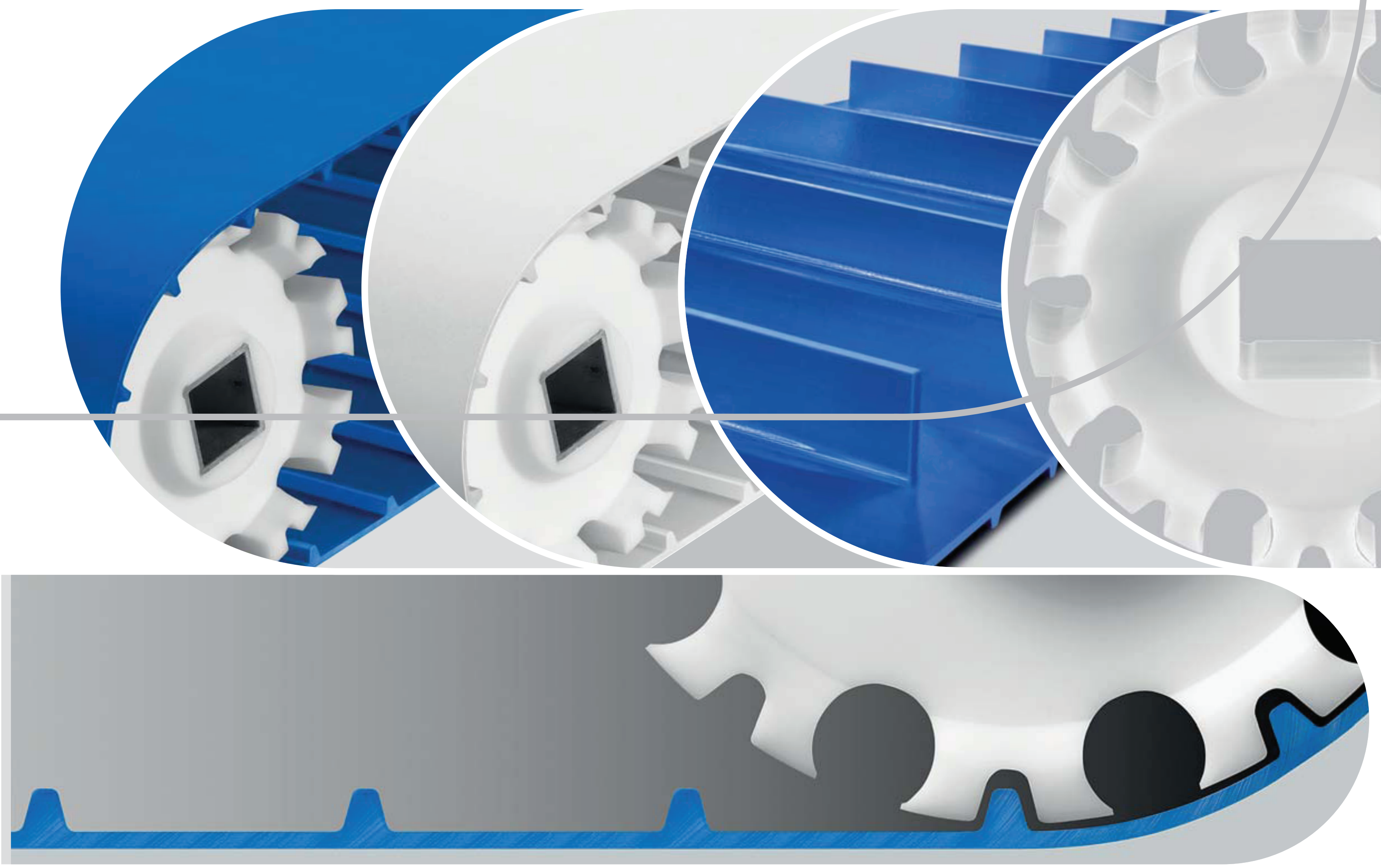
habasit

Services
Media No. 6033

Habasit Cleandrive™ Positive Drive Belts

Engineering Guide

Habasit – Solutions in motion



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Warning

Habasit belts and chains are made of various plastics that WILL BURN if exposed to sparks, incendiaries, open flame or excessive heat. NEVER expose plastic belts and chains to a potential source of ignition. Flames resulting from burning plastics may emit TOXIC SMOKE and gasses as well as cause SERIOUS INJURIES and PROPERTY DAMAGE.

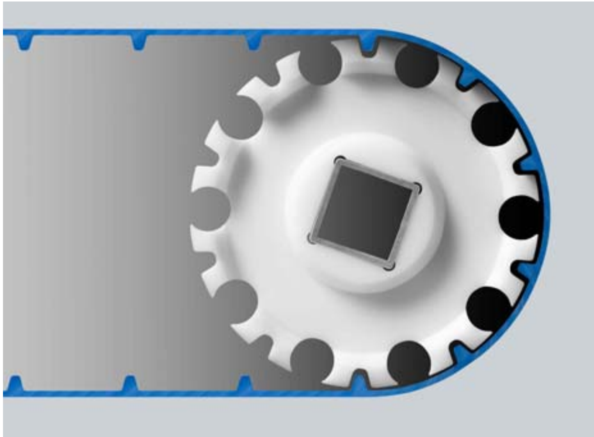
Contents

Introduction
The features of Habasit Cleandrive^{TM}

The Habasit Cleandrive^{TM} positive drive belt delivers significant advantages for wet applications in the food processing industry. The advanced technology and design of the Habasit Cleandrive^{TM} belt meet customers' most stringent hygiene requirements, while delivering exceptional performance, reliability and cost-efficiency.

New belt meets all wet-application requirements
The new Habasit Cleandrive^{TM} conveyor and processing belt from Habasit addresses – and solves – both challenges, providing an exciting and innovative solution to meet the strictest hygiene requirements of wet applications in the food processing industry, while delivering outstanding performance reliability and significant cost-efficiency.

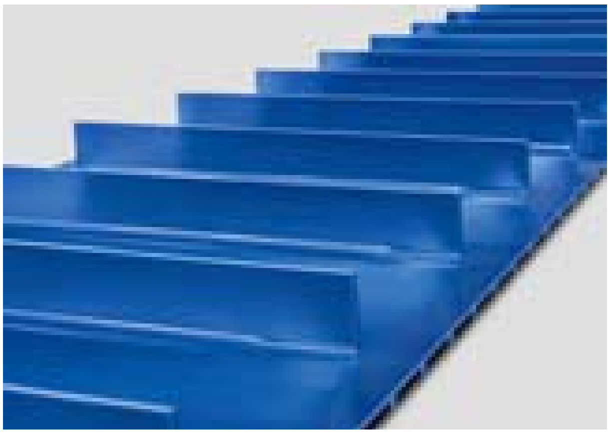
No belt creep and good tracking over the belt lifetime
High-tech aramide cords integrated into the belt during manufacture provide longitudinal reinforcement without affecting the smooth surface structure. This ensures belt stability even on long-term and under load, with no elongation, and thus good tracking behavior over the belt lifetime. Cutting to width does not touch the cords, so that no fibers contaminate the conveyed foods, even without costly edge sealing.



The well-designed full-belt-width drive bars combined with the finely tuned tooth shape of the sprockets provide continuous, strong sprocket engagement. The result is a highly reliable performance of the conveyor, and lower maintenance and downtime.

Introduction
The features of Habasit Cleandrive™

Chemical and temperature resistance
Made of high-quality food-grade thermoplastic material, the belt is designed to withstand the most aggressive cleaning methods and agents, and to cope with temperature variations from fryer outfeed to freezer infeed. With approvals received from the leading food authorities, the belt's chemical and temperature resistance not only cuts hygiene risks, but also increases belt reliability and lifetime.



Wide range of auxiliaries
The Habasit Cleandrive™ is offered with a full range of thermoplastic weldable cleats, scoops, profiles and side walls, all designed to meet the highest standards of hygiene. Made from the same material as the belt, with the same cleaning agent resistance, these are quick and easy to wash. Habasit's experience in profile welding means that auxiliaries always bond excellently to the belt.

Easy construction, installation – and retrofit
Habasit Cleandrive™ belts are manufactured in open-length coils, and only require one joint in order to be installed endless. Habasit's fabric belt technology experience means it can offer a choice of proven joining systems, featuring fast installation times and smooth and reliable belt seams.

Construction and installation of Habasit Cleandrive™ belts is easy, thanks to the low- or no-tension design of positive drive belts. Since the carefully designed, integrated drive bars of the Habasit Cleandrive™ belt fit into the well-known HabasitLINK® plastic modular belt 2 inch sprocket – as well as 2 inch sprockets from other manufacturers – there is no need for special rollers or custom-made sprockets, and retrofit is also made easier.

Introduction
Product range

CD.M25.S-UA.WB
Pitch 26.8 mm *(1.055"),* TPU elastomer material

CD.M25.S-UA.CB
Pitch 26.8 mm *(1.055")*, TPU elastomer material

CD.M50.S-UA.WB
Pitch 50.4 mm *(1.984"),* TPU elastomer material

CD.M50.S-UA.CB
Pitch 50.4 mm *(1.984")*, TPU elastomer material

Introduction
Materials for belts and sprockets

Materials for belts

Material	Code	Property	Food approv.	Density g/cm^3 *lb/in^3*	Temperature range	Habasit colors
Thermoplastic polyurethane	TPU	Thermoplastic material with good chemical and hydrolysis resistance. Hardness: 95 Shore A	EU FDA	1.15 *0.042*	-30 °C to +80 °C *-22 °F to +176 °F*	blue white

Materials for sprockets

Material	Code	Property	Food approv.	Density g/cm^3 *lb/in^3*	Temperature range	Habasit colors
Polyoxymethylene (Acetal)	POM (AC)	Thermoplastic material specially designed for sprockets, with high strength and good abrasion resistance. Good chemical resistance to oil and alkalines, but not suitable for long-term contact with high concentration of acids and chlorine.	EU FDA	1.42 *0.051*	wet conditions: -40 °C to +60 °C *-40 °F to +140 °F* dry conditions: -40 °C to +90 °C *-40 °F to +200 °F*	white
Polyethylene	PE UHMW	Ultrahigh molecular weight material for machined sprockets. Very good chemical resistance.	EU FDA	0.94 *0.034*	-70 °C to +50 °C *+94 °F to +120 °F*	natural

Materials for wear strips and guides

Material	Code	Property	Density g/cm^3 *lb/in^3*	Temperature range
Ultra high molecular weight polyethylene	UHMW PE (PE 4000)	Offers reduced wear and longer lifetime. Habasit offers standard guiding profiles and wear strips.	0.94 *0.043*	-50 °C to +65 °C *-58 °F to +150 °F*
High molecular weight polyethylene	HMW PE (PE 1000)	Offers almost the same features of UHMW PE but with a harder surface.	0.95 *0.043*	-50 °C to +65 °C *-58 °F to +150 °F*
Medium molecular weight polyethylene	HDPE (PE 500)	Low-cost material suitable for most applications with moderate load and low speed.	0.95 *0.043*	-50 °C to +65 °C *-58 °F to +150 °F*

The listed selection of belts per application are recommendations only. Habasit Cleandrive™ belts may be used in other applications as well.

Meat and poultry

Belt code	Meat (beef and pork)																			Poultry								
	Cutting lines	Deboning lines	Dressing lines	Trim lines	Fat line	Offal/lung lines	Hide lines	Marinate lines	Breading machines	Freezing	Hoofs / shanks lines	High-impact/shute discharge	Bacon microwave	Bone incline decline	High-impact/shute discharge	Transfer/crossover conveyance	Elevator	Metal detectors	Ground meat	Live birds	Cut-up/deboning / trim lines	Chiller-discharge	Rehang/bird accumulation	Breading machines	Freezing	Metal detectors	Elevator	Spiral freezer
CD.M25.S-UA.WB			x	x	x	x		x	x	x						x		x	x			x		x	x	x		
CD.M25.S-UA.CB			x	x	x	x		x	x	x						x		x	x			x		x	x	x		
CD.M50.S-UA.WB			x	x	x	x		x	x	x						x	x	x	x			x		x	x	x	x	
CD.M50.S-UA.CB			x	x	x	x		x	x	x						x	x	x	x			x		x	x	x	x	

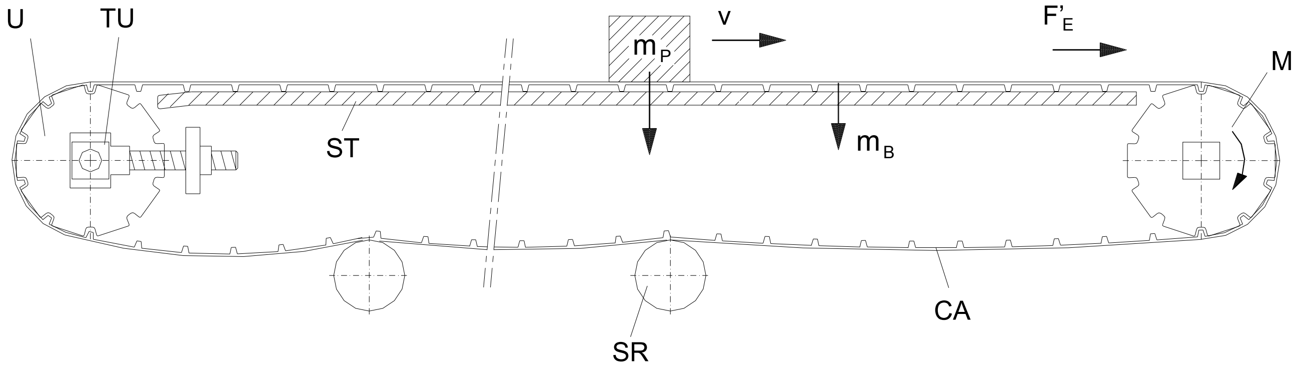
Bakery and snacks

Belt code	Bakery																Snack food (pretzel, potato chips, tortilla)						
	Raw dough handling	Divider	Proofer	Oven infeed/outfeed	Cooling	Coating/glazing lines	Freezing	Incline decline	Metal detectors	Spiral infeed/outfeed	Conditioning	Laminating	Pan handling	Corn draining	Proofer	Potato processing	Corn processing	Boiler infeed	Fryer	Oven infeed/outfeed	Cooling	Seasoning	Incline decline
CD.M25.S-UA.WB						x	x	x	x	x			x			x		x				x	x
CD.M25.S-UA.CB						x	x	x	x	x			x			x		x				x	x
CD.M50.S-UA.WB						x	x	x	x	x			x			x		x				x	x
CD.M50.S-UA.CB						x	x	x	x	x			x			x		x				x	x

Fruits and vegetables

Belt code	Fruits and vegetables												
	Bulk feeding	Prewashing/rinsing	Washer	Draining	Peeling	Elevator	Control/sorting table	Filling	Freezing lines	Palletizing/depalletizing	Container conveyance	Sterilization/cooling	Metal detectors
CD.M25.S-UA.WB							x	x	x				x
CD.M25.S-UA.CB							x	x	x				x
CD.M50.S-UA.WB						x	x	x	x				x
CD.M50.S-UA.CB						x	x	x	x				x

Design guide
Cleandrive™ belt conveyor components



M **Driving shafts** can be square or round. Square shafts allow higher transmission of torque. The sprockets are usually fixed on the shaft.

U **Idling shafts** usually equipped with sprockets.

ST **Slider supports on the transport side** with parallel or V-shaped wear strips carry the moving belt and load.

SR **Belt support on the return way** can be equipped with rollers (preferred) or longitudinal wear strips (slider support). If static charge-up is an issue steel rollers might be an alternative.

CA **Catenary sag** is an unsupported length of the belt that provides a small tension for drive sprockets to ensure engagement.

TU **Take-up device:** For example a screw type, gravity or pneumatic type, is used to apply a slight belt pre-tension if required and for adjustment of a catenary sag.

F'_E **Effective tensile force (belt pull)** is calculated near the driving sprocket, where it reaches in most cases its maximum value during operation. It depends on the friction forces between the belt and the supports (ST) (SR).

v **Belt speed:** Applications exceeding 50 m/min *(150 ft/min)* negatively affect the life expectancy of the belt. For speeds higher than 50 m/min always consult the Habasit specialist.

m_P **Conveyed product weight** as expected to be distributed over the belt surface; calculated average load per m^2 *(ft^2).*

m_B **Belt mass (weight)** is added to the product mass for calculation of the friction force between belt and slider frame.

SN **Snub roller:** Shown on page Design guide – drive concepts. These rollers are used in a bi-directional center drive configuration as belt backbending rollers and if a gravity take-up is used. They have a larger diameter than the belt support rollers for the belt to bend easily 90° to 180° around it.

Habasit Cleandrive™ belts are joined by Quickmelt or Flexproof joining method. For a fast installation and de-installation the belts can be equipped with a mechanical joint but a reduced admissible tensile strength must be considered, consult product data sheet.

(Glossary of terms see Appendix)

Design guide
Horizontal conveyors – basic design

Cleandrive™
Belts are designed with driving bars and are positively driven by sprockets. For a proper sprocket engagement the belt usually has a small catenary sag CA only (fig. 1) just after the drive section. Belts equipped with a mechanical joint must have a small initial tension that can be applied by a take-up unit TU (fig. 2).

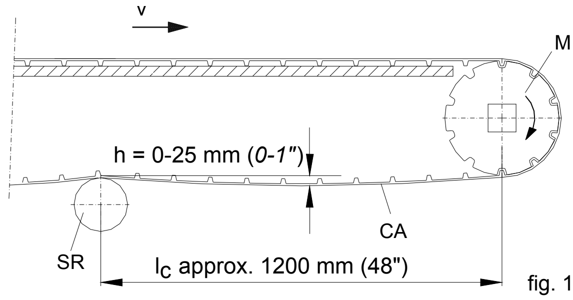


fig. 1

Take-up unit (fig. 2)
A screw type take-up unit (TU) usually placed at idle shaft can be used to apply a slight initial tension of approx. 0.1% to 0.2% (measure the distance over the joint) to the belt in specific if small sprockets (5 or 6 teeth) or a mechanical joint is used.

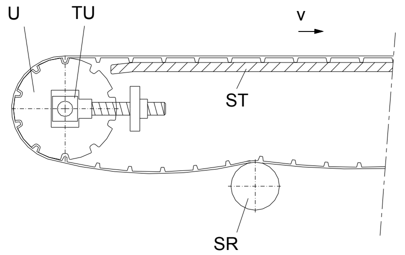


fig. 2

Gravity take-up (fig. 3)
For conveyors with a fixed shaft distance a gravity take-up (G), that is a shaft with sprockets, can be an adequate solution. Optionally a vertical screw type take-up unit (TU) can be used as well.

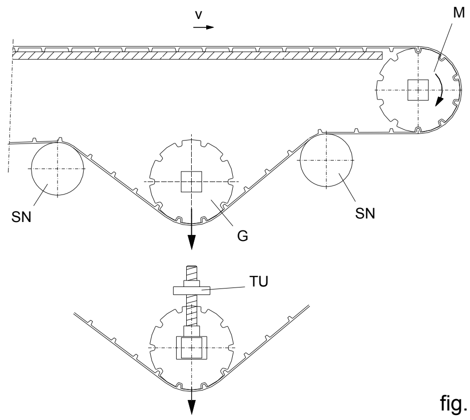


fig. 3

Belt type	Tensioner weight G per m (ft) belt width
1" + 2"	10 kg/m *(7 lb/ft)*

Short conveyors ($L_0 \leq$ 1.5 m *(5ft)*)
In this case belt support on return side can be omitted. Observe parallel alignment of shafts (fig. 4)

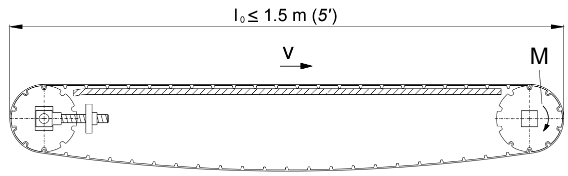


fig. 4

Longer conveyors ($L_0 >$ 1.5 m *(5ft)*)
Common design, belt on return side supported by rollers or discs (if flights applied), wear strips can be used as well but friction will be higher. In case of multiple catenary sags, vary support roller spacing e.g. 1800/1200/1800/… to prevent belt speed variations due to oscillation (fig. 5).

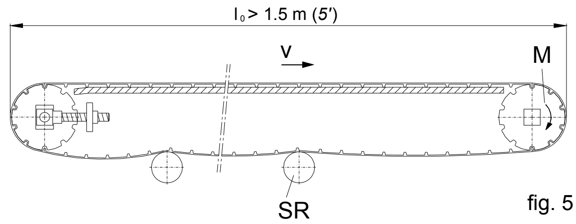


fig. 5

Design guide
Horizontal conveyors – drive concepts

Common head drive (fig. 1)
Unidirectional, one motor at conveyor end in pull operation drives the sprockets and the belt. Maintain approx. 180° belt wrap on sprockets.

Bi-directional drive (two motors)
One motor at each end, only one pulls the belt. The other remains disengaged by a clutch (no fig.).

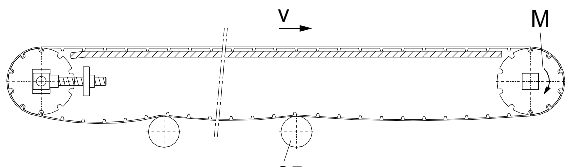


fig. 1

Recommended roller diameters:				
Belt type	CDM25 *(1")*		CDM50 *(2")*	
	mm	*inch*	mm	*inch*
SR roller	50	*2*	75	*3*
SN roller	75	*3*	100	*4*
G gravity sprocket pitch diameter	102.7	*4*	129.1	*6*

Bidirectional drive (center drive, fig. 2)
One drive shaft usually placed in the middle of the belt return path. Drive sprockets with minimum 10 teeth and two snub rollers (SN) to ensure approx. 180° belt wrap. A take-up unit is used to apply a slight belt initial tension of approx. 0.1% to 0.2% specifically if small (5 and 6 teeth) transfer sprockets or a mechanical joint is used

To consider:
Since the driving force is applied on the return way of the belt, the shaft load F'_W will be two times the calculated belt pull.

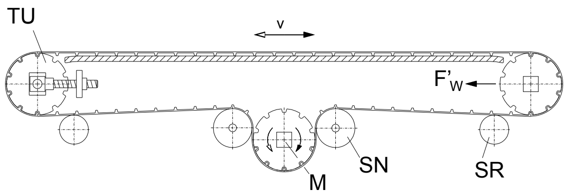


fig. 2

Push-pull drive concept (fig. 3)
This drive concept requires a belt pretension and is only recommended for light-loaded and short (up to 2 m) conveyors. A tensioning device must keep the tension at 110% of the effective belt force. The shaft load will increase to:

Push drive:
$F_w = 2.2 \times F'_E$ (see also Calculation guide)

Pull drive:
$F_w = 3.2 \times F'_E$ (see also Calculation guide)

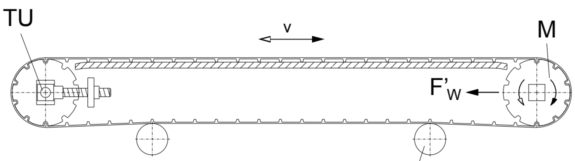


fig. 3

Design guide
Inclined conveyors – basic design

For the design of **inclined conveyors,** the following basic rules have to be considered:

For Z conveyors (fig. 3.) use *2″* belt type only.

M — **The driving shaft** must be located at the top end of the conveyor. (fig. 1 and fig. 2).

ST — **Slider supports** on the transport side with parallel, serpentine or chevron wear strips or slider bed.

SR — **Roller supports** are preferred at belt return way. Belts equipped with flights can be supported at free-edge (indent) sections by roller discs (specifically for Z conveyors) or static shoes. Outer sprockets must be in plan with discs or shoes (fig. 2). If static charge-up is an issue steel rollers might be an alternative.

CA — **Catenary sag**
l_C = 900 mm to 1200 mm *(35″ to 48″)*
follows the same working principle as for horizontal belts but in most cases it is positioned at the lower end of the belt (fig. 1).

TU — To avoid large and concentrated catenary sag **(CA)** at idle shaft it is rec ommended to install a **screw type take-up** unit **(TU)** to adjust the conveyor length to the given belt length. Do not put the belt on a high tension.

U — To reduce the friction at belt bending idle sprockets are recommended.

SH — Hold-down shoes for belt back-bending if application is wet. Use rollers for dry situations. The belt radius must be approx. 200 mm *(8″)*

I — Belt indent **minimum** 50 mm *(2″).*

m_p — For maximum belt load prior belt back-bending see table fig. 4.

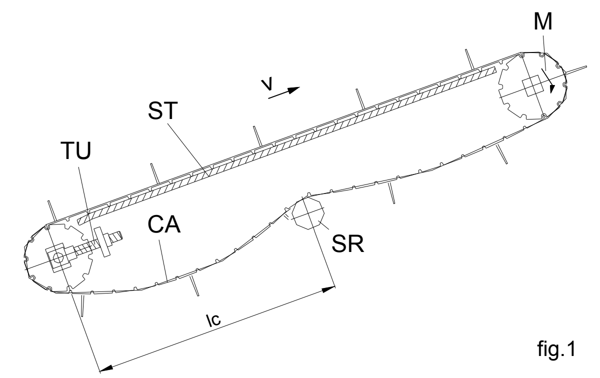


fig.1

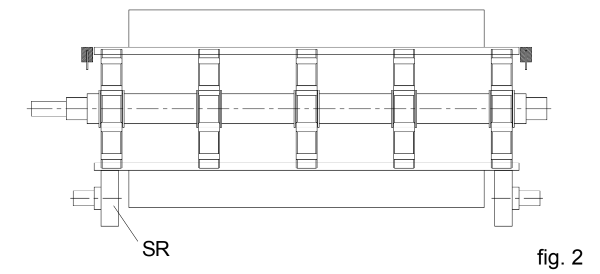


fig. 2

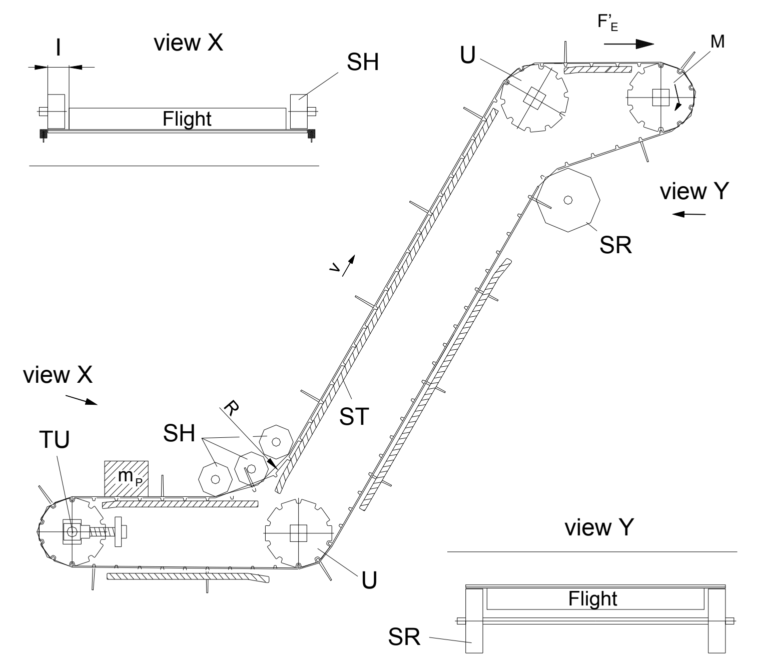


fig. 3

Max. load prior belt back-bending.
Belt width:
-609 mm *(24″)* = approx. 25 kg
-508 mm *(20″)* = approx. 50 kg

fig. 4

Design guide
Trough shaped conveyors – basic design

With trough-shaped belts the edges will be subjected to increased elongation forces as the belt moves from the trough-shaped support to the sprockets on the shafts. It is therefore important to ensure that the translation length l’ selected is not too small.
(fig. 1)

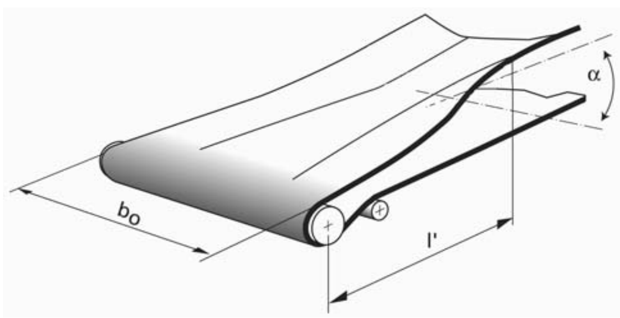


fig. 1

Recommended translation length

$l' = c \times b_0$			
Trough angle	10°	20°	30°
Factor c	1.0	1.5	2

Use the larger number of sprockets recommended per shaft.

Due to the drive bars the belt support is usually designed by wear strips or slider bed.
Belt return way can be supported by rollers.
Although trough-shaped belts do have a certain self-guiding effect it is recommended to apply partly tracking guides at belt edges with sufficient clearance.
(fig. 2)

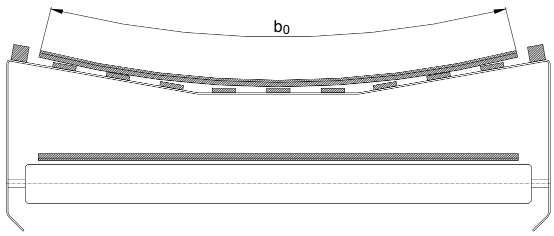


fig. 2

For trough-shaped applications increase the drive shaft position A1 to belt base of +5 mm *(0.2")* see also sprocket evaluation.

Design guide
Sprocket evaluation

Number of sprockets and wear strips valid for *1″* and *2″* belts
For lightly loaded belts with adjusted utilization below 50% the sprockets can be placed further apart.
For heavily loaded belts with adjusted utilization above 50% and/or application with scrapers the sprockets must be placed closer together with a larger number of sprockets on the drive shaft.
Belts can be cut to any size between 100 mm *(4")* and 609 mm *(24").* The table below shows the number of sprockets including distances for typical belt widths b_0. To calculate the adjusted belt tensile force use formulas on page Calculation guide or contact your Habasit representative. If you are in doubt use the larger number of sprockets.

Belt width b_0 (imperial)	**Number of sprockets**				**Edge distance x**	**Number of wear strips**	
inch	Min. number sprockets	Distance a *inch*	Number of sprockets for belt load >50%	Distance a *inch*	*inch*	Carry way *)	Return way
4	2	*2.0*	2	*2.0*	*1*	2	2
6	2	*4.0*	3	*2.0*	*1*	2	2
8	3	*2.5*	3	*2.5*	*1.5*	2	2
10	3	*3.5*	4	*2.3*	*1.5*	3	2
12	3	*4.5*	5	*2.3*	*1.5*	3	2
14	4	*3.7*	5	*2.8*	*1.5*	3	2
16	4	*4.3*	6	*2.6*	*1.5*	4	3
18	5	*3.8*	7	*2.5*	*1.5*	4	3
20	5	*4.3*	8	*2.4*	*1.5*	4	3
22	6	*3.8*	9	*2.4*	*1.5*	5	3
24	6	*4.2*	9	*2.6*	*1.5*	5	3

*) The required number depends on product size and weight, the indicated number provides a distance between 2”and 4”

Belt width b_0 (metric)	**Number of sprockets**				**Edge distance x**	**Number of wear strips**	
mm	Min. number sprockets	Distance a mm	Number of sprockets for belt load >50%	Distance a (mm)	mm	Carry way *)	Return way
100	2	50	2	50	25	2	2
150	2	100	3	50	25	2	2
200	3	60	3	60	40	2	2
250	3	85	4	57	40	3	2
300	3	110	5	55	40	3	2
350	4	90	5	68	40	3	2
400	4	107	6	64	40	4	3
450	5	93	7	62	40	4	3
500	5	105	8	60	40	4	3
550	6	118	9	59	40	5	3
609	6	106	9	66	40	5	3

*) The required number depends on product size and weight, the indicated number provides a distance between 50 mm and 100 mm.

If the width is in between the indicated widths choose the number of sprockets and wear strips from the nearest width and adjust distance **a** accordingly.

For wider belts, sprocket and wear strip placement on request.

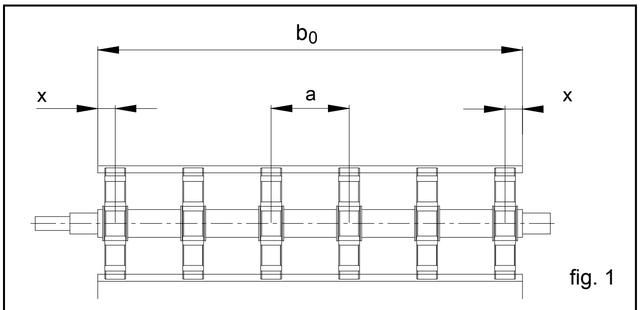


fig. 1

Design guide
Sprocket evaluation

Dimensional requirements for installation

Sprocket type *(1")*	Standard material	No. of teeth	Nominal pitch Ø dp		Hub width B_L		Square bore Q		Round bore R		A_1 + 1 mm (effective)		A_0 + 1 mm S = 6 mm	
			mm	*inch*	mm	*inch*	mm	*inch*	mm	*inch*	mm	*inch*	mm	*inch*
CD25S05000-C3 *	POM	5	43.0	*1.69*	30	*1.18*	15	*0.6*	20	*0.75*	16.5	*0.65*	22.5	*0.89*
CD25S06000-C3 *	POM	6	51.6	*2.03*	30	*1.18*	20	*0.75*	20	*0.75*	20.8	*0.82*	26.8	*1.06*
CD25S07000-C3	POM	7	60.1	*2.37*	30	*1.18*	25	*1*	30	$1^{3/16}$	25.1	*0.99*	31.1	*1.22*
CD25S08000-C3	POM	8	68.6	*2.70*	30	*1.18*	25	*1*	30	$1^{3/16}$	29.3	*1.15*	35.3	*1.39*
CD25S10000-C3	POM	10	85.7	*3.37*	30	*1.18*	25/40	*1.0/1.5*	30	$1^{3/16}$	37.9	*1.49*	43.9	*1.73*
CD25S12000-C3	POM	12	102.7	*4.04*	30	*1.18*	25/40	*1.0/1.5*	30	$^{3/16}$	46.4	*1.82*	52.4	*2.06*
CD25S14000-C3	POM	14	119.8	*4.72*	30	*1.18*	40/60	*1.5/2.5*	30/50	*1.5/2.5*	54.9	*2.16*	60.9	*2.40*
CD25S16000-C3	POM	16	136.9	*5.39*	30	*1.18*	40/60	*1.5/2.5*	30/50	*1.5/2.5*	63.5	*2.50*	69.5	*2.73*
CD25S08000-H3	POM	8	68.6	*2.70*	30	*1.18*	15	*0.5*	15	*0.5*	29.3	*1.15*	35.3	*1.39*
CD25S10000-H3	POM	10	85.7	*3.37*	30	*1.18*	20	*0.75*	30	$1^{3/16}$	37.9	*1.49*	43.9	*1.73*
CD25S14000-H3	POM	14	119.8	*4.72*	30	*1.18*	40	*1.5*	30/50	*1.5*	54.9	*2.16*	60.9	*2.40*
CD25S16000-H3	POM	16	136.9	*5.39*	30	*1.18*	40	*1.5*	30/50	*1.5/2.5*	63.5	*2.50*	69.5	*2.73*
CD25S12000-M2	POM	12	102.7	*4.04*	30	*1.18*	40	*1.5*	30		46.4	*1.82*	52.4	*2.06*

-C3*: Machined sprockets for idle shaft only (do not use it as drive sprockets)
-C3: Machined sprockets
-H3: Machined HyCLEAN sprockets
-M2: Molded HyCLEAN sprockets
Other dimensions on request

Sprocket type *(2")*	Standard material	No. of teeth	Nominal pitch Ø dp		Hub width B_L		Square bore Q		Round bore R		A_1 + 1 mm (effective)		A_0 + 1 mm S = 8.7 mm	
			mm	*inch*	mm	*inch*	mm	*inch*	mm	*inch*	mm	*inch*	mm	*inch*
CD50S05000-C3	POM	5	80.8	*3.18*	30	*1.18*	25	*1*	30	*1.5*	33.2	*1.31*	41.9	*1.65*
CD50S06000-C3	POM	6	96.9	*3.82*	30	*1.18*	40	*1.5*	30	*1.5*	41.3	*1.62*	50.0	*1.97*
CD50S08000-C3	POM	8	129.1	*5.08*	30	*1.18*	40/60	*1.5/2.5*	30/50	*1.5/2.5*	57.4	*2.26*	66.1	*2.60*
CD50S10000-C3	POM	10	161.2	*6.35*	30		40/60	*1.5/2.5*	30/50	*1.5/2.5*	73.4	*2.89*	82.1	*3.23*
CD50S12000-C3	POM	12	193.4	*7.31*	30	*1.18*	40/60	*1.5/2 5*	30/50	*1.5/2.5*	89.5	*3.52*	98.2	*3.87*
CD50S16000-C3	POM	16	257.8	*10.15*	30	*1.18*	40/60	*1.5/2 5*	30/50	*1.5/2.5*	121.7	*4.79*	130.4	*5.13*
CD50S05000-H3	POM	5	80.8	*3.18*	30	*1.18*	15	*0.75*	20	*0.75*	33.2	*1.31*	41.9	*1.65*
CD50S06000-H3	POM	6	96.9	*3.82*	30	*1.18*	25	*1*	30	*1*	41.3	*1.62*	50.0	*1.97*
CD50S12000-H3	POM	12	193.4	*7.31*	30	*1.18*	40/60	*1.5/2 5*	30/50	*1.5/2.5*	89.5	*3.52*	98.2	*3.87*
CD50S16000-H3	POM	16	257.8	*10.15*	30	*1.18*	40/60	*1.5/2 5*	30/50	*1.5/2.5*	121.7	*4.79*	130.4	*5.13*
CD50S08000-M2	POM	8	129.1	*5.08*	30	*1.18*	40	*1.5*	30		57.4	*2.26*	66.1	*2.60*
CD50S10000-M2	POM	10	161.2	*6.35*	30	*1.18*	40	*1.5*	30		73.4	*2.89*	82.1	*3.23*

-C3: Machined sprockets
-H3: Machined HyCLEAN sprockets
-M2: Molded HyCLEAN sprockets
Other dimensions on request

Key ways for round bore shape follow European standards for metric sizes and US standards for imperial sizes. The S-M2 sprocket with round bore 30 mm is without key way.

Design guide
Sprocket evaluation

Design recommendations
The correct adjustment of the belt support or shaft placement (dimension A_1) is important. Noise, increased sprocket wear and engagement problems may result if the recommendations are not followed.

Slider bed support (fig. 1)
If a slider bed is used, keep a small distance to the sprockets. It is recommended to bevel the support edge by 15° as shown. Make sure guides do not touch the sprockets.

Wear strip support (fig. 2)
For smoother product transfer and best load support wear strips (or a notched slider bed) can be placed in between the sprockets. It is recommended to bevel the support edge by 15° as shown. Make sure guides do not touch the sprockets.

Retrofit
For conveyor retrofits compare A_1/A_0 values. It may be necessary to adjust drive shaft or slider support height to keep the correct level of transport. Depending on load weight or position, additional belt support (carry way) may be required.
Replace the sprockets with dedicated sprockets specifically made for Cleandrive™ belts. All sprockets need to be fixed for lateral movement on the shafts.

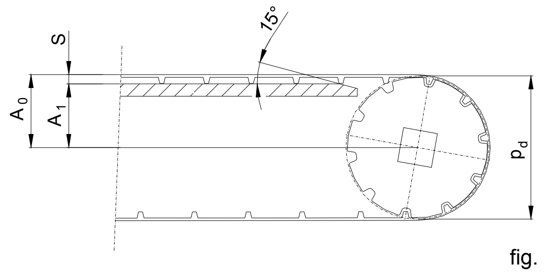


fig. 1

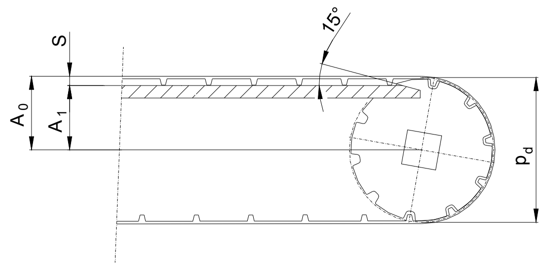


fig. 2

Design guide
Sprocket evaluation

Sprocket installation
In general **all sprockets** on each shaft **are fixed** for lateral movement. Depending on cleaning requirements various locking methods are possible.

- Retainer rings (circlip) (fig. 1).
- Set screws and set collars (fig. 2).
  Mainly used with round shafts on key ways.
- Plastic retainer rings (Habasit) (fig. 3).
  Simple low-cost method, most popular shafts.

A small gap of 0.3 mm *(0.01")* should be maintained between sprocket hub and retaining device. All devices must be securely fastened.

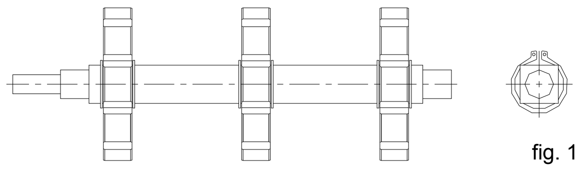


fig. 1

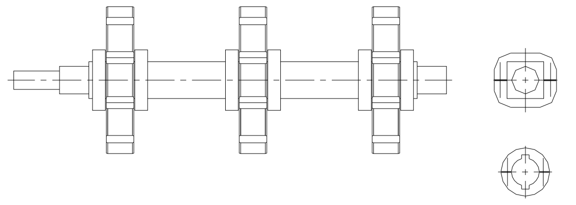


fig. 2

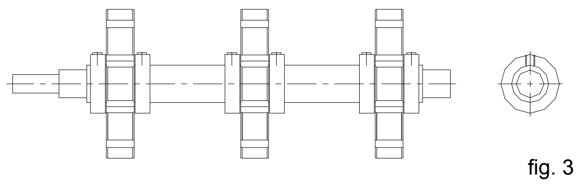


fig. 3

Positioning and spacing of sprockets
The number of sprockets (n) and spacing must be evaluated from the table on page 19, Sprocket evaluation, see illustration and table.

Sprocket alignment on the shafts (fig. 4)
During installation of the sprockets on the shafts it is important to make sure the teeth of all sprockets are correctly aligned. For this purpose the sprockets normally feature an alignment mark. For square shafts, if the number of sprocket teeth is a multiple of 4, every radial orientation of the sprocket is possible. Therefore some sprockets do not feature alignment marks.

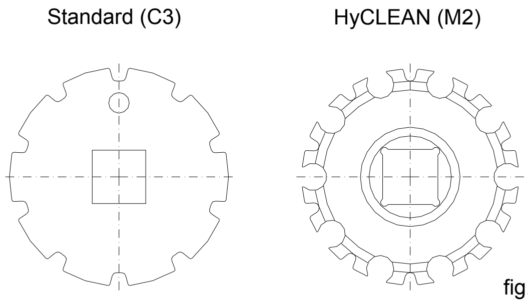


fig. 4

Design guide
Sprocket evaluation

Key ways for round shafts (fig. 1)

øD	mm	20	25	30	35	40	50	60	70	80	90		
b	mm	6	8	8	10	12	14	18	20	22	25		
a	mm	2.8	3.3	3.3	3.3	3.3	3.8	4.4	4.9	5.4	5.4		
According to DIN 6885 Tolerance for a: 0/-0.2													
øD	*inch*	*0.75*	*1*	*1 3/16*	*1.25*	*1 7/16*	*1.5*	*2*	*2.5*	*2.75*	*3.25*	*3.5*	*4.5*
b	*inch*	*0.18*	*0.24*	*0.24*	*0.24*	*0.37*	*0.37*	*0.50*	*0.62*	*0.62*	*0.75*	*0.87*	*1.00*
a	*inch*	*0.098*	*0.13*	*0.13*	*0.13*	*0.193*	*0.193*	*0.256*	*0.319*	*0.319*	*0.37*	*0.429*	*0.488*
According to ANSI B17.1 Tolerance for a: 0/-0.001													

Shaft tolerances
The dimensional tolerance of round and square shaft shapes is according to ISO 286-2 = **h12.**

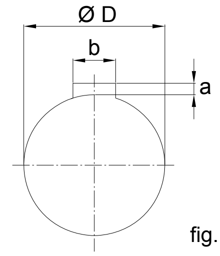
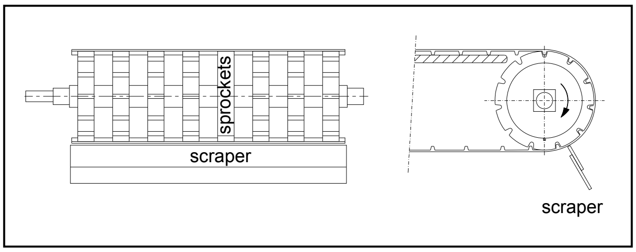


fig. 1

Design guide
Belt scraper placement

Scraper
In a low-tension system a belt scraper is placed in most cases below drive sprockets. Optionally it can be placed at idle shaft. Apply dedicated type and the larger recommended number of sprockets to support the belt in an optimal way, see sprockets evaluation table.



Design guide
Slider support systems and belt tracking

Slider support systems (fig. 1)
Various design versions are possible. The following are commonly used:

A The parallel wear strip arrangement (fig. 2). This is the most economic method. For lower belt wear, the parallel wear strip segments may be arranged alternating offset instead of in-line or as serpentine strip. For number of wear strips please refer to the product data sheets.

B The V-shaped arrangement of wear strips (chevron type fig. 3). This provides equal distribution of load and wear over the total belt width. The max. distances between the wear strips has to be 100 mm *(4")* for 2" belts. Max. angle β = 45°.

The supports consist of strips made from high-density polyethylene or other suitable low-wearing plastics or metal.

Cross section

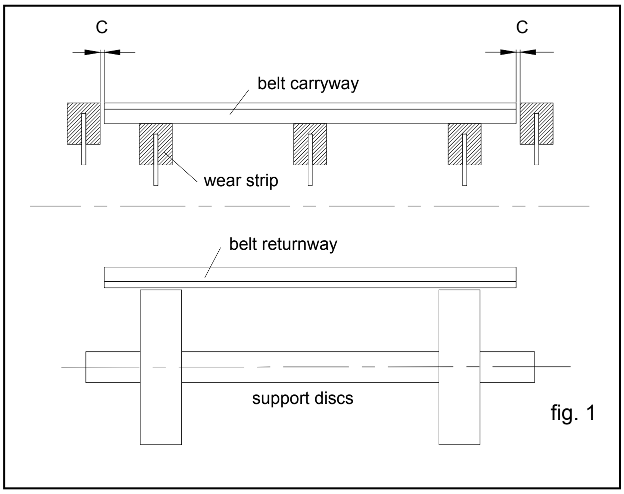


fig. 1

Version A

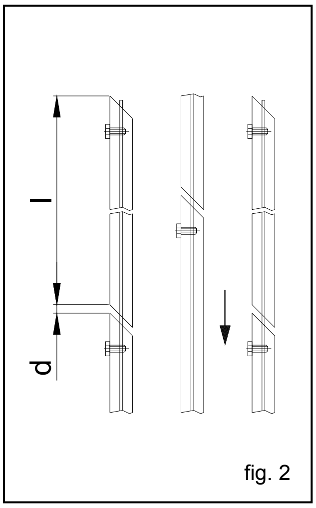


fig. 2

Version B

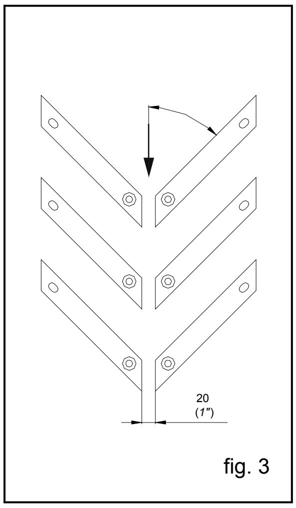


fig. 3

For the proposed **number of wear strips** see page 19, Sprocket evaluation (table). For both versions A and B it is important to allow for thermal expansion or contraction of the strips.
Formula to calculate the necessary clearance d:

$d > \Delta l = l/1000 \cdot \alpha \cdot (T - 20\,°C)$ [mm]

l = length at installation temperature (20 °C) [mm]
T = max. operation temperature [°C]

Materials	Coeff. of linear thermal expansion α [mm/m · °C]	
	-73 to 30°C	31 to 100°C
	-100 to 86°F	*87 to 210°F*
UHMW PE, HDPE	0.14	0.20
Steel	0.01	0.01

Belt tracking
To track a belt use a protruding conveyor frame, wear strips or deflectors with an infeed angle of approx. 15° (fig. 4). Flanged support or idle rollers are not recommended because the belt can rise onto the flange and get damaged at its edges. Consider a total clearance C (fig. 1 and 4) of 2.5% of the belt width.

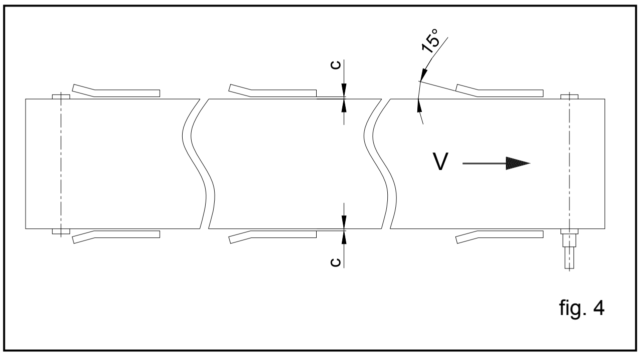


fig. 4

Design guide
Slider support systems and belt tracking

Wear strips and guiding profiles
Habasit offers various wear strips made of high molecular weight polyethylene (UHMW PE or HDPE and prelubricated UHMW PE). This material provides low friction between the belt and support. Ask for separate literature.
Stainless steel supports are possible but will increase the friction force on the belt.

U-shaped profiles (MB01) are commonly used as wear strips for slider supports. They are fitted onto a metal upright of approx. 2.5 mm *(0.1")* or 3 mm *(0.12")* thickness (fig. 1).

T-shaped (MB 01T) and **WS01** profiles provide a larger contact surface for better belt/load support (fig. 2 and 3)

Special dimensions are possible on request, please contact your Habasit representative.

Type	S (mm)	*inch*
MB 01-X	2.2	*0.09*
MB 01-A	2.7	*0.11*
MB 01-B	3.2	*0.13*
MB 01-C	4.5	*0.18*
MB 01-D	5	*0.20*
MB 01T-X	2.2	*0.09*
MB 01T-A	2.7	*0.11*
MB 01T-B	3.2	*0.13*
MB 01T-C	4.5	*0.18*

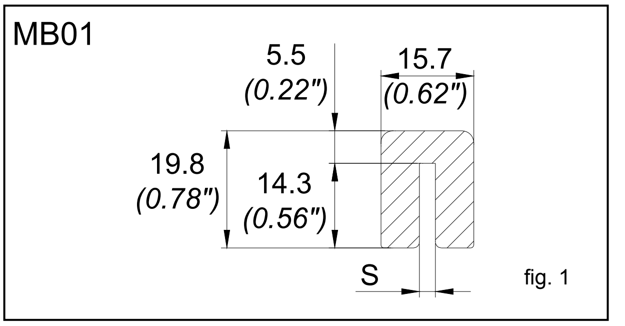


fig. 1

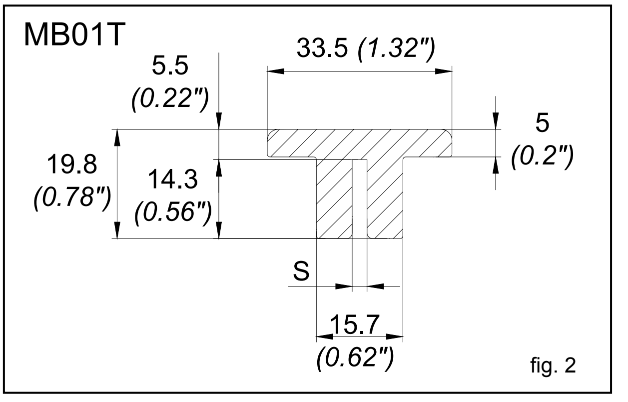


fig. 2

WS01 wear strip kit

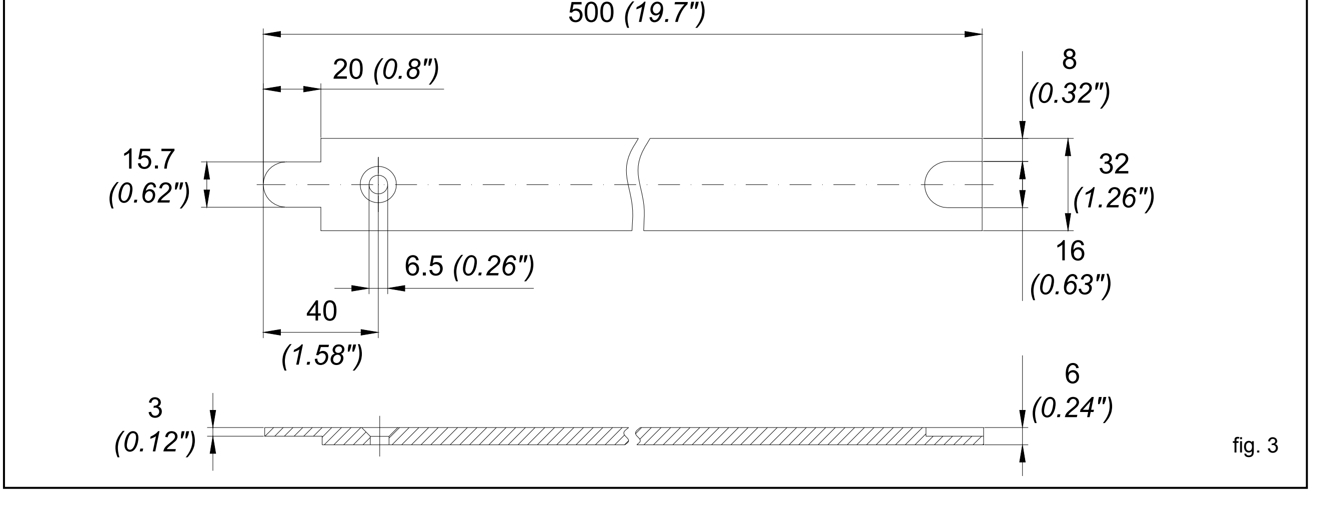


fig. 3

WS01 kit (supplied with DIN963 – M6x30 screws and nuts)

Design guide
Design aspects for belt installation

Belt joining (fig. 1)
Cleandrive^{TM} belts can be joined by various Habasit presses. For this purpose it might be necessary to consider a framework opening (only if there is a transport level protruding frame). In most cases the optimal belt joining area is near the drive section.

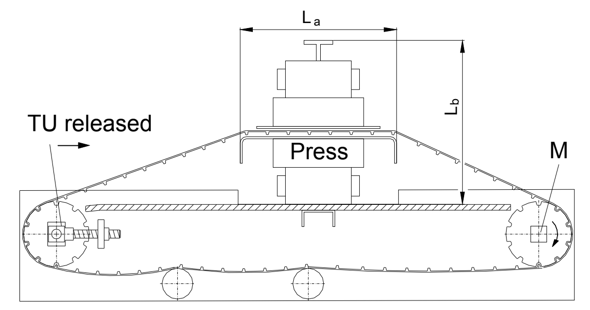


fig. 1

Press size
PQ601 requires an access of L_a= 300 mm *(12")* and L_b= 450 mm *(18").* A typical flexproof press (804 series) needs, L_a= 400 mm (16”) and L_b= 500 mm *(20").* Other presses can have different sizes. Make sure the belt support structure has enough beam strength to take a press weight of 120 kg *(265 lbs)* for 804 series or 30 kg *(66 lbs)* for PQ601.

Consider additional belt length
If there is a (TU) device one can release the belt for joining. If this device is missing the idle shaft might be dismantled to lift the belt into the press.
Contact your Habasit representative for the actual belt length. For proper belt joining consult the joining data sheet.

Mechanical joint (belt joining):
In case the belt is equipped with a mechanical joint there is no additional belt length required.
Mechanical joined belts require a small initial tension that can be applied by a TU unit.

Calculation guide
Habasit support and belt calculation procedure

Habasit provides support for calculation to analyze the forces and verify the admissible belt strength for different conveyor designs.
For further questions and additional documentation please contact Habasit.

After having preselected a suitable belt style and type from product data sheets, the calculation of the belt has to verify and proof the suitability of this belt for the application.
The following formulas are partially simplified.
For abbreviations, glossary of terms and conversion of units see tables in Appendix.

The following procedure is proposed:

Step	Procedure	Typical formula (other diverted formula see detailed instructions)	refer to page
1	Calculate the **effective tensile force (belt pull) F'_E** generated during conveying process near the driving sprocket, taking into account product weight, belt weight, friction values and inclination height.	$F'_E = (2\ m_B + m_P)\ l_0 \cdot \mu_G \cdot g$ $F'_E = [(2\ m_B + m_P)\ l_1 \cdot \mu_G + m_P \cdot h_0]\ g$	25
2	Calculate the **adjusted tensile force (belt pull) F'_S** multiplying with the adequate service factor of your application, taking into account frequent starts/stops, direct or soft start drive.	$F'_S = F'_E \cdot c_S$ [N/m]	25
3	Calculate the **admissible tensile force F'_{adm}**. Speed and high or low temperature may limit the max. admissible tensile force below nominal tensile strength F'_N (refer to the product data sheet).	$F'_{adm} = F'_N \cdot c_T \cdot c_V$ [N/m]	26
4	Verify the strength of the selected belt by **comparison of F'_S** with the **admissible tensile force F'_{adm}**.	$F'_S \leq F'_{adm}$ [N/m]	27
5	Check the dimensioning of the **driving shaft and sprocket.**	$f = 5/384 \cdot F_W \cdot lb^3 / (E \cdot I)$ [mm] $T_M = F'_S \cdot b_0 \cdot d_P/2$ [Nm]	28/29
6	Establish the effective **belt length and catenary sag dimensions,** taking into account the thermal expansion.	$F'_C = l_C^2 \cdot m_B \cdot g / (8 \cdot h_C)$ [N/m] $l_g = d_P \cdot \pi + 2 \cdot l_0 + 2.66 \cdot h_C^2 / l_C$ [m]	30/31
7	Calculate the required shaft **driving power.**	$P_M = F'_S \cdot b_0 \cdot v / 60$ [W]	33
8	Check the **chemical resistance** of the belt material selected for your specific process.	Table of chemical resistance	35
9	Check your **conveyor design,** if it fulfills all calculated requirements.		

Calculation guide
Verification of the belt strength

1) Effective tensile force (belt pull) F'_E

Horizontal straight belt without accumulation

$F'_E = (2\ m_B + m_P)\ l_0 \cdot \mu_G \cdot g$ [N/m]

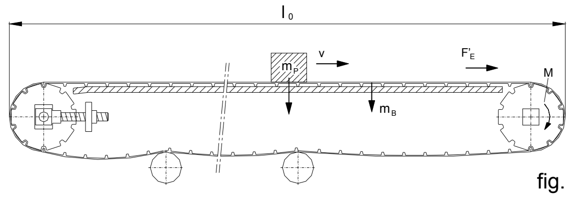


fig. 1

Inclined conveyor without accumulation

$F'_E = [(2\ m_B + m_P)\ l_1 \cdot \mu_G + m_P \cdot h_0]\ g$ [N/m]

F'_E = Effective tensile force [N/m]
m_B = Weight of belt [kg/m²]
m_P = Weight of conveyed product [kg/m²]
μ_G = Coefficient of friction belt to slider support
l_0 = Conveying length [m]
h_0 = Height of elevation [m]
g = Acceleration factor due to gravity (9.81 m/s²)

(Values for μ_G see Appendix)

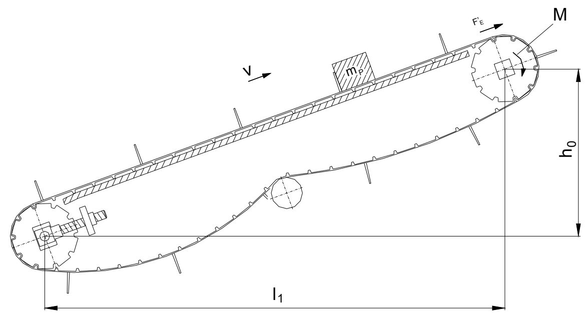


fig. 2

2) Adjusted tensile force (adj. belt pull) F'_S

$F'_S = F'_E \cdot c_s$ [N/m]

F'_S = Adjusted tensile force (belt pull) per m of belt width [N/m]
F'_E = Effective tensile force [N/m]
c_s = Service factor (see table below)

Service factors c_s
Service factors take into account the impact of stress conditions reducing the belt life.

Operating condition	Service factors c_s		
	Standard head drive	Pusher drive (uni- and bidirectional)	Center drive (uni- and bidirectional)
Start-up prior to loading	1	1.4	1.2
Frequent starts/stops during process (more than once per hour)	+ 0.2	+ 0.2	+ 0.2

Note: Drive with soft start is recommended and is mandatory for frequent starts/stops and start-up with full load.

Calculation guide
Verification of the belt strength

3) Admissible tensile force F_{adm}

Speed and temperature reduce the maximum admissible tensile force F'_{adm} below nominal tensile strength F'_N. For nominal tensile strength F'_N please refer to the product data sheets.

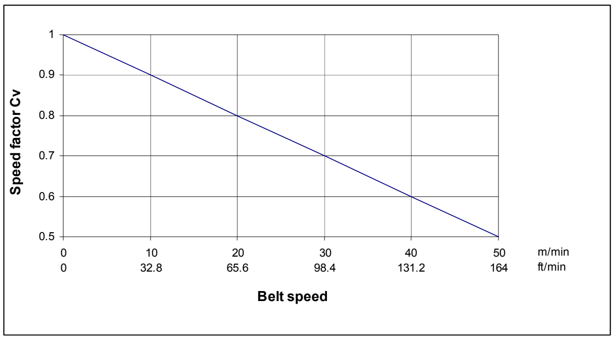
$F'_{adm} = F'_N \cdot c_T \cdot c_V$ [N/m]

F'_{adm} = Admissible tensile force [N/m]
F'_N = Nominal tensile strength [N/m]
c_T = Temperature factor (see diagram below)
c_V = Speed factor (see diagram below)

Speed factor c_V
The belt speed increases the stress in the belt mainly at the point where the direction of movement is changing:

- driving sprockets
- idling shafts with or without sprockets
- support rollers
- snub rollers

The speed factor is similarly used in the algorithms of LINK-SeleCalc.

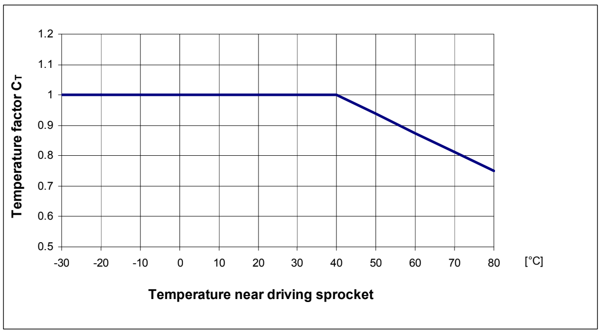


Temperature factor c_T

The measured breaking strength (tensile test) of thermoplastic material increases at temperatures below 20°C *(68°F)*. At the same time other mechanical properties are reduced at low temperatures.

For this reason follows:
At temperatures ≤ **20 °C *(68 °F)*: c_T = 1**

Material	°C	°F
Thermoplastic polyurethane (TPU)	-30 to +80	*-22 to +176*



The temperature factor c_T considers the joint of the belt. For applications with temperatures lower than 0°C *(32 °F)* please contact your local partner.

4) Verification of the belt strength

The selected belt is suitable for the application, if the adjusted tensile force (belt pull) (F'_S) is smaller or equal to the admissible tensile force (F'_{adm}).

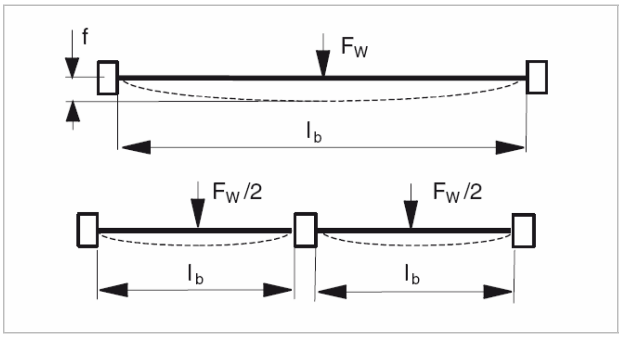
$$F'_S \leq F'_{adm} \text{ [N/m]}$$

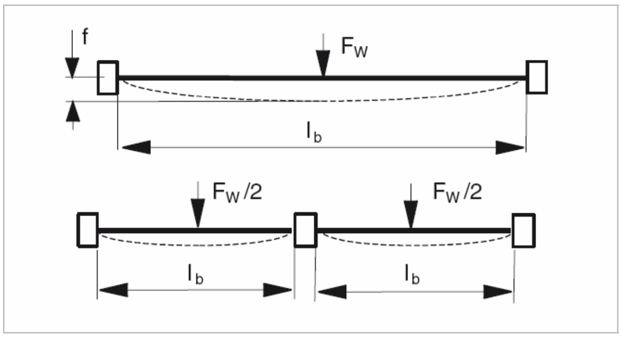
F'_{adm} = Admissible tensile force [N/m]
F'_S = Adjusted tensile force (belt pull) per m of belt width [N/m]

5) Dimensioning of shafts

Select shaft type, shaft material and size. The shaft must fulfill the following conditions:

- Max. shaft deflection under full load (F_W):
  f_{max} = 2.5 mm *(0.1")*.
  For more accurate approach contact your local partner.
  If the calculated shaft deflection exceeds this max. value, select a bigger shaft size or install an intermediate bearing on the shaft.
- Torque at max. load F'_S below critical value (admissible torque, see table “Maximum admissible torque”).





Shaft deflection

2 bearings: $f = 5/384 \cdot F_W \cdot l_b^3 / (E \cdot I)$ [mm]
3 bearings: $f = 1/2960 \cdot F_W \cdot l_b^3 / (E \cdot I)$ [mm]

For unidirectional head drives: $F_W = F'_S \cdot b_0$
For bidirectional center drives: $F_W = 2 \cdot F'_S \cdot b_0$
For unidirectional pusher drives: $F_W = 2.2 \cdot F'_S \cdot b_0$
For bidirectional pusher drives: $F_W = 3.2 \cdot F'_S \cdot b_0$

Note: Pusher drives need a tensioning device.

b_0 = belt width [m]
l_b = distance between bearings [mm]
If the effective distance is not known use belt width + 100 mm

Shaft size		Inertia I	
mm	*inch*	mm^4	*$inch^4$*
Ø 20	*Ø 0.75*	7,850	*0.0158*
Ø 25	*Ø 1.0*	19,170	*0.05*
□ 25	*□ 1.0*	32,550	*0.083*
Ø 40	*Ø 1.5*	125,660	*0.253*
□ 40	*□ 1.5*	213,330	*0.42*
Ø 60	*Ø 2.5*	636,170	*1.95*
□ 60	*□ 2.5*	1,080,000	*3.25*
Ø 90	*Ø 3.5*	3,220,620	*7.50*
□ 90	*□ 3.5*	5,467,500	*12.50*

Table Inertia

Calculation guide
Dimensioning of shafts

Shaft materials	Modulus of elasticity E	Shearing strength	Possible material specifications
Carbon steel	206,000 N/mm^2	60 N/mm^2	St 37-2, KG-37
Stainless steel (low strength)	95,000 N/mm^2	60 N/mm^2	X5CrNi18 10, AISI 316, 304
Stainless steel (high strength)	195,000 N/mm^2	90 N/mm^2	X12CrNi 17 7, AISI 301
Aluminum	70,000 N/mm^2	40 N/mm^2	AlMg3, AA 5052

Torque on journal (shaft end on motor side)
The torque is calculated in order to evaluate the shaft journal diameter needed for transmission. Verify the selected size of the shaft journals by comparing the effective torque (T_M) with the **admissible torque** indicated in table "Maximum admissible torque."

effective torque: $T_M = F'_S \cdot b_0 \cdot d_P/2 \cdot 10^{-3}$ **[Nm]**

admissible torque: $T_{adm} = \tau_{adm} \cdot p \cdot d_W^3 / 16 \cdot 10^{-3}$
simplified: $T_{adm} \approx \tau_{adm} \cdot d_W^3 / 5000$ **[Nm]**

b_0 = belt width (m)
d_P = pitch diameter of sprocket [mm]
T_{adm} = max. admissible shearing stress [N/mm^2]
- for carbon steel approx. 60 N/mm^2
- for stainless steel approx. 90 N/mm^2
- for aluminum-alloy approx. 40 N/mm^2

d_W = shaft diameter [mm]

Shaft Ø (d_w)		Carbon steel		Stainless steel	
mm	*inch*	Nm	*in-lb*	Nm	*in-lb*
20	*0.75*	94	*834*	141	*1,251*
25	*1.0*	184	*1,629*	276	*2,444*
30	*$1^{3/16}$*	318	*2,815*	477	*4,233*
40	*1.5*	754	*6,673*	1,131	*10,009*
45	*1.25*	1,074	*9,501*	1,610	*14,251*
50	*2.0*	1,473	*13,033*	2,209	*19,549*
55	*1.25*	1,960	*17,347*	2,940	*26,020*
60	*2.5*	2,545	*22,520*	3,817	*33,781*
80	*3.0*	6,032	*53,382*	9,048	*80,073*
90	*3.5*	8,588	*76,007*	12,882	*114,010*

Table "Maximum admissible torque," T_{adm}

Calculation guide
Calculation of catenary sag

The catenary sag (belt sag) is an unsupported length of the belt right after the driven sprockets. Due to its weight the sag exerts tension to the belt, which is necessary for firm engagement of the sprockets in the belt. This tension again is depending on the length (l_C) and height (h_C) of the sag.

Experience shows that the sag of the dimensions proposed in the Design guide provides the belt tension needed for proper engagement of the sprockets.

Belt tension of catenary sag:

$F'_C = (l_C^2 \cdot m_B \cdot g) / (8 \cdot h_C)$ [N/m]

Example:
For l_C = 1 m, m_B = 4.3 kg/m^2, h_C = 0.025 m.
F'_C = 211 N/m (≈ 21 kg/m)

F'_C	=	Belt tension of catenary sag [N]
l_C	=	Length of the sag [m]
h_C	=	Height of the sag [m]
m_B	=	Weight of belt [kg/m^2]
g	=	Acceleration factor due to gravity (9.81 m/s^2)

Calculation guide
Effective belt length and width

Basically the belt length must end up in a multiple of the belt pitch distance in order to ensure proper sprocket engagement. If the design is made with a catenary sag (CA) or if a take-up unit (TU) is applied the effective belt (l_g) length is the theoretical length rounded to next belt pitch.

After belt length (l_g), the additional length (Δl_C) and the catenary sag distance (l_C) have been established it is of particular interest to calculate the height (h_C) required by the sag.

$$\Delta l_C = l_g - (2 \cdot l_0 + d_P/1{,}000)\ [m]$$

$$h_C = 1000 \cdot (\Delta l_C \cdot l_C / 2.66)^{-1}\ [mm]$$

l_g, l_0, l_C = Length [m]
d_P = Pitch diameter of sprocket [mm]
h_C = Height of catenary sag [mm]

The catenary height usually does not exceed 25 mm *(1")*.

Influence of thermal expansion
After installation the belt may be heated or cooled by the process, its length will change and consequently the height h_C of the catenary sag will change as well. Length variations of Cleandrive™ belts are very small and negligible in most cases. For very long belts that run under temperature conditions differing considerably from installation conditions, the necessary belt length correction can be calculated using the formula below.
The same formula can be applied in an anologous way to belt width. Relative variations in width are much higher; it may be necessary to factor them in when designing the lateral guides.

$$l_g(T) = l_g + l_g /1{,}000 \cdot \alpha \cdot (T_2 - T_1)\ [m]$$

l_g = Total belt length [m]

l_g = Total belt length [m]
T_1 = Installation temperature [°C]
T_2 = Process temperature [°C]
α = Coeff. of linear thermal expansion (in longitudinal direction)

Belt material	Coeff. of linear thermal expansion α	
	mm/m • °C	*in/ft • °F*
TPU/aramide (longitudinal direction)	0.002	*0.000013333*
TPU (transversal direction)	0.16	*0.00107*

Dimensional change due to humidity
Due to humidity and environmental conditions a belt can have a dimensional change in width of up to 2.5%. In conveyor design this increase of the belt width must be considered, i.e. there must be allowed sufficient lateral play between frame and belt.

Longitudinal dimension is affected less due to the reinforcement with aramide; the length variation can be compensated in the catenary sag or belt take-up unit.

Calculation guide
Dimensioning of belts with flights

If flights are applied the accumulated flight pitch distances must be equal to effective belt length. Usually the flight pitch is a multiple of the belt pitch distances but can also vary.

If possible determine flight distance in a way to meet always a drive bar; see sketch below:

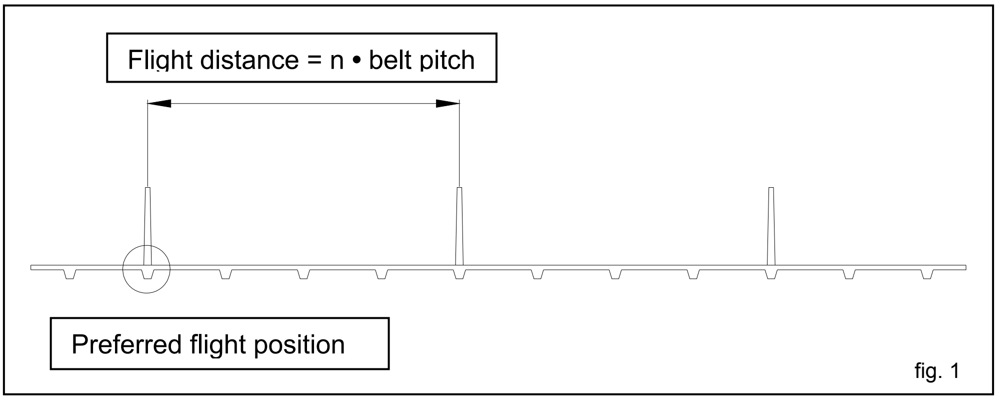


fig. 1

Calculation guide
Calculation of driving power

The required power for driving a belt is the result of the friction forces in the conveyor, the change of height for elevators plus the efficiency losses (also friction) of the drive itself. The latter are not taken into account in the following formula.

Note that the efficiency of gear and drive motor is to be considered for drive motor installation and that the drive motor should not run near 100% working load.

For efficiency of the gear and drive motor and the necessary power installed consult the drive manufacturer.

$P_M = F'_S \cdot b_0 \cdot v / 60$ [W]

F'_S	=	Adjusted tensile force (belt pull) per m of belt width [N/m]
P_M	=	Drive output power [W]
b_0	=	Belt width [m]
v	=	Belt speed [m/min]

Material properties
Coefficient of friction

Coefficient of friction between belt and slider support (wear strips), μ_G
Following tables list the coefficient of friction. The lower values of the range given are typical under lab condition (new clean belt and new wear strip), higher values are based on experimental data after considerable running time. The latter should be used for calculation.

Belt material	Condition	UHMW PE	Stainless steel
TPU and TPU +H15	dry	0.4..1.0	0.5..1.3
	wet (water)	0.3..1.0	0.4..1.0

Dimensional change
Due to humidity and environmental conditions a belt can have a dimensional change in lateral direction of up to 2.5%. In conveyor design this increase of the belt width must be considered, i.e. there must be allowed sufficient lateral play between frame and belt. Longitudinal dimension is affected less due to the reinforcement with aramide; the length variation can be compensated in the catenary sag or belt take-up unit.

Material properties
Chemical resistance

The data presented in the following table are based on the information given by the raw material manufacturers and suppliers. It does not relieve of a qualification test on the products for your application.
In individual cases the stability of the material in the questionable medium is to be examined.

Thermoplastic polyurethane material TPU
Conditions: 20 °C *(68 °F)*

Recommendation:
■ good resistance ▼ limited resistance □ not resistant

Acetic acid >25%	□
Acetone	▼
Alcohols	□
Alkalis, strong	□
Alkalis, weak	■
Ammonia, gaseous and aqueous	■
Ammonium salts	■
Amyl acetate	▼
Amyl alcohol	▼
Aniline	▼
Arachis oil	■
Baking fats	■
Baking powder	■
Beer	■
Benzene	▼
Benzoic acid	■
Bitter almond oil	■
Bitumen	■
Bleaching lyes	□
Boric acid	■
Brandy	■
Bromine	▼
Butanol	▼
Butter	■
Butyric acid	■
Calcium cyanamide	■
Carbon tetrachloride	▼
Castor oil	■
Caustic soda	□
Caustic soda solution	□
Chlorine	□
Chlorobenzene	▼
Chromic acid	□
Cider	■
Citric acid	■
Coconut oil	■
Cola concentrates	■
Common salt	■
Cottonseed oil	■
Cresol	▼
Cyclohexane	□
Cyclohexanol	▼
Cyclohexanone	▼
Decaline	■
Detergents, acid	■
Detergents, alkaline	■
Detergents, chlorinated	□
Detergents, neutral	■
Developer, photographic	■
Diazonium salts	■
Diesel oil	■
Diethylene glycol	□
Edible fats and salad oils	■
Essential oils	■
Ester	▼
Ether	■
Ethyl acetate	▼
Ethyl alcohol	▼
Fats	■
Fatty acids	■
Fatty alcohols	□
Fertilizers	■
Fish, fish waste	■
Formaldehyde	▼
Formic acid	▼
Fructose	■
Fruit juices	■
Fuel oil	■
Glacial acetic acid	□
Glucose	■
Glycerine	■
Glycol	□
Heptane	■
Hexane	■

Material properties
Chemical resistance

Hydrocarbons, aromatic	□
Hydrocarbons, aliphatic	■
Hydrocarbons, chlorinated	▼
Hydrochloric acid <20%	□
Hydrofluoric acid	▼
Hydrogen peroxide	□
Hydroquinone	■
Hypochlorite (javelle water)	□
Inks	■
Iodine	▼
Isooctane	■
Isopropanol	▼
Javel water (javelle water/hypochlorite)	□
Kerosene	■
Ketones	▼
Latex	■
Lemonades	■
Linseed oil	■
Liqueurs	■
Margarine	■
Methanol	▼
Methyl acetate	▼
Methyl ethyl ketone	▼
Methylene chloride	▼
Milk	■
Mineral oil	■
Molasses	■
Motor oil	■
Mustard	■
Nitric acid <40%	□
Nitrocellulose thinners	▼
Oils, mineral	■
Oils, vegetable	■
Oxalic acid	■
Ozone	■
Palm oil	■
Paraffin oil	■
Peanut oil	■
Perfumes	■
Petrol	■
Petroleum ether	■

Phenol	□
Phthalic acid	■
Plaster	■
Plasticizer	■
Potash lye	□
Potassium Comp.	■
Potassium salts	■
Propanol	▼
Proteins	■
Resorcinol	□
Salicylic acid	■
Salt water	■
Sea water	■
Sewage	■
Soaps	■
Starch syrup	■
Stearic acid	■
Sugar	■
Sulfite waste liquors	■
Sulfuric acid < 50%	■
Tallow	■
Tanning agents	■
Tar	■
Tartaric acid	■
Tetrachloroethylene	▼
Toluene	□
Transformer oil	■
Trichloroethylene	▼
Turpentine oil	□
Urea	■
Urine	■
UV	▼
Vaseline	■
Vinegar	■
Wetting agents	■
Wine	■
Xylene	□
Yeast	■

The concentration of a chemical can affect the resistance of a material against it. If no concentration is specified for a chemical the chemical resistance rating refers to either the pure chemical or usual commercially available concentrations of it. When a chemical is used in a substantially lower concentration than listed in this table the Habasit product may have a better chemical resistance rating than given in this table. Be aware that contact time, temperature and quantity of the chemical also affect the chemical resistance of the Habasit product.
The information supplied is either derived from technical literature or is supported by tests and experience.

Appendix
Symbols for calculations

Term	Symbol	Metric value	Imperial value
Acceleration factor due to gravity	g	9.81 m/s^2	–
Adjusted tensile force (belt pull) with service factor, per m of belt width	F'_S	N/m	*lb/ft*
Admissible tensile force, per unit of belt width	F'_{adm}	N/m	*lb/ft*
Belt length with accumulated products	l_a	m	*ft*
Belt pitch	p	mm	*inch*
Belt speed	v	m/s	*ft/min*
Belt tension caused by the catenary sag	F'_C	N/m	*lb/ft*
Belt width	b_0	mm	*inch*
Coefficient of friction belt/product	μ_P	–	–
Coefficient of friction belt/support	μ_G	–	–
Coefficient of thermal expansion	α	$\frac{mm}{m \cdot °C}$	$\frac{inch}{ft \cdot °F}$
Conveying distance, horizontal projection	l_1	m	*ft*
Conveying height	h_0	mm	*inch*
Distance between bearings	l_b	mm	*inch*
Distance between conveyor shafts	l_0	m	*ft*
Effective tensile force (belt pull), per m of belt	F'_E	N/m	*lb/ft*
Height of catenary sag	h_C	mm	*inch*
Length of catenary sag	l_C	mm	*inch*
Mass of belt / m^2 (weight of belt / m^2)	m_B	kg/m^2	*lb/sqft*
Mass of product / m^2 (weight of prod. / m^2)	m_P	kg/m^2	*lb/sqft*
Nominal tensile strength, per m of belt width	F'_N	N/m	*lb/ft*
Operation temperature	T	°C	*°F*
Pitch diameter of sprocket	d_P	mm	*inch*
Power, motor output	P_M	kW	*PS*
Service factor	c_S	–	–
Shaft deflection	f	mm	*inch*
Shaft diameter	d_W	mm	*inch*
Shaft load	F_W	N	*lb*
Speed factor	c_V	–	–
Temperature factor	c_T	–	–
Torque of motor	T_M	Nm	*in-lb*
Total geometrical belt length	l_g	mm	*inch*

Appendix
Symbols for illustrations

Term	Symbol	Metric value	Imperial value
Belt	BE		
Belt thickness	S	mm	*inch*
Catenary sag	CA	–	–
Distance between end of slider support and sprocket shaft center	C	mm	*inch*
Flight indent (free belt edge)	E	mm	*inch*
Free belt edge outside of side guard	F	mm	*inch*
Height of flights	H	mm	*inch*
Hub size (shaft diameter) of sprocket, square or round	B	mm	*inch*
Idling shaft	U	–	–
Length of flight module	L	mm	*inch*
Level (height) of belt surface in respect to the shaft center	A_0	mm	*inch*
Level (height) of slider support in respect to the shaft center	A_1	mm	*inch*
Motor/drive shaft	M	–	–
Partial belt lengths	D_1, D_2	mm	*inch*
Pitch diameter of sprocket	d_p	mm	*inch*
Retainer clip for sprockets	RC	–	–
Slider shoe for hold-down or support of belt	SH	–	–
Slider support return side	SR	–	–
Slider support transport side	ST	–	–
Sprocket	SP	–	–
Sprocket distance	a	mm	*inch*
Sprocket distance to belt edge	X	mm	*inch*
Take-up device (tensioning device)	TU	–	–
Thickness of transfer plate	K	mm	*inch*
Width (length) of sprocket hub	B_L	mm	*inch*

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