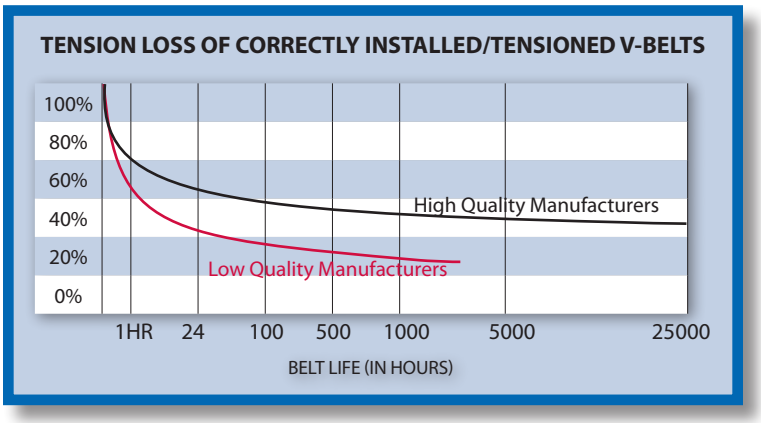
proper belt tensioning

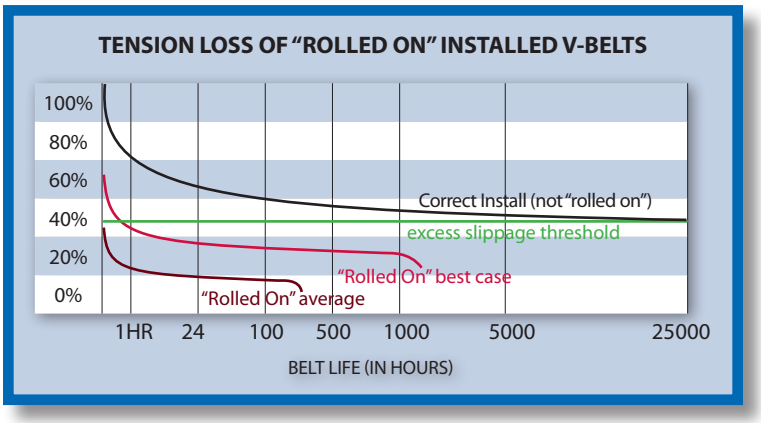
why it matters and how it affects belt life

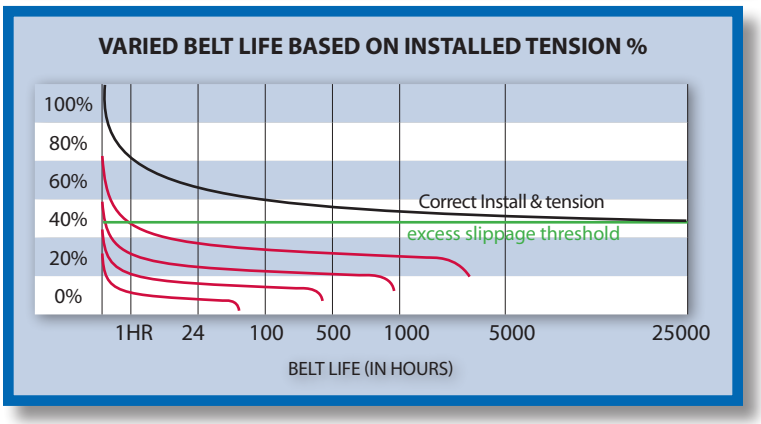
why does belt tension matter?

Proper belt tension is a critical step when installing a belt. V-belts operate on friction; the friction is multiplied by the mechanical advantage of the wedging principle. Correct V-Belt tensioning is the single most important factor necessary for long, satisfactory operation. How you tension a belt at installation will determine how long the belt will run.

Too little tension results in slippage, excess heat, and premature belt & pulley wear. Too much tension results in excessive stress on belts, bearings, and shafts. However, there is still a wide range of tension which a belt will operate satisfactorily. The intent is to find this proper range for any V-Belt drive.





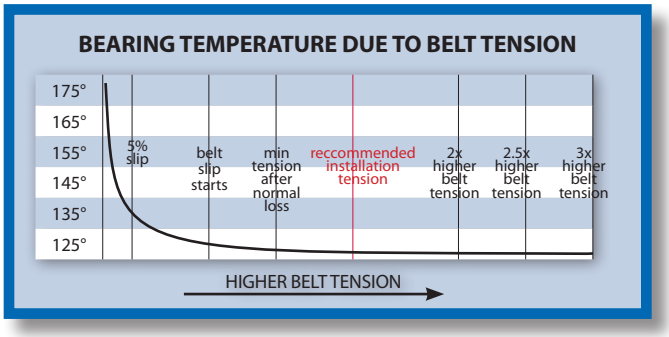


Tension loss occurs on all manufacturer's belts. The highest quality belts still lose nearly 50% of installed tension, while lower quality belts lose over 70% of installed tension. You cannot "feel" the correct tension on a V-Belt. On a test given to over 200 experienced maintenance personnel, only 1% tensioned a belt correctly using the "feel" method. Most were at 7%- 50% of correct tension.

Rolling or prying a belt on a drive gives one of two results, both lead to shortened belt life. Rolling causes low belt tension resulting in low belt life due to slip and heat build up. Prying a belt damages cables in the belt, leading to early belt failure.

Belt life varies greatly depending on not only how the belt is installed, but on how the belt is tensioned at installation.

Belt tensioning also affects bearing life. When a belt is loose it will slip, causing excess heat. This leads to hot bearings and lowered bearing life.



BESTORQ®
POWER TRANSMISSION PRODUCTS

	Smallest Pulley Diameter Range	RPM Range	Belt Deflection Setting			
			uncogged belts		cogged belts	
			used belt	new belt	used belt	new belt
4L, A, AX	2.0 - 2.9	1000 - 2500	1.8	2.6	2.0	3.0
		2501 - 4000	1.4	2.0	1.6	2.4
	3.0 - 3.6	1000 - 2500	3.6	5.4	4.0	6.0
		2501 - 4000	2.8	4.1	3.3	4.9
	3.8 - 4.8	1000 - 2500	4.4	6.6	4.9	7.3
		2501 - 4000	3.7	5.7	4.3	6.4
	5.0 - 7.0	1000 - 2500	5.3	7.8	5.7	9.2
		2501 - 4000	4.6	6.8	5.1	7.6
5L, B, BX	3.4 - 4.2	860 - 2500			4.8	7.2
		2501 - 4000			4.1	6.2
	4.4 - 5.6	860 - 2500	5.2	7.9	7.1	10.5
		2501 - 4000	4.5	6.6	7.1	9.1
	5.8 - 8.6	860 - 2500	6.2	9.4	8.4	12.4
		2501 - 4000	6.0	6.8	7.3	10.7
C, CX	7.0 - 9.0	500 - 1740	11.3	17.0	14.7	21.9
		1741 - 3000	9.4	13.6	11.9	17.5
	9.5 - 16.0	500 - 1740	14.0	20.8	15.8	23.5
		1741 - 3000	12.5	18.3	14.5	21.6
D	12.0 - 16.0	200 - 850	24.7	37.1		
		851 - 1500	21.1	31.4		
	18.0 - 20.0	200 - 850	30.4	45.2		
		851 - 1500	25.6	38.0		
3V, 3VX	2.2 - 2.4	1000 - 2500			3.3	4.9
		2501 - 4000			2.9	4.3
	2.65 - 3.65	1000 - 2500	3.7	5.1	4.2	6.2
		2501 - 4000	3.0	4.5	3.8	5.6
	4.12 - 6.90	1000 - 2500	4.9	7.3	5.3	7.8
		2501 - 4000	4.3	6.6	4.8	7.3
5V, 5VX	4.4 - 6.7	500 - 1749			10	15.2
		1750 - 3000			8.9	13.2
		3001 - 4000			5.6	8.5
	7.1 - 10.9	500 - 1740	12.6	18.9	14.8	22.1
		1741 - 3000	11.2	16.5	13.7	20.1
	11.8 - 16.0	500 - 1740	15.5	23.4	17.1	25.5
		1741 - 3000	14.5	21.8	16.8	25
8V, 8VX	12.5 - 17.0	200 - 850	33	49.5		
		851 - 2100	27	39.9		
	18.0 - 22.4	200 - 850	39.5	59		
		851 - 2100	35.1	52.8		
3VK	2.65 - 3.65	750 - 2500	5.6	8.3		
		2501 - 4000	4.5	6.8		
	4.12 - 6.90	1000 - 2500	7.4	11.0		
		2501 - 4000	6.5	9.7		
5VK	7.1 - 10.9	200 - 500	21.0	31.5		
		500 - 1250	18.0	27.0		
		1251 - 1900	16.8	25.2		
		1901 - 3000	16.0	24.0		
	11.8 - 16.0	200 - 740	26.6	39.9		
		741 - 1250	23.3	34.9		
		1251 - 2250	21.8	32.6		
8VK	12.5 - 20.0	200 - 550	44.8	67.2		
		551 - 800	39.0	58.5		
		851 - 1150	35.6	53.4		
		1151 - 2100	33.6	50.4		
	21.2 - 22.4	200-550	66.0	99.0		
		551-850	62.0	93.0		
		851 - 2100	57.5	86.3		

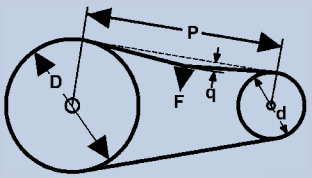
optimize belt drive life

To get the most from your belt drive, pay proper attention to your V-Belt tensioning and pulley size.

Proper V-Belt Tensioning

All belts do not feel the same when properly tensioned due to different materials and tension cables used in their manufacturing processes. Therefore, one should not use "feel" to judge the correct tension of a belt. To more accurately tension V-Belt drives use the Force-Deflection Method shown below.

Force-Deflection Method



1. Measure the span length **P**.
2. At center of the span length apply a force **F** (using a belt tension gauge) perpendicular to the belt span, large enough to deflect the belt 1/64" for each 1" of belt span, **q**. So, for a 32" span, the deflection amount would be 32/64" or 1/2".
3. The force **F** to apply is shown, per belt, in the table to the left. NOTE: The force shown in the table is per rib. So, for a 5-rib belt, you will need to multiply the force shown in the table by five to apply to all five ribs at once.

Minimum Pulley Diameters

The successful operation of a belt drive is highly dependent on the diameter of the pulleys involved. The ARPM (Association for Rubber Product Manufacurers) publishes minimum recommended pulley diameters for each belt profile. Using pulleys smaller than these recommended diameters will result in a dramatic increase in belt tension and will substantially decrease the overall belt life.

Minimum Recommended Pulley Diameters

Belt Type	Pitch Diameter	Outside Diameter
4L*	2.30	2.50
A	3.00	3.25
AX	2.20	2.45
B	5.40	5.75
BX	4.00	4.35
3V	2.65	2.65
3VX	2.20	2.20
5V	7.10	7.10
5VX	4.40	4.40

*4L at this diameter has HP rating below 1/2 HP