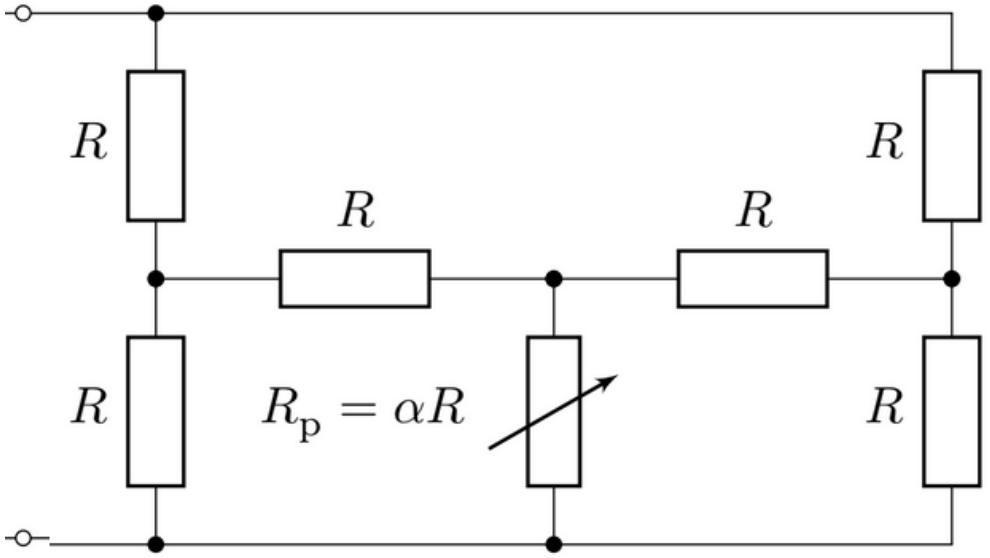
ETH zürich

Nachbesprechung

Allgemeines

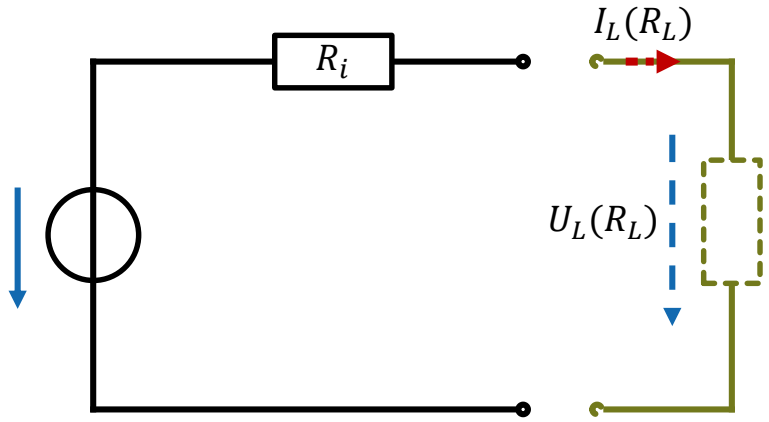
Netzwerkanalyse

1. b) Wie gross ist der Widerstand zwischen den Klemmen?

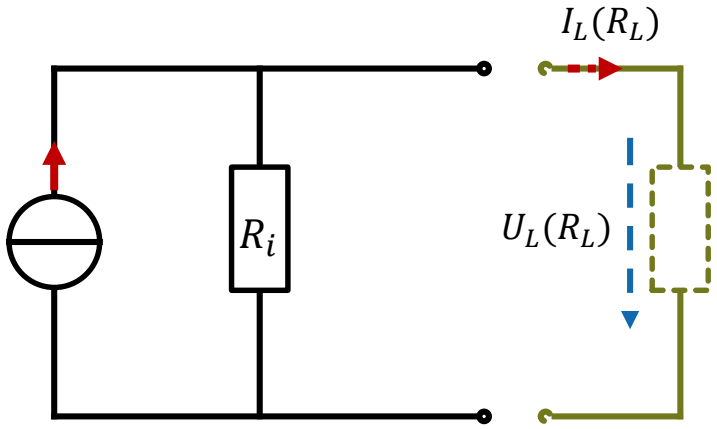


Theorie

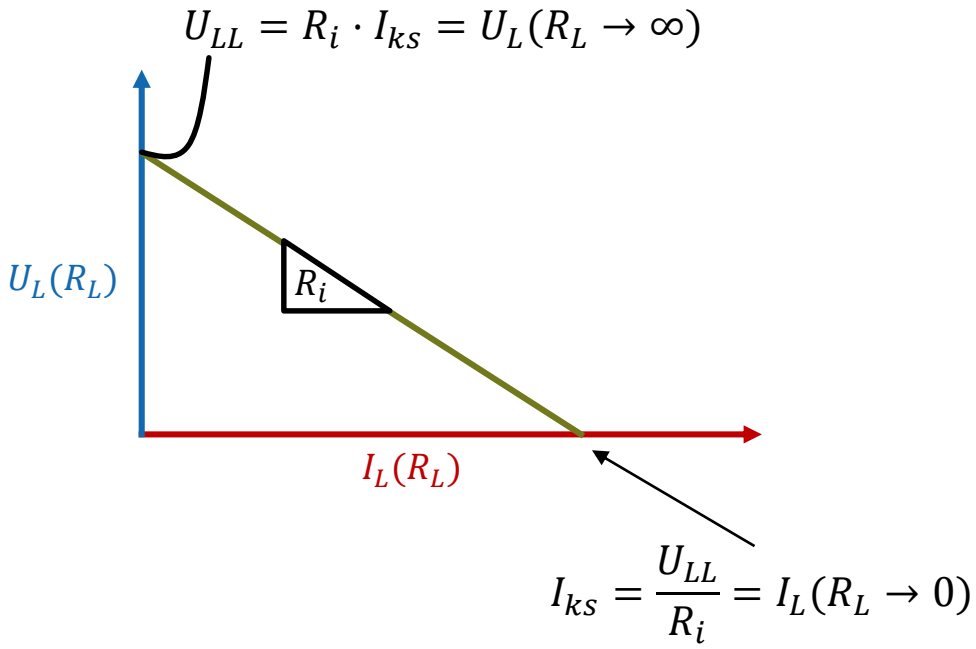
Recap: Reale Quellen



Reale Spannungsquelle

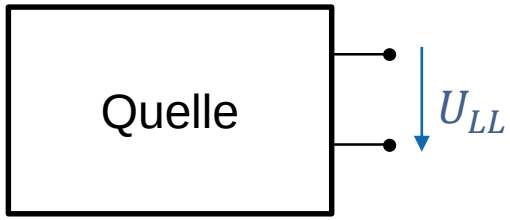


Reale Stromquelle

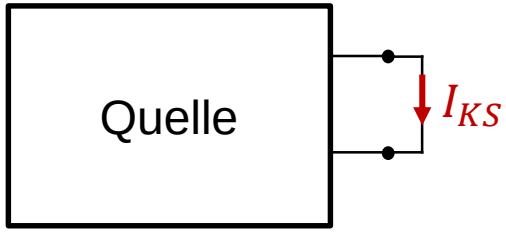


Zwei der folgenden Angaben sind ausreichend um eine Quelle zu Beschreiben

- Leerlaufspannung

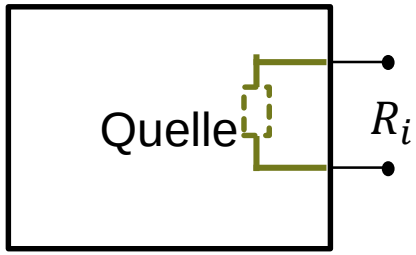


- Kurzschlussstrom

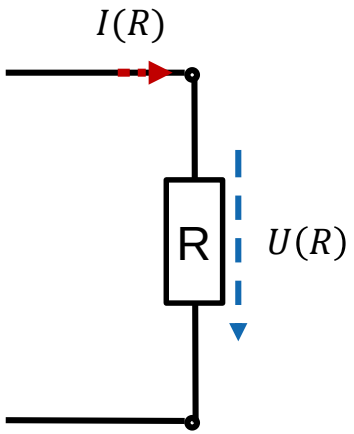


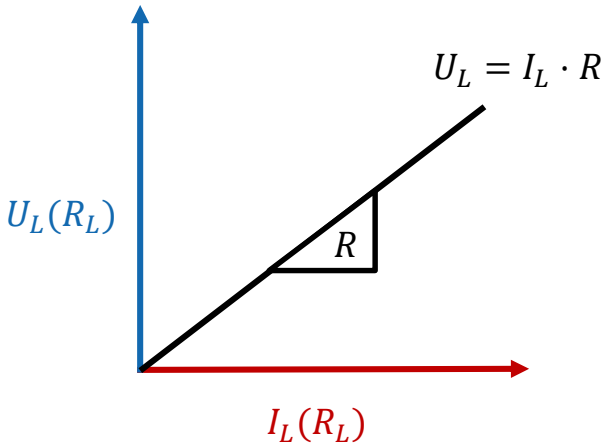
$$U_{LL} = I_{KS} \cdot R_I$$

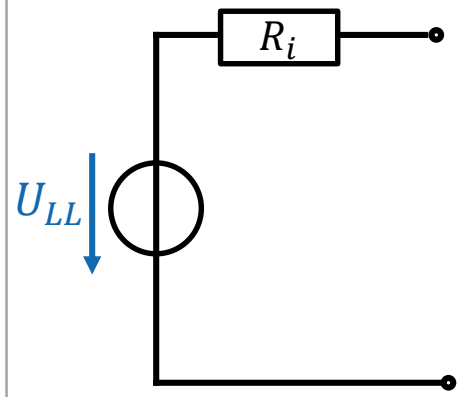
- Innenwiderstand

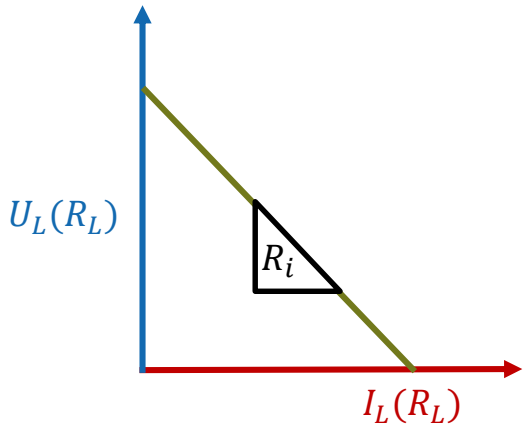


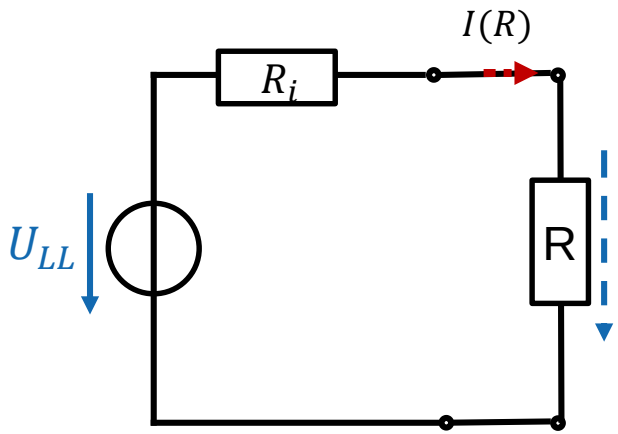
Arbeitspunktbestimmung



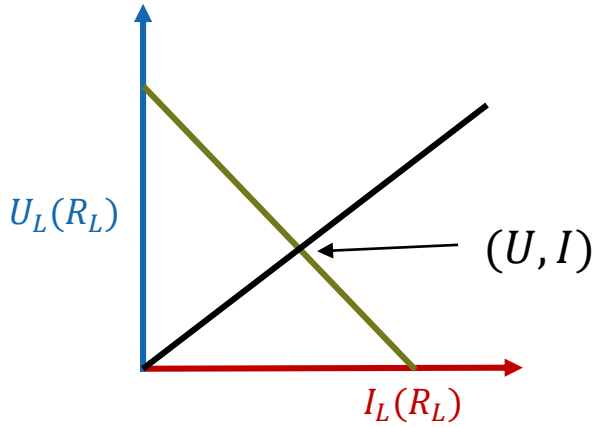




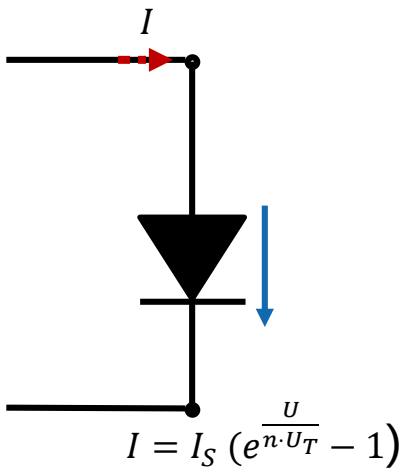


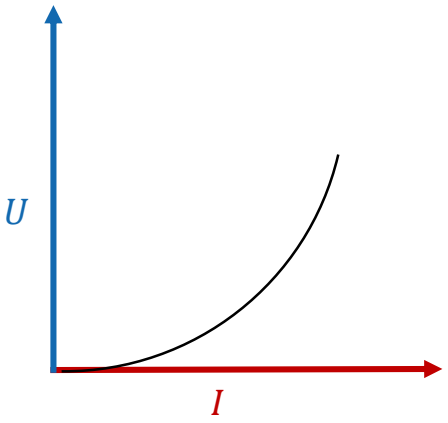


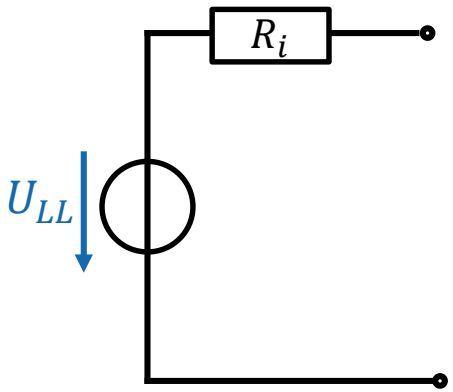
$$U(R) = R \cdot I_L = U_{LL} \cdot \frac{R}{R + R_i}$$

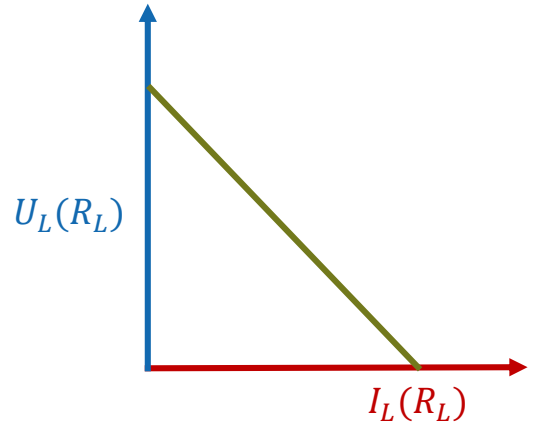


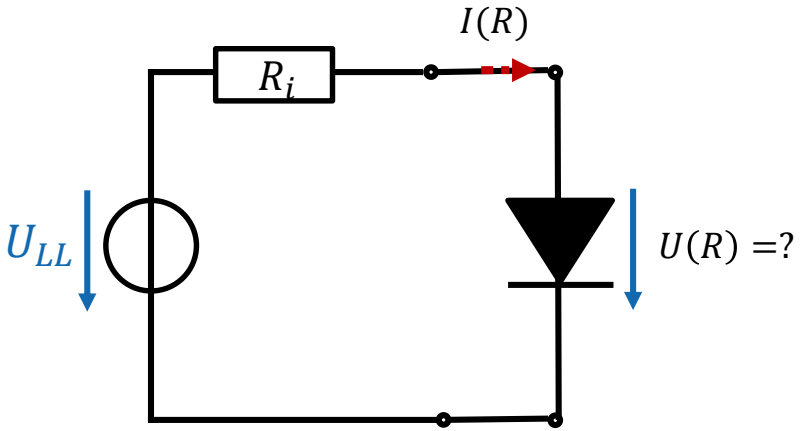
Arbeitspunktbestimmung

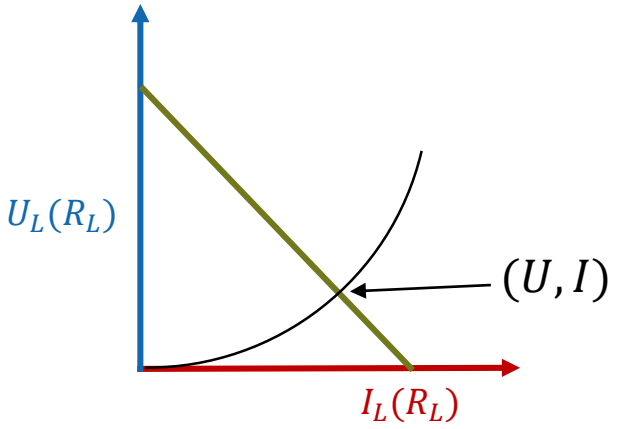






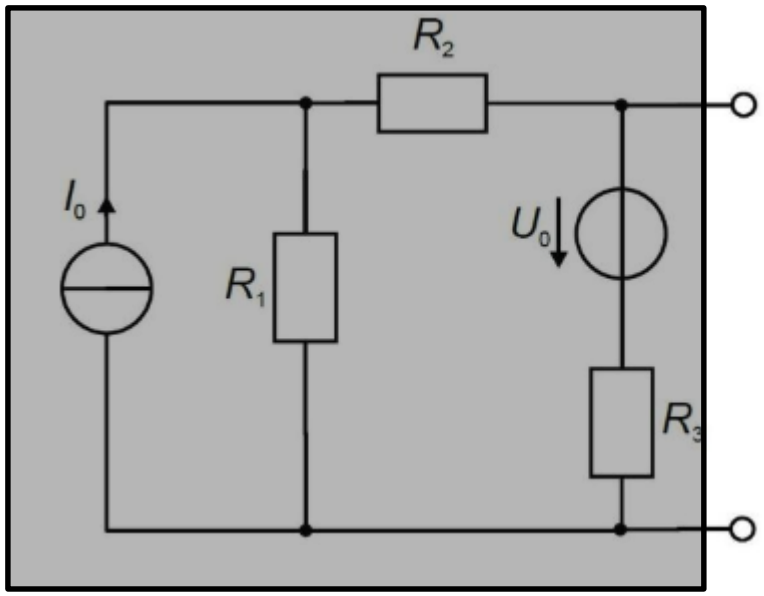




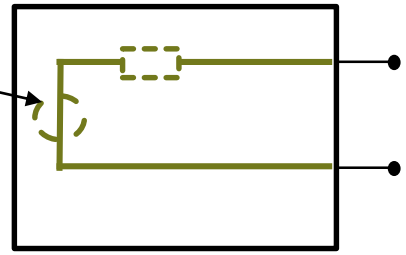


Theorem von Norton und Thévenin

<u>Jedes</u> Netzwerk, dass aus linearen Bauteilen besteht und 2 Klemmen besitzt, lässt sich als reale Quelle darstellen.

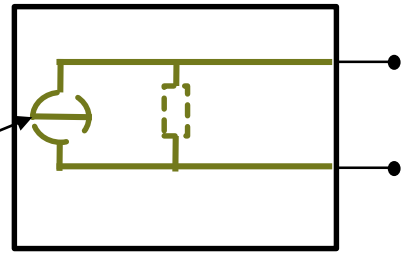


Leerlaufspannung



Théveninäquivalent:
Darstellung als Spannungsquelle

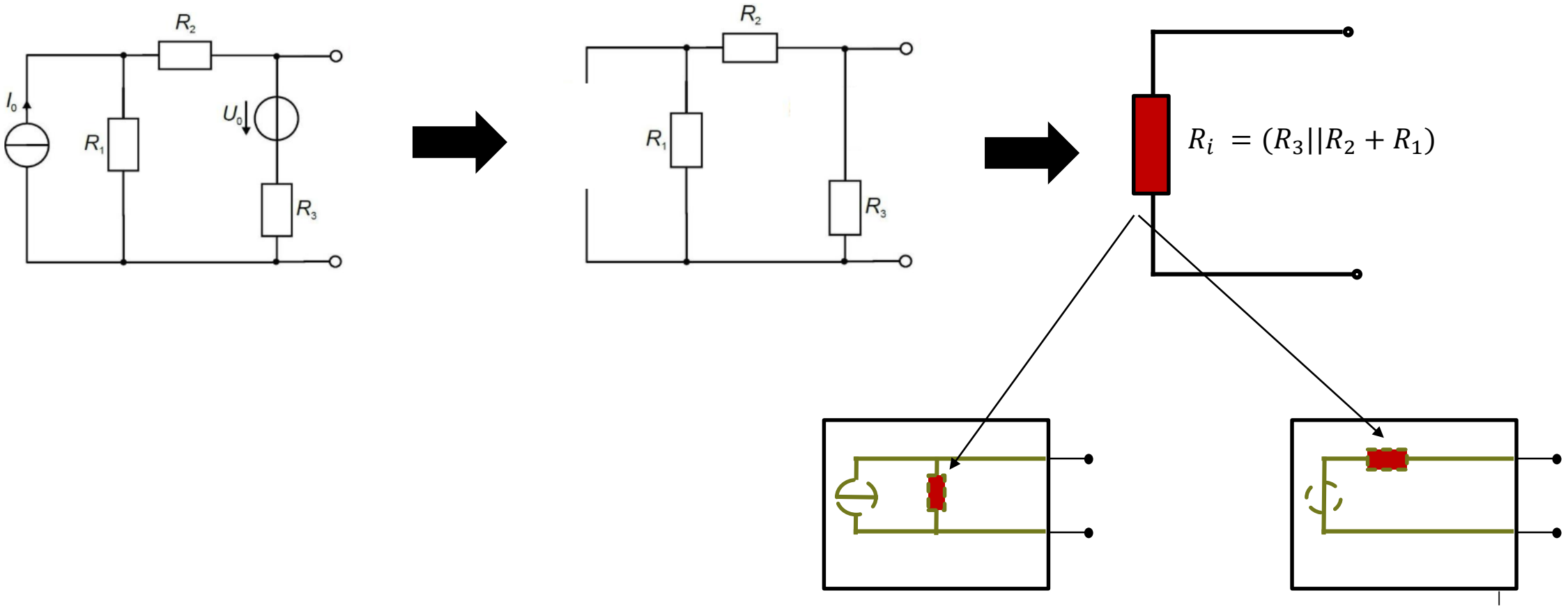
Kurzchlussstrom



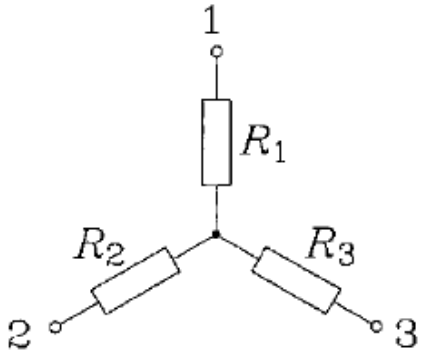
Nortonäquivalent:
Darstellung als Stromquelle

Berechnung des Innenwiderstandes

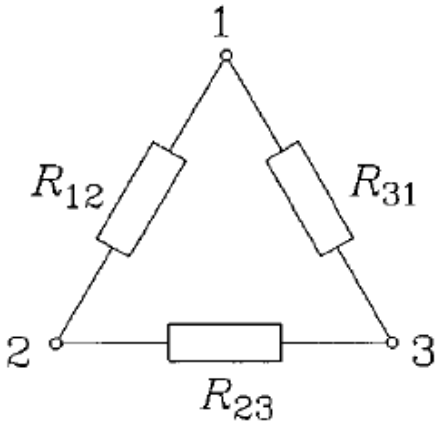
1. Setze alle Quellen zu 0
2. Forme Netzwerk solange um, bis nur noch ein Widerstand zwischen den Klemmen vorhanden ist



Stern Dreieck Umformung



Sternschaltung



Dreieckschaltung

Umwandlung von Stern in Dreieck

$$R_{13} = R_1 + R_2 + \frac{R_1 R_2}{R_3}$$

$$R_{23} = R_2 + R_3 + \frac{R_2 R_3}{R_1}$$

$$R_{31} = R_3 + R_1 + \frac{R_3 R_1}{R_2}$$

Umwandlung von Dreieck in Stern

$$R_1 = \frac{R_{12} R_{31}}{R_{12} + R_{23} + R_{31}}$$

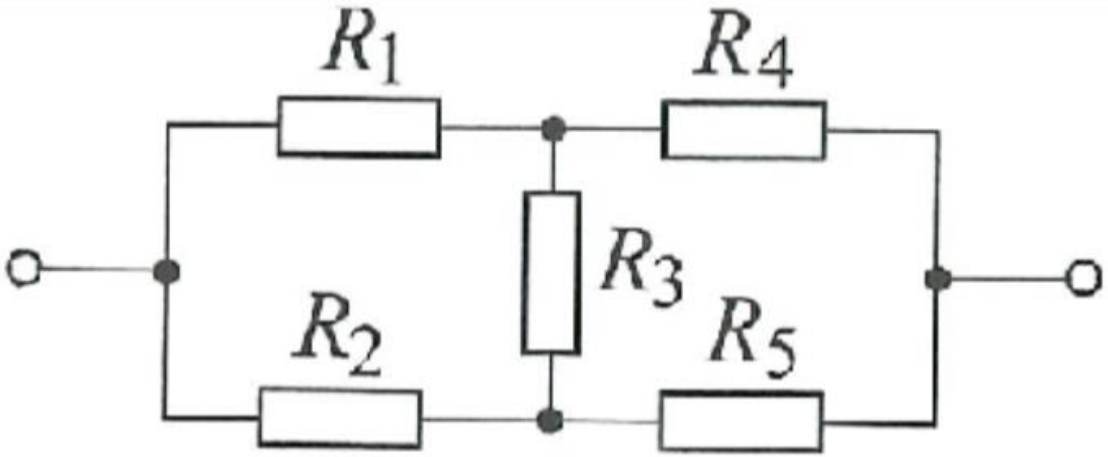
$$R_2 = \frac{R_{23} R_{12}}{R_{12} + R_{23} + R_{31}}$$

$$R_3 = \frac{R_{31} R_{23}}{R_{12} + R_{23} + R_{31}}$$

Aufgaben

Stern-Dreieck

Fasse folgende Widerstände zu einem zusammen



Ersatzquelle

Zeichne eine Ersatzspannungsquelle für folgende Schaltung