Sine Vibration

English units

Mass entered in lbm, converted to consistent units: $m = W/386$ [lbf sec^2/in]

Stiffness k [lbf/in], length [in], force [lbf], acceleration [in/sec^2]

$1\,G = 386$ in/sec^2

Metric units

Mass m [kg], stiffness k [N/m], length [m], force [N]

$1\,G = 9.81$ m/sec^2

Base-drive sine (fixed-base modes, modal damping)

$\ddot{q}_j = \omega^2 L_j A/(\omega_j^2 - \omega^2 + 2i\zeta\omega_j\omega)$, $\{\ddot{x}\} = [T]\{r_b A;\, \ddot{q}\}$

Base force: $F = r_b^T M_{bb} r_b A + \{L\}^T\{\ddot{q}\}$ (English: lbf per G = mass in lbm)

Notching: input = min(spec, $F_{lim}/|F/A|$, $a_{lim}/|\ddot{x}/A|$)

Equivalent sine

Equivalent sine amplitude $\approx$ SRS$(f_n, Q)/Q$ (Smallwood ramp-invariant SRS)