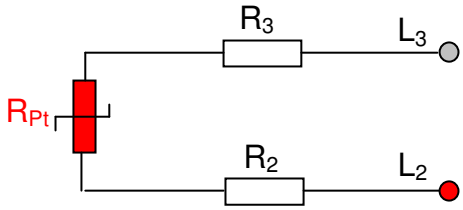
The effect of 2, 3 or 4 wire connection using Pt100/RTDs

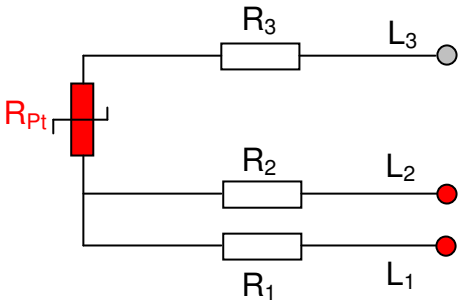
2-wire connection



$$R_{Pt\ 100} = R_{Pt} + R_2 + R_3$$

The wire resistances R_2 and R_3 are inevitably included in the measured value. Wire resistance can be cancealled by calibration, but just at one specific temperaure of the wire (often room temperature).

3-wire connection



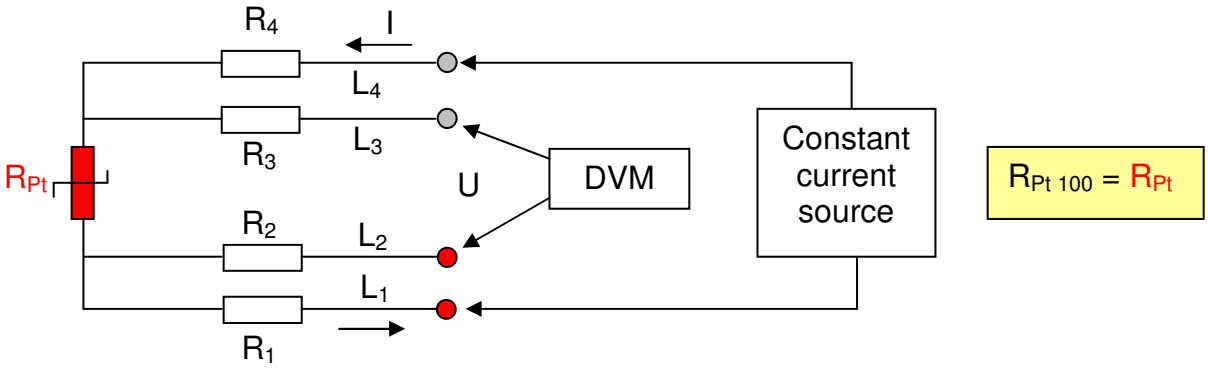
$$\Omega_1 = R_2 + R_{Pt} + R_3$$

$$\Omega_2 = R_1 + R_2$$

$$\Omega_1 - \Omega_2 = R_{Pt\ 100} = R_{Pt} + R_3 - R_1$$

If and only if the wire resistances R_1 and R_3 are equal you measure the true Pt100 resistance. As the wire L_2 also is coloured red (and hard to follow) you have to keep all the wire resistances R_1, R_2 and R_3 equal.

4-wire connection



$$R_{Pt\ 100} = R_{Pt}$$

The current source will maintain the excitation current constantly (0,1 – 1 mA). Following the Law of Ohm, R = U / I, the resistance can be calculated. The digital volt meter, DVM, has an input impedance of at least 10 Mohms. Thus just an extremely small current will pass through the DVM which means that the voltage drops over the wire resistances R_2 and R_3 will be practically none.

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