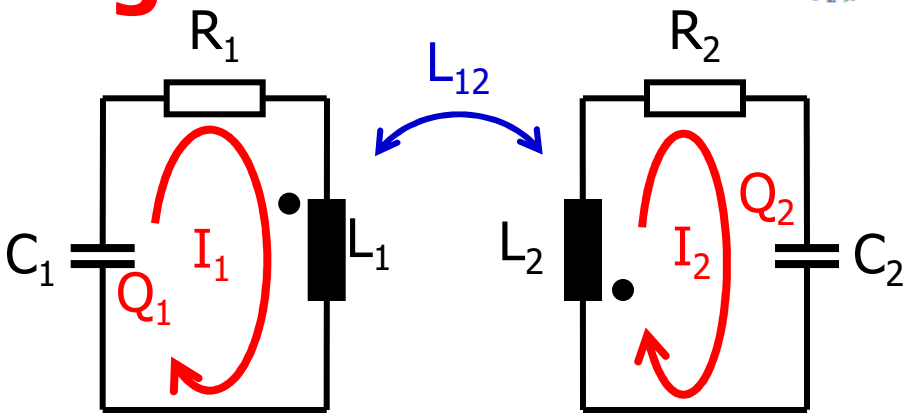
7.2. Gekoppelte Schwingkreise

Induktive Kopplung:

$$L_1\ddot{Q}_1 + R_1\dot{Q}_1 + \frac{1}{C_1}Q_1 = -L_{12}\ddot{Q}_2$$

$$L_2\ddot{Q}_2 + R_2\dot{Q}_2 + \frac{1}{C_2}Q_2 = -L_{12}\ddot{Q}_1$$



Lösungsweg: Transformation auf Normalkoordinaten

Beispiel: $L_1 = L_2 = L$ $C_1 = C_2 = C$ $R_1 = R_2 = R$

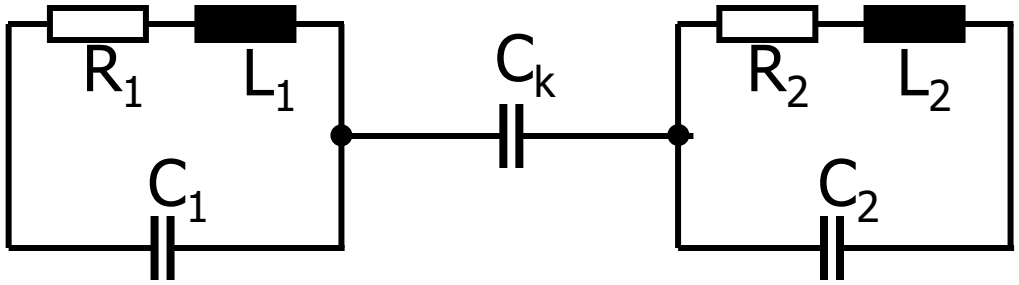
Normalkoordinaten: $Q_\pm = Q_1 \pm Q_2$ $\quad (L \pm L_{12})\ddot{Q}_\pm + R\dot{Q}_\pm + \frac{1}{C}Q_\pm = 0$

Eigenfrequenzen: $\omega_\pm = \sqrt{\frac{1}{(L \pm L_{12})C} - \frac{1}{4}\alpha_\pm^2}$ $\quad \alpha_\pm = \frac{R}{L \pm L_{12}}$

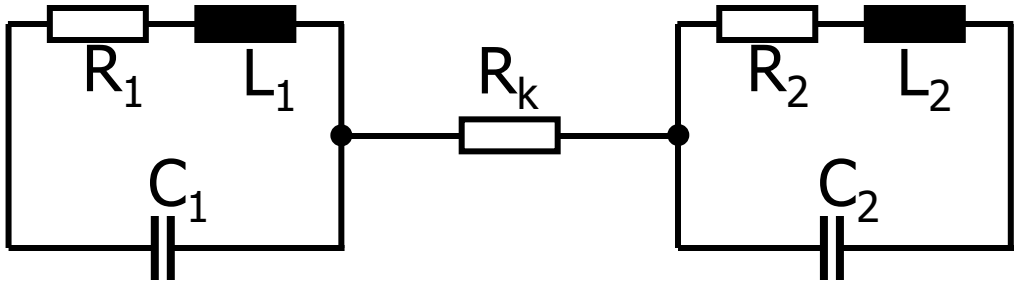
Normalmoden (Schwingfall): $Q_\pm \sim e^{-\frac{1}{2}\alpha_\pm t} e^{i\omega_\pm t}$

Andere (analoge) Kopplungen

Kapazitive Kopplung:

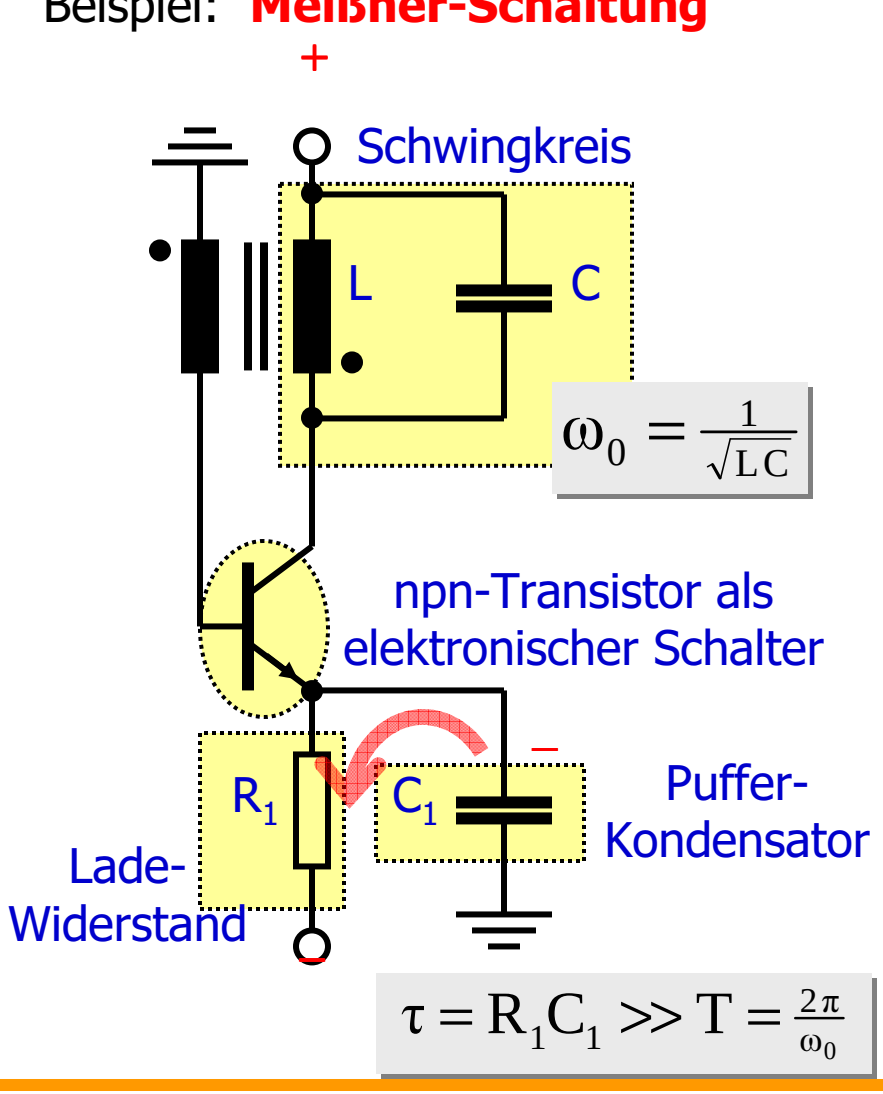


Galvanische Kopplung:

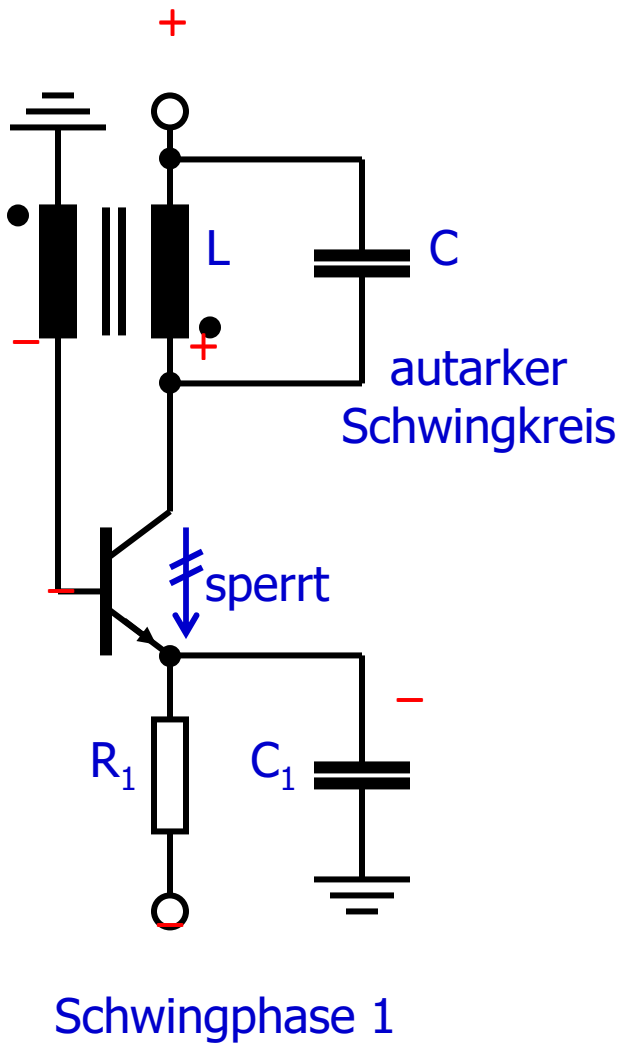


7. 3. Ungedämpfte Schwingungen

Beispiel: **Meißner-Schaltung**



$\tau = R_1 C_1 >> T = \frac{2\pi}{\omega_0}$



Schwingphase 1

Meißner-Schaltung