

$$30.1 \quad U_N = 230 \text{ V} \quad I_B = 21 \text{ A} \\ l = 50 \text{ m} \quad U_L = 3\%$$

$$A1: 1,5 \text{ } \phi$$

TAEV 2012/II/Tab 2-3

$$I_N = 9 \text{ L } 25 \text{ A}$$

$$A2 = 4 \text{ } \phi$$

TAEV 2012/II/Tab 2-4

B2, 2 bel. Adern, 25 A

A3:

$$U_L = \frac{\mu_L \cdot U_N}{100\%} = \frac{3\% \cdot 230}{100\%} = 6,9 \text{ V}$$

$$A_3 = \frac{2 \cdot I_B \cdot l}{\gamma \cdot U_L} = \frac{2 \cdot 21 \cdot 50}{56 \cdot 6,9} = 5,43 \text{ mm}^2$$

\Rightarrow YM-J 3x6

$$30.2 \quad U_N = 230 \text{ V} \quad P = 2 \text{ kW}$$

$$u_L = 1,5\% \quad A = 1,5 \text{ \AA}$$

$$I = \frac{P}{U \cdot \cos \varphi} = \frac{2000}{230 \cdot 1} = 8,7 \text{ A}$$

$$U_L = \frac{u_L \cdot U_N}{100\%} = \frac{1,5\% \cdot 230}{100\%} = 3,45 \text{ V}$$

$$l = \frac{U_L \cdot \gamma \cdot A}{2 \cdot I \cdot \cos \varphi} = \frac{3,45 \cdot 56 \cdot 1,5}{2 \cdot 8,7 \cdot 1} = 16,6 \text{ m}$$

$$30.3 \quad l = 100 \text{ m} \quad A = 50 \text{ mm}^2 \text{ Cu}$$

$$U_{\text{Anf.}} = 228 \text{ V}$$

$$I = 54 \text{ A}$$

$$U_L = \frac{2 \cdot I \cdot l \cdot \rho}{\gamma \cdot A} = \frac{2 \cdot 54 \cdot 100 \cdot 1}{56 \cdot 50} = 3,86 \text{ V}$$

$$\mu_L = \frac{U_L}{U_N} \cdot 100 \% = \frac{3,86}{230} \cdot 100 \% = 1,68 \%$$

$$\begin{aligned} U_{\text{Ende}} &= U_{\text{Anfang}} - U_L = \\ &= 228 - 3,86 = 224,14 \text{ V} \end{aligned}$$

$$30.4 \quad l = 80 \text{ m} \quad A = 4 \text{ } \phi$$

$$U_N = 230 \text{ V}$$

$$P_1 = 20 \times 40 \text{ W} \quad P_2 = 2 \text{ kW} \\ = 800 \text{ W}$$

$$I_1 = \frac{P_1}{U_N \cdot \cos \varphi} = \frac{800}{230 \cdot 1} = 3,48 \text{ A}$$

$$I_2 = \frac{P_2}{U_N \cdot \cos \varphi} = \frac{2000}{230 \cdot 1} = 8,7 \text{ A}$$

$$U_{L1} = \frac{2 \cdot I_1 \cdot l \cdot \cos \varphi}{\gamma \cdot A} = \frac{2 \cdot 3,48 \cdot 80 \cdot 1}{56 \cdot 4} = 2,49 \text{ V}$$

$$U_{L12} = \frac{2 \cdot (I_1 + I_2) \cdot l \cdot \cos \varphi}{\gamma \cdot A} = \\ = \frac{2 \cdot (3,48 + 8,7) \cdot 80 \cdot 1}{56 \cdot 4} = 8,7 \text{ V}$$

$$\Delta U = U_{L12} - U_{L1} = 8,7 - 2,49 = 6,21 \text{ V}$$

↳ zusätzlicher Spannungs.
⇒ = U_{L2}

$$30.5 \quad l = 150 \text{ m} \quad \text{Cu} \\ A = 35 \text{ mm}^2 \quad U_A = 226 \text{ V} \\ \mu_L = 1,5\%$$

$$U_L = \frac{\mu_L \cdot U_N}{100\%} = \frac{1,5\% \cdot 230}{100\%} = 3,45 \text{ V}$$

$$U_L = \frac{2 \cdot I \cdot l \cdot \cos \varphi}{\gamma \cdot A}$$

$$I = \frac{U_L \cdot \gamma \cdot A}{2 \cdot l \cdot \cos \varphi} = \frac{3,45 \cdot 56 \cdot 35}{2 \cdot 150 \cdot 1} = 22,54 \text{ A}$$

$$\begin{array}{lll} 30.6 & U_N = 230V & P = 4kW \\ & l = 18m & A = 2,5\phi \\ & \cos\varphi = 1 & \end{array}$$

$$I = \frac{P}{U \cdot \cos\varphi} = \frac{4000}{230 \cdot 1} = 17,4A$$

$$\begin{aligned} U_L &= \frac{2 \cdot I \cdot l \cdot \cos\varphi}{\gamma \cdot A} = \frac{2 \cdot 17,4 \cdot 18 \cdot 1}{56 \cdot 2,5} = \\ &= 4,47V \end{aligned}$$

30.7 YM

$$P_{ab} = 3 \text{ kW}$$

$$l = 16 \text{ m}$$

$$\eta = 0,6$$

$$\mu_L \leq 3\%$$

$$DC \quad 230 \text{ V}$$

$$P_{zu} = \frac{P_{ab}}{\eta} = \frac{3 \text{ kW}}{0,6} = 5 \text{ kW}$$

$$I_B = \frac{P_{zu}}{U} = \frac{5000}{230} = 21,7 \text{ A}$$

$$A_1 = 1,5 \phi$$

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Tab II/2-3

LS-Schalter: C25

$$A_2 = 2,5 \phi$$

C, 2 bel. Adern

Tab II/2-4

$$30.8 \quad U_N = 230V$$

$$A = 4 \phi$$

$$\cos \varphi = 1$$

$$\mu_L = 1,5\%$$

$$l = 24m$$

$$U_L = \frac{\mu_L \cdot U_N}{100\%} = \frac{1,5 \cdot 230}{100\%} = 3,45V$$

$$U_L = \frac{2 \cdot I \cdot l \cdot \cos \varphi}{\gamma \cdot A}$$

$$I = \frac{U_L \cdot \gamma \cdot A}{2 \cdot l \cdot \cos \varphi} = \frac{3,45 \cdot 56 \cdot 4}{2 \cdot 24 \cdot 1} = 16,1A$$

$$30.9 \quad I = 24 \text{ A}$$

$$l = 12 \text{ m}$$

$$\cos \varphi = 1$$

$$U_N = 230 \text{ V}$$

$$A = 4 \text{ } \phi$$

$$U_L = \frac{2 \cdot I \cdot l \cdot \cos \varphi}{\gamma \cdot A} = \frac{2 \cdot 24 \cdot 12 \cdot 1}{56 \cdot 4} = 2,6 \text{ V}$$

$$u_L = \frac{U_L}{U_N} \cdot 100\% = \frac{2,6}{230} \cdot 100\% = 1,1\%$$

$$P_v = U_L \cdot I \cdot \cos \varphi = 2,6 \cdot 24 \cdot 1 = 62 \text{ W}$$

$$P = U \cdot I \cdot \cos \varphi = 230 \cdot 24 \cdot 1 = 5520 \text{ W}$$

$$p_v = \frac{P_v}{P} \cdot 100\% = \frac{62}{5520} \cdot 100\% = 1,1\%$$

$$30.10 \quad P = 4 \text{ kW} \quad U_N = 230 \text{ V}$$

$$l = 28 \text{ m}$$

$$A = 2,5 \text{ mm}^2$$

$$I = \frac{P}{U \cdot \cos \varphi} = \frac{4000}{230 \cdot 1} = 17,4 \text{ A}$$

$$U_L = \frac{2 \cdot I \cdot l \cdot \cos \varphi}{\gamma \cdot A} = \frac{2 \cdot 17,4 \cdot 28 \cdot 1}{56 \cdot 2,5} = 7 \text{ V}$$

$$\mu_L = \frac{U_L}{U_N} \cdot 100\% = \frac{7}{230} \cdot 100\% = 3\%$$

$$P_V = U_L \cdot I \cdot \cos \varphi = 7 \cdot 17,4 \cdot 1 = 121,8 \text{ W}$$

$$p_V = \frac{P_V}{P} \cdot 100\% = \frac{121,8}{4000} \cdot 100\% = 3\%$$

$$30.11 \quad U_N = 230V$$

DC

$$l = 42m$$

$$P_{ab} = 3,5 kW$$

$$\eta = 0,64$$

$$\mu_L = 2\%$$

$$P_{zu} = \frac{P_{ab}}{\eta} = \frac{3,5 kW}{0,64} = 5468 W$$

$$I = \frac{P_{zu}}{U} = \frac{5468}{230} = 23,7 A$$

$$U_L = \frac{\mu_L \cdot U_N}{100\%} = \frac{2 \cdot 230}{100} = 4,6 V$$

$$P_v = U_L \cdot I = 23,7 \cdot 4,6 = 109 W$$

$$U_L = \frac{2 \cdot I \cdot l}{\gamma \cdot A}$$

$$A = \frac{2 \cdot I \cdot l}{\gamma \cdot U_L} = \frac{2 \cdot 23,7 \cdot 42}{56 \cdot 4,6} = 7,7 \text{ mm}^2$$

~~□~~ gelb \Rightarrow $\geq 25 A$

Tab II/2-4 C; 2 bel. Adern

$\Rightarrow 4 \phi$

$\Rightarrow 10 \phi$ gewählt

$$30.12 \quad U_N = 230V \quad P = 3kW$$

$$\mu_L = 2,5\%$$

$$P_v = \mu_L = 2,5\%$$

$$P_v = \frac{P_v \cdot P}{100\%} = \frac{2,5 \cdot 3000}{100\%} = 75W$$

$$30.13 \quad U_N = 230V$$

$$u_L = 3\%$$

$$l = 24m$$

$$I = 7,1 A$$

$$\cos \varphi = 0,8$$

$$A_1 = 1,5 \phi \quad \text{Tab II/2-3}$$

LSS C13A

Tab II/2-4 B2, 2 bel. Adl.

$$A_2 = 1,5 \phi$$

$$U_L = \frac{u_L \cdot U_N}{100\%} = \frac{3 \cdot 230}{100} = 6,9V$$

$$A = \frac{2 \cdot I \cdot l \cdot \cos \varphi}{\rho \cdot U_L} = \frac{2 \cdot 7,1 \cdot 24 \cdot 0,8}{56 \cdot 6,9} = 0,7 \text{ mm}^2$$

\Rightarrow YM-7 3x 1,5