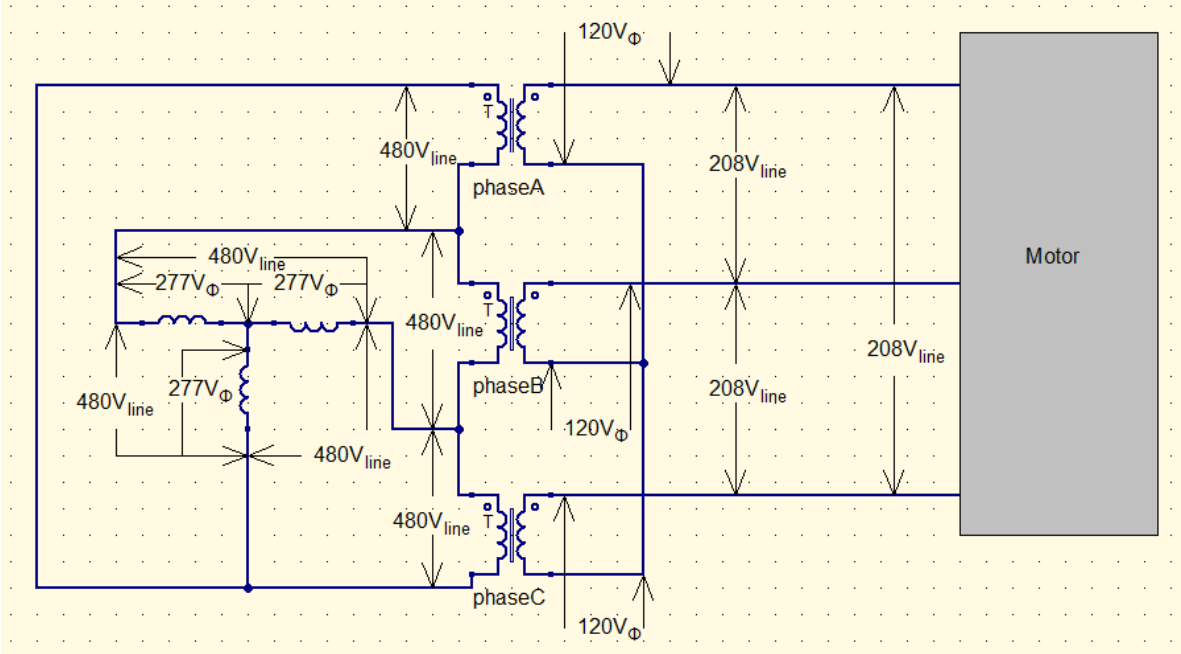
1. Clearly label each voltage.



2. What is the synchronous speed of this motor?

$$n_s = 120 * \frac{f}{p} = 120 * \frac{60Hz}{6poles} \tag{1}$$

$$\underline{\overline{|n_s = 1200rpm|}}$$

3. How many poles does this motor have?

$$poles = phases * 2 = 3 * 2 \tag{2}$$

$$\underline{\overline{|6\ poles|}}$$

4. What is the slip of this motor?

$$s = \frac{n_s - n}{n_s} = \frac{1200rpm - 1076rpm}{1200rpm} \tag{3}$$

$$\underline{\overline{|s = 0.10\bar{3}|}}$$

5. What is the mechanical output in BHP (brake horsepower) of this motor at full speed?

$$rated\ hp * efficiency = 10hp * 0.8 \tag{4}$$

$$\underline{\overline{|8BHP|}}$$

6. What is the total impedance Z_{motor} of this motor at full load?

$$Z = \frac{V}{FLA} = \frac{208V}{30A} = 6.9\bar{3}\Omega \tag{5}$$

$$\theta = cos^{-1}(pf) = cos^{-1}(0.7071) \approx cos^{-1}(\frac{\sqrt{2}}{2}) = 45^\circ$$

$$\underline{\overline{|Z = 6.9\bar{3}\Omega < 45^\circ|}}$$

7. What is the resistive impedance R_{motor} of this motor at full load?

$$|Z| * cos(\theta) = \frac{\sqrt{2}}{2} \tag{6}$$
$$R = 4.9\Omega$$

8. What is the reactive impedance X_{motor} of this motor at full load?

$$|Z| * sin(\theta) = 6.9\overline{3} * \frac{\sqrt{2}}{2} \tag{7}$$
$$X = 4.9\Omega$$

9. What is the $\frac{X}{R}$ ratio of the motor?

10. What is the full load apparent power drawn by this motor?

$$S = FLA * V * \sqrt{3} = 208V * 30A * \sqrt{3} \tag{8}$$
$$S = 10.8kVA$$

11. What is the Full Load Active power drawn by this motor?

$$P = S * cos(\theta) = 10.8kVA * \frac{\sqrt{2}}{2} \tag{9}$$
$$\overline{\underline{|P = 7.63668kW|}}$$

12. What is the full load reactive power drawn by this motor?

$$Q = S * sin(\theta) = 10.8kVA * \frac{\sqrt{2}}{2} \tag{10}$$
$$\overline{\underline{|Q = 7.63668kW|}}$$

13. What is the locked rotor apparent power drawn by the motor?

$$S = V * LRA * \sqrt{3} = 208V * 180A * \sqrt{3} \tag{11}$$
$$\overline{\underline{|S = 64.8kVA|}}$$

14. Determine $I_{secondary_{line}}$.

$$I = \frac{S}{V} = \frac{10.8kVA}{208V} \tag{12}$$
$$\overline{\underline{|I = 51.96A|}}$$

15. Determine $I_{secondary_{\phi}}$.

$$I_{line} = I_{\phi} = 51.96A \tag{13}$$

16. Determine $I_{primary_\phi}$.

$$I_{primary} = \frac{I_{secondary}}{a} = \frac{51.96A}{4} \tag{14}$$
$$\underline{\overline{|I_{primary_\phi} = 13A|}}$$

17. Determine $I_{primary_{line}}$.

$$I_{line} = I_\phi * \sqrt{3} = 13A * \sqrt{3} \tag{15}$$
$$\underline{\overline{|I_{line} = 22.5A|}}$$

18. Determine $I_{utility_{line}}$.

$$I_{utility} = I_{primary} = 22.5A \tag{16}$$

19. Determine $P_{secondary_\phi}$.

$$P = VI = 120V * 51.96A = 6.235kW \tag{17}$$

20. Determine $P_{secondary_{3\phi}}$

$$P_{3\phi} = 3 * P = 3 * 6.235kW = 18.7kW \tag{18}$$

21. Determine $P_{primary_\phi}$.

$$P = VI = 480V * 13A = 6.24kW \tag{19}$$

22. Determine $P_{primary_{3\phi}}$

$$P_{3\phi} = 3 * P = 3 * 6.24kW = 18.7kW \tag{20}$$

23. Determine $P_{utility}$.

$$P_{utility} = P_{primary_{3\phi}} = 18.7kW \tag{21}$$