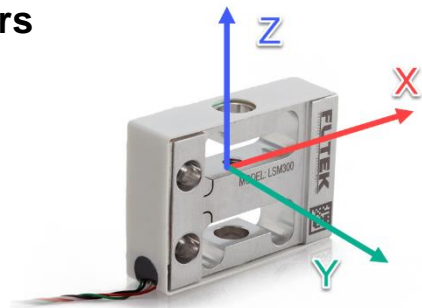


Extraneous Load Factors

Equation: $\sigma_{max} \geq AF_x + BF_y + CF_z + DM_x + EM_y + FM_z$



Extraneous Load Coefficients:

Capacity [lb]	Material	A	B	C	D	E	F
2.2	2024-T4	140	630	6700	1000	220	1600
5	2024-T4	110	400	2700	670	220	1000
10	2024-T4	100	310	1400	480	220	730
25	2024-T4	81	210	600	310	220	450
50	2024-T4	63	150	320	280	220	320
100	2024-T4	44	120	200	270	220	220
200	17-4 PH COND A	51	120	210	270	210	240

*All Force and Moment to be calculated using lb and in-lb units

σ_{max} Table:

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

*Value is 75% of Fatigue Strength based on 10-20 x 10⁶ cycles and allow for factors that influence Fatigue such as surface finish, stress concentrations, corrosion, temperature and other variables during the production of the transducer, for runout life (100 x 10⁶) use 75% of values shown.

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Deflection & Natural Frequency

Capacity [lb]	Z-Deflection [in]	F _z Natural Frequency [Hz]*	β
2.2	0.008	260	0.04
5	0.007	440	0.04
10	0.006	650	0.04
25	0.005	1080	0.04
50	0.005	1550	0.04
100	0.005	2180	0.04
200	0.004	2070	0.11

*Natural frequencies results are based on FEA analysis. Analysis was performed assuming constrained fixed end.

Natural Frequency & Frequency Response Equation's:

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

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

*β values are obtained by FUTEK Engineering

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