交流电桥

- 优劣：

直流：
优：电源稳定，电路简单，是主要测量电路.
缺：直流放大器复杂，有零漂，工频干扰

交流.
优：放大简单，无零漂，不受干扰.
缺：需专用测量仪器，或不易取高精度.

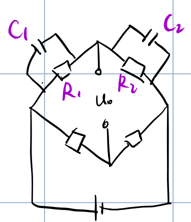
- $\dot{U}_o = \dot{U}\dfrac{Z_1Z_3 - Z_2Z_4}{(Z_1+Z_3)(Z_3+Z_4)}$

$Z_1\cdot Z_3 - Z_2Z_4 = 0$

即 $\begin{cases} r_1r_3 = r_2r_4 \\ \varphi_1+\varphi_3 = \varphi_2+\varphi_4 \end{cases}$

$Z_1 \longrightarrow Z_1+\Delta Z_1$, $\dot{U}_o = \dot{U}\cdot\dfrac{Z_3/Z_4 \quad \Delta Z_1/Z_1}{(1+\Delta Z_1/Z_1 + Z_2/Z_1)(1+Z_3/Z_4)}$

- 单桥 当 $Z_1 = Z_2 = Z_3 = Z_4$，有 $\dot{U}_o = \frac{1}{4}\dot{U}\frac{\Delta Z_1}{Z_1} = \frac{1}{4}\dot{U}K\varepsilon$



$Z_1 = \dfrac{R_1}{1+j\omega R_1C_1}$ $\qquad \Delta Z_1 \doteq \dfrac{\Delta R_1}{(1+j\omega R_1C_1)^2}$

半桥 $\dot{U}_o = \frac{1}{2}\dot{U}\frac{\Delta Z_1}{Z_1} = \frac{1}{2}\dot{U}K\varepsilon$

还要满足电容平衡条件.

$R_1C_1 = R_2C_2$

$$\dot{U}_o = \frac{1}{2}\dot{U}\frac{1}{1+\omega^2R^2C^2}\frac{\Delta R}{R} - j\cdot\frac{1}{2}\dot{U}\frac{\omega C}{1+\omega^2R^2C^2}\Delta R$$

全桥. $U_{sc} = \frac{1}{4}K(\varepsilon_1+\varepsilon_3-\varepsilon_2-\varepsilon_4)U_{sr}$.

$\begin{cases} \varepsilon_2 = \varepsilon_4 = -\varepsilon \\ \varepsilon_1 = \varepsilon_3 = \varepsilon \end{cases}$，有 $U_{sc} = K\varepsilon U_{sr}$

想要应变效果叠加，相邻电阻 ΔR 方向相反(一增一减)

- 应用.

$U_{sc} = \frac{1}{4}\cdot K\varepsilon U_m\sin\omega t$ (拉伸应变)

$U_{sc} = -\frac{1}{4}K\varepsilon U_m\sin\omega t$ (拉伸负应变)

若 $\varepsilon_n = \varepsilon_m\sin\Omega t$

$U_{sc} = \frac{1}{4}K\varepsilon_m\sin\Omega t\cdot U_m\sin\omega t$.

$= \frac{1}{8}K\varepsilon_mU_m\left(\cos(\omega-\Omega)t - \cos(\omega+\Omega)t\right)$

若 $\varepsilon_n = \varepsilon + \varepsilon_m \sin \Omega t$

$$u_{sc} = \frac{1}{4} k \varepsilon U_m \sin \omega t + \frac{1}{8} k \varepsilon_m U_m \left(\cos(\omega - \Omega)t - \cos(\omega + \Omega)t \right)$$