

M 14: $A_1=10\text{cm}^2$; $l_1=15\text{cm}$; $n_1=1000$; $\mu_r=1$; $A_2=5\text{cm}^2$; $l_2=10\text{cm}$; $n_2=500$; $\mu_r=1000$; $k=0,87$

$$\underline{14.1} \quad L = \frac{n^2}{R_m} = \frac{n^2 \mu A}{l} \Rightarrow L_1 = \frac{10^6 \cdot 4\pi \cdot 10^7 \text{ H} \cdot 10 \cdot 10^{-4} \text{ m}^2}{m \cdot 0,15 \text{ m}} = 8,38 \text{ mH}$$

$$L_2 = \frac{25^4 \cdot 4\pi \cdot 10^7 \text{ H} \cdot 10^3 \cdot 5 \cdot 10^{-4} \text{ m}^2}{m \cdot 0,1 \text{ m}} = 1,57 \text{ H}$$

$$M = k \sqrt{L_1 L_2} = 99,8 \text{ mH}$$

14.2 da Spule 2 im Leerlauf: $i_2(t) = 0$ (= konst.)

$$u_1 = L_1 \frac{di_1}{dt} + M \frac{di_2}{dt} \quad \text{und} \quad u_2 = M \frac{di_1}{dt} + L_2 \frac{di_2}{dt} \quad \text{da } i_2(t)=0=\text{konst.} \Rightarrow \frac{di_2}{dt} = 0$$

$$\Rightarrow \frac{u_1}{u_2} = \frac{L_1}{M} \quad u_2 \frac{M}{L_1} u_1 = 11,91 u_1$$

$$u_1 = L_1 \frac{di}{dt} \quad di = \frac{u_1}{L} dt \quad \int_{i_0}^i di = \frac{u_1}{L} \int_{t_0}^t dt \quad i - i_0 = \frac{u_1}{L} (t - t_0) \quad \text{da } i_0=0 \text{ ist } i = \frac{u_1}{L} t$$

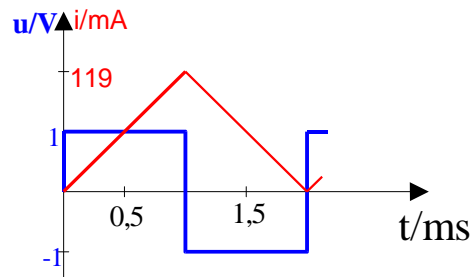
0 < t < t₁:

$$\text{da } i_0=0, \quad t_0=0 \text{ und } u_1(t) = 1\text{V folgt: } i = i(t) = \frac{u_1}{L} t = \frac{1\text{V}}{8,38 \cdot 10^{-3} \text{Vs}} t = 0,119 \text{ A} \frac{t}{\text{ms}}$$

t₁ < t < t₂:

$$\int_{i_1}^i di = \frac{u_1}{L} \int_{t_1}^t dt \quad i - i_1 = \frac{u_1}{L} (t - t_1) \quad i = i_1 + \frac{u_1}{L} (t - t_1) \quad \text{wobei: } i_1=119\text{mA}; \quad u_1=-1\text{V}$$

$$i = 119 \text{ mA} + 119 \text{ mA} \frac{t - t_1}{\text{ms}} \quad t = 2 \text{ ms}; \quad i = 0$$



14.3: $t_0 = t_1 = 1 \text{ ms}$

$$\text{Für } t < t_1: \quad i = 119 \text{ mA} \frac{t}{\text{ms}}$$

$$\text{Für } t > t_1: \quad \int_{i_1}^i di = \frac{u_L}{L} dt \Rightarrow i - i_1 = 0 \Rightarrow i = i_1 \Rightarrow i = i_1 = 119 \text{ mA} = \text{konst.}; \quad u_2 = 11,9 u_1$$