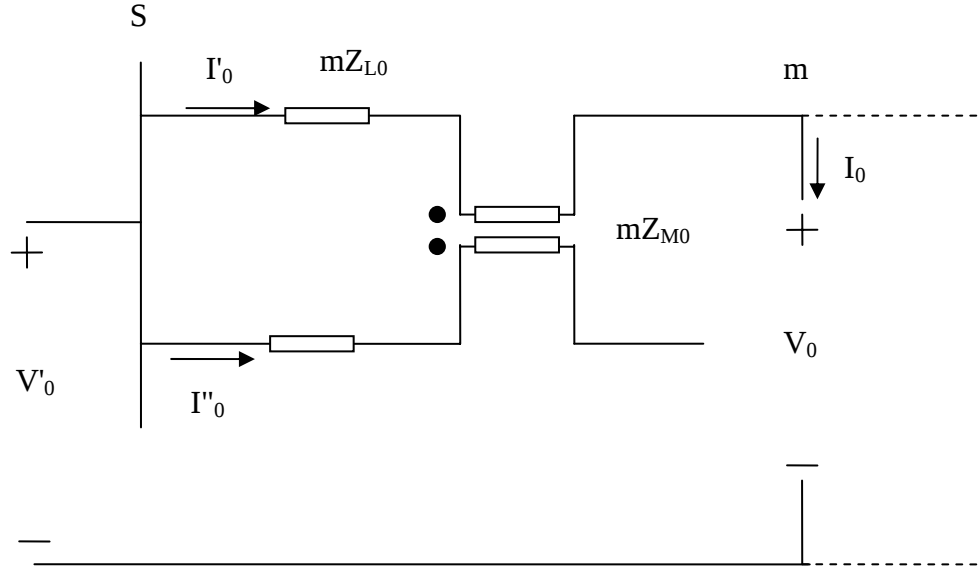


Protección Direccional de Tierra (67N)
Efecto de la Influencia Mutua de Secuencia Cero

Esquema general:



S, salida m (Falta ag de frente):

$$V'_0 = V_0 + mZ_{L0} \cdot I'_0 + mZ_{M0} \cdot I''_0$$

67N:

$$V_{pol} = -3V'_0$$

$$I_{op} = 3I'_0$$

$$-30^\circ \leq \text{Arg} \frac{V_{pol}}{I_{op}} \leq 150^\circ$$

$$\frac{V_{pol}}{I_{op}} = \frac{-V'_0}{I'_0}$$

$$\frac{V_{pol}}{I_{op}} = \frac{-(V_0 + mZ_{L0} \cdot I'_0 + mZ_{M0} \cdot I''_0)}{I'_0}$$

$$\frac{V_{pol}}{I_{op}} = -\left(\frac{V_0}{I'_0} + mZ_{L0} + mZ_{M0} \frac{I''_0}{I'_0} \right)$$

$$V_0 = -Z_0 \cdot I_0$$

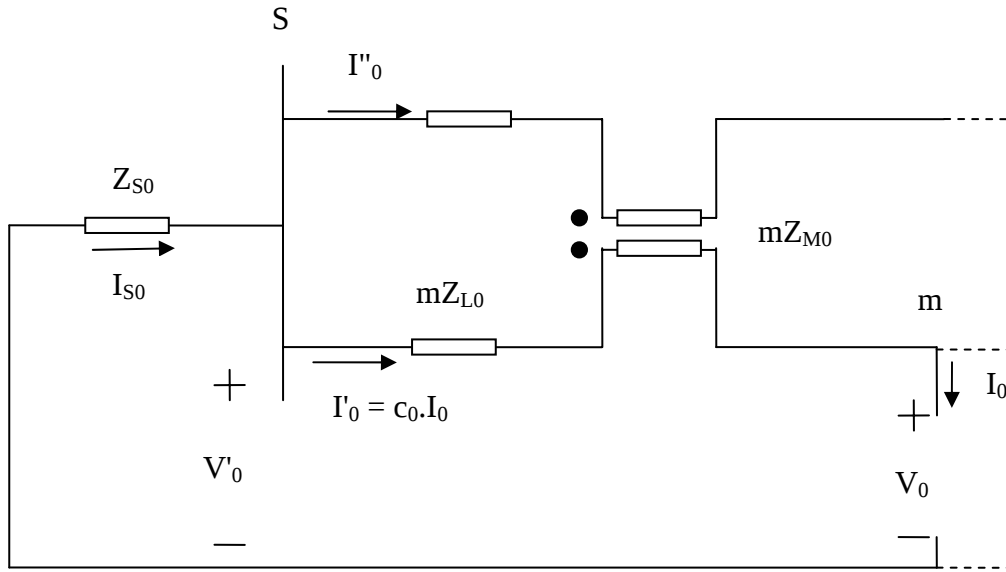
$$I'_0 = c_0 \cdot I_0$$

$$\frac{V_{pol}}{I_{op}} = - \left(-\frac{Z_0}{c_0} + mZ_{L0} + mZ_{M0} \frac{I_0''}{I_0'} \right)$$

$$\frac{V_{pol}}{I_{op}} = \frac{Z_0}{c_0} - mZ_{L0} - mZ_{M0} \frac{I_0''}{I_0'}$$

El efecto del término en Z_{M0} depende de $\frac{I_0''}{I_0'}$, tendiendo a la no direccionalidad si I_0'' está en fase con I_0' .

Esquema particular con Fuente S:



$$V_{pol} = -3V_0' \quad I_{op} = 3I_0'$$

Condición de Operación: $-30^\circ \leq \text{Arg} \frac{V_{pol}}{I_{op}} \leq 150^\circ$

S, salida m:

$$\frac{V_{pol}}{I_{op}} = Z_{S0} \left(1 + \frac{I_0''}{I_0'} \right) = Z_{S0} \frac{I_{S0}}{I_0'}$$

$$\text{Arg} \frac{V_{pol}}{I_{op}} = \text{Arg}(Z_{S0}) + \text{Arg}(I_{S0}) - \text{Arg}(I_0')$$

$$\text{Arg} \frac{V_{pol}}{I_{op}} \approx 90^\circ + \text{Arg}(I_{S0}) - \text{Arg}(I_0')$$