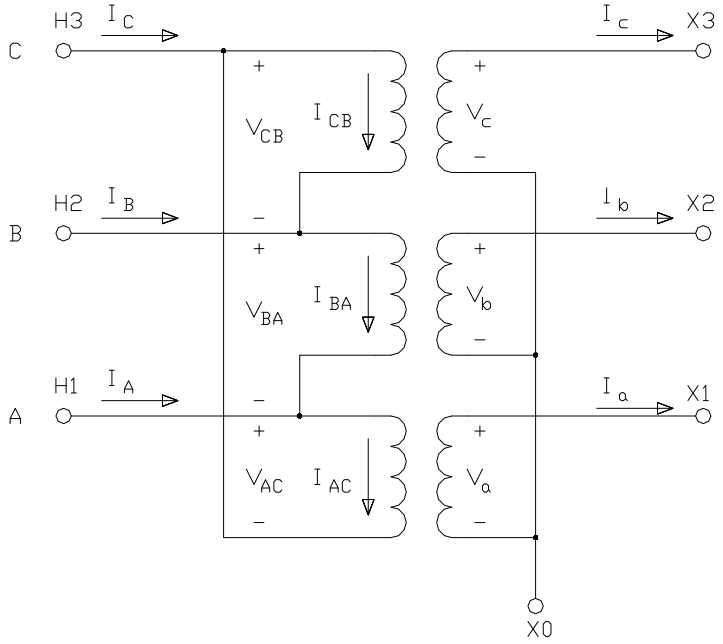
VOLTAGE AND CURRENT SHIFTS IN DELTA-WYE TRANSFORMER



Define: $kV \equiv 115 \cdot kV$ $a := e^{j \cdot 120 \cdot deg}$ $MVA := volt \cdot amp \cdot 10^6$ $kVA \equiv kV \cdot A$

Voltage ratio $N := \frac{115}{12.47}$ Turns ratio $n := N \cdot \sqrt{3}$ $n = 15.973$

Base power $P_B := 12000kVA$

	Primary		Secondary	
Base voltage	$E_{Bp} := 115kV$		$E_{Bs} := \frac{E_{Bp}}{N}$	$E_{Bs} = 1.434 \times 10^6 \cdot V$
Base current	$I_{Bp} := \frac{P_B}{\sqrt{3} \cdot E_{Bp}}$	$I_{Bp} = 60.245 \cdot amp$	$I_{Bs} := \frac{P_B}{\sqrt{3} \cdot E_{Bs}}$	$I_{Bs} = 555.6 \cdot amp$

Primary Voltages

$V_A := \frac{115}{\sqrt{3}} \cdot e^{j \cdot 0 \cdot deg} \cdot kV$ $V_B := \frac{115}{\sqrt{3}} \cdot e^{-j \cdot 120 \cdot deg} \cdot kV$ $V_C := \frac{115}{\sqrt{3}} \cdot e^{j \cdot 120 \cdot deg} \cdot kV$

$V_{AC} := V_A - V_C$ $V_{BA} := V_B - V_A$ $V_{CB} := V_C - V_B$

Secondary Voltages

$V_a := \frac{1}{n} \cdot V_{AC}$ $V_b := \frac{1}{n} \cdot V_{BA}$ $V_c := \frac{1}{n} \cdot V_{CB}$

$V_a = (717025 - 413974.6i) \cdot volt$ $V_b = (-717025 - 413974.6i) \cdot volt$ $V_c = 827949.2i \cdot volt$

$|V_a| = 7.2 \cdot kV$ $|V_b| = 7.2 \cdot kV$ $|V_c| = 7.2 \cdot kV$

$\arg(V_a) = -30 \cdot deg$ $\arg(V_b) = -150 \cdot deg$ $\arg(V_c) = 90 \cdot deg$

Secondary Currents

$I_a := 1000 \cdot e^{-j \cdot 60 \cdot deg} amp$ $I_b := 1000 \cdot e^{-j \cdot 180 \cdot deg} \cdot amp$ $I_c := 1000 \cdot e^{j \cdot 60 \cdot deg} \cdot amp$

Primary Currents

$I_{AC} := \frac{1}{n} \cdot I_a$ $I_{BA} := \frac{1}{n} \cdot I_b$ $I_{CB} := \frac{1}{n} \cdot I_c$

$I_{AC} = (31.3 - 54.2i) \cdot amp$ $I_{BA} = -62.6 \cdot amp$ $I_{CB} = (31.3 + 54.2i) \cdot amp$

$|I_{AC}| = 62.6 \cdot amp$ $|I_{BA}| = 62.6 \cdot amp$ $|I_{CB}| = 62.6 \cdot amp$

$arg(I_{AC}) = -60 \cdot deg$ $arg(I_{BA}) = -180 \cdot deg$ $arg(I_{CB}) = 60 \cdot deg$

$I_A := I_{AC} - I_{BA}$ $I_B := I_{BA} - I_{CB}$ $I_C := I_{CB} - I_{AC}$

$I_A = (93.9 - 54.2i) \cdot amp$ $I_B = (-93.9 - 54.2i) \cdot amp$ $I_C = 108.4i \cdot amp$

$|I_A| = 108.43 \cdot amp$ $|I_B| = 108.43 \cdot amp$ $|I_C| = 108.43 \cdot amp$

$arg(I_A) = -30 \cdot deg$ $arg(I_B) = -150 \cdot deg$ $arg(I_C) = 90 \cdot deg$

$k := 0 .. 5$

$VSr_k :=$

$0 \cdot volt$
$Re(V_a)$
$0 \cdot volt$
$Re(V_b)$
$0 \cdot volt$
$Re(V_c)$

$VSx_k :=$

$0 \cdot volt$
$Im(V_a)$
$0 \cdot volt$
$Im(V_b)$
$0 \cdot volt$
$Im(V_c)$

$VPr_k :=$

$0 \cdot volt$
$Re(V_A)$
$0 \cdot volt$
$Re(V_B)$
$0 \cdot volt$
$Re(V_C)$

$VPx_k :=$

$0 \cdot volt$
$Im(V_A)$
$0 \cdot volt$
$Im(V_B)$
$0 \cdot volt$
$Im(V_C)$

$|I_c| = 1 \times 10^3 \cdot amp$

$ISr_k :=$

$0 \cdot amp$
$Re(I_a)$
$0 \cdot amp$
$Re(I_b)$
$0 \cdot amp$
$Re(I_c)$

$ISx_k :=$

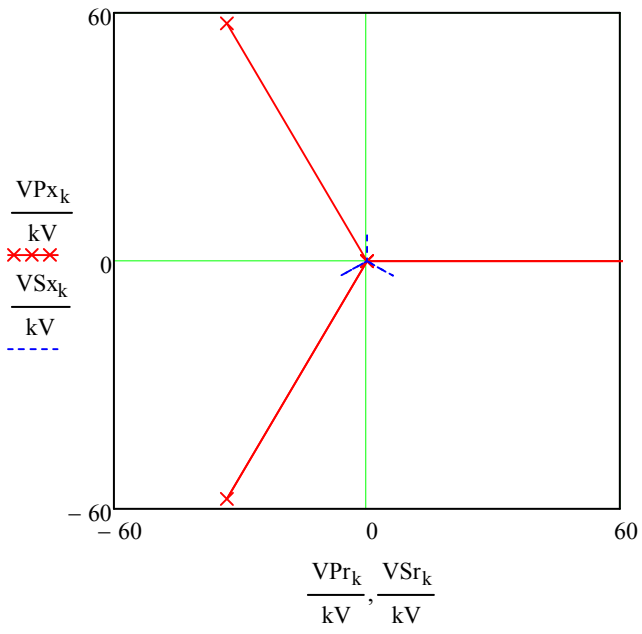
$0 \cdot amp$
$Im(I_a)$
$0 \cdot amp$
$Im(I_b)$
$0 \cdot amp$
$Im(I_c)$

$IPr_k :=$

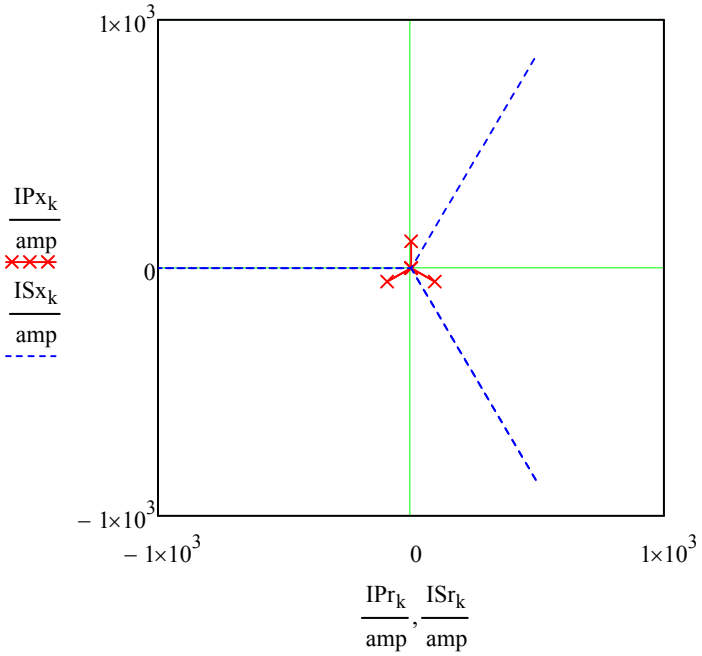
$0 \cdot amp$
$Re(I_A)$
$0 \cdot amp$
$Re(I_B)$
$0 \cdot amp$
$Re(I_C)$

$IPx_k :=$

$0 \cdot amp$
$Im(I_A)$
$0 \cdot amp$
$Im(I_B)$
$0 \cdot amp$
$Im(I_C)$



Voltages



Currents