

Attn: FIRST Robot Teams

16 January 2006

Over the past several years we have supplied timing belts with backcovers for use as robot drive tracks. With every new year comes different performance requirements for the tracks. Ultimately the selection of a belt, backing, and pulley is up to the individual robot team. The purpose of this guide is to convey the BRECOflex products most likely to assist the teams in reaching their goals. Considerations include: delivery times and stocked items, belt strength, and backing characteristics.

50mm wide TK10 [TK10 K13] belts and pulleys

Many teams have gravitated to the 50mm wide TK10 belting for the following reasons: The TK10 has a large 13mm wide self-tracking guide and therefore does not need flanges. Flanges may damage the playing surface and can be knocked off in collisions. We have a stock selection of pulleys for this width and type of belt (3 day delivery). In a critical situation T10 pulleys can be modified to work with TK10 belts. The 50mm width welded-endless TK10 gives an allowable tensile load of 490 lbf per belt. In a track drive each belt must be able to withstand the full loading. 32mm to 100mm wide versions of this belt are available if required. A condensed listing of our backings along with static friction test data on the three arena surfaces is attached. Delivery time for any TK10 belt at any length over 750mm with any of these backings is 2-3 weeks. Note that 2" wide HK, a similar English version of this belt may be substituted in your design if desired. We have a more limited stock of 2" wide HK pulleys so check with us when designing. Plastics such as nylon, UHMW, or delrin can be machined from roll stock to serve as light weight idlers. Only the drive and any driven pulleys need to be toothed. Consult our belt catalog B212 and backing catalog B208 for minimum pulley and idler diameters.

Backing Selection:

This year the primary running surface is carpet and there is an aluminum diamond plate ramp with a clear polycarbonate top flat surface. While excessive friction can cause problems with turning and ripping the cover, most teams strive for sufficient friction depending on the operation being performed on the surface. The Linatex, and Supergrip Blue / Green covers have been shown to give the highest friction on carpet. Extreme friction levels are possible with clean, new clear polycarbonate on PVC Blue or Linatex. PVC Herringbone was tested with the backing oriented so as not to coincide with the diamond plate pattern. Steering may be impossible when these two patterns intermesh. Generally, durability and friction are inversely related. There may be sharp edges that may damage these high friction backings. Please refer to our B208 backings catalog for specific backing info. All catalogs are available for download in PDF from www.brecoflex.com

Track Drive Layout and Belt length calculations:

The team's approach will dictate the required drive layout including pulley placement and size as well as any supporting sliderbeds. UHMW sliderbeds or UHMW tape has a 0.3 coefficient of friction with our base belt material. We recommend PAZ nylon coated belting for use with steel or aluminum sliderbeds to achieve a 0.3 coefficient of friction. Consider the track contact patch dimensions in relation to the ability to turn the robot and possible backing damage for a given backing/surface friction.

Belt length is calculated in two-equal sized pulley, 1:1 ratio drive as double the pulley-to-pulley center distance plus one circumference of one pulley at the pitch line. The pitch line is the center of the steel cords in the belt. Pitch circumference is equal to the number of teeth times the belt pitch. EX. The calculated belt length for (2) 25-tooth 10mm pitch pulleys and a CTC of 795mm is 1840mm. Remember that the belt length must be a multiple of the belt pitch to be manufacturable!



Tensioning Considerations:

Timing belts must be tensioned to run correctly. The easiest way to do this is to put one of the pulleys in slots. Lock the position of the tensioning pulley to prevent fatiguing the belt with a spring-action. Belts should be ordered as a matched set to help with alignment when tensioning. Proper tension is the minimum tension required to avoid sagging or flapping of the slack side of the belt when maximum power is applied.

Feel free to call our engineering department for technical assistance or for help with sizing. Please ask for customer service if you know what you want and need price and delivery or need to check inventory.

Timing Belt Backing Friction Tests

Coefficient of Friction	Number	Name	Surface		
			Carpet	Diamond Plate	Polycarbonate Clear
Backing	1	S.G. Green	1.5	0.7	0.7
	2	S.G. Blue	1.5	0.6	0.7
	3	Red Linatex	1.6	0.9	1.4
	4	Linatrilite	1.2	0.7	1.0
	5	PVC Herringbone	0.9	0.8	0.9
	6	DL Machined Side	0.9	0.4	0.5
	7	DL Molded Side	0.6	0.4	0.6
	8	W. Nub	1.4	0.6	0.7
	9	PVC Blue	0.5	0.5	1.6

