

I. How to Select the Right CT

Q: When is a CT necessary?

A: A current transformer (CT) is necessary if you need to measure the current, energy, frequency, and other parameters of the power system *and* when one or both of the following conditions apply:

- (1) The voltage of your power system is above 240 V.
- (2) The current of your power system is greater than 100 amps.

Q: How do I select the right CT?

A: If any particular specification has been requested, please follow it when choosing your product. In areas where no specification has been requested, please refer to guidelines below.

Primary Current (I_1) and Secondary Current (I_2)

- I_1 should be the lowest standard value above 125 % of the maximum primary load current.
- I_2 should be 5 A in most cases. However, when the circuit of the secondary side is longer than found in average situations, it is suggested, in order to reduce power loss (i.e. the output VA of the CT), that the secondary current be 1 A. When the secondary current is 1 A, the burden is reduced to 1/25 of that when I_2 is 5 A.

Burden

- For a revenue CT, the burden should be IEC 5 ~ 15 VA or IEEE B.01 ~ B.05.
- For a metering CT, choose a burden VA equal to, or greater than, 125 % of the total combined VA of instruments connected to the secondary side.
- For a protective CT, please contact the manufacturer for assistance.

Accuracy

- For a revenue CT, the accuracy should be at least IEC 0.2 or 0.5 CL or IEEE 0.3 or 0.6 CL.
- For a metering CT, it should be at least IEC 1.0 or 3.0 CL or IEEE 0.6 or 1.2 CL.
- For a protective CT, please contact the manufacturer for assistance.

Rated Frequency

Choose the same rated frequency as that of the power system.

Outdoor Type or Indoor Type

Choose according to the location where the CT will be used. Note that an outdoor CT can also be used indoors.

Terminal Type, Window Type, or Wound Type

- A **terminal type CT** comes with a primary conductor. Ordinarily, a terminal type CT is chosen in most circumstances where one needs a medium-voltage CT with a primary current of 3000 A or lower.
- A **window type CT** does not come with a primary conductor. This type of CT is easier to install, can withstand a greater thermal overcurrent, and reduces failure rate. Usage scenarios of a window type CT are as follows:
 - (1) When a low-voltage CT with a primary current of 100 A or greater is needed, a window type CT is usually chosen.
 - (2) When a medium-voltage CT with a primary current of 300 A or greater is needed, a window type CT may be chosen.
 - (3) When a medium-voltage CT with a primary current greater than 3000 A is needed, a window type CT is usually chosen.

However, when a greater output (VA), a higher accuracy level, or a greater inside diameter of the CT window is required of a CT, please consult with the manufacturer – as well as the *selection table* provided by them – to ensure output and accuracy requirements can be met.

- Sometimes, a low-voltage CT with a primary current lower than 100 A may be called for, together with the requirement of a large output, a high accuracy, or a great inside diameter of the CT window. To meet this demand, a window type CT with a primary current of 120 A, 150 A, or 200 A can be selected and be wound with a primary conductor (with more than one turn). This solution is sometimes called a **wound type CT**.

Insulation Material

If any indoor or outdoor CT will be used in a location of extreme conditions, such as a desert, the Frigid Zones, or high altitudes (above 1000 meters), special requirements will apply –

please contact the manufacturer for information. In other situations, please follow these suggestions:

- When choosing an **outdoor** CT, select either resin or oil as insulation material.
- When choosing an **indoor** CT, resin should be its insulation material if:
 - (1) the CT is of medium voltage.

OR

 - (2) the CT will be used in a humid environment.

(If neither condition applies to an **indoor** CT, you may freely choose from a variety of insulation materials.)

Electrical Standard

Choose whichever standard is ordinarily used in your region.

Q: What if I need a special CT outside the IEC and IEEE standards?

A: Please contact the manufacturer for assistance.

II. How to Select the Right PT

Q: When is a PT necessary?

A: A potential transformer (PT) is necessary if you need to measure the voltage, energy, frequency, and other parameters of the power system and if the voltage of your power system is above 240 V.

Q: How do I select the right PT?

A: If any particular specification has been requested, please follow it when choosing your product. In areas where no specification has been requested, please refer to guidelines below.

Primary Voltage (V_1) and Secondary Voltage (V_2)

- When selecting a primary voltage, choose the first standard voltage above $(100 + 10) \%$ of the power system voltage.
- When selecting a secondary voltage, choose according to the rated voltage of the instruments being connected to the secondary side of the PT. For a step-down transformer, V_1 / V_2 should be an integer – this is to facilitate calculation of the power system parameters.

Burden

- For an instrument PT, choose a burden VA in the 125 ~ 150% range of the total combined VA of instruments being connected to the secondary side of the PT.
- For a control PT, choose a burden VA that is greater than, or equal to, 1.5 times the total combined VA of all the equipment being connected to the secondary side of the PT.

Accuracy

- For a revenue PT, the accuracy should be at least **IEC 0.2 or 0.5 CL or IEEE 0.3 or 0.6 CL**.
- For a general-purpose PT, it should be at least **IEC 1.0 or 3.0 CL or IEEE 0.6 or 1.2 CL**.
- For a control PT, there is no specific requirement for accuracy if the burden is greater than IEC 500 VA or IEEE ZZ (IEEE 400 VA); if the burden is no greater than the IEC 500 VA or IEEE ZZ (IEEE 400 VA), choose an accuracy no lower than **IEC 1.0 or 3.0 CL or IEEE 1.2 or 0.6 CL**.

Rated Frequency

Choose the same rated frequency as that of the power system.

Outdoor Type or Indoor Type

Choose according to the location where the PT will be used. Note that an outdoor PT can be used indoors as well.

Single-Phase (1 ϕ) or Three-Phase (3 ϕ)

Ordinarily, choose a single-phase PT. If a three-phase PT is needed, it can be formed by combining single-phase PTs by means of a V - V or Δ - Δ connection (for an ungrounded system), or by means of a Y - Y connection (for a grounded system). However, for an ungrounded system, the Δ - Δ method is not recommended, as the V - V method is more economical and less prone to failure. When making a V - V connection, two ungrounded single-phase PTs are needed; if making a Y - Y connection, three grounded single-phase PTs are required. A three-phase PT, when formed with a V - V connection, has an output of **0.866 x (2 x VA / 1 ϕ)**; when formed with a Y - Y connection, it has an output of **3 x VA / 1 ϕ** .

Insulation Material

If any indoor or outdoor PT will be used in a location of extreme conditions, such as a desert, the Frigid Zones, or high altitudes (above 1000 meters), special requirements will apply – please contact the manufacturer for information. In other situations, follow these guidelines:

- When choosing an outdoor PT, select either resin or oil as insulation material.
- When choosing an indoor PT, resin should be its insulation material if:
 - (3) the PT is of medium voltage

OR

- (4) the PT will be used in a humid environment.

If neither condition applies to an indoor PT, you may freely choose from a variety of insulation materials.

Electrical Standard

Choose whichever standard is ordinarily used in your region.

Q: What if I need a special PT outside the IEC and IEEE standards?

A: Please contact the manufacturer for assistance.