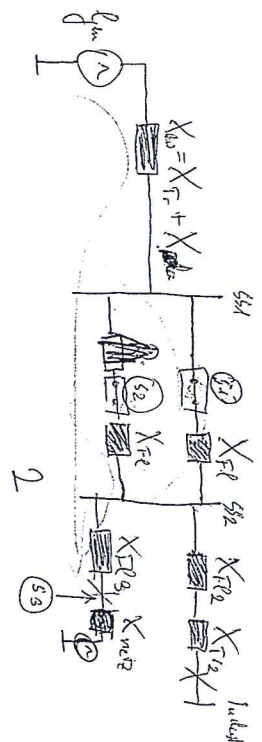


# 1.1: Musterlösung

## Aufgabe 1

ESB →



Rechnung →  $U_0 = 245 \text{ kV}$

$$X_{L0} = X_d + X_T = \frac{U_0^2}{S_{K3}} = \frac{245^2 \text{ kV}^2}{1750 \text{ MVA}} = 34,3 \Omega$$

$$X_{F1} = 1 \cdot 0,1' = 950 \text{ km} \cdot 0,385 \Omega/\text{km} = 134,75 \Omega$$

$$X_{F2} = 1 \cdot 0,1' = 100 \text{ km} \cdot 0,35 \Omega/\text{km} = 35 \Omega$$

$$X_{F3} = 1 \cdot 0,1' = 1140 \text{ km} \cdot 0,25 \Omega/\text{km} = 104,5 \Omega$$

$$X_{T1} = U_k \cdot \frac{U_0^2}{S_n} = 0,109 \cdot \frac{245^2 \text{ kV}^2}{750 \text{ MVA}} = 17,2 \Omega$$

$$X_{L0} = X_{L0} + X_{F3} = \frac{U_0^2}{S_{K3}} = \frac{245^2 \text{ kV}^2}{2500 \text{ MVA}} = 24 \Omega$$

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$$I_k = \frac{U_0}{\sqrt{3} \cdot X_k} \quad (5/1) \quad X_{ges} = X_{L0} + \frac{1}{\frac{1}{X_{F1}} + \frac{1}{X_{F2}}} + X_{F3} = 34,3 + \frac{1}{\frac{1}{134,75} + \frac{1}{35}} + 104,5$$

5/3

$$X_{ges} = X_n - X_{F3} = 24 \Omega - 10 \Omega = 14 \Omega$$

$$S_{K3} = \sqrt{3} \cdot U_0 \cdot I_k = \frac{U_0^2}{X_{ges}} = \frac{245^2 \text{ kV}^2}{14 \Omega} = 4287,5 \text{ MVA}$$

5/1 weiter

$$I_{ges} = \frac{U_k}{\sqrt{3} \cdot X_{ges}} = \frac{245 \text{ kV}}{\sqrt{3} \cdot 112,9 \Omega} = 1,253 \text{ kA}$$

$$I_1 = I_{ges} \cdot \frac{X_{F2}}{X_{F1} + X_{F2}} = 1,253 \text{ kA} \cdot \frac{35}{134,75 + 35} = 0,6265 \text{ kA}$$

5/2

$$S_{K4} = \sqrt{3} \cdot U_k \cdot I_1 = \sqrt{3} \cdot 245 \text{ kV} \cdot 0,6265 \text{ kA} = 265,86 \text{ MVA}$$

5/3

$$S_{K1} = \sqrt{3} \cdot U_k \cdot I_1 = \sqrt{3} \cdot 245 \text{ kV} \cdot 0,6265 \text{ kA} = 265,86 \text{ MVA}$$

5/4

$$X_{g1} = X_{L0} + \frac{1}{\frac{1}{X_{F1}} + \frac{1}{X_{F2}}} + X_{F3} + X_{T1} = 148,88 \Omega$$

$$= 34,3 \Omega + 35 \Omega + 104,5 \Omega + 17,2 \Omega = 148,88 \Omega$$

$$X_{g2} = X_{T1} + X_{F2} + X_{T2} = 35 \Omega + 17,2 \Omega = 52,2 \Omega$$

$$I_{ges} = I_{g1} + I_{g2}$$

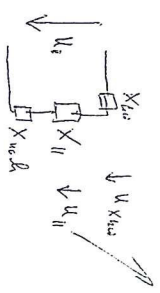
$$I_{g1} = \frac{U_k}{\sqrt{3} \cdot X_{g1}} + \frac{U_k}{\sqrt{3} \cdot X_{g2}} = \frac{U_k}{\sqrt{3}} \cdot \left( \frac{1}{X_{g1}} + \frac{1}{X_{g2}} \right)$$

$$I_{ges} = 1,253 \text{ kA}$$

5/5

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$$\text{Überschuldung } \rho = U_n \cdot I = R \cdot I^2 \cdot \frac{U_k}{\sqrt{3} \cdot X_{g1}} = 0,98 \text{ kA} \rightarrow \text{nicht 2}$$



$$R_1 = 5 \Omega$$

$$\rho = R_1 \cdot \frac{I^2}{2} = 5 \Omega \cdot \frac{0,98^2}{2} = 2,401 \text{ kA}$$