Urethane Timing Belts

Gates® MECTROL™
A Tomkins Company

Passion for Products

IMAGINATION,
DESIGN,
EXECUTION

OUR EXPERTISE
Gates Mectrol is a world leading manufacturer of polyurethane timing belts for the synchronous conveying, linear and rotary positioning and power transmission markets. We employ more than thirty experienced engineers and chemists who are dedicated to the development and application of automation components. As a result, we can provide you with the most extensive range and highest quality urethane timing belt products in the industry.

OUR CREATIVITY
With manufacturing facilities and partner distributors located throughout the world, Gates Mectrol is available to serve your specific design challenges anywhere, at anytime. Our associates know and understand our business - and yours.

OUR "CAN DO!" ATTITUDE
Gates Mectrol's passion for products is alive in our 'Can Do' attitude to offer the best application engineering tools and assistance available. Our online suite of design tools, combined with highly skilled application engineers, means that we can solve your most difficult challenges. Let Gates Mectrol's team of engineers work for you.

Gates® MECTROL™
A Tomkins Company

Gates Mectrol Urethane Timing Belts

Broadest Range Available

Linear Belt Overview

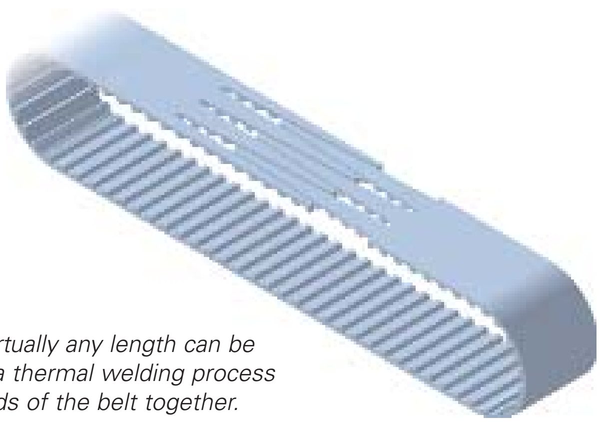
Linear timing belts provide the greatest degree of flexibility for both synchronous conveying and linear positioning applications.

Gates Mectrol can produce linear timing belts in a variety of tooth profile, length, and material combinations. This gives you a huge range of possible configurations for your application.

You can purchase linear belt lengths by the roll, or we can produce endless belts to meet your specifications. Endless belts are ideal for conveying and motion control applications.
As a result, Gates Mectrol can satisfy your immediate requirements and service your future application needs.

Features

- Very high tensile strength and stiffness
- Parallel cord construction
  - No cords exposed at edges of belt
  - Better tracking
  - Uniform tensioning
- Tough polyurethane construction
  - Durable and cut resistant
  - Oil, chemical and water resistant
  - Non-marking
- Steel or Kevlar® tension members
- Choice of polymers including FDA/USDA grades, antistatic resin, and Hytrel®
- Nylon back and nylon tooth surface options available for quieter operation and reduced friction
- Various molded profiles and backing materials available
- Wide range of tooth profiles to meet your application requirements

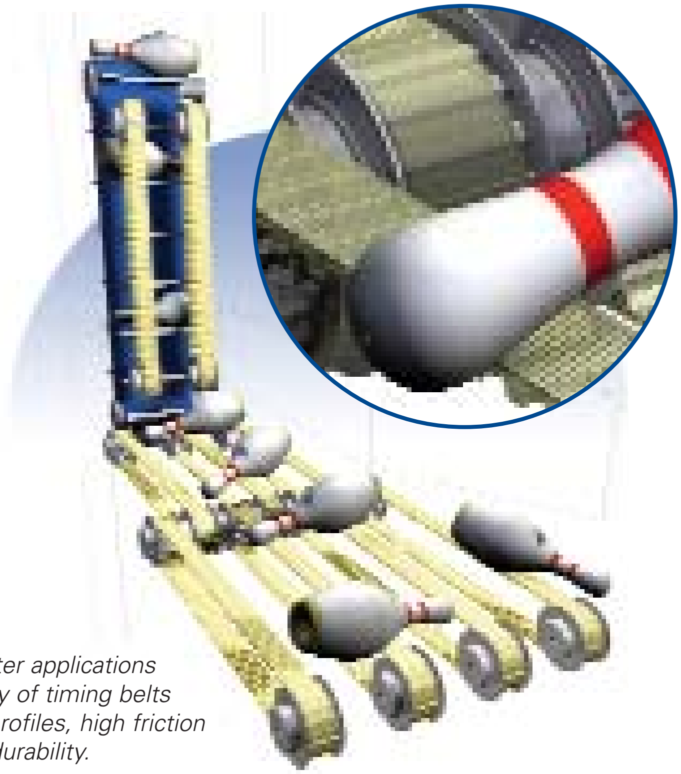


Endless belts of virtually any length can be produced utilizing a thermal welding process which joins the ends of the belt together.

Linear Belt Applications

Application Characteristics

- High precision positioning or indexing
- Synchronous conveying
- High acceleration, deceleration or continuous high running speeds
- Precise product orientation
- Multiple belt, common shaft conveying
- Customized belts to meet any application need



Bowling pinsetter applications require a variety of timing belts with different profiles, high friction backings, and durability.

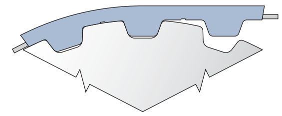
Urethane timing belts are ideal for use in vertical and horizontal door applications. Durable and clean running, these belts provide quiet and positive motion for industrial, train, elevator, and consumer door applications.

Urethane timing belts are oil and cut resistant making them ideal for harsh environments, such as stamping plant conveyors.

Our Application Engineering staff is available to you at **apps@gatesmectrol.com** or **1-800-394-4844**

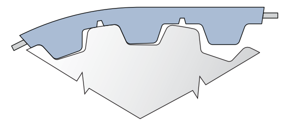
Tooth Profile Comparison

Inch Profile Belts - XL, L, H, XH



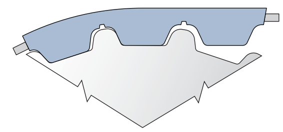
These classic trapezoidal tooth profiles are the original timing belt tooth design. This tooth profile is commonly used for **conveying applications**. They offer a good selection of pitch spacing for use with molded profile belts. The tooth profile is fairly low and has a large surface area at the tip of the tooth providing good support on sliding conveying surfaces.

T Profile Belts - T2.5, T5, T10, T20



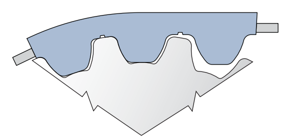
These metric trapezoidal profiles are similar to inch profiles, also commonly used for **conveying applications,** yet have a slightly deeper tooth engagement than inch profiles. The tooth meshing is more reliable. However, backlash can be slightly greater.

AT Profile Belts - AT5, AT10, AT20



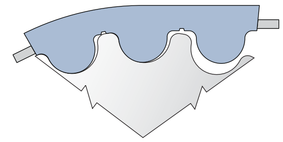
This profile was developed to enable higher load carrying capacity combined with low backlash. The stronger and stiffer tooth makes these belts ideal for **linear positioning and motion control**, but may require larger pulley diameters.

STD Profile Belts - STD5, STD8

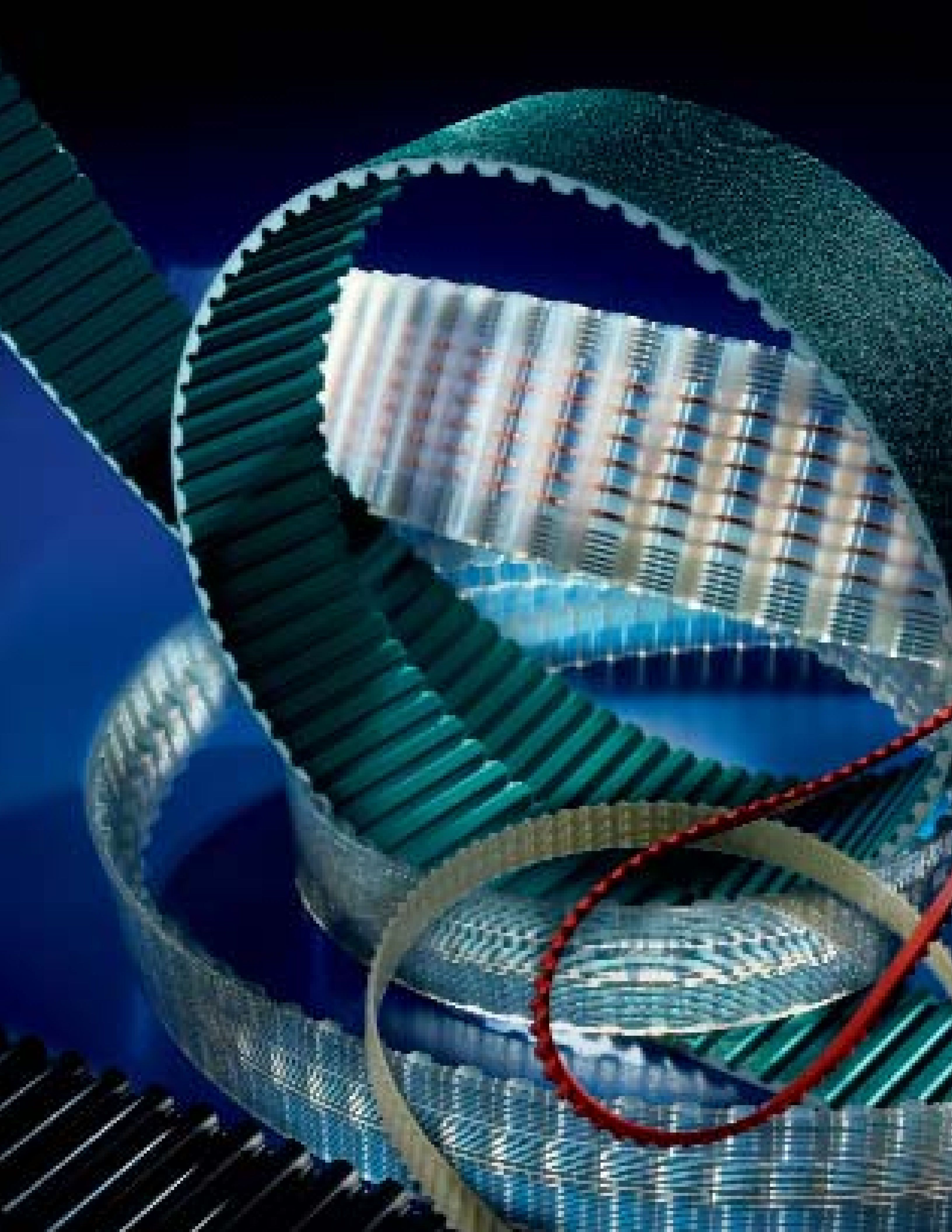


This profile provides superior load distribution, low backlash, and **reduced wear and noise** characteristics. It is an excellent profile for **linear and rotary positioning** and **power transmission** applications.

HTD Profile Belts - HTD5, HTD8, HTD14

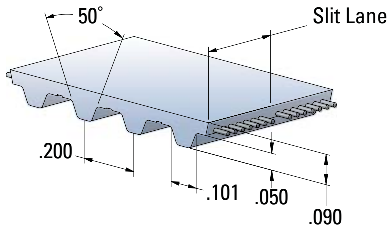


This rounded profile is similar to STD, and is also an excellent profile for **linear and rotary positioning** and **power transmission** applications, yet has deeper tooth engagement. However, HTD may exhibit slight increases in noise and wear.



Inch Profile Belts

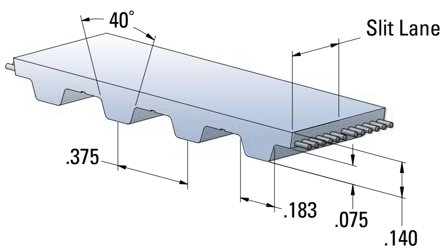
XL .200" Pitch



Belt Section		XL	L	H*, H-HF*	WH	XH
Min. Welded Belt Length	Inch	17	17	17 (4" wide) 33.5 (6" wide)	33	40.25
Standard Roll Lengths	Feet	200	200	200	200	100
	meters	61	61	61	61	30
Standard Slitting Lanes	Inch	1/4	1/2	1.0	N/A	1.0
Available Slitting Lanes	Inch	N/A	N/A	3/4	N/A	N/A

All roll lengths are ±1%.
*HB - Heavy Back option available.

L .375" Pitch

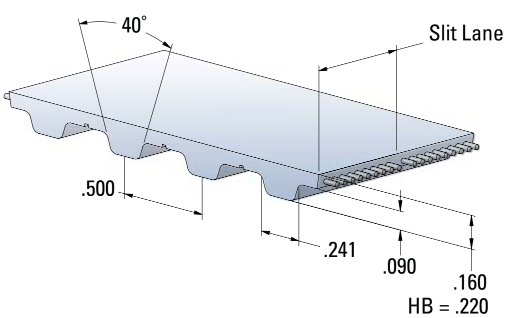


Available Widths

Code	Inch	mm	XL	L	H, H-HF	WH	XH
025	1/4	6.35	X				
031	5/16	7.94	X				
037	3/8	9.53	X	X	X		
050	1/2	12.7	X	X	X		X
075	3/4	19.05	X	X	X		X
100	1	25.4	X	X	X		X
150	1 1/2	38.1	X	X	X		X
200	2	50.8	X	X	X		X
300	3	76.2	X	X	X		X
400	4	101.6	X	X	X		X
600	6	152.4			X	X	X
900	9	228.6				X	
1200	12	304.8				X	
1500	15	381				X	
1800	18	457.2				X	
3600	36	914				X	

All belts are available in any width between the minimum and maximum listed width. For widths over 18” contact Applications Engineering.

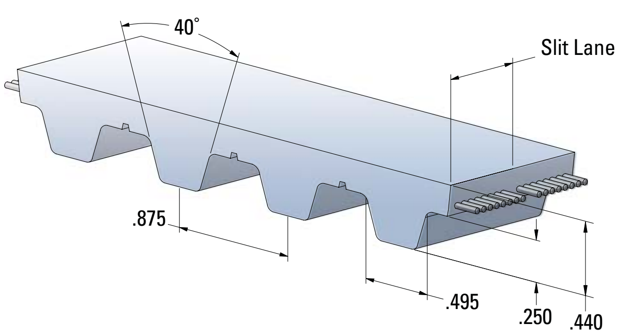
H, H-HF .500" Pitch
WH .500" Pitch—From 6" to 36" Wide



Width Tolerances

Width	XL	L	H, H-HF	WH	XH
Up to 2”	± .020”	± .020”	± .020”	N/A	± .040”
> 2”- 4”	± .030”	± .030”	± .030”	N/A	± .040”
> 4”- 6”	N/A	N/A	± .030”	N/A	± .040”
> 8”- 36”	N/A	N/A	N/A	± .060”	N/A

XH .875" Pitch



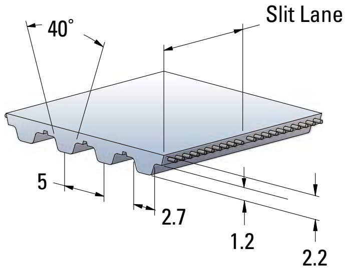
To Order Inch Profile Belts

600 H 200 ( ) ( )

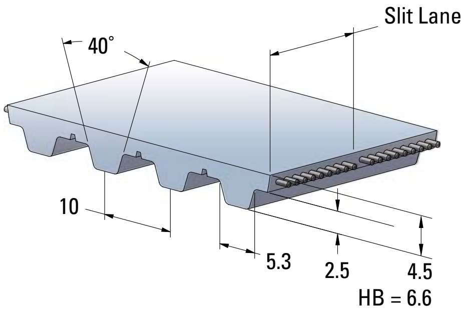
- Insert “NT” for Nylon Teeth, “NB” for Nylon Back, “NTB” for Nylon on Both Sides, "HB" for Heavy Backing, “FDA” for FDA, USDA Approved
- Insert “K” if specifying Kevlar®
- Width: 2.0" x 100 = 200
- Profile: H (1/2")
- Length: 60.0" x 10 = 600

T Profile Belts

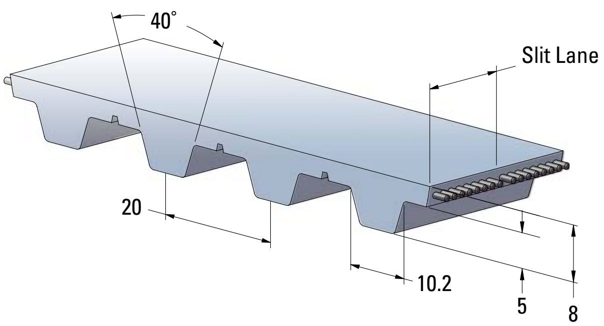
T5 5mm Pitch



T10, T10-HF 10mm Pitch
WT10 10mm Pitch
from 150 to 900mm wide



T20 20mm Pitch



Belt Section		T5	T10*, T10-HF*	WT10	T20
Min. Welded Belt Length	mm	440 (50mm wide) 450 (100mm wide)	450 (100mm wide) 850 (150mm wide)	850	1000
Standard Roll Lengths	meters	50 or 100		60	50 or 100
Standard Slitting Lanes	mm	25	25	N/A	25
Available Slitting Lanes	mm	10, 16	16, 32	N/A	N/A

All roll lengths are ±1%.
*HB - Heavy Back option available.

Available Widths

mm	T5	T10, T10-HF	WT10	T20
6	X			
10	X	X		
12	X	X		
16	X	X		
20	X	X		
25	X	X		X
32	X	X		X
50	X	X		X
75	X	X		X
100	X	X		X
150		X	X	X
225			X	
300			X	
380			X	
450			X	
900			X	

All belts are available in any width between the minimum and maximum listed width. For widths over 450mm contact Applications Engineering.

Width Tolerances

Width	T5	T10, T10-HF	WT10	T20
Up to 50mm	±0.5mm	±0.5mm	N/A	± 1.0mm
> 50-100mm	±0.75mm	±0.75mm	N/A	± 1.0mm
> 100-150mm	N/A	±0.75mm	N/A	± 1.0mm
> 150-900mm	N/A	N/A	±1.0mm	N/A

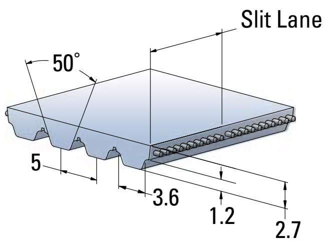
To Order T Profile Belts

50 T10 1080 ( ) ( )

- ( ) Insert “NT” for Nylon Teeth, “NB” for Nylon Back, “NTB” for Nylon on Both Sides, “HB” for Heavy Backing, “FDA” for FDA, USDA Approved
- ( ) Insert “K” if specifying Kevlar®
- 1080 Length: 1080 (108 Teeth x 10mm)
- T10 Profile: T10 (10mm)
- 50 Width: 50mm

AT Profile Belts

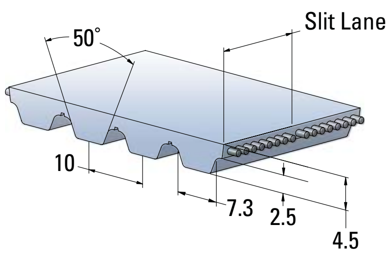
AT5 and ATL5   5mm Pitch



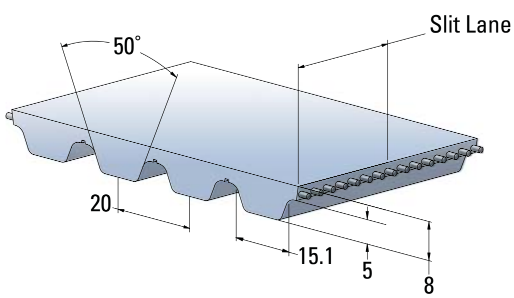
Belt Section		AT5	ATL5	AT10	ATL10, ATL10-HF	AT20, ATL20
Min. Welded Belt Length	mm	440	450	460 (100mm wide) 860 (150mm wide)	900	1000
Standard Roll Lengths	meters	50 or 100				30
Standard Slitting Lanes	mm	25	25	25	25	N/A
Available Slitting Lanes	mm	16	16	N/A	N/A	N/A

All roll lengths are ±1%.

AT10, ATL10, and ATL10-HF   10mm Pitch



AT20 and ATL20   20mm Pitch



Available Widths

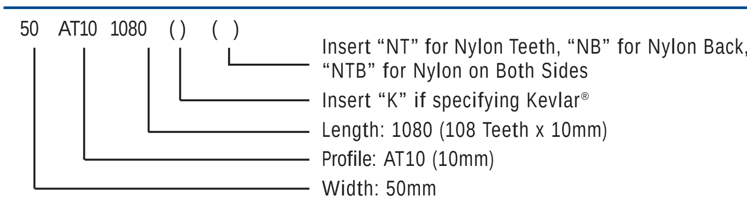
mm	AT5	ATL5	AT10, ATL10, ATL10-HF	AT20, ATL20
6	X			
10	X	X		
12	X	X		
16	X	X	X	
20	X	X	X	
25	X	X	X	X
32	X	X	X	X
50	X	X	X	X
75	X	X	X	X
100	X	X	X	X
150		X	X	X

All belts are available in any width between the minimum and maximum listed width.

Width Tolerances

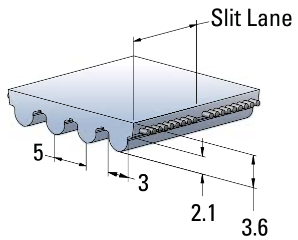
Width	AT5	ATL5	AT10	ATL10, ATL10-HF	AT20	ATL20
Up to 50mm	±0.5mm	±0.5mm	±0.75mm	± 1.0mm	± 1.0mm	± 2.0mm
> 50-100mm	±0.75mm	±0.75mm	± 1.0mm	±1.5mm	± 1.5mm	± 2.0mm
> 100-150mm	N/A	±0.75mm	± 1.0mm	± 1.5mm	± 1.5mm	± 2.0mm

To Order AT Profile Belts

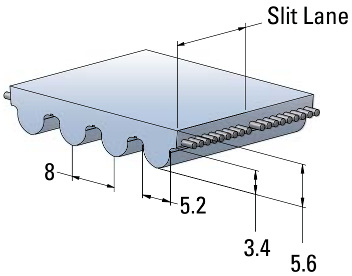


HTD and STD Profile Belts

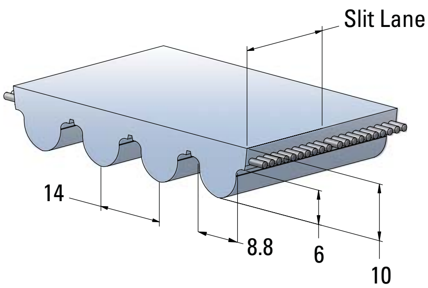
HTD5 5mm Pitch



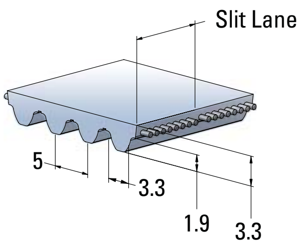
HTD8 8mm Pitch



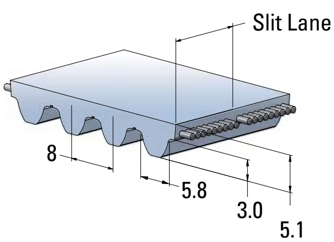
HTD14, HTDL14 14mm Pitch



STD5 5mm Pitch



STD8 8mm Pitch



Belt Section		HTD5	HTD8	HTD14, HTDL14	STD5	STD8
Min. Welded Belt Length	mm	450	456	1000	450	456
Standard Roll Lengths	meters	50 or 100				
Standard Slitting Lanes	mm	25	20, 30	55	25	20, 30
Available Slitting Lanes	mm	N/A	25	85	N/A	25

All roll lengths are ±1%.

Available Widths

mm	HTD5	HTD8	HTD14, HTDL14	STD5	STD8
5	X			X	
10	X	X		X	X
15	X	X		X	X
20		X			X
25	X	X	X	X	X
30		X			X
40			X		
50	X	X		X	X
55			X		
85	X	X	X	X	X
100	X	X	X	X	X
115			X		
150	X	X		X	
170			X		

All belts are available in any width between the minimum and maximum listed width.

Width Tolerances

Width	HTD5	HTD8	HTD14, HTDL14	STD5	STD8
Up to 50mm	±0.5mm	±0.75mm	±1.0mm	±0.5mm	±0.75mm
> 50-100mm	±0.75mm	± 1.0mm	±1.5mm	±0.75mm	± 1.0mm
> 100-150mm	±0.75mm	± 1.0mm	±2.0mm	±0.75mm	N/A
> 150-170mm	N/A	N/A	±2.0mm	N/A	N/A

To Order HTD and STD Profile Belts

25 HTD5M 1000 ( ) ( )

- Insert “NT” for Nylon Teeth, “NB” for Nylon Back, “NTB” for Nylon on Both Sides
- Insert “K” if specifying Kevlar®
- Length: 1000mm
- Profile: HTD5 (5mm)
- Width: 25mm

Linear Belt Specifications

Belt Section			XL	L	H	H-HF	XH	T5	AT5	ATL5
Pitch (inch and metric)			.200"	.375"	.500"	.500"	.875"	5mm	5mm	5mm
Ultimate Tensile Strength per Inch or 25mm Belt Width	Steel	lb/in N/25mm	730 3250	1340 5965	1500 6660	2300 10235	3020 13435	730 3250	1450 6450	2300 10235
	Kevlar®	lb/in N/25mm	1525 6780	2140 9520	1830 8145	N/A N/A	3600 16010	1525 6780	1820 8095	N/A N/A
Max. Allowable Belt Tension (T_{1all}) per Inch or 25mm Belt Width *(Safety Factor >4)*	Steel and Kevlar® – Open Ended	lb/in N/25mm	185 825	360 1610	375 1670	575 2560	755 3360	185 825	365 1625	575 2560
	Steel and Kevlar® – Welded	lb/in N/25mm	140 625	200 890	245 1090	290 1290	380 1695	140 625	225 1005	225 1005
Allowable Effective Tension for the Belt Teeth T_{eall} (15 and More Teeth in Mesh)	Open Ended	lb/in N/25mm	180 790	360 1580	440 1930	440 1930	880 3855	200 880	290 1270	290 1270
	Welded	lb/in N/25mm	135 595	270 1185	330 1445	330 1445	660 2890	150 660	220 965	220 965
Specific Belt Weight w_b (Imperial - Weight/ft/inch) (Metric Pitch - Weight/meter/cm)	Steel	lb Kg	0.036 0.016	0.059 0.027	0.066 0.030	0.072 0.033	0.180 0.082	0.048 0.022	0.071 0.032	0.080 0.036
	Kevlar®	lb Kg	0.033 0.015	0.052 0.024	0.055 0.025	N/A N/A	0.155 0.070	0.043 0.020	0.060 0.030	N/A N/A
Specific Belt Stiffness c_{sp}	Steel	lb/in N/mm	47950 8400	92800 16255	109,000 19085	133600 23400	213600 37410	47950 8400	100500 17605	133600 23400
	Kevlar®	lb/in N/mm	52250 9155	80000 14000	60700 10635	N/A N/A	100000 17500	52250 9155	80000 14000	N/A N/A
Min. No. of Pulley Teeth z_{min}			10	10	14	12	18	10	15	15
Min. Pitch Diameter (Inch or mm)			.64”	1.19”	2.23”	1.91”	5.01”	16mm	24mm	24mm
Min. Diameter of Tensioning Idler Running on Back of Belt		in mm	1.125 30	2.375 60	3.125 80	2.375 60	5.875 150	1.125 30	2.375 60	2.375 60
Available in FDA/USDA Construction *(FDA/USDA 86 shore A Urethane)*			Yes	Yes	Yes			Yes		
Stock Colors (C=Clear, W=White)			C	C	C	C	C	C	W	W

Table 1

Dupont™, Hytrel®, and Kevlar® are trademarks or registered trademarks of E.I. du Pont de Nemours and Company.

Temperature Range	–30°C to +80°C (-22°F to 176°F)	
Durometer	92 Shore A - Standard PU, 85 Shore A - FDA/USDA	
Coefficient of Friction	Urethane vs. Steel (dry)	0.5 to 0.7
	Urethane vs. Aluminum (dry)	0.5 to 0.6
	Urethane vs. UHMW (dry)	0.2 to 0.4
	Nylon vs. Steel (dry)	0.2 to 0.4
	Nylon vs. UHMW (dry)	0.1 to 0.3

Table 1A

T10	T10-HF	AT10	ATL10	ATL10-HF	T20	AT20	ATL20	HTD5	HTD8	HTD14	HTDL14	STD5	STD8
10mm	10mm	10mm	10mm	10mm	20mm	20mm	20mm	5mm	8mm	14mm	14mm	5mm	8mm
1500 6660	2300 10235	3020 13435	5160 22955	5400 24020	3020 13435	5160 22955	6900 30760	2300 10235	3020 13435	4470 19890	7650 34040	2300 10235	3020 13435
1830 8145	N/A N/A	3600 16010	N/A N/A	N/A N/A	3600 16010	4650 20683	N/A N/A	2000 8900	3600 16010	4030 17925	N/A N/A	2000 8900	3600 16010
375 1670	575 2560	755 3360	1290 5740	1350 6005	755 3360	N/A N/A	1725 7690	575 2560	755 3360	1120 4970	1910 8510	575 2560	755 3360
245 1090	290 1290	N/A N/A	N/A N/A	380 1695	380 1695	N/A N/A	N/A N/A	290 1290	380 1695	N/A N/A	N/A N/A	290 1290	380 1695
380 1665	380 1665	585 2565	585 2565	585 2565	715 3135	N/A N/A	1220 5345	230 1010	425 1865	775 3450	775 3455	220 965	410 1800
285 1250	285 1250	N/A N/A	N/A N/A	440 1930	535 2345	N/A N/A	N/A N/A	160 705	270 1185	N/A N/A	N/A N/A	155 680	255 1120
0.095 0.043	0.102 0.046	0.124 0.056	0.147 0.067	0.153 0.069	0.162 0.074	0.218 0.099	0.239 0.109	0.090 0.041	0.130 0.059	0.235 0.107	0.271 0.123	0.087 0.039	0.113 0.051
0.080 0.036	N/A N/A	0.092 0.042	N/A N/A	N/A N/A	0.131 0.060	0.160 0.073	N/A N/A	N/A N/A	0.103 0.047	0.185 0.084	N/A N/A	0.064 0.029	0.095 0.043
109,000 19085	133600 23400	213600 37410	334600 58600	290000 50790	213600 37410	334600 58600	440000 77050	133600 23400	213600 37410	294400 51560	440000 77050	133600 23400	213600 37410
60700 10635	N/A N/A	100000 17500	N/A N/A	N/A N/A	100000 17500	100000 17500	N/A N/A	N/A N/A	100000 17500	86500 15150	N/A N/A	N/A N/A	100000 17500
16	12	18	25	20	15	18	30	14	20	28	43	14	20
51mm	38mm	57mm	80mm	64mm	96mm	115mm	191mm	22mm	51mm	125mm	191mm	22mm	51mm
3.125 80	2.375 60	4.750 120	5.875 150	5.125 130	4.750 120	7.125 180	9.875 250	2.375 60	4.750 120	7.875 200	9.875 250	2.375 60	4.750 120
Yes													
C	C	W	W	W	C	W	W	W	W	W	W	W	W

- HF designates high flex cords.
- All belt is available with Nylon Fabric on either or both sides.
  - For Nylon on the tooth side, specify “NT”
  - For Nylon on the back side, specify “NB”
  - For Nylon on both sides, specify “NTB”
- For special colors, consult a Gates Mectrol Applications Engineer.
- Belting produced to specific length tolerance is available upon request.
- Many linear positioning applications require belts of a specific length tolerance, or a “minus pitch tolerance.” Gates Mectrol can produce belts to specific minus tolerances. Consult with a Gates Mectrol applications engineer to determine the proper length tolerance calculation.

Wide Belt Overview

Gates Mectrol can produce urethane timing belts in widths up to 900mm. This belt is specifically designed for synchronous conveying applications.

These belts are primarily used as process conveyor belts. Process (or conversion steps) normally occur on the belt, therefore the conveyed product requires additional width.

Features

- High strength Kevlar® cord construction
- Parallel cord construction
  - No cords exposed at edges of belt
  - Better tracking
  - Uniform tensioning
- Tough polyurethane construction
  - Durable and cut resistant
  - Oil, chemical and water resistant
  - Non-marking
- Choice of polymers including FDA/USDA grades and Hytrel®
- Nylon back and nylon tooth surface options available for quieter operation and reduced friction
- Various molded profiles and backing materials available
- No lubrication required

In deboning applications, USDA approved urethane timing belts provide zero slip conveying, easy wash down and clean up while being very resistant to knife cuts.

Wide Belt Applications

Application Characteristics

- Replaces flat conveyor belt
  - No retensioning required
  - Lower shaft forces
  - Positive indexing
  - Higher acceleration without slippage
- Alternative to modular plastic conveyor
  - Quieter operation
  - Easier cleaning
  - No hinges or pins to break and contaminate products
- High speed conveying
- Rapid indexing
- Automated process conveyor belts
- Bulk product conveying
- Food and confectionary conveying
- Clean room or wash down environments
  - Consult Application Engineering staff for restrictions

Four 45 cm wide, timing belts accelerate skiers for faster loading of detachable chair lifts. Timing belts ensure uniform speed of each skier.

Gates Mectrol's extra wide urethane timing belts used in synchronous conveying provide dramatically higher production speeds - as shown on this diaper production line.

Our Application Engineering staff is available to you at **apps@gatesmectrol.com** or **1-800-394-4844**

Wide Belt Specifications

Belt Section			WH	WT10
Pitch (inch and metric)			.500"	10mm
Ultimate Tensile Strength per Inch or 25mm Belt Width	Kevlar®	lb/in N/25mm	830 3645	830 3645
Max. Allowable Belt Tension (T_{1all}) per Inch or 25mm Belt Width *(Safety Factor >4)*	Kevlar® Welded	lb/in N/25mm	140 610	140 610
Allowable Effective Tension for the Belt Teeth T_{eall} (15 and More Teeth in Mesh)	Welded	lb/in N/25mm	330 1445	285 1250
Specific Belt Weight w_b (Imperial - Weight/ft/inch) (Metric Pitch - Weight/meter/cm)	Kevlar®	lb Kg	0.056 0.025	0.085 0.039
Specific Belt Stiffness c_{sp}	Kevlar®	lb/in N/mm	30350 5300	30350 5300
Min. No. of Pulley Teeth z_{min}			14	16
Min. Pitch Diameter (Inch or mm)			2.23"	51mm
Min. Diameter of Tensioning Idler Running on Back of Belt		in mm	3.12 80	3.12 80
Available in FDA/USDA Construction *(FDA/USDA 85 shore A Urethane)*			Yes	Yes
Stock Colors (C=Clear, W=White)			C, W	C, W

Table 2

WMTD3 - under development

Temperature Range	–30°C to +80°C (-22°F to 176°F)	
Durometer	92 Shore A - Standard PU, 85 Shore A - FDA/USDA	
Coefficient of Friction	Urethane vs. Steel (dry)	0.5 to 0.7
	Urethane vs. Aluminum (dry)	0.5 to 0.6
	Urethane vs. UHMW (dry)	0.2 to 0.4
	Nylon vs. Steel (dry)	0.2 to 0.4
	Nylon vs. UHMW (dry)	0.1 to 0.3

Flat Belt Overview

Gates Mectrol can provide you with a range of high strength, low stretch flat belts for use in your lifting and positioning applications.

These flat belts are normally sold in open ended lengths and are clamped on each end. We can also provide you with thermally welded endless belts to your specifications.

Note: Gates Mectrol's high-strength flat belts are generally not interchangeable with traditional flat belts due to the fact that they are designed NOT to stretch, and therefore, should not be run on crowned pulleys.

Application Characteristics

- Heavy load lifting or lowering
- Allows for "slip" requirement
- Smooth uniform motion
- High running speeds
- Small bending radius for small design envelope
- Very low stretch characteristics

Features

- Smooth, vibration free operation
- Small pulley diameters
- High strength, low stretch for long life
- Sealed edges, no cord fraying
- Easily guided with flanged pulleys or v-guides
- Very high operating surface speeds
- Variety of polymers available
- Kevlar® or steel cord construction
- No lubrication needed
- No retentioning requireed

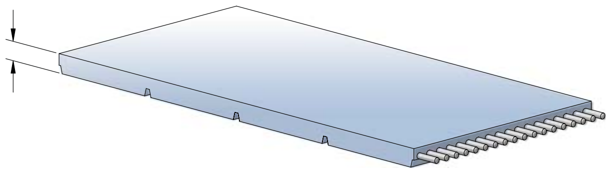
Precision high strength, low stretch flat belts utilize tough urethane construction with specialty high carbon steel cords to lift heavy loads such as elevators.

Our Application Engineering staff is available to you at **apps@gatesmectrol.com** or **1-800-394-4844**

Flat Belts

Belt Section		F8, F8U	FL8	F12, F12U	FL12	F30	FX9, FX12	FR16
Min. Welded Belt Length	Inch	19	21	20	24	N/A	N/A	N/A
	mm	483	533	508	610	N/A	N/A	N/A
Standard Roll Lengths	Feet	200	200	200	200	200	200	200
	meters	61	61	61	61	61	61	61
Standard Slitting Lanes	Inch	1	1	1	1	1	1	0
	mm	25	25	25	25	25	25	0

All roll lengths are ±1%.



Belt Type	Thickness
F8	0.080"
FL8	0.080"
F12	0.125"
FL12	0.125"
F30	3mm
FX9	0.090"
FX12	0.120"
FR16	4mm

Available Widths

Code	Inch	mm	F8, FL8, F12, FL12, F8U, F12U	F30	FX9, FX12	FR16
025	1/4	6.35				
050	1/2	12.7	X			
075	3/4	19.05	X		X	
100	1	25.4	X	X	X	X
150	1 1/2	38.1	X	X	X	X
200	2	50.8	X	X	X	X
300	3	76.2	X	X	X	X
400	4	101.6	X	X	X	X

All belts are available in any width between the minimum and maximum listed width.

Width Tolerances

Width	F8, FL8, F12, FL12, F8U, F12U	F30	FX9, FX12	FR16
Up to 2”	± .020”	± .020”	± .030”	± .040”
> 2”- 4”	± .030”	± .030”	± .030”	± .040”

To Order Flat Belts

600 F12 200 ( ) ( )

- ( ) Insert “NT” for Nylon One Side, “NTB” for Nylon on Both Sides, “FDA” for FDA, USDA Approved
- ( ) Insert “K” if specifying Kevlar®
- 200 — Width: 2.0" x 100 = 200
- F12 — F12
- 600 — Length: 60.0" x 10 = 600

Flat Belt Specifications

Belt Section				F8	FL8	F12	FL12	F30
Thickness			**inch** **metric**	**.080** **2.0**	**.080** **2.0**	**.125** **3.0**	**.125** **3.0**	**.120** **3.0**
Ultimate Tensile Strength per Inch or 25mm Belt Width	Steel		lb/in N/25mm	1500 6660	3020 13435	1500 6660	5160 22955	6900 30760
	Kevlar®		lb/in N/25mm	1830 8145	N/A N/A	1830 8145	N/A N/A	N/A N/A
Max. Allowable Belt Tension (T_{1all}) per Inch or 25mm Belt Width *(Safety Factor >4)*	Steel and Kevlar®	Open Ended	lb/in N/25mm	375 1670	755 3360	375 1670	1290 5740	1725 7690
		Welded	lb/in N/25mm	245 1090	380 1695	245 1090	645 2870	863 1005
Specific Belt Weight w_b (Imperial - Weight/ft/inch) (Metric Pitch - Weight/meter/cm)	Steel		lb Kg	.057 .026	.073 .033	.078 .035	.113 .051	.255 .116
	Kevlar®		lb Kg	.045 .020	N/A N/A	.066 .030	N/A N/A	N/A N/A
Specific Belt Stiffness c_{sp}	Steel		lb/in N/mm	89950 15755	213600 37410	89950 15755	334600 58600	440000 77050
	Kevlar®		lb/in N/mm	60700 10635	N/A N/A	60700 10635	N/A N/A	N/A N/A
Min. Pulley Diameter (Inch or mm)			in mm	2.0 50	2.375 60	2.0 50	3.0 75	5.0 125
Min. Diameter of Tensioning Idler Running on Back of Belt			in mm	3.0 80	4.75 120	3.0 80	4.75 120	8.0 200
Standard Material				PU	PU	PU	PU	PU
Stock Colors (C=Clear 92A PU, W=White, B=Black)				C	C	C	C	B

* Standard with antistatic nylon fabric on one side

Materials		92A PU	85A PU	TPR
Temperature Range		-25°C to 80°C	-30°C to 75°C	-40°C to 100°C
Durometer		92A	85A	90A
Coefficient of Friction	Belt Material vs. Steel (dry)	0.5	0.7	0.5
	Urethane vs. Aluminum (dry)	0.5	0.6	0.5
	Belt Material vs. UHMW (dry)	0.2	0.4	0.2
	Nylon vs. Steel (dry)	0.2 to 0.4	0.2 to 0.4	0.2 to 0.4
	Nylon vs. UHMW (dry)	0.1 to 0.3	0.1 to 0.3	0.1 to 0.3

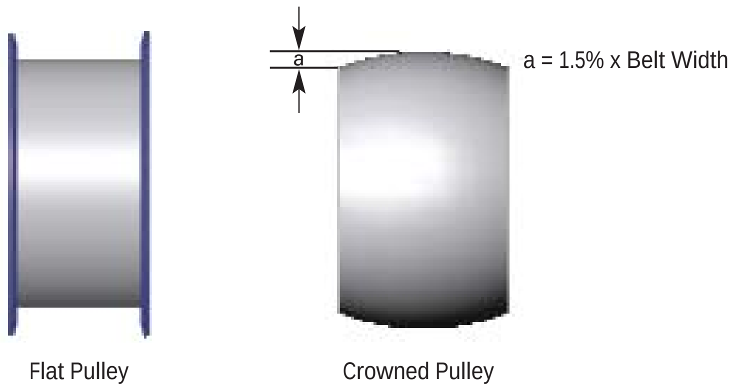
Flat Belt Specifications

FX9	FX12	FR16
.090 **2.3**	**.120** **3.0**	**.157** **4.0**
N/A N/A	N/A N/A	N/A N/A
4000 17800	5000 22240	4000 17800
1000 4450	1250 5560	1000 4450
N/A N/A	N/A N/A	N/A N/A
N/A N/A	N/A N/A	N/A N/A
.043 .020	.060 .027	.090 .041
N/A N/A	N/A N/A	N/A N/A
90000 15760	130000 22760	90000 15760
3.0 75	4.0 100	5.0 125
4.5 115	6.0 150	5.0 125
PU TPR	PU TPR	PU w/Nylon*
B	B	B

Pulley Design Recommendations

A flat faced pulley with flanges is preferred. In contrast to typical flat belts, these belts are designed for very high strength and extremely low stretch. Therefore, crowned pulleys should not be used.

If crowned pulleys are used, the maximum allowable crown is 1.5% of belt width.



- All belt is available with Nylon Fabric on either or both sides.
  For Nylon on one side, specify “NT”
  For Nylon on both sides, specify “NTB”
- For special colors, consult a Gates Mectrol Applications Engineer.
- Belting produced to specific length tolerance is available on request.

Self Tracking Belts

Notched V-Guide – Allows Maximum Flexibility

Gates Mectrol self tracking timing belts have all the capabilities of standard urethane timing belts but utilize guides to eliminate any lateral movement. Our range of specially designed urethane V-guides are notched along belt length to provide optimum flexibility around pulleys.

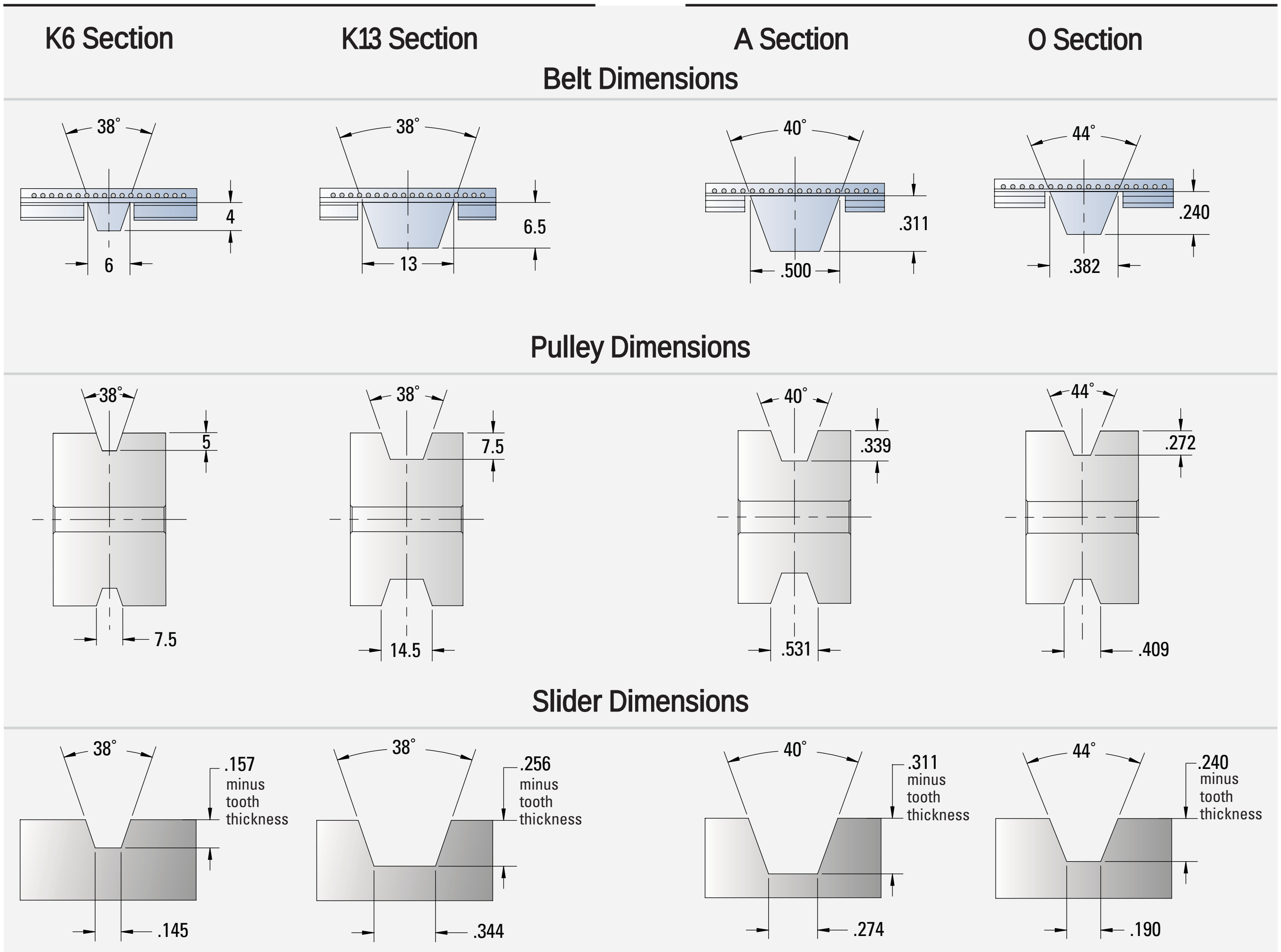
Gates Mectrol produces V-guided belts in two constructions — **fabricated**, any of four V-guides can be added to any pitch belt in any width, length combination, or — **integral**, the V-guide is integrally molded to specific belt pitches for greater strength and consistency.

Belt Features

- V-guides can be added to virtually any of our belts, eliminating the need for flanged pulleys.
- Notched construction for extra flexibility around tight belt paths
- Produced with the same durable urethane as the base belt
- Different sizes available to serve any application requirement
- Integrally produced with the belt for durability or fabricated to fit onto our existing belts

Fabricated V-Guides

For Metric Tooth Profile Belts | For Inch Tooth Profile Belts



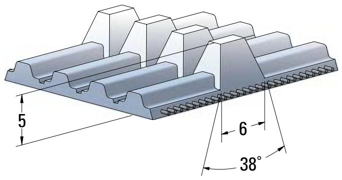
Self Tracking Belts

Application Characteristics

- Long length conveying or linear positioning where tracking is an issue
- Conveying applications where pulley flanges are not acceptable
- Reduce or eliminate any belt "wander" by providing continuous guiding along conveyor length

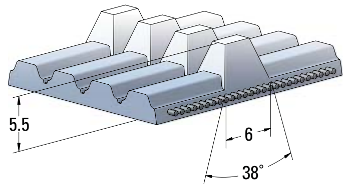
Integral V-Guides

T5V



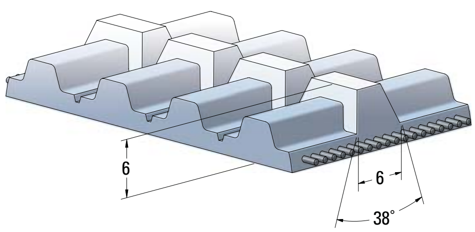
Available widths – 16, 25, 32, 50, 75, 100 mm

AT5V, ATL5V



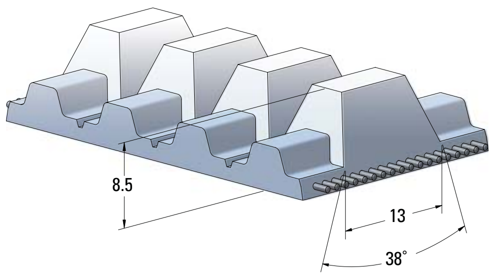
Available widths – 16, 25, 32, 50 mm

T10VS



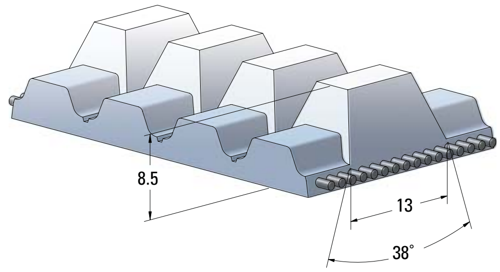
Available widths – 16, 25, 32, 50 mm

T10V



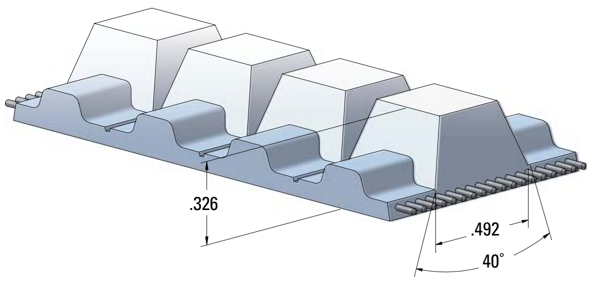
Available widths – 32, 50, 75, 100, 150 mm

AT10V



Available widths – 25, 32, 50, 75 mm

HV



Available widths – 1.5, 2, 3, 4, 6 inch

Our Application Engineering staff is available to you at **apps@gatesmectrol.com** or **1-800-394-4844**

Profiles

Gates Mectrol timing belts can be customized with welded-on profiles to meet the specific demands of your application.

These profiles can be molded in virtually any configuration for holding, pushing, lifting, or actuating. This makes these profile belts ideal for your assembly, packaging, inserting and other automation equipment applications.

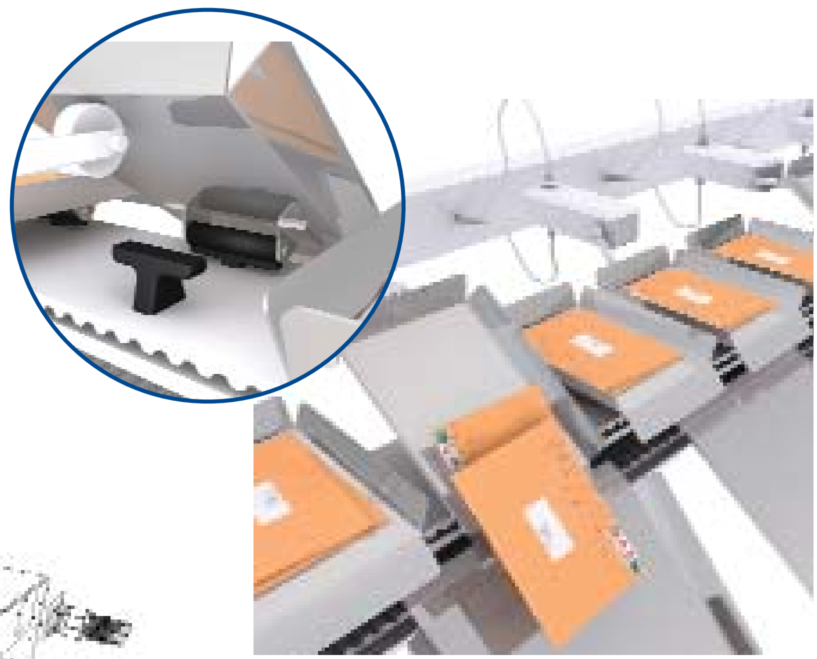
Our molded profiles are produced in the same tough urethane and become an integral part of the belt by **thermal bonding**.

Application Characteristics

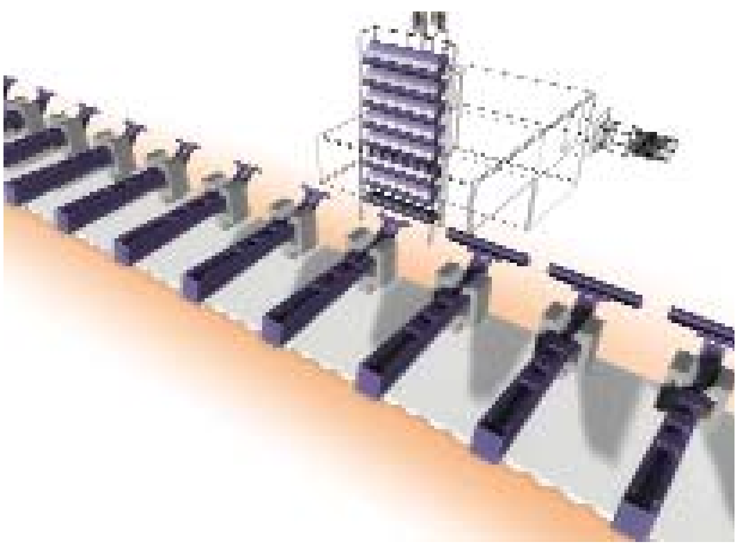
- Pushing, carrying or actuating in packaging applications
- Product location in process applications
- Holders for mounting devices
- Interchangeable spacing for alternate product conveying

Features

- Non-marking, durable urethane construction
- Molded and located on the belt to exacting tolerances
- Can be molded to virtually any custom configuration
- Available in multiple durometers
- FDA/USDA compounds available
- Thermally fused to base belt material
- Available with metal inserts, including threaded inserts



Custom profiles are used for pins and rests on a tilt-tray mail sorting machine.



Exact placement of the profile allows for precision assembly of parts. In this application, razor heads are mounted accurately as a result of the Gates Mectrol profiled timing belt.

Profiles

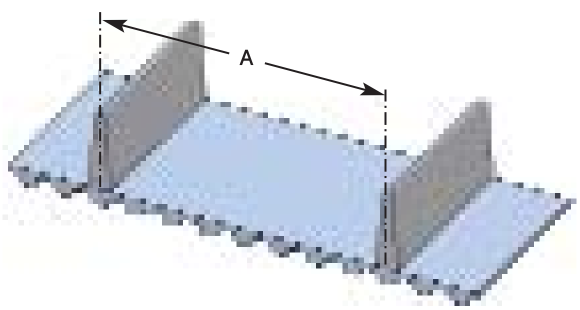
Hundreds of profile designs are available from Gates Mectrol's extensive mold inventory. Our applications engineers can work with you to design any profile to meet your specific requirements. Tooling charges are minimal for most customized designs.

Although it is possible to have nearly any design utilizing welded profiles, ultimate performance for your application can be achieved by following the design guidelines outlined below:

1. Spacing of Profiles

It is recommended that the profile spacing, A, correspond with the pitch of the belt teeth. This allows for the best spacing tolerances, and minimizes the effects of the belt's overall length tolerance on the profile spacing.

Profiles can be spaced on non-pitch increments. However, if non-pitch spacing is used, the cumulative tolerance of the belt length must be considered.



Profile Spacing Tolerance

Profile Spacing	Over tooth Non-cumulative	Not over tooth
0.2"≤A<1.0" 5mm≤A<25.4mm	±0.015" ±0.38mm	±0.020" ±0.5mm
1.0"≤A<9.0" 25.4mm≤A<228.6mm	±0.020" ±0.5mm	±0.025" ±0.6mm
9.0"≤A<18.0" 228.6mm≤A<457.2mm	±0.025" ±0.6mm	±0.030" ±0.8mm
18.0"A<27.0" 457.2mmA<685.8mm	±0.030" ±0.8mm	±0.035" ±0.9mm
27.0"≤A<36.0" 685.8mm≤A<914.4mm	±0.035" ±0.9mm	±0.040" ±1.0mm

For spacing greater than 36.0", add 0.006" per ft.

For spacing greater than 914.4mm, add 0.15mm per 305mm.

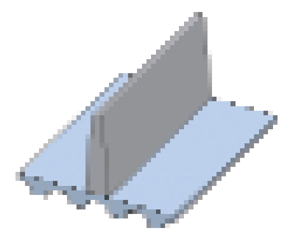
Tighter tolerances on profile spacing are available. Contact a Gates Mectrol Applications Engineer for more information.

2. Dimensions of Profiles

The most important consideration while dimensioning a profile is the size of the base of the profile, (the "foot" of the profile), and the position of the profile on the belt.

The profile thickness can affect the flexibility of the belt, and can determine the minimum allowable pulley diameter. The flexibility of the belt can be maximized, however, by positioning the profile directly over the tooth of the belt.

Over Tooth



Not Over Tooth

As the thickness of the foot of the profile increases, the minimum pulley diameter in the system must be increased according to the table on the next page.

The molded tolerances of the profile itself i.e. thickness, height, length, etc. are controlled within ±.010". The installed height tolerance of a profile is typically +.010", –.020".

Gates Mectrol's applications engineers will be happy to assist in all regards where tolerances are an issue. Please contact: apps@gatesmectrol.com.

Profiles

Minimum Number of Pulley Teeth For Profiles Over a Tooth*

Profile “Foot” Thickness	Inch mm	1/16 1.60	1/8 3.00	3/16 5.00	1/4 6.00	5/16 8.00	3/8 10.00	7/16 11.00	1/2 13.00	5/8 16.00	3/4 19.00
Pitch XL		10	10	18	25	40	50	60	100		
L		12	12	12	18	30	40	50	60	100	
H		14	14	14	14	18	25	35	45	80	100
XH		18	18	18	18	18	18	18	20	35	50
T5		12	12	18	25	40	50	60	100		
AT5, ATL5		15	15	18	25	40	50	60	100		
T10		16	16	16	16	18	25	35	45	80	100
AT10, ATL10, ATL10-HF		18	18	18	18	22	25	35	45	80	100
T20, AT20, ATL20		18	18	18	18	18	18	18	20	35	50
HTD5, STD5		14	14	16	25	40	50	60	100		
HTD8, STD8		20	20	20	24	30	40	50	60	100	
HTD14, HTDL14		28	28	28	28	28	28	30	30	50	72

Minimum Number of Pulley Teeth For Profiles Not Over a Tooth*

Profile “Foot” Thickness	Inch mm	1/16 1.60	1/8 3.00	3/16 5.00	1/4 6.00	5/16 8.00	3/8 10.00	7/16 11.00	1/2 13.00	5/8 16.00	3/4 19.00
Pitch XL		12	30	45	50	60	100				
L		12	20	40	45	55	60	70	80	100	
H		14	14	25	30	45	50	55	65	80	100
XH		18	18	20	30	40	45	50	54	58	60
T5		12	30	45	50	60	100				
AT5, ATL5		15	30	45	50	60	100				
T10, AT10, ATL10, ATL10-HF		18	20	30	40	45	50	55	65	80	100
T20, AT20, ATL20		18	18	20	30	40	45	50	54	58	60
HTD5, STD5		18	30	45	50	60	100				
HTD8, STD8		20	20	40	45	55	60	70	80	100	
HTD14, HTDL14		28	28	30	42	58	64	72	78	82	86

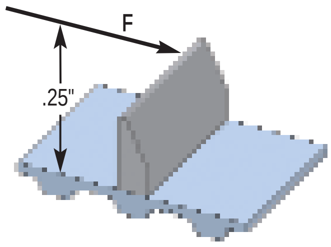
*Minimum number of pulley teeth must be equal to or greater than minimum shown in the appropriate Belt Specifications Table.

3. Profile Strength.

The strength, and therefore capacity of the profile, depends primarily on the size of the welded profile foot.

The strength of the profile is affected by the type and direction of the force applied to it. Under high loads, the failure mode will normally be either bending and distortion of the profile and belt, or in some cases, the polyurethane may actually tear.

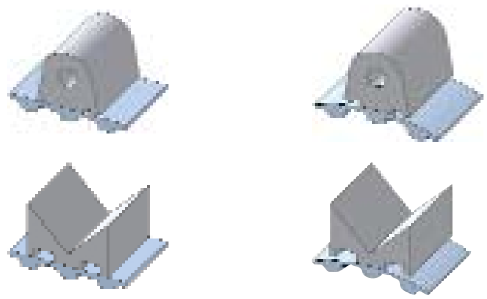
With a load introduced against the profile at a point 1/4" above the belt surface, the strength of the profile is 2,500 lbs. per square inch of welded foot area, or 1724 N/cm^2.



Profiles

4. Wide Base Profiles, and Profiles With Relief

For profiles requiring a wide base, such as pushers, one foot should be left unwelded. This allows for flexing around the pulley yet it remains rigid when loaded.



5. Segmented Profiles

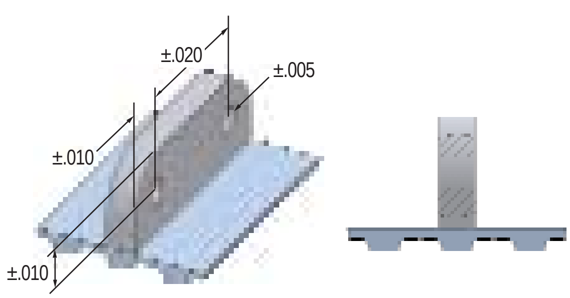
When large profiles are required as carriers, they must be either segmented or slotted. This is necessary to allow flexing around the pulley. On the flat conveyor surface, the profiles remain intact.

6. Profiles With Holes

Profiles with holes for securing paddles or other attachments can be produced. Holes are either drilled before bonding, or are molded into the profile depending upon the volume and requirements of the application.

Tolerances of the hole placement depends upon whether the holes are drilled or molded. The tolerance of the hole from the belt surface is subject to the melting process of the foot of the profile and the surface of the belt.

Generally, tolerances are as shown below. However, tighter tolerances are possible. Please consult our Applications Engineering Department.



7. Profiles With Inserts

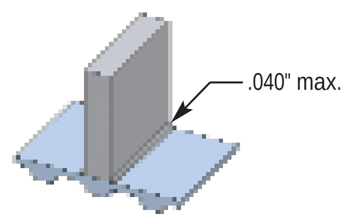
Profiles can be molded with metallic inserts. These are particularly useful in some applications to replace attachment chain.

The actual inserts can either be manufactured by Gates Mectrol or provided by the customer.

8. Flash Bead

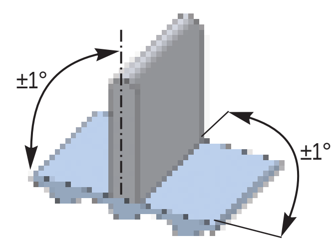
During the welding process, a bead of urethane develops at the meeting point of the profile and belt.

The welding bead is removed, "de-flashed", as necessary.



9. Perpendicularity

All profiles are perpendicular to 1°.

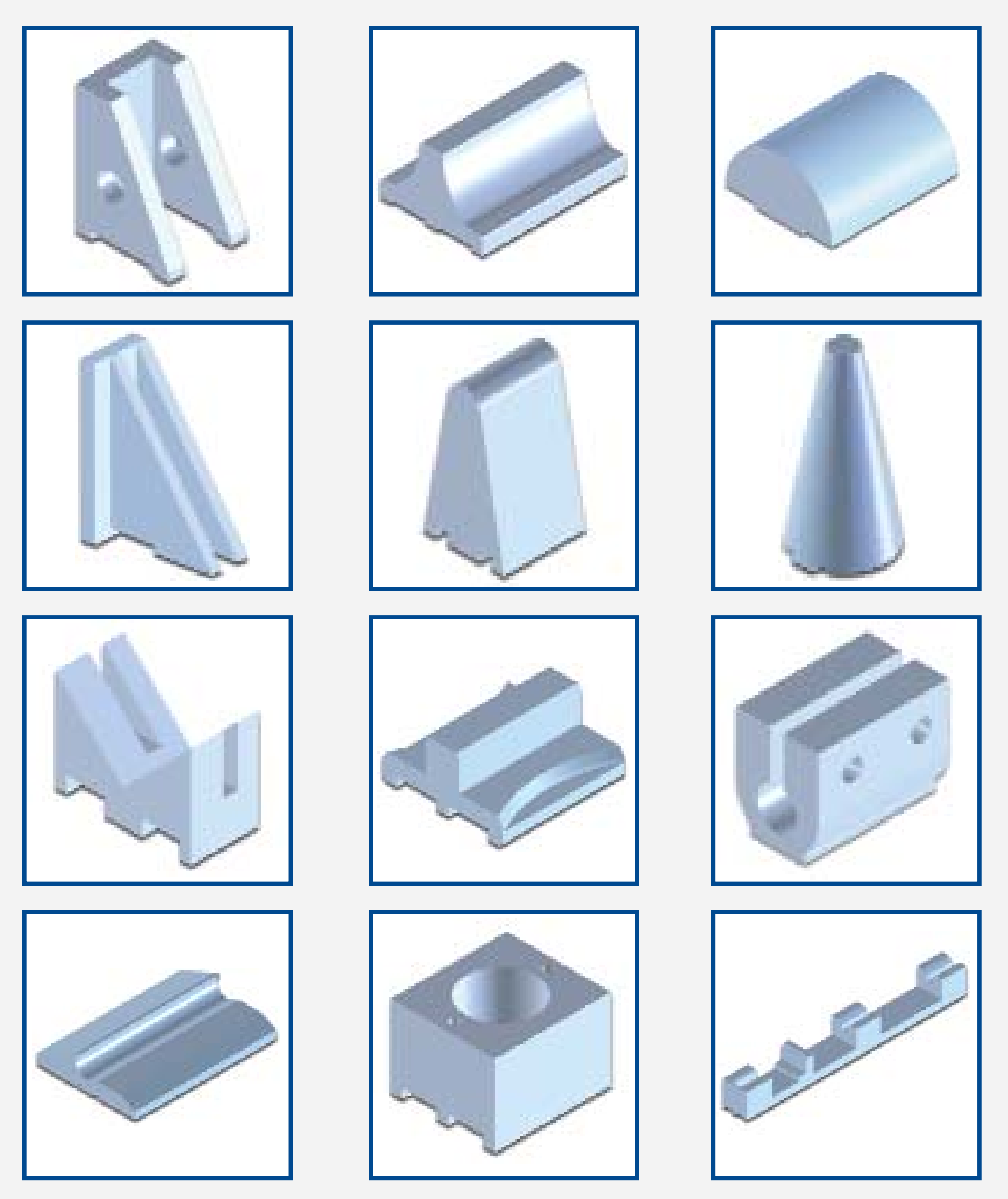


10. Ordering

When ordering a profiled belt, it is advisable to submit a drawing of the profiled belt. For your convenience, standard drawing forms are available from our Applications Engineering Department.

Once a design is finalized, Gates Mectrol will submit a drawing to the customer for approval. This custom belt-drawing number should then be used for future ordering.

Profiles



Gates Mectrol InStock profiles offer cost savings and fast delivery. Our most requested profiles are available with a seven day lead time for a standard or stock belt. Visit our web site for a review of our most popular profiles.

Our Application Engineering staff is available to you at **apps@gatesmectrol.com** or **1-800-394-4844**

Backings

If your product requires special handling on the production line, you may want to consider customized backings. We can produce virtually any of our timing belts with almost any combination of backing materials.

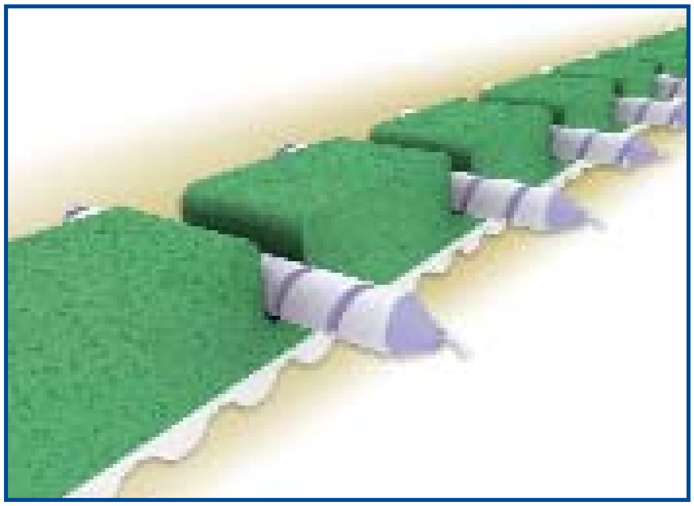
Features

A customized backing can provide:

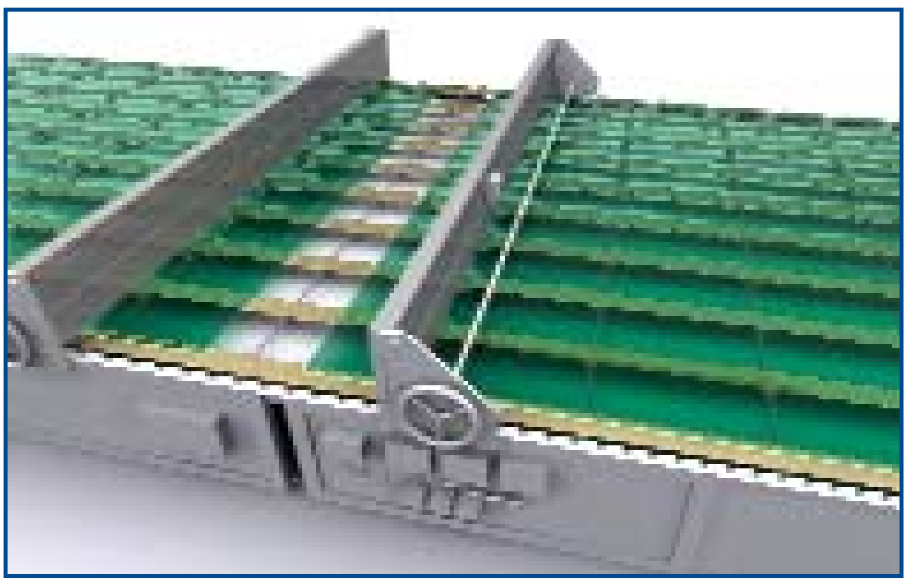
- A dramatic increase or decrease in the co-efficient of friction
- Varying levels of cushioning and durability through material thickness and hardness selection
- High release properties
- Static conductivity
- Various levels of chemical resistance
- An ability to alter wear characteristics

Application Characteristics

- High friction for feeding or separating applications
- Low friction for light feed or accumulation requirements
- Ability to conform to unusual product shapes
- Combine friction with vacuum for ultimate grab



A unique foam backing is used to carefully grasp and transport candles for cooling.



In glass conveying applications the use of a specially constructed, high friction backing allows for glass shards to be discharged from the belt.

Backings

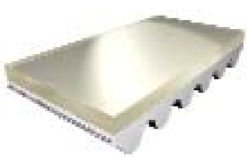
Perform a wide variety of functions

Many applications require belts with unique surface characteristics. A wide variety of co-extruded as well as post-laminated backings are available solving your toughest application requirements. Specifications follow.

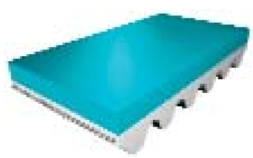
- Special nylon fabric can be added to the belt back or tooth side during the manufacturing process. This reduces the coefficient of friction for sliding surfaces or product accumulation
- High friction surfaces
- A variety of materials can be added for vibration dampening
- An antistatic surface is available with a resistivity of less than 10^6 Ohms/Square

Polyurethane

Gates Mectrol urethane backings are available in several different varieties. Some are produced as an integral part of the belt, some co-extruded and some are fused to the belt in a secondary operation. Available in different durometers, with different coefficients of friction, urethane backings are the toughest and most durable backing material.


Clear Urethane


Glass Backing


Blue Urethane


Ridge Top


White Urethane

Rubber

Feeding applications generally require extremely high friction. Rubber can provide this high friction, even while wet. Some rubber backings also offer antistatic properties, higher temperature ratings, and good chemical and abrasion resistance.


Linatex®


Linaplus FG™


Tan Natural Rubber


Nitrile Rubber


Thermoplastic Rubber

Silicone

Silicone rubber combines high friction along with excellent release and heat resistance.


FDA Silicone

Backings

Foam

Many applications require a combination of friction and the ability to conform to unusual product shapes. Gates Mectrol foam backings are available in different densities for various compliance, cushioning and friction surfaces. Belts can be constructed with a foam layer for cushioning and a tougher high friction outer layer.


HD Yellow


HD Gray


Yellow


Blue


Green


Brown


Red


Neoprene


Natural

PVC

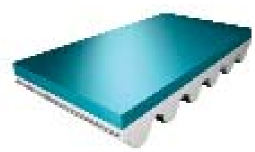
Available with unusual surface patterns and characteristics, PVC backings offer a well bonded, economical solution with very good wear properties.


Rough Top


Small Pebble


Large Pebble


Herringbone


Blue PVC

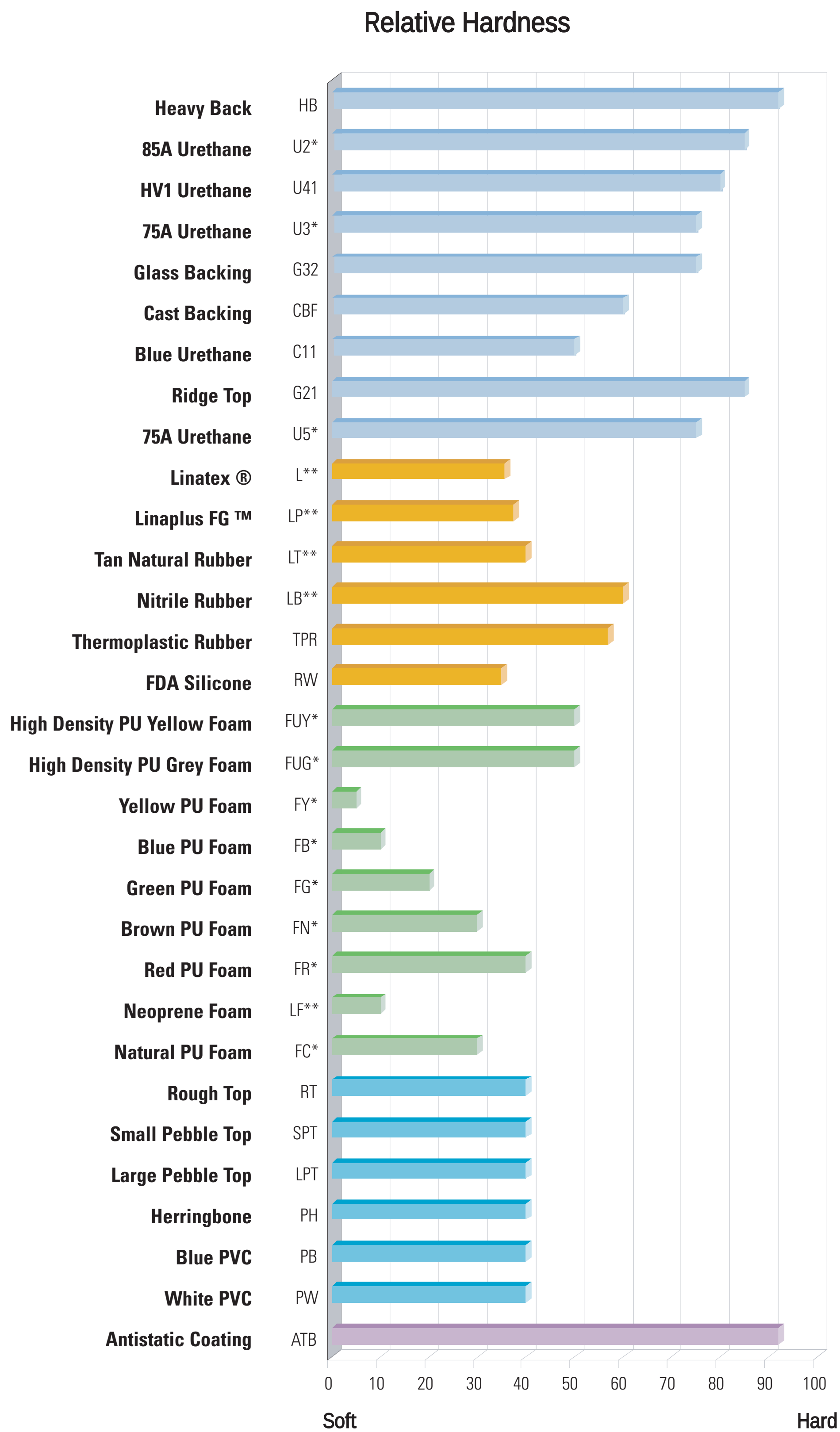

White PVC

Specialty Backings

Gates Mectrol can develop nearly any type of backing for unusual applications. Antistatic backing is an example.

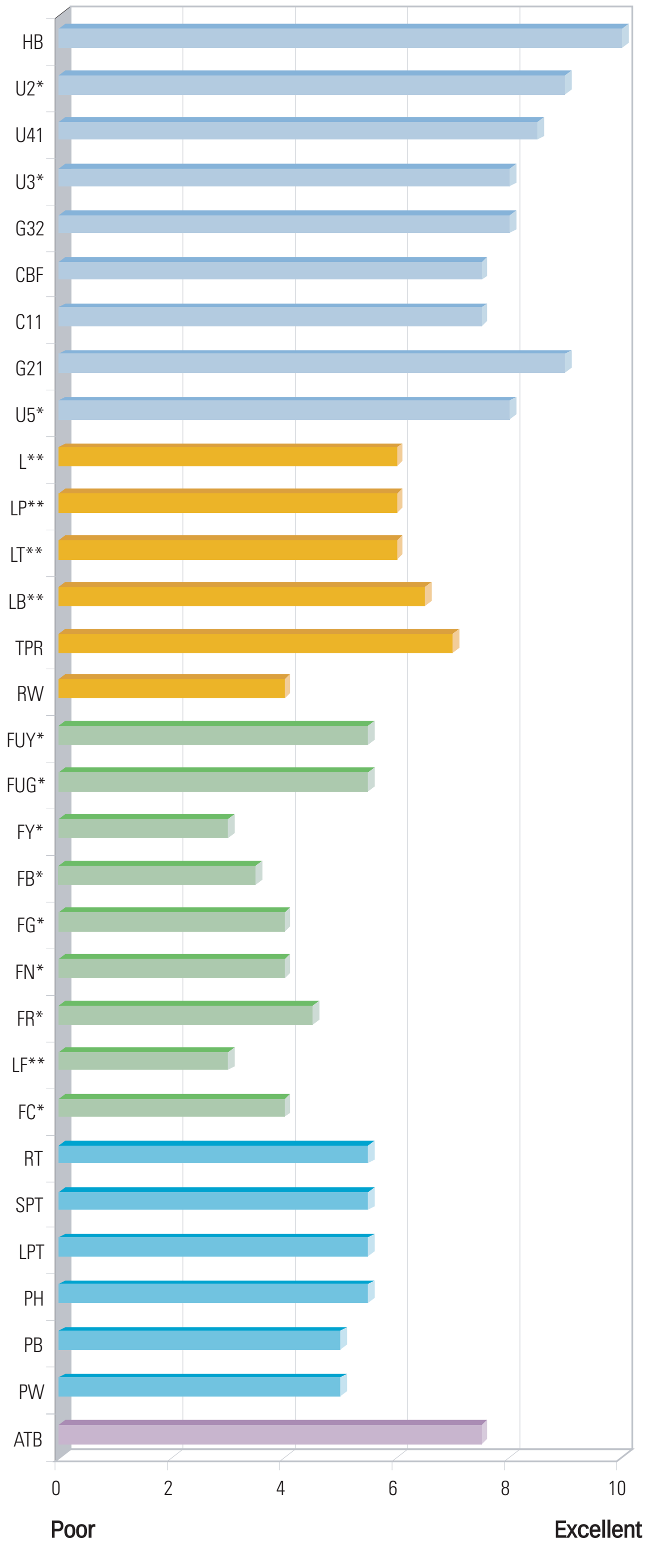

Antistatic Coating

Backings

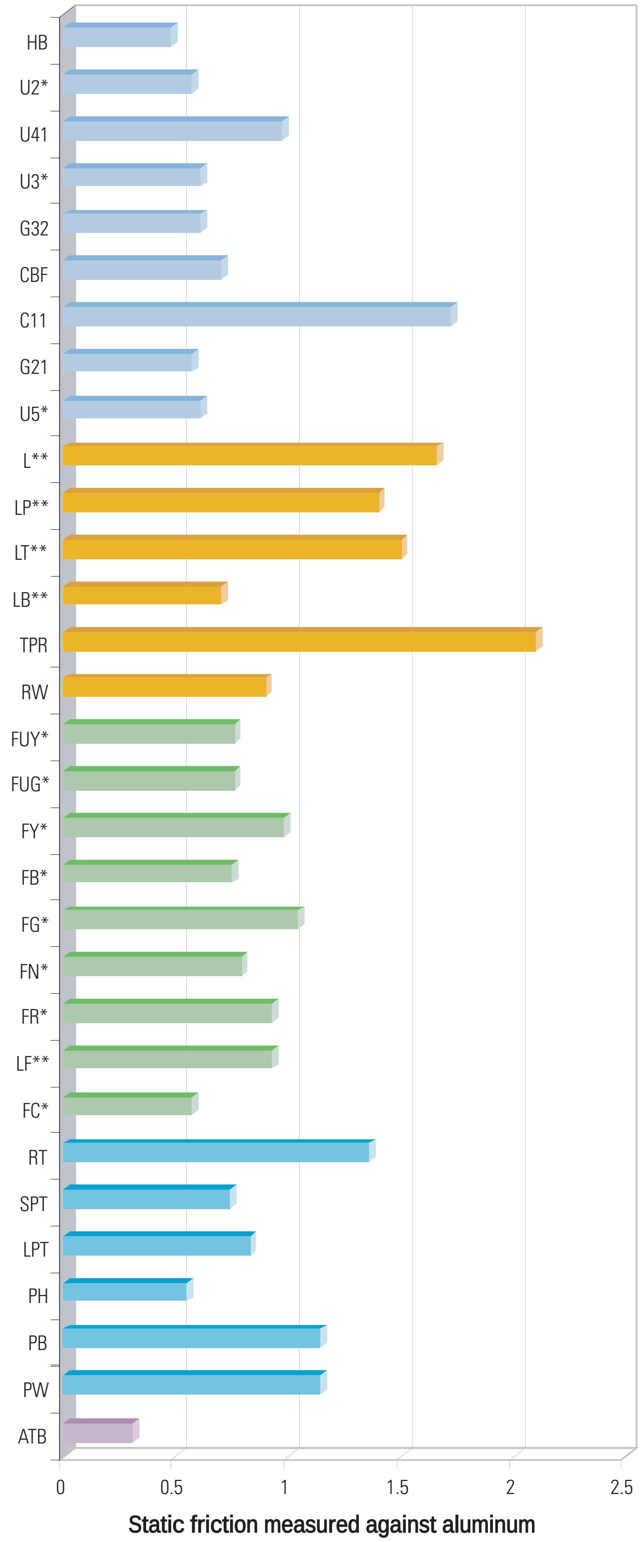

Relative Hardness
Heavy Back HB
85A Urethane U2*
HV1 Urethane U41
75A Urethane U3*
Glass Backing G32
Cast Backing CBF
Blue Urethane C11
Ridge Top G21
75A Urethane U5*
Linatex ® L**
Linaplus FG ™ LP**
Tan Natural Rubber LT**
Nitrile Rubber LB**
Thermoplastic Rubber TPR
FDA Silicone RW
High Density PU Yellow Foam FUY*
High Density PU Grey Foam FUG*
Yellow PU Foam FY*
Blue PU Foam FB*
Green PU Foam FG*
Brown PU Foam FN*
Red PU Foam FR*
Neoprene Foam LF**
Natural PU Foam FC*
Rough Top RT
Small Pebble Top SPT
Large Pebble Top LPT
Herringbone PH
Blue PVC PB
White PVC PW
Antistatic Coating ATB
0 10 20 30 40 50 60 70 80 90 100
Soft
Hard

Backings

Relative Abrasion Resistance



Static Coefficient of Friction



Backings

Polyurethane

HB	Heavy Back	Same as standard 92 A base material. Very tough and durable.
U2*	85A Urethane	Softer PU than base material. Higher friction, more flexibility, similar durability.
U41	HV1 Urethane	Specifically compounded for very high coefficient of friction.
U3*	75A Urethane	Softer version of standard urethane. Better friction, more compression, flexible, very tough.
G32	Glass Backing	Longitudinal groove pattern for glass conveying. Good friction and grooves for holding back abrasives and dirt.
CBF	Cast Backing	High friction with no seam or bonding issues to belt. Available on belts under 600 mm diameter.
C11	Blue Urethane	Extremely high coefficient of friction. Ideal for feeding applications, retains abrasion resistance.
G21	Ridge Top	Durable backing with longitudinal ridges. Ideal for conveying oily steel.
U5*	75A Urethane	Softer, high friction with very good abrasion resistance.

Rubber

L**	Linatex ®	High friction, pure gum rubber. Good abrasion resistance, excellent for pulling and feeding applications.
LP**	Linaplus FG ™	FDA approved, high friction pure gum rubber.
LT**	Tan Natural Rubber	Natural pure gum rubber, high friction.
LB**	Nitrile Rubber	Oil and fuel resistant, synthetic rubber.
TPR	Thermoplastic Rubber	High friction, ideal for conveying applications. Good oil, ozone and abrasion resistance.

Silicone Rubber

RW	FDA Silicone	High release, high friction, FDA approved.

Foam

FUY*	High Density PU Yellow Foam	High friction. Very good abrasion resistance. Excellent for paper feed applications.
FUG*	High Density PU Gray Foam	High friction. Very good abrasion resistance. Excellent for paper feed applications.
FY*	Yellow PU Foam	Lower density. Excellent cushioning and conforming to products while providing good friction.
FB*	Blue PU Foam	Low density. Excellent cushioning and conforming to products while providing good friction.
FG*	Green PU Foam	Mid range density, firmer holding and cushioning, excellent friction.
FN*	Brown PU Foam	Mid range density, firmer holding and cushioning, excellent friction.
FR*	Red PU Foam	Upper range density, good cushioning, friction and abrasion resistance.
LF**	Neoprene Foam	Black neoprene good abrasion resistance, compliance and static conductivity.
FC*	Natural PU Foam	Celloflex.

PVC

RT	Rough Top	Intricate surface modeling, excellent friction surfaces. Great for glass and incline conveyors.
SPT	Small Pebble Top	Textured surface with small nubs for non-slip surface.
LPT	Large Pebble Top	Textured surface with larger nubs for non-slip surface.
PH	Herringbone	Raised herringbone pattern for non-slip and dispersing surface.
PB	Blue PVC	Smooth high sheen, high friction surface.
PW	White PVC	Smooth white, FDA high friction surface for non-abrasive applications.

Special

ATB	Antistatic Coating	Extremely good conductivity characteristics for electronic and explosives conveying applications.

Backings

	Hardness Shore A / Density Kg/m (3)	Material Thickness mm	Abrasion Resistance Rating ‡	Static Coefficient of Friction †	Kinetic Coefficient of Friction †	Max. Temp. Degrees C	Pulley Diameter Factor	Oil Resistance	Color
Polyurethane									
HB	92	2	10	0.5	0.5	80	30	E	Clear
U2*	85	2 or 3	9	0.6	0.5	80	30	E	Clear
U41	80	1	8.5	1.0	0.8	80	30	E	Clear
U3*	75	2 or 3	8	0.6	0.6	70	30	E	Clear
G32	75	5	8	0.6	0.6	70	Ø 100mm	E	Clear
CBF	60	1 to 3	7.5	0.7	0.5	70	25	E	Clear
C11	50	1.5	7.5	1.7	0.9	60	20	E	Blue
G21	85	3	9	0.6	0.5	80	Ø 100mm	E	Clear
U5*	75	2 or 3	8	0.6	0.6	70	25	E	White
Rubber									
L**	35	1/16" to 1/2"	6	1.6	1.6	60	20	P	Red
LP**	38	1/16" to 3/16"	6	1.4	1.4	60	20	P	White
LT**	40	1/16" to 1/4"	6	1.5	1.5	60	20	P	Tan
LB**	60	1/16" to 1/4"	6.5	0.7	0.5	110	25	E	Black
TPR	57	3	7	2.1	1.4	105	25	G	Red
Silicone Rubber									
RW	35	1 or 2	4	0.9	0.9	200	20	P	White
Foam									
FUY*	50	2 to 5	5.5	0.8	0.8	60	30	E	Yellow
FUG*	50	2 to 5	5.5	0.8	0.8	60	30	E	Gray
FY*	- / 160	6 to 12	3	1.0	1.0	60	15	E	Yellow
FB*	- / 220	6 to 12	3.5	0.8	0.8	60	15	E	Blue
FG*	20 / 300	6 to 12	4	1.0	1.0	60	15	E	Green
FN*	30 / 400	6 to 12	4	0.8	0.8	60	15	E	Brown
FR*	40 / 500	6 to 12	4.5	0.9	0.9	60	20	E	Red
LF**	- / 250	1/8" to 1/2"	3	0.9	0.9	60	15	A	Black
FC*	30 / 400	2 to 5	4	0.6	0.5	60	15	E	Natural
PVC									
RT	40	4.5	5.5	1.4	1.3	60	Ø 90mm	P	Blue-green
SPT	40	1.5	5.5	0.7	0.6	60	Ø 25mm	P	White
LPT	40	6	5.5	0.8	0.7	60	Ø 40mm	P	White
PH	40	4.5	5.5	0.6	0.3	60	Ø 90mm	P	White
PB	40	1 or 2	5	1.1	1.1	60	Ø 40mm	P	Blue-green
PW	40	2	5	1.1	1.1	60	Ø 40mm	P	White
Special									
ATB	92	N/A	7.5	0.3	0.3	80	N/A	E	Black

* Add thickness in mm to designator
** Add thickness in 1/16” to designator
‡ 10 = very high resistance
† Friction measured against aluminum
Oil resistance: E = Excellent G = Good P = Poor A = Acceptable

Minimum Pulley Diameter = (Pulley Diameter Factor) x (Material Thickness) or above listed diameter
Note: Pulley diameter must be greater than or equal to the minimum pulley required for a given belt section. See belt specifications.

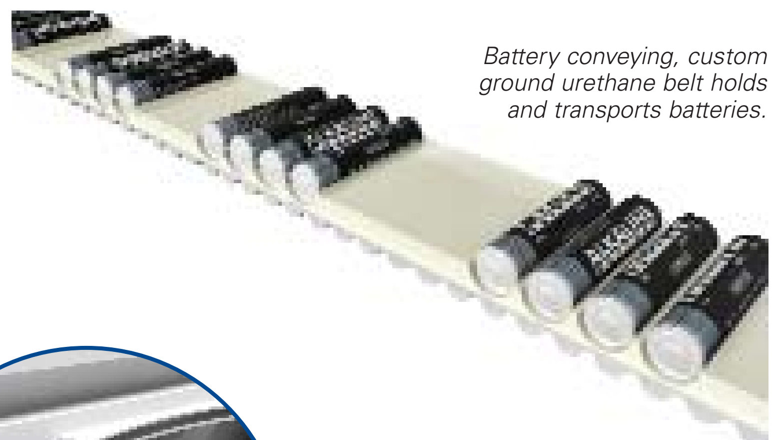
Fabrication Capabilities

Gates Mectrol can provide you with a wide range of base manufacturing modifications. But if your application requires more, we also provide a full range of secondary fabrication possibilities.

Whether grinding edges and surfaces to tight tolerances, punching and machining holes and slots, or CNC machining of three dimensional contours, Gates Mectrol can provide a complete solution.

Features

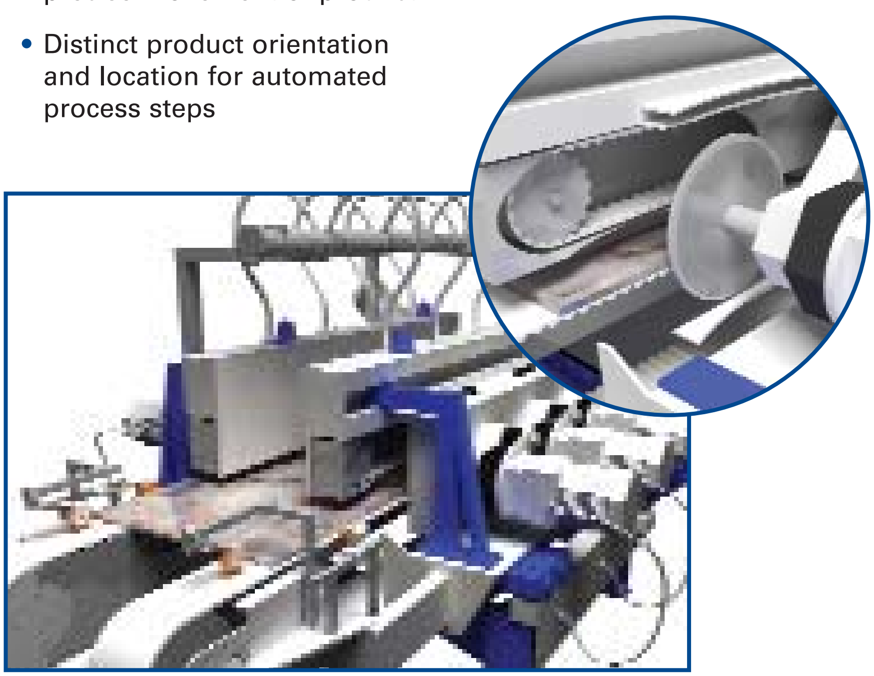
- Nearly unlimited customizing options
- Ground tolerances on nearly any dimension for extra precision
- Unusual shapes, contours and configurations
- Holes, slots, and any CNC machined shape in the belt surface
- Combination of primary tooling and secondary machining to achieve any design potential



Battery conveying, custom ground urethane belt holds and transports batteries.

Application Characteristics

- Vacuum conveying belts
  - machined tooth side and perforations
- Precision machined belts for precise movement of product
- Distinct product orientation and location for automated process steps



Squaring machine utilizes custom belts with precision ground thickness and width.

Our Application Engineering staff is available to you at **apps@gatesmectrol.com** or **1-800-394-4844**

Truly Endless Belts

Certain power transmission and high-performance positioning applications require more strength and stiffness than a welded belt can offer.

Gates Mectrol offers two types of truly endless belts for the job.

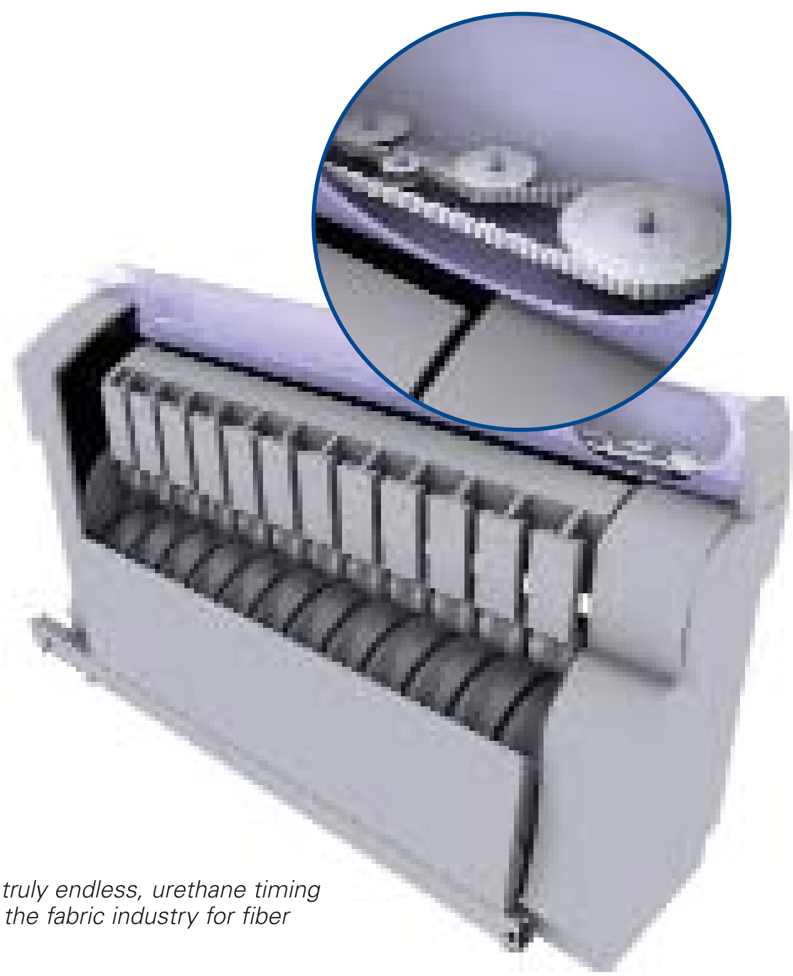
- Gates Mectrol **F-Series** belts, flex belts, are made to custom lengths ranging from 2.5 to 12.5 meters. A unique process provides the flexibility to have custom sized belts without expensive tooling.
- Gates Mectrol **S-Series** belts, cast belts, are produced on fixed molds and have a continuously wound steel or Kevlar® cord. They are available in stock sizes.

Application Characteristics

- Power transmission
- High power, high performance conveying
- Harsh environment
  - Abrasion and chemical resistance
- Applications where cleanliness is critical

Features

- Helically wound cords for high strength, truly endless power transmission capabilities
- High quality, thermo-set polyurethane designed specifically for timing belt applications (S-Series) or thermoplastic urethane for longer length belts (F-Series)
- Available with either steel or Kevlar® reinforcement
- Standard molded sleeves (S-Series) or custom length belts available - up to 12.5 meters (F-Series)
- Nylon tooth surface option on F-Series for quieter operation



Double sided, truly endless, urethane timing belt is used in the fabric industry for fiber winding.

Our Application Engineering staff is available to you at **apps@gatesmectrol.com** or **1-800-394-4844**

F-Series Belts

F-Series belts, **flex belts**, are produced with steel or Kevlar® reinforcing cords and the same tough urethane as Gates Mectrol's standard linear belts.

Belt Section	XL	L	H	XH	T5	T10	T20	AT5	AT10	AT20	HTD5	HTD8
Minimum Length	99.0"	99.0"	99.0"	99.0"	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Maximum Length	236"	492"	492"	492"	10.0	12.5	12.5	10.0	12.5	12.5	10.0	12.5
Minimum Width	.25"	.25"	.50"	1.0"	10mm	10mm	16mm	10mm	16mm	25mm	10mm	16mm
Maximum Width	4.0"	6.0"	4.0"	4.0"	100mm	100mm	150mm	100mm	100mm	150mm	150mm	150mm
Double Sided	Up to 196"	No	Up to 196"	No	Up to 5 meters	Up to 5 meters	No	Up to 5 meters	Up to 5 meters	No	Up to 5 meters	Up to 5 meters

To Order Belts: F-Series (Inch Profile)

2360 XL 400 NT F

- F — Series, F
- NT — Optional Nylon teeth - F-Series Only
- 400 — Width: 4" x 100
- XL — Profile: XL
- 2360 — Length: 236" x 10 = 2360

F-Series Belts

Inch Profile Belts - F-Series

Belt Section		XL	L	H	XH
Pitch		.200"	.375"	.500"	.875"
Ultimate Tensile Strength	Lb/in N/25mm	810 3600	1225 5460	1665 7410	2965 13200
Max Allowable Tension per Inch/mm Belt Width	Lb/in N/25mm	200 900	305 1365	415 1855	740 3300
Allowable Effective Tension for Belt Teeth	Lb/in N/25mm	180 790	360 1580	440 1930	880 3855
Specific Belt Weight w_b (Weight/ft/inch)	Lb kg	0.037 0.017	0.058 0.026	0.067 0.030	0.179 0.081
Minimum Number of Pulley Teeth		10	10	14	18
Min. Pitch Diameter		.64”	1.19”	2.23”	5.01”
Minimum Diameter of Tension Idler	in mm	1.125 30	2.375 60	3.125 80	5.875 150
Temperature Range		-30°C to +80°C (-22°F to 176°F)			

Metric Profile Belts - F-Series

Belt Section		T5	AT5	T10	T10HF	AT10	T20	AT20	HTD5	HTD8
Pitch		5mm	5mm	10mm	10mm	10mm	20mm	20mm	5mm	8mm
Ultimate Tensile Strength	Lb/in N/25mm	780 3480	1395 6200	1755 7800	2475 11000	2965 13200	2965 13200	4675 20800	2475 11000	2965 13200
Max Allowable Tension per Inch/mm Belt Width	Lb/in N/25mm	195 870	350 1550	440 1950	620 2750	740 3300	740 3300	1170 5200	620 2750	740 3300
Allowable Effective Tension for Belt Teeth	Lb/in N/25mm	200 880	290 1270	380 1665	380 1665	585 2565	715 3135	1220 5345	220 965	410 1800
Specific Belt Weight w_b (Weight/meter/cm)	Lb kg	0.048 0.022	0.070 0.032	0.097 0.044	0.105 0.048	0.121 0.055	0.160 0.072	0.208 0.095	0.090 0.041	0.132 0.060
Minimum Number of Pulley Teeth		10	15	16	12	18	15	18	14	20
Min. Pitch Diameter		16mm	24mm	51mm	38mm	57mm	96mm	115mm	22mm	51mm
Minimum Diameter of Tension Idler	in mm	1.125 30	2.375 60	3.125 80	2.375 60	4.750 120	4.750 120	7.125 180	2.375 60	4.750 120
Temperature Range		-30°C to +80°C (-22°F to 176°F)								

To Order Belts: F-Series (Metric Profile)

100 T10 3000 NT F

- F — Series, F
- NT — Optional Nylon teeth - F-Series Only
- 3000 — Length: 3000mm
- T10 — Profile: T10
- 100 — Width: 100mm

S-Series Belts

S-Type belts, **cast belts**, are produced on discreet molds and are available from stock in the sizes listed. For belt lengths not listed, please consult a Gates Mectrol applications engineer.

No. of Teeth	Belt Length (mm) T2.5	T5	T5 DL
30		150	
33		165	
36		180	
37		185	
40		200	
43		215	
44		220	
45		225	
48	120		
49		245	
50		250	
51		255	
52		260	260
54		270	
55		275	
56		280	
59	145	295	
61		305	
63		315	
64	160		
66		330	
68		340	
70		350	
71	177.5	355	
72	180		
73	182.5	365	
74	185		
78		390	
80	200	400	

No. of Teeth	Belt Length (mm) T2.5	T5	T5 DL
82		410	410
84		420	
89		445	
90		450	
91		455	
92	230		
95		475	
96		480	480
98	245		
100		500	
102		510	
103			515
105		525	
106	265		
109		545	
110		550	
112		560	
114	285		
115		575	
116	290		
118			590
122	305	610	
124		620	620
126		630	
127	317.5		
128		640	
130		650	
132	330	660	
135		675	

No. of Teeth	Belt Length (mm) T2.5	T5	T5 DL
138		690	
140		700	
144		720	
150		750	750
152	380		
155		775	
158	395		
163		815	815
168	420	840	
172			860
180		900	
188		940	940
192	480		
198		990	
200	500		
215		1075	
216	540		
220		1100	
240	600		
243		1215	
248	620		
260	650		
263		1315	
276		1380	
280	700	2090	
312	780		
366	915		
380	950		

To Order Belts: S-Series

100 T10 500 S

- S — Series, S
- 500 — Length: 500mm
- T10 — Profile: T10
- 100 — Width: 100mm

S-Series Belts

No. of Teeth	Belt Length (mm) T10	T10 DL
26	260	
33	330	
37	370	
40	400	
41	410	
44	440	
45	450	
50	500	
51	510	
52	520	520
53	530	
56	560	
60	600	600
61	610	
63	630	630
66	660	
69	690	
70	700	
72	720	720
73	730	
75	750	
78	780	
81	810	
84	840	840
88	880	
89	890	
90	900	
91	910	
92	920	920

No. of Teeth	Belt Length (mm) T10	T10 DL
96	960	
97	970	
98	980	980
101	1010	
108	1080	
110	1100	
111	1110	
114	1140	
115	1150	
121	1210	1210
124	1240	
125	1250	
130	1300	
132	1320	
135	1350	
139	1390	
140	1400	
142	1420	
145	1450	
146	1460	
150	1500	
156	1560	
161	1610	
175	1750	
178	1780	
188	1880	
196	1960	
225	2250	

No. of Teeth	Belt Length (mm) AT5	AT10
45	225	
50		500
51	255	
55	275	
56	280	560
60	300	
61		610
66		660
68	340	
70		700
73		730
75	375	
78	390	780
80		800
81		810
84	420	840
89		890
91	455	
92		920
96		960
98		980
100	500	
101		1010
105		1050
108		1080
109	545	
115		1150
120	600	1200
121		1210
122	610	
125		1250
126	630	
132	660	1320
140		1400
144	720	
150	750	1500
156	780	
160		1600
165	825	
170		1700
180		1800
195	975	
210	1050	
225	1125	
300	1500	

Available Widths

T2.5	4mm up to 200mm
T5	6mm up to 200mm
T10	10mm up to 200mm
AT5	6mm up to 200mm
AT10	16mm up to 200mm

Field Welders

Minimize down-time, reduce manufacturing costs

Features

- Simple design to produce endless belts in the field
- Pre-programmed, state-of-the-art temperature controls
- Wide selection of inch and metric pitch models
- Easy, step-by-step processing instructions
- Complete turnkey package

Tension Meter

Achieving correct static belt tension is easy

Gates Mectrol TC6 Tension Meter determines correct belt tension - critical for belt peak performance.

- Tension the belt too low:
  - Belt may ratchet (skip teeth on pulley)
  - Belt life may be decreased due to increased flex fatigue
- Tension the belt too high:
  - System bearing life may be decreased due to excessive bearing loads
  - Belt life may be decreased due to excessive belt tensile loads

The natural frequency of a belt span is a function of the static tension, span length and belt span mass. The TC6 measures and displays the belt's natural frequency. Using the measured frequency in a simple formula determines the belt's static tension.

The TC6 uses an optical sensor to determine the belt's natural frequency, and therefore it can be used on belts made of non-ferrous (as well as ferrous) materials. The TC6 also comes standard with an RS232 port and software for downloading the measurements to a MS Excel spreadsheet.

Technical Specifications

• Measuring Range:	<10 Hz (up to >800 Hz)
• Accuracy:	± 3% of the measured value (± 1 digit)
• Measured Value Reading:	6-digit LCD for the measured value and other parameters (memory, location, time, etc.)
• L × W × H:	120mm × 60mm × 25mm; Probe Neck is approximately 20cm long
• Weight:	Approximately 180g
• Probe:	Opto-Electronic method using visible, red light
• Light Exit:	At the lateral end of a flexible and rotating neck (approx. 20cm long)
• Battery:	9V monoblock battery (in battery compartment) 3V CR2032 button cell (inside the gauge)
• Data Transfer:	RS232, 9600 Baud, N81

Technical Design Tools Online

Gates Mectrol's belt design tools make selecting the right belt for your application easy anytime: http://apps.gatesmectrol.com/

Gates Mectrol has introduced a new suite of online design tools for calculating all types of urethane timing belt applications.

These new design tools are, by far, industry state-of-the-art, offering the most comprehensive, easy to use and accurate calculations available.

For linear and rotary positioning applications, synchronous conveying or power transmission, simply enter all of your known parameters, and these programs will guide you through step-by-step calculations, resulting in the selection of the most appropriate belt for your application.

Included with your output will be information which is "total system" inclusive, providing necessary data for selecting all related drive components, as well as for programming electronic controls.

Log on to www.gatesmectrol.com today, and register for instant access to the industry's best calculation tools available.

For those without Internet access, the following Belt Selection Guide, offers a manual approach to the basics of our belt selection applications.

Belt Selection Guide

Many conveying timing belts operate at low speeds and minimal loads. This eliminates the need for extensive calculations and a simplified approach to belt selection can be used. For these lightly loaded applications, the belt can be selected according to the dimensional requirements of the system, product size, desired pulley diameter, conveyor length, etc.

The belt width ***b*** is often determined according to the size of the product conveyed, and as a rule, the smallest available belt pitch is used. For proper operation, the pre-tension T_i should be set as follows:

$$T_i \approx 0.3 \cdot b \cdot T_{1all}$$

where: T_i = belt pre-tension
T_{1all} = max allowable belt tension for 1" or 25mm wide belt (see Table 1 or Table 2)

U.S. customary units: T_i [lb], T_{1all} [lb/in], b [in]
Metric units: T_i [N], T_{1all} [N/25mm], b [mm].

For all applications where the loads are significant, the following step-by-step procedure should be used for proper belt selection.

Step 1. Determine Effective Tension

The effective tension T_e at the driver pulley is the sum of all individual forces resisting the belt motion. The individual loads contributing to the effective tension must be identified and calculated based on the loading conditions and drive configuration. However, some loads cannot be calculated until the layout has been decided.

To determine the effective tension T_e use one of the following methods for either conveying or linear positioning.

Conveying

T_e for conveying application is primarily the sum of the following forces (see Figs. 1 and 2).

1. The friction force F_f between the belt and the slider bed resulting from the weight of the conveyed material.

$$F_f = \mu \cdot w_m \cdot L_m \cdot \cos\beta$$

where: μ = coefficient of friction between the slider bed and the belt (see Table 1A)
w_m = load weight per unit length over conveying length
L_m = conveying length
β = angle of conveyor incline

U.S. customary units: F_f [lb], w_m [lb/ft], L_m [ft].
Metric units: F_f [N], w_m [N/m], L_m [m].

2. The gravitational load F_g to lift the material being transported on an inclined conveyor.

$$F_g = w_m \cdot L_m \cdot \sin\beta$$

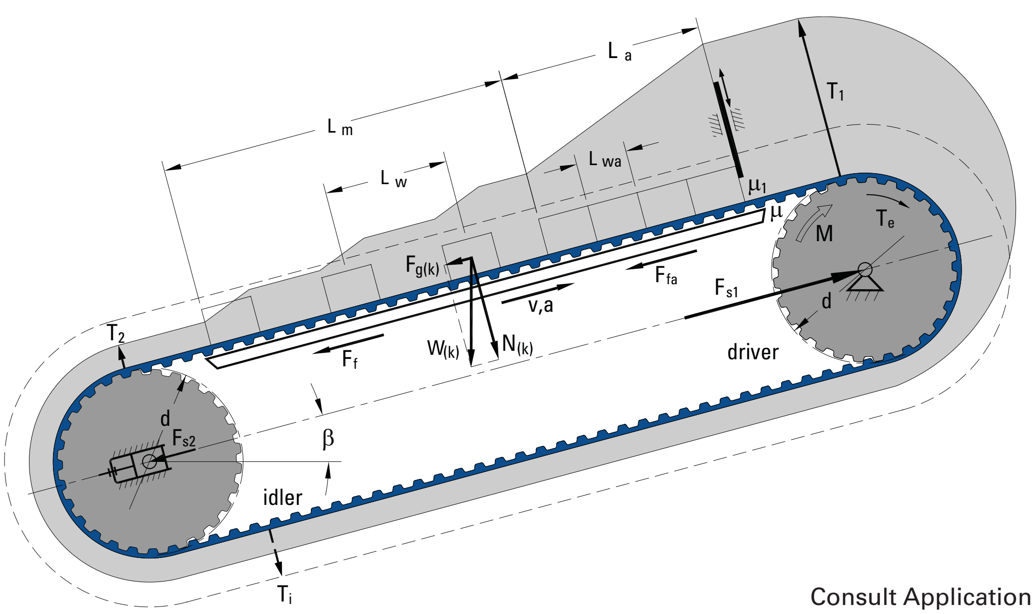


Fig. 1

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Belt Selection Guide

3. The friction force F_{fv} resulting from vacuum in vacuum conveyors.

$$F_{fv} = \mu \cdot P \cdot A_v$$

where: P = pressure (vacuum) relative to atmospheric
A_v = total area of vacuum openings

U.S. units: F_{fv} [lb], P [lb/ft^2], A_v [ft]
Metric units: F_{fv} [N], P [Pa], A_v [m]

The formula above assumes a uniform pressure and a constant coefficient of friction.

4. The friction force F_{fa} over the accumulation length in material accumulation applications.

$$F_{fa} = (\mu + \mu_a) \cdot w_{ma} \cdot L_a \cdot \cos\beta$$

where: L_a = accumulation length
μ_a = friction coefficient between accumulated material and the belt (see Table 1A)
w_{ma} = material weight per unit length over the accumulation length

U.S. customary units: L_a [ft], w_{ma} [lb/ft].
Metric units: L_a [m], w_{ma} [N/m].

5. The inertial force F_a caused by the acceleration of the conveyed load (see linear positioning).

6. The friction force F_{fb} between belt and slider bed caused by the belt weight.

$$F_{fb} = \mu \cdot w_b \cdot b \cdot L_c \cdot \cos\beta$$

where: w_b = specific belt weight
b = belt width
L_c = conveying length

U.S. customary units: w_b [lb/ft^2], b [ft], L_c [ft].
Metric units: w_b [N/m^2], b [m], L_c [m].*

For initial calculations, use belt width which is required to handle the size of the conveyed product.

Thus for conveyors, T_e is expressed by:

$$T_e = F_f + F_g + F_{fv} + F_{fa} + F_a + (F_{fb}) + \ldots$$

F_{fb} can be calculated by estimating the belt mass. In most cases, this weight is insignificant and can be ignored.

Note that other factors, such as belt supporting idlers, or accelerating the material fed onto the belt, may also account for some power requirement. In start-stop applications, acceleration forces as presented for linear positioning, may have to be evaluated.

Linear Positioning

T_e for a linear positioning application is primarily the sum of the following six factors (see Fig. 3).

1. The force F_a required for the acceleration of a loaded slide with the mass m_s (replace the mass of the slide with the mass of the package in conveying).

$$F_a = m_s \cdot a$$

The average acceleration a is equal to the change in velocity per unit time.

$$a = \frac{v_f - v_i}{t}$$

where: v_f = final velocity
v_i = initial velocity
t = time

U.S. customary units: F_a [lb], a [ft/s^2], v_f and v_i [ft/s] t[s].
The mass is derived from the weight W_s [lb] and the acceleration due to gravity g (g = 32.2 ft/s^2):

$$m_s = \frac{W_s}{g} = \frac{W_s}{32.2}\left[\frac{lb \cdot s^2}{ft}\right]$$

Metric units: F_a [N], a [m/s^2], v_f and v_i [m/s], t [s], m_s [kg].

2. The friction force F_f between the slide and the linear rail is determined experimentally, or from data from the linear bearing manufacturer. Other contributing factors to the friction force are bearing losses from the yolk, piston and pillow blocks (see Fig. 3).

3. The externally applied working load F_w (if existing).

4. The weight W_s of the slide (not required in horizontal drives).

* *If working in US units, w_b found in the belt specifications must be converted to the units lb/ft². If working in metric units, w_b must be converted to the units N/m².*

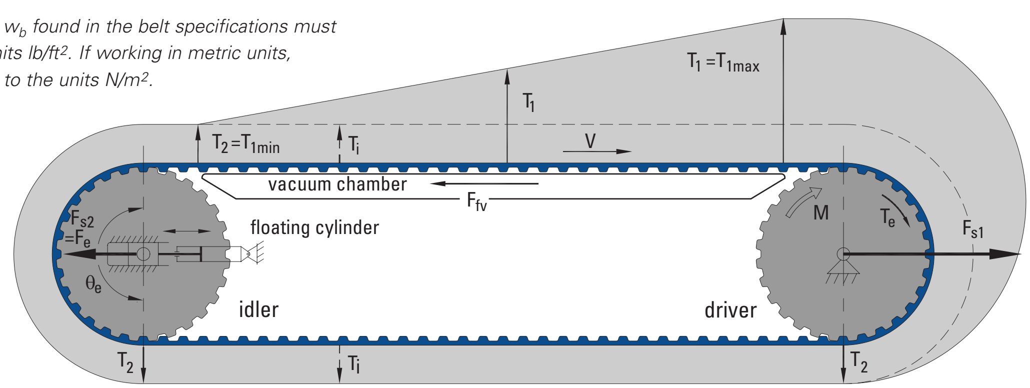

Fig. 2

5. The force $\boldsymbol{F_{ai}}$ required to accelerate the idler.

$$F_{ai} = \frac{J_i \bullet \alpha}{r_o} = \frac{m_i \bullet r_o^2}{2 \bullet r_o} \bullet \frac{a}{r_o} = \frac{m_i \bullet a}{2}$$

where: $J_i = \frac{m_i \cdot r_o^2}{2}$ = inertia of the idler
m_i = mass of the idler
r_o = idler outer radius
$\alpha = \frac{a}{r_o}$ = angular acceleration

In the formula above, the mass of the idler $\boldsymbol{m_i}$ is approximated by the mass of a full disk.

$$m_i = \rho \bullet b_i \bullet \pi \bullet r_o^2$$

where: ρ = density of idler material
b_i = width of the idler

U.S. units: ρ [lb•s²/ft⁴], b_i and r_o [ft].
Metric units: ρ [kg/m³], b_i and r_o [m].

6. The force $\boldsymbol{F_{ab}}$ required to accelerate the belt mass.

$$F_{ab} = m_b \bullet a$$

The belt mass $\boldsymbol{m_b}$ is obtained from the specific belt weight $\boldsymbol{w_b}$ and belt length and width.

$$m_b = \frac{w_b \bullet L \bullet b}{g}$$

U.S. units: F_{ab} [lb], m_b [lb•s²/ft], a [ft/s²], w_b [lb/ft²], L and b [ft],
g = 32.2 ft/s².
Metric units: F_{ab} [N], m_b [kg], a [m/s²], w_b [N/m²], L and b [m],
g = 9.81 m/s².*

Thus for linear positioners, $\boldsymbol{T_e}$ is expressed by:

$$T_e = F_a + F_f + F_w + W_s + [F_{ai}] + [F_{ab}]$$

Note that the forces in brackets can be calculated by estimating the belt mass and idler dimensions. In most cases, however, they are negligible and can be ignored.

Step 2. Select Belt Pitch

Use Graphs 2a, 2b, 2c or 2d to select the nominal belt pitch $\boldsymbol{p}$ according to $\boldsymbol{T_e}$. The graphs also provide an estimate of the required belt width. (For H pitch belts wider than 6" (152.4mm) and T10 pitch belts wider than 150mm, use Graph 1).

Step 3. Calculate Pulley Diameter

Use the preliminary pulley diameter $\boldsymbol{\tilde{d}}$ desired for the design envelope and the selected nominal pitch $\boldsymbol{p}$ to determine the preliminary number of pulley teeth $\boldsymbol{\tilde{z}_p}$.

$$\tilde{z}_p = \frac{\pi \bullet \tilde{d}}{p}$$

Round to a whole number of pulley teeth $\boldsymbol{z_p}$. Give preference to stock pulley diameters. Check against the minimum number of pulley teeth $\boldsymbol{z_{min}}$ for the selected pitch given in Table 1 or Table 2.

Determine the pitch diameter $\boldsymbol{d}$ according to the chosen number of pulley teeth $\boldsymbol{z_p}$.

$$d = \frac{p \bullet z_p}{\pi}$$

Step 4. Determine Belt Length and Center Distance

Use the preliminary center distance $\boldsymbol{\tilde{C}}$ desired for the design envelope to determine a preliminary number of belt teeth $\boldsymbol{\tilde{z}_b}$.

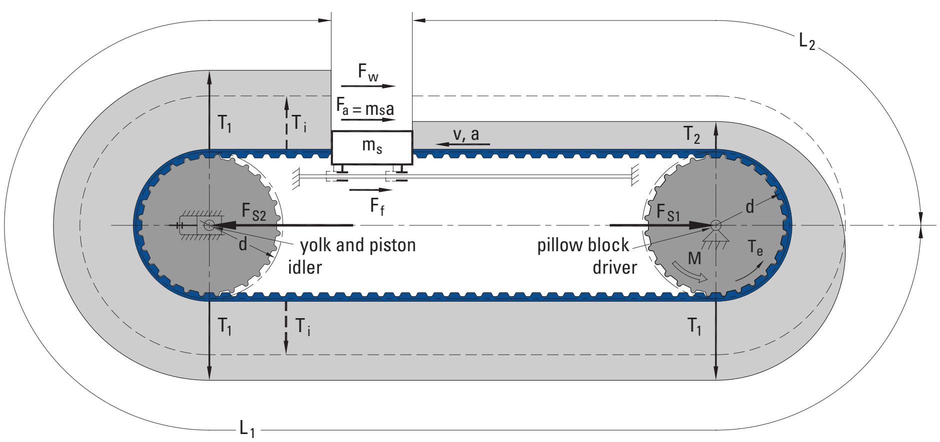

Fig. 3

Belt Selection Guide

For equal diameter pulleys:

$$\tilde{z}_b = 2 \cdot \frac{\tilde{C}}{p} + z_p$$

For unequal diameter pulleys: (See Fig. 4)

$$\tilde{z}_b \approx 2 \cdot \frac{\tilde{C}}{p} + \frac{z_{p_2} + z_{p_1}}{2} + \frac{p}{4C} \cdot \left(\frac{z_{p_2} - z_{p_1}}{\pi}\right)^2$$

Choose a whole number of belt teeth z_b. If you have profiles welded to the belt, consider the profile spacing while choosing the number of belt teeth.

Determine the belt length L according to the chosen number of belt teeth.

$$L = z_b \cdot p$$

Determine the center distance C corresponding to the chosen belt length.

For equal diameter pulleys:

$$C = \frac{L - \pi \cdot d}{2}$$

For unequal diameter pulleys:

$$C \approx \frac{Y + \sqrt{Y^2 - 2\,(d_2 - d_1)^2}}{4}$$

where: $Y = L - \frac{\pi \cdot (d_2 + d_1)}{2}$

Step 5. Calculate The Number of Teeth in Mesh of the Small Pulley

Calculate the number of teeth in mesh z_m, using the appropriate formula.

For two equal diameter pulleys:

$$z_m = \frac{z_p}{2}$$

For two unequal diameter pulleys:

$$z_m \approx z_{p_1} \cdot \left(0.5 - \frac{d_2 - d_1}{2\pi \cdot C}\right)$$

Step 6. Determine Pre-tension

The pre-tension T_i, defined as the belt tension in an idle drive, is illustrated as the distance between the belt and the dashed line in Figs. 1, 2, and 3. The pre-tension prevents jumping of the pulley teeth during belt operation. Based on experience, timing belts perform best with the slack side tension as follows:

$$T_2 = (0.1,...,0.3)\,T_e$$

Drives with a fixed center to center distance

Drives with fixed center distances have the position of the adjustable shaft locked after pre-tensioning the belt (see Figs. 1 and 3). Assuming tight and slack side tensions are constant over the respective belt lengths, and a minimum slack side tension in the range of the above relationship (uni-directional load only), the pre-tension is calculated utilizing the following equation:

$$T_i = T_2 + T_e \cdot \frac{L_1}{L}$$

where: L = belt length = $L_1 + L_2$
L_1 = tight side belt length
L_2 = slack side belt length

U.S. units: L_1 [ft], and L_2 [ft].
Metric units: L_1 [m], and L_2 [m].

Drives with a fixed center to center distance are used in linear positioning, conveying and power transmission applications. In linear positioning applications, the maximum tight side length is inserted in the equation above.

The pre-tension for drives with a fixed center distance can also be approximated using the

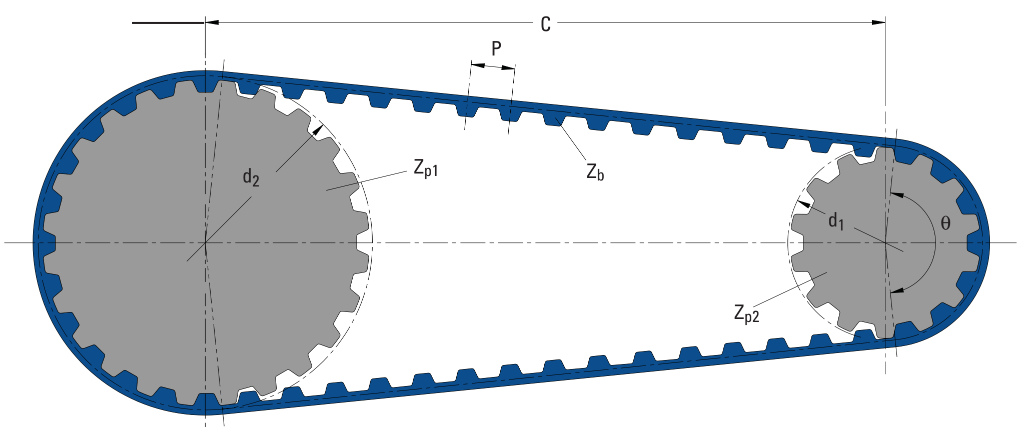

Fig. 4

following formulas:

Conveying

(see Figs. 1 and 2)

$$T_i = (0.45,...,0.55)\,T_e$$

Linear Positioning

(see Fig. 3)

$$T_i = (1.0,...,1.2)\,T_e$$

$$T_i = (1.0,..., 2.0)\,T_e$$ => for ATL series only

Drives with a constant slack side tension

Drives with constant slack side tension have an adjustable idler, tensioning the slack side, which is not locked (Figs. 2 and 5). During operation, the consistency of the slack side tension is maintained by the external tensioning force, F_e. Drives with a constant slack side tension may be considered for some conveying applications, they have the advantage of minimizing the required pre-tension.

The minimum pre-tension can be calculated from the analysis of the forces at the idler in Fig. 5:

$$T_i \approx T_2 = \frac{F_e}{2\sin\frac{\theta_e}{2}}$$

where θ_e is the wrap angle of the belt around the back bending idler (Fig. 5).

Step 7. Calculate Tight Side Tension and Slack Side Tension

Conveying

(see Figs. 1 & 2)

The tight side tension T_1 and the slack side tension T_2 are obtained by:

$$T_1 \approx T_i + 0.75T_e$$

$$T_2 = T_1 - T_e$$

Linear Positioning

(see Fig. 3)

The maximum tight side tension T_{1max} is obtained by:

$$T_{1max} \approx T_i + T_e$$

The respective minimum slack side tension T_{2min} is obtained by:

$$T_{2min} \approx T_i - T_e$$

for a fixed center distance.

Step 8. Calculate Belt Width

Determine the allowable tension T_{1all} for the cords of a 1" (or 25 mm) wide belt of the selected pitch given in Table 1 or Table 2. Note that T_{1all} is different for open end (positioning) and welded (conveying) belts. Determine the necessary belt width to withstand T_{1max}.

$$b \geq \frac{T_{1max}}{T_{1all}}$$

U.S. units: T_1 [lb], T_{1all} [lb/in], b [in].
Metric units: T_1 [N], T_{1all} [N/25mm], b [mm].

Determine the allowable effective tension T_{eall} for the teeth of a 1" (or 25 mm) wide belt of the selected pitch from Table 1 or Table 2. Note that T_{eall} is different for open end (positioning) and welded (conveying) belts.

Use Table 3 (Tooth in Mesh Factor) that follows to determine the tooth-in-mesh-factor t_m corresponding to the number of teeth in mesh z_m.

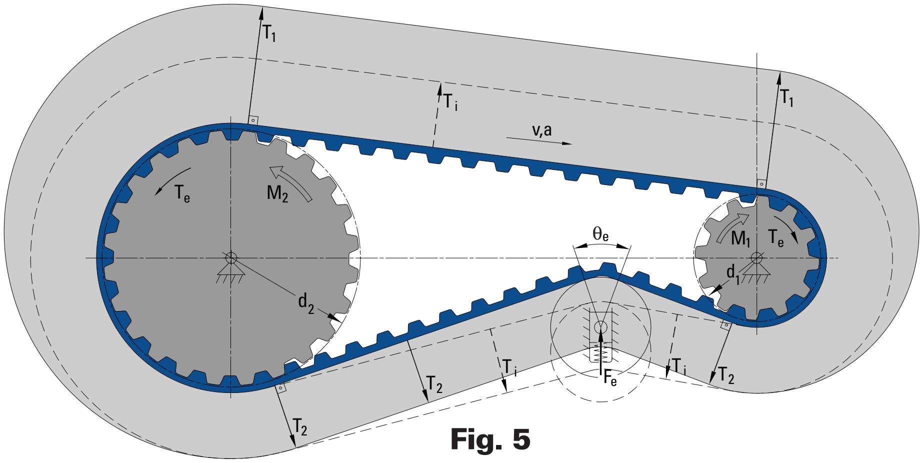

Fig. 5

Determine the speed factor t_v using Table 4 (Speed Factor) that follows.

Calculate the width of the belt teeth b necessary to transmit T_e using the following formula:

$$b \geq \frac{T_e}{T_{eall} \bullet t_m \bullet t_v}$$

U.S. units: T_e [lb], T_{eall} [lb/in], b [in].
Metric units: T_e [N], T_{eall} [N/25mm], b [mm].

Select the belt width that satisfies the last two conditions, giving preference to standard belt widths. However, belts of nonstandard widths are also available.

The factors t_m and t_v prevent excessive tooth loading and belt wear.

The forces contributing to T_e, which in Step 1 were estimated, can now be calculated more accurately. Evaluate the contribution of these forces to the effective tension and, if necessary, recalculate T_e and repeat steps 6, 7 and 8.

For conveyors, the dimensions of the transported products will normally determine the belt width.

Step 9. Calculate Shaft Forces

Determine the shaft force F_{s1} at the driver pulley:

For angle of wrap $\theta = 180°$:
$F_{s1} = T_1 + T_2$
For angle of wrap around the small pulley $\theta < 180°$ (unequal diameter pulleys):

$$F_{s1} = \sqrt{T_1^2 + T_2^2 - 2T_1 \bullet T_2 \cos\theta}$$

where $\theta = 2 \bullet \pi \bullet \left(0.5 - \frac{d_2 - d_1}{2 \bullet \pi \bullet C}\right)$

Determine the shaft force F_{s2} at the idler pulley:

For angle of wrap $\theta = 180°$:
$F_{s2} = 2 \bullet T_2$ when load moves toward the driver pulley, and

$F_{s2} = 2 \bullet T_1$ when load moves away from the driver pulley.

For angle of wrap around the small pulley $\theta < 180°$ (unequal diameter pulleys):

$F_{s2} = T_2 \bullet \sqrt{2 (1 - \cos\theta)}$ when load moves toward the driver and

$F_{s2} = T_1 \bullet \sqrt{2 (1 - \cos\theta)}$ when the load moves away from the driver.

Step 10. Calculate the Stiffness of a Linear Positioner

The total stiffness of the belt depends mainly on the stiffness of the belt segments between the pulleys. In most cases, the influence of belt teeth and belt cords in the tooth-in-mesh area can be ignored.

Calculate the resultant stiffness coefficient of tight and slack sides k, as a function of the slide position (Fig. 6).

$$k = c_{sp} \bullet b \bullet \frac{L}{L_1 \bullet L_2}$$

where: L_1 = tight side length
L_2 = slack side length
c_{sp} = specific stiffness (Table 1).

U.S. units: k [lb/in], C_{sp} [lb/in], b [in], L [in].
Metric units: k [N/mm], C_{sp} [N/mm], b [mm], L [mm].

Note that k is at its minimum when the tight and slack sides are equal.

Determine the positioning error Δx due to belt elongation caused by the remaining static force F_{st} on the slide:

$$\Delta x = \frac{F_{st}}{k}$$

In Fig. 6, for example, F_{st} is comprised of F_f and F_w and is balanced by the static effective tension T_{est} at the driver pulley.

Note that Δx is inversely proportional to the belt width. If you want reduced Δx, increase the belt width or select a belt with stiffer cords and/or with a larger pitch.

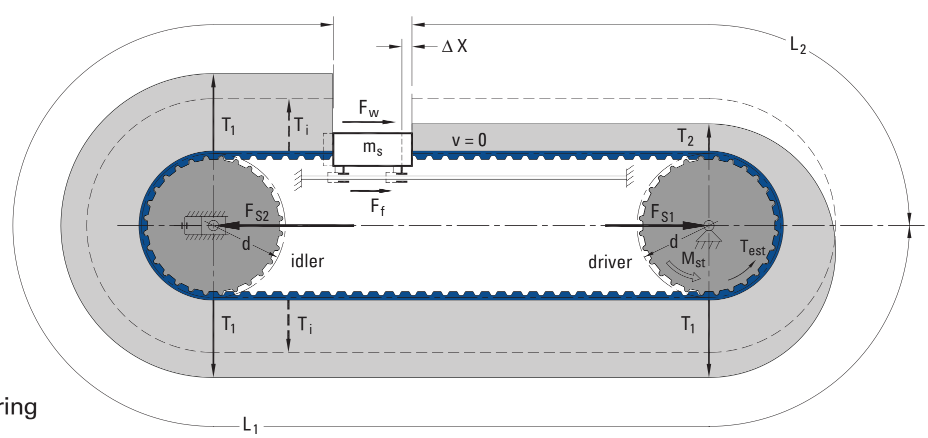

Fig. 6

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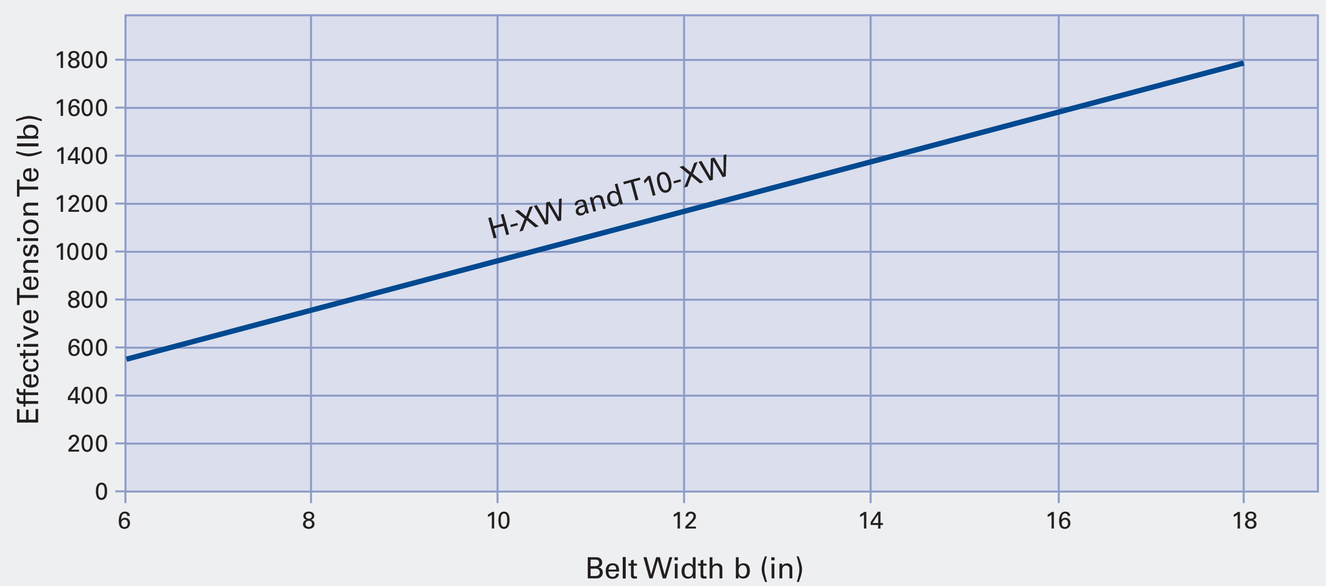
Technical Design Tools



Graph 1

Tooth In Mesh Factor

No. of Teeth in Mesh zm	Tooth in Mesh Factor tm
3	0.39
4	0.5
5	0.59
6	0.67
7	0.74
8	0.8
9	0.85
10	0.89
11	0.92
12	0.95
13	0.97
14	0.99
15	1

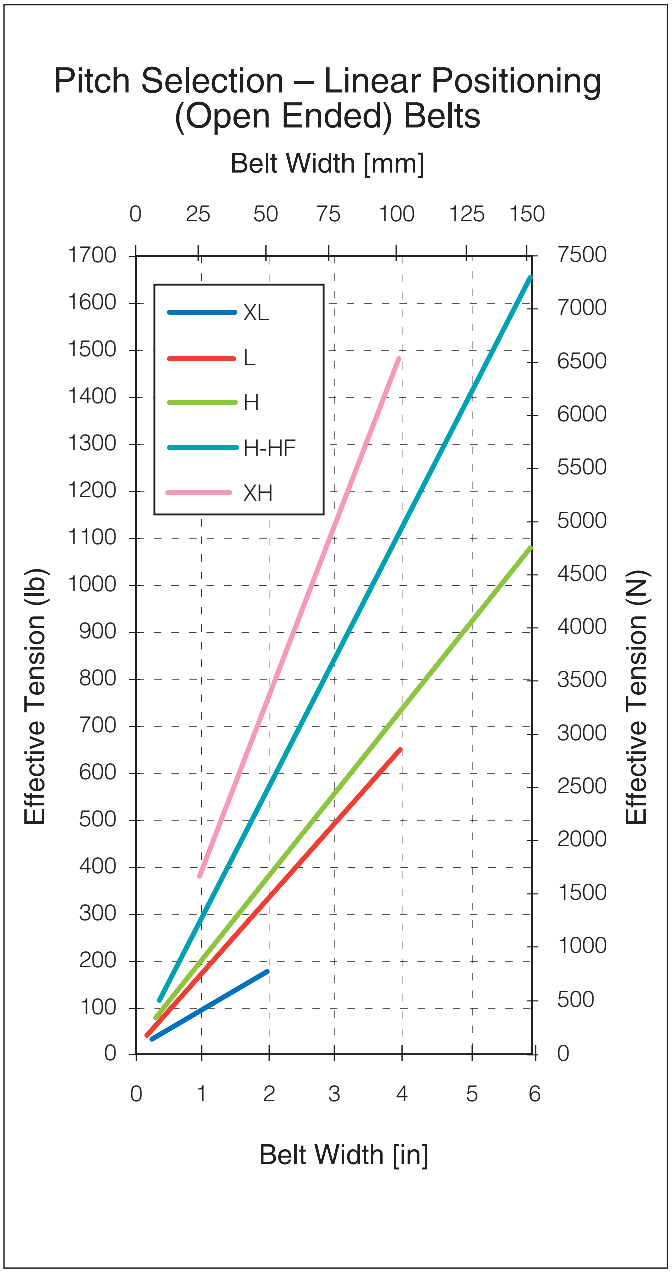
Table 3

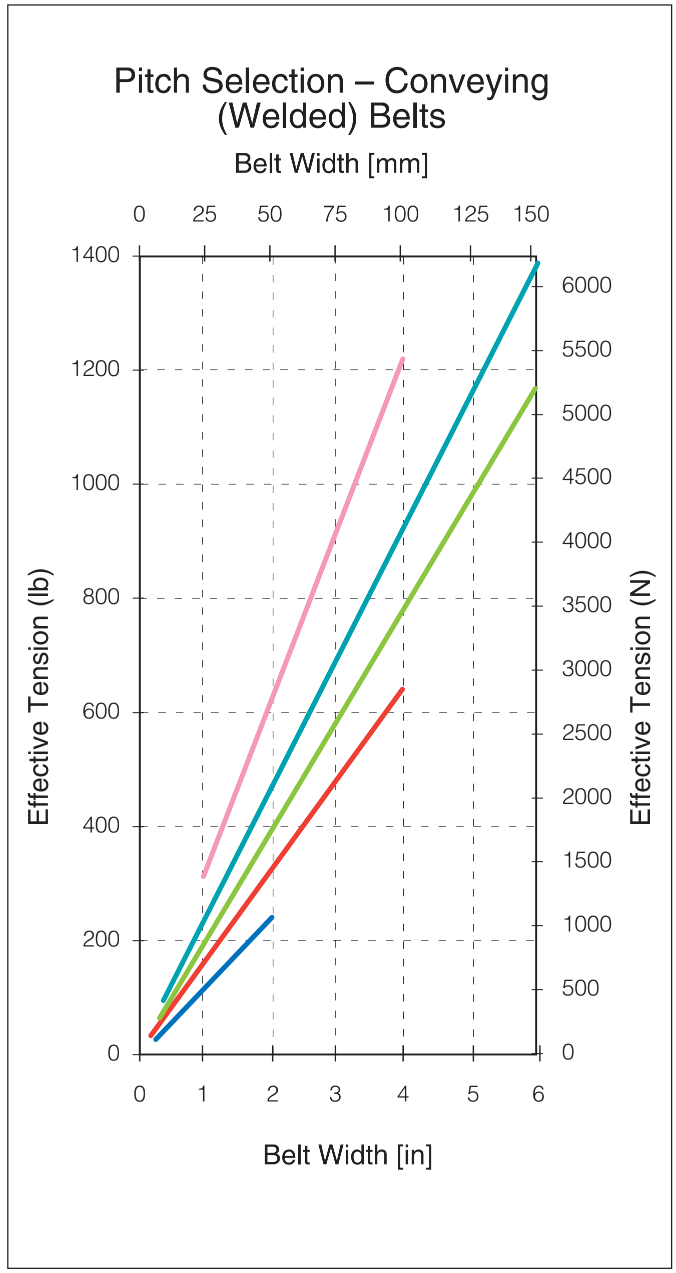
Speed Factor

Speed		Speed Factor
ft/min	m/s	tv
0	0	1
200	1	0.99
400	2	0.98
600	3	0.97
800	4	0.95
1000	5	0.93
1200	6	0.9
1400	7	0.87
1600	8	0.84
1800	9	0.81
2000	10	0.77

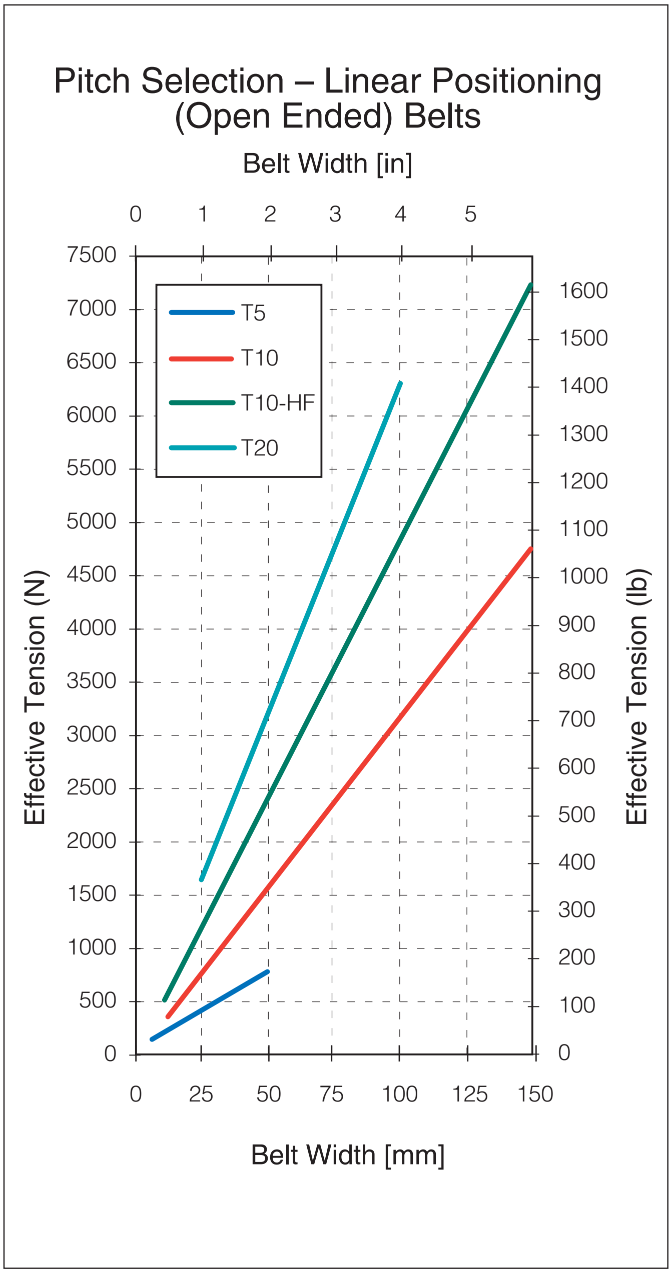
Table 4

Technical Design Tools

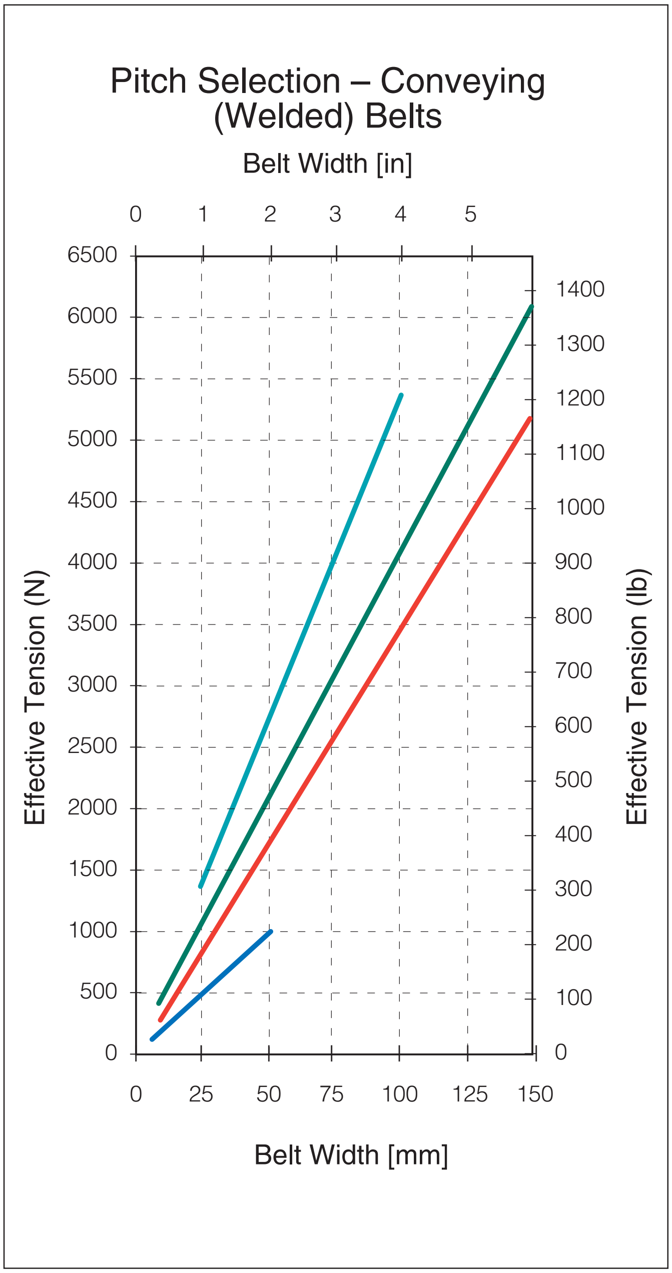




GRAPH 2a

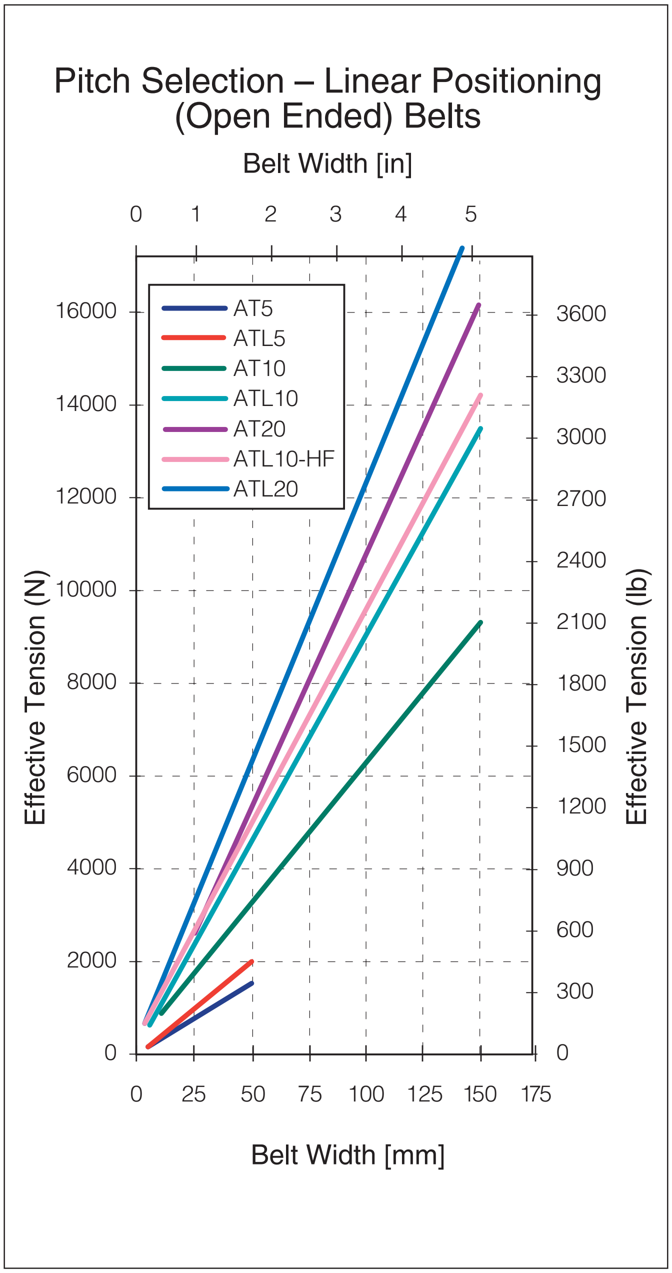


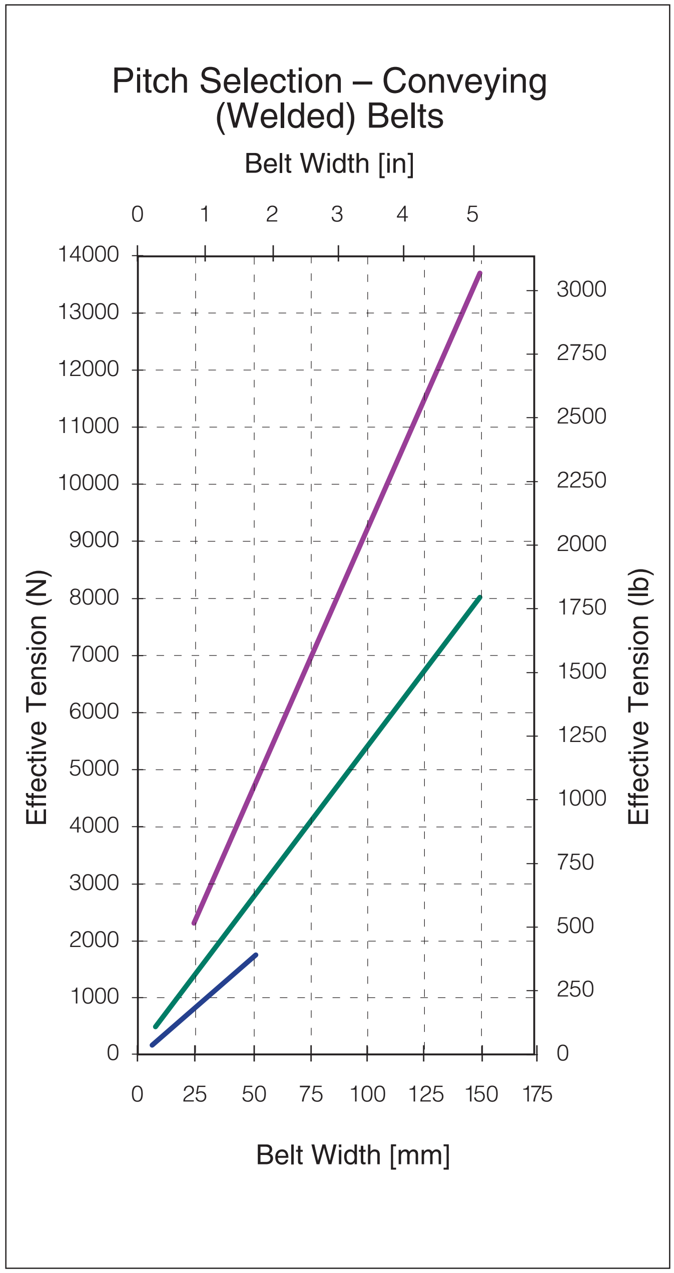
Pitch Selection – Linear Positioning (Open Ended) Belts
Belt Width [in]
0
1
2
3
4
5
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
T5
T10
T10-HF
T20
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
Effective Tension (N)
Effective Tension (lb)
0
25
50
75
100
125
150
Belt Width [mm]



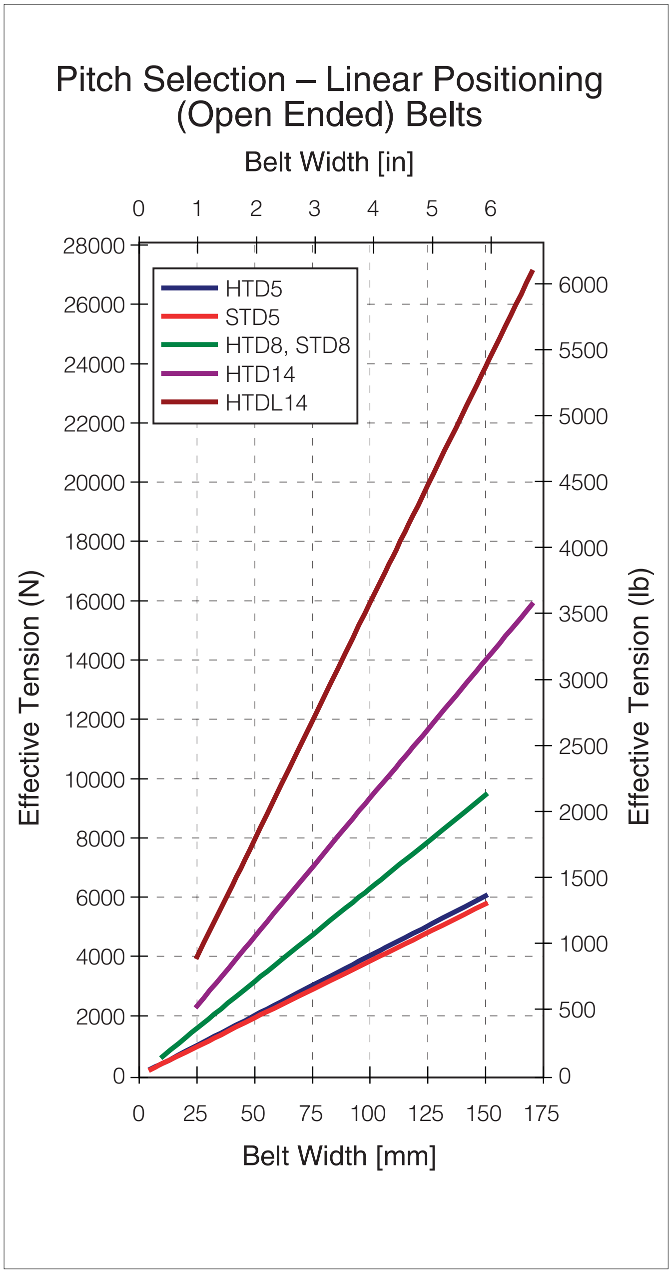
Pitch Selection – Conveying (Welded) Belts
Belt Width [in]
0
1
2
3
4
5
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
Effective Tension (N)
Effective Tension (lb)
0
25
50
75
100
125
150
Belt Width [mm]

GRAPH 2b

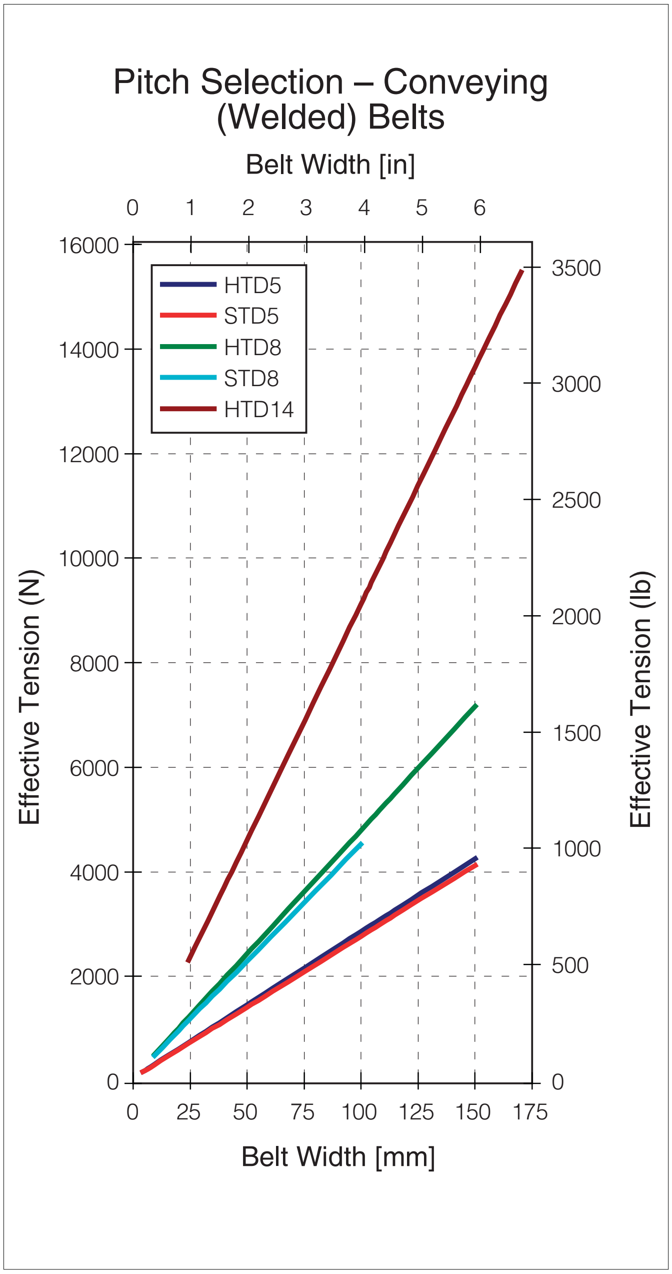

Pitch Selection – Linear Positioning (Open Ended) Belts
Belt Width [in]
0 1 2 3 4 5
AT5
ATL5
AT10
ATL10
AT20
ATL10-HF
ATL20
Effective Tension (N)
0 2000 4000 6000 8000 10000 12000 14000 16000
Effective Tension (lb)
0 300 600 900 1200 1500 1800 2100 2400 2700 3000 3300 3600
0 25 50 75 100 125 150 175
Belt Width [mm]


Pitch Selection – Conveying (Welded) Belts
Belt Width [in]
0 1 2 3 4 5
Effective Tension (N)
0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000
Effective Tension (lb)
0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000
0 25 50 75 100 125 150 175
Belt Width [mm]

GRAPH 2c



Pitch Selection – Linear Positioning (Open Ended) Belts
Belt Width [in]
0
1
2
3
4
5
6
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
HTD5
STD5
HTD8, STD8
HTD14
HTDL14
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Effective Tension (N)
Effective Tension (lb)
0
25
50
75
100
125
150
175
Belt Width [mm]



Pitch Selection – Conveying (Welded) Belts
Belt Width [in]
0
1
2
3
4
5
6
16000
14000
12000
10000
8000
6000
4000
2000
0
HTD5
STD5
HTD8
STD8
HTD14
3500
3000
2500
2000
1500
1000
500
0
Effective Tension (N)
Effective Tension (lb)
0
25
50
75
100
125
150
175
Belt Width [mm]

GRAPH 2d

Belt Selection Examples

Conveying

v	= 120 ft/min	Speed
W	= 60 lb	Box weight
18" x 12"		Box bottom size
C	= 28 ft (336 in)	Center distance
b	= 15°	Conveyor angle of incline
d_o	≈ 3.5"	Pulley outside diameter

slider bed made of steel
belt teeth covered with nylon fabric

Considering only the box size, a belt width of approximately 12" would be necessary. Instead of using one 12" wide belt, however, we decide to build a conveyor with two parallel running belts. The minimum belt width will be determined.

Step 1

The boxes are carried lengthwise on 2 ft centers

Weight distribution over conveyor length $w_m = 30$ lb/ft.

Friction force

$$F_f = \mu \cdot w_m \cdot L_m \cdot \cos\beta$$

$$F_f = 0.3 \cdot 30\ \frac{lb}{ft} \cdot 28\ ft \cdot \cos 15° \qquad F_f = 243.4\ lb$$

(coefficient of friction μ = 0.3 obtained from Table 1A)

Gravitational load

$$F_g = w_m \cdot L_m \cdot \sin\beta$$

$$F_f = 30\ \frac{lb}{ft} \cdot 28\ ft \cdot \sin 15° \qquad F_f = 217.4\ lb$$

Effective tension

$$T_e = F_f + F_g$$

$$T_e = 243.4\ lb + 217.4\ lb \qquad T_e = 460.8\ lb$$

Step 2

Selected belt tooth profile =>H (Graph 2a)

An effective tension of 460.8 lb can be transmitted by either L or H belt. We choose H tooth profile (0.5"). The minimum belt width to transmit the load will be approximately 2.5 inches.

Step 3

Approximate number of pulley teeth $\qquad \tilde{z}_p = \frac{\pi \cdot \tilde{d}}{p}$

$$\tilde{z}_p = \frac{\pi \cdot 3.5\ in}{0.5\ in} \qquad = \tilde{z}_p = 21.99$$

Chosen number of teeth $\qquad z = 22$

(chosen number of teeth is greater than the recommended minimum number of pulley teeth for H tooth profile belt [z_{min} = 14] given in Table 1)

Pulley pitch diameter $\qquad d = \frac{p \cdot z_p}{\pi}$

$$d = \frac{0.5\ in \cdot 22}{\pi} \qquad d = 3.501\ in$$

Step 4

Preliminary number of belt teeth $\qquad \tilde{z}_b = 2 \cdot \frac{\tilde{C}}{p} + z_p$

$$\tilde{z}_b = 2 \cdot \frac{336\ in}{0.5\ in} + 22 \qquad \tilde{z}_b = 1366$$

Chosen number of belt teeth $\qquad z_b = 1366$

Belt length $\qquad L = z_p \cdot p$

$$L = 1366 \cdot 0.5\ in \qquad L = 683\ in$$

Step 5

Number of teeth in mesh $\qquad z_m = \frac{z_p}{2}$

$$z_m = \frac{22}{2} \qquad z_m = 11$$

Step 6

Pre-tension $\qquad T_i = 0.5T_e$

$$T_i = 0.5 \cdot 460.8\ lb \qquad T_i = 230.4\ lb$$

Step 7

Tight side tension

$$T_1 \approx T_i + 0.75T_e$$

$$T_1 \approx 230.4\ lb + 0.75 \cdot 460.8\ lb \qquad T_1 = 576\ lb$$

Slack side tension $\qquad T_2 = T_1 - T_e$

$$T_2 = 576 - 460.8\ lb \qquad T_2 = 115.2\ lb$$

Step 8

Allowable belt tension (from Table 1) $\qquad T_{1all} = 245$ lb/in

Belt width b to withstand T_{1max} $\qquad b \geq \frac{T_{1max}}{T_{1all}}$

$$b \geq \frac{576\ lb}{245\ \frac{lb}{in}} \qquad b \geq 2.35\ in$$

Allowable effective tension (from Table 1) $\qquad T_{eall} = 330$ lb/in

Tooth in mesh factor (from Table 3; for $z_m = 11$) $\qquad t_m = 0.92$

Speed factor (from Table 4; for v = 120 ft/min) $\qquad t_v = 1$

Belt width to transmit T_e $\qquad b \geq \frac{T_e}{T_{eall} \cdot t_m \cdot t_v}$

$$b \geq \frac{460.8\ lb}{330\ \frac{lb}{in} \cdot 0.92 \cdot 1} \qquad b \geq 1.52\ in$$

Chosen belt width—boxes will be conveyed on two belts 1.5" wide each

(Note that each belt is loaded by half of the calculated forces)

Belt Selection Examples

Step 9

Shaft force at driver

$F_{s1} = T_1 + T_2$

$F_{s1} = 576\text{ lb} + 115.2\text{ lb}$ $\quad F_{s1} = 691.2\text{ lb}$

Shaft force at idler

$F_{s2} = 2T_2$

$F_{s2} = 2 \cdot 115.2\text{ lb}$ $\quad F_{s2} = 230.4\text{ lb}$

Linear Positioning

v	$= 3.5$ m/s	Speed
a	$= 20$ m/s²	Slide acceleration
m_s	$= 30$ kg	Slide mass
F_f	$= 50$ N	Friction force
$\Delta\chi$	≤ 0.1 mm	Positioning error
d_o	≈ 50mm	Pulley diameter
C	$= 3000$ mm	Center distance
S	$= 2500$ mm	Travel
L_p	$= 160$ mm	Platform length

Step 1

Force to accelerate the slide $\quad F_a = m_s \cdot a$

$F_a = 30\text{ kg} \cdot 20\text{ m/s}^2$ $\quad F_a = 600N$

Friction force $\quad F_f = 50N$

Effective tension $\quad T_e = F_a + F_f$

$T_e = 600N + 50N$ $\quad T_e = 650N$

Step 2

Selected belt tooth form =>AT5 (Graph 2c)

For linear positioning, belts of the AT series are preferred, because of the higher cord and tooth stiffness.

Step 3

Approximate number of pulley teeth $\quad \tilde{z}_p = \frac{\pi \cdot \tilde{d}}{p}$

$\tilde{z}_p = \frac{\pi \cdot 50mm}{5mm}$ $\quad \tilde{z}_p = 31.4$

Chosen number of teeth $\quad z_p = 32$

(greater than the recommended minimum number of pulley teeth for an AT5 belt [$z_{min} = 12$] given in Table 1)

Pulley pitch diameter $\quad d = \frac{p \cdot z_p}{\pi}$

$d = \frac{5mm \cdot 32}{\pi}$ $\quad d = 50.93mm$

Step 4

Preliminary number of belt teeth $\quad \tilde{z}_b = 2 \cdot \frac{\tilde{C}}{p} + z_p$

$\tilde{z}_b = \frac{2 \cdot 3000mm}{5mm} + 32$ $\quad \tilde{z}_b = 1232$

Chosen number of belt teeth $\quad z = 1232$

Belt length $\quad L = z_b \cdot p$

$L = 1232 \cdot 5mm$ $\quad L = 6160mm$

(incl. 160mm over the slide)

Step 5

Number of teeth in mesh $\quad z_m = \frac{z_p}{2}$

$z_m = \frac{32}{2}$ $\quad z_m = 16$

Step 6

Belt pre-tension $\quad T_i = 1.1 \cdot T_e$

$T_i = 1.1 \cdot 650N$ $\quad T_i = 715N$

Step 7

Maximum tight side tension $\quad T_{1max} \approx T_i + T_e$

$T_{1max} \approx 715N + 650N$ $\quad T_{1max} = 1365N$

Maximum slack side tension $\quad T_{2max} \approx T_{1max} - T_e$

$T_{2max} \approx 1365N - 650N$ $\quad T_{2max} = 715N$

Step 8

Allowable belt tension (from Table 1) $\quad T_{1all} = 1615N/25mm$

Belt width b to withstand T_{1max} $\quad b \geq \frac{T_{1max}}{T_{1all}}$

$b \geq \frac{1365N}{1615N} \cdot 25mm$ $\quad b \geq 21.1mm$

Allowable effective tension (from Table 1) $\quad T_{eall} = 1270N/25mm$

Tooth in mesh factor (from Table 3; for $z_m = 16$) $\quad t_m = 1$

Speed factor (from Table 4; for v = 3.5 m/s) $\quad t_v = 0.96$

Belt width to transmit T_e $\quad b \geq \frac{T_e}{T_{eall} \cdot t_m \cdot t_v}$

$b \geq \frac{650N}{\frac{1270N}{25mm} \cdot 1 \cdot 0.96}$ $\quad b \geq 13.3mm$

Chosen belt width (for increased stiffness a wider belt is chosen) $\quad b = 50mm$

Step 9

Maximum shaft force at driver $\quad F_{s1max} = T_{1max} + T_{2max}$

$F_{s1max} = 1365N + 715N$ $\quad F_{s1max} = 2080N$

Maximum shaft force at idler $\quad F_{s2max} = 2 \cdot T_{1max}$

$F_{s2max} = 2 \cdot 1365N$ $\quad F_{s2max} = 2730N$

Step 10

Belt stiffness $\quad k = c_{sp} \cdot b \cdot \frac{L_1 + L_2}{L_1 \cdot L_2}$

$$k = 17600 \cdot \frac{N}{mm} \cdot 50mm \cdot \frac{6000mm}{3290mm \cdot 2710mm}$$

$$k = 592.2\ \frac{N}{mm}$$

Slide displacement $\quad \Delta x = \frac{F_{st}}{k}$

$\Delta x = \frac{50N}{592.2\ \frac{N}{mm}}$ $\quad \Delta x = 0.084mm < 0.1mm$

Static load on the slide F_{st} is equal to the friction force ($F_{st} = F_f = 50N$)

Chemical Resistance

Chemical Name	Butyl Rubber	Cloroprene (Neoprene)	Chloro-sulfonated Polyethylene (Hypalon)	Fluorocarbon A (Viton)	Natural Rubber	Nitrile (Buna N)	Poly-urethane	Silicone
Acetic Acid, 30%	2	1	1	3	2	2	4	1
Acetic Acid, Hot	4	2	5	5	4	5	4	4
Acetone	1	4	2	4	3	4	4	3
Acetyl Chloride	4	4	4	1	4	4	4	3
Acrylic Acid	5	5	5	4	5	2	5	5
Alkyl Acetone	1	1	5	1	1	3	4	2
Alkyl Alcohol	4	4	5	4	4	1	1	2
Alkyl Benzene	5	4	5	2	5	4	4	4
Alkyl Chloride	4	4	5	2	4	2	3	5
Aluminum Acetate	2	2	1	4	1	4	4	4
Aluminum Ammonium Sulphate	5	2	5	1	2	2	5	5
Aluminum Chloride	1	2	1	1	1	1	2	2
Aluminum Nitrate	1	2	1	1	1	1	3	2
Ammonia, Anhydrous	1	1	2	4	4	2	4	2
Ammonia Gas, Cold	1	1	1	4	1	1	2	1
Ammonia Gas, Hot	4	4	2	4	3	2	4	1
Ammonium Chloride	1	2	1	1	1	2	2	3
Ammonium Hydroxide	1	3	1	3	3	4	4	1
Amyl Acetate	2	4	4	4	5	4	4	4
Animal Fats (Lards)	3	3	3	1	5	1	3	2
Animal Fats (oils)	2	2	5	1	4	1	3	5
Antifreeze Solutions	3	3	2	2	1	1	4	3
Antimony Pentachloride	4	4	4	1	4	2	4	4
Apple Acid	4	2	2	1	1	1	5	2
Argon	2	4	4	1	5	1	1	2
Aromatic Alcohol	5	3	5	1	3	3	5	5
Aromatic Fuels	4	4	4	1	4	2	4	4
Aromatic Hydrocarbons	4	4	5	1	4	4	3	3
Aromatic Spirits	4	5	5	1	4	3	5	5
Aromatic Vinegar	1	2	5	1	1	3	2	1
Arsenic Chloride	4	1	5	4	4	3	5	5
Ascorbic Acid	5	5	5	1	5	5	5	5
Automotive Brake Fluid	2	2	2	4	2	3	4	3
Baking Soda	1	1	5	1	1	1	1	1
Barium Fluoride	3	2	3	3	4	1	1	4
Barium Nitrate	2	1	2	1	4	1	2	2
Benzene	4	4	4	2	4	4	4	4
Benzilic Acid	5	5	5	5	5	5	5	5
Benzol	4	4	4	2	4	4	4	4
Bleach Solutions	2	4	1	5	4	4	4	2
Blood	5	1	5	2	5	3	2	2
Borax	1	5	1	1	5	2	1	2
Boric Acid	1	2	1	1	1	1	1	1

1 = Excellent 2 = Good 3 = Poor 4 = Not Recommended 5 = No Data Available

Chemical Resistance

Chemical Name	Butyl Rubber	Cloroprene (Neoprene)	Chloro-sulfonated Polyethylene (Hypalon)	Fluorocarbon A (Viton)	Natural Rubber	Nitrile (Buna N)	Poly-urethane	Silicone
Butadiene	4	4	3	3	4	4	4	4
Butanol (Butyl Alcohol)	2	2	1	5	1	1	5	2
Butter Animal Fat	3	3	2	5	4	1	3	2
Butyl Acetate	2	4	5	4	4	4	4	4
Butyric Acid	2	4	3	3	4	4	4	4
Calcium Carbonate	1	1	1	1	1	1	4	4
Calcium Nitrate	1	1	1	1	1	1	1	2
Calcium Phosphate	1	2	1	1	1	1	1	1
Calcium Sulfate	1	4	1	2	3	1	2	5
Camphor	5	5	5	2	5	1	5	5
Cane Sugar Liquors	1	2	5	1	1	1	4	1
Carbon Fluorides	5	5	5	5	5	5	5	5
Carbon Monoxide	1	4	1	1	3	1	1	1
Carbonated Beverages	5	1	5	1	5	1	2	3
Carbonic Acid	1	4	1	1	1	2	1	1
Castor Oil	2	1	1	1	1	1	1	1
Catsup	5	2	5	1	1	1	4	5
Caustic Lime	1	2	1	1	1	1	5	1
Cement, Portland	5	5	5	1	5	1	5	5
Chloric Acid	5	5	5	5	5	5	5	5
Chlorine (Wet)	5	4	5	1	5	5	4	4
Chlorine Water	4	4	5	1	4	3	4	4
Chloroethane	5	4	5	1	5	1	3	5
Chloroform	4	4	4	2	4	4	4	4
Cholesterol	5	5	5	5	5	5	5	5
Chromic Acid	3	4	5	1	4	4	4	3
Citric Acid	1	1	1	1	1	1	1	1
Clorine (Dry)	5	4	5	1	5	5	4	4
Clorox	5	5	5	1	5	2	5	2
Coconut Oil	2	4	3	1	4	1	3	1
Copper Sulfate	1	2	1	1	2	1	4	1
Cottonseed Oil	3	3	2	1	4	1	1	1
Creosote (Coal Tar)	4	2	4	1	4	1	3	4
Degreasing Fluid	3	5	4	5	4	4	1	5
Developing Fluids	2	2	1	1	1	1	5	2
Dichloroethane	4	4	5	1	4	2	3	5
Dichloroethylene	3	4	4	1	4	4	3	5
Diesel Oil	4	4	3	1	4	1	3	4
Dimethyl Acetemide	5	5	5	4	5	5	5	5
Dimethyl Formamide (DMF)	2	4	4	4	4	3	4	3
Dry Cleaning Fluids	4	4	4	1	4	3	4	4
DTE Light Oil	4	2	4	1	4	1	2	3
Epoxy Resins	1	1	5	4	5	5	5	5

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Chemical Resistance

Chemical Name	Butyl Rubber	Cloroprene (Neoprene)	Chloro-sulfonated Polyethylene (Hypalon)	Fluorocarbon A (Viton)	Natural Rubber	Nitrile (Buna N)	Poly-urethane	Silicone
Ethanol	1	2	1	5	1	1	5	2
Ethyl Butyl Ketone	2	5	5	5	4	4	5	5
Ethyl Hexyl Alcohol	1	1	1	1	1	1	4	2
Ethylene Alcohol	1	1	1	1	1	1	2	1
Ethylene Chloride	4	4	4	2	4	4	4	4
Ferric Sulfate	1	2	1	1	1	1	2	3
Fertilizer Salts, Aqueous	5	1	5	1	5	1	5	5
Fish Oil	4	2	5	1	4	1	2	1
Fluorine	4	4	5	2	4	4	4	4
Fluorine, Gas	4	4	4	1	4	4	4	4
Fluorine, Liquid	5	5	5	2	5	4	5	5
Freon 11	4	4	1	2	4	2	5	4
Freon 112	4	2	2	2	4	2	2	4
Freon 13	1	1	1	1	5	1	3	4
Gallic Acid	2	2	2	1	1	2	4	5
Gasoline Premium Unleaded	4	3	3	1	4	2	2	4
Gelatin	1	2	1	1	1	1	4	1
Glue	1	1	1	1	2	1	1	1
Glycerol (Glycerin)	1	1	1	1	1	1	4	1
Glycol Ethyl Ether	1	4	5	4	4	2	5	5
Glycols	1	2	1	1	1	1	5	1
Grain Alcohol	1	1	1	2	1	1	4	1
Honey	5	1	5	1	5	1	3	5
Hydrofluoric Acid (Anhydrous)	5	5	5	1	5	4	5	4
Hydrogen	1	1	1	1	2	1	2	3
Hydrogen Peroxide	5	4	2	5	4	4	5	3
Iodine	2	4	2	1	4	2	4	3
Isobutyl Alcohol	1	1	1	1	1	2	4	1
Isopropanol	1	3	1	5	1	1	4	1
Lactic Acid, Cold	1	1	1	1	1	1	4	1
Lard(Animal Fat)	3	2	4	1	4	1	1	2
Lubricating Oils, Diester	4	3	4	2	4	2	4	4
Lubricating Oils, Petroleum	4	2	2	1	4	1	2	4
Magnesium Acetate	1	4	1	4	4	4	4	4
Magnesium Salts	1	1	1	1	1	1	1	1
Maleic Acid	2	4	4	1	4	3	5	4
Mercuric Sulfate	2	2	2	2	2	1	5	2
Mercury	1	1	1	1	1	1	1	1
Methane	4	2	2	1	3	1	3	4
Methanol (Methyl Alcohol)	1	4	1	4	1	1	4	1
Methyl Butyl Ketone	1	4	4	4	4	4	4	4
Methyl Chloride	4	4	4	2	4	4	4	4
Methyl Ethyl Ketone (MEK)	1	4	4	4	4	4	4	4

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Chemical Resistance

Chemical Name	Butyl Rubber	Cloroprene (Neoprene)	Chloro-sulfonated Polyethylene (Hypalon)	Fluorocarbon A (Viton)	Natural Rubber	Nitrile (Buna N)	Poly-urethane	Silicone
Nicotine	5	3	5	2	5	5	2	5
Nitrogen	1	2	1	1	1	1	1	1
Nitrous Acid	5	5	5	5	3	4	5	5
Nitrous Oxide	1	5	1	3	1	1	2	1
Olefins	5	5	5	1	5	5	5	5
Oleic Acid	4	4	2	2	4	1	2	4
Ozone	2	4	1	1	4	4	1	1
Peanut Oil	3	4	2	1	4	1	2	1
Pectin (Liquor)	5	3	5	5	5	1	1	1
Phosphoric Acid 20%	2	3	1	1	2	4	3	3
Pine Oil	4	4	4	1	4	2	1	4
Polyethylene Glycol	1	2	1	1	1	1	5	5
Potassium Acid Sulfate	1	1	5	3	1	3	4	2
Pyruvic Acid	5	5	5	5	5	5	5	5
Radiation	4	3	3	3	3	3	3	2
Salt Water	1	2	1	1	1	1	4	1
Silicone Greases	1	1	1	1	1	1	1	3
Silver Bromide	5	5	5	5	5	5	5	5
Silver Nitrate	1	2	1	1	1	2	1	1
Soap Solutions	2	2	1	1	2	1	3	1
Soda	1	1	5	1	1	1	5	1
Soybean Oil	3	2	1	1	4	1	2	1
Steam <300 F	2	3	4	2	5	4	4	3
Sulfuric Acid, 40%	2	3	3	1	4	3	5	4
Table Salt	1	1	1	1	1	1	1	3
Tannic Acid	1	2	1	1	1	1	1	2
Tetrahydrofuran (THF)	2	4	4	4	4	4	3	4
Titanic Acid	5	5	5	5	5	5	5	5
Toluene	4	4	4	2	4	4	4	4
Toloul	4	4	4	5	4	4	4	4
Trimethyl Amine (TMA)	5	5	5	4	5	5	5	5
Turpentine	4	4	4	2	4	1	4	4
Uric Acid	5	5	5	5	5	5	5	5
Vegetable Oils	3	1	2	1	4	1	1	1
Vinegar	1	2	1	1	2	2	4	3
Vinyl Acetate	1	4	3	4	4	4	4	4
Vinyl Chloride	4	4	5	2	4	4	5	5
Water	1	2	1	1	1	1	1	2
Wax	4	1	1	1	4	1	1	1
Xylene	4	4	4	2	4	4	4	4
Zinc Acetate	1	2	1	4	1	2	4	4

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Other Gates Mectrol Products

Gates Mectrol is one of the foremost manufacturers of motion control products. Our company's rapid growth in becoming a market leader is testimony to the quality of our products, and our ability to service the demands of our customers, worldwide.

Along with our urethane timing belts, Gates Mectrol manufactures a complete line of quality pulleys in both standard and custom designs using both Inch and Metric pitches.

Pulleys

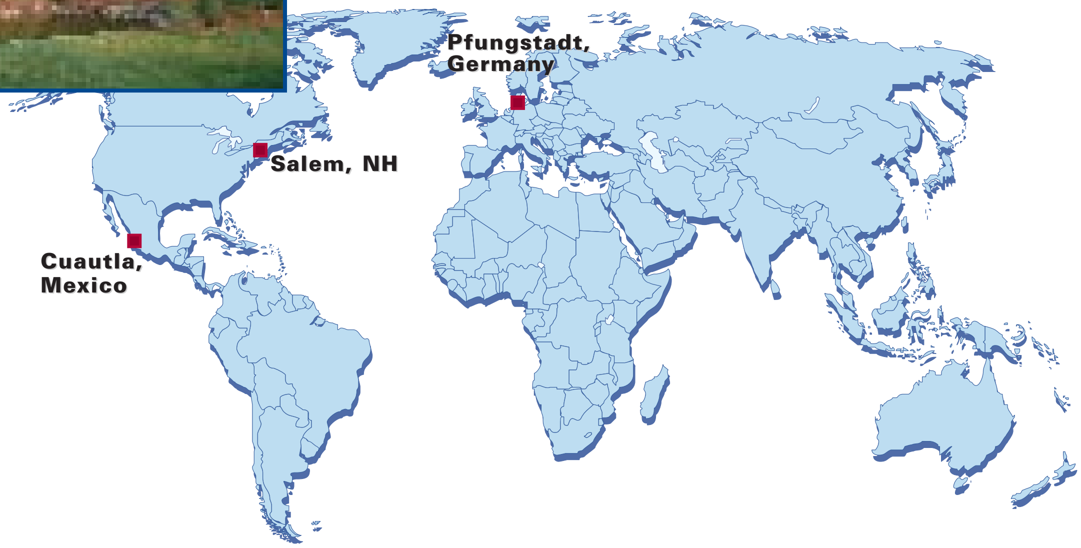
Our standard pulleys may be easily modified to include specific bores, keyways and setscrews. Custom pulley work may include self-tracking features, special materials and plating. We also offer special pitches upon request to accommodate high precision, zero-backlash applications.

Clamp Plates

Gates Mectrol offers a large selection of standard clamp plates for installation of our open ended belts into your particular application. Customized clamp plates are also available.

Facilities

Two of industry's leading belt manufacturers have joined forces as the urethane belt business of Mectrol Corporation was acquired by Gates Corporation in late 2004. Our newly formed company is known as Gates Mectrol.



Over 180 Gates Mectrol associates, working from three different manufacturing locations worldwide, are committed to providing the Gates Mectrol 'CAN DO' spirit to all of our customers and meeting your precision synchronization needs.

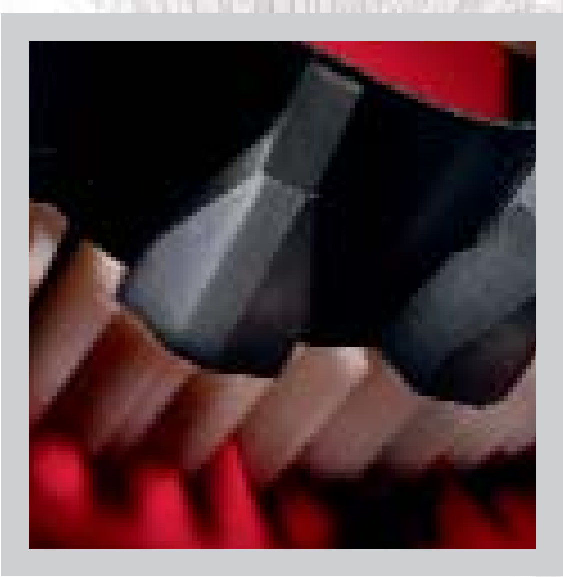
Gates Mectrol's passion for products is evidenced in our commitment to employing state-of-the-art manufacturing technologies, striving to insure the highest levels of quality and customer service. To this end, Gates Mectrol has achieved ISO 9001:2000 certification.

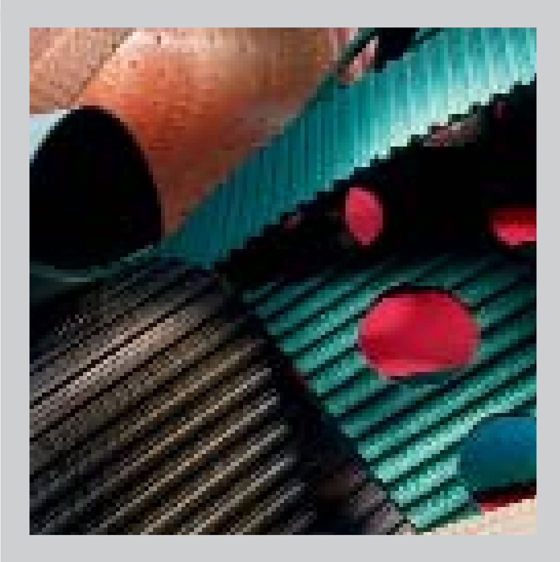
Gates Mectrol is driving LEAN manufacturing techniques throughout every aspect of our company.

CEEC (Communicate, Educate, Empower and Conquer) is a team of committed Gates Mectrol associates who are driving new and better philosophies throughout our entire organization.

Gates Mectrol is eager to have the opportunity to serve you.

Gates® MECTROL™
A Tomkins Company





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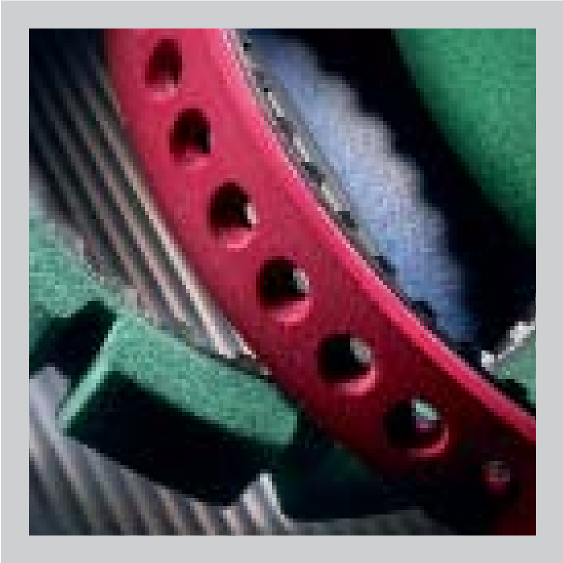

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