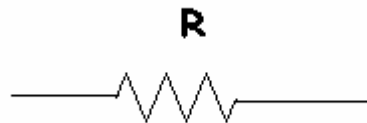


## VIII. JEMBATAN WHEATSTONE

### Teori :

Elemen listrik → Rangkaian listrik → Perangkat elektronik → Aplikasi elektronik & Pengukuran ilmiah

Elemen listrik fundamental → Tegangan (V) → Arus (I) → Hambatan/Resistansi (R) →  $\Omega$  (Ohm) → simbol :



→ membatasi besar arus (I) rangkaian → *short circuit*

### Hambatan :

- Ohmik → V dan I linear (konduktor, sebagian semikonduktor, isolator)
- Non Ohmik → V dan I non linear (Kebanyakan semikonduktor)

Hambatan → fungsi luas penampang, panjang, hambatan jenis, dan suhu →  $f(A, L, \rho, T)$  → material → konduktor, semikonduktor, isolator.

Dapat dinyatakan :

$$\text{Secara umum : } R = \frac{\rho L}{A}$$

Kebanyakan konduktor logam  $\rightarrow T \gg \rightarrow \rho \gg \rightarrow R \gg$

Semikonduktor  $\rightarrow T \gg \rightarrow$

(a)  $R \gg \rightarrow$  PTC  $\rightarrow$

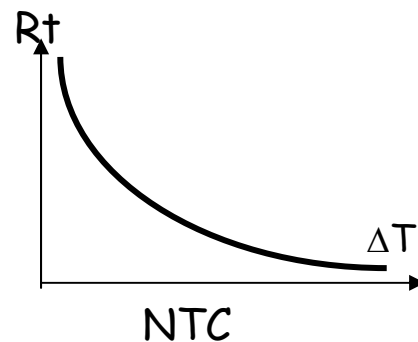
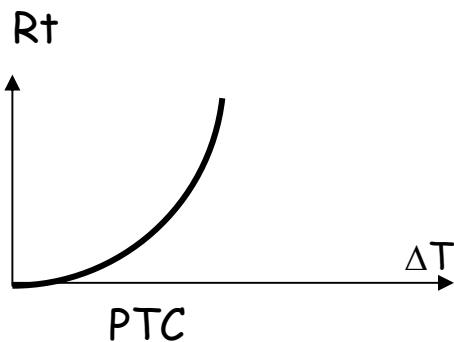
(positive temperature coefficient)  $\rightarrow$  PTC  $\rightarrow b \rightarrow +$

(b)  $R \ll \rightarrow$  NTC  $\rightarrow$

(Negative Temperature Coefficient)  $\rightarrow$  NTC  $\rightarrow b \rightarrow -$

$$R_T = R_o e^{b\Delta T}$$

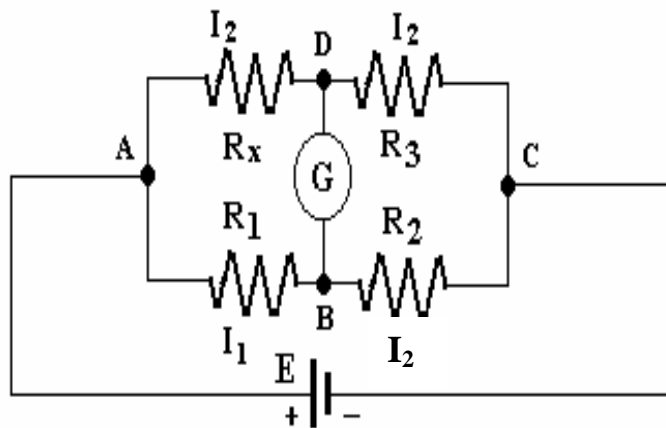
Contoh : Termistor



Jembatan Wheatstone  $\rightarrow$  salah satu metode pengukuran hambatan ( $R$ )  $\rightarrow$  4 buah hambatan + 1 Galvanometer ( $G$ )  $\rightarrow$  salah satu hambatan tidak diketahui nilainya  $\rightarrow$

$I_x$

$I_3$



Bila  $G \rightarrow 0$

$$V_G = 0$$

$$V_{AD} = V_{AB}$$

$$I_x R_x = I_1 R_1 \quad \rightarrow \quad I_x = \frac{I_1 R_1}{R_x} \dots (1)$$

$$I_G = 0$$

$$I_1 = I_2 \dots (2)$$

$$I_x = I_3 \dots (3)$$

$$V_G = 0$$

$$V_{DC} = V_{BC}$$

$$I_2 R_2 = I_3 R_3$$

$$I_1 R_2 = I_x R_3 \dots (2) \& (3)$$

$$I_1 R_2 = \frac{I_1 R_1}{R_x} R_3$$

$$R_2 R_x = R_1 R_3$$

Dengan kondisi diatas nilai  $R_x$  dapat diketahui