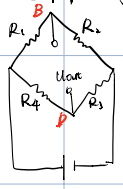
直流电桥 输出电压



$$\begin{vmatrix} R_1 & R_2 \\ R_4 & R_3 \end{vmatrix} = U_0$$

A 系数

$R_1R_3 = R_2R_4$

$\frac{R_2}{R_1} = \frac{R_3}{R_4}$

$$U_0 = U\cdot\frac{R_1R_3 - R_2R_4}{(R_1+R_2)(R_3+R_4)}$$

B、D 节点断开时，U_{BD}

$$= U\left(\frac{R_1}{R_1+R_2} - \frac{R_4}{R_3+R_4}\right)$$

输入端

当 $R_1 \longrightarrow R_1+\Delta R_1$，$U_0 = \left(\frac{R_1+\Delta R_1}{R_1+\Delta R_1+R_2} - \frac{R_4}{R_3+R_4}\right)U$

$$= \left(\frac{1+\Delta R_1/R_1}{1+\Delta R_1/R_1+R_2/R_1} - \frac{R_4/R_3}{1+R_4/R_3}\right)U$$

$$= U\frac{1+\cancel{R_2/R_1}+\Delta R_1/R_1+\cancel{\Delta R_1/R_1\cdot R_4/R_3}-\cancel{R_2/R_1}-\cancel{\Delta R_1\cdot R_4/R_1R_3}-R_2/R_1\cdot R_4/R_3}{(1+\Delta R_1/R_1+R_2/R_1)(1+R_4/R_3)}$$

$$= U\cdot\frac{1+\Delta R_1/R_1-\boxed{R_2/R_1\cdot R_4/R_3}}{(1+\Delta R_1/R_1+R_2/R_1)(1+R_4/R_3)} = 1$$

桥臂比 $n = R_2/R_1 = R_3/R_4$　　$\Delta R_1/R_1 = 0$

$$= U\frac{\Delta R_1/R_1}{(1+n)(1+\frac{R_4}{R_3})} = U\frac{n}{(1+n)^2}\frac{\Delta R_1}{R_1}$$

$\frac{R_4}{R_3} \to \frac{1}{n}$

$K_U = U\cdot\frac{n}{(1+n)^2}$

K_U 越大，U_0 越大。

$n=1$ 即 $R_1=R_2$，$R_3=R_4$ 时，K_U 最大，$K_U = \frac{1}{4}U$。

$U_0 = \frac{1}{4}U\frac{\Delta R_1}{R_1} = \frac{1}{4}U\cdot K\cdot\varepsilon$，灵敏度 $K_U = \frac{1}{4}U$。

桥臂系数 $\frac{1}{4}$

半桥：R_1 R_2 最变化相反的应变片

$R_1 \longrightarrow R_1+\Delta R_1$

$R_2 \longrightarrow R_2-\Delta R_2$

输出电压 $U_0 = U\left(\frac{R_1+\Delta R_1}{R_1+\Delta R_1+R_2-\Delta R_2} - \frac{R_3}{R_3+R_4}\right)$

$\Delta R_1 = \Delta R_2$ 时，非线性误差消除

$$= \frac{1}{2}U\frac{\Delta R}{R}$$

$K_U = \frac{1}{2}U$，$K = \frac{1}{2}$

（扩大一倍）

- 温度补偿
- 消除非线性.
- 灵敏度扩大一倍.

- 全桥

$K_u = U$. $K = 1$, 灵敏度 x4.