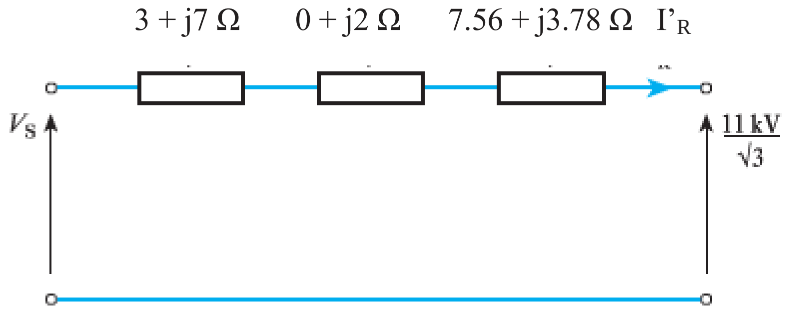
Example 1 - Solution

Since we are required to calculate the sending-end voltage, nominally 11 kV, we refer all impedances to the 11 kV side of the transformer:

0.01 Ω becomes 0.01 x $(11000/400)^2$ = 7.56 Ω

j0.005 Ω becomes j0.005 x $(11000/400)^2$ = j 3.78 Ω



Simplified diagram with impedances referred to 11kV

Hence,

Ztotal = 10.56 + j 12.78

The next step is to calculate I_R (and I_S) from the three-phase power delivered,

250 kW:

Power delivered = $3V_RI_R\cos\Theta$

$250 \times 10^3 = 3 \times (400/✓3) \times I_R$

$\mathbf{I_R = 360.8\ A}$

However, in order to calculate the voltage drop down the equivalent network referred to 11 kV.

$I'_R = 360.8 \times (400/11000) = 13.12$ A

$V_s = V_R + I_RZ_t$

= (11000/✓3) + 13.12(10.56 =J12.78)

= 6351 + 138.5 + j167.7

= 6489.5 + j167.7

= **6491.7 V/ph**

or **11.24 kV line**