

Grundlegender Aufbau einer Stern und einer Dreiecksschaltung

Für die Umwandlung von der Stern in die Dreiecksschaltung lauten sie:

$$R_{12} = \frac{R_{10} \cdot R_{20} + R_{10} \cdot R_{30} + R_{20} \cdot R_{30}}{R_{30}}$$

$$R_{13} = \frac{R_{10} \cdot R_{20} + R_{10} \cdot R_{30} + R_{20} \cdot R_{30}}{R_{20}}$$

$$R_{23} = \frac{R_{10} \cdot R_{20} + R_{10} \cdot R_{30} + R_{20} \cdot R_{30}}{R_{10}}$$

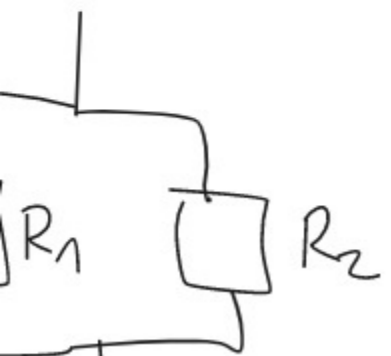
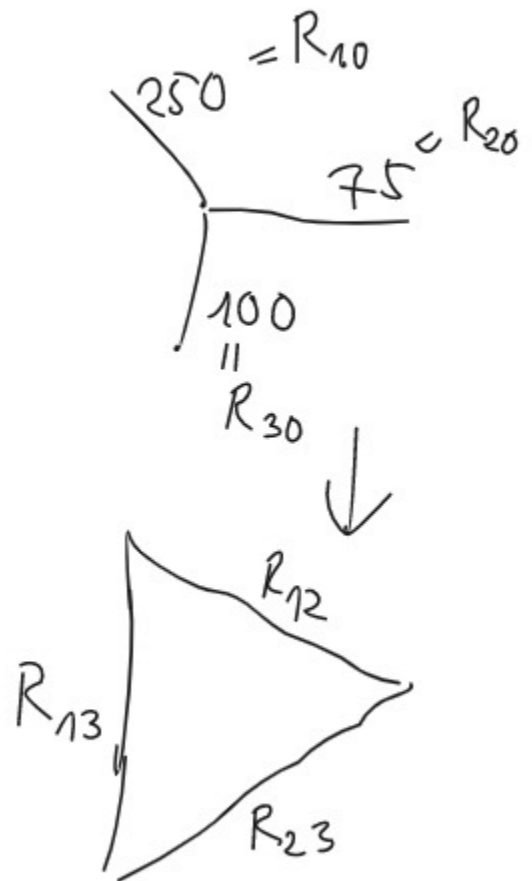
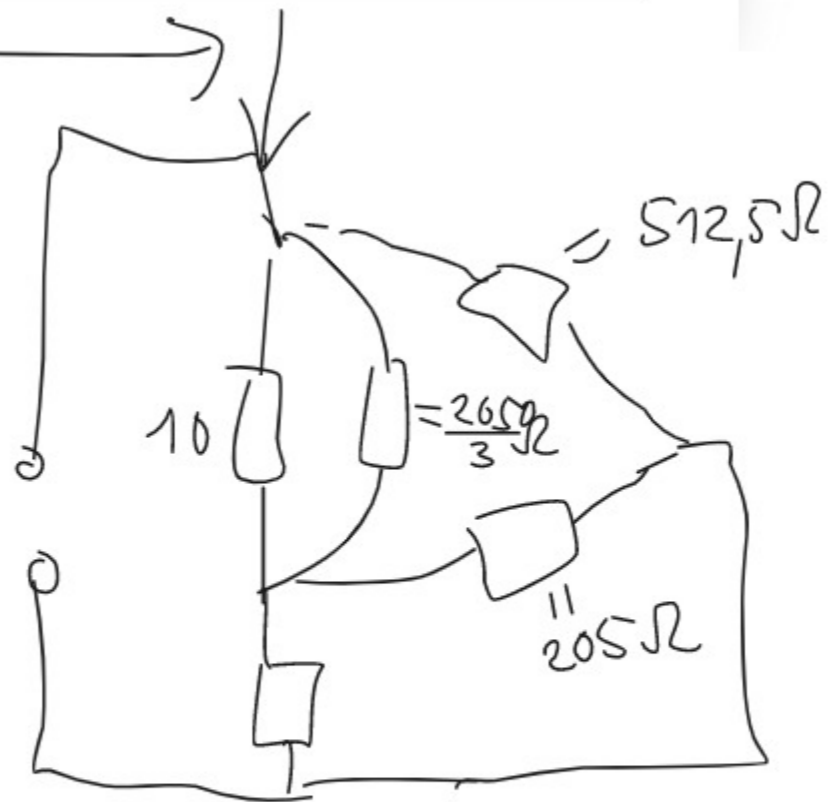
$$R_{\Delta} = (250 \cdot 75 + 250 \cdot 100 + 75 \cdot 100) \Omega^2 = 51250 \Omega^2$$

$$R_{12} = \frac{R_{\Delta}}{R_{30}} = \frac{51250 \Omega^2}{100 \Omega} = 512,5 \Omega$$

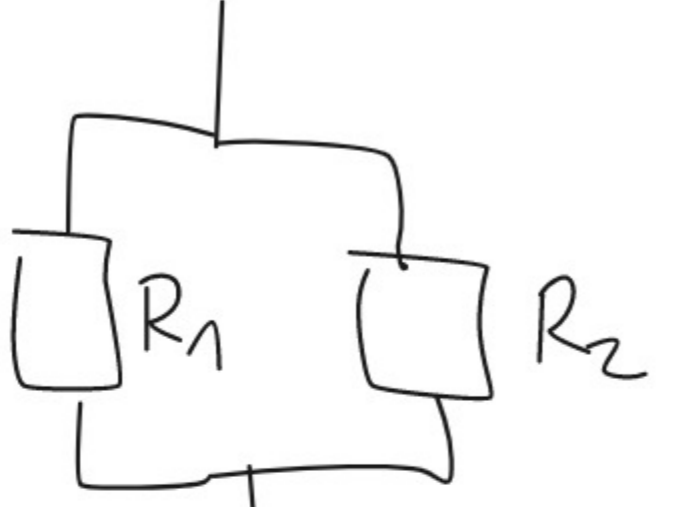
$$R_{23} = \frac{R_{\Delta}}{R_{10}} = \frac{51250 \Omega^2}{250 \Omega} = 205 \Omega$$

$$R_{13} = \frac{R_{\Delta}}{R_{20}} = \frac{51250 \Omega^2}{75 \Omega} = \frac{2050}{3} \Omega$$

Stern-Dreieck-Umwandlung

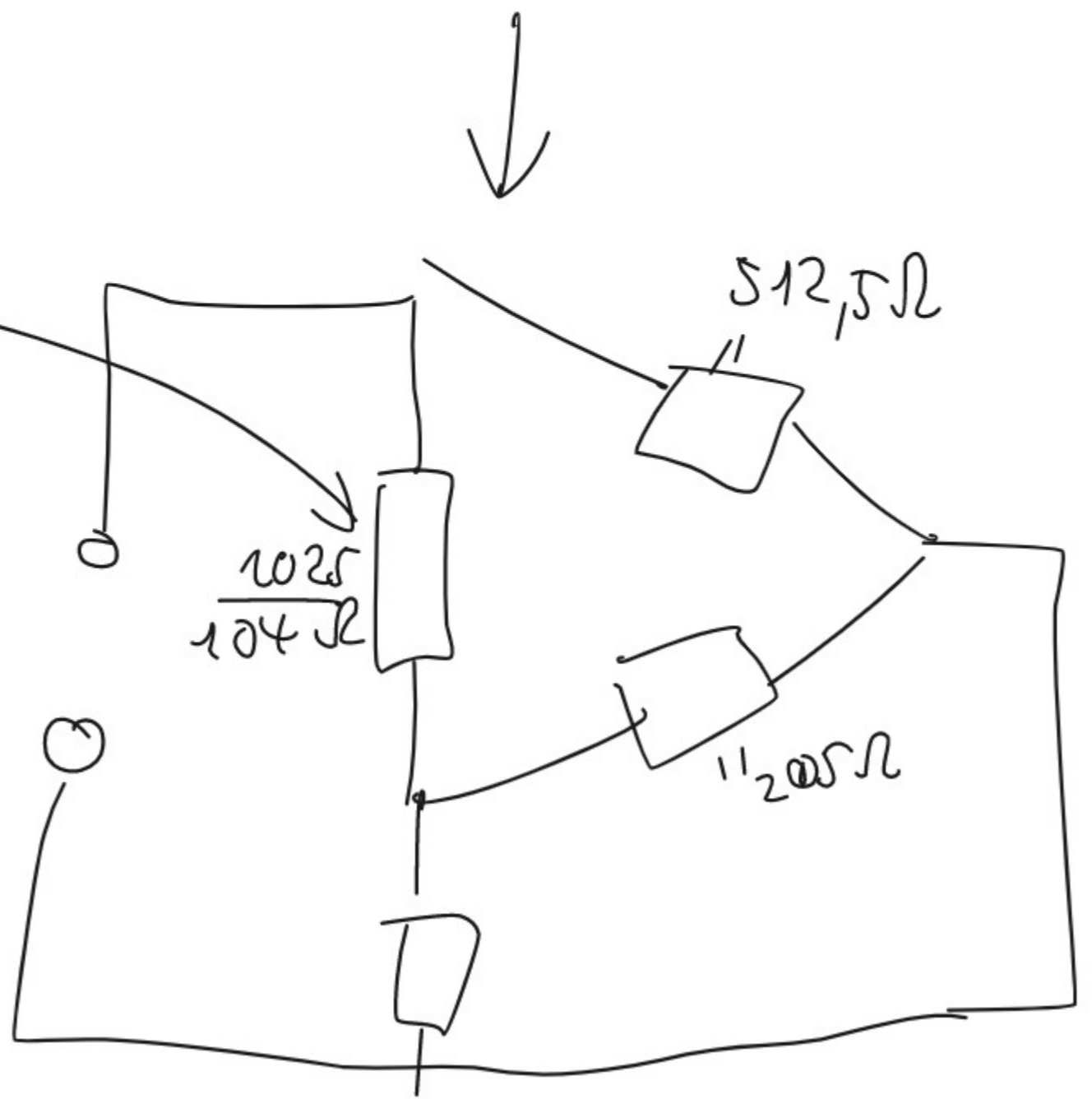
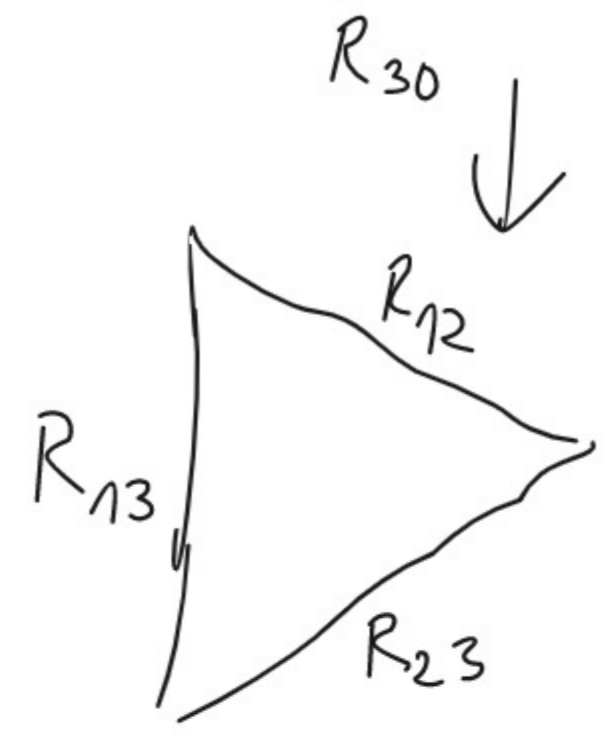
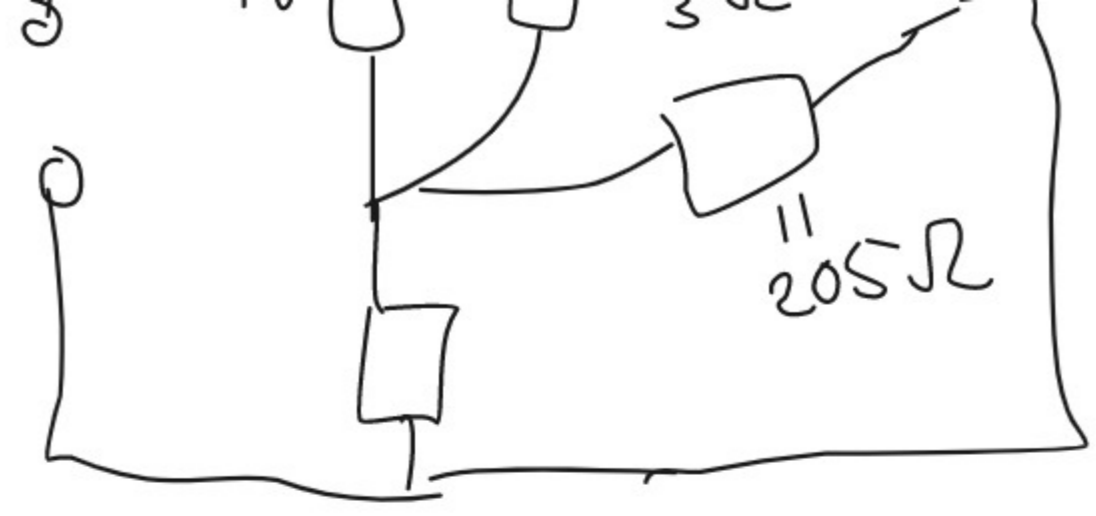


2050



$$R = \frac{R_1 \cdot R_2}{R_1 + R_2} = \frac{10 \Omega \cdot \frac{2050}{3} \Omega}{10 \Omega + \frac{2050}{3} \Omega} = \frac{1025}{104} \Omega$$

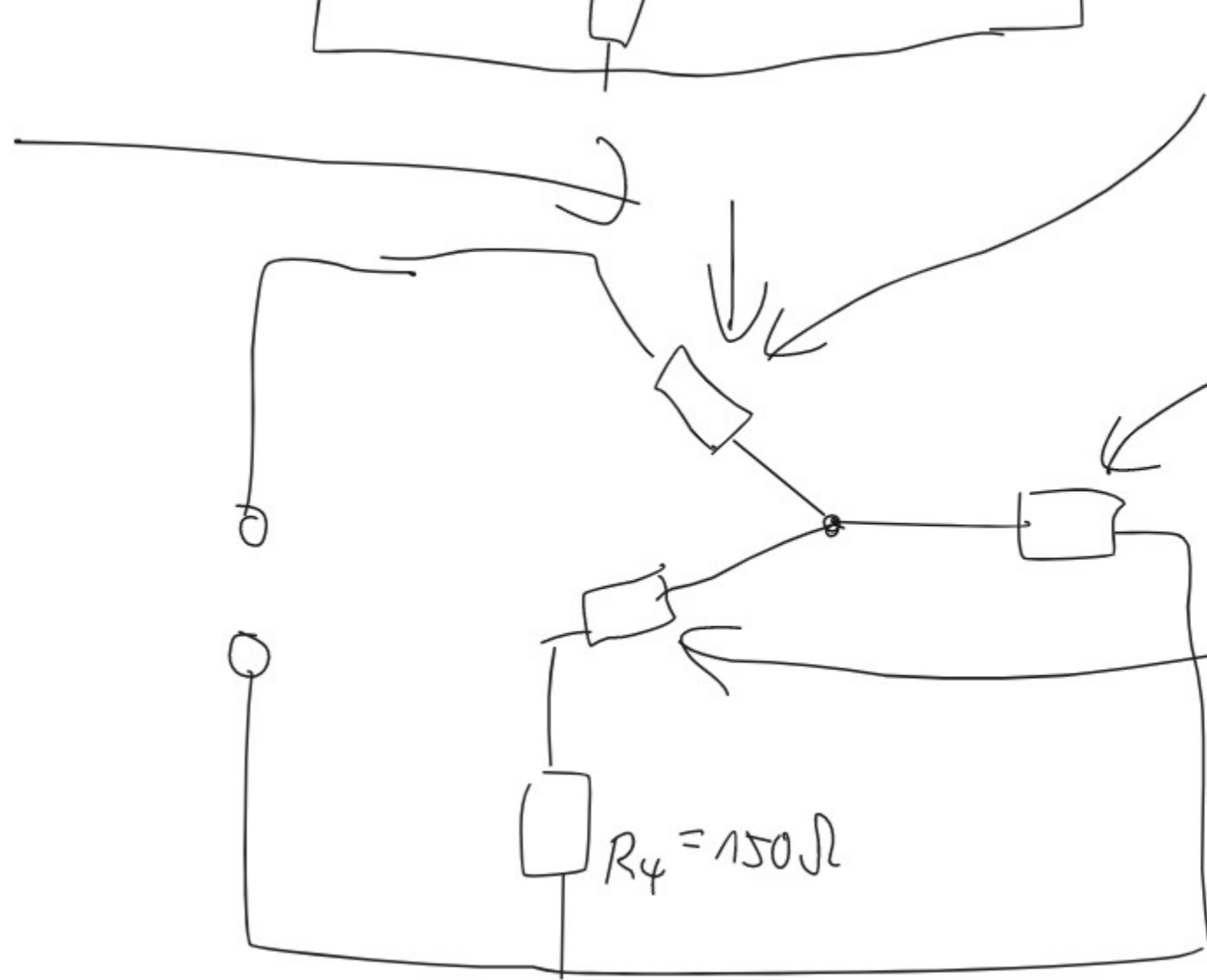
Dreieck-Stern-



$$R_{\Delta} = \frac{1025}{104} \Omega + 512,5 \Omega + 205 \Omega = \frac{75645}{104} \Omega$$

$$R_{10} = \frac{\frac{1025}{104} \Omega \cdot 512,5 \Omega}{R_{\Delta}} \text{ m\u00f6}$$

Dreieck-Stern-
Umwandlung



$$R_{10} = \frac{104 \cdot 512,5 \cdot 205}{512,5 + 205 + 104} =$$

$$= \frac{125}{18} \Omega$$

$$R_{20} = \frac{512,5 \Omega \cdot 205 \Omega}{R_{\Delta}} = \frac{1300}{9} \Omega$$

$$R_{30} = \frac{\frac{1025}{104} \Omega \cdot 205 \Omega}{R_{\Delta}} = \frac{25}{9} \Omega$$

$$R_{ges} = R_{10} + \left((R_{30} + R_4) \parallel R_{20} \right)$$

$$= R_{10} + \frac{(R_{30} + R_4) \cdot R_{20}}{R_{30} + R_4 + R_{20}} =$$

$$= \frac{125}{18} \Omega + \frac{\left(\frac{25}{9} \Omega + 150 \Omega\right) \cdot \frac{1300}{9} \Omega}{\frac{25}{9} \Omega + 150 \Omega + \frac{1300}{9} \Omega} = \frac{17375}{214} \Omega =$$

$$= 81,191588... \Omega \approx 81,2 \Omega$$

Tipp
Nenner ermitteln und Ergebnis notieren

$R_{10} = \frac{R_{12} \cdot R_{13}}{R_{12} + R_{13} + R_{23}}$ ✓
 $R_{20} = \frac{R_{12} \cdot R_{23}}{R_{12} + R_{13} + R_{23}}$ ✓
 $R_{30} = \frac{R_{13} \cdot R_{23}}{R_{12} + R_{13} + R_{23}}$ ✓

= $\frac{\text{Produkt der Dreieckswiderstände an der Klemme z}}{\text{Summe aller Widerstände des Dreiecks}}$

Dreieck Stern Umwandlung Formel

$$R_{10} = \frac{R_{12} \cdot R_{13}}{R_{12} + R_{13} + R_{23}}$$

$$R_{20} = \frac{R_{12} \cdot R_{23}}{R_{12} + R_{13} + R_{23}}$$

$$R_{30} = \frac{R_{13} \cdot R_{23}}{R_{12} + R_{13} + R_{23}}$$