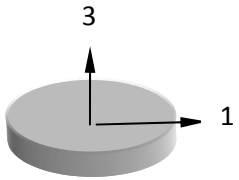
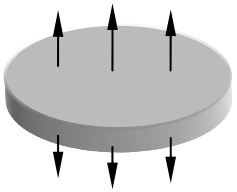
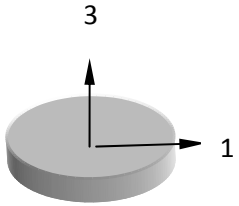
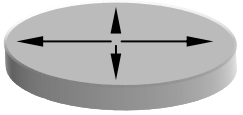
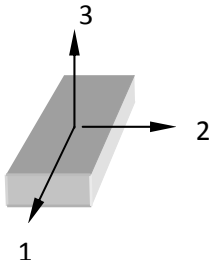
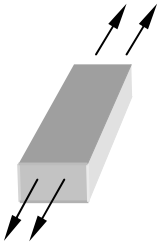
# Modes of Vibration

| Shape | Axes | Polarization Direction | Applied field, F | Mode of Vibration | Frequency | Displacement | Voltage |
|---|---|---|---|---|---|---|---|
| Thin disk |  |  |  |  | $f_r = N_t/t$ | $\Delta$ thk = $d_{33}$*V | $V = \frac{g_{33}F_3thk}{\pi r^2}$ |
| |  |  |  |  | $f_r = N_p/OD$ | $\Delta r = \frac{2d_{33}Vr}{thk}$ | $V = \frac{g_{31}f_r}{2\pi r}$ |
| Rod |  |  |  |  | $f_r = N_3/L$ | $\Delta L = d_{33}$*V | $V = \frac{g_{33}F_3L}{\pi r^2}$ |

# Modes of Vibration

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bar |  |  |  |  | $f_r = N_1/L$ | $\Delta L = \frac{d_{31} V L}{thk}$<br><br>$\Delta W = \frac{d_{31} V W}{thk}$ | $V = \frac{g_{31} F_2}{L}$<br><br>$V = \frac{g_{31} F_1}{W}$ |