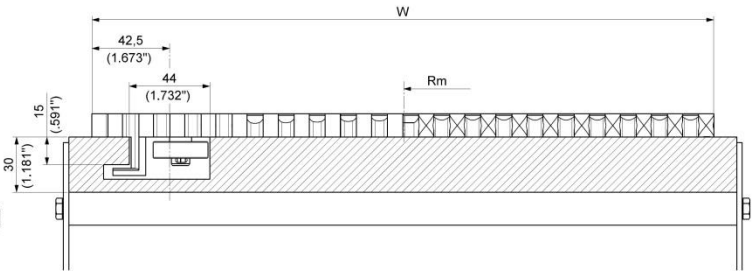
- The V-pattern should point toward the drive side in order to help track the belt
- Uniform wear across the full width of the chain to maximize chain lifetime
- Angled surface is effective in removing abrasive material from the underside of the belt
- Recommended for heavy loading applications (best product support)
- Not recommended for bi-directional conveyors

Wear strips for Regina Sideflexing Belt 2556 Series

Straight section configuration



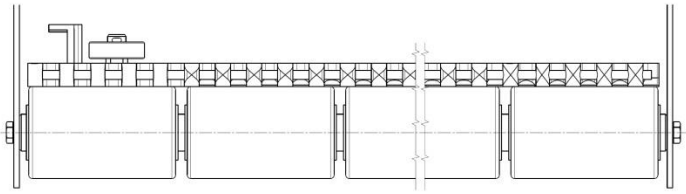
Corner section configuration



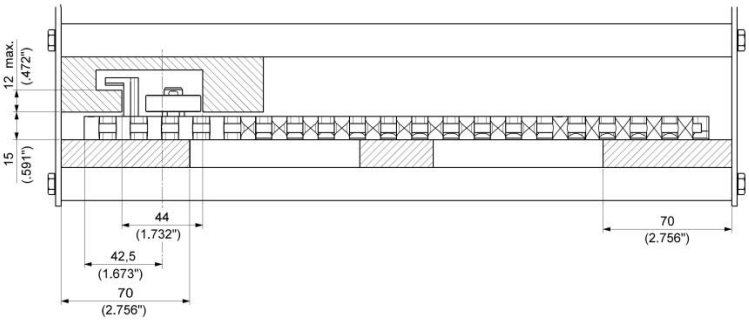
- Use conveyor frames with 44mm (1.732”) guide clearance
- Use standard chain guide wearstrips with 40mm (1.575”) width and 85mm (3.346”) spacing for straight section
- All sharp edges of straight and corner sections should be roundedto ensure smooth chain movement
- Inside edge of straight and corner sections should contain a lead-in or chamfer for a smooth transition
- The wearstrips under the belt must be levelled and even with each other
- UHMWPE tranks are recommended

Return section wearstrips

Straight section configuration



Corner section configuration



- Straight section: rubberized rollers with minimum diameter of 40mm (1.575”) are recommended to maximize chain life
- Corner tracks
  - Bearing must always be guided
  - The minimum recommend width for side belt support is 70mm (2.756”)
  - A center support is recommended for belts wider than 595mm (23.425”)
  - UHMWPE is recommended as material for guides and supports

- Serpentines are also suitable to provide uniform wear across the full width of the belt
- All sharp edges of return tracks should be rounded to ensure smooth chain movement
- Inside edges of straight and corner sections contain a lead-in or chamfer for a smooth transition

4.2.2 GUIDE CLEARANCE

In addition to a standard guide clearance at room temperature between belt and conveyor frame, contraction and expansion of the belt must be considered due to difference in temperature, in order to:

- Avoid interference with the conveyor frame when the belt expands at high temperatures
- Guarantee full support and tracking of the belt when the belt contracts at low temperatures

Standard conveyor guide clearance A, based on conveyor length is showed below.

STANDARD CONVEYOR GUIDE CLEARANCE			
Dimension A		Conveyor Length	
in	*mm*	*in*	*mm*
0.38	9,70	Up to 30	Up to 9
0.63	16,00	30 to 50	9 to 15
0.75	19,10	Over 50	Over 15

The total guide clearance GC can be computed as:

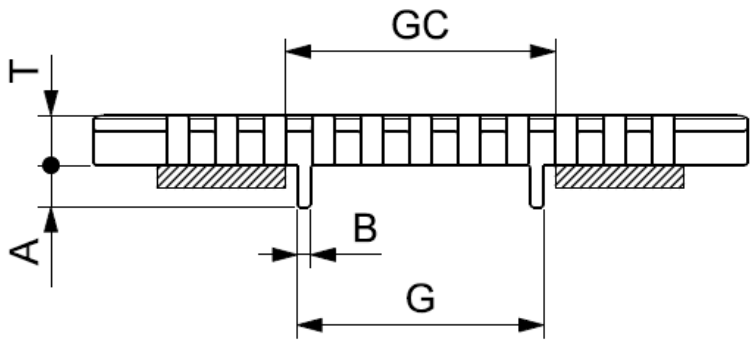
GC = W + A + ΔW(ΔT)

W = belt width at room temperature
A = standard guide clearance at room temperature, based on conveyor length
ΔW(ΔT) = W x CTE x ΔT = width variation in function of temperature
CTE = coefficient of thermal expansion
ΔT = operating temperature – initial temperature

COEFFICIENTS OF THERMAL EXPANSION		
Material	Inches / Feet /°F	mm / m / °C
Acetal	0.0006	0,090
Polyethylene	0.0015	0,230
Polypropylene	0.0010	0,150
Nylon	0.0005	0,070

Matveyor® dedicated chains

The proper clearance between chain and guides is shown below.



Matveyor® Straight Running dedicated width chains:

CHAIN SERIES	MINIMUM GUIDE CLEARANCE GC	
	in	*mm*
611AG K 29, 34, 37	0.858	21,80
611AG K 51	1.488	37,80
600, 610, LBP 610, 500, 1600, 1500, USPM, USP (Modular Belt),	1.732	44,00
300GATM, 611AG K 76	1.772	45,00
7200, 7300, 7300GATM, USP (Dedicated Widths)	1.752	44,50
USPG ATM	1.811	46,00

Matveyor® side-flexing chain minimum guide clearance:

CHAIN SERIES	MINIMUM GUIDE CLEARANCE GC			
	STRAIGHT SECTION		CURVE SECTION	
	in	*mm*	*in*	*mm*
782M, 783M, 793M	1.732	44,00	1.732	44,00
783T, 793T, 793L	1.811	46,00	1.752	44,50

Minimum Side-flexing Radius

Matveyor® chains minimum side-flexing radius (referring to the medium Radius):

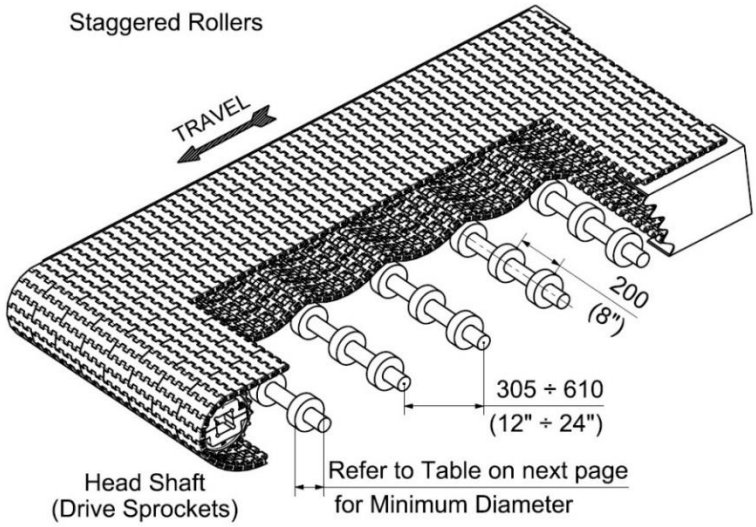
CHAIN SERIES	CHAIN WIDTH		SIDEFLEXING RADIUS	
	in	*mm*	*in*	*mm*
783T, 793T1 793L	3.25 - 3.30	82,6 - 83,8	18	457,2
	4.5	114,3 - 190,5	24	609,6
782M, 783M	3.3	190,5	19.69	500
793M	3.30 - 4.50	83,8 - 114,3	19.69	500
2556HTB	10.04	255	23.62	600
	13.39	340	31.5	800
	16.73	425	39.37	1000
	20.08	510	47.24	1200
	23.43	595	55.12	1400
	26.77	680	62.99	1600
	30.12	765	70.87	1800
	33.46	850	78.74	2000
2556HTB-SR	13.39	340	19.69	500
	16.73	425	23.62	600
	20.08	510	31.5	800
	23.43	595	39.37	1000
	26.77	680	47.24	1200
	30.12	765	55.12	1400
	33.46	850	62.99	1600

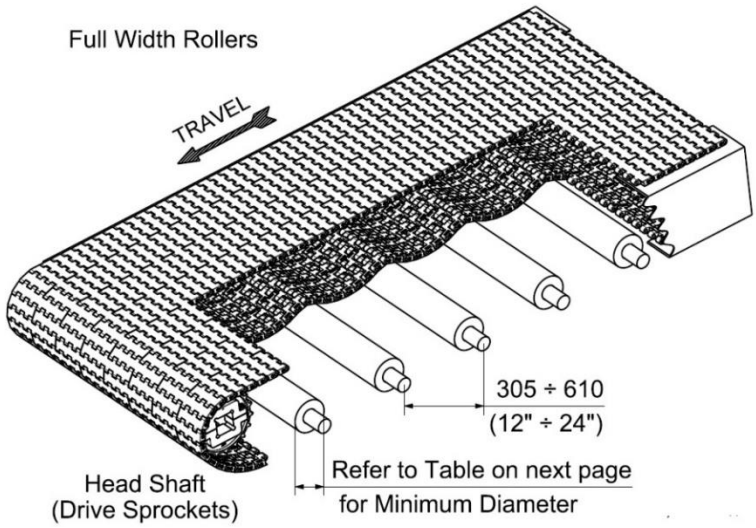
For 2556 series the radius indicated is the minimum central radius.

4.2.3 RETURN PART

The return part of the conveyor is important for the performance of the belt. If the return part is not properly designed, it can result is additional wear to the top surface of the belt, the belt can oscillate, resulting in additional wear / elongation & shock movement in the upperpart.

Rollers
The most common return part design is using rotating rollers or bars:



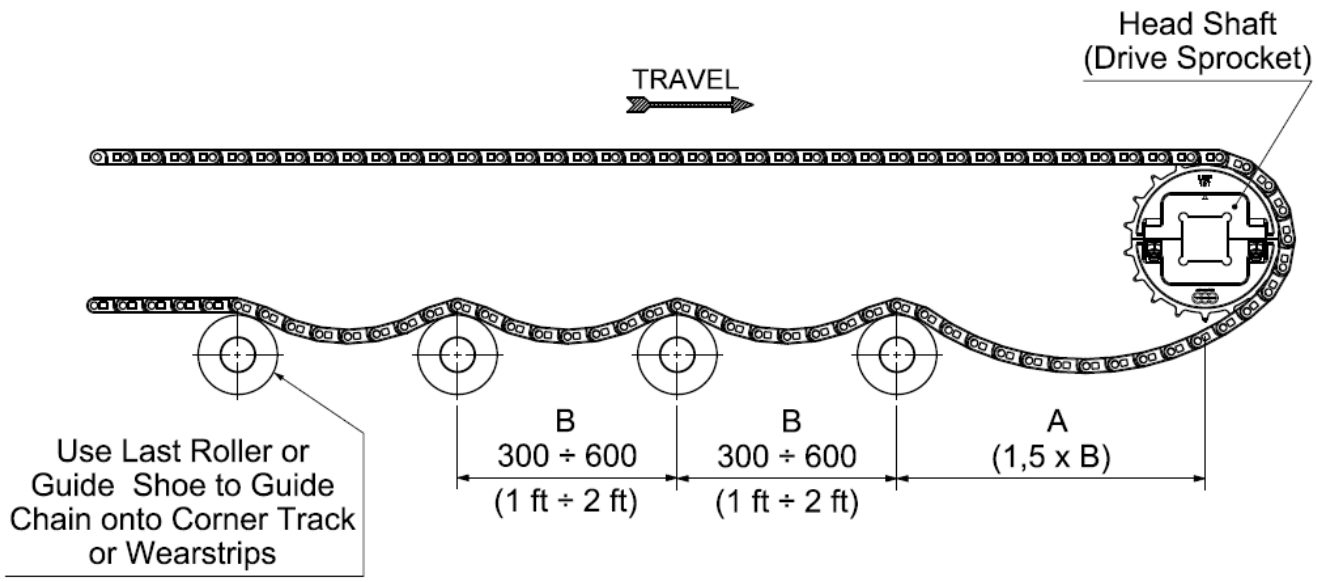


- Provide the lowest coefficient of friction when free to rotate (rolling friction vs. sliding friction)
- On the other hand, this design can increase wear of belt top surface when not free to rotate
- Good design to cover elongation of the belt
- Selecting the proper roller diameter is also important, in order to avoid:
    - difficult rotation when too big
    - noise and reduced belt support when too small: min roller radius > min chain back-flex radius. See table on the page 69.

- Bending of rollers may cause belt deformation and uneven wear
- Rollers are recommended to be at least two times greater than the minimum back-flex radius of the chain

CHAIN SERIES	BACK FLEX RADIUS	
	in	*mm*
2556	0.787	20,00
200,HF 200, 300, 500, 600, 610, HF 510, 611, RR611, 1500, 1600, UCC138	0.787	20,00
HF 1600, HFS 1600	0.984	25,00
7200,7300, USPM, HF USPM, HFS USPM, USP	1000	25,40
UCC	1.575	40,00
RR 1500	2.165	55,00
3125	3.000	76,20
1110, LBP XSPM	3.150	80,00
782M, 783M	4.724	120,00
783T, 793M, 793T, 793L	5.116	130,00
LBP USPM	9.055	230,00
RR 1600	9.446	240,00

- The first roller should be located far enough away from the head sprocket to allow for proper catenary sag
- Dimension “A” should be 1.5 to 2 times greater than Dimension “B”



Static Tubes/Static Return Shoes

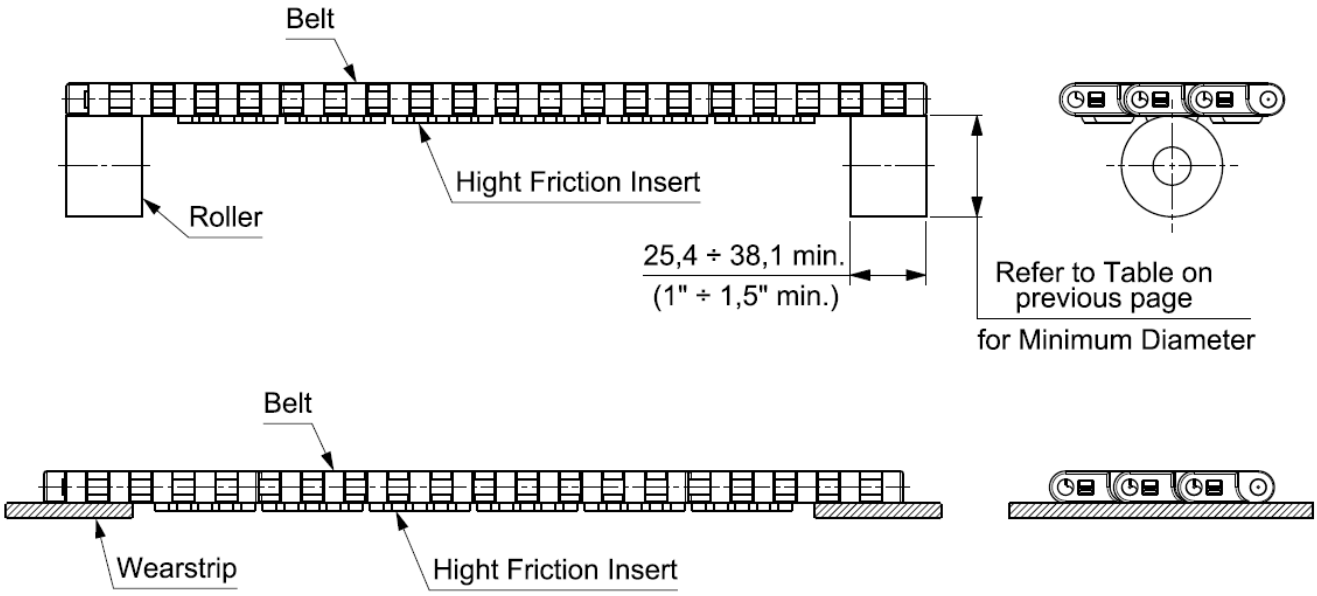
- Even though they will cause more belt drag than rotating rollers, they are recommended for pasteurizers, warmers & coolers with an internal belt return, because of the limited maintenance requirements
- For Regina 3125 Series belt a 3” (76,2 mm) radius static half-round shoe or a 6” (152,4 mm) diameter static tube is recommended
- All static tubes and shoes must be level and perpendicular to chain direction of travel
- A good surface finish is very important. We recommend cold rolled stainless steel with a 32 µ-in Ra max. Further we recommend to use UHMWPE or PVC coverings for can and plastic container applications, which are non-abrasive, to reduce the friction & surface wear of the belt

LBP belts

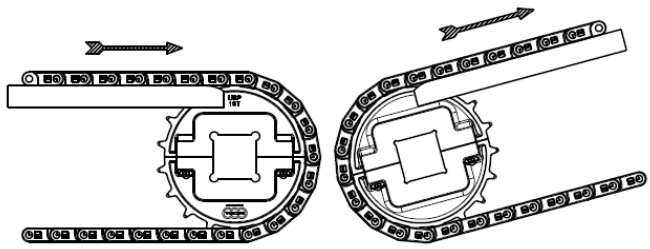
- We recommend to use return shoes with a radius larger than the minimum backflex radius of the belt
- Rollers and wearstrips are not recommended

HF belts

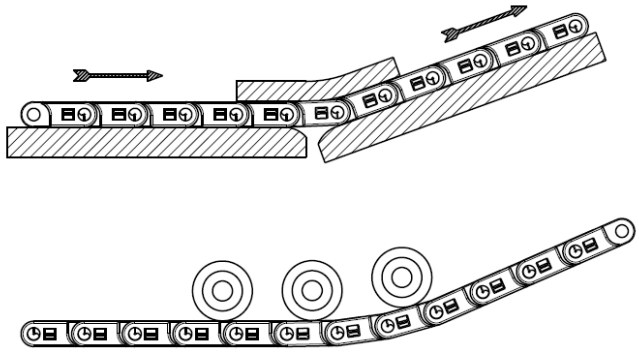
- A belt execution with rubber surface over the entire width of the belt full width rotating rollers are recommended
- A belt execution with side-indents using rollers or straight wearstrips running on the side-indent are recommended:



- The transfer from horizontal section to incline can be a separated head to tail construction (with a deadplate transfer, if needed):



- If horizontal and incline/decline are integrated in one conveyor, the radius of carry transition areas should be as large as possible and the belt needs to be supported, to prevent the it from being lifted out of the track:



This support can be positioned at the side indent of the belt.

- If the incline/decline angle is severe, a spring or pneumatic take-up system may need to be considered
- In decline conveyors, a snub roller after the drive sprockets can be utilized to maintain a 150° to 180° wrap

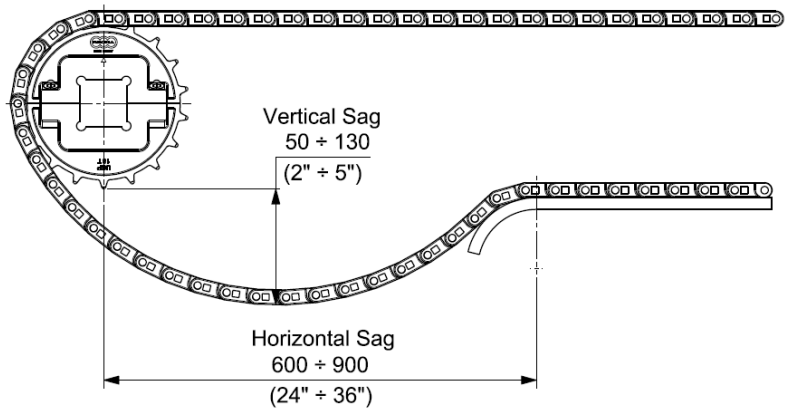
Catenary Sag

The catenary sag is the section of the conveyor, where the chain is not supported and usually located directly after the drive in the return part. It provides:

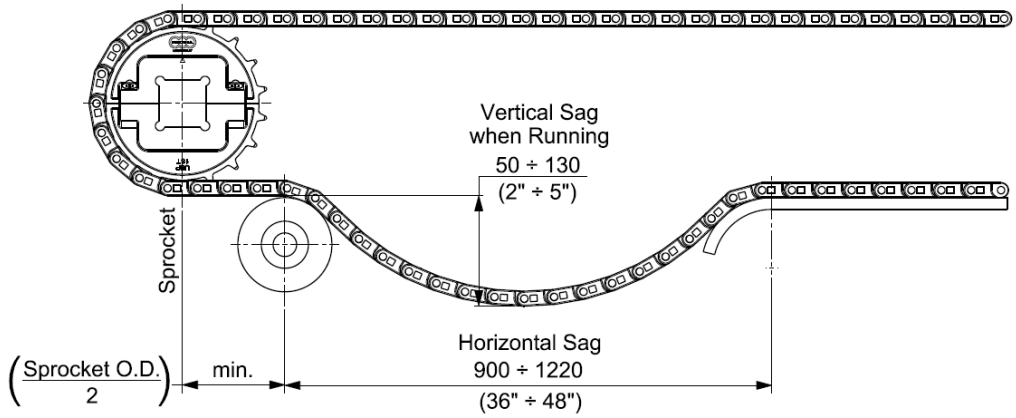
- Mechanical balance of any tension not absorbed by the sprocket teeth
- Avoiding jumping/sliding of the belt
- Release the chain of the drive sprocket at the proper moment
- Room to allow elongation due to elongation, thermal expansion and mechanical stretching

The recommended wrap around angle is appr. 150 - 180°:

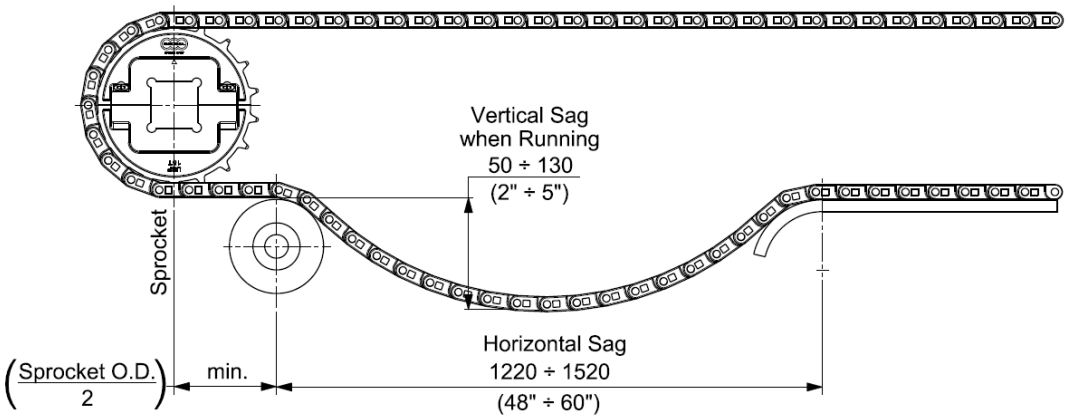
Catenary Sag - Conveyors with up to 12 mt. (40 ft) Centers and Top Load up to 75 Kg/m^2 (15 lba/ft^2)



Catenary Sag - Conveyors with up to 18 mt. (60 ft) Centers and Top Load up to 100 Kg/m^2 (20 lba/ft^2)



Catenary Sag - Conveyors with longer than 18 mt. (60 ft) Centers and Top Load in excess of 100 Kg/m^2 (20 lba/ft^2)



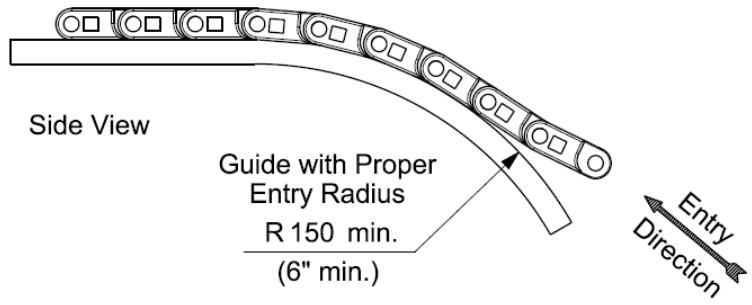
- The catenary section of a conveyor must be properly designed to accommodate elongation for a given chain in order to avoid any obstruction with the conveyor structure.
    - Double-deck applications: provide enough height between decks to allow for the necessary belt sag and avoid interference of the upper return belt with the containers or spray systems on the bottom deck

- We recommend having catenary sag of appr. 50 to 125mm (2 to 5 in.). The catenary sag should be located as close to the drive as possible and should be measured while the chain is running.

- Avoid take-up systems, unless:
  - there is not enough room for proper catenary sag (center drive conveyor)
  - small drive sprockets with high load are used
  - catenary is not viable (vertical or bent to the side conveyor)

Entry Radius for Sliding Returns

- Allocation for sufficient entry radius to the return section of the conveyor must be provided in order to allow the chain to feed smoothly onto the return ways.

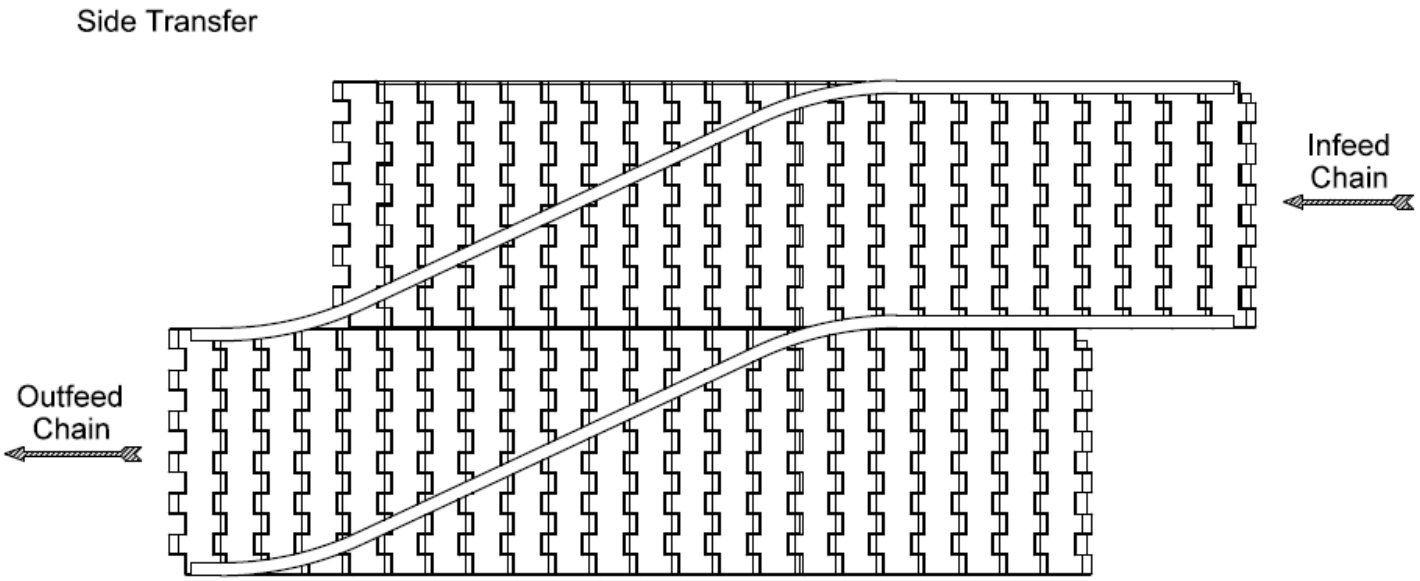


- The curve radius should be greater than the minimum backflexing radius of the chain (see table at page 69), but a 6 in (152 mm) minimum entry radius is recommended to prevent non-uniform wear
- Rounded corners should be provided at the entry of the return wearstrips to prevent catching or snagging of the chain

4.2.4 TRANSFERS

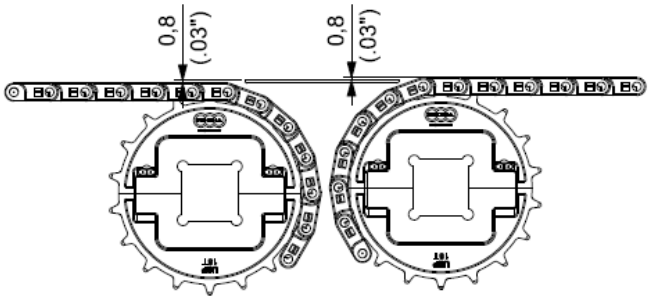
With product transfers it is important to provide smooth transfer from chain to chain, in order to avoid product handling issues. Tipping of products during transfers may cause product fall, jams and loss of productions.

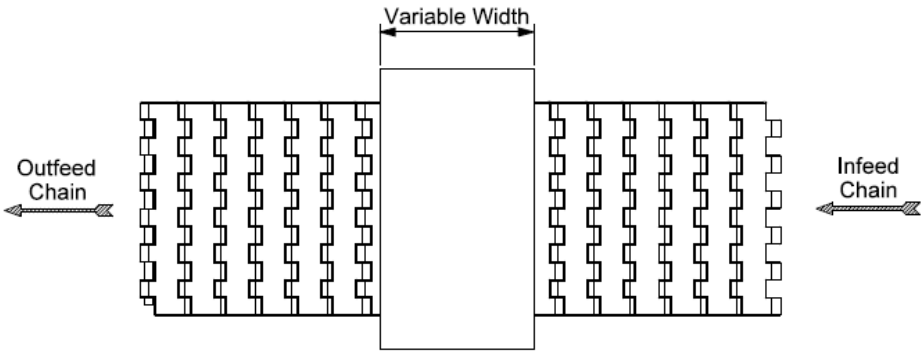
Side Transfer
Allows transfer without stranded products:



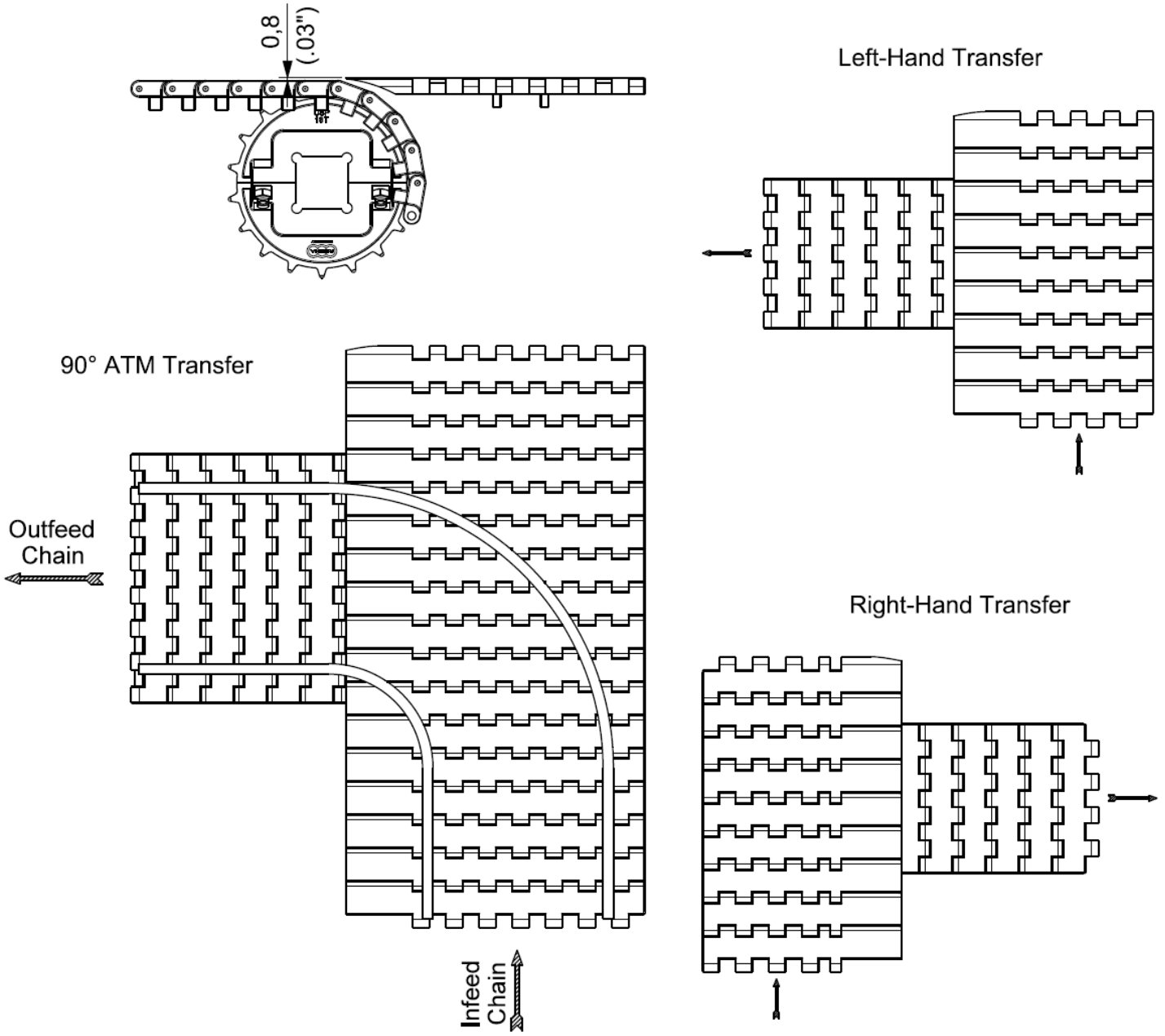
Inline Deadplate Transfer

- Infeed chain should be mounted slightly higher than the deadplate & the deadplate to be mounted slightly higher than the top surface of the outfeed chain (appr. 1mm steps)
- With deadplates most likely products will remain on the transfer, therefore deadplates should be as short as possible: with a smaller pitch of the belt & sprocket the deadplate can be shorter compared to larger pitch & sprocket diameter



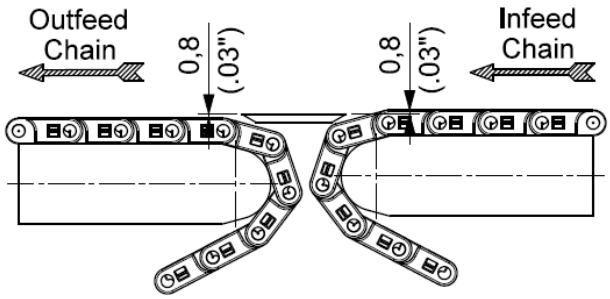


90° ATM Transfer (Active Transfer Modules)
ATM is a self-clearing transfer which eliminates stranded product on transfer sections. Both left-handed and right-handed transfers available.

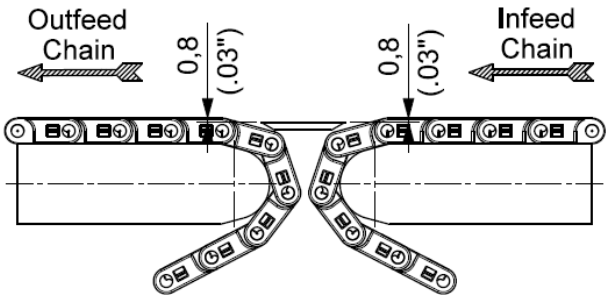


Nose-Over transfer

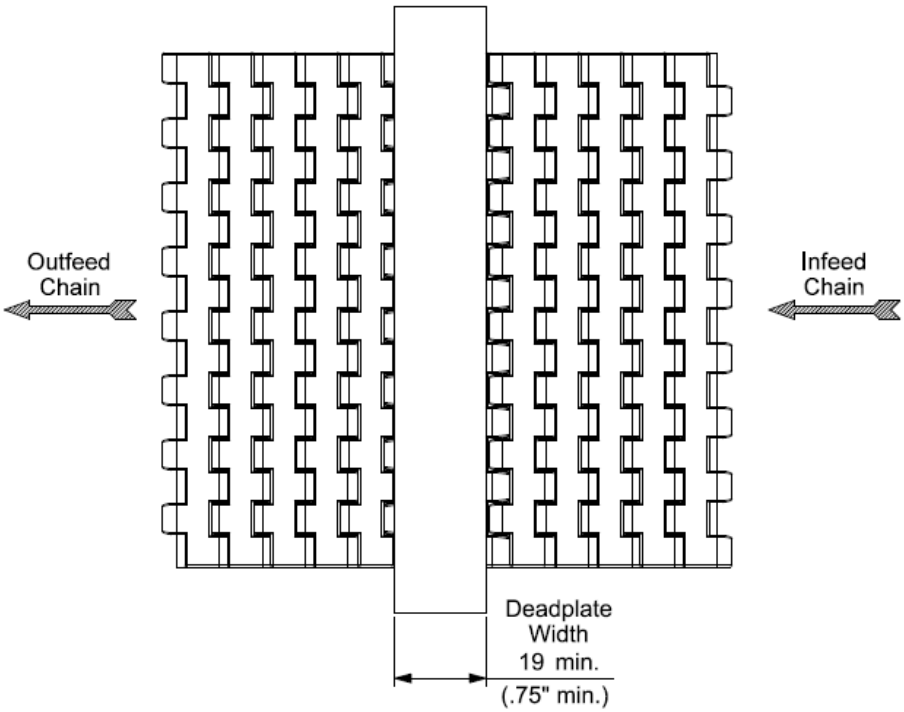
- This system uses a smaller nose-bar or sprocket in place of normal diameter sprockets, in combination with short pitch belts, in order to reduce the width of the transfer plate
- This reduces the length of the deadplate significantly and it is especially beneficial for unstable and light products, as well as small packs.
  The deadplate may not be required when conveyed products are big enough to travel over the gap (Boxes, 6-packs, etcetera)
- Two different nose-bar positioning options are acceptable and can be found in the field:

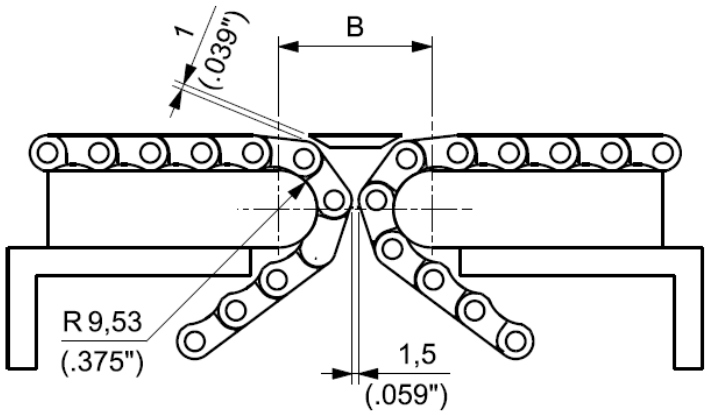


Transfer Plate and Outfeed Chain both step down from the Infeed Chain



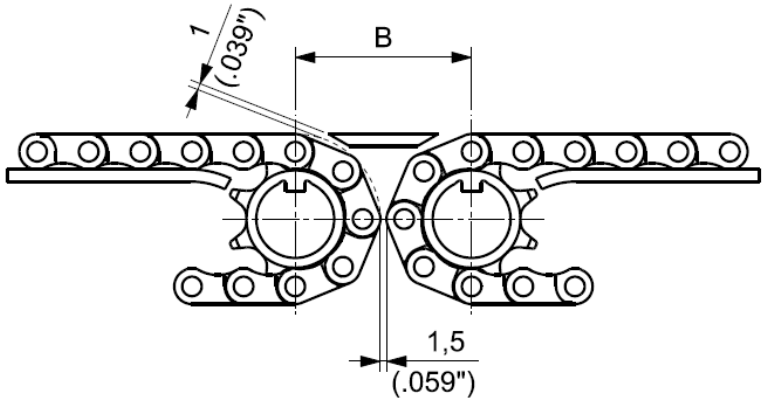
Infeed Chain and Outfeed Chain are level to each other and the Transfer Plate steps down





BELT SERIES	Nosebar MINIMUM CENTER TO CENTER DISTANCE B	
	in	*mm*
610, 300, 200	1.494	37,95
600, 500	1.604	40,74
HF510, HF200	1.652	41,95
LBP 610	2.258	57,37

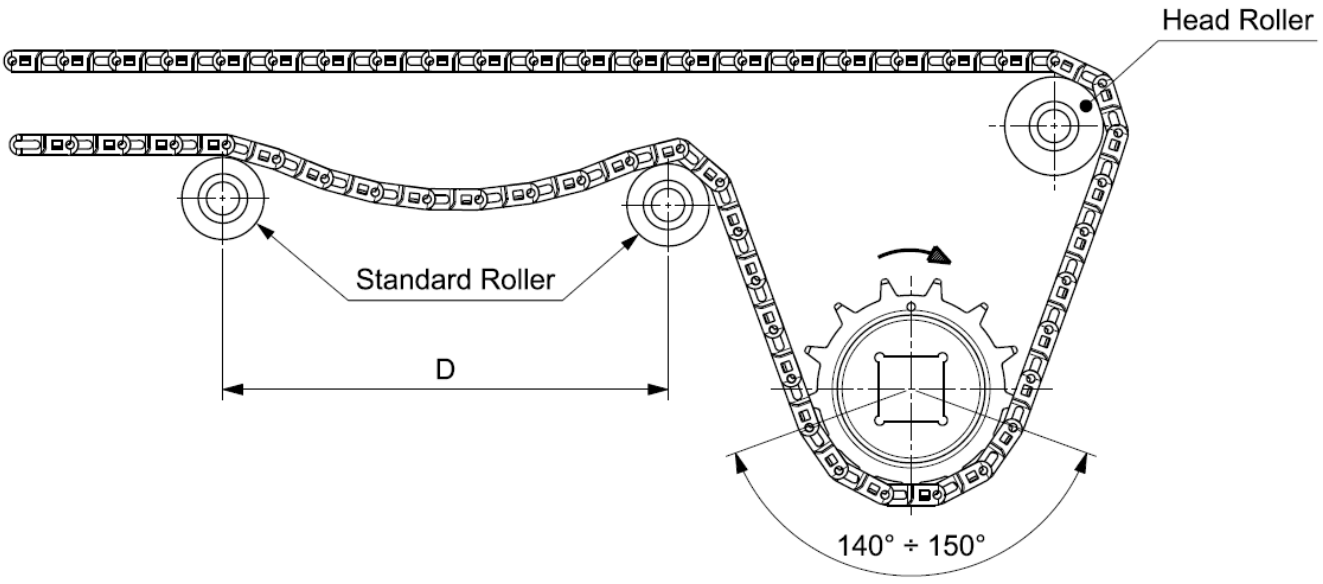
- Using 8T sprockets in place of a nose-bar slightly increase the deadplate size, but it reduces the chain tension and minimizes noise



8T sprockets		
BELT SERIES	MINIMUM CENTER TO CENTER DISTANCE B	
	in	*mm*
610, 300, 200	1.706	43,39
HF510, HF200	1.866	47,39
LBP 610	2.498	63,46

Tight transfer drive for Regina Sideflexing belt 2556 Series

- A horizontal span D of 600mm (24”) and a vertical sag E of 75 to 125mm (3 to 5”) are recommended.
- Generally, tensioners are not recommended. For a tight transfer drive configuration, in case of horizontal spans less than 600mm (24”) a take-up installed on the catenary sag is advisable to reduce pulsations.
- The recommended head roller with a minimum diameter (tight transfer only) is 70mm (2.756”).
- Use return roller with a minimum diameter of 40mm (1.575”) to minimize backflexing. The joint wear decreases and chain life increases.
- The recommended drive wrap angle is 140 - 150°, to guarantee the correct sprocket engagement.

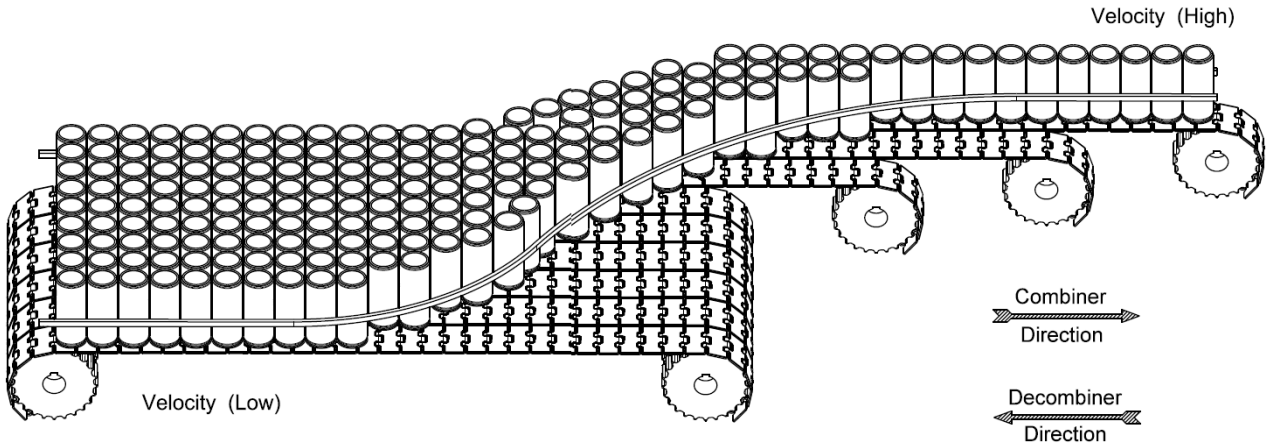


Combiners/Decombiners

The most efficient way to convey products is normally in mass, because of the lower speed and accumulating capabilities. Nonetheless, some machines, such as rinsers, fillers, inspection stations, labelers…, require the products to be in single file. The machines that allow these transitions, from mass flow to single file and vice-versa, are called combiners and decombiners, respectively.

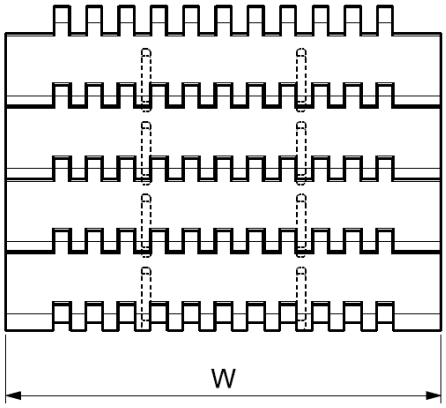
Chains run side by side at progressively higher or lower speed. By means of a guide, products are transferred from chain to chain.

- Regina DT² and e-F.A.S.T. are the ideal materials for these applications, because it allows a seamless transfer from chain to chain, even in reduced or no lube conditions
- If space permits, use enough lanes to keep speed differentials between adjacent strands to about 50 - 75 ft/min (15 - 23 m/min), depending on product
- When several chains run side by side, such as on multiple width conveyors and combiners or decombiners, make sure the return chains do not interfere with each other



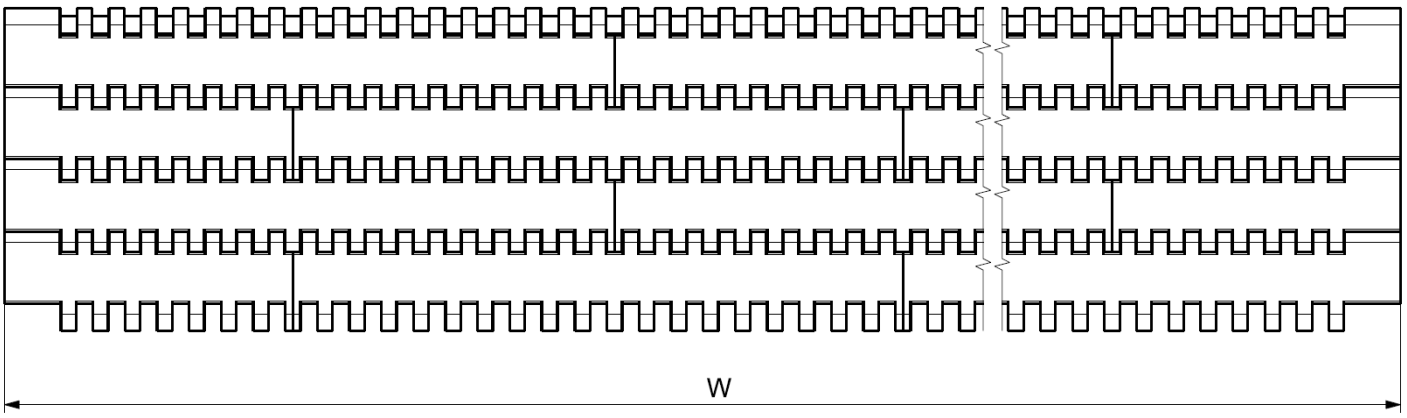
4.3 AVAILABLE CHAIN WIDTHS

Dedicated chain widths



- Refer to the table on the next page for specific widths
- Most chain series are available with or without tracking guides

Modular belts



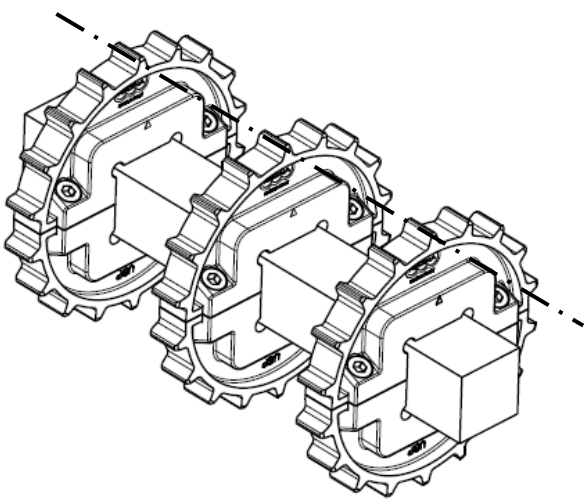
- Refer to the table on the next page for specific widths
- Width determined and assembled to customer specifications
- Smaller non-standard cuts are available for certain belt styles

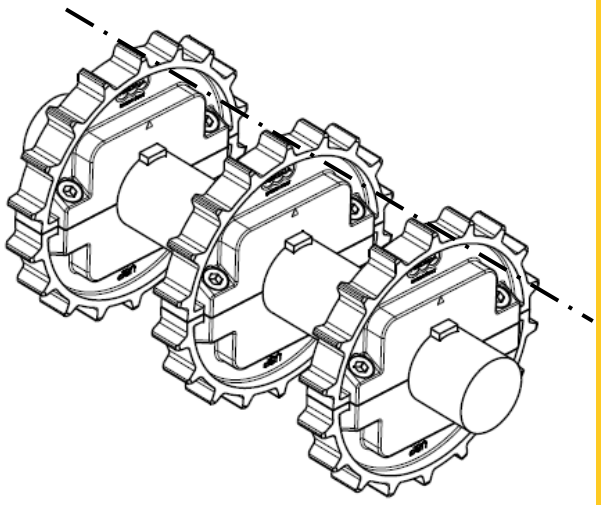
CHAIN SERIES	DEDICATED WIDTHS	STANDARD (MODULAR BELT UNCUT)		NON-STANDARD (MODULAR BELT UNCUT)	ACTIVE TRANSFER MODULE WIDTH	ACCESSORIES	
		Min. Belt Width	Belt Width Increment	Belt Width Increment		Guides Available*	Retention System
600	85 mm	170 mm	85 mm	17 mm	110 mm	Yes	No
610	85 mm	170 mm	85 mm	17 mm	-	Yes	No
500	85 mm	170 mm	85 mm	17 mm	-	Yes	No
HF 510	2" - 85 mm	170 mm	85 mm	17 mm	-	Yes	No
LBP 610	85 mm	170 mm	85 mm	-	-	Yes	No
300, 200	3" - 4,5"	6"	3"	0,75"	6,3"	DW: Yes STD: No ATM: Yes	No
HF 200	3"	6"	3"	0,75"	-	No	No
611, RR 611	29 mm, 34 mm, 37mm, 51 mm, 76 mm	-	-	-	-	Yes	No
1600, HF 1600, HFS 1600	83,8 mm, 85 mm	170 mm	85 mm	17 mm	110 mm - 195 mm	Yes	No
1500	83,8 mm, 85 mm	170 mm	85 mm	17 mm	195 mm	Yes	No
RR 1500	-	170 mm	85 mm	17 mm	-	No	No
RR 1600	30 mm, 38,5 mm, 47mm, 58 mm	-	-	-	-	No	No
1110	-	6"	3"	1.5"	-	No	No
7300	3.25", 4.5", 6", 7.5"	9"	3"	1/3"	6.3" - 6.9"	DW: Yes STD: No ATM: Yes	No
7200	3.25", 4.5", 6", 7.5"	9"	3"	1/3"	-	DW: Yes STD: No	No
USPM	83,8 mm	170 mm	85 mm	17 mm	127,5 mm	Yes	No
HF USPM	85 mm	170 mm	85 mm	17 mm	-	Yes	No
HFS USPM	-	255 mm	85 mm	17 mm	-	Yes	No
LBP USPM	85 mm	170 mm	85 mm	-	-	Yes	No
LBP XSPM	85 mm	170 mm	85 mm	-	-	Yes	No
USP	3.25", 4.5", 7.5"	6"	3"	1"	6", 9"	DW: Yes STD: No ATM: Yes	No
UCC	3.25", 4.5", 6", 7.5", 12", 15", 18", 24"	-	-	-	6.5", 9.5"	DW: No ATM: Yes	No
UCC 138	1.37"	-	-	-	-	No	No
3125	-	12"	3"	1.5"	-	No	No
2556HTB	-	255 mm	85 mm	-	-	No	Tab+Bearing
2556HTB-SR	-	340 mm	85 mm	-	-	No	Tab+Bearing
783T, 793T	3.25", 83,8 mm, 4.5"	-	-	-	-	No	Tab
782M, 783M	83,8 mm	-	-	-	-	No	Magnetic
793M	83,8 mm, 4.5"	-	-	-	-	No	Magnetic
793L	4.5"	-	-	-	-	No	Low Center

* DW = Dedicated width, STD = Standard (Modular belt uncut), ATM = Active transfer module

4.4 SPROCKET/POCKET POSITIONING

- When installing the sprockets, make sure that all sprocket faces are positioned the same way on the shaft:

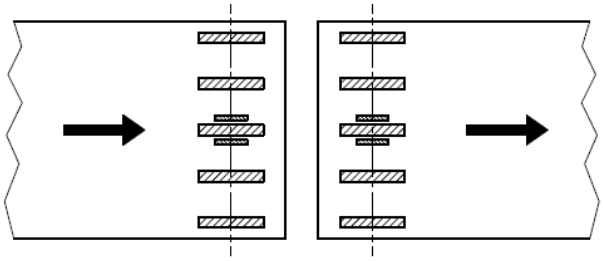




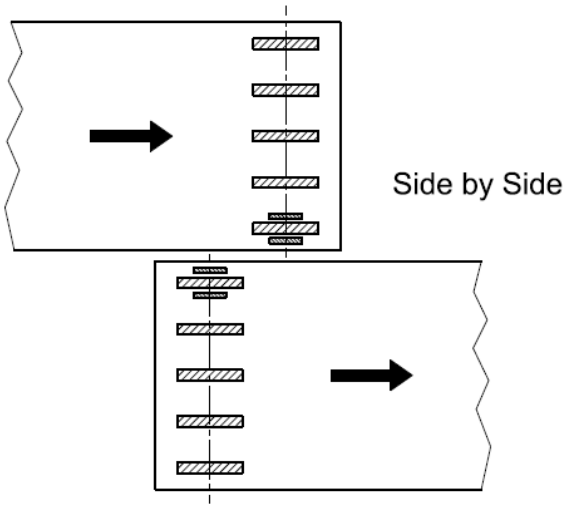
- Confirm that all sprockets have the same tooth face (teeth are in line)
- For round bores:
  - Secure the sprockets with setscrews (imperial bores only).
  - Key all sprockets on the drive shaft and only one on the idler (center, if possible)

Sprocket Axial Positioning and Locking Methods for Matveyor®

- It is generally recommended to lock axially only one sprocket per shaft to guide the belt, and leave the other sprockets able to slide freely to compensate for expansion or contraction of the belt.
- Sprockets can be locked axially using set screws, roll pins, welded blocks or shaft collars.
- The axial locking positioning depends on the type of transfer to the adjacent conveyor:



Head to Head



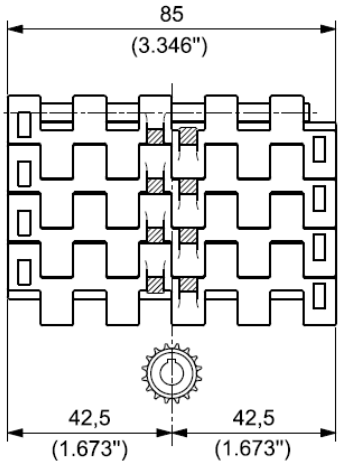
Side by Side

BLOCKED SPROCKET ON SHAFT

600 - 610 - 500 - HF510 - LBP610 SERIES

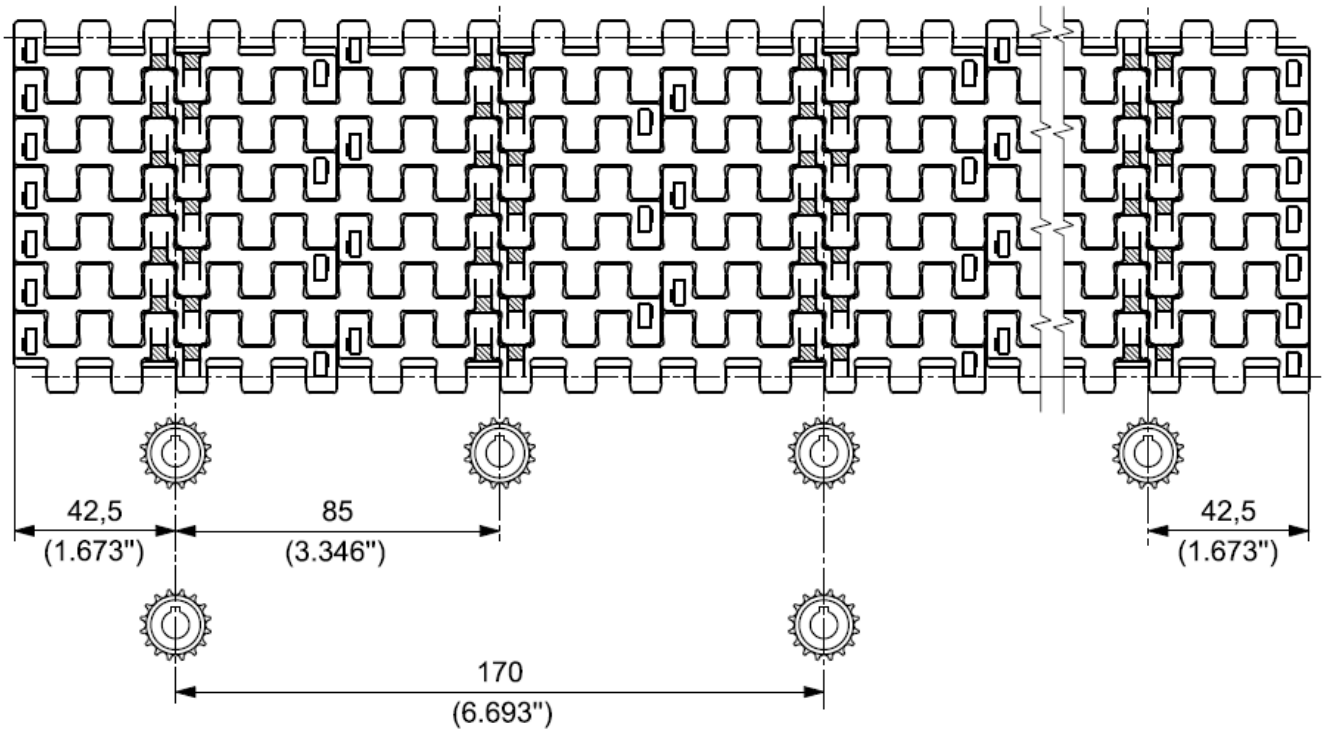
Dedicated widths

- For chain 85mm (3.3456”) wide use N.1 drive sprocket and N.1 idler wheel.
- Please consider pocket positioning dimension of 42,5mm (1.673”) from chain edge.



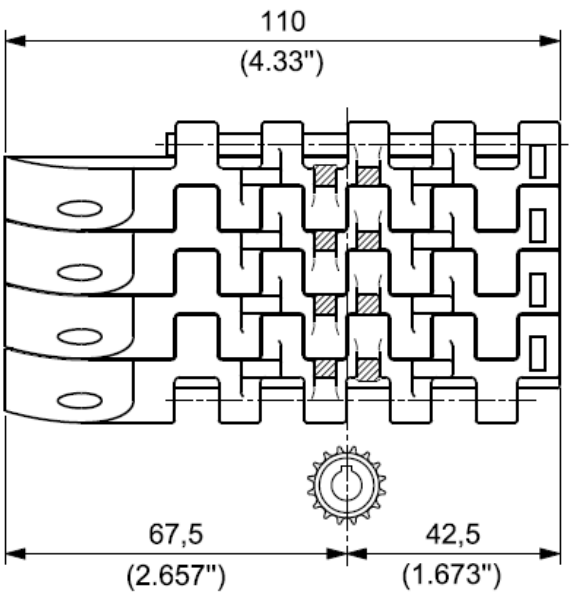
Modular belts

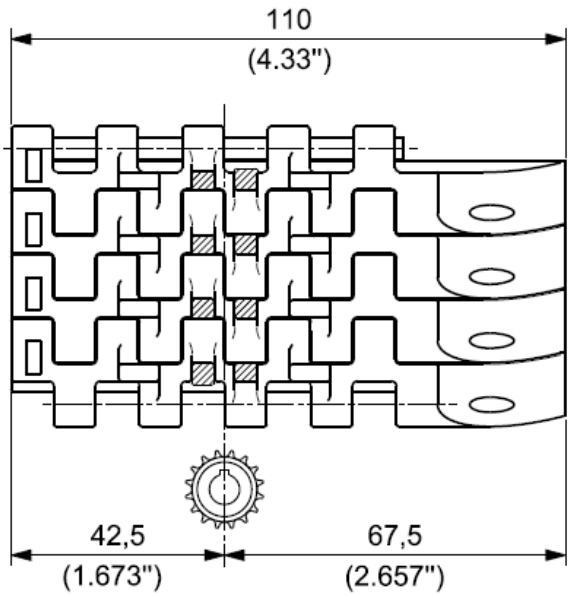
- For other widths please consider first pocket position dimension of 42,5mm (1.673”) from belt edge, and 85mm (3.346”) spacing between other consecutive pockets.
- A spacing of 170mm (6.693”) between idler sprockets (or wheels) should normally be used on idler shaft.
  The example refers to a 340mm (13.384”) wide belt.



Active transfer modules:

- For chain 600GATM use N. 1 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimensions of 42,5mm (1.673”) from chain edge.

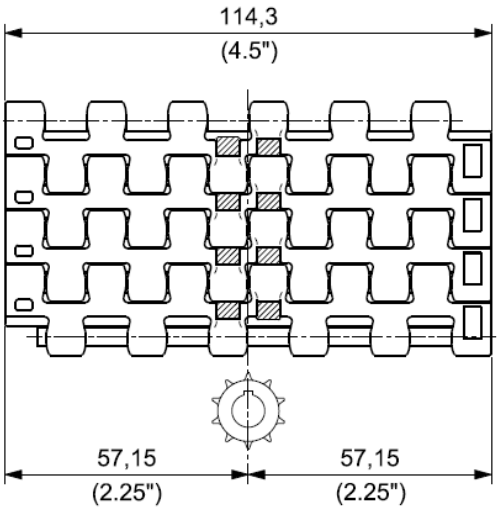




300 - 200 - HF200 SERIES

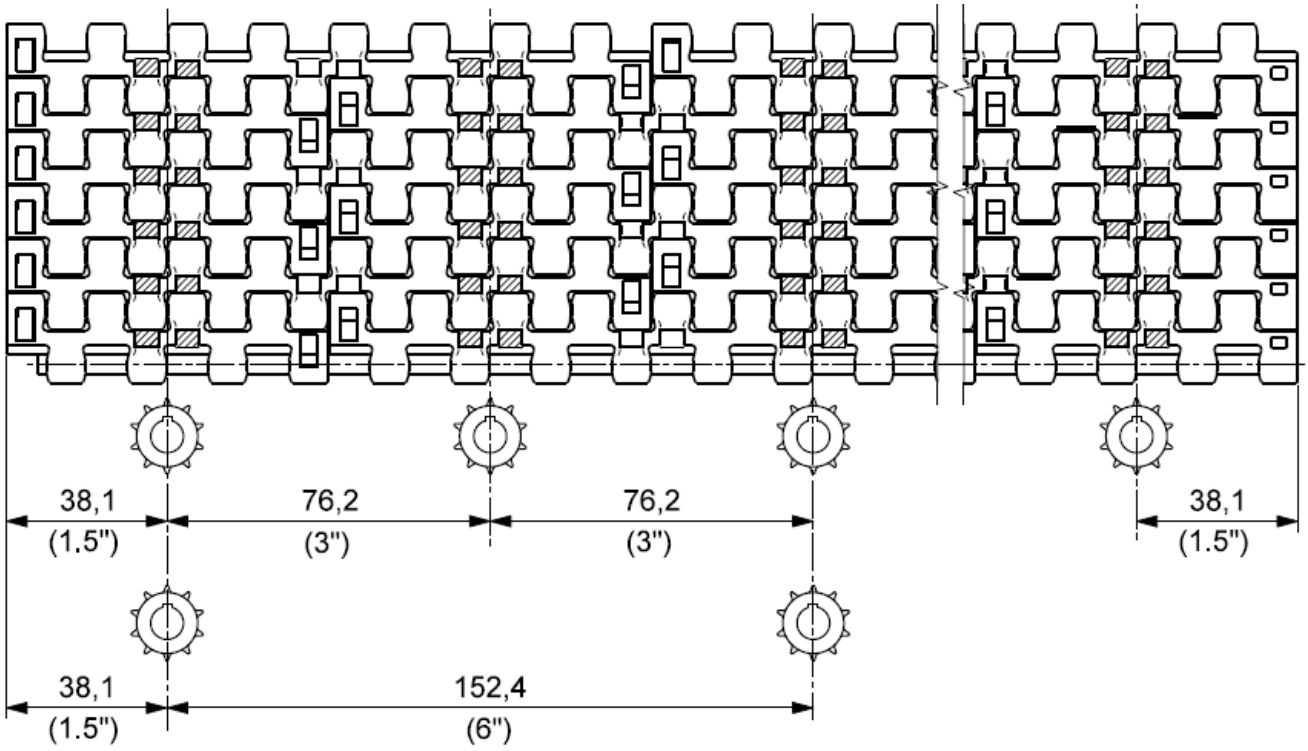
Dedicated widths

- For chain 4.5” (114,3 mm) wide use N.1 drive sprocket and N.1 idler wheel.
- Please consider pocket positioning dimension of 2.25” (57,15 mm) from chain edge.



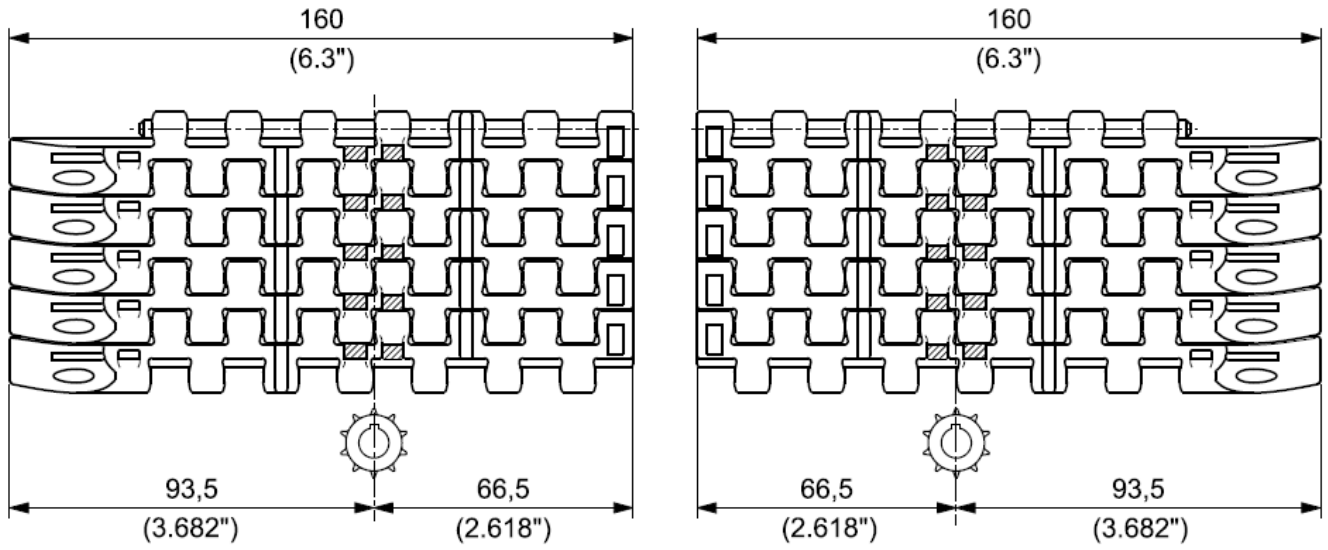
Modular belts

- For other widths please consider first pocket position dimension of 1.5” (38,1 mm) from belt edge, and 3” (76,2 mm) spacing between other consecutive pockets.
- A spacing of 6” (152,4 mm) between idler sprockets (or wheels) should normally be used on idler shaft.



Active transfer modules (ATM)

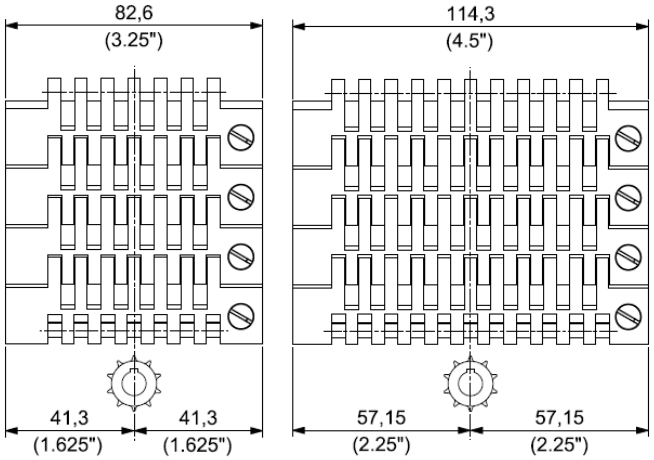
- For chain 300GATM use N.1 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimensions of 2.618” (66,5 mm) from chain edge.

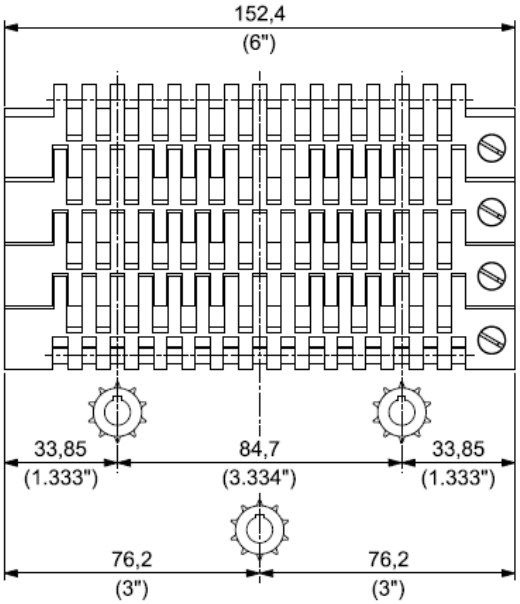


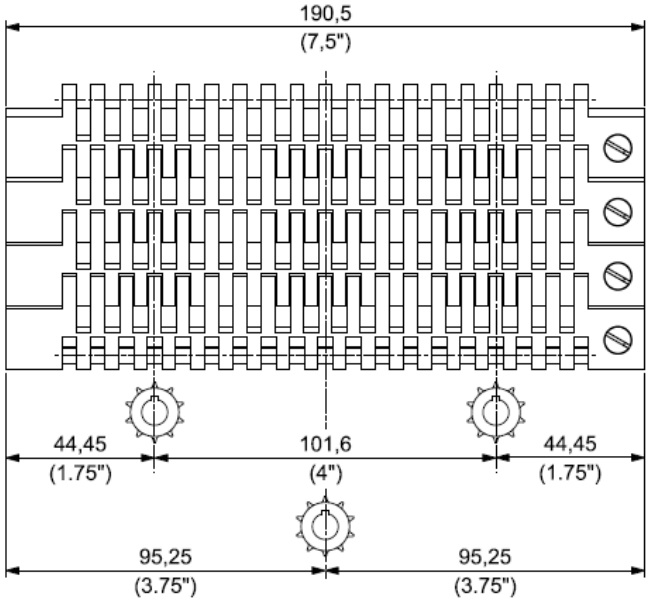
7300 - 7200 SERIES

Dedicated width

- For chain 3.25” (82,6 mm) wide use N.1 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimension of 1.625” (41,3 mm) from chain edge.
- For chain 4.5” (114,3 mm) wide use N.1 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimension of 2.25” (57,1 mm) from chain edge.
- For chain 6” (152,4 mm) wide use N.2 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimension of 1.33” (33,85 mm) for drive and 3” (76,2 mm) fro idler from chain edge.
- For chain 7.5” (190,5 mm) wide use N.2 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimension of 1.75” (44,45 mm) for drive and 3.75” (95,25 mm) from idler from chain edge.



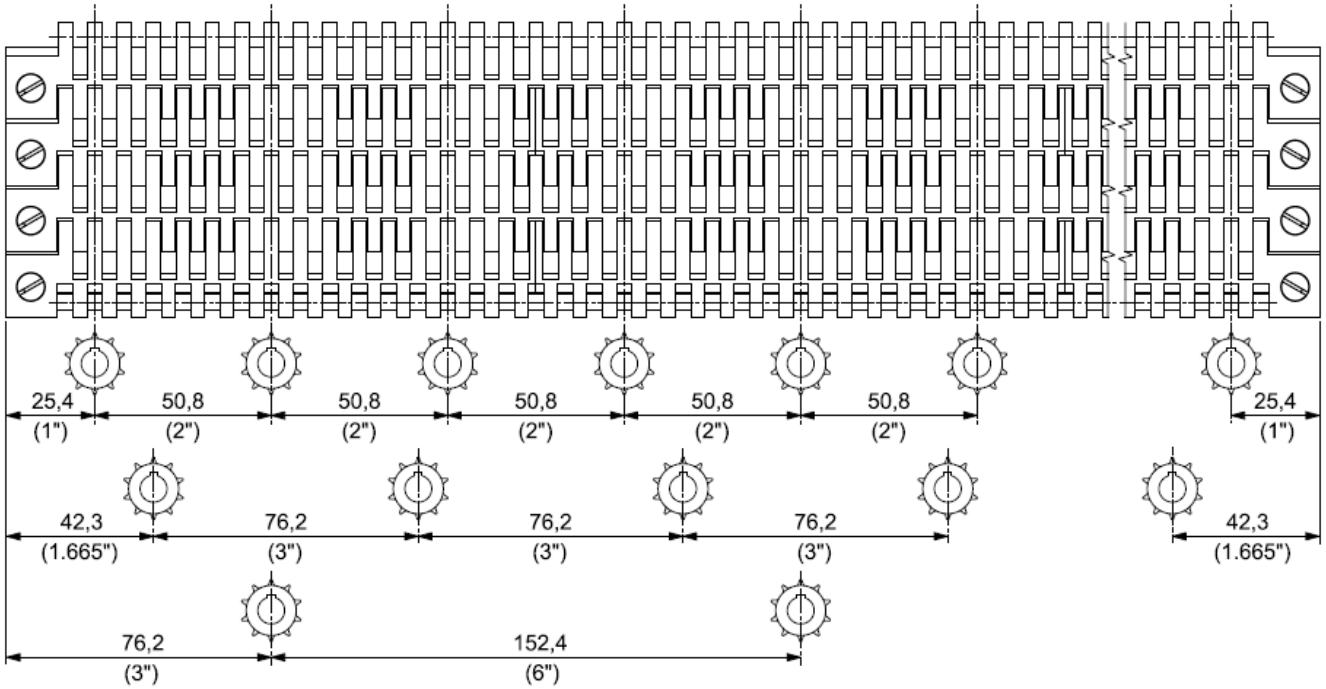




- For lighter duty applications N.1 drive sprocket and N.1 idler sprocket can be used.

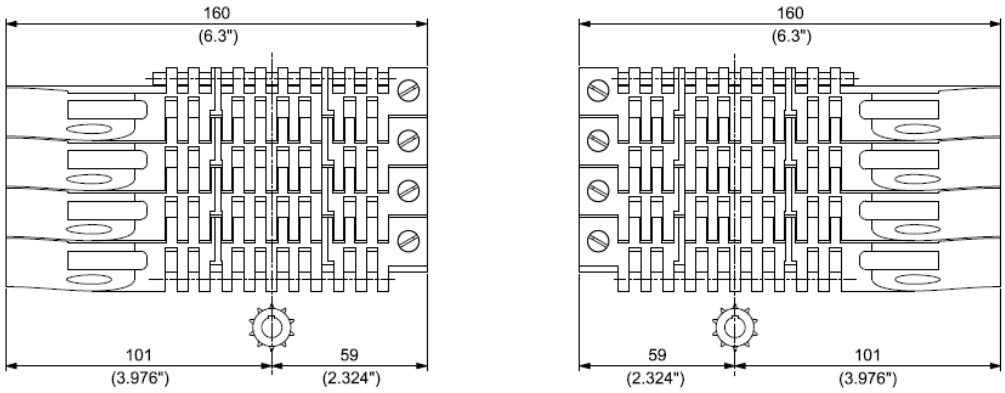
Modular belts

- For other widths please consider first pocket position dimension of 1” (25,4 mm) from belt edge, and 2” (50,8 mm) spacing between other consecutive pockets for heavier duty applications.
- Please consider first pocket position dimension of 1.67” (42,3 mm) from belt edge, and 3” (76,2 mm) spacing between other consecutive pockets for lighter duty applications.
- A spacing of 6” (152,4 mm) between idler sprockets (or wheels) should normally be used on idler shaft.

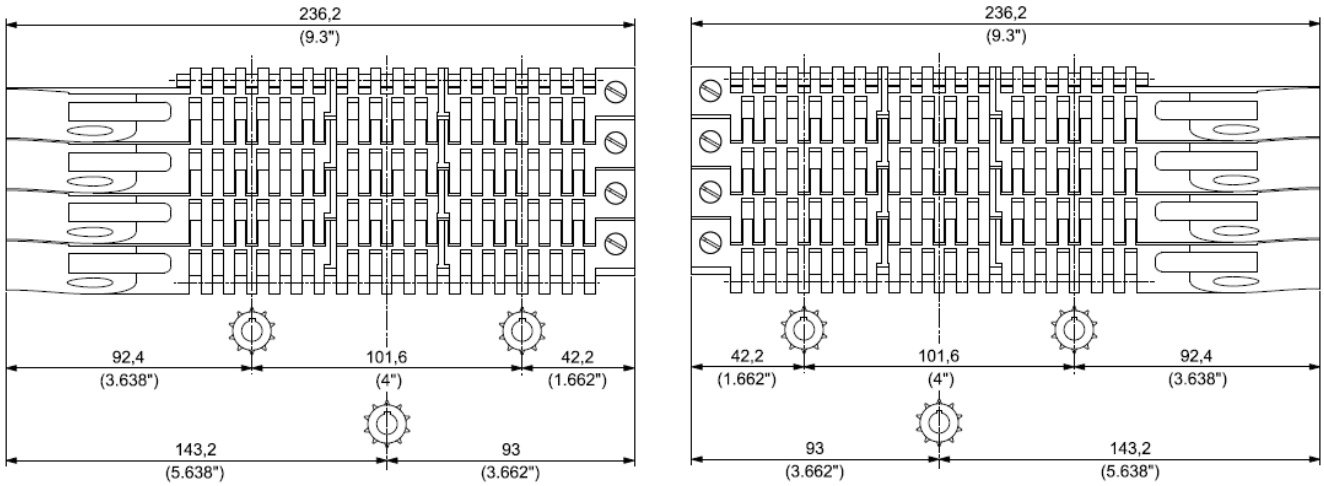


Active transfer modules

- For chain 7300GATM, 6.3” (160 mm) wide, use N.1 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimensions of 2.324” (59 mm) from chain edge.



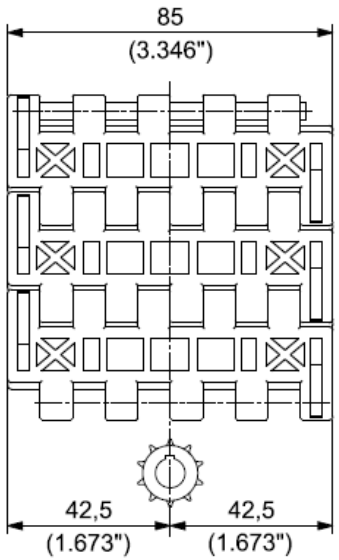
- For chain 7300GATM, 9.3” (236,2 mm) wide, use N.2 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimensions of 1.662” (42,2 mm) for drive sprocket and 3.662” (93 mm) for idler sprocket from chain edge.

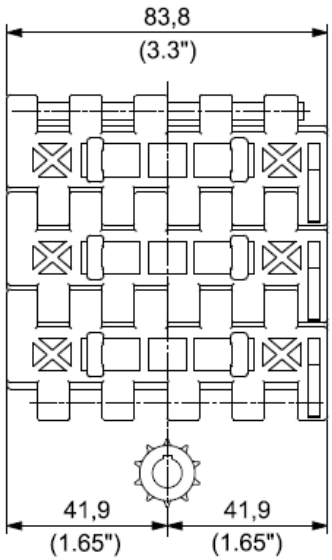


1600 - 1500 - RR1600 - RR1500 - HF1600 - HFS1600 SERIES

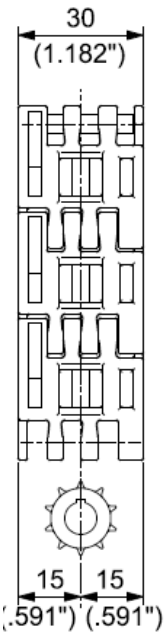
Dedicated widths

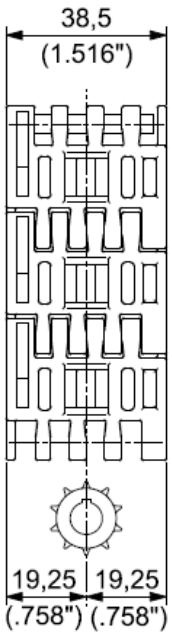
- For chain 83,8 (3.3”) wide use N.1 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimension of 41,9mm (1.65”) from chain edge.
- For chain 85 (3.346”) wide use N.1 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimension of 42,5mm (1.673”) from chain edge.

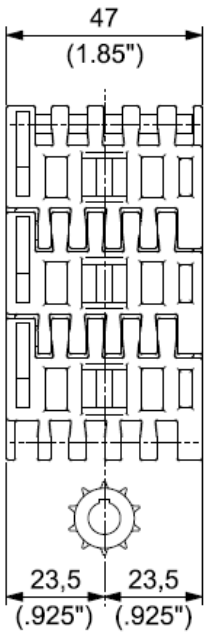


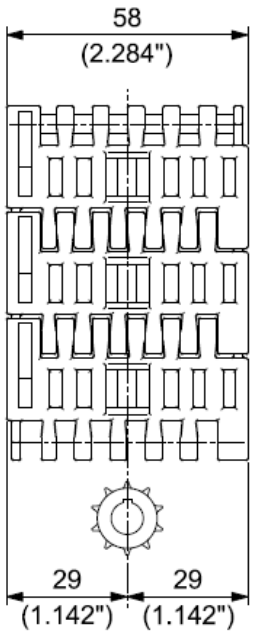


- For chain RR1600 use N.1 drive sprocket and N.1 idler wheel. Please consider pocket positioning in the middle of the chain.



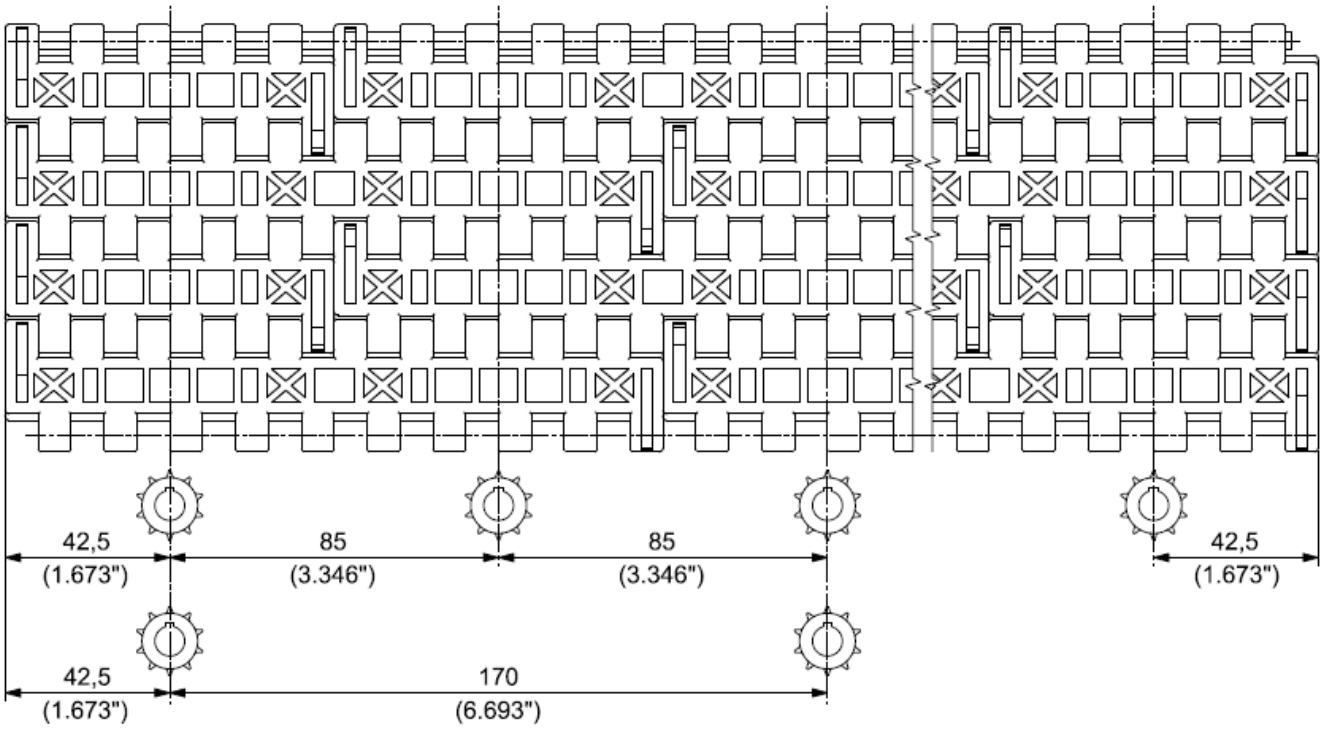






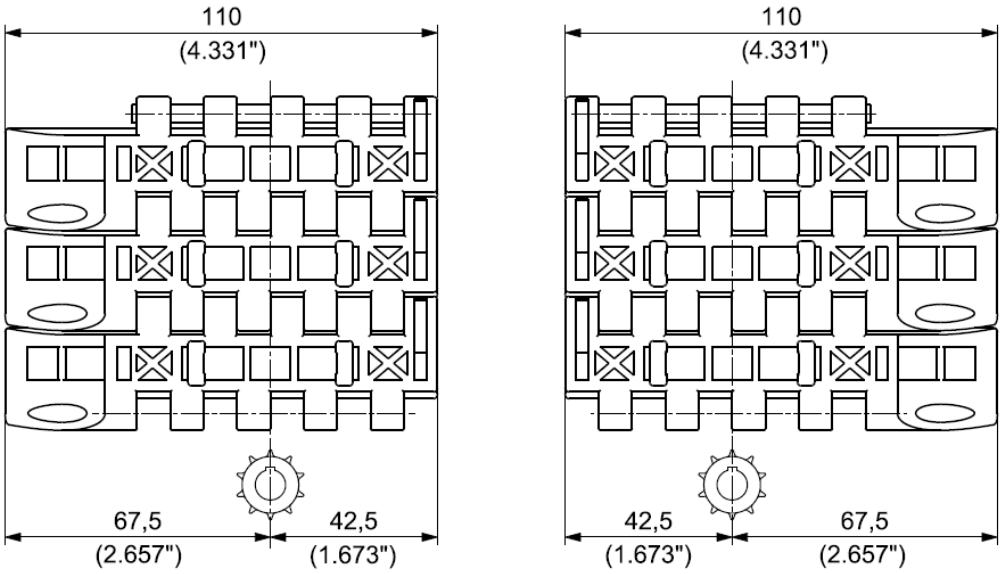
Modular belts

- For other widths please always consider the same first pocket position dimension of 42,5mm (1.673”) from belt edge, and 85mm (3.346”) spacing between other consecutive pockets.
- A spacing of 170mm (6.693”) between idler sprockets (or wheels) should normally be used on idler shaft.
  The example refers to a 340mm (13.384”) wide belt.

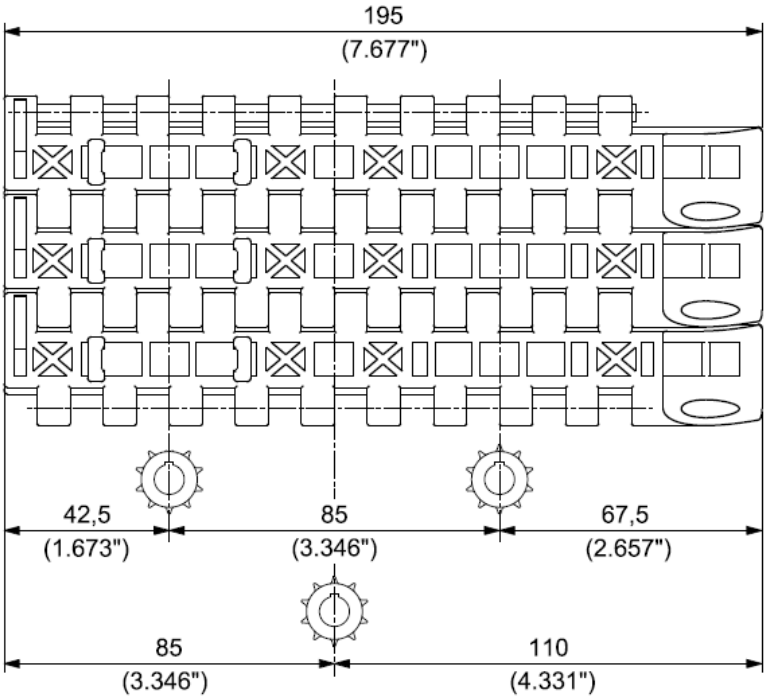


Active transfer modules

- For 1500-1600GATM chain of 85mm (3.346”) wide use N.1 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimension of 42,5mm (1.673”) from chain edge.



- For 1500-1600GATM chain of 170mm (6.693”) wide, N.2 drive sprockets and N.1 idler sprocket can be used.
- For drive sprockets please consider pocket positioning dimension of 42,5mm (1.643”) from chain edge and 85mm (3.346”) spacing between other consecutive pockets.
- For idler sprocket please consider pocket positioning dimension of 85mm (3.346”) from chain edge.

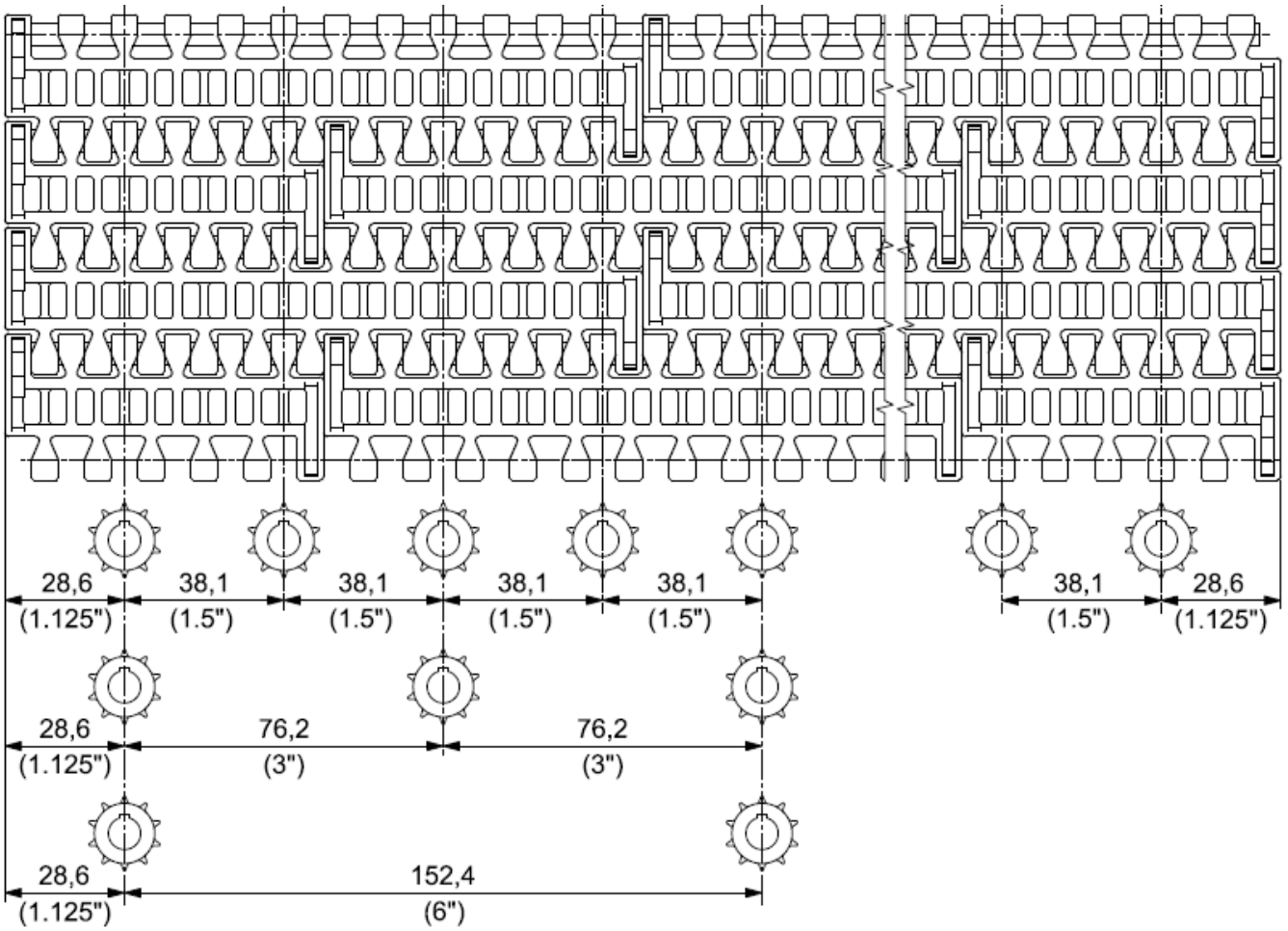


- For lighter applications N.1 drive sprocket and N.1 idler sprocket can be used.

1110 SERIES

Modular belts

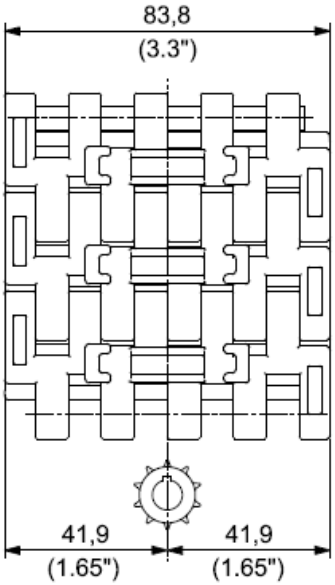
- Please always consider the first pocket positioning of 28,6mm (1.125”) from belt edge, and 76,2mm (3”) spacing between other consecutive pockets.
- A spacing of 152,4mm (6”) between idler sprockets (or wheels) should normally be used on idler shaft.
- For applications with long center to center distances and high loads a spacing of 38,1mm (1.5”) is recommended.



USPM - HFUSPM - HFSUSPM - LBPUSPM - LBPXSPM SERIES

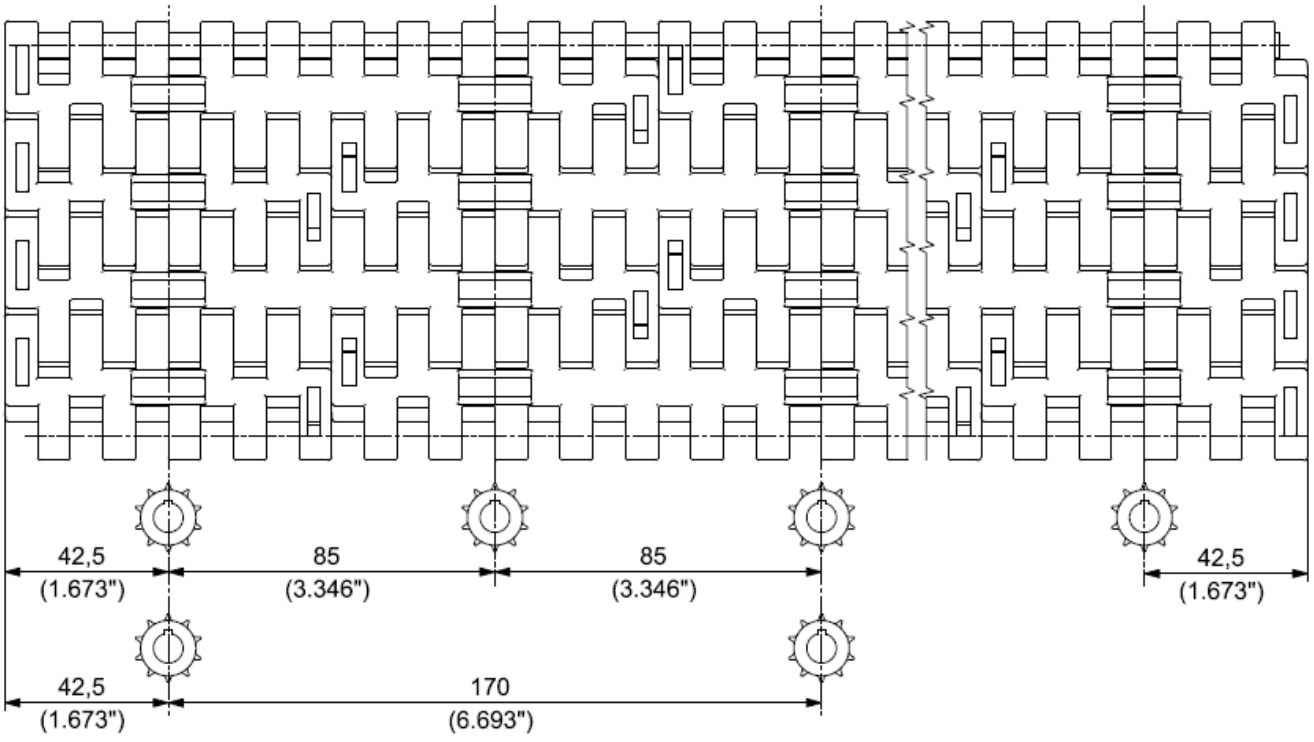
Dedicated widths

- For chain USPM 83,8 (3.3”) wide use N.1 drive sprocket and N.1 idler wheel.Please consider pocket positioning dimension of 41,9mm (1.65”) from chain edge.
- For chains HF USPM and LBP USPM 85mm (3.346”) wide use N.1 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimension of 42,5mm (1.673”) from chain edge.



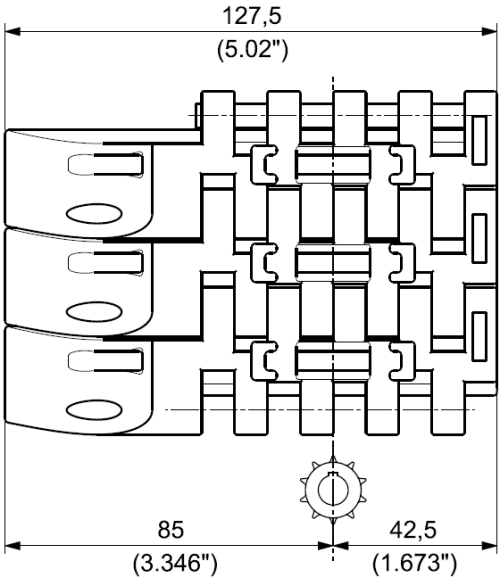
Modular belts

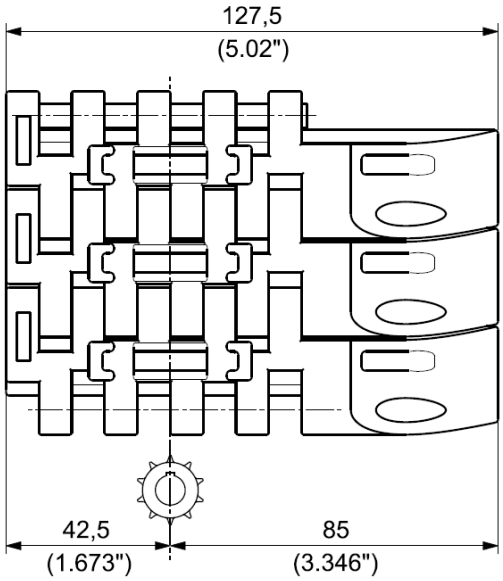
- For other widths please always consider the same first pocket position dimension of 42,5mm (1.673”) from belt edge, and 85mm (3.346”) spacing between other consecutive pockets.
- A spacing of 170mm (6.693”) between idler sprockets (or wheels) could normally be used on idler shaft.
  The example refers to a 340mm (13.384”) wide belt.



Active transfer modules:

- For USPMGATM chain use N.1 drive sprocket and N.1 idler wheel. Please consider pocket positioning dimension of 42,5mm (1.673”) from chain edge.

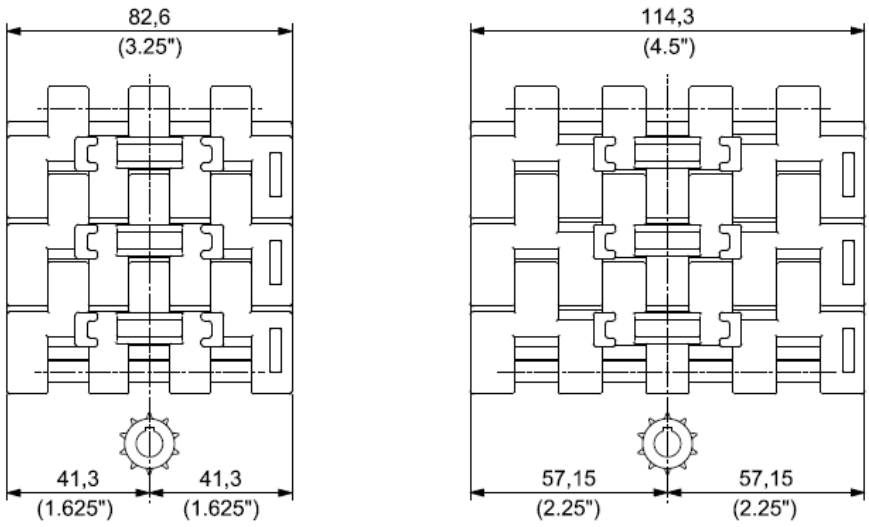




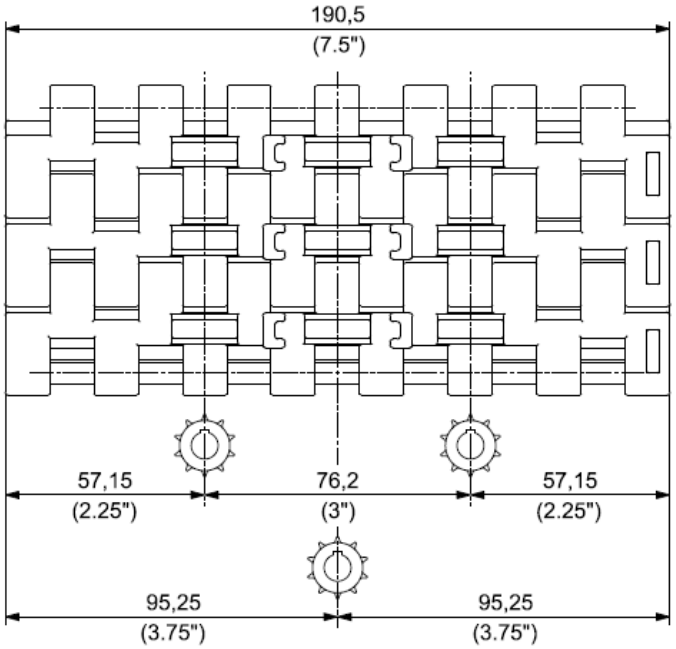
USP SERIES

Dedicated chain:

- For chain 82,6mm (3.25”) wide, use N.1 drive sprocket and N.1 idler sprocket. Please consider pocket positioning dimensions of 41,3mm (1.625”) from chain edge.
- For chain 114,3mm (7.5”) wide, use N.1 drive sprocket and N.1 idler sprocket. Please consider pocket positioning dimensions of 57,15mm (2.25”) from chain edge.



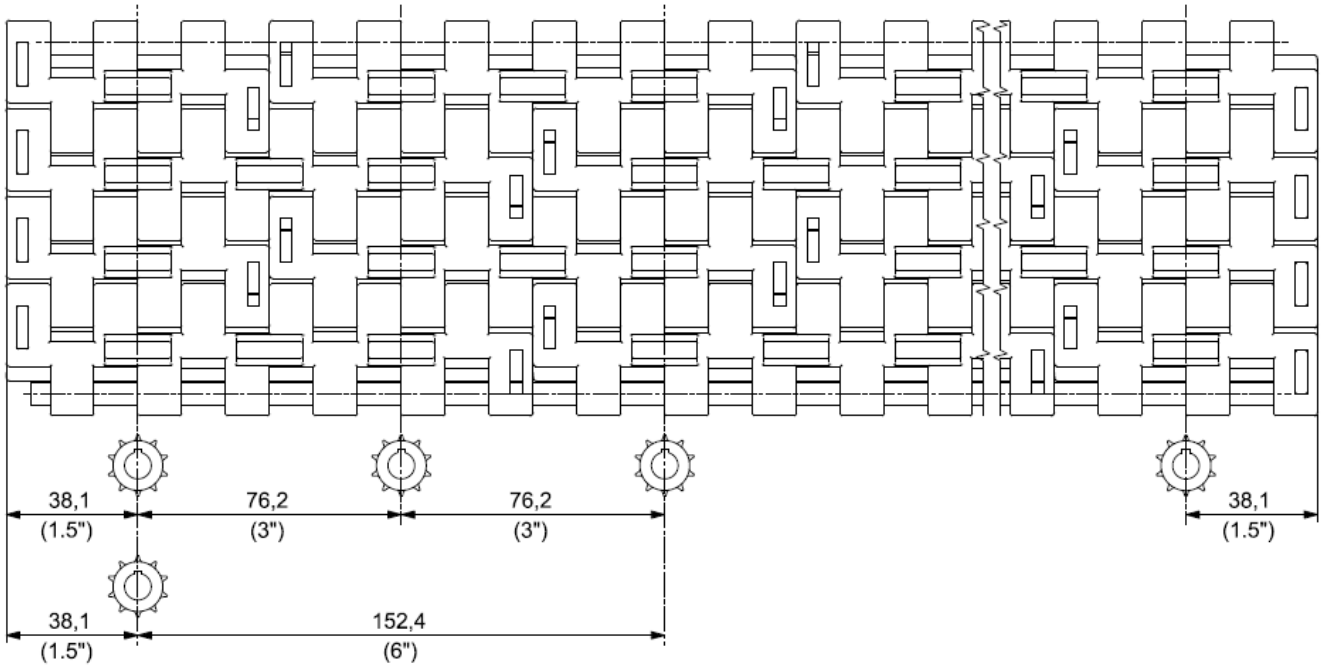
- For chain 190,5mm (7.5”) wide, N.2 drive sprockets and N.1 idler sprocket could be used.
- For drive sprockets please consider pocket positioning dimension of 57,15mm (2.25”) from chain edge and 76,2mm (3”) spacing between other consecutive pockets.
- For idler sprocket please consider positioning dimension of 95,25mm (3.75”) from chain edge.



- For lighter applications N.1 drive sprockets and N.1 idler sprocket could be used

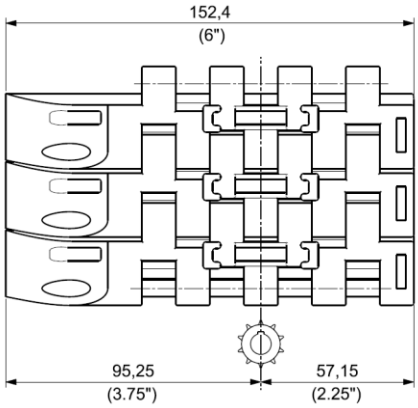
Modular belts

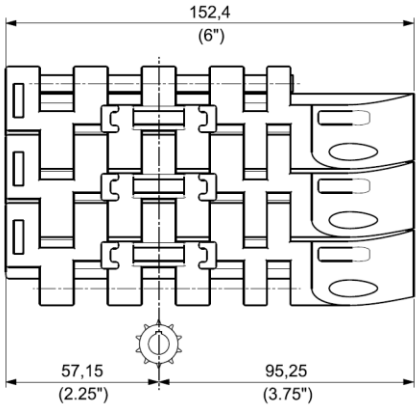
- For other widths please always consider same first pocket positioning dimension of 38,1mm (1.5”) from belt edge, and 76,2mm (3”) spacing between idler sprockets (or wheels) should be normally be used on drive shaft.
  The example refers to a 304.8mm (12”) wide belt.
- A spacing of 152,4 mm (6”) between idler sprockets (or wheels) could normally be used on idler shaft.

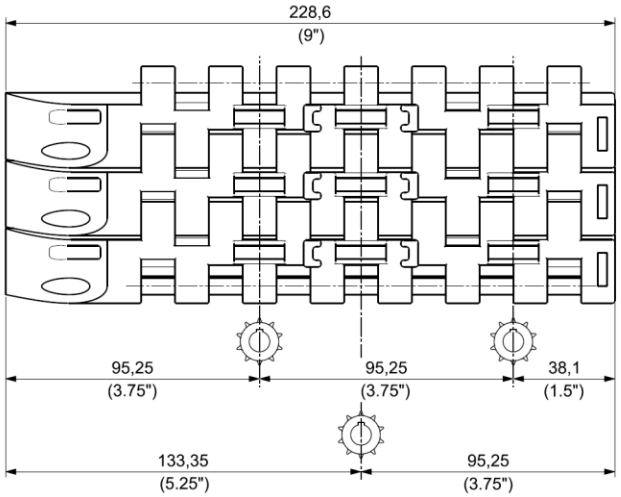


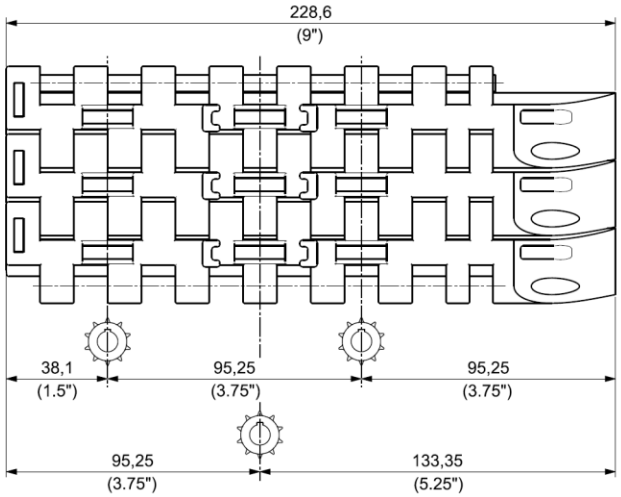
Active transfer modules:

- For USPGATM chain of 152,4 mm (6”) wide, use N.1 drive sprocket and N.1 idler sprocket. Please consider pocket positioning dimension of 57, 15mm (2.25”) from chain edge.
- For USPGATM chain of 228,6 mm (9”) wide, N.2 drive sprockets and N.1 idler sprocket can be used. For drive sprockets please consider pocket positioning dimension of 38,1mm (1.5”) from chain edge and 95,25mm (3.75”) spacing between other consecutive pockets. For idler sprocket please consider pocket positioning dimension of 95,25mm (3.75”) from chain edge.





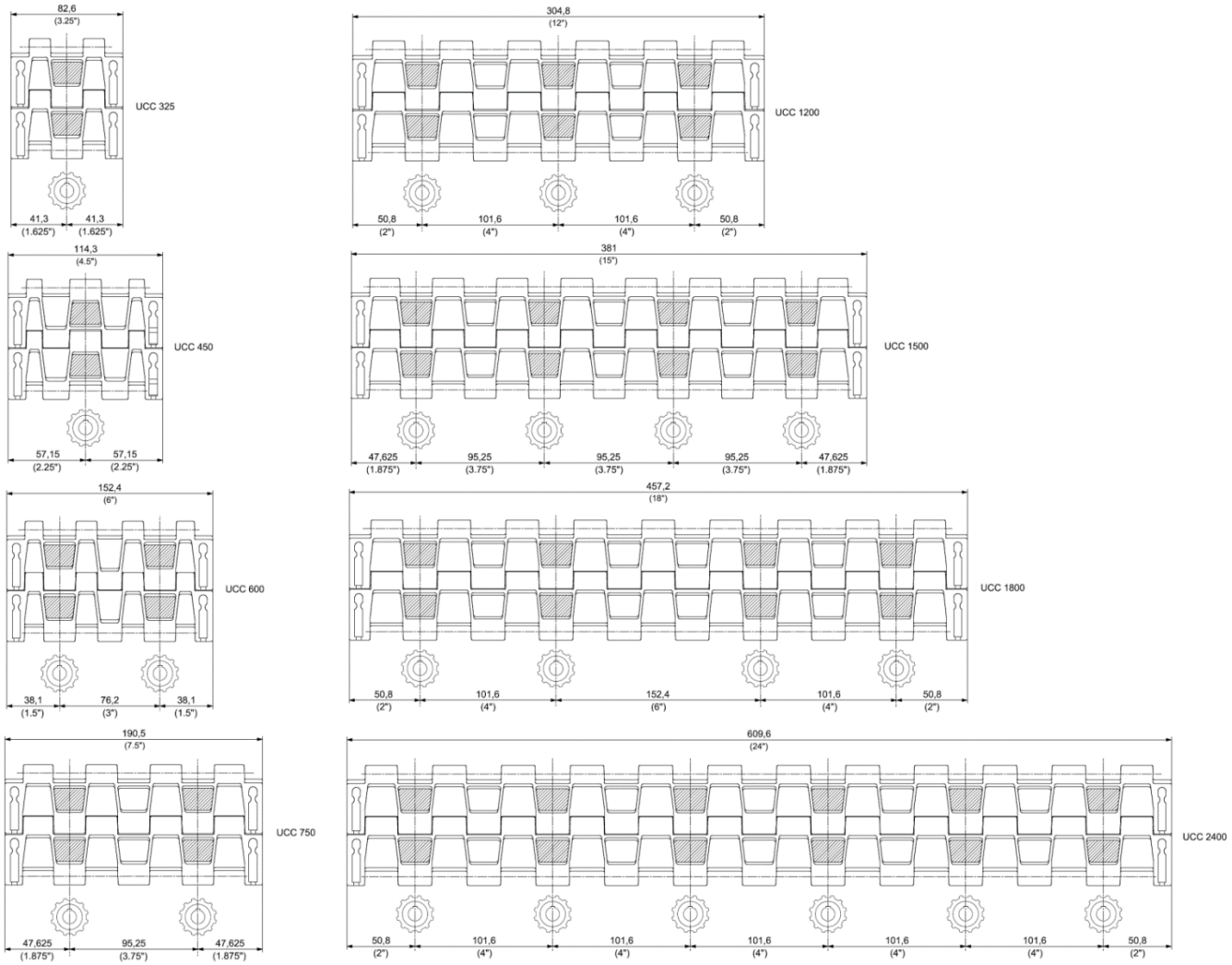




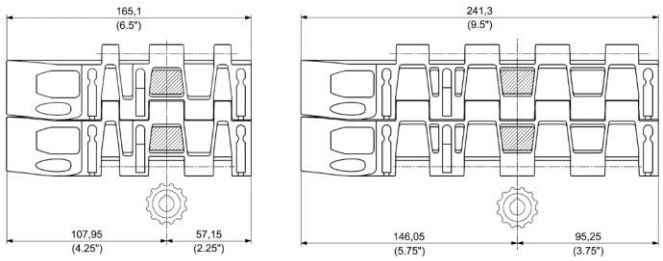
UCC SERIES

Dedicated widths

- The following positioning instruction refers to applications with high product loads and long center to center distances, thus used for most of applications, either for drive shaft and idler shaft (please refers to draft below).
- For some of the UCC chains listed below and for less demanding applications, the number of sprockets could be reduced.



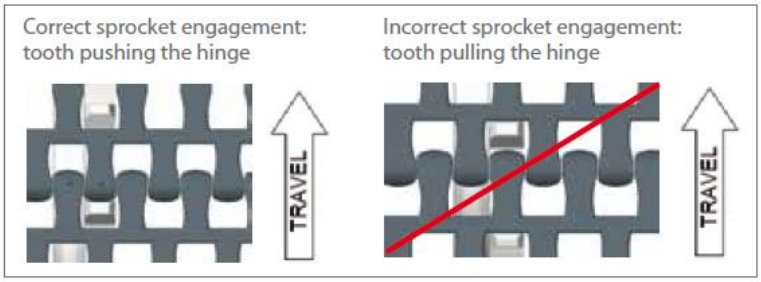
Active transfer modules:



2556 SERIES

Sprockets axial positioning

When installing the sprockets, make sure that the tooth is pushing, not pulling.

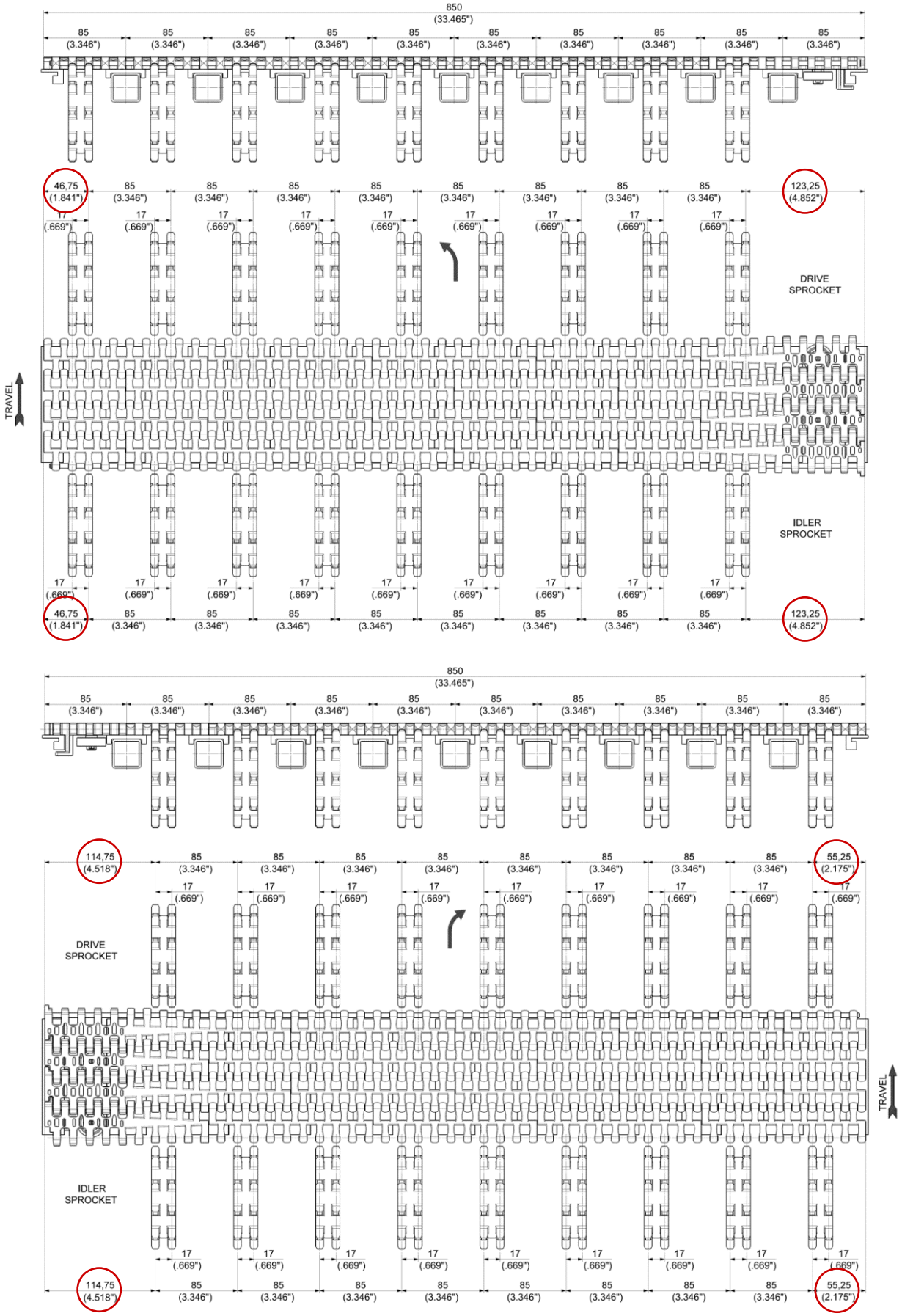


Charts showing the correct sprockets axial positioning for 850mm (33.465”) wide belts are reported in the next two pages. For narrower widths, please always keep the same positioning of sprockets at the belt’s side (circled in red), and decrease the number of sprockets in the middle.
The following table shows the number of sprockets recommended per belt width.

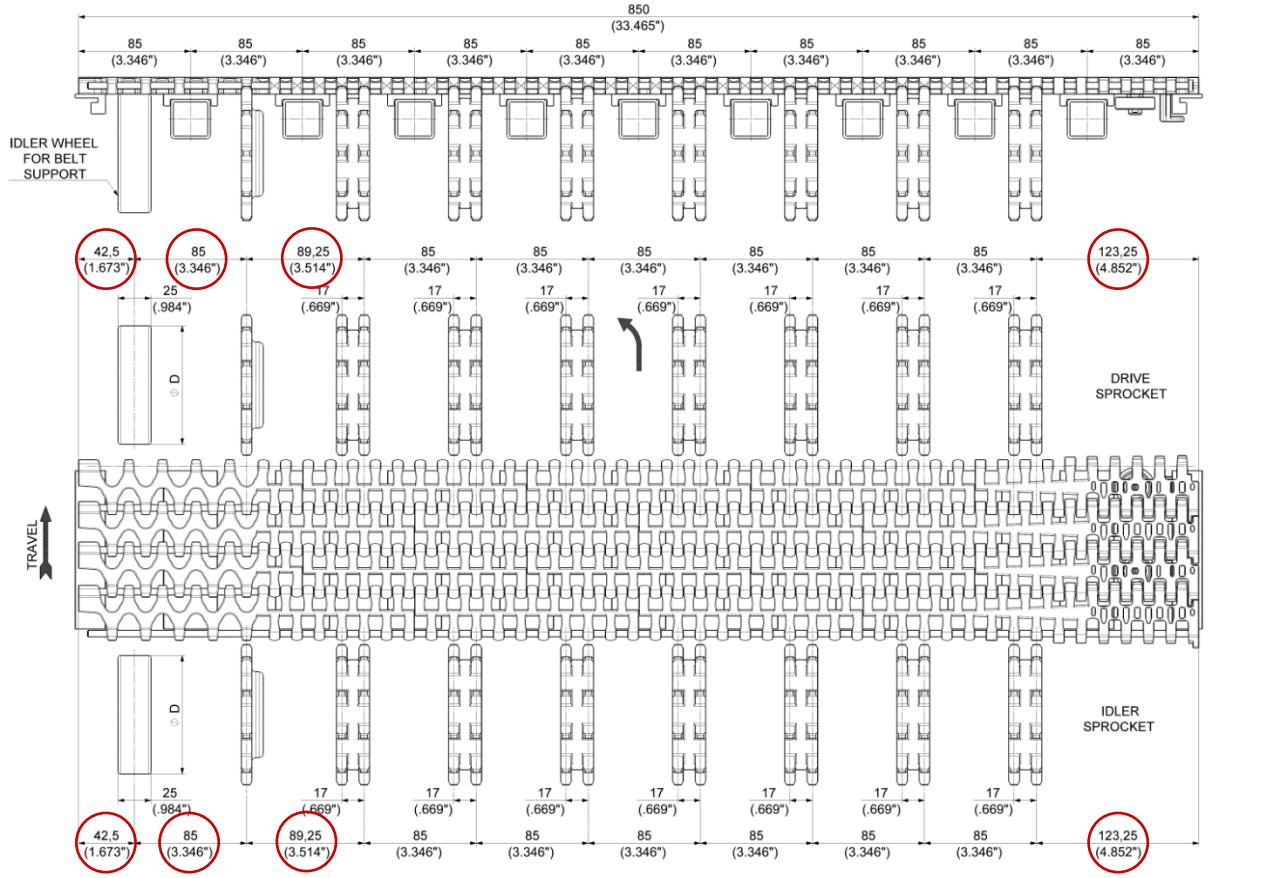
BELT WIDTH		NUMBER OF SPROCKETS			
		2556HTB		2556HTB-SR	
in	*mm*	drive	idler	drive	idler
10.039	255	2	2	-	-
13.386	340	3	3	2	2
16.732	425	4	4	3	3
20.079	510	5	5	4	4
23.425	595	6	6	5	5
26.772	680	7	7	6	6
30.118	765	8	8	7	7
33.465	850	9	9	8	8

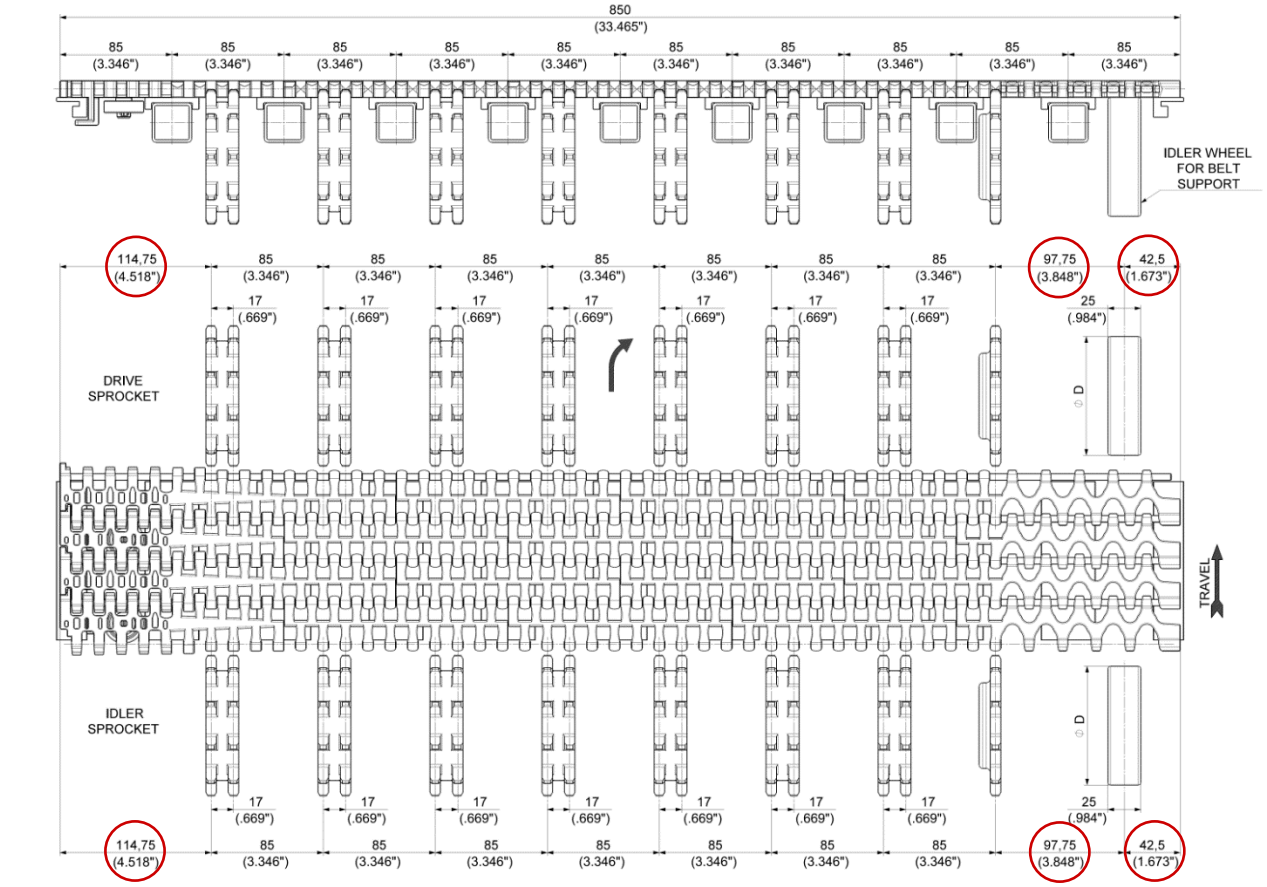
The 2556HTB-SR Series requires the wheel supporting in the inner side of the belt.
The supporting wheel has to be considered in addition to the number of sprockets listed above.

2556HTB Standard sideflexing radius



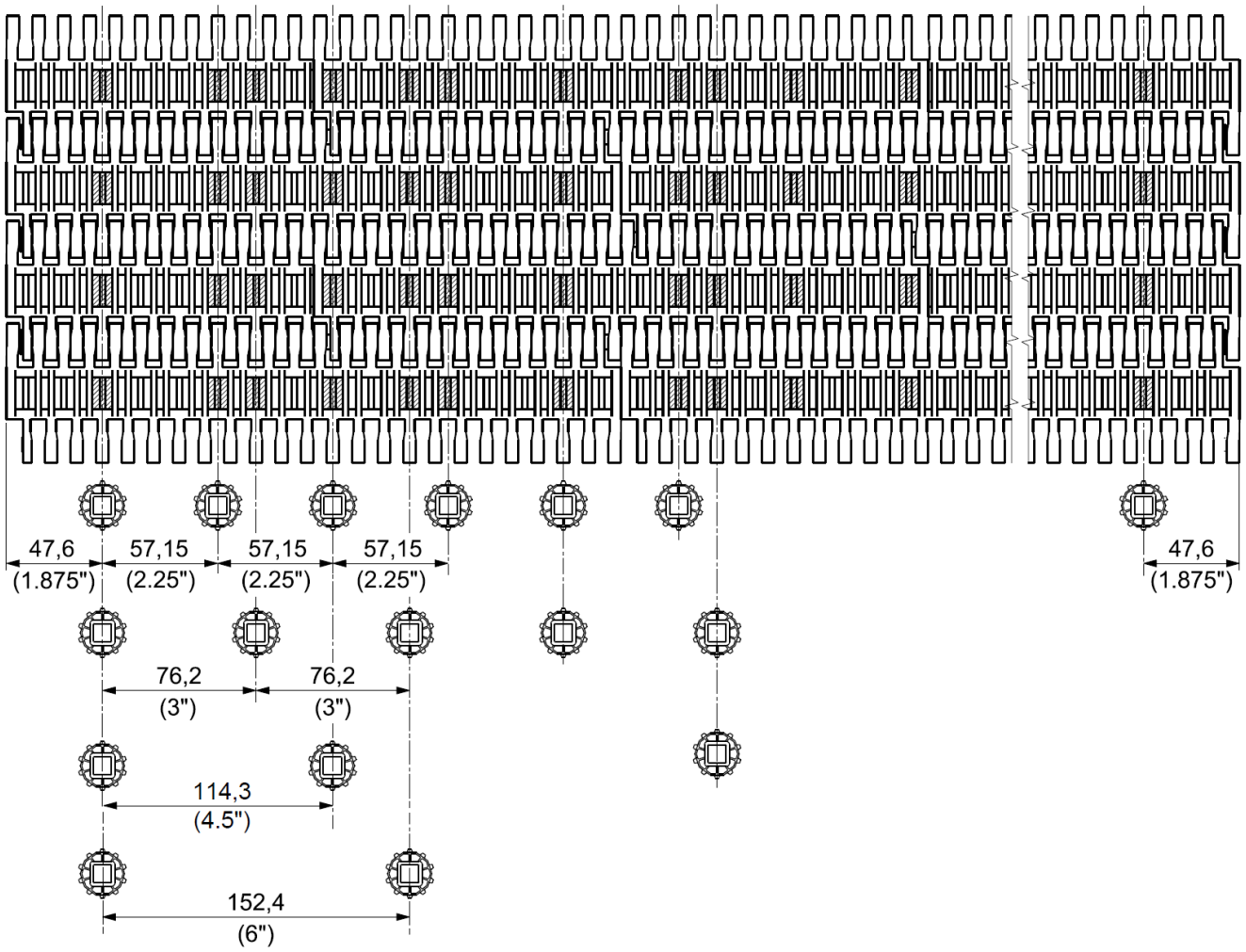
2556HTB-SR Reduced sideflexing radius





3125 SERIES

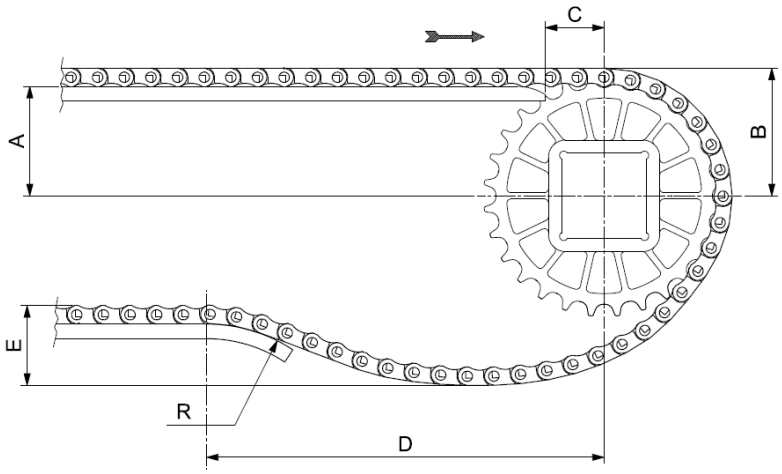
- Please always consider the same first pocket position dimension of 47,6mm (1.875”) from belt edge, and 76,2 (3”) spacing between other consecutive pockets.
- A spacing of 152,4mm (6”) between idler sprockets should normally be used on idler shaft.
- For applications with long center to center distances and high loads a spacing of 57,15mm (2.25”) is recommended.



4.5 SPROCKET/WEARSTRIP POSITIONING

Below are belt and sprocket installations with a typical catenary arrangement. Particular care should be taken to ensure that rail or slider bed carry ways at the drive end of the conveyor are tapered or angled downward to ensure smooth entry of the chain.

600 - 500 - 610 - HF510 & 300 - 200 - HF200 SERIES

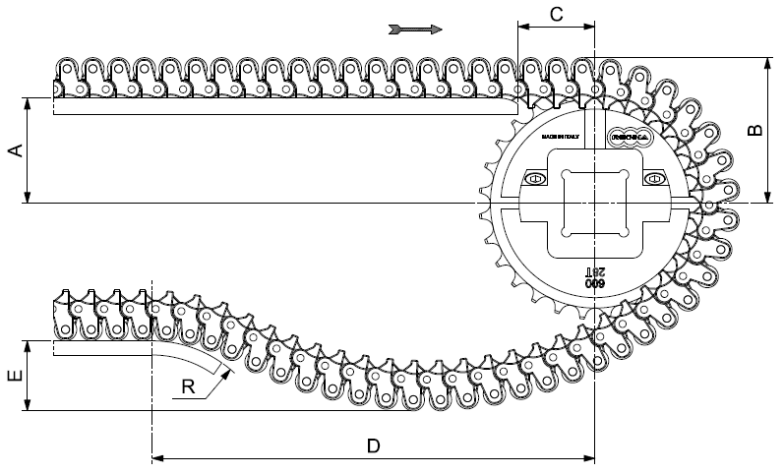


N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8*	0.48	12,3	0.83	21	0.47	12	-	-	-	-	-	-
14	0.95	24,2	1.29	32,9	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
16	1.11	28,2	1.45	36,9	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
19	1.35	34,2	1.69	42,9	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
28	2.06	52,4	2.41	61,1	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
32	2.38	60,4	2.72	69,1	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
36	2.7	68,5	3.04	77,2	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
38	2.85	72,5	3.2	81,2	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100

* Cannot work with 600 and 500 series.

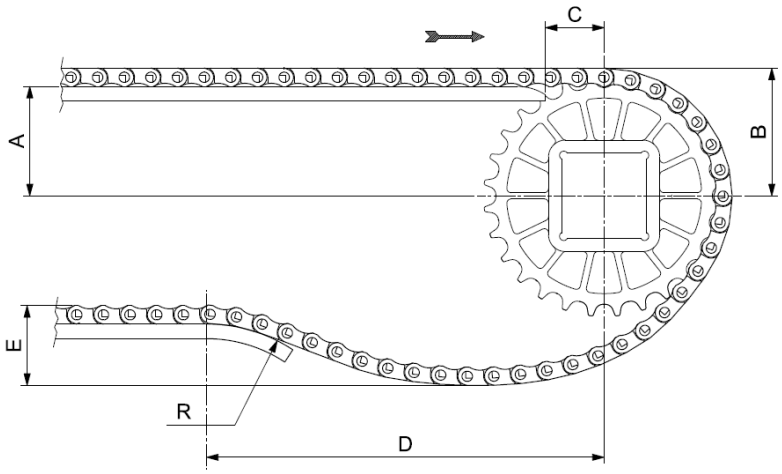
Please note position B is to the top of the plastic module, not including the rubber

LBP 610



N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	0.48	12,3	1.27	32,3	0.47	12	-	-	-	-	-	-
14	0.95	24,2	1.74	44,2	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
16	1.11	28,2	1.9	48,2	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
19	1.35	34,2	2.13	54,2	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
28	2.06	52,4	2.85	72,4	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
32	2.38	60,4	3.17	80,4	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
36	2.7	68,5	3.48	88,5	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
38	2.85	72,5	3.64	92,5	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100

611

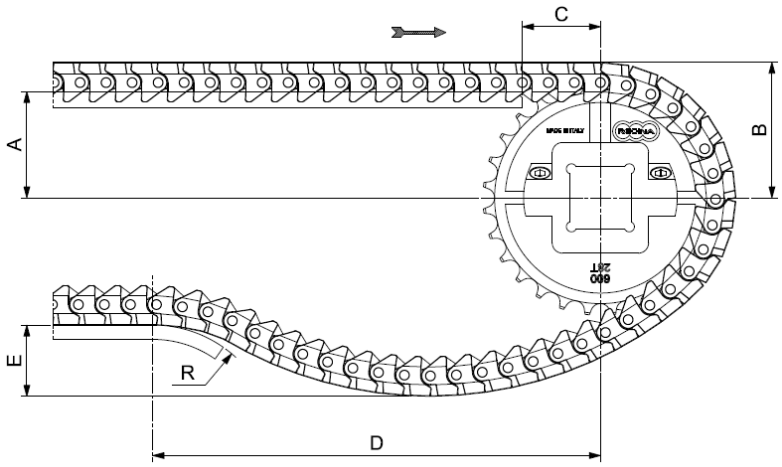


N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	0.48	12,2	0.82	20,9	0.47	12	-	-	-	-	-	-
14	0.95	24,2	1.29	32,9	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
16	1.11	28,2	1.45	36,9	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
19	1.35	34,2	1.69	42,9	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
24	1.74	44,3	2.09	53	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
28	2.06	52,4	2.41	61,1	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
32	2.38	60,4	2.72	69,1	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
36	2.7	68,5	3.04	77,2	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
38	2.85	72,5	3.2	81,2	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100

Sprockets for 611 Series are diversely available depending on whether the chain has tracking guide or not. In particular:

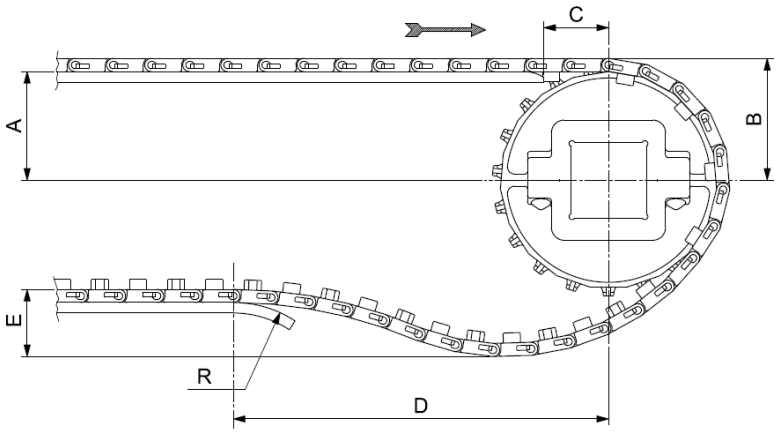
N° of TEETH	MANUFACTURING	CHAIN TYPE COMBINATION	
		CHAINS WITHOUT TRACKING GUIDE	CHAINS WITH TRACKING GUIDE
8	Machined + solid	All widths	51mm, 76mm
14	Machined + solid	All widths	51mm, 76mm
16	Moulded + solid	All widths	All widths (two different sprockets)
19	Machined + solid	All widths	51mm, 76mm
24	Machined + solid	All widths	29mm, 34mm, 37mm
28	Moulded + solid	All widths	51mm, 76mm
28	Moulded + split	All widths	All widths (two different sprockets)
32	Moulded + split	All widths	51mm, 76mm
36	Moulded + split	All widths	51mm, 76mm
38	Moulded + split	All widths	51mm, 76mm

RR 611



N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	0.48	12,2	1.05	26,5	0.47	12	.	.	.	.	.	.
14	0.95	24,2	1.51	38,5	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
16	1.11	28,2	1.67	42,5	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
19	1.35	34,2	1.91	48,5	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
28	2.06	52,4	2.63	66,7	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
32	2.38	60,4	2.94	74,7	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
36	2.70	68,5	3.26	82,8	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100
38	2.85	72,5	3.42	86,8	0.47	12	17.7-23.6	450-600	2.00-4.00	50-100	4	100

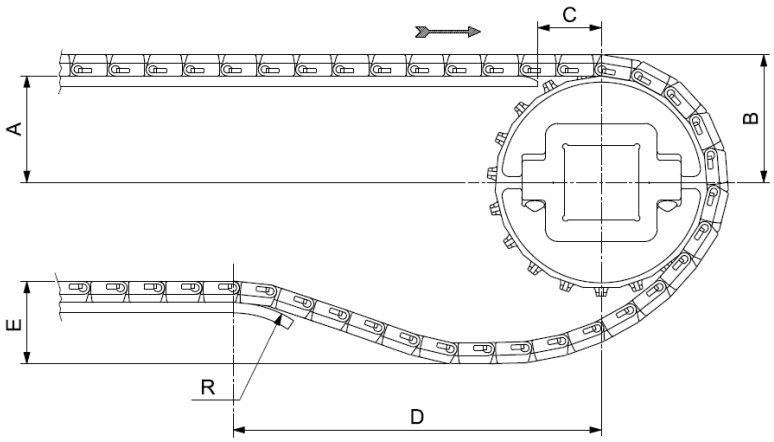
1600 - 1500 - HF1600 - HFS1600 SERIES



N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	1.13	28,8	1.70	43,1	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
10	1.44	36,7	2.01	51	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
11	1.60	40,7	2.17	55	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
12	1.76	44,7	2.32	59	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
13	1.92	48,7	2.48	63	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
14	2.07	52,7	2.64	67	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
16	2.39	60,7	2.95	75	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
18	2.71	68,8	3.27	83,1	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
19	2.87	72,8	3.43	87,1	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
20	3.02	76,8	3.59	91,1	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
21	3.19	80,9	3.75	95,2	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100

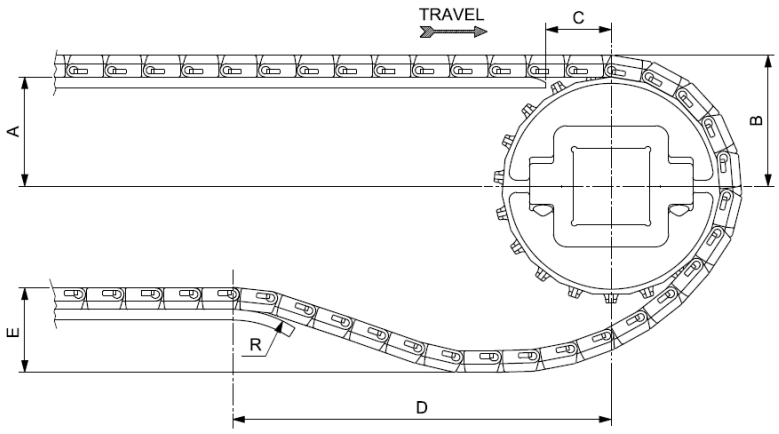
Please note position B is to the top of the plastic module, not including the rubber

RR1500 - RR1600 SERIES



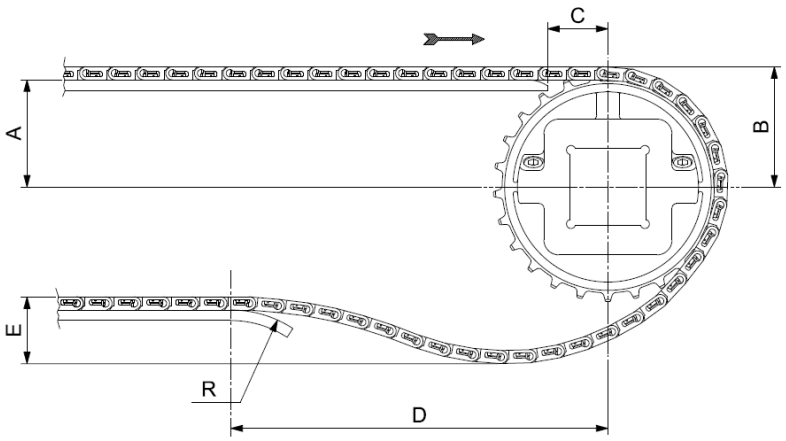
N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	1.13	28,8	1.70	43,1	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
10	1.44	36,7	2.01	51	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
11	1.60	40,7	2.17	55	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
12	1.76	44,7	2.32	59	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
13	1.92	48,7	2.48	63	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
14	2.07	52,7	2.64	67	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
16	2.39	60,7	2.95	75	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
18	2.71	68,8	3.27	83,1	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
19	2.87	72,8	3.43	87,1	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
20	3.02	76,8	3.59	91,1	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100
21	3.19	80,9	3.75	95,2	0.98	25	17,7-23,6	450-600	2.00-4.00	50-100	4	100

1110 SERIES



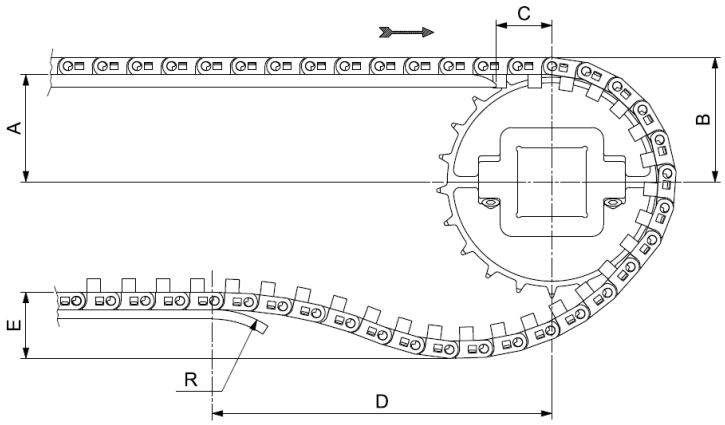
N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	1.12	28,4	1.71	43,4	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
10	1.43	36,3	2.02	51,3	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
11	1.59	40,3	2.18	55,3	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
12	1.74	44,3	2.33	59,3	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
13	1.9	48,3	2.49	63,3	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
14	2.06	52,3	2.65	67,3	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
16	2.37	60,3	2.96	75,3	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
18	2.69	68,3	3.28	83,3	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
19	2.85	72,4	3.44	87,4	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
20	3.01	76,4	3.60	91,4	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
21	3.17	80,4	3.76	95,4	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100

7300-7200 SERIES



N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
17	1.87	47,5	2.21	56,2	0.75	19	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
21	2.35	59,6	2.69	68,3	0.75	19	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
24	2.70	68,6	3.04	77,3	0.75	19	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
25	2.82	71,7	3.17	80,4	0.75	19	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
27	3.06	77,7	3.40	86,4	0.75	19	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100

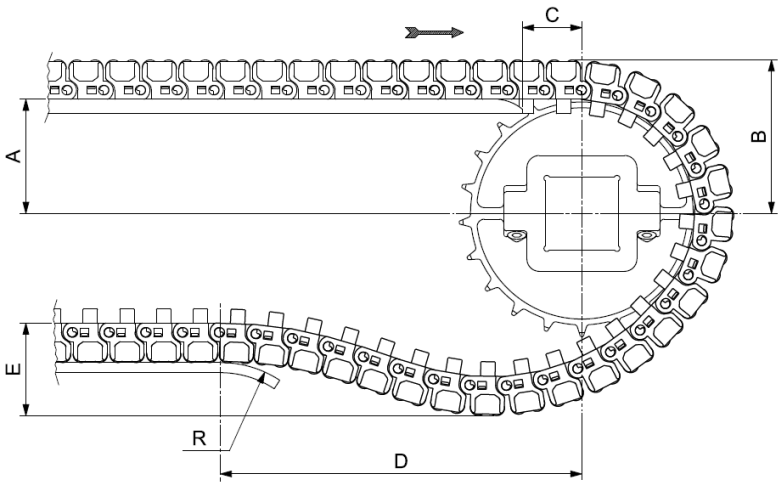
USP - USPM - HFUSPM - HFSUSPM SERIES



N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	1.06	26,8	1.56	39,5	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
10	1.37	34,7	1.87	47,4	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
13	1.84	46,7	2.34	59,4	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
14	2.00	50,7	2.50	63,4	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
15	2.15	54,7	2.65	67,4	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
16	2.31	58,8	2.81	71,5	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
18	2.63	66,8	3.13	79,5	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100
21	3.11	78,9	3.61	91,6	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.94	100

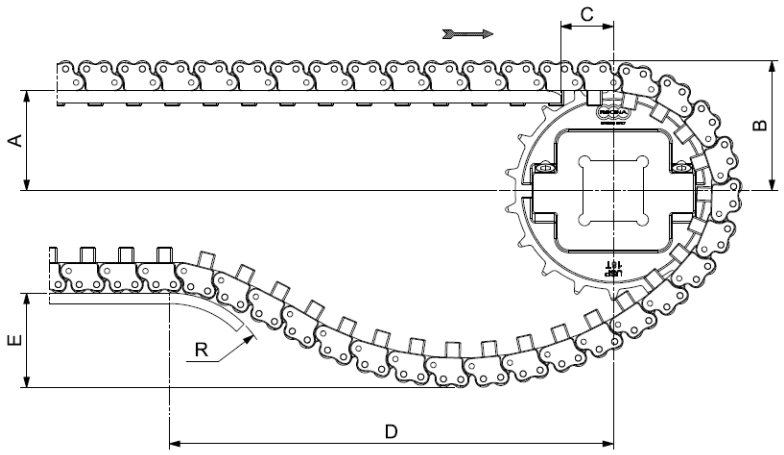
Please note position B is to the top of the plastic module, not including the rubber

LBP USPM SERIES



N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	1.06	26,8	2.13	54	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200
10	1.37	34,7	2.44	61,9	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200
12	1.68	42,7	2.75	69,9	0.98	25	17.7-23.7	450-601	2.00-5.00	50-127	7.87	200
13	1.84	46,7	2.91	73,9	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200
14	2.00	50,7	3.07	77,9	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200
15	2.15	54,7	3.22	81,9	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200
16	2.31	58,8	3.39	86	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200
18	2.63	66,8	3.70	94	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200
21	3.11	78,9	4.18	106,1	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200

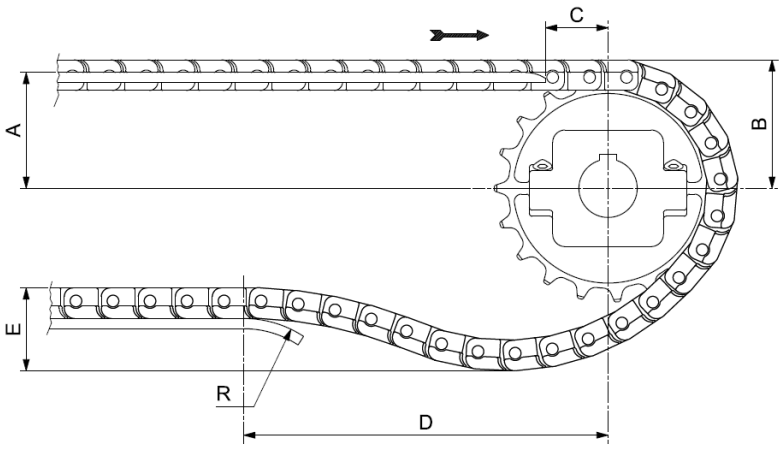
LBP XSPM



N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	1.06	26,8	1.84	46,8	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.15	80
10	1.37	34,7	2.15	54,7	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.15	80
12	1.68	42,7	2.47	62,7	0.98	25	17.7-23.7	450-601	2.00-5.00	50-125	3.15	80
13	1.84	46,7	2.63	66,7	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.15	80
14	2.00	50,7	2.78	70,7	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.15	80
15	2.15	54,7	2.94	74,7	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.15	80
16	2.31	58,8	3.10	78,8	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.15	80
18	2.63	66,8	3.42	86,8	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.15	80
21	3.11	78,9	3.89	98,9	0.98	25	17.7-23.6	450-600	2.00-4.00	50-100	3.15	80

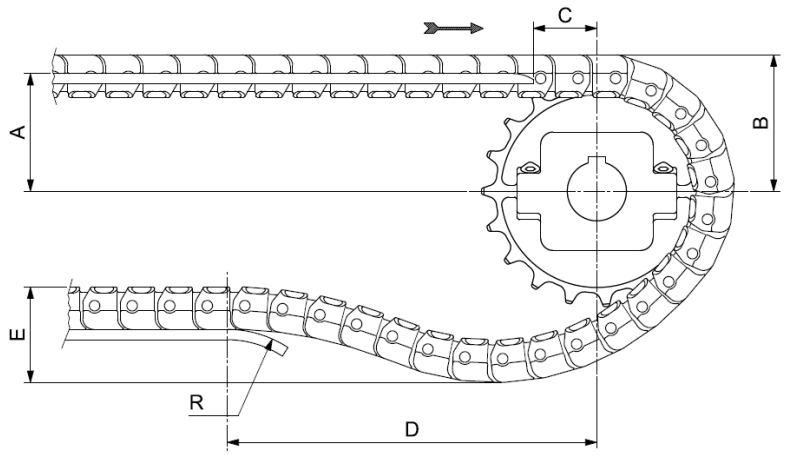
SIDEFLEXING CHAIN

783T - 783M - 782M



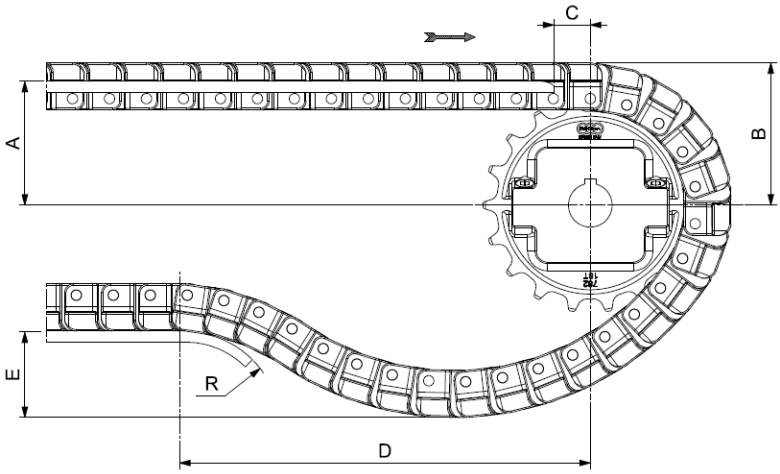
N ° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
16	2.69	68,4	3.04	77,1	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	7.87	200
18	3.01	76,5	3.35	85,1	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	7.87	200
19	3.17	80,5	3.51	89,2	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	7.87	200

793T - 793M



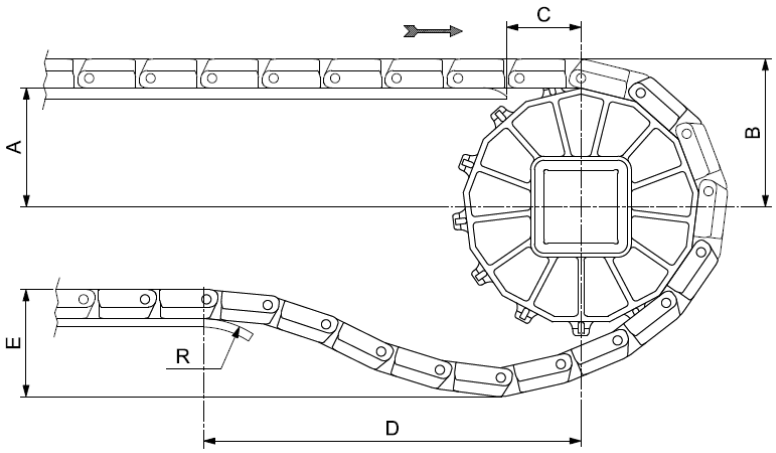
N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
16	2.69	68,4	3.19	81,1	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	7.87	200
18	3.01	76,5	3.51	89,1	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	7.87	200
19	3.17	80,5	3.67	93,2	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	7.87	200

793L



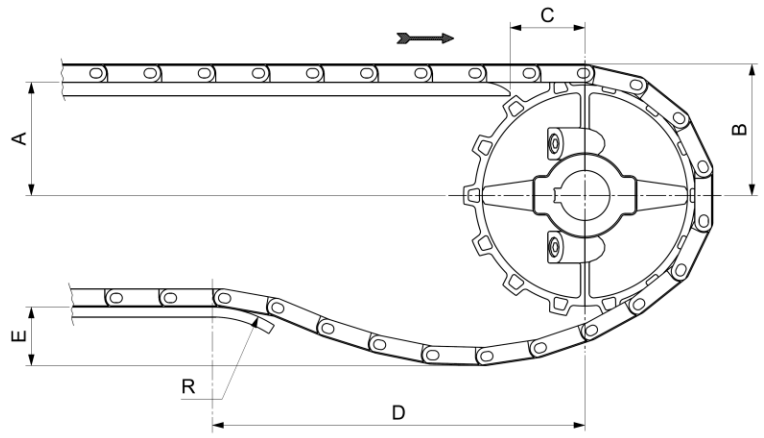
N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
16	2.69	68,4	3.53	89,7	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	7.87	200
18	3.01	76,5	3.85	97,7	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	7.87	200
19	3.17	80,5	4.01	101,8	0.98	25	17.7-23.6	450-600	3.00-5.00	75-125	7.87	200

3125



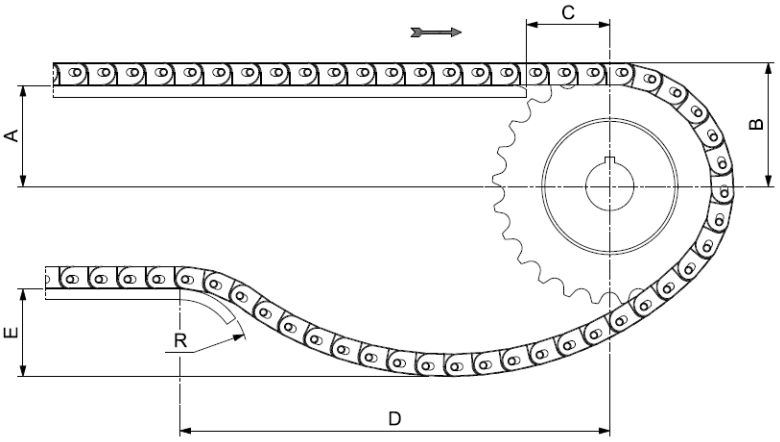
N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
10	2.93	74,3	4.93	98,04	1.97	50	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200
13	3.87	98,2	5.87	122,03	1.97	50	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200
16	4.81	122,3	6.81	146,09	1.97	50	17.7-23.6	450-600	2.00-4.00	50-100	7.87	200

UCC SERIES



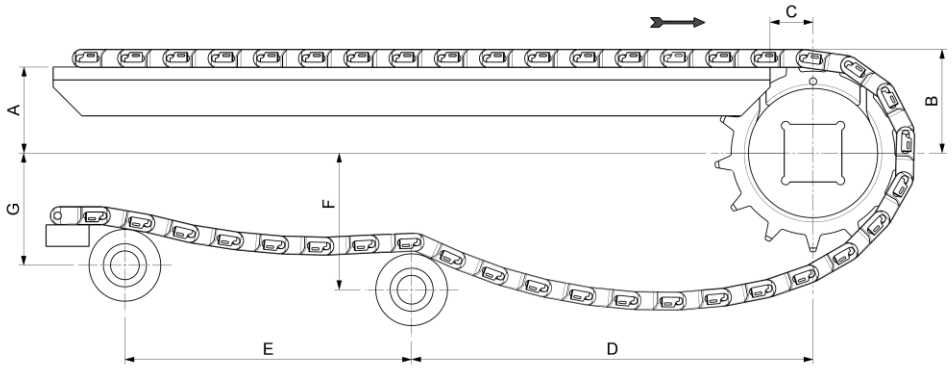
N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
12	2.65	67,3	3.15	80	1.5	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30
14	3.12	79,3	3.62	92	1.5	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30

UCC 138 SERIES



N° of TEETH	A		B		C		D		E		R	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
9	0.76	19,2	1.35	34,2	1.50	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30
11	0.99	25,2	1.58	40,2	1.50	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30
13	1.23	31,2	1.82	46,2	1.50	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30
15	1.46	37,2	2.05	52,2	1.50	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30
17	1.70	43,2	2.29	58,2	1.50	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30
19	1.94	49,2	2.53	64,2	1.50	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30
21	2.18	55,3	2.77	70,3	1.50	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30
23	2.41	61,3	3.00	76,3	1.50	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30
24	2.53	64,3	3.12	79,3	1.50	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30
25	2.65	67,3	3.24	82,3	1.50	38,1	24-48	600-1200	1.00-4.00	25-100	0.98-1.18	25-30

2556 SERIES

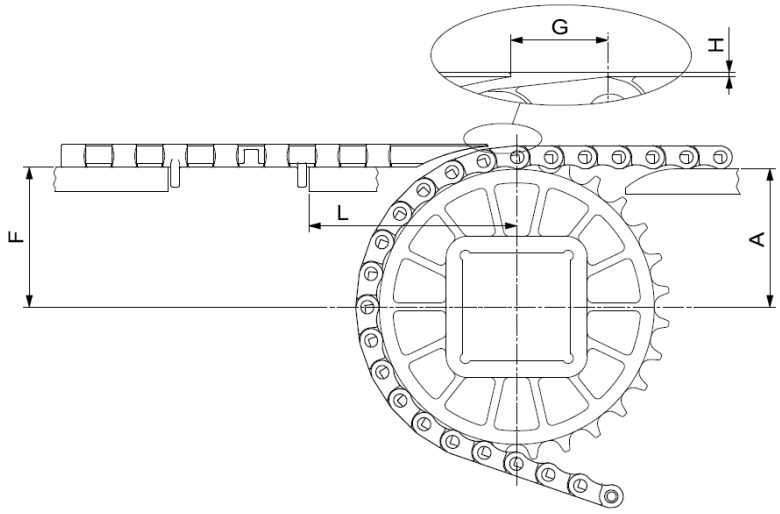


N° of TEETH	PITCH DIAMETER		A		B		C		D		E		F		G	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	3.27	83,0	1.38	35,1	1.88	47,8	1.18 min	30 min	15.75-23.62	400-600	5.91-7.87	150-200	2.76-4.33	70-110	2.36-3.94	60-100
10	4.05	102,8	1.77	45,0	2.27	57,7	1.18 min	30 min	15.75-23.62	400-600	5.91-7.87	150-200	2.76-4.33	70-110	2.36-3.94	60-100
13	5.22	132,7	2.36	60,0	2.86	72,7	1.18 min	30 min	15.75-23.62	400-600	5.91-7.87	150-200	2.76-4.33	70-110	2.36-3.94	60-100
15	6.01	152,7	2.76	70,0	3.26	82,7	1.18 min	30 min	15.75-23.62	400-600	5.91-7.87	150-200	2.76-4.33	70-110	2.36-3.94	60-100
16	6.41	162,8	2.95	75,0	3.45	87,7	1.18 min	30 min	15.75-23.62	400-600	5.91-7.87	150-200	2.76-4.33	70-110	2.36-3.94	60-100

4.6 SPROCKET/ACTIVE TRANSFER MODULE POSITIONING

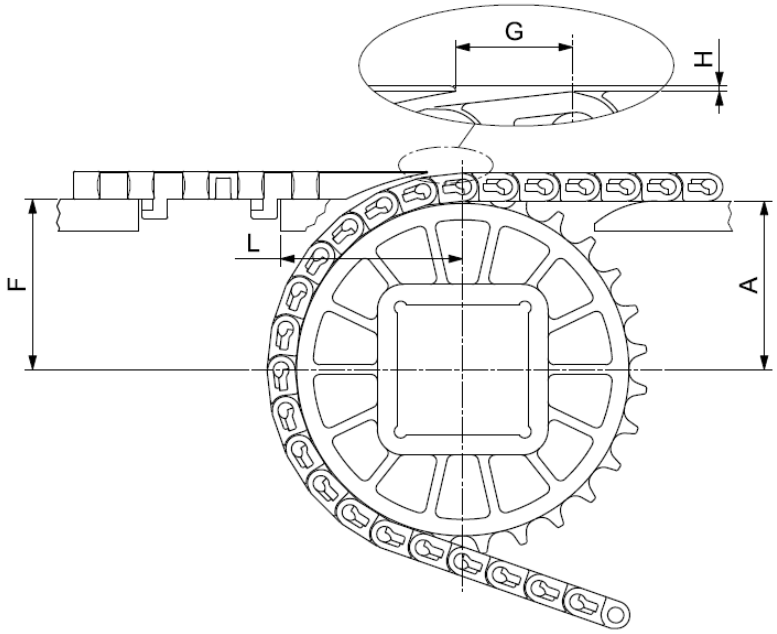
When using the active transfer system, particular attention must be paid to the vertical oscillation of the take-away belt when engaging the sprocket (chordal effect): if excessive, it could cause unstable products to fall down during the head transfer. The smaller the number of teeth, the larger the chordal effect will be.
It is recommended that pre-production tests are carried out and adjustments be made as necessary to both feed and discharge belts to achieve successful product transfer.

300 SERIES



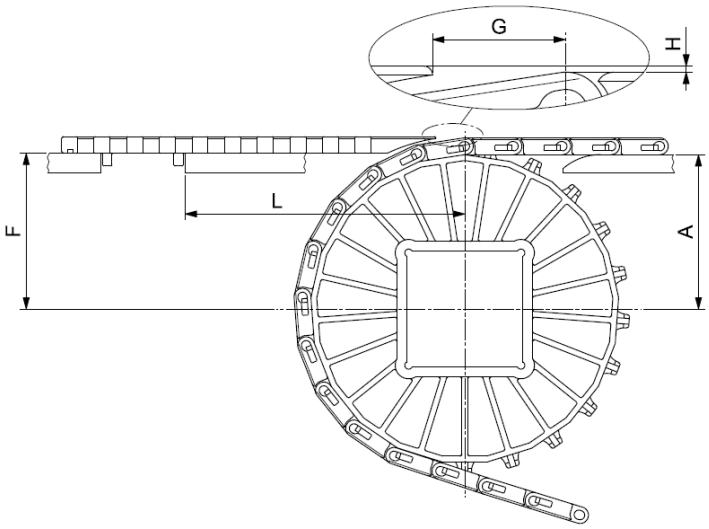
N° of TEETH	A		F		G		H		L	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
14	0.953	24,20	0.957	24,30	0.37	9,40	0.004	0,10	3.051	77,50
16	1.110	28,19	1.114	28,30	0.402	10,21	0.004	0,10	2.24	78,31
19	1.346	34,19	1.350	34,29	0.433	11,00	0.004	0,10	2.272	79,10
28	2.063	52,40	2.067	52,50	0.516	13,11	0.004	0,10	2.354	81,21
32	2.378	60,40	2.382	60,50	0.551	14,00	0.004	0,10	2.386	82,10
36	2.697	68,50	2.701	68,61	0.579	14,71	0.004	0,10	2.417	82,81
38	2.854	72,49	2.858	72,59	0.594	15,09	0.004	0,10	2.433	83,19

600 SERIES



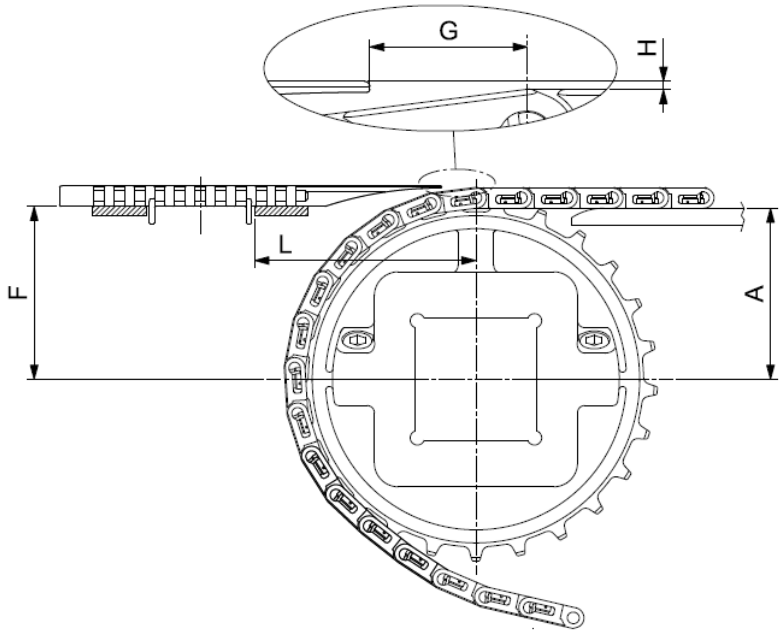
N° of TEETH	A		F		G		H		L	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
14	0.95	24,20	0.96	24,30	0.37	9,40	0.004	0,10	2.21	56,1
16	1.11	28,20	1.11	28,30	0.4	10,20	0.004	0,10	2.24	56,9
19	1.35	34,20	1.35	34,30	0.43	11,00	0.004	0,10	2.27	57,7
28	2.06	52,40	2.07	52,50	0.52	13,10	0.004	0,10	2.35	59,8
32	2.38	60,40	2.38	60,50	0.55	14,00	0.004	0,10	2.39	60,6
36	2.70	68,50	2.70	68,60	0.58	14,70	0.004	0,10	2.42	61,4
38	2.85	72,50	2.86	72,60	0.59	15,10	0.004	0,10	2.43	61,8

1600-1500 SERIES



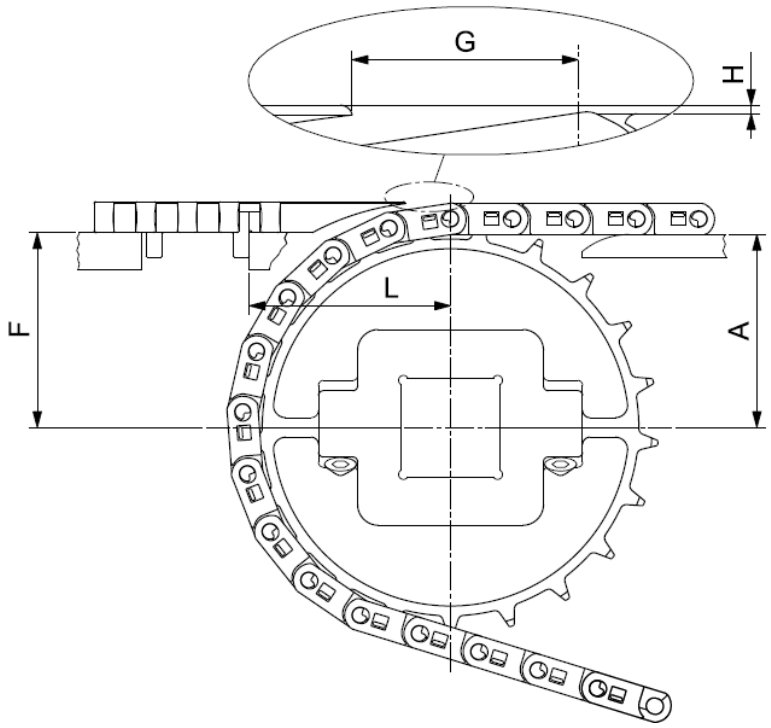
N° of TEETH	A		F		G		H		L	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
ATM K85 (LEFT AND RIGHT VERSIONS)										
8	1.13	28,8	1.14	28,9	0.47	11,9	0.004	0,1	2.31	58,6
10	1.44	36,7	1.45	36,8	0.52	13,1	0.004	0,1	2.35	59,8
11	1.60	40,7	1.61	40,8	0.54	13,7	0.004	0,1	2.38	60,4
12	1.76	44,7	1.76	44,8	0.56	14,3	0.004	0,1	2.40	61,0
13	1.92	48,7	1.92	48,8	0.58	14,8	0.004	0,1	2.42	61,5
14	2.07	52,7	2.08	52,8	0.60	15,3	0.004	0,1	2.44	62,0
16	2.39	60,7	2.39	60,8	0.64	16,2	0.004	0,1	2.48	63,0
18	2.71	68,8	2.71	68,9	0.68	17,2	0.004	0,1	2.52	63,9
19	2.87	72,8	2.87	72,9	0.69	17,6	0.004	0,1	2.53	64,3
20	3.02	76,8	3.03	76,9	0.71	18	0.004	0,1	2.55	64,7
21	3.19	80,9	3.19	81	0.73	18,5	0.004	0,1	2.57	65,2
ATM K170 (RIGHT VERSION)										
8	1.13	28,8	1.14	28,9	0.47	11,9	0.004	0,1	5.65	143,6
10	1.44	36,7	1.45	36,8	0.52	13,1	0.004	0,1	5.7	144,8
11	1.60	40,7	1.61	40,8	0.54	13,7	0.004	0,1	5.72	145,4
12	1.76	44,7	1.76	44,8	0.56	14,3	0.004	0,1	5.74	145,9
13	1.92	48,7	1.92	48,8	0.58	14,8	0.004	0,1	5.76	146,4
14	2.07	52,7	2.08	52,8	0.60	15,3	0.004	0,1	5.78	146,9
16	2.39	60,7	2.39	60,8	0.64	16,2	0.004	0,1	5.82	147,9
18	2.71	68,8	2.71	68,9	0.68	17,2	0.004	0,1	5.86	148,8
19	2.87	72,8	2.87	72,9	0.69	17,6	0.004	0,1	5.88	149,3
20	3.02	76,8	3.03	76,9	0.71	18	0.004	0,1	5.89	149,7
21	3.19	80,9	3.19	81	0.73	18,5	0.004	0,1	5.91	150,1

7300 SERIES



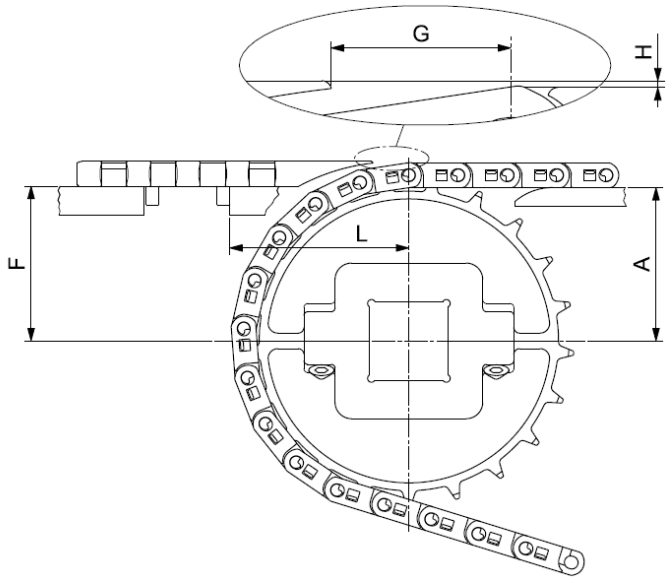
N. of TEETH	A		F		G		H		L	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
ATM 4½" (LEFT AND RIGHT VERSIONS)										
17	1.87	47,5	1.87	47,6	0.57	14,5	0.004	0,1	3.66	93,0
21	2.35	59,6	2.35	59,7	0.63	16,1	0.004	0,1	3.72	94,6
24	2.70	68,6	2.71	68,7	0.67	17,1	0.004	0,1	3.76	95,6
25	2.82	71,7	2.82	71,8	0.69	17,5	0.004	0,1	3.78	96,0
27	3.06	77,7	3.06	77,8	0.71	18,0	0.004	0,1	3.80	96,5
ATM 7½" (LEFT AND RIGHT VERSIONS)										
17	1.87	47,5	1.87	47,6	0.57	14,5	0.004	0,1	5.32	135,2
21	2.35	59,6	2.35	59,7	0.63	16,1	0.004	0,1	5.30	136,8
24	2.70	68,6	2.71	68,7	0.67	17,1	0.004	0,1	5.43	137,8
25	2.82	71,7	2.82	71,8	0.69	17,5	0.004	0,1	5.44	138,2
27	3.06	77,7	3.06	77,8	0.71	18,0	0.004	0,1	5.46	138,7

USPM SERIES



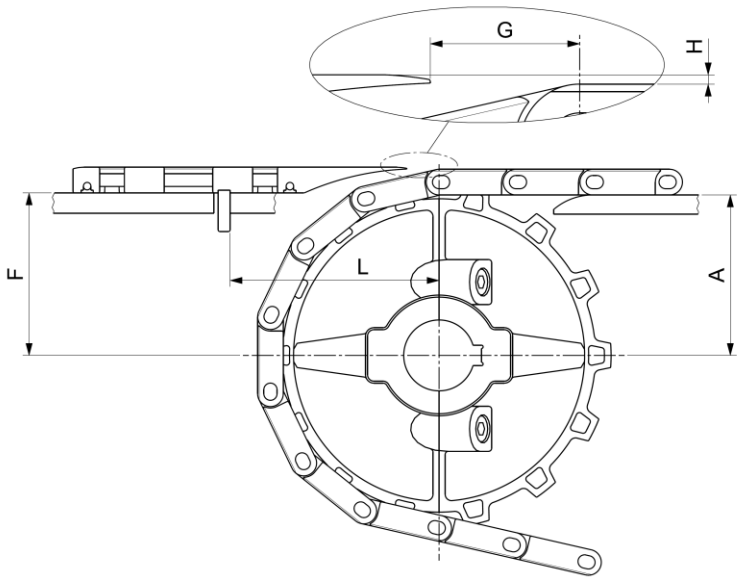
N° of TEETH	A		F		G		H		L	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	1.06	26,8	1.06	26,9	0.48	12,3	0.004	0,10	3.00	76,1
10	1.37	34,7	1.37	34,8	0.53	13,5	0.004	0,10	3.04	77,3
13	1.84	46,7	1.84	46,8	0.59	15,1	0.004	0,10	3.11	78,9
14	2.00	50,7	2.00	50,8	0.61	15,5	0.004	0,10	3.12	79,3
15	2.15	54,7	2.16	54,8	0.63	16,0	0.004	0,10	3.14	79,8
16	2.31	58,8	2.32	58,9	0.65	16,4	0.004	0,10	3.16	80,3
18	2.63	66,8	2.63	66,9	0.68	17,3	0.004	0,10	3.19	81,1
21	3.11	78,9	3.11	79,0	0.73	18,5	0.004	0,10	3.24	82,3

USP SERIES



N° of TEETH	A		F		G		H		L	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
ATM 4½" (LEFT AND RIGHT VERSIONS) & belts										
8	1.06	26,8	1.06	26,9	0.48	12,3	0.004	0,1	3.38	85,9
10	1.37	34,7	1.37	34,8	0.53	13,5	0.004	0,1	3.43	87,2
13	1.84	46,7	1.84	46,8	0.59	15,1	0.004	0,1	3.49	88,7
14	2	50,7	2	50,8	0.61	15,5	0.004	0,1	3.51	89,2
15	2.15	54,7	2.16	54,8	0.63	16	0.004	0,1	3.53	89,7
16	2.31	58,8	2.32	58,9	0.65	16,4	0.004	0,1	3.55	90,1
18	2.63	66,8	2.63	66,9	0.68	17,3	0.004	0,1	3.58	90,9
21	3.11	78,9	3.11	79	0.73	18,5	0.004	0,1	3.63	92,1
ATM 7½" (LEFT AND RIGHT VERSIONS)										
8	1.06	26,8	1.06	26,9	0.48	12,3	0.004	0,1	4.88	124
10	1.37	34,7	1.37	34,8	0.53	13,5	0.004	0,1	4.93	125,3
13	1.84	46,7	1.84	46,8	0.59	15,1	0.004	0,1	4.99	126,8
14	2	50,7	2	50,8	0.61	15,5	0.004	0,1	5.01	127,3
15	2.15	54,7	2.16	54,8	0.63	16	0.004	0,1	5.03	127,8
16	2.31	58,8	2.32	58,9	0.65	16,4	0.004	0,1	5.05	128,2
18	2.63	66,8	2.63	66,9	0.68	17,3	0.004	0,1	5.08	129
21	3.11	78,9	3.11	79	0.73	18,5	0.004	0,1	5.13	130,2

UCC SERIES

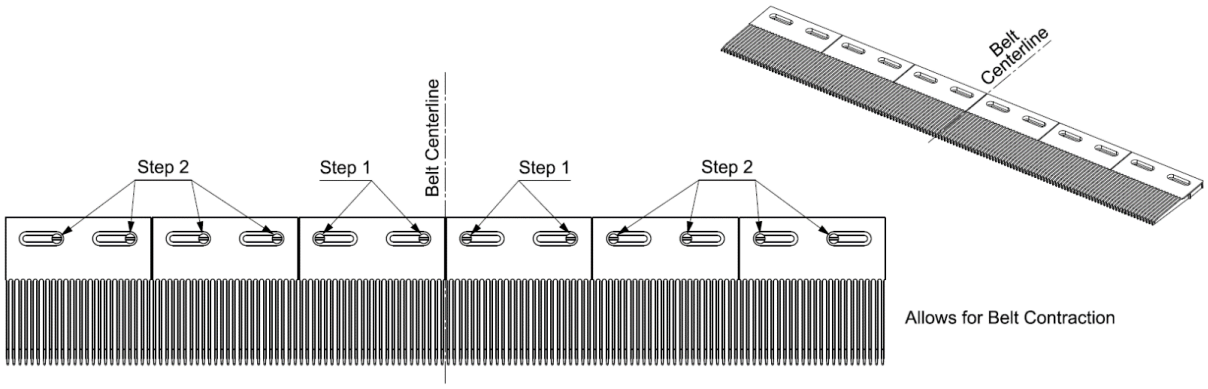


N° of TEETH	A		F		G		H		L	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
ATM 4½" (LEFT AND RIGHT VERSIONS)										
12	2.65	67,3	2.67	67,8	0.59	14,9	0.02	0,5	4.03	102,3
14	3.12	79,3	3.14	79,8	0.63	16	0.02	0,5	4.07	103,4
ATM 7½" (LEFT AND RIGHT VERSIONS)										
12	2.65	67,3	2.67	67,8	0.59	14,9	0.02	0,5	4.35	110,5
14	3.12	79,3	3.14	79,8	0.63	16	0.02	0,5	4.39	111,6

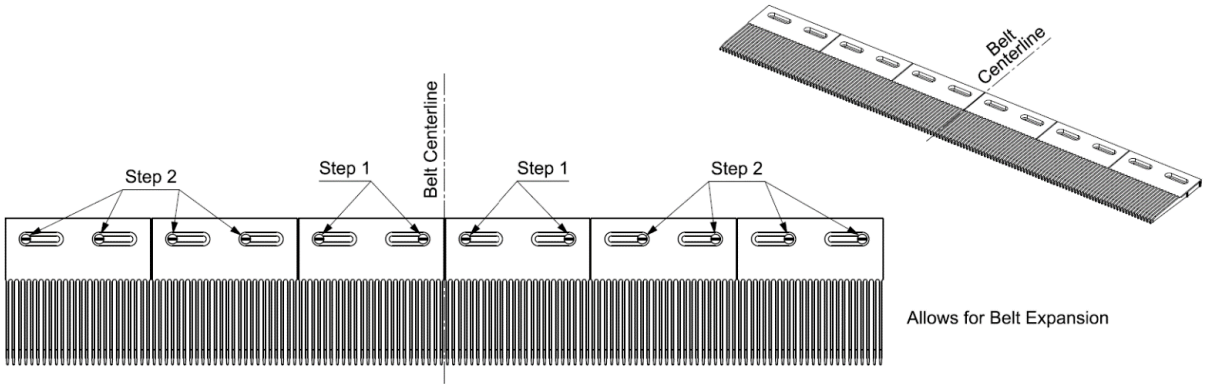
4.7 TRANSFER COMB INSTALLATION AND POSITIONING

4.7.1 INSTALLATION

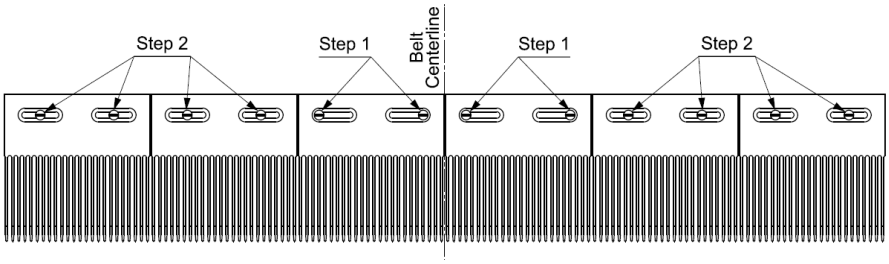
- Using a transfer comb system provides a smooth head transfer of products, thanks to the engagement of the comb fingers with the belt ribs.
- Being typically used on wider belts, whose width is significantly affected by temperature variations, transfer combs need to be able to shift laterally, to follow the thermal contraction or expansion of the belt.
- The hardware provided by Regina for each comb is specifically designed to allow lateral movement, even when securely screwed into the mounting plate (or “z-bar”).
- In order to maximize the lateral shift of the combs (see table next page for values), it is recommended to position the fastening screws in the comb slots according to the application temperature range (Installation at ambient temperature):
  1. The center comb (for even number of combs) or the two center most transfer combs (for odd number of combs) should be fixed to avoid any movement. This will help tracking the belt
  2.a. **Low Temperature Application**: position the fastening screws in the rest of the transfer plates all the way to one side of the slot closest to the center of the belt



2.b. **High Temperature Application**: position the fastening screws in the rest of the transfer plates all the way to one side of the slot furthest away from the center of the belt

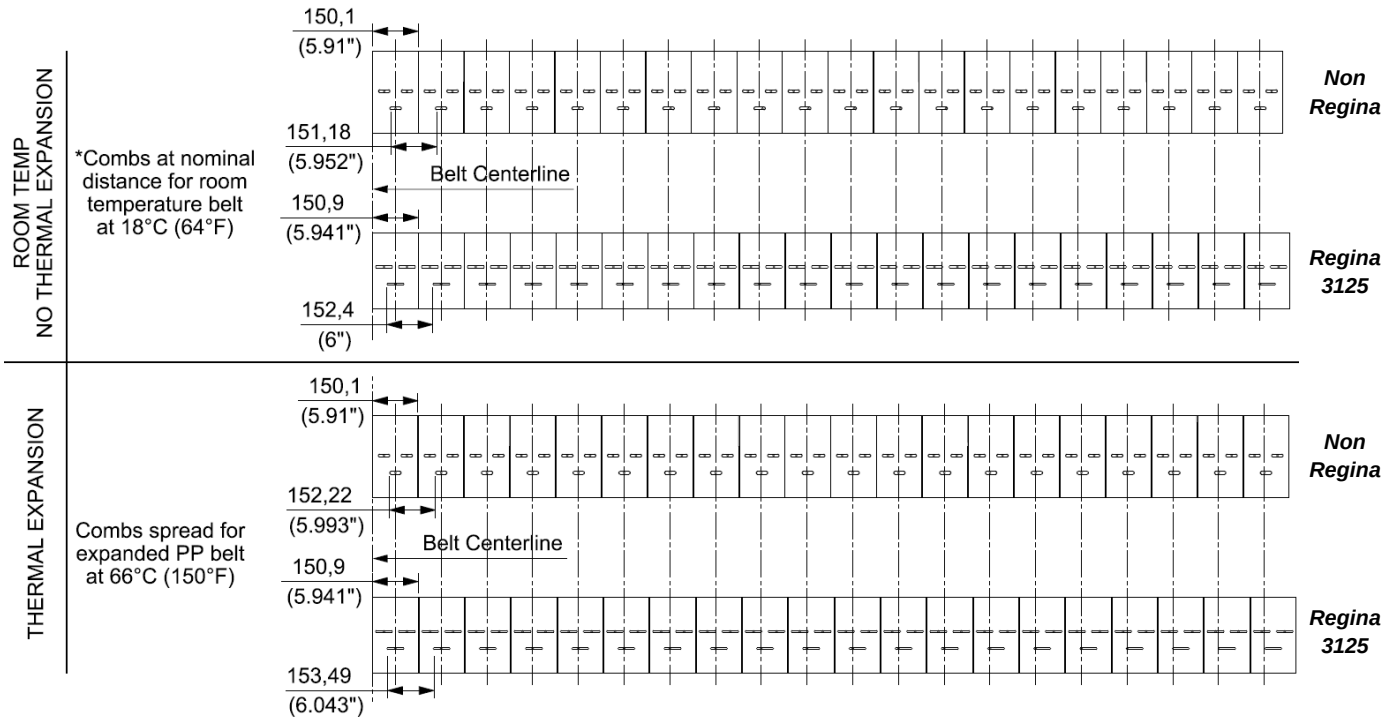


2.c. **Room Temperature Application**: position the fastening screws in the rest of the transfer plates at the center of each slot



Belt Series	Comb Ref.	Maximum lateral shift	
		in	*mm*
RR611	TC611-01	0.59	15
	TC611-03	0.59	15
	TC611-04	0.59	15
	TC611-06	0.59	15
	TC611-07	0.59	15
RR1500	TC1500-01	-	-
RR1600	TC1600-01	0.6	14
	TC1600-02	0.6	14
	TC1600-03	0.6	14
	TC1600-04	0.6	14
1110	TC1110-01	0.6	16
	TC1110-02	0.6	16
3125	TC3000-01	1.3	32
	TC3000-02	1.3	32
	TC3000-03	2	51
	TC3000-04	2	51
	TC3000-05	2	51

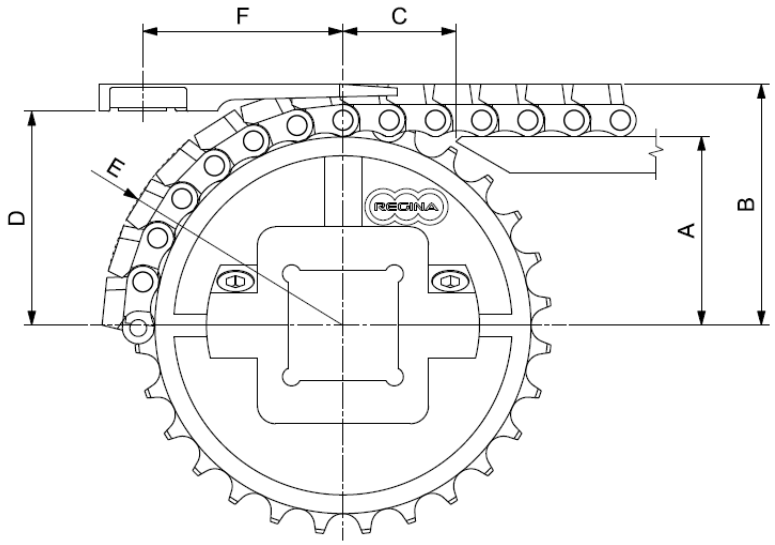
- Make sure that the transfer combs are allowed to slide freely from side to side. After mounting there will be approximately 1/16 in (1.5 mm) gap between the edges of the transfer combs.
- Regina 3125 series combs are 5.94” (150,9 mm) wide and are designed to be mounted with a 6” (152,4 mm) transversal pitch. When retrofitting existing units using non-Regina products, the mounting plate (or “z-bar”) may need to be re-drilled, in order to install the Regina combs with the possibility of maximum lateral shift and avoid that the positioning of some outer screws may fall outside the comb slots. The following drawing shows an example:



4.7.2 POSITIONING

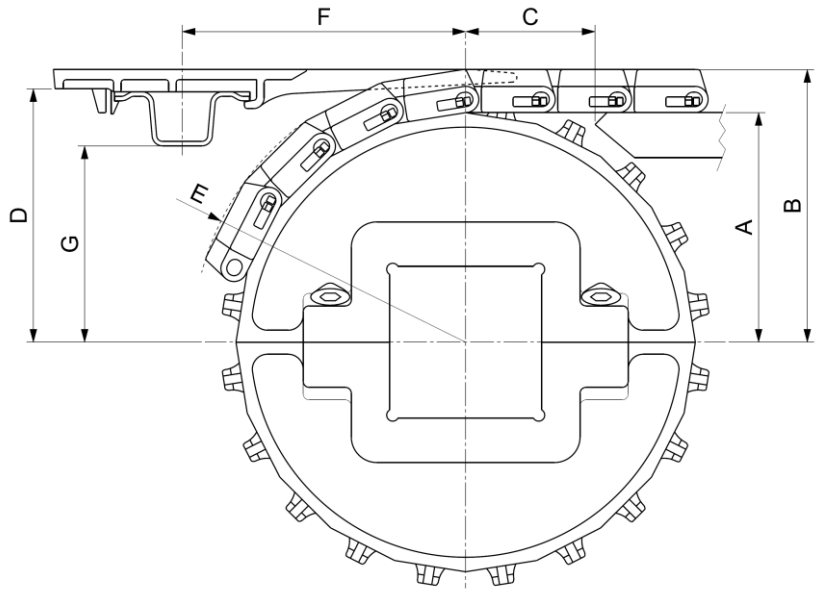
The level of the transfer combs with all the conveyed products should be tested. In order to guarantee smooth container transfer, height of the infeed and discharge conveyors and comb mounting plate (“z-bar”) may need to be adjusted. The top of the transfer combs should be even with the top of the chain or approximately 1/16 in (1.5 mm) above the tops of the chain ribs. The transfer combs should be mounted level from front to back

RR611



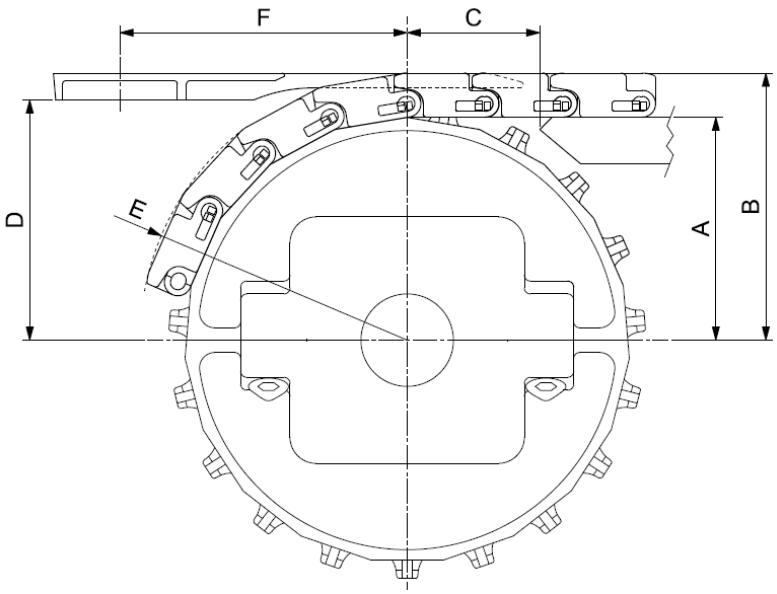
N° of TEETH	A		B		C		D		E		F	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	0.48	12,2	1.05	26,5	0.71	18	0.75	19,0	1.05	26,5	1.71	43,3
14	0.95	24,2	1.51	38,5	0.71	18	1.22	31,0	1.51	38,5	1.81	45,9
16	1.11	28,2	1.67	42,5	0.71	18	1.38	35,0	1.67	42,5	1.84	46,7
19	1.35	34,2	1.91	48,5	0.71	18	1.61	41,0	1.91	48,5	1.88	47,8
28	2.06	52,4	2.63	66,7	0.71	18	2.33	59,2	2.63	66,7	2.00	50,7
32	2.38	60,4	2.94	74,7	0.71	18	2.65	67,2	2.94	74,7	2.04	51,8
36	2.70	68,5	3.26	82,8	0.71	18	2.96	75,3	3.26	82,8	2.08	53,0
38	2.85	72,5	3.42	86,8	0.71	18	3.12	79,3	3.42	86,8	2.11	53,5

RR1500 SERIES



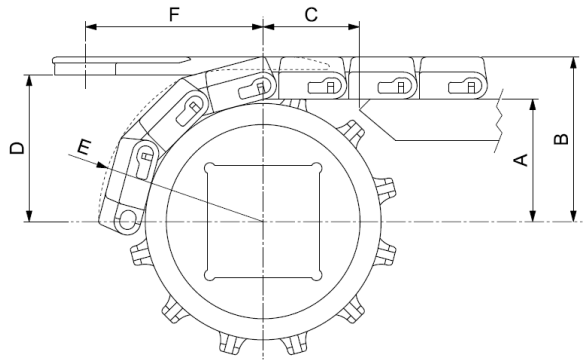
N. of TEETH	A		B		C		D		E		F	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	1.13	28,8	1.70	43,1	0.98	25	1.45	36,7	1.69	42,8	3.71	94,3
10	1.44	36,7	2.01	51,0	0.98	25	1.76	44,7	2.00	50,9	3.71	94,3
11	1.60	40,7	2.17	55,0	0.98	25	1.91	48,6	2.16	54,9	3.71	94,3
12	1.76	44,7	2.32	59,0	0.98	25	2.07	52,6	2.32	58,9	3.71	94,3
13	1.92	48,7	2.48	63,0	0.98	25	2.23	56,6	2.48	62,9	3.71	94,3
14	2.07	52,7	2.64	67,0	0.98	25	2.39	60,6	2.64	67,0	3.71	94,3
16	2.39	60,7	2.95	75,0	0.98	25	2.70	68,7	2.95	75,0	3.71	94,3
18	2.71	68,8	3.27	83,1	0.98	25	3.02	76,7	3.27	83,1	3.71	94,3
19	2.87	72,8	3.43	87,1	0.98	25	3.18	80,7	3.43	87,1	3.71	94,3
20	3.02	76,8	3.59	91,1	0.98	25	3.34	84,7	3.59	91,1	3.71	94,3
21	3.19	80,9	3.75	95,2	0.98	25	3.49	88,8	3.79	96,2	3.71	94,3

RR1600 SERIES

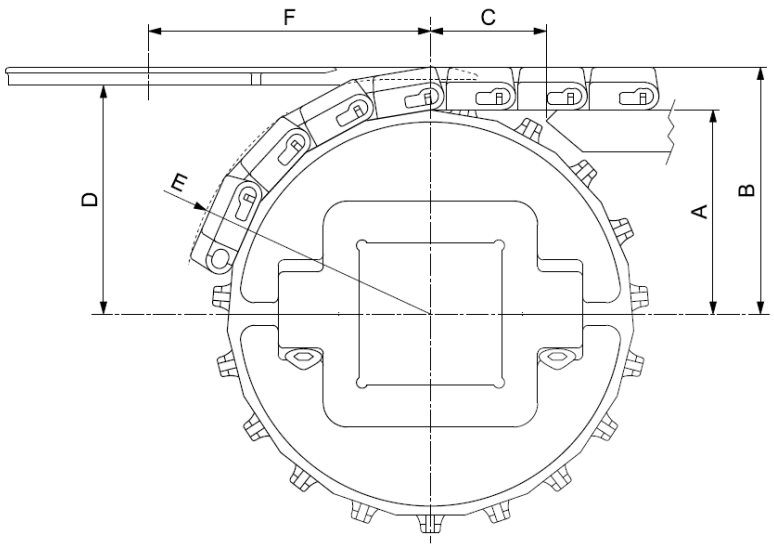


N. of TEETH	A		B		C		D		E		F	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
8	1.13	28,8	1.70	43,1	0.98	25	1.35	34,4	1.70	43,1	2.75	69,8
10	1.45	36,8	2.01	51,1	0.98	25	1.67	42,4	2.01	51,1	2.82	71,6
11	1.60	40,7	2.17	55,0	0.98	25	1.82	46,3	2.17	55,0	2.85	72,4
12	1.76	44,7	2.32	59,0	0.98	25	1.98	50,3	2.32	59,0	2.88	73,2
13	1.92	48,7	2.48	63,0	0.98	25	2.14	54,3	2.48	63,0	2.91	74,0
14	2.07	52,7	2.64	67,0	0.98	25	2.30	58,3	2.64	67,0	2.94	74,7
16	2.39	60,8	2.96	75,1	0.98	25	2.61	66,4	2.96	75,1	3.00	76,1
18	2.71	68,8	3.27	83,1	0.98	25	2.93	74,4	3.27	83,1	3.05	77,5
19	2.87	72,8	3.43	87,1	0.98	25	3.09	78,4	3.43	87,1	3.07	78,1
20	3.02	76,8	3.59	91,1	0.98	25	3.24	82,4	3.59	91,1	3.10	78,8
21	3.19	80,9	3.75	95,2	0.98	25	3.41	86,5	3.75	95,2	3.13	79,4

1110 SERIES

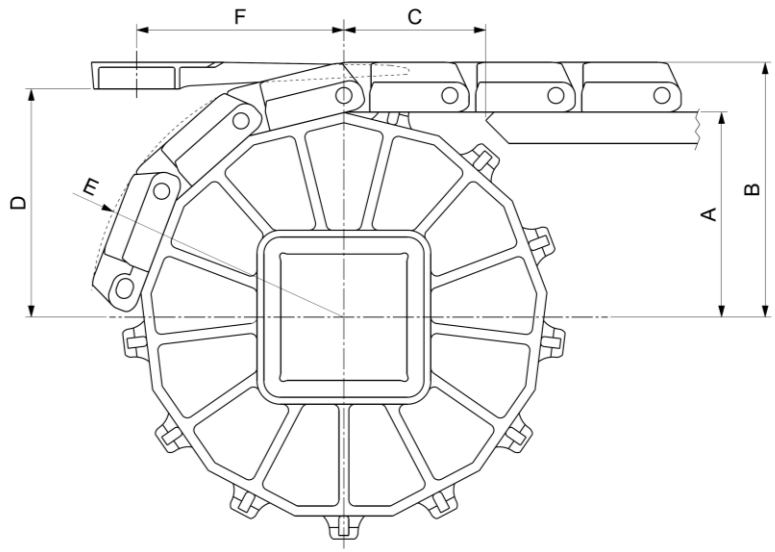


N° of TEETH	A		B		C		D		E		F	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
TC1110-01 COMB POSITIONING												
8	1.12	28,4	1.71	43,4	0.98	25	1.46	37,1	1.71	43,4	2.13	54,1
10	1.43	36,3	2.02	51,3	0.98	25	1.77	45,0	2.03	51,6	2.2	55,9
11	1.59	40,4	2.18	55,4	0.98	25	1.93	49,0	2.19	55,6	2.22	56,4
12	1.74	44,2	2.33	59,2	0.98	25	2.08	52,8	2.34	59,4	2.25	57,2
13	1.9	48,3	2.49	63,3	0.98	25	2.24	56,9	2.5	63,5	2.28	57,9

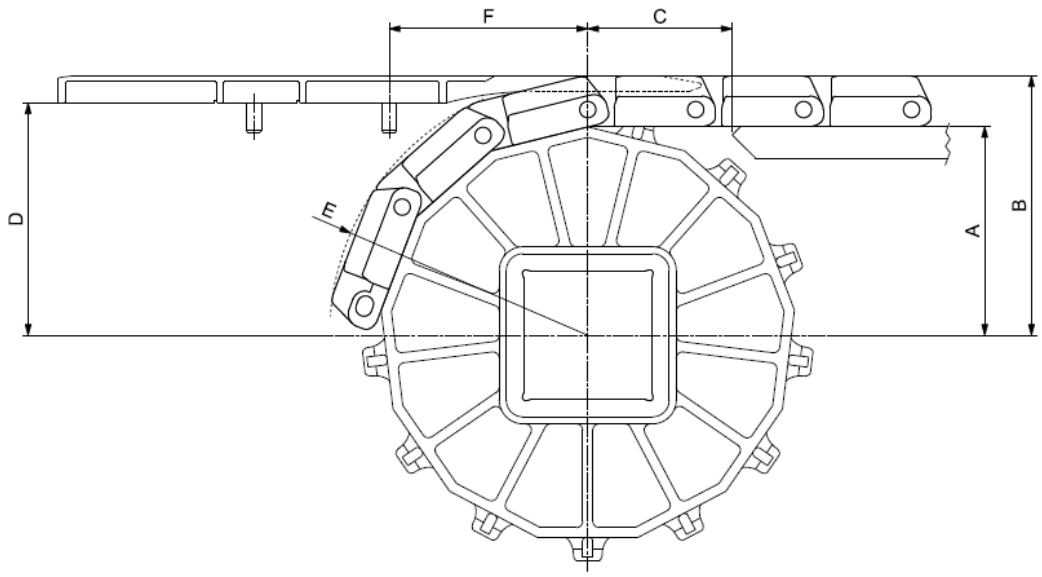


N° of TEETH	A		B		C		D		E		F	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
TC1110-02 COMB POSITIONING												
14	2,06	52,3	2,65	67,3	0,98	25	2,4	60,9	2,66	67,5	3,43	87,1
16	2,37	60,3	2,96	75,3	0,98	25	2,71	68,9	2,97	75,5	3,48	88,3
18	2,69	68,3	3,28	83,3	0,98	25	3,03	76,9	3,29	83,5	3,52	89,4
19	2,85	72,4	3,44	87,4	0,98	25	3,19	81	3,44	87,5	3,54	89,9
20	3,01	76,4	3,6	91,4	0,98	25	3,35	85	3,61	91,6	3,56	90,4
21	3,17	80,4	3,76	95,4	0,98	25	3,5	89	3,76	95,6	3,58	90,9

3125 SERIES



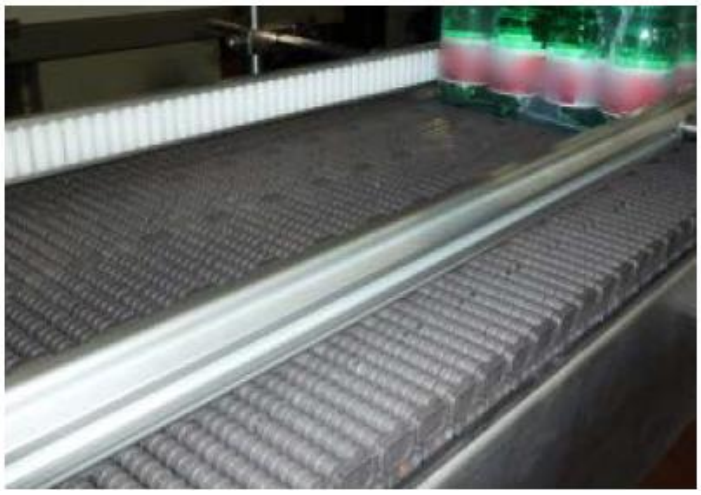
N. of TEETH	A		B		C		D		E		F	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
TC3000-01, TC3000-01 COMB POSITIONING												
10	2.93	74,3	3.87	98,2	1.97	50	3.36	85,4	3.83	97,4	3.75	95,3
13	3.87	98,2	4.81	122,1	1.97	50	4.30	109,3	4.78	121,5	3.91	99,3
16	4.81	122,3	5.76	146,2	1.97	50	5.25	133,4	5.74	145,7	4.05	102,9
TC3000-02, TC3000-04 COMB POSITIONING												
10	2.93	74,3	3.87	98,2	1.97	50	3.36	85,4	3.83	97,4	4.60	116,9
13	3.87	98,2	4.81	122,1	1.97	50	4.30	109,3	4.78	121,5	4.76	120,9
16	4.81	122,3	5.76	146,2	1.97	50	5.25	133,4	5.74	145,7	4.90	124,4



N. of TEETH	A		B		C		D		E		F	
	in	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*	*in*	*mm*
TC3000-05 COMB POSITIONING												
10	2.93	74,3	3.87	98,2	1.97	50	3.41	86,7	3.83	97,4	3.01	76,5
13	3.87	98,2	4.81	122,1	1.97	50	4.35	110,6	4.78	121,5	3.27	83,0
16	4.81	122,3	5.76	146,2	1.97	50	5.30	134,7	5.74	145,7	3.50	88,9

Section V

INSTALLATION AND MAINTENANCE

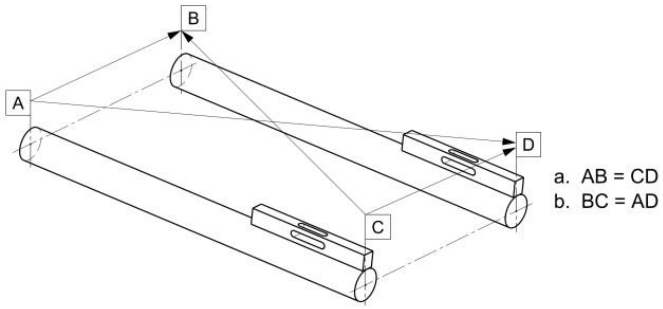


INSTALLATION AND MAINTENANCE

5.1 INSTALLATION

When installing chains, either into a new conveyor or as a replacement, it is necessary to inspect all the components interacting with the chain and the chain itself, to insure a smooth uninhibited path throughout the system. Following is a checklist:

1. Regina only uses high quality packaging, but the risk of damage during transportation can never be fully eliminated. Therefore, prior to beginning the installation it is recommended to visually inspect the chain, sprockets and any other Regina component for any damage
2. Check shaft and return roller parallelism:

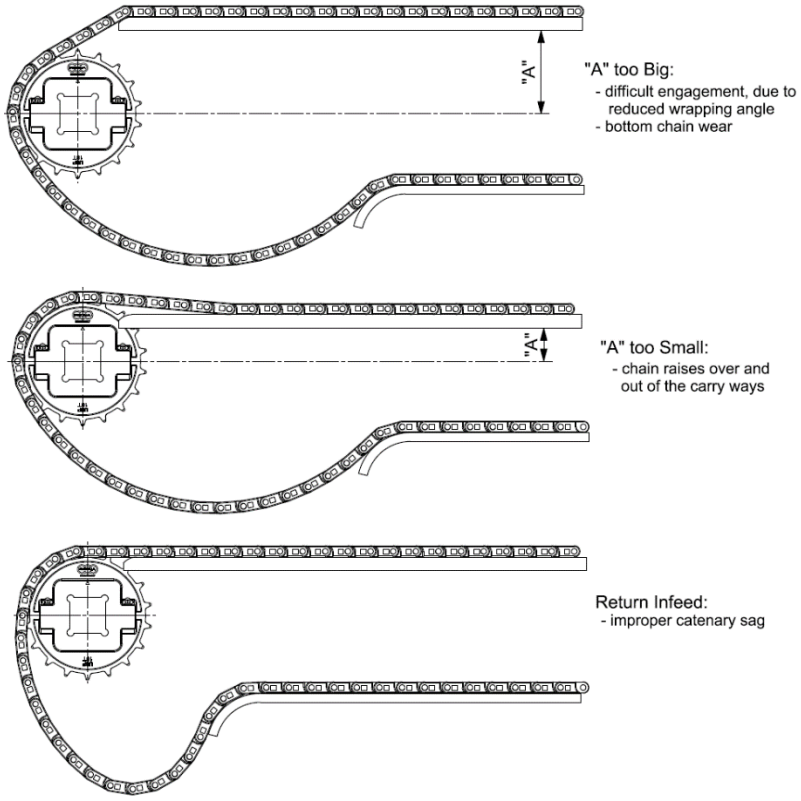


Check that both shafts are horizontal and that the following holds:

a. AB = CD
b. BC = AD

Misalignment can cause overloading on one side of the belt, leading to failure and/or uneven wear and can cause pins to work their way out.

3. Check all sprockets, idlers and turning disks for proper elevation and alignment with the conveyor tracks.
4. Check all wear strips (carrying and return), dead plates, dividers and transfer mechanisms for proper location, elevation, spacing and flatness:



INSTALLATION AND MAINTENANCE

5. Make sure that all fasteners are set to the proper torque settings, as recommended by the conveyor manufacturer. Fasteners used on wear strips and dead plates must have recessed heads.
6. Check all conveyor junction points for proper elevation, alignment and fastening.
7. Inspect conveyor system for obstructions by pulling a short section of chain (3 feet) through the entire conveyor:
    a. wear strip discontinuities not properly chamfered or bent down
    b. presence of foreign objects: screwdrivers, bolts and nuts, welding debris, debris
    c. proper clearance in curve sections

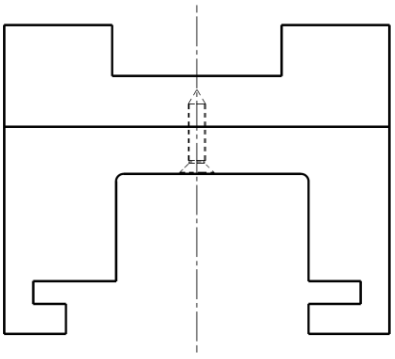
8. Check lubrication system (if present).
9. Install conveyor chain, assuring that the following has been done:
    a. If present, retract take-up device to the minimum setting, as indicated by the device's manufacturer.
    b. Clean the floor before unrolling the chain
    c. Support wide belt coils in order to avoid excessive bending
    d. Do not connect sections on the floor: heavy sections are more easily damageable
    e. Assemble one roll/section at a time on conveyor frame, avoiding twisting or damaging the chain:
        i. check for correct direction of chain travel
        ii. pull one section through the return part, starting from the drive shaft discharge
        iii. insure that all pins and top plates are flush and properly secured
        iv. connect the next section at the drive shaft discharge
        v. repeat steps i to iv, until head and tail can be connected
        vi. connect head and tail, and adjust the proper catenary sag (see sections …)

    f. If present, adjust take up device to the manufacturer's specifications.
    Note: Readjustment is usually necessary following operation under loading conditions.
    Although not recommended, if a mechanical screw or spring take-up is used, exercise caution not to overload the chain.

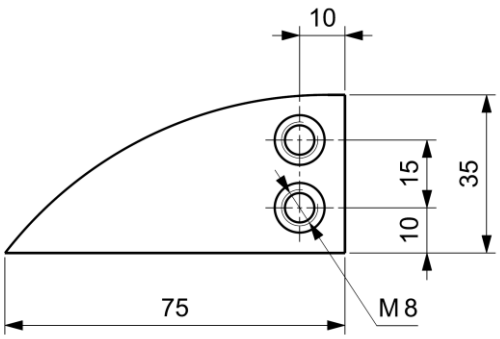
10. Ensure that lubricant is evenly distributed throughout the conveyor system. See lubrication section for more information.
11. Start-up the system:
    a. Check free movement manually before starting the motor
    b. Run the conveyor briefly without products and check for unusual noises, signs of interference, unusual operation
    c. If problems occur, stop the conveyor and refer to the trouble shooting guide
    d. Repeat, loading the conveyor
    e. Adjust catenary sag as needed, as elongation may occur in few days, due to hinge/pin adjustments

5.1.1 MAGNETIC CURVES

REGINA magnetic curves are supplied with an upper and return part connected by Ø 4 mm stainless steel self-tapping screws.
All curves are supplied with the return guide shoe equipped with N.4 M8 brass threaded inserts already assembled.



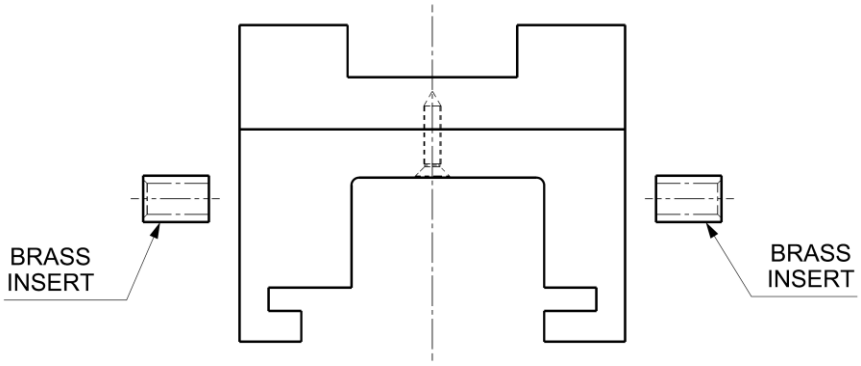
Curve supply condition



Return shoe guide

The magnetic curves can be installed on the conveyor in the two following ways:

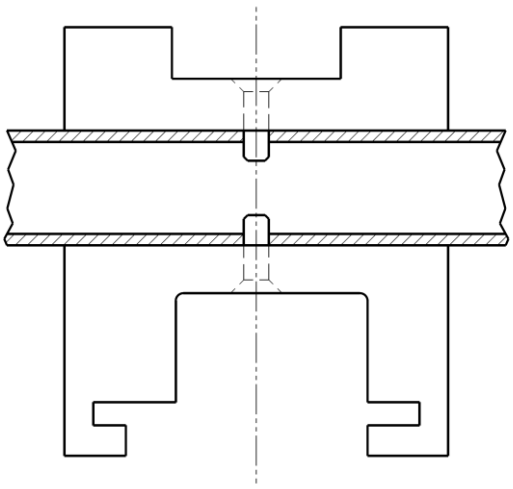
1) Fixing the outer and the inner side of the curve (upper and return part jointed together) to the conveyor frame. In this case, the curve is installed with the upper and return part connected as supplied by REGINA and it is fixed to the conveyor making lateral holes on the return part of the curve and using M10 brass threaded inserts. These inserts can be ORDERED SEPARATELY with the P/N I-SCTBM10 (component NOT supplied with the curves).



Curve installation with lateral threaded inserts

For curves wider than 350 mm (13.78”), further support is recommended by using conveyor crossbars to avoid bending of the curve under the weight of the products.

2) The upper and return part of the curve can be installed separately on the conveyor. In this case, the curve, which is supplied with the upper and return part connected with stainless steel self-tapping screws, must be disassembled and fixed to a conveyor crossbar using the holes present on both parts of the curve. The screws to fix the upper and lower part of the curve to the crossbar must have a proper length depending on the conveyor structure. Those screws are NOT supplied by REGINA.



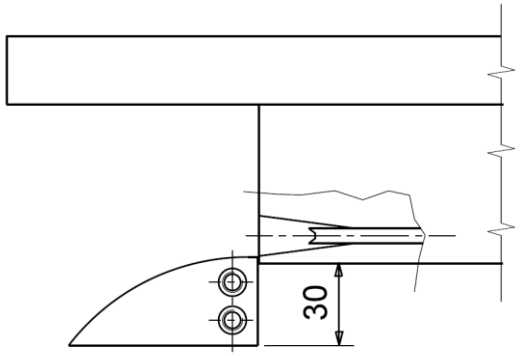
Curve installation on conveyor crossbar

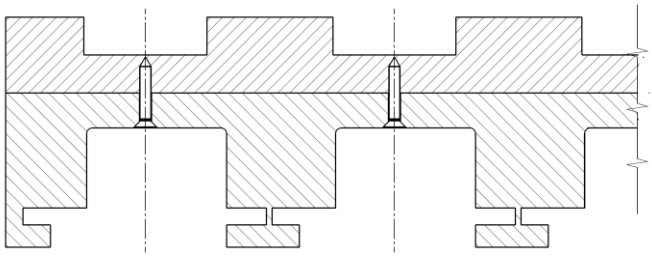
3) The return guide shoe is necessary to support the chain at the right level to enter the return part of the curve. The position of the guide depends on the return part design, for which there are two possible configurations:
   a. Return with chains tracks at the same vertical level
   b. Return with staggered chains tracks
      This is used when the pitch between the tracks is too small to allow the chains to run at the same level in the return. Two levels of chains tracks are made: one level for the uneven tracks and another level for the odd tracks.

INSTALLATION AND MAINTENANCE

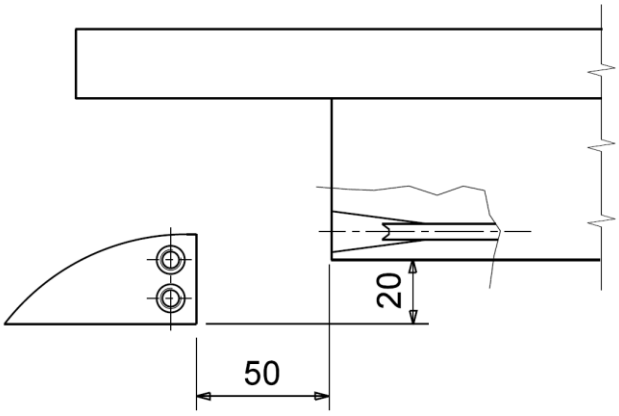
Drawings below show the recommended position of the guide shoe according to return configuration.

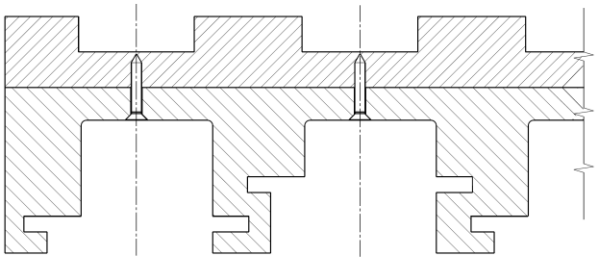
RETURN WITH CHAINS TRACKS AT THE SAME LEVEL





RETURN WITH STAGGERED CHAINS TRACKS





INSTALLATION AND MAINTENANCE

5.2 CLEANING

Regardless of the conveying environment, periodic cleaning of the conveyor system is necessary to maintain trouble free operation. **Contaminating agents** can come from:

- **The Conveyor**:
  - Chain and wearstrip dusting
  - Debris (metal chips)
  - Grease
  - Dry-lube build-up

- **The Conveyed Product**:
  - Broken glass
  - Sticky product spillage (food, syrups, beer, soda, wine)
  - Metal chips and grinding debris

- **Foreign Materials**:
  - Dirt
  - Sand
  - Grit

Build-up of contaminating agents on the chain and in the conveyor tracks can cause:

- **Increased wear** on
  - Chain surface and hinges
  - Sprocket teeth
  - Wearstips

- **Increase back-line pressure** and **container damage**

- **Decreased product handling** leading to
  - Product tipping
  - Chain pulsation
  - Difficult chain articulation and tenting

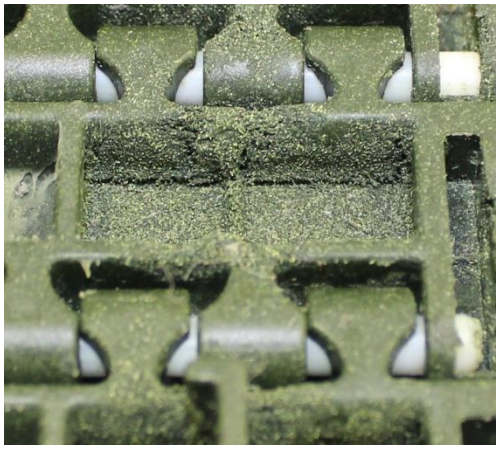
- **Increased motor amperage draw**

It is recommended that periodic cleaning be established for the removal of contaminants. Particular attention must be paid to **Chain/Cleaner compatibility**:

- Avoid chlorine (bleach), ammonia and iodine
- **Carbon Steel**
  - Not compatible with water or any chemical cleaner
  - Use compressed air and soft brushes

- **Stainless Steel and Polypropylene**
  - Check the chemical resistance table in the material section
  - Cleaning agents must have the proper concentration

- **Acetal**
  - Avoid strong corrosive cleaners (even if used with SS chains, like phosphoric acid or strong caustic agents)
  - Use low-acid or low-alkaline watery solutions (pH value 4÷10), or alcohol
  - Stains on chain surface and strong smell from chain indicate chemical attack:



- Cracks and notches, especially on hinges

↓

- Deterioration of chain material

↓

- Mechanical resistance reduction

Cleaning methods

- High pressure hot water rinse or steam cleaning (max 80°C). Spray the chain/belt on each conveyor, both on the carry and in the return sections.
- Warm softened water combined with mild soap.
- For very dirty chains/belts, use a bristle brush on the upper side and underside.
- Application of foaming agents or other chemical cleaners.
  In this case, check the chemical compatibility with conveyor materials and carefully follow the instructions provided by the manufacturer to determine proper concentration of solutions and proper safe use and disposal.

After cleaners application, thoroughly rinse chains/belts (upper side and underside), wearstrips, tracks and conveyor frame with clean softened water.

Frequency of cleaning is also an important factor to be considered.

<u>Dry running lines</u>
The required intervals for cleaning depend on:

- Product type that is being filled. Beverage spillage like syrup, beer, soda can make chain/belt surface sticky if it dries up. It is recommended to remove it as soon as possible. On the contrary, spillage of mineral water does not require immediately cleaning.
- Product stability. The main indicator for the need of cleaning is an increase of friction between the chain/belt surface and container, which can lead to falling container.
- Position in the line. Conveyors in proximity of a filler (inliner, decombiner, single lane) need to be cleaned more often compared to a mass handling conveyors near the case packers.

In general, most critical sections should be washed down daily to obtain maximum sanitation and performance. At the very minimum, rinse daily and thoroughly sanitize weekly.

<u>Partial lubricated lines</u>
Thoroughly clean these lines weekly

INSTALLATION AND MAINTENANCE

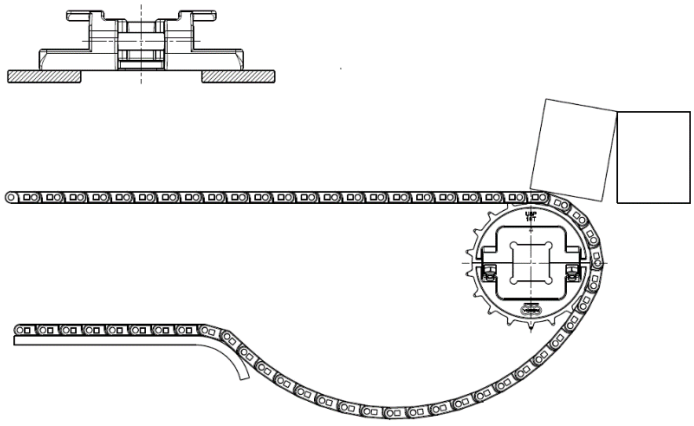
5.3 PERIODIC INSPECTION

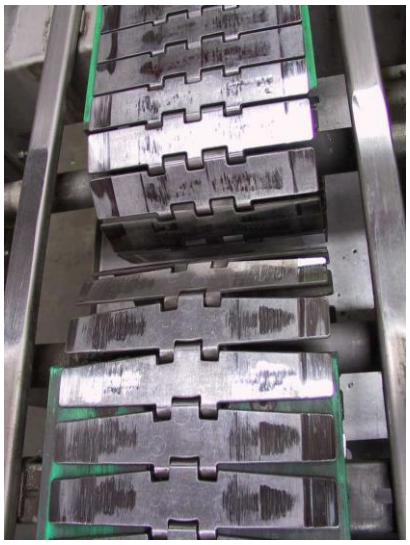
After the initial inspections performed before and after installation, it is important to foresee periodic inspections, because wear and damage of components may affect the operations of the conveyor.
In addition to regular wear with time, wear and damage may occur because the conveyor and its components are not operating properly. Proper operation of conveyor components also needs to be regularly checked.

5.3.1 UNUSUAL WEAR/DAMAGE PATTERNS

They may occur on:

- **Chain Surface**
  - **Localized Wear and Scallops**, due to:
    - Improper return wearstrips: reduced sliding area combined with heavy chain
    - Entry radius of return wearstrips too small
    - Return rollers do not rotate freely
    - Wrong transfer point positioning and clearance





  - **Grooves**: pieces of broken containers trapped between chain and conveyor frame
  - **Flatness and continuity**: bent or broken flights/modules

A damaged chain surface will decrease product handling.

- **Thrust surface *side-flexing chain/curve***: an increased **pressure** on a side-flexing chain can cause:
  - wearstrip and chain damage
  - Increased noise levels
  - decreased product handling, due to chain pulsations

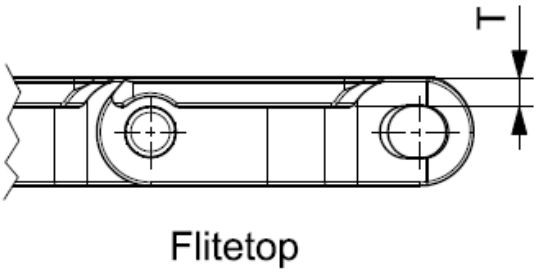
- **Sprocket tooth and chain pocket**: chain/sprocket misalignment (due to guide ring wear, sprockets loosening, or incorrect installation) and incorrect evaluation, can cause:
  - Sprocket tooth damage
  - Chain pocket damage
  - Poor engagement

- **Wearstrips and chain bottom**: caused by incorrect sprocket/wearstrip positioning and/or chamfer/bend of wear strip discontinuities, can generate uneven wear

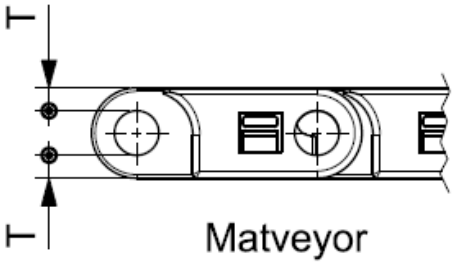
5.3.2 REGULAR WEAR OF COMPONENTS

- **Chain Thickness Reduction**: due to chain/wearstrip sliding and product accumulation, can cause:
  - difficult side transfer of products, due to differential thickness between adjacent chains
  - decreased mechanical resistance of the chain

  A reduction in thickness of the chain up to ~ ½ T may be acceptable:



Flitetop

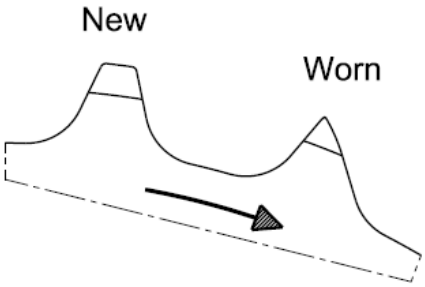


Matveyor

- **Chain Elongation**: look for excessive gaps between chain flights. It increases with:
  - shorter conveyors and higher speed, causing hinge wear
  - stretching due to overload

  Catenary sag can be adjusted, by removing chain links, **up to 3% of the total chain length**. Beyond that, the chain will no longer engage the sprocket(s).

- **Sprocket Tooth and Chain Pocket**: increased wear on sprocket teeth will cause them to become hook-like shaped which, combined with a large amount of debris at the sprocket/pocket location, can cause:
  - engagement issues: chain jumps on sprockets
  - chain hanging up on sprocket, leading to possible jams with conveyor structure



- **Hold-down tabs wear**: when excessive, the chain may lift too much out of the curve and cause transfer problems with adjacent chain

- **Wearstrips**
  - difficult side transfer of products, due to differential level between adjacent chains
  - embedded debris in the wearstrip can cause increased abrasive action against the chain
  - increased beveled curve wear can increase the chances of chain lifting out of the curve

5.3.3 OPERATION OF CONVEYOR COMPONENTS

- **Rotating parts**
  - check freedom of rotation of: rollers, discs, sprockets and idlers
- **Excessive debris**
  - remove: wear debris, spilled products, broken containers
- **Chain pulsation**
  - check lubrication system and conveyor obstructions
  - excessive conveyor length
  - check dry lube build-up
- **Take-up system**: make sure tension is not
  - excessive: over-tensioning
  - too small: jams
- **Lubrication system**: make sure it is functioning properly

5.4 REPLACEMENT AND REPAIRS

Following are some guidelines that will be helpful in making decisions on repair and replacement, also based on the findings of periodic inspections (see previous section).

- **Chain**
  - If a foreign object catches in the chain, repair is usually necessary to only one or two links or a small section of chain. Normally, this type of repair is easily accomplished by removing all of the damaged links or sections of the chain.
  - Caution should be exercised when replacing new links into old or badly worn chain to ensure the new conveying surface will be flat. If chain surfaces do not match up, it is recommended that new chain, wear strips, and sprockets be installed.
  - Chains are normally replaced when the chain elongates due to normal wear in the chain joint or when it has been stretched due to an overload. If the chain pitch exceeds 3% elongation it should be replaced.
- **Flights/modules**
  - If the flight thickness is reduced to half of its original thickness, or the surface is damaged and causing handling issues, then the flight or entire chain should be replaced.
  - On gripper chains, as the thickness is reduced, the gap between opposing grippers will spread: this could lead to product dropping from insufficient holding pressure.
- **Sprocket**
  - Sprockets should be replaced when the tooth profile takes the appearance of a hook or the tooth is reduced. In this instance, sprocket replacement is necessary to insure continued smooth conveyor operation.
- **Wearstrip**
  - Wearstrips need to be replaced when wear is causing differential level between adjacent chains.
  - If the side wearing surfaces of a side flexing chain are badly worn, rivets, pin ends, and sharp edges may singly or in combination accelerate wear strip abrasion and possibly cause conveyor frame damage. Again, Regina recommends chain replacement.

In general, it is advised that when replacing the chain, new sprockets and new wear strips should also be installed. Neglecting one or more of these conveyor components could result in accelerated wear and premature damage to the new replacement parts.

INSTALLATION AND MAINTENANCE

masino
KONAFLEX

Myynti

Vantaa
Pyymosantie 4
01720 Vantaa

Turku
Polttolaitoksenkatu 5
20380 Turku

Tampere
Lentokentänkatu 9 C
33900 Tampere

Oulu
Revontie 2
90830 Haukipudas

Huolto ja kokoonpano

Vantaa
Pyymosantie 4
01720 Vantaa

Turku
Polttolaitoksenkatu 5
20380 Turku

Puh. 010 8345 500
power.hydraulics@masino.fi
www.masino.fi/masino-konaflex

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