

V-Flat Drives

A V-flat drive is a V-belt drive which uses a flat pulley on one or more shafts. Single Classical V-Belts, Banded Classical V-Belts, Banded Wedge V-Belts and Hex belts are suitable for V-flat drives. Individual Wedge V-Belts are not recommended due to the narrow bottom width leading to inherent instability on the flat pulley. Cogged belts are suitable only when used singly. This is due to the varying relationship between the pitch length and inside length resulting from the manufacturing process. Open ended belts with metal fasteners extending below the inside surface of the belt are also unsuitable for V-flat drives. Drives where the larger pulley is flat may be designed using published data for the V-belt section being considered. When three or more pulleys or hex belts are being used, special considerations must be taken. Three major items must be considered when designing a V-flat drive:

- **Pitch Diameter Correction.** The “pitch diameter of the flat pulley must be determined for the belt section being selected in order to find an accurate speed ratio and belt length. The “Add-On” values are shown in the table below.
- **Belt Tension.** When the value of $(D - d)/C = 1.0$, the Arc of Contact on the larger pulley (usually the flat, driven) is approximately 240° and the Arc of Contact on the smaller pulley (usually the V-sheave, driver) is 120°. With this relationship, the tension will be equivalent to a V-V drive. As the Arc of Contact on the flat pulley decreases, tension must be increased in order to maintain sufficient friction. The Arc of Contact Correction Factors show below must be used to properly adjust the belt horsepower rating resulting from the increased tension.
- **Flat Pulley Width and Crown.** The table below shows the minimum recommended flat pulley widths. Lateral movement of belts (tracking) requires the additional face width. Flat pulleys should be used whenever possible and crowned pulleys should be machined flat. If unavoidable, the maximum permissible crown is 1/8” per foot of pulley face width.

Arc of Contact Correction Factor for V-Flat Drives		
$\frac{D - d}{C}$	Arc of Contact on Small Sheave degrees	Arc of Contact Correction Factor (A_c) All V-Belts
0.0	180	0.75
0.1	174	0.76
0.2	169	0.78
0.3	163	0.79
0.4	157	0.80
0.5	151	0.81
0.6	145	0.83
0.7	139	0.84
0.8	133	0.85
0.9	127	0.85
1.0	120	0.82
1.1	113	0.80
1.2	106	0.77
1.3	99	0.73
1.4	91	0.70
1.5	83	0.65

Flat Diameter “Add-On” to Determine Pitch Diameter	
Belt Section	“Add-On” inches
A	0.5
B	0.7
C	0.9
D	1.2
E	1.6
3V	0.5
5V	0.8
8V	1.3

Belt Section	Minimum Recommended Face Widths of Flat Pulleys for V-Flat Drives									For Each Additional Belt Add
	Number of Belt Ribs (A,B,C,D,E Single or Banded; 3V,5V,8V Banded)									
	1	2	3	4	5	6	8	10	12	
A	1.75**	2.37**	3.00**	3.62**	4.25**	4.87**				0.62
B	2.25	3.00	3.75	4.50	5.25	6.00	7.50	9.00	10.50	0.75
C	2.75	3.75	4.75	5.75	6.75	7.75	9.75	11.75	13.75	1.00
D	3.75	5.18	6.62	8.06	9.50	10.93	13.81	16.68	19.56	1.44
E	4.75	6.50	8.25	10.00	11.75	13.50	17.00	20.50	24.00	1.75
3V	---	1.51	1.91	2.32	2.72	3.13	3.94	4.75	15.38	0.41
5V	---	2.54	3.23	3.91	4.60	5.29	6.67	8.04		0.69
8V	---	4.12	5.25	6.38	7.50	8.62	10.88	13.12		1.12

**For standard “A” groove only. Use “B” values for A belts used in A-B pulleys.

--- Not recommended

Blank - Nonstandard

These values are for sheaves with standard groove spacing. For deep groove sheaves, multiple pitch sheaves, or nonstandard groove spacing, allowance must be made for additional drive width.

Note: Banded Belts can only be used with standard and not deep groove sheaves.