INSTALLING/TENSIONING V-DRIVES

INSTALLING A DRIVE

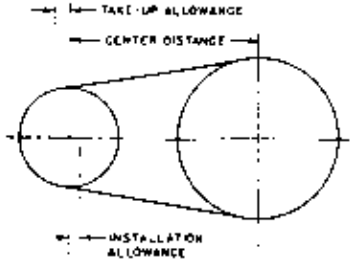
Check Condition of Sheaves–Before a new set of V-belts are installed, check the condition of the sheaves. Dirty or rusty sheaves impair the drive's efficiency and abrade the belts, which result in premature failure.

Worn sheaves shorten belt life as much as 50%. If the grooves are worn to where the belt bottoms, slippage may result and burn the belts. If the sidewalls are "dished out," the bottom shoulder ruins the belts prematurely by wearing off the bottom corners.

Check Sheave Alignment–Sheave adjustment should be checked by placing a straight edge or tight cord across the sheave faces so that it touches all four points of contact. Ordinarily, a misalignment of more than one-half of one degree (one-eighth inch in one foot) will adversely affect belt life. Improper sheave alignment produces uneven wear on one side of the belt, causes the belt to roll over in the sheaves or throws all the load on one side of the belt, stretching or breaking the cords on that side.

INSTALLATION AND TAKE-UP ALLOWANCES

After calculating a center distance from a standard pitch length, make provision for adjusting the center distance as in sketch below, to allow for installation of the belts without injury, for tensioning, and for maintenance of proper tension throughout the life of the belt. (Refer to Tables 11 or 12 for values).



Placing Belts on Sheaves–Shorten the center distance of the drive until the belts can be put on the sheaves without forcing. Forcing the belts can cause internal injury to the belts.

Belt Selection–For maximum service, replace V-belt drives with a complete new matched set of belts or use the new Matchmaker belts.

Never employ a used belt as a replacement for a unit of a set. Used belts, normally, are worn in cross-section and stretched. A new belt so applied will ride higher in the sheave, travel faster and operate at a much higher tension than the used belts. The cord center may be ruptured, allowing the new belt to elongate. Shortly after this occurs it will cease to accept its full share of the load, leaving the drive under-belted. Thus, the new belt is wasted. Belts of different manufacturers should not be mixed for the same reasons.

Table 11-Center Distance Allowance for Narrow Belt Installation and Take-Up

Nom. Belt Lgth. in Inches	Min. Installation Allowance (in inches) (Below Center)						Min. Take-up Allowance (Above Center)
	3V Dyna-V	3V Poly-band	5V Dyna-V	5V Poly-band	8V Dyna-V	8V Poly-band	
Up to & incl. 47.5	.05	1.2	...	...	...	...	1.0”
50-71	0.8	1.4	1.0	2.1	...	...	1.2
75-106	0.8	1.4	1.0	2.1	1.5	3.4	1.5
112-125	0.8	1.4	1.0	2.1	1.5	3.4	1.8
132-170	0.8	1.4	1.0	2.1	1.5	3.4	2.2
180-200	...	...	1.0	2.1	1.8	3.6	2.5
212-236	...	...	1.2	2.4	1.8	3.6	3.0
250 & 265	...	...	1.2	2.4	1.8	3.6	3.2
280 & 300	...	...	1.2	2.4	1.8	3.6	3.5
315-355	...	...	1.2	2.4	2.0	4.0	4.0
375	...	...	...	...	2.0	4.0	4.5
400-560	...	...	...	...	2.0	4.0	5.5

INSTALLING/TENSIONING V-DRIVES

Table 12 - Center Distance Allowance for Classical Belt Installation and Take-up

Nom. Belt Lgth. in Inches	Min. Installation Allowance (in inches) (Below Center)							Min. Take-up Allowance (Above Center)
	A	B	B Poly-band	C	C Poly-band	D	D Poly-band	
26-37	0.75	1.00	1.50	1.50	...	...	...	1.00”
38-59	0.75	1.00	1.50	1.50	2.00	...	...	1.50
60-89	0.75	1.25	1.61	1.50	2.00	...	...	2.00
90-119	1.00	1.25	1.61	1.50	2.00	...	...	2.50
120-157	1.00	1.25	1.81	1.50	2.11	2.0	2.00	3.00
158-194	...	1.25	1.81	2.00	2.20	2.00	3.00	3.50
195-239	...	1.50	1.81	2.00	2.31	2.00	3.20	4.00
240-269	...	1.50	2.00	2.00	2.50	2.50	3.20	4.50
270-329	...	1.50	2.20	2.00	2.50	2.50	3.50	5.00
330-419	...	...	...	2.00	2.70	2.50	3.60	6.00
420 & Over	...	...	...	2.50	2.90	3.00	4.10	1-1/2% of belt lgth.

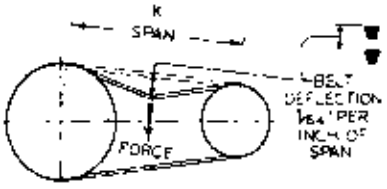
TENSIONING A DRIVE

General Rules of Tensioning–

1. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions.
2. Check tension frequently during the first 24-48 hours of run-in operation.
3. Over tensioning shortens belt and bearing life.
4. Keep belts free from foreign material which may cause slip.
5. Make V-Drive inspection on a periodic basis. Tension when slipping. Never apply belt dressing as this will damage the belt and cause early failure.

SIMPLE TENSIONING PROCEDURE

1. Measure the span length, K.
2. At the center of the span (K) apply a force (perpendicular to the span) large enough to deflect the



1/64, for every inch of span length. For example, one deflection of a 100 inch span would be 100/64 or 1-9/16 inches.

3. Compare the force you have applied with the values given in Tables 13 or 14. If the force is between the values for normal tension, and 1-1/2 times normal ten sion, the drive tension should be satisfactory. A force below the value for normal tension indicates an under-tensioned drive. If the force exceeds the value for 1-1/2 times normal tension, the drive is tighter than it needs to be.

For V-Belt Tension Testers, See Page PT7-123.

After the proper operating tension has been applied to the belts, a double-check should be made of the following:

a. Parallel postion of the sheave shafts.

b. Correct alignment of sheave grooves.

Installing/Tensioning V-Drives

Table 13-Belt Deflection Force (Check factory for conditions not covered in this table)

V-Belt Section	Small Sheave		Deflection Force In Lbs. For Drive Speed Ratio of:			
	Speed Range	Diameter	1.0	1.5	2.0	4.0 +
A (AP)	1800-3600	3.0	2.0	2.3	2.4	2.6
	1800-3600	4.0	2.6	2.8	3.0	3.3
	1800-3600	5.0	3.0	3.3	3.4	3.7
	1800-3600	7.0	3.5	3.7	3.8	4.3
B (BP)	1200-1800	4.6	3.7	4.3	4.5	5.0
	1200-1800	5.0	4.1	4.6	4.8	5.6
	1200-1800	6.0	4.8	5.3	5.5	6.3
	1200-1800	8.0	5.7	6.2	6.4	7.2
C (CP)	900-1800	7.0	6.5	7.0	8.0	9.0
	900-1800	9.0	8.0	9.0	10.0	11.0
	900-1800	12.0	10.0	11.0	12.0	13.0
	700-1500	16.0	12.0	13.0	13.0	14.0
D (DP)	900-1500	12.0	13.0	15.0	16.0	17.0
	900-1500	15.0	16.0	18.0	19.0	21.0
	700-1200	18.0	19.0	21.0	22.0	24.0
	700-1200	22.0	22.0	23.0	24.0	26.0
AX	1800-3600	3.0	2.5	2.8	3.0	3.3
	1800-3600	4.0	3.3	3.6	3.8	4.2
	1800-3600	5.0	3.7	4.1	4.3	4.6
	1800-3600	7.0	4.3	4.6	4.8	5.3
BX	1200-1800	4.6	5.2	5.8	6.0	6.9
	1200-1800	5.0	5.4	6.0	6.3	7.1
	1200-1800	6.0	6.0	6.4	6.7	7.7
	1200-1800	8.0	6.6	7.1	7.5	8.2
CX	900-1800	7.0	10.0	11.0	12.0	13.0
	900-1800	9.0	11.0	12.0	13.0	14.0
	900-1800	12.0	12.0	13.0	13.0	14.0
	700-1500	16.0	13.0	14.0	14.0	15.0
DX	900-1500	12.0	16.0	18.0	19.0	20.0
	900-1500	15.0	19.0	21.0	22.0	24.0
	700-1200	18.0	22.0	24.0	25.0	27.0
	700-1200	22.0	25.0	27.0	28.0	30.0

Table 14-POLYBAND Plus Belt Deflection Force (lbs.) (Force is pounds for one belt only)

Cross Section	Small Sheave Diameter Range	RPM Range	Belt Deflection Force*	
			Normal	New Belt
5VF	7.1-10.9	200-700	21.1	30.9
		701-1250	18.0	26.3
		1251-1900	16.7	23.4
		1901-3000	15.8	23.0
5VF	11.8-16.0	200-700	26.8	39.5
		701-1250	23.5	34.7
		1251-2100	22.7	33.3
8VF	12.5-20.0	200-500	44.7	65.8
		501-850	38.5	56.6
		851-1150	35.2	51.6
		1151-1650	33.5	49.0
8VF	21.2-25.0	200-500	65.9	97.6
		501-850	61.2	90.6
		851-1200	57.0	84.3

* Multiply the force required for one belt by the number of belts in the Polyband Plus unit to get total force to apply.

Example: New 8VF drive with a small sheave dia. equal to 20".
The rpm of the sheave is 1000.
The belt to be installed is 8/8VF4000.
Total deflection force = table value x 8 = 51.6 x 8 = 413 lbs.

Belt Pull and Bearing Loads

Belt Pull Calculations–The following method of calcu lating belt pull is found to be the most convenient and ac curate for drives operating at design loads and tensions:

$$T1 + T2 = 33{,}000\ (2.5\text{-}G)\ \left(\frac{HP}{GV}\right)$$

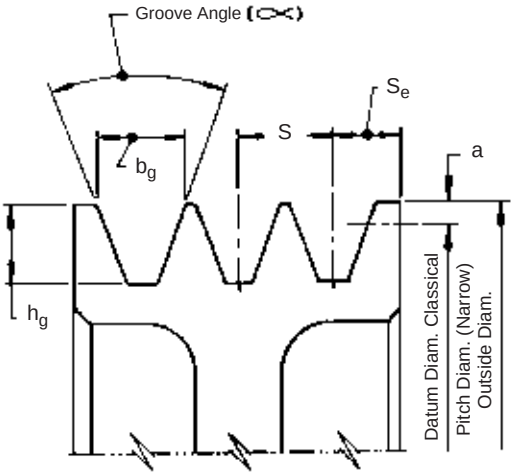
WHERE:
T_1 = Tight side tension, pounds
T_2 = Slack side tension, pounds
HP = Design horsepower
V = Belt speed, feet per minute = (PD) (RPM) (.262)
G = Arc of contact correction factor

Arc of Contact Factors

D-d / C	Arc of Contact	Factor G	D-d / C	Arc of Contact	Factor G
.00	180°	1.00	.80	133°	.87
.10	174°	.99	.90	127°	.85
.20	169°	.97	1.00	120°	.82
.30	163°	.96	1.10	113°	.80
.40	157°	.94	1.20	106°	.77
.50	151°	.93	1.30	99°	.73
.60	145°	.91	1.40	91°	.70
.70	139°	.89	1.50	83°	.65

Arc of contact is on small sheave d=Diam.of small sheave.
D=Diam. of large sheave. C=Center distance.

V-Belt Sheave Groove Dimensions



Narrow

Belt Section	Outside Diameter Range	∞ ± 0.25	b_g ± .005	h_g Min.	a	S ± .015	Se	
3VX, 3V	LESS THAN 3.50 . . . . . . 3.50 TO 6.00 . . . . . . 6.01 to 12.00 . . . . . . 0ver12.00	36° 38° 40° 42°	.350	0.340	0.025	0.406	0.344	+.094 -.000
5VX, 5V	Less than 10.00 . . . . . . 10.00 to 16.00 . . . . . . 0ver 16.00	38° 40° 42°	.600	0.590	.050	0.688	0.500	+.125 -.000
8VX, 8V	Less than 16.00 . . . . . . 16.00 to 22.40 . . . . . . 0ver 22.40	38° 40° 42°	1.000	0.990	.100	1.125	0.750	+.250 -.000

Classical

Belt Section	Pitch Diameter Min. Recom.	Pitch Diameter Range	m + 0.33	b_g		h_g Min.	2a ref *	S ± .025	Se	
AX, A	3.0	2.6 to 5.4 . . . . . 0ver 5.4	34° 38°	.494 .504	±.005	.460	.125	.625	.375	+.090 -.062
BX, B	5.4	4.6 to 7.0 . . . . . 0ver 7.0	34° 38°	.637 .650	±.006	.550	.175	.750	.500	+.120 -.065
A, B AX, BX	-	To 7.0 . . . . . . 0ver 7.0	34° 38°	.612 .625	±.006	.612	A (.634/.602) B (.333/.334)	.750	.500	+.120 -.065
CX, C	9.0	7.0 to 7.99 . . . . 8.0 to 12.0 . . . . 0ver 12.0	34° 36° 38°	.879 .887 .895	±.007	.750	.200	1.000	.688	+.160 -.070
DX,D	13.0	12.0 to 12.9 . . . 13.0 to 17.0 . . . 0ver 17.0	34° 36° 38°	1.259 1.271 1.283	±.008	1.020	.300	1.438	.875	+.220 -.080
E	21.0	18.0 to 24.0 . . . 0ver 24.0	36° 38°	1.527 1.542	±.010	1.300	.400	1.750	1.125	+.250 -.000

Note–For complete manufacturing tolerances – see RMA, MPTA, Narrow/Classical V-belt Standards.

* Datum diameter, not pitch diameter.

More Power and Life From V-Drives

TROUBLE AREA AND OBSERVATION	CAUSE	REMEDY
BELT STRETCH BEYOND TAKE-UP		
Belt stretch unequally.	Mis-aligned drive, unequal work done by belts.	Realign and re-tension drive.
All belts stretch about equally.	Belt tensile member broken from improper installation.	Replace all belts with new matched set properly installed.
	Insufficient take-up allowance.	Check take-up and follow allowance on page .
	Greatly overloaded or underdesigned drive.	Redesign.
SHORT BELT LIFE		
Relatively rapid failure; no visible reason.	Tensile members damaged through improper installation.	Replace with all new matched set, properly installed.
	Worn sheave grooves (check with groove gauge)	Replace sheaves.
	Under-designed drive.	Redesign.
Sidewalls soft and sticky. Low adhesion between cover plies. Cross-section swollen.	Oil or grease on belts or sheaves.	Remove source of oil or grease. Clean belts and grooves with cloth moistened with alcohol.
Sidewalls dry and hard. Low adhesion between cover plies. Bottom belt cracked.	High temperatures.	Remove source of heat. Ventilate drive better.
BELT TURN OVER 	Excess lateral belt whip.	Use Banded belt.
	Foreign material in grooves.	Remove material–shield drive.
	Mis-aligned sheaves.	Realign the drive.
	Worn sheave grooves (check with groove gauge).	Replace sheave.
	Tensile member broken through improper installation.	Replace with new matched set properly installed.
	Incorrectly placed flat idler pulley.	Carefully align flat idler on slack side of drive as close as possible to driver sheave.
DETERIORATION OF RUBBER COMPOUNDS USED IN BELT	Belt dressing.	Never use dressing on V-belts. Clean with cloth moistened with alcohol. Tension drive properly to prevent slip.
Extreme cover wear.	Belts rub against belt guard or other obstruction.	Remove obstruction or align drive to give needed clearance.
Spin burns on belt.	Belts slip under starting or stalling load.	Tighten drive until slipping stops.
Bottom of belt cracked.	Too small sheaves.	Redesign for larger sheaves.
Broken belts.	Object falling into or hitting drive.	Replace with new matched set of belts. Provide shield for drive.
IMPROPER DRIVEN SPEED		
Incorrect driveR-driveN ratio.	Design error.	Use correct sheave sizes.
Spin burns on belt.	Belt slip.	Re-tension drive until belt stops slipping.
BELT NOISE	Belt slip.	Re-tension drive until it stops slipping.
HOT BEARINGS		
Drive over-tensioned.	Worn grooves-belts bottoming and will not transmit power until over-tensioned.	Replace sheaves. Tension drive properly.
	Improper tensioning.	Re-tension drive.
Sheaves too small.	Motor manufacturers sheave diameters not followed.	Redesign drive.
Poor bearing condition.	Underdesigned bearing or poor bearing maintenance.	Observe recommended bearing design and maintenance.
Sheaves out too far on shaft.	Error or obstruction problem.	Place sheaves as close as possible to bearings. Remove any obstruction preventing this.
Drive under-tensioned.	Belts slipping and causing heat build-up.	Re-tension drive.

NOTES

DODGE®