

# Monitoring High Voltage Systems

Warning: Systems greater than 600V phase-to-phase are not fully supported by eGauge Systems. Supported CTs are rated for up to 600Vac, systems at higher voltages will need to source alternate CTs.

Amperage-output CTs (e.g., 5A output, or 100:5 ratio, etc) can cause serious shock or electrocution. Use appropriate protection when installing and handling equipment.

**Amperage-output CTs must not be connected directly to the eGauge meter and may cause damage.**

## Monitoring High Voltage Systems

First, a disclaimer: although it's technically possible to monitor a high voltage system (greater than 480Vac phase to phase or 277Vac phase to neutral, or 600Vac phase to phase using EV1000 sensors), eGauge Systems doesn't officially support this and doesn't offer hardware capable of doing so directly. eGauge support can assist with eGauge configuration, but cannot offer any guarantees regarding accuracy. Note that a wiring mixup during installation can damage or destroy the eGauge - this damage is **not covered under warranty**.

In order to calculate real power, the eGauge meter needs two measurements - a voltage reference and an amperage reference (technically the meter also captures amperage and voltage waveforms, which lets the meter calculate power factor and thus real power).

## Voltage Reference

eGauge Systems cannot guarantee meter accuracy when third party potential transformers are used. It is recommended to use the [EV1000 high voltage sensor](#) when measuring a system with higher voltage than the eGauge meter rating, or on a different side of a transformer from where the eGauge voltage taps are connected.

In most installations, the eGauge can tap directly into the line voltage at the site (up to 277Vac Ph-N). Connecting the eGauge directly to higher voltages will damage or destroy the meter. However, it is possible to use stepdown transformers to reduce higher voltages to something the eGauge can safely read. These stepdown transformers are referred to as Potential Transformers (PTs) or Instrument Transformers. Most will take a common service voltage (eg, 480V, 600V, 4160V) and

reduce it to 120Vac.

With the release of the [EV1000 High Voltage Sensor](#), it's now possible to monitor high voltage services without the use of bulky stepdown transformers. The EV1000 can be used to measure up to 707Vac, making it ideal for 600V services. Note that the EV1000 is only supported on EG4xxx and newer meters - the EV1000 cannot be used with EG30xx and older meters.

## Amperage Reference

To obtain an amperage measurement, the eGauge uses Current Transformers (CTs) with a 333mV output. These CTs clamp directly around conductors, and as such are rated for the voltage used by those conductors (a 600V rating is typically adequate for most installation scenarios). 333mV output CTs are the only CTs which can be connected directly to the eGauge. Connecting any other CT output type (eg, 4-20mA, 5A) will **damage or destroy the meter**.

## Necessary Hardware

eGauge Systems currently stocks and supports one PT ([Functional Devices TR50VA008](#), 480V to 120V) and several CT lines rated for use on up to 600V services. The [EV1000 High Voltage Sensor](#) can be used on measurements up to 707Vac (for example, the phase to neutral voltage on a 347/600V service is 347V, so the EV1000 would work well here). For a service at a higher voltage, the customer will need to identify and purchase:

1. Potential Transformers or Instrument Transformers which can take a higher voltage down to <277V (preferably 120V). The transformer should have a relatively low VA rating to minimize phase shift (we suggest <=50VA, although up to 100VA is acceptable). Stepdown transformers intended for *high accuracy measurements* are generally referred to as *Instrument Transformers*. The transformer may require a larger enclosure or additional mounting hardware as well - they tend to be bulky and heavy. The total number of conductors on a service will determine the number of transformers required. A three phase four wire (wye, with neutral) service needs three transformers; a three phase three wire (delta, no neutral) needs two transformers.

2. A CT which can be installed around conductors carrying the service voltage (or overrated depending on code and installation requirements). The CT should either have 333mV output or 5A output (more on that below). Solid core CTs are recommended, although rope CTs are acceptable.

There aren't many (if any) 333mV output CTs rated for use on a 600V+ systems. The 5A output profile is much more common. A 5A output CT **cannot be connected directly to the eGauge**. However, it is possible to read from a 5A output CT using one of a supported CTs. Essentially, the output from the 5A CT is shorted (wires connected together). One of the standard 333mV output CTs is clipped around this new loop, and the eGauge measures the output current of the CT (0-5A). A custom scale factor is used to for the eGauge to treat this as a reading from the larger CT. In a similar manner, a custom scale factor is set on the line voltage readings to force the eGauge to treat the 120Vac as the voltage on the primary side of the transformer.

eGauge support can assist with this part of the device configuration, but cannot offer specific CT or transformer suggestions.

## Summary

It is technically possible to measure power used/generated on services over 600Vac (phase to phase), although not officially supported. The customer will need to find suitable hardware (CTs and PTs). eGauge support can offer advice on the suitability of a given piece of hardware but cannot provide specific hardware recommendations. eGauge support can also assist with configuration and testing, although it's not possible to guarantee any specific level of accuracy.

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Please visit [kb.egauge.net](https://kb.egauge.net) for the most up-to-date documentation.