What is 3 phase electricity?

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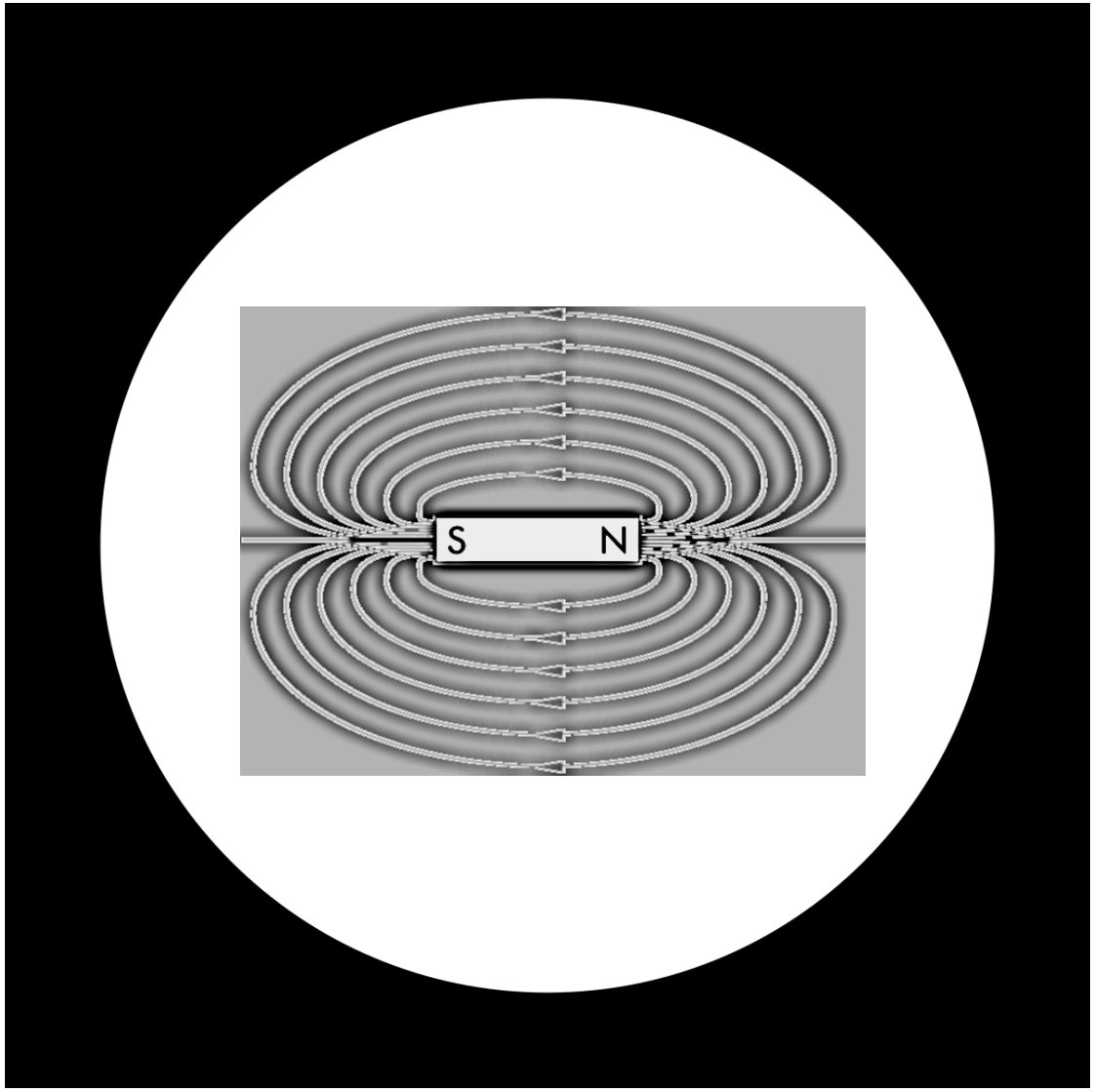
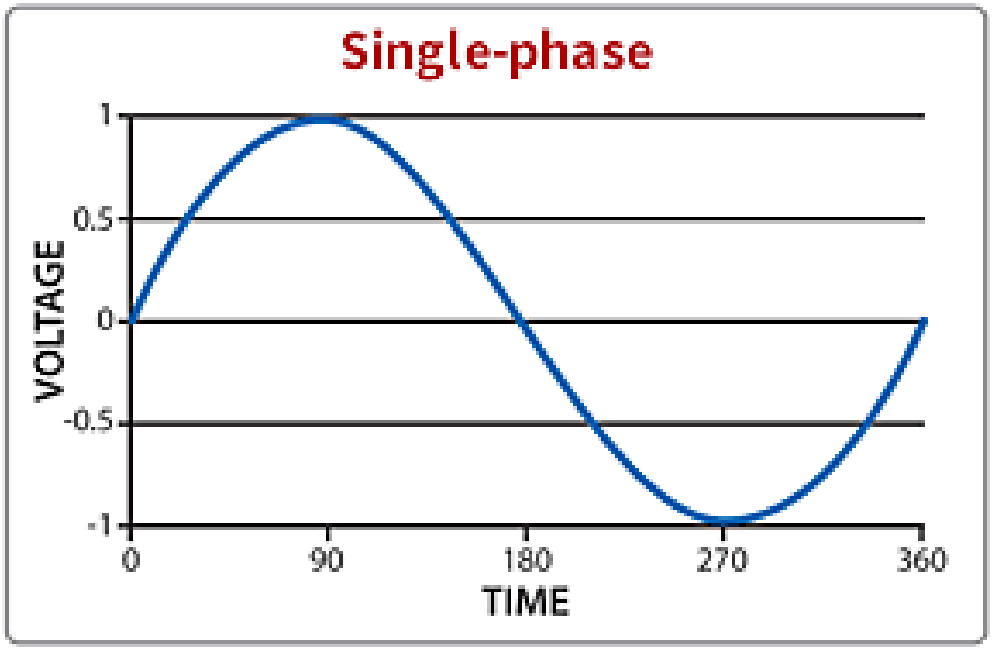


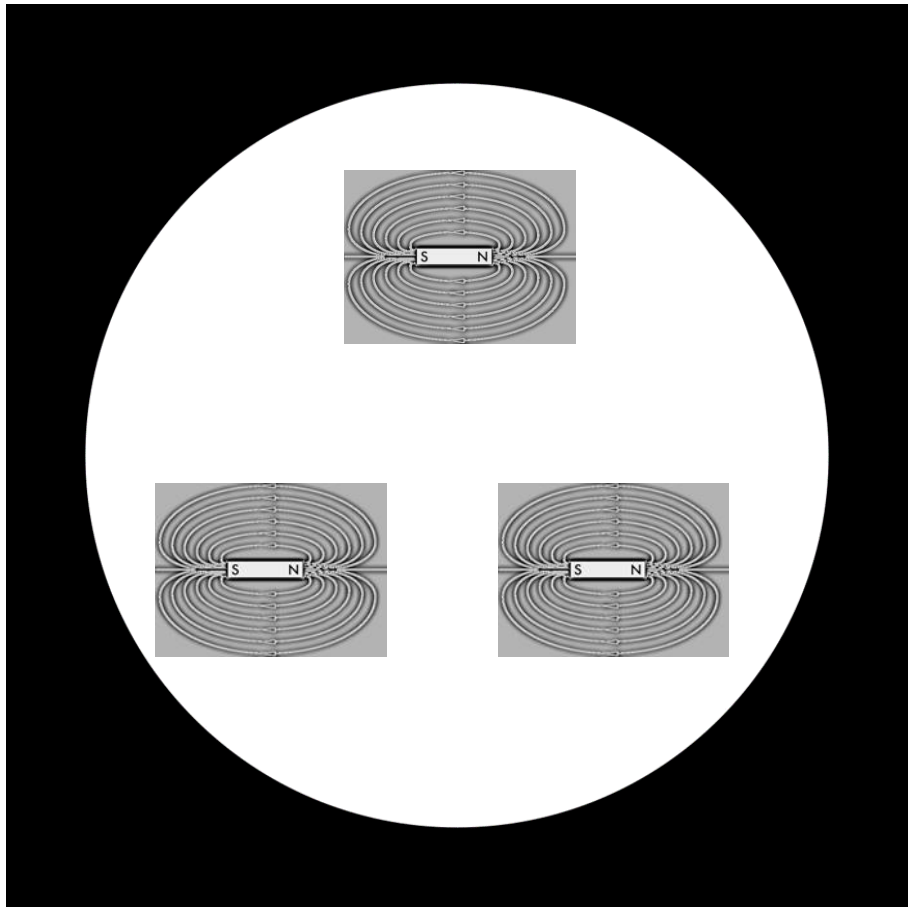


With the wave form of single-phase power, when the wave passes through zero, the power supplied at that moment is zero. The wave cycles 50-60 times per second depending on your location.


BUFFALO

Single Phase Power

- Single phase electricity is used in most homes and small businesses
- Able to supply ample power for most smaller customers, including homes and small, non-industrial businesses
- Adequate for running motors up to about 5 horsepower; a single phase motor draws significantly more current than the equivalent 3-phase motor, making 3-phase power a more efficient choice for industrial applications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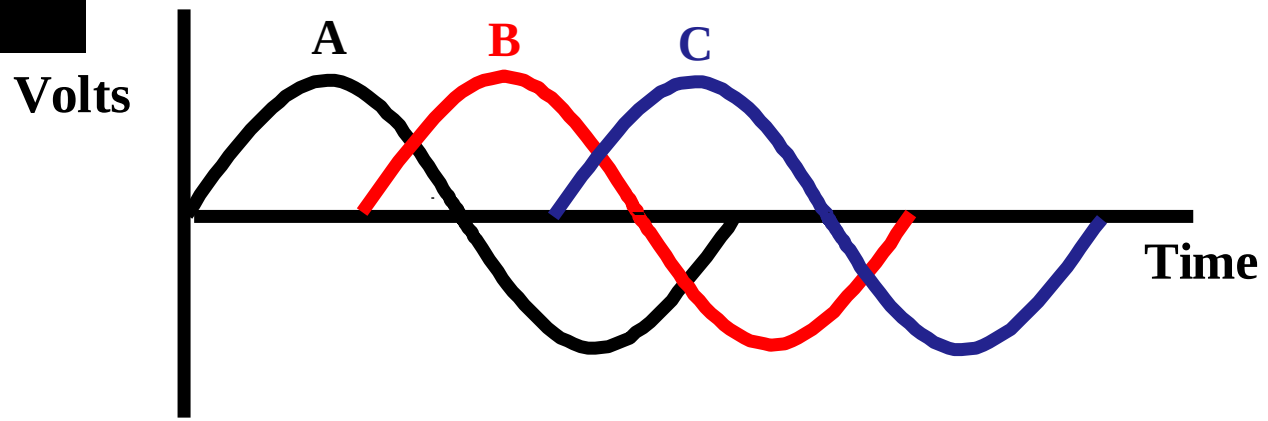
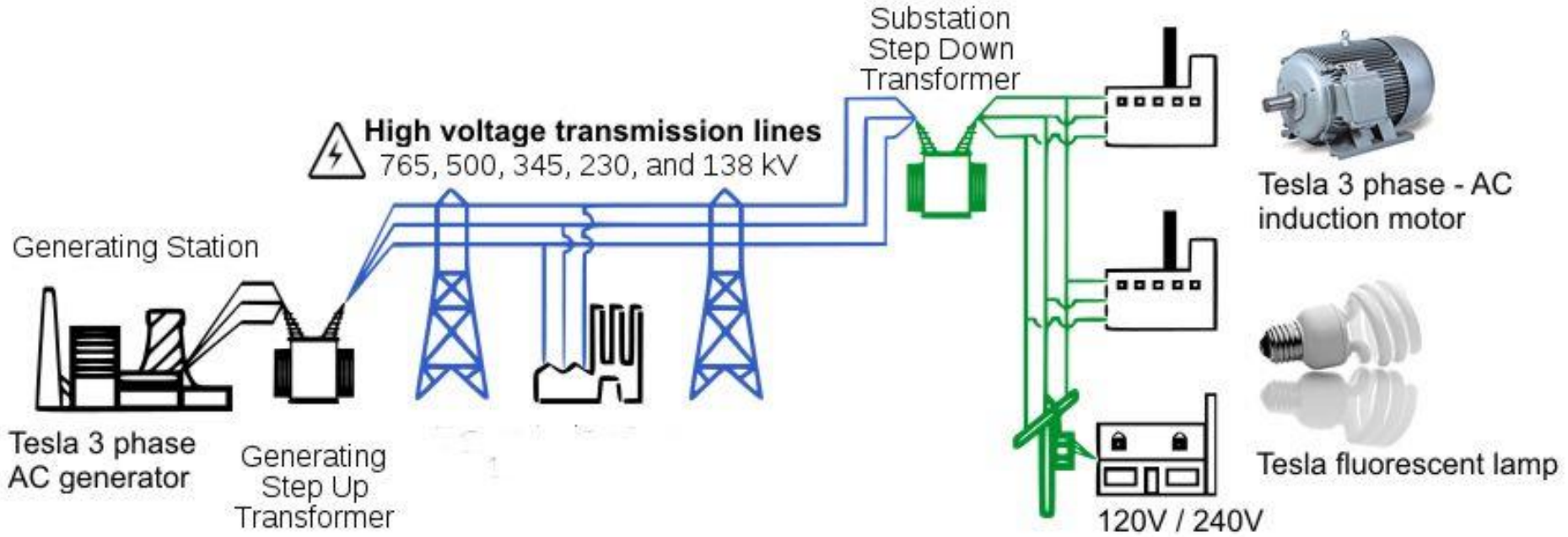

Volts
A
B
C
Time

3-Phase Power

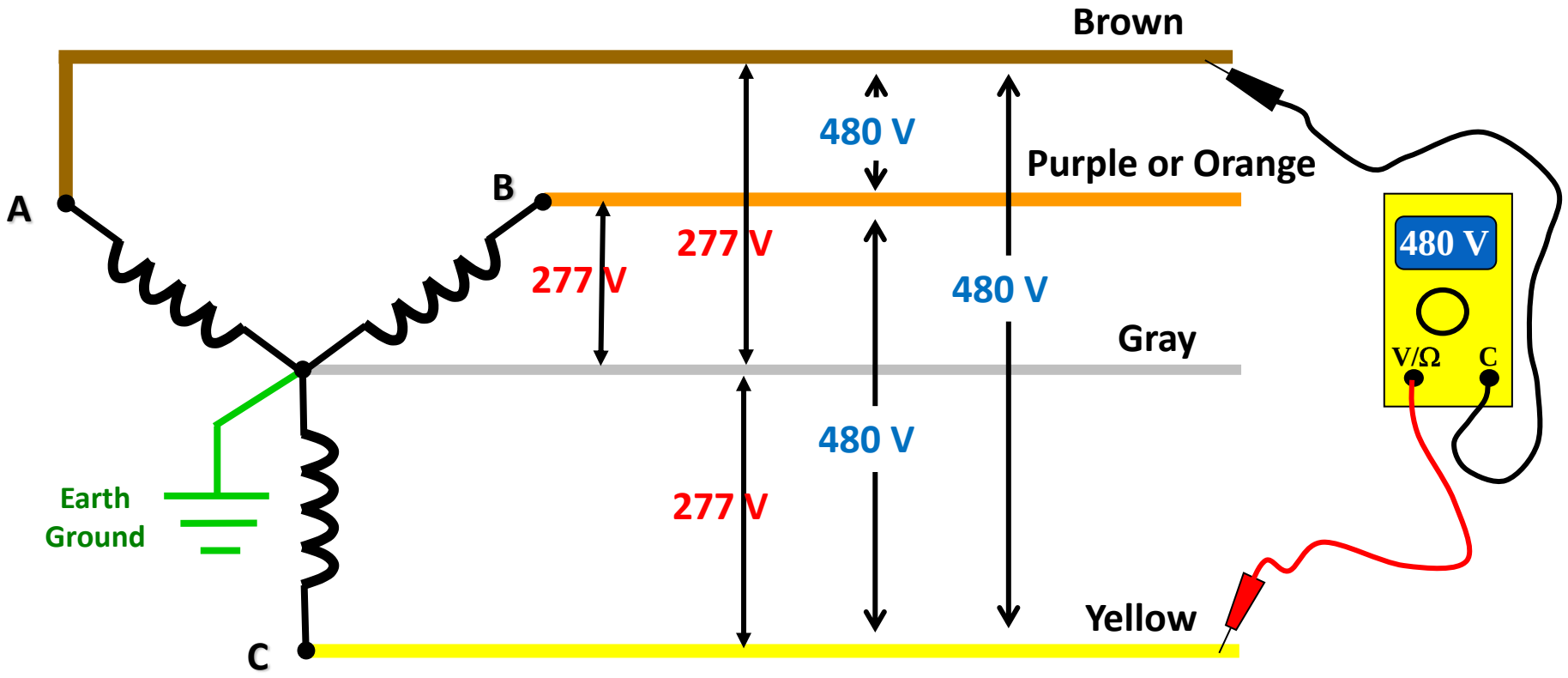
- Common in large businesses, as well as industry and manufacturing around the globe
- Increasingly popular in power-hungry, high-density data centers
- Expensive to convert from an existing single phase installation, but 3-phase allows for smaller, less expensive wiring and lower voltages, making it safer and less expensive to run
- Highly efficient for equipment designed to run on 3-phase

Nowadays, the three-phase system serves as the basis of most electrical systems, which consist of energy generation, transmission and consumption. This is one of the most important innovations contributed by Nikola Tesla (1856-1943) because it enabled more efficient and simplified energy generation and transmission.



Distribution System and Components

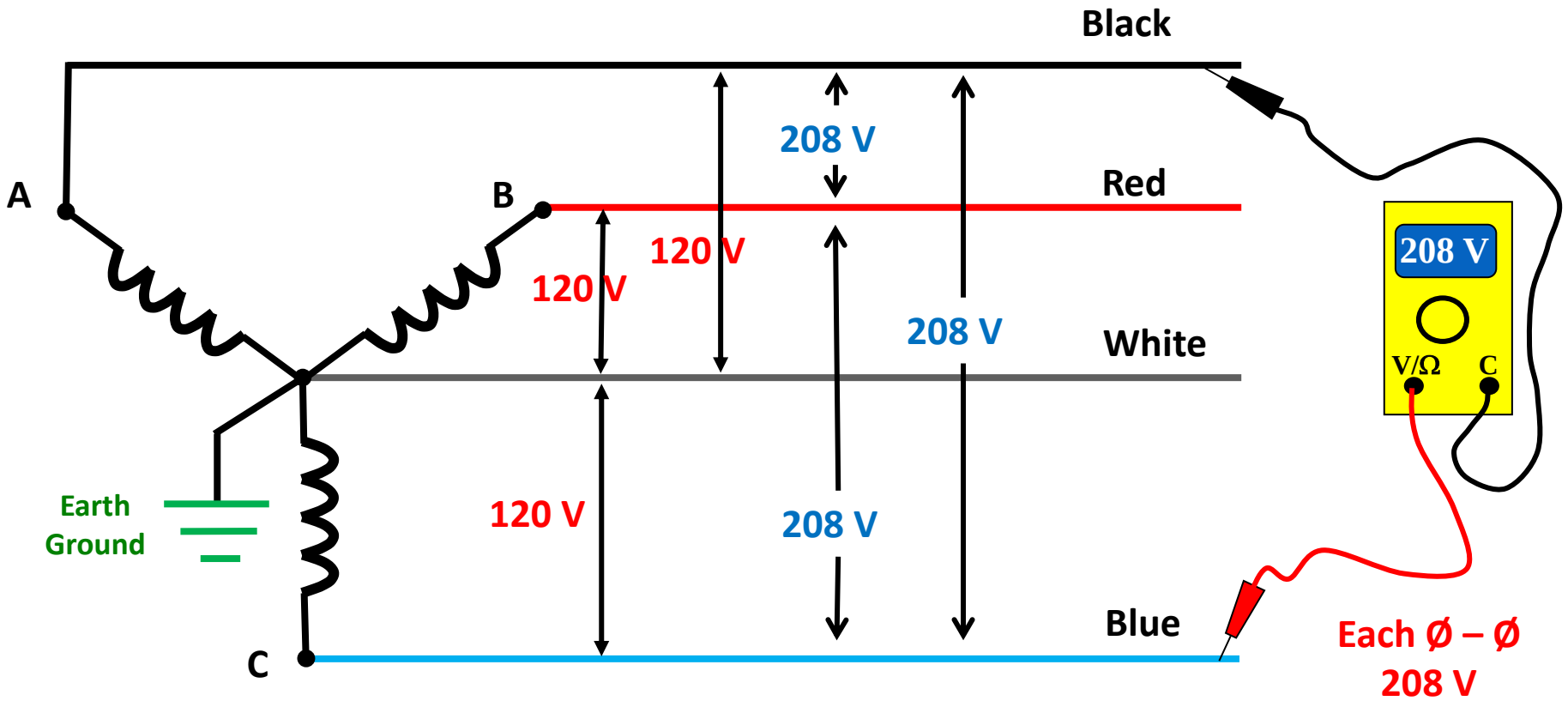
480/277 VAC, 3Ø, 4-wire System *Wye Connected*



Each Ø To Ø = 480 V

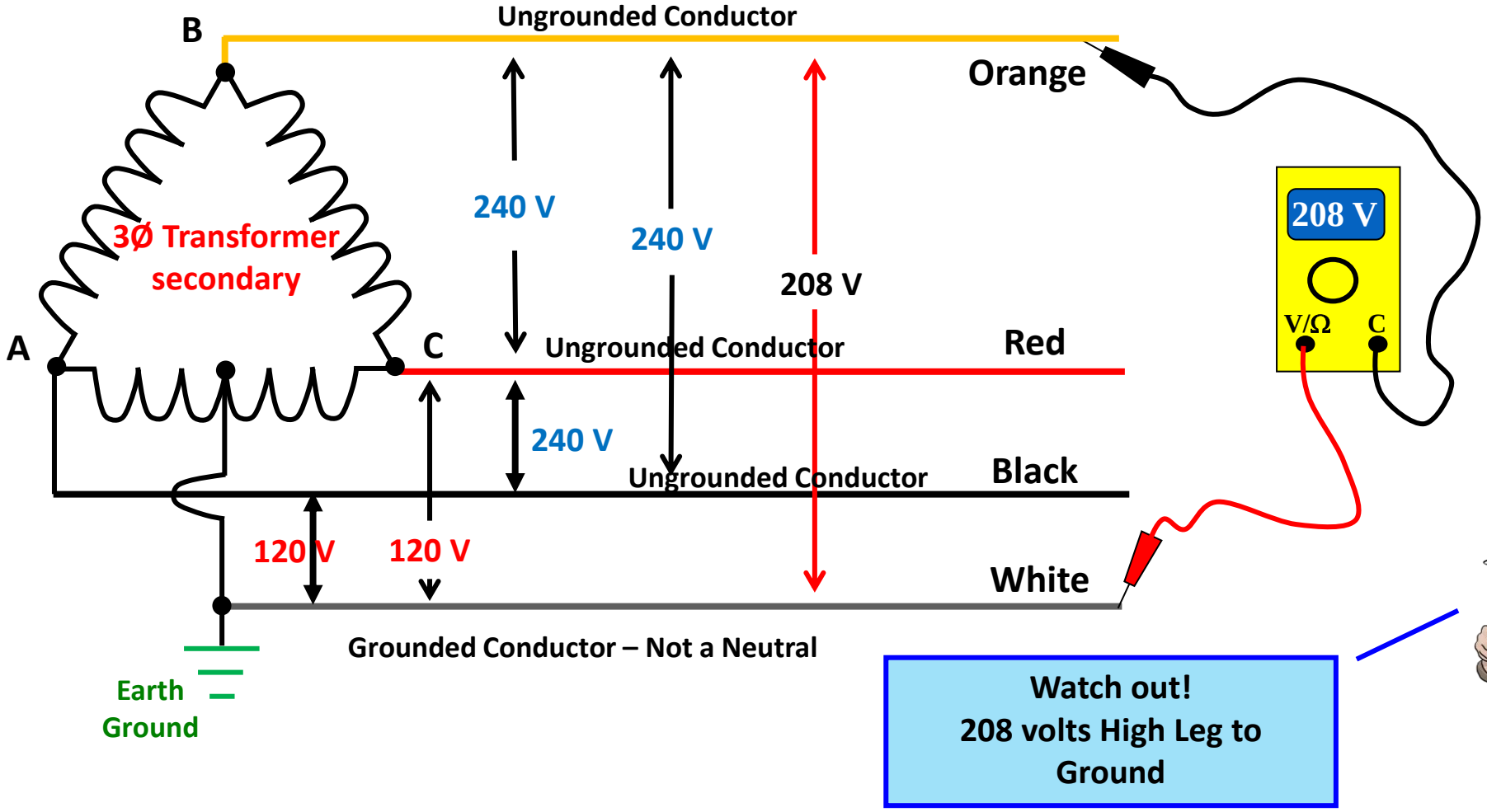
Distribution System and Components

120/208 VAC, 3Ø, 4-wire System *Wye Connected*



Distribution System and Components

120/240 VAC, 3Ø, 4-wire System *(Delta High Leg)*



Ohm's Law and the Nameplate

AC/DC FORMULAS				
To Find	DC	AC		
		1ϕ, 115 or 220 V	1ϕ, 208, 230, or 240 V	3ϕ – All Voltages
I, HP known	$\frac{HP \times 746}{E \times E_{ff}}$	$\frac{HP \times 746}{E \times E_{ff} \times PF}$	$\frac{HP \times 746}{E \times E_{ff} \times PF}$	$\frac{HP \times 746}{1.73 \times E \times E_{ff} \times PF}$
I, kW known	$\frac{kW \times 1000}{E}$	$\frac{kW \times 1000}{E \times PF}$	$\frac{kW \times 1000}{E \times PF}$	$\frac{kW \times 1000}{1.73 \times E \times PF}$
I, kVA known		$\frac{kVA \times 1000}{E}$	$\frac{kVA \times 1000}{E}$	$\frac{kVA \times 1000}{\mathbf{1.73} \times E}$
kW	$\frac{I \times E}{1000}$	$\frac{I \times E \times PF}{1000}$	$\frac{I \times E \times PF}{1000}$	$\frac{I \times E \times 1.73 \times PF}{1000}$
kVA		$\frac{I \times E}{1000}$	$\frac{I \times E}{1000}$	$\frac{I \times E \times 1.73}{1000}$
HP (output)	$\frac{I \times E \times E_{ff}}{746}$	$\frac{I \times E \times E_{ff} \times PF}{746}$	$\frac{I \times E \times E_{ff} \times PF}{746}$	$\frac{I \times E \times 1.73 \times E_{ff} \times PF}{746}$

Three Types of Power in AC Circuits

Apparent Power (kVA)

Total power developed by the source

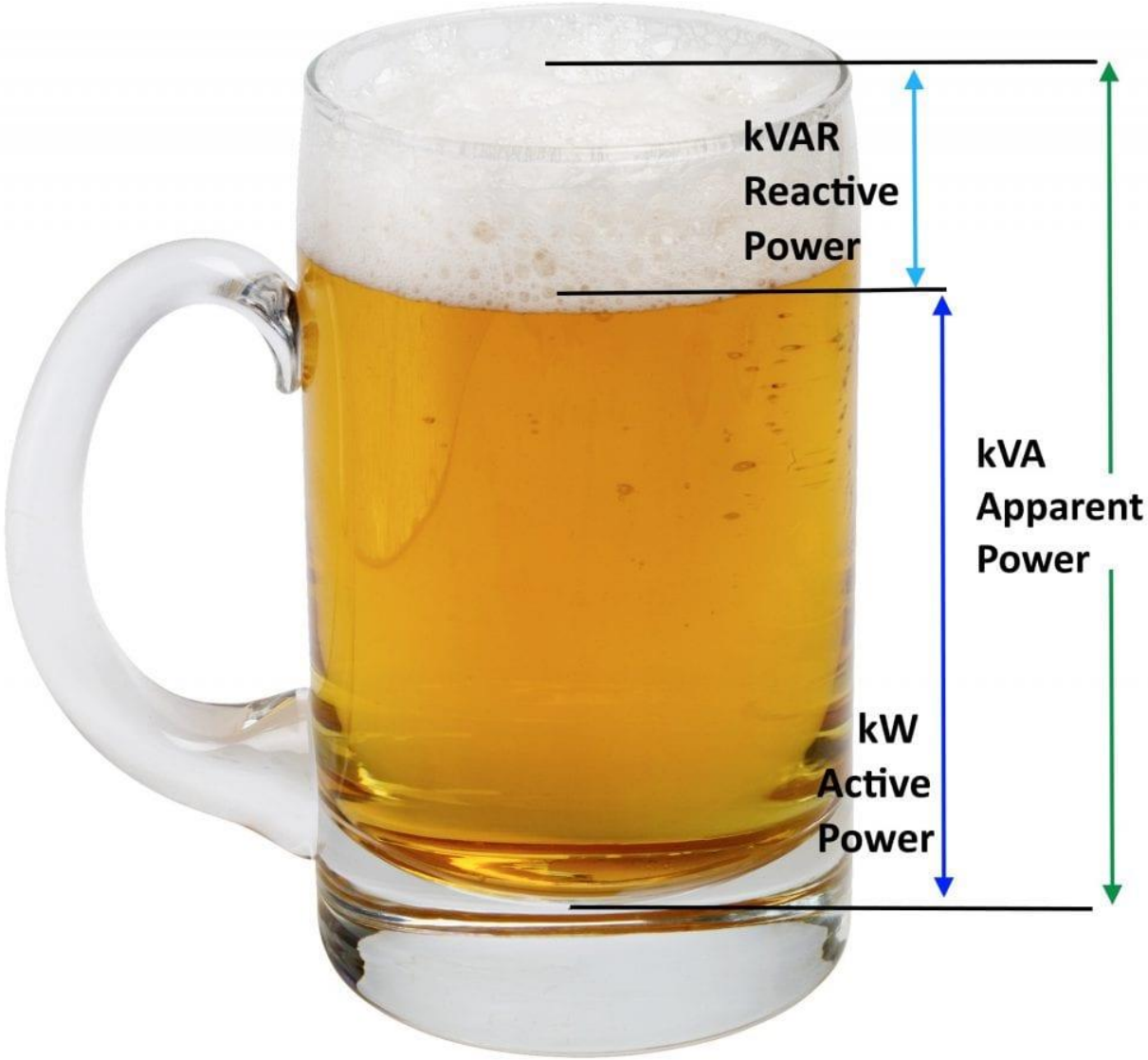
Reactive Power (kVAR)

Power lost to magnetic fields and capacitance

True Power (kW)

Power that does work

WB PG. 8



Power factor is the ratio of useful power or true power in kW divided by what we're charged for in kVA. So it's telling us how much value for money we're getting for the power we consume.

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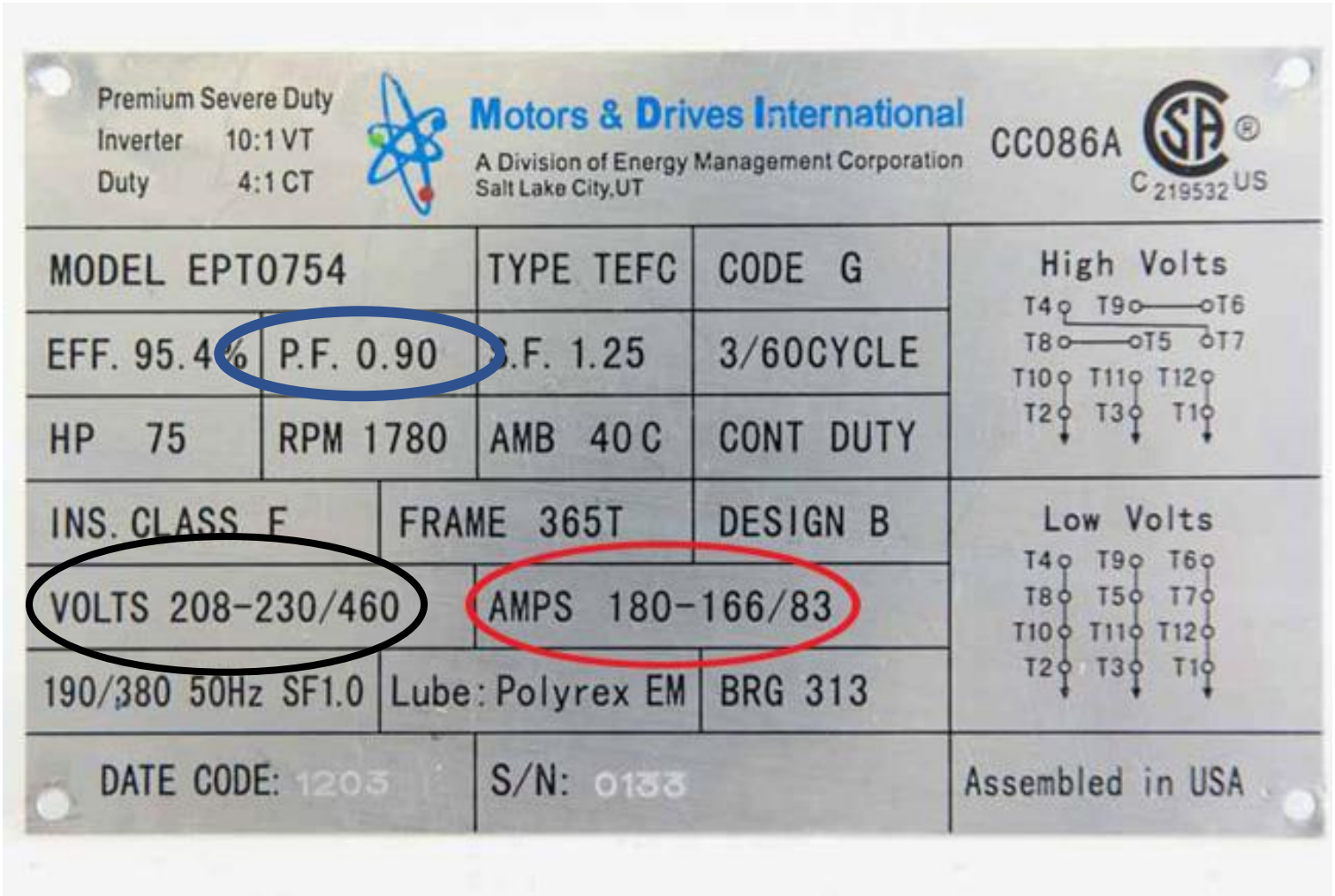

Calculating 3 Phase Power Usage

How much would it cost to operate our 75 HP motor for 1 month?

Watts = Amps times Volts times 1.73 times power factor

83 amps times 460 volts times 1.73 times .9 = 59446 Watts

59446 divided by 1000 = 59.446 kW

Motor runs 24 Hours a day, times 30 days = 720 Hours a month.

720 times 59.446 = 42801 kw/hours per month

.10/Kw/hr times 42801 = $4280.10 a month

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Advantages of 3 Phase Power

Three-phase power delivers three alternating currents through the same circuit, each uniformly separated in [illegible] the [illegible] power supplied by the circuit [illegible] consistent.

A three phase system provides constant power while a single phase system provides pulsating power [illegible]

A three phase machine having the same rating occupies less space as compared to the single phase [illegible] the single phase system.

[illegible] simpler in construction, smaller in size and can be started automatically with smooth operation.

[illegible] machines with noise and vibration.

Questions?

- If you'd like to learn more about how to work on electrical equipment at your facility,

  TPC can help!

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