



Table of Contents



- [Phasor Representation:](#)
- [Complex Form:](#)
- [FAQs](#)
 - [What is a phasor?](#)
 - [Why do we use phasors in electrical engineering?](#)
 - [What is the significance of 120° phase displacement?](#)
 - [Can phasor diagrams be used for unbalanced systems?](#)
 - [Why is complex representation important?](#)

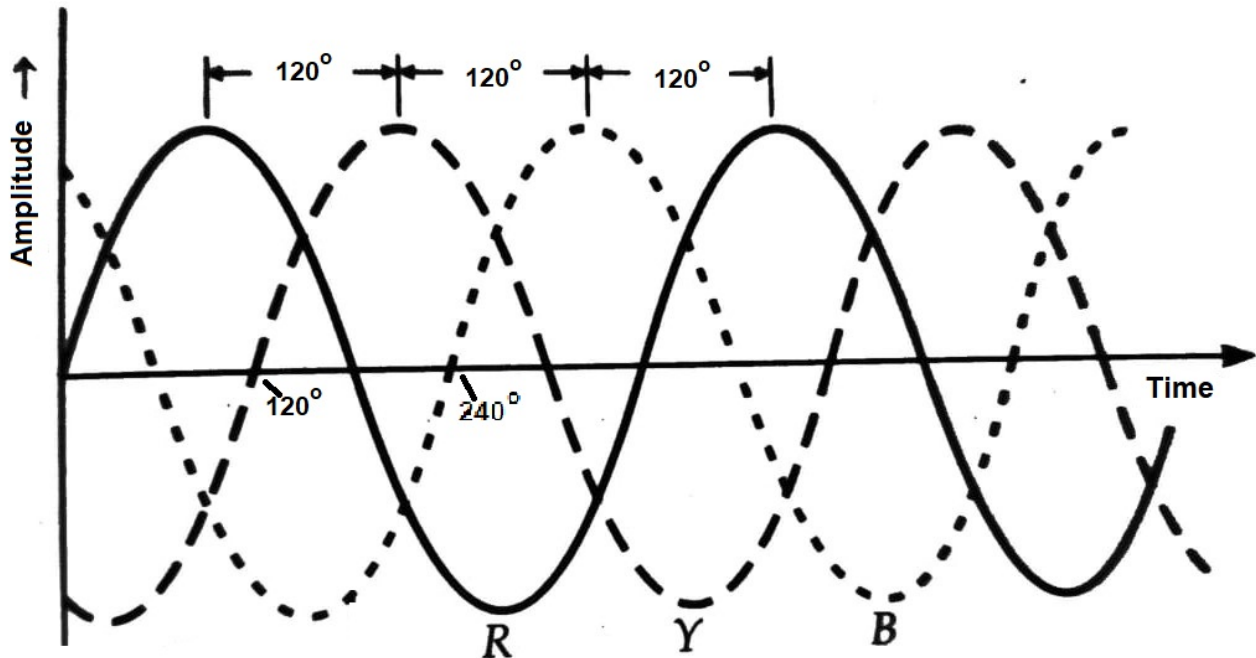
Phasor Representation:

Three sinusoidal voltages with equal amplitude and frequency, but a phase difference of 120° (or $2\pi/3$ radians) between them, constitute a three-phase supply. Common names for them include Phase R, Phase Y, and Phase B. For such a supply, the general form is as follows:

$$V_R = V_m \sin(\omega t)$$

$$V_Y = V_m \sin(\omega t - 120^\circ)$$

$$V_B = V_m \sin(\omega t - 240^\circ) \quad \text{or} \quad V_m \sin(\omega t + 120^\circ)$$



Graphical Representation

Phasor representation is a way of representing sinusoidal quantities. These include voltages and currents. They are represented as complex numbers in the complex plane. This method makes analysis easier. The phasor is represented as a rotating vector (phasor) with magnitude V_m and θ corresponding to the phase of the sinusoidal function.

Complex Form:

The two most typical connection configurations in a three-phase system are star and delta.

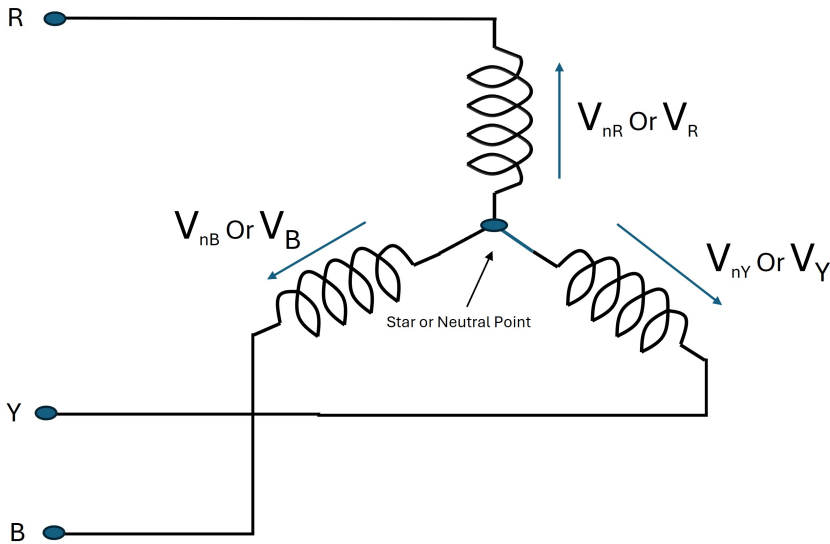
Star Connection:

In balanced three-phase star system,

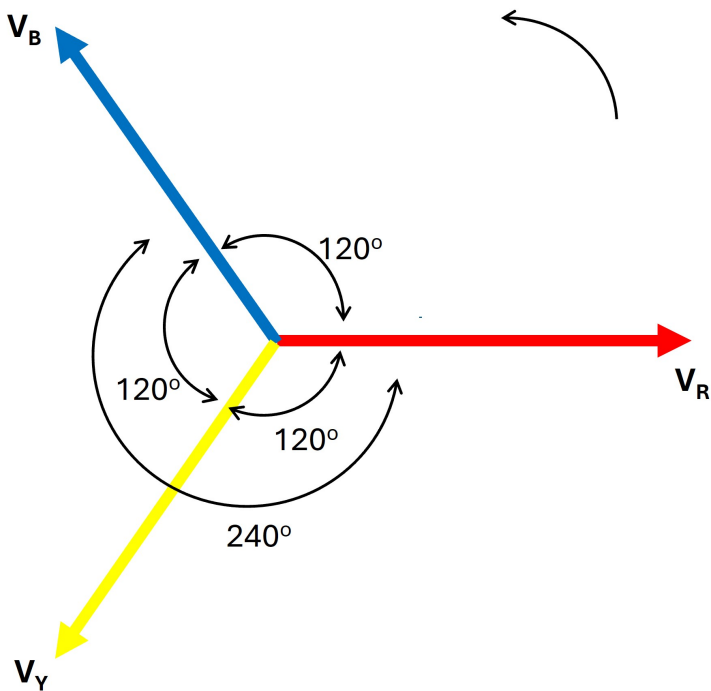
- $V_R = V_m \angle 0^\circ$
- $V_Y = V_m \angle -120^\circ$
- $V_B = V_m \angle +120^\circ == V_m \angle -240^\circ$



The phasors connected in the star, where n is the neutral or star point.
The phase voltages are denoted as V_{nR} , V_{nY} , and V_{nB} , which are also known as V_R , V_Y , and V_B .



Winding in Star Form



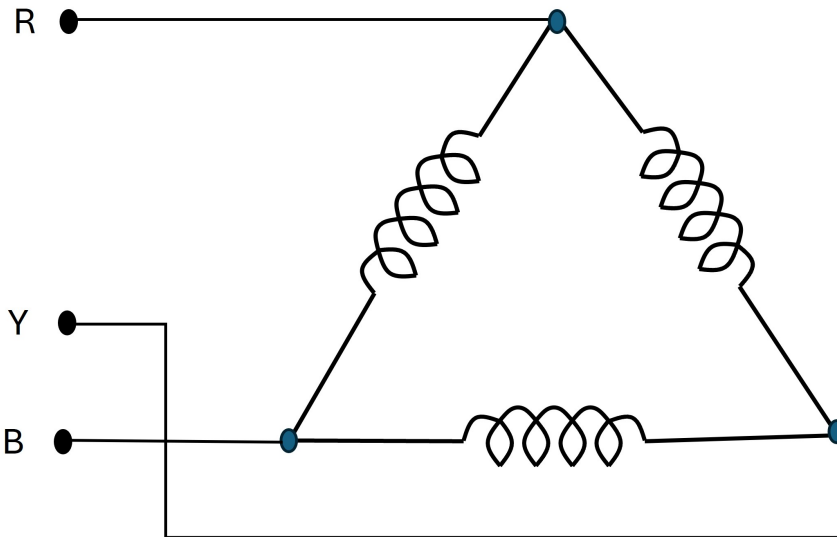


Vector Representation of Phase Voltage

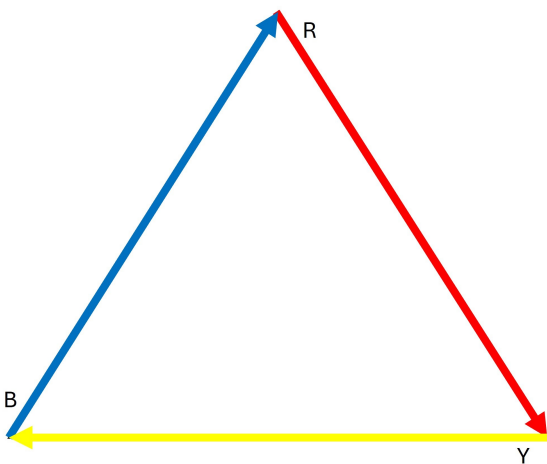
Delta Connection:

In balanced three-phase delta system,

- $V_{RY} = V_m \angle 0^\circ$
- $V_{YB} = V_m \angle -120^\circ$
- $V_{BR} = V_m \angle +120^\circ = V_m \angle -240^\circ$



Winding in Delta Form





FAQs

What is a phasor?

A phasor is a rotating vector used to represent AC voltage or current with a fixed magnitude and angle. It simplifies AC calculations.

Why do we use phasors in electrical engineering?

Phasors convert sinusoidal waveforms into simple vectors, making analysis of AC circuits easier—especially when dealing with phase shifts.

What is the significance of 120° phase displacement?

It ensures continuous and balanced power transfer, reducing torque pulsations in motors.

Can phasor diagrams be used for unbalanced systems?

Yes, but the phasors will have different lengths and angles. Analysis becomes more complex.

Why is complex representation important?

It helps to:

- Add or subtract AC voltages/currents
- Solve impedance networks
- Perform advanced power calculations

Related terms:

[Phase sequence and Polarity of Three Phase System](#)