# 并联去耦等效电感推导

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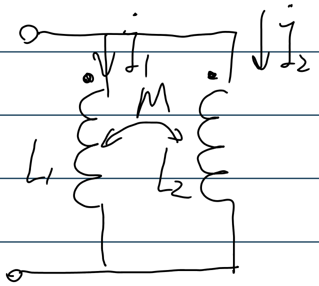
①：同向并联




有：$\dot U = j\omega L_1\dot I_1 + j\omega M\dot I_2$

$\dot U = j\omega M\dot I_1 + j\omega L_2\dot I_2$ 搂混淆!

有：$\frac{\dot U}{j\omega L_1} = \dot I_1 + \frac{M}{L_1}\dot I_2$

$\frac{\dot U}{j\omega M} = \dot I_1 + \frac{L_2}{M}\dot I_2$

①：$\dot U\left(\frac{1}{j\omega L_1} - \frac{1}{j\omega M}\right) = \frac{M}{L_1}\dot I_2 - \frac{L_2}{M}\dot I_2$

则：$\dot U = \frac{\frac{M}{L_1}-\frac{L_2}{M}}{\frac{1}{j\omega L_1}-\frac{1}{j\omega M}}\dot I_2 = j\omega\frac{M^2-L_1L_2}{M-L_1}\dot I_2 = j\omega\frac{L_1L_2-M^2}{L_1-M}\dot I_2$

$$\begin{cases} \frac{\dot U}{j\omega M} = \frac{L_1}{M}\dot I_1 + \dot I_2 \\ \frac{\dot U}{j\omega L_2} = \frac{M}{L_2}\dot I_1 + \dot I_2 \end{cases} \Rightarrow \frac{\dot U}{j\omega}\left(\frac{1}{M}-\frac{1}{L_2}\right) = \left(\frac{L_1}{M}-\frac{M}{L_2}\right)\dot I_1, \Rightarrow \dot U_1 = j\omega\left(\frac{L_1L_2-M^2}{L_2-M}\right)\dot I_1$$

故有：

$$\dot I_1+\dot I_2 = \left(\frac{L_2-M}{L_1L_2-M^2} + \frac{L_1-M}{L_1L_2-M^2}\right)\frac{\dot U_1}{j\omega}$$

$$\therefore \frac{\dot U_1}{\dot I_1+\dot I_2} = j\omega\frac{1}{\frac{L_1+L_2-2M}{L_1L_2-M^2}} = \frac{L_1L_2-M^2}{L_1+L_2-2M},\quad L_{eq+} = \frac{L_1L_2-M^2}{L_1+L_2-2M},$$

当反并时，显 $L_{eq-} = \frac{L_1L_2-M^2}{L_1+L_2+2M}$.