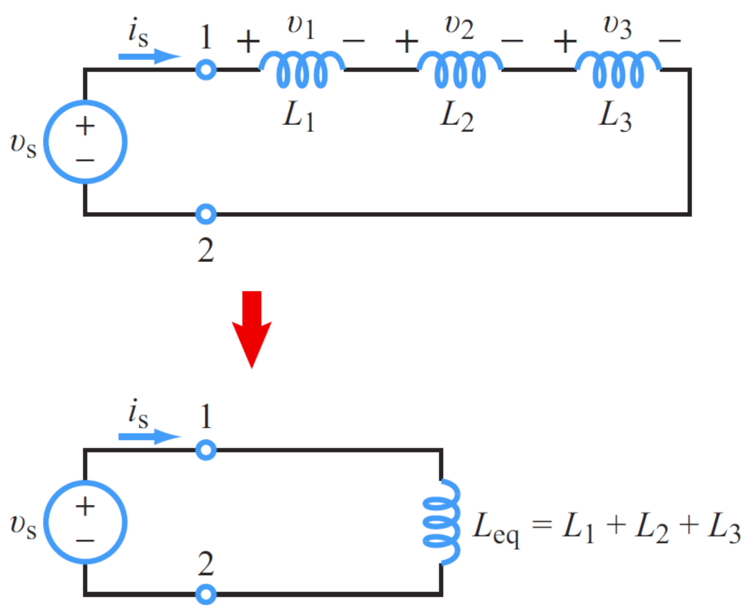
Inductor in Series and Parallel

Inductor in Series

Combining In-Series Inductors



For the three inductors on the left,

$$\begin{aligned} v_s &= v_1 + v_2 + v_3 \\ &= L_1 \frac{di_s}{dt} + L_2 \frac{di_s}{dt} + L_3 \frac{di_s}{dt} \\ &= (L_1 + L_2 + L_3) \frac{di_s}{dt}, \end{aligned}$$

For the equivalent circuit,

$$v_s = L_{eq} \frac{di_s}{dt}$$

Hence,

$$L_{eq} = L_1 + L_2 + L_3$$

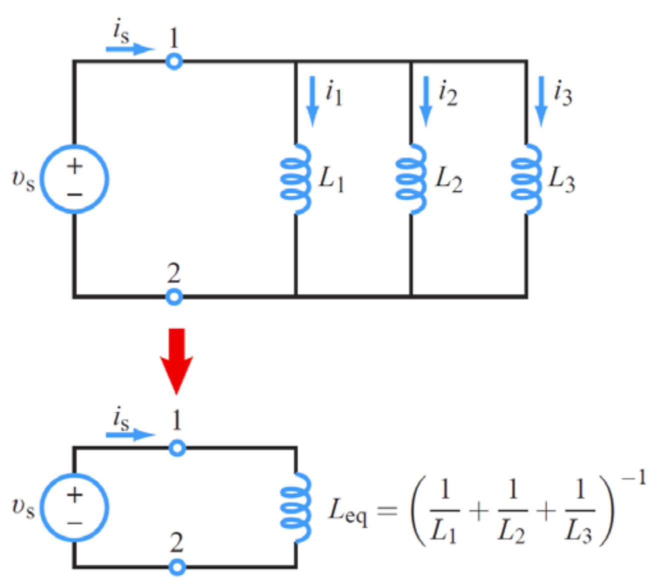
For the general case of N inductors in series:

$$L_{eq} = \sum_{i=1}^{N} L_i = L_1 + L_2 + \cdots + L_N$$

(inductors in series).

Inductors in Parallel

Combining In-Parallel Inductors



For the inductors on the left,

$$\frac{1}{L_{eq}} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3}$$

For the general case of N inductors in parallel:

$$\frac{1}{L_{eq}} = \sum_{i=1}^{N} \frac{1}{L_i} = \frac{1}{L_1} + \frac{1}{L_2} + \cdots + \frac{1}{L_N}$$

(inductors in parallel).