

AC 3phases Connection Method Introduction

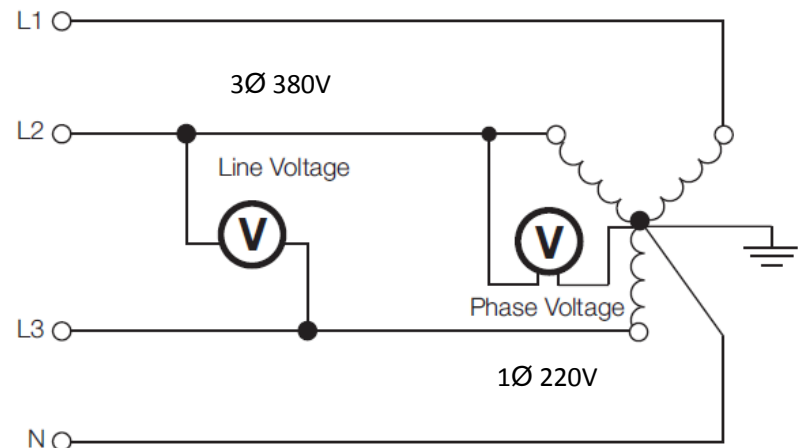
Prepared by Marketing Team

AC 3Ø input has two methods, there are Star(Y) and Delta(Δ) type.

A: Y type

1. Definition :

Connecting one end of each of the coils together as shown right makes a star or wye connection. The phase voltage (or phase to neutral voltage) is the voltage measured across a single coil. The line voltage (phase to phase voltage) is measured across two coils.



In a star or wye-connected system, the line voltage is higher than the phase voltage by a factor of the square root of 3 (1.732).

$$V_{\text{line}} = V_{\text{phase}} \times \sqrt{3}$$

$$I_{\text{line}} = I_{\text{phase}}$$

2. Application :

- In the long distance transmission, only three phase lines are used to form a **three-phase three wire system**.
- The circuit that arrives at the user often involves 220V and 380V two kinds of voltage, need three phase line and a zero line, form **three-phase four wire system**.
- In order to avoid the electric shock caused by leakage, the user also needs to add a ground wire, and then there are three phase lines, a zero line and a ground wire, so there is also the saying that the **three-phase five wire system**.

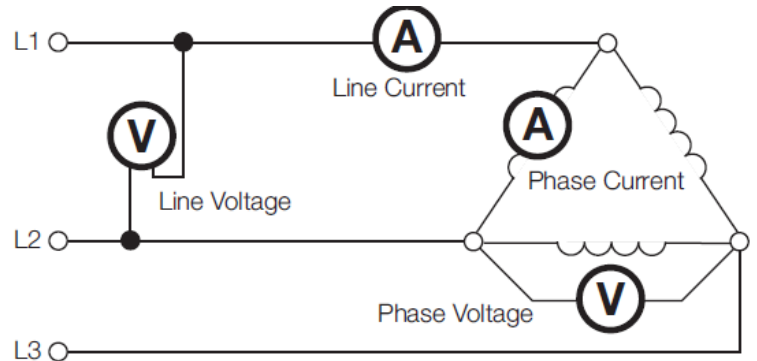
3. Note

When the three-phase load is unbalanced, the neutral line should be connected, otherwise the load of each phase will vary. If three-phase is balanced, neutral line current is 0A.

B: Δ type

1. Definition :

The three separate coils are connected to form a triangle in a delta-connected system, which derives its name from the fact that a schematic diagram of this connection resembles the Greek letter delta (Δ).



In this configuration the line voltage and phase voltages are the same.

$$V_{\text{line}} = V_{\text{phase}}$$

$$I_{\text{line}} = \sqrt{3} \times I_{\text{phase}}$$

2. Application :

There is no neutral point and no neutral line, so there is only **three phase three wire system**.

For special example: $V_l = 240V$, Center dots could make two 120V Voltage, and center dots could be connect to FG.



General Y & Δ compared

| | Voltage(V) | Current(I) | Connect Method | | | Neutral Line |
|----------|-----------------------------|-----------------------------|----------------|-------------|-------------|--------------|
| | | | 3 ϕ 3W | 3 ϕ 4W | 3 ϕ 5W | |
| Y | $V_l = V_p \times \sqrt{3}$ | $I_l = I_p$ | ✓ | ✓ | ✓ | ✓ |
| Δ | $V_l = V_p$ | $I_l = I_p \times \sqrt{3}$ | ✓ | | | |

C: AC 3Ø input voltage term:

1 Three-phase generator : A generator with equal amplitude, equal frequency and mutual phase difference of 120 degrees of potential.

.2 three-phase power supply :The three-phase generator is used as the power supply.

3 three-phase circuit :The circuit which is supplied by three-phase power supply.

4 line voltage :The voltage between phase and phase is line voltage that is 380V in China.

5 phase voltage : Between phase and neutral line is called phase voltage that is 220V in China.

6 The neutral line (also called the zero line and the zero phase) is connected in Star "center line", no voltage and current in each phase is equal to the load, and when the single-phase load and the other two load ranges, or three-phase unequal, there will be an overall balance of the load current circuit, so as not to damage the use of electrical appliances.

D: AC 3Ø input in different country

| Country | Winding Method | 1Ø Volatge | 3Ø Volatge | Frequency |
|---------|----------------|------------|--------------|-----------|
| China | Y | 220V | 380V | 50Hz |
| Taiwan | Δ | 110V | 220/380V | 60Hz |
| Korea | Δ | 110/220V | 200/220/380V | 60Hz |
| Japan | Δ | 100V | 200V | 50/60Hz |
| India | Y | 230V | 400V | 50Hz |
| Russia | Y | 127/220 | 380V | 50Hz |
| Germany | Y | 220V | 380V | 50Hz |
| France | Y | 127/220V | 380V | 50Hz |
| UK | Y | 230V | 415/480V | 50Hz |
| Italy | Y | 127/220V | 380V | 50Hz |
| USA | Δ | 120V | 240/480V | 60Hz |
| Canada | Δ | 120V | 240/480V | 60Hz |