

# Technote 113 – Meter vs System Accuracy

## Purpose

To explain electric meter, current transformer and system accuracy and what contributes to inaccuracy.

## What is accuracy?

Accuracy is the degree to which the result of a measurement conforms to the real value.

In measurement systems, one may see the accuracy stated in the datasheet or manual as +/- 1%. This means that a measured value may be 1% higher or 1% lower than the actual (real) value. The lower the percentage, the more accurate a device will be. Therefore, a device that has a 0.5% accuracy rating is guaranteed to have measurements closer to the real value than a meter with 1% accuracy.

With metering systems, it is important to understand that there are several factors when it comes to determining accuracy of a meter system. Items that can affect accuracy are:

- The length of the CT wires
- Splicing of the CT wires
- Using a different CT with the meter than intended
- Utilizing a damaged CT
- A CT that has not been clamped shut completely

## Split core versus Solid core may have different accuracy

When a meter is sold as a kit with CTs included, the manufacturer is generally able to guarantee a better overall accuracy than if they were sold separately. If they are purchased separately, then it's necessary to look at the overall accuracy of the Meter and the CT's.

## Meter accuracy

This is the accuracy of the meter's internal measuring components. This does not account for any inaccuracy outside of the meter (current transformers, etc.). This means that current transformer inputs have their own accuracy across their full range of measurement. For example: On a meter with a 0.1A CT input, the accuracy is on the entire 0 to 0.1A range of the input.

## CT accuracy

This is the accuracy of the current transformers themselves. Each CT is rated for a certain accuracy of the full scale of the CT (i.e. 100A). This means a 0.5% rated 100A CT could be +/- 0.5A. Similarly, a 0.5% rated 400A CT could be +/- 2A. A 100A CT and 400A CT may have the same accuracy of 0.5%, but they have a different number of amps deviation from the real value (0.5A and 2A respectively).

Another thing to consider, is that many CT's are only guaranteed that accuracy if they're measuring current above a certain value. For example, if a meter says that the accuracy is 1% if over 2% of the 200A CT rating. This mean at least 4A needs to flow through the conductor for the CT to read accurately.

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## Overall System accuracy

When looking at the entire system accuracy, both the Meter accuracy and the CT accuracy need to be taken into consideration. For a system with 1% CTs and a 1% meter, the overall system accuracy is calculated using the following equation:

$$(\text{Meter Accuracy})^2 + (\text{CT accuracy})^2 = (\text{System Accuracy})^2$$

For example: If a CT and a meter both have 1% accuracy, the formula would be:

$$1^2 + 1^2 = \text{System Accuracy}^2$$

When solved for System Accuracy:

$$\text{Sqrt}(1^2 + 1^2) = \text{System Accuracy}$$

$$\text{Sqrt}(1 + 1) = \text{System Accuracy}$$

$$\text{Sqrt}(2) = \text{System Accuracy}$$

$$1.41 \% = \text{System Accuracy}$$

Rev	Date	Author	Description of Changes
1	07/27/2018	TJG	Initial document
2	12/13/2018	TJG	Removed draft, published.