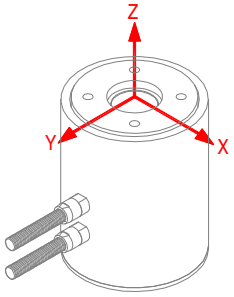
Extraneous Load Factors



Equation: $\sigma_{max} \geq$ (A)Fx +(B)Fy +(C)Fz +(D)Mx +(E)My +(F)Mz

Material: 17-4 P.H. Stainless Steel (S.S.*), 2024-T4 Aluminum (AL*)

Material	Load Capacity (lb)	Torque Capacity (in-lb)	A	B	C	D	E	F
2024-T4/T351	50	50	447	526	218	266	255	212
	50	100						
	50	150						
	100	50						
	100	100						
	100	150						
	150	50						
	150	100						
	150	150	379	372	131	199	194	96
	200	200	379	372	131	199	194	96
17-4 PH S.S.	500	500	166	225	71	148	100	81

σ_{max} Table

Material	Static Load (=60% Y.S.)	Fatigue (Non Reversing Loads)	Fatigue (Full Reversing Loads)
2024-T4/T351	28,000	18,000	15,000
17-4 PH S.S.	87,000	78,000	62,000*

*Value is 75% of Fatigue Strength based on 10-20 x 10^6 cycles and allow for factors that influence Fatigue such as surface finish, stress concentrations, corrosion, temperature and other variables for the production of the transducer, for infinite Fatigue Life (100 x 10^6) use 75% of values shown.

Deflection & Natural Frequency

Load Capacity (lb)	Torque Capacity (in-lb)	Deflection (in)	Torsional Stiffness (in-lb/rad)	Natural Frequency (Hz) Load only	β
50	50	0.001	17000	526	0.11
50	100	0.001			0.11
50	150	0.001			0.11
100	50		17000		0.11
100	100				0.11
100	150				0.11
150	50	0.0015	17000		0.11
150	100	0.0015			0.11
150	150	0.0015		372	0.11
200	200	0.002		372	0.11
500	500	0.002	153275	2254	0.48

*FN results are based on calculation of deflection & weight scene on Sensor arm.

Natural Frequency & Frequency Response Equation's:

$$\text{Natural Frequency (FN)} = 3.13 \sqrt{\frac{1}{\frac{\beta}{Capacity} \bullet Deflection}} \text{ (Hz)}$$

$$\text{Frequency Response with load (FR)} = 3.13 \sqrt{\frac{1}{\frac{\beta + AppliedLoad}{Capacity} \bullet Deflection}} \text{ (Hz)}$$

*Where β values are obtained by Futek Engineers