Static Tension (Tst)	5.9	Force (F)	0.44 lbf	Total deflection 0.234 in

	min		max	Nominal	
Deflection Force (F)	0.20		0.76	0.44	lb
				0.200	kG
Y	2.05	table	2.05		
Tst	2.0	desired Tst	11.0		
L	27.0	belt length	27.0		
t	15.0	span length	15.0		

D	0.50	gear diameter
d	0.50	pulley diameter
c	15.00	pulley center distance
P	27.00	belt free length
t	15.00	belt span length

$$t = \sqrt{CD^2 - \left(\frac{PD - pd}{2}\right)^2} \qquad (10\text{-}3)$$

where: t = Span length (in.)
CD = Drive center distance (in.)
PD = Large pitch diameter (in.)
pd = Small pitch diameter (in.)

X: $\frac{15}{64}$ Df 0.45 lb (202.4 g) $= \dfrac{T_{st} + \left(\frac{t}{L}\right) Y}{16} = \dfrac{6.0 + \left(\frac{15.0}{27.0}\right) 2.1}{16.0}$

$$\text{Deflection force, Min.} = \frac{T_{st} + \left(\frac{t}{L}\right) Y}{16} \quad \text{(lbf)}$$

Y: $\frac{12}{64}$ Df 0.44 lb (201.9 g) $= \dfrac{T_{st} + \left(\frac{t}{L}\right) Y}{16} = \dfrac{6.0 + \left(\frac{12.0}{22.0}\right) 2.1}{16.0}$

$$\text{Deflection force, Max.} = \frac{1.1\, T_{st} + \left(\frac{t}{L}\right) Y}{16} \quad \text{(lbf)}$$

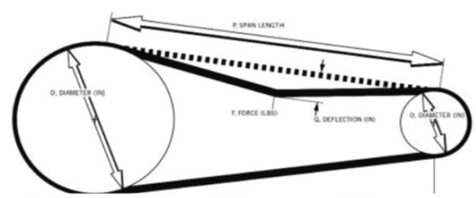
where: T_{st} = Static tension (lbf)
t = Span length (in.)
L = Belt pitch length (in.)
Y = Constant, from **Table 9**

Table 9 Belt Tensioning Force

Belt	Belt Width	m	Y	Minimum T_{st} (lbf) Per Span
2 mm GT3	4 mm	0.026	1.37	1.3
	6 mm	0.039	2.05	2.0
	9 mm	0.058	3.08	3.0
	12 mm	0.077	4.10	4.0
3 mm GT3	6 mm	0.077	3.22	2.2
	9 mm	0.120	4.83	3.3
	12 mm	0.150	6.45	4.4
	15 mm	0.190	8.06	5.5
	9 mm	0.170	14.9	8.4

12/64	0.188
15/64	0.234

F = Deflection Force
q = Deflection, 1/64" per inch of span length
c = Center Distance
D = Large Pulley Pitch Diameter
d = Small Pulley Pitch Diameter
P = Span Length



Motion Transfer Drives: Motion transfer drives, by definition, are required to carry extremely light torque loads. In these applications, belt installation tension is needed only to cause the belt to conform to and mesh properly with the pulleys. The amount of tension necessary for this is referred to as the minimum tension (T_{st}). Minimum tensions, on a per span basis, are included in **Table 9**, on page **T**-30. Some motion transfer drives carry very little torque, but have a need for accurate registration requirements. These systems may require additional static (or installation) tension in order to minimize registration error.

Registration Drives: Registration drives are required to register, or position accurately. Higher belt installation tensions help in increasing belt tensile modulus as well as in increasing meshing interference, both of which reduce backlash. Tension values for these applications should be determined experimentally to confirm that desired performance characteristics have been achieved. As a beginning point, use values from **Table 10** multiplied by 1.5 to 2.0.

Table 10 Static Belt Tension, T_{st} (lbf) Per Span – General Values

Belt	4 mm	6 mm	9 mm	12 mm	15 mm	20 mm	25 mm
2 mm GT3	2	3	4	5	—	—	—
3 mm GT3	—	8	11	15	19	25	—
5 mm GT3	—	—	18	22	27	35	43
3 mm HTD	—	5	9	12	16	22	—
5 mm HTD	—	—	13	18	24	33	43
T2.5	0.34	0.67	1.37	—	—	—	—
T5	—	3	7	—	12	—	—
T10	—	—	—	—	28	—	41

Belt	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"
MXL	2	3	3	4	5	—	—
XL	2	3	4	5	6	8	9

LDO NEMA17 - Radial Load
28N @ 20mm from flange

	R_1	ℓ_2	P
D_1	9.3	20.0	28.0
	18.7	40.0	20.0
	R_2	ℓ_1	ℓ_2

	R_1	ℓ_2	P
D_2	6.5	12.0	28.0
	21.5	40.0	12.0
	R_2	ℓ_1	ℓ_2

	R_1	ℓ_2	P
D3	3.7	6.0	28.0
	24.3	40.0	6.0
	R_2	ℓ_1	ℓ_2

	R_1	ℓ_2	P
D3	12.0	30.0	28.0
	16.0	40.0	30.0
	R_2	ℓ_1	ℓ_2

P = radial load
R_1, R_2 = bearing loads
ℓ_1 ℓ_2 = distances from radial load to bearings

$$R_1 = \frac{\ell_2 P}{\ell_1 + \ell_2} \qquad (1)$$

$$R_2 = \frac{\ell_1 P}{\ell_1 + \ell_2} \qquad (2)$$

(a) Radial Shaft Load Between Bearings

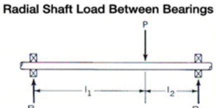


Figure 3 Radial Load Between Bearings

(b) Overhung Radial Load

Notation same as in paragraph (a).

$$R_1 = \frac{\ell_2 P}{\ell_1 - \ell_2} \qquad (3)$$

$$R_2 = \frac{\ell_1 P}{\ell_1 - \ell_2} \qquad (4)$$

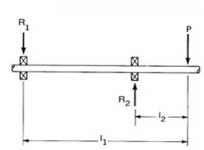


Figure 4 Overhung Radial Load