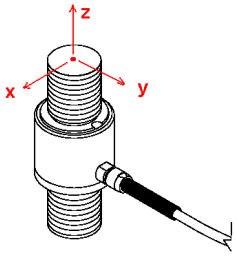
# Extraneous Load Factors




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

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

| Material | Model # | Capacity (lb) | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|
| (AL) | LCM300 | 25 | 1200 | 1200 | 560 | 3500 | 3500 | 1040 |
| (S.S.) | | 50 | 3500 | 3500 | 870 | 8955 | 8955 | 7225 |
| | | 100 | 3336 | 3336 | 530 | 9050 | 9050 | 8345 |
| | | 250 | 770 | 770 | 220 | 1955 | 1955 | 1380 |
| | | 500 | 665 | 665 | 150 | 1420 | 1420 | 1250 |
| | | 1,000 | 475 | 475 | 86 | 1405 | 1405 | 1190 |
| | LCM325 | 2,000 | 660 | 660 | 30 | 775 | 775 | 610 |
| | | 3,000 | 400 | 400 | 20 | 420 | 420 | 345 |
| | LCM350 | 4,000 | 480 | 480 | 16 | 305 | 305 | 225 |
| | | 5,000 | 330 | 330 | 13 | 206 | 206 | 170 |
| | LCM375 | 7,500 | 180 | 180 | 10 | 105 | 105 | 78 |
| | | 10,000 | 120 | 120 | 8 | 75 | 75 | 55 |

All force and moments to be calculated using lb & in-lb units

## $\sigma_{max}$ Table

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

| Model # | Capacity (lb) | Deflection (in.) | Natural Frequency (Hz) | $\beta$ |
|---|---|---|---|---|
| LCM300 | 25 | 0.0008 | 8,750 | 0.004 |
| | 50 | 0.0012 | 7,500 | 0.0072 |
| | 100 | 0.0013 | 10,200 | 0.0072 |
| | 250 | 0.0013 | 16,200 | 0.0072 |
| | 500 | 0.0013 | 22,900 | 0.0072 |
| | 1,000 | 0.0015 | 30,100 | 0.0072 |
| LCM325 | 2,000 | 0.0013 | 20,100 | 0.0443 |
| | 3,000 | 0.0014 | 21,600 | 0.0443 |
| LCM350 | 4,000 | 0.0018 | 14,200 | 0.1075 |
| | 5,000 | 0.0021 | 14,700 | 0.1075 |
| LCM375 | 7,500 | 0.0021 | 14,100 | 0.1769 |
| | 10,000 | 0.0025 | 14,900 | 0.1769 |

## 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 $\beta$ values are obtained by Futek Engineers