

Emphatec SigNext® - CTSM Current Transformer Shorting Module

Application Note



Emphatec SigNext® - CTSM, catalog number 330123, is a unique and innovative solution to the problem of current transformers becoming open circuited. If the secondary of a CT is not loaded by a low impedance, device hazardous voltages can be produced. For example, if the secondary is completely unloaded, i.e. open circuited, the CT will act as a step-up voltage transformer. Since the secondary has many more turns than the primary, the secondary voltage produced can be very high and pose a safety hazard – a shock hazard to personnel and a fire hazard if the winding insulation breaks down.

If the device monitoring the secondary of a CT, such as an ammeter, is to be removed or disconnected, the CT must be shorted or the circuit the CT is monitoring, which is the load circuit, must be shut off. There are many terminal blocks available for shorting CT's with the sliding link type being most popular.

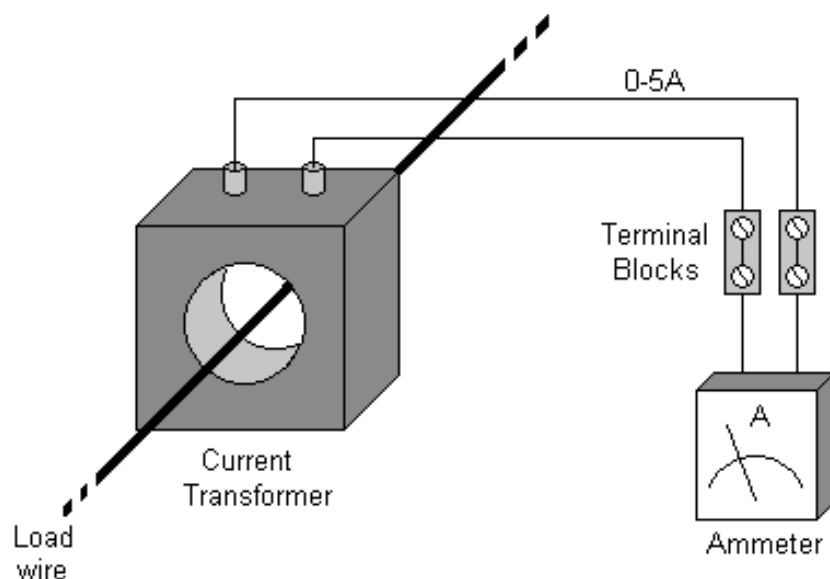


Figure 1: Typical CT circuit

Figure 1 shows a typical CT circuit including the current transformer, ammeter and terminal blocks. The ammeter could be analog or digital or could be replaced by an analog signal conditioner that converts the AC current to 4-20mA to be interfaced to a PLC or DCS input.

The terminal blocks provide a convenient point for applying a short circuit to the secondary of the CT. This could be a plug-in jumper, a sliding link, a pull-pin – there are many types of terminals used in CT applications.

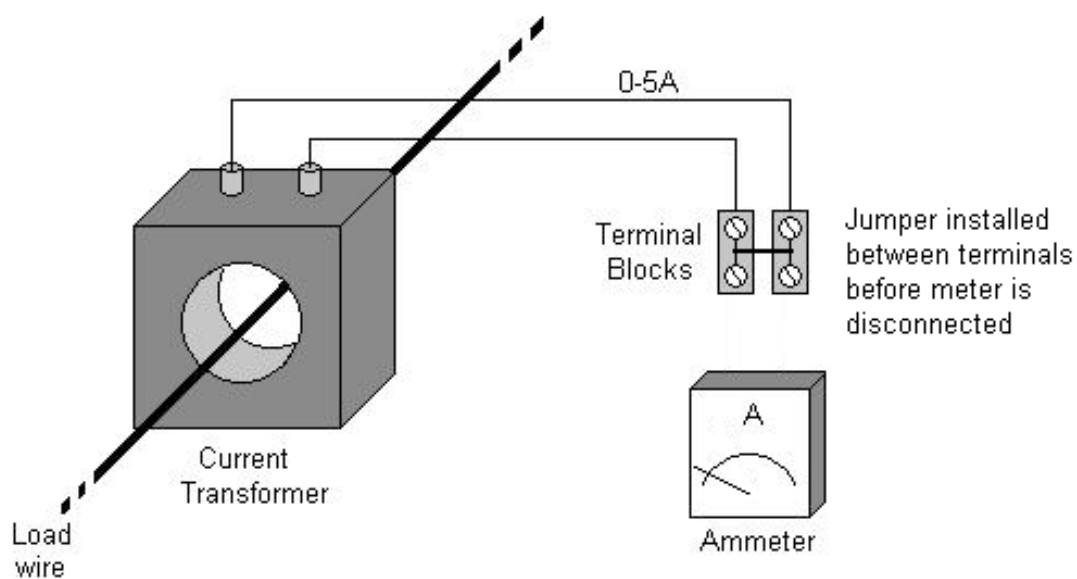


Figure 2: Short Circuited CT

With the CT secondary short circuited the secondary current is still 0-5A (the most common CT secondary rating) but no hazardous voltages are present. The ammeter can be safely removed and the load circuit continues operating. But what happens if there is a break in the wiring between the CT and ammeter?

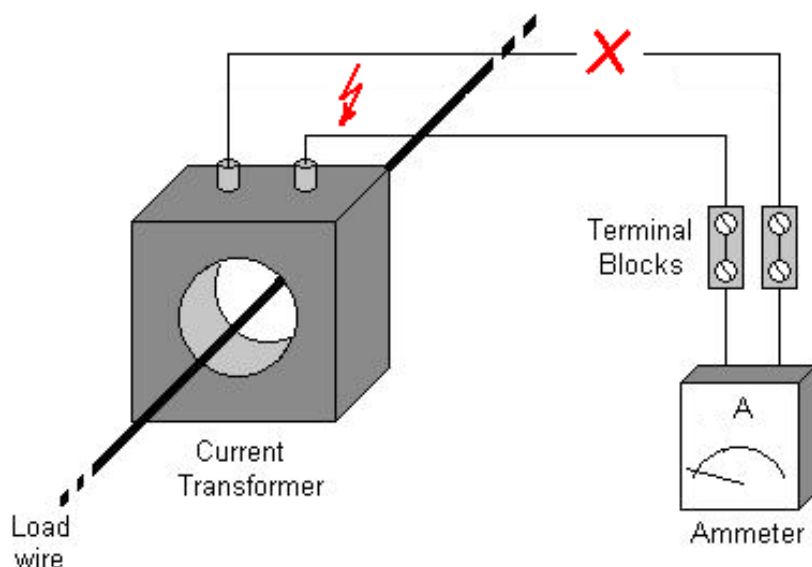


Figure 3: Open Circuit secondary

If there is a break in the wiring the current in the secondary obviously goes to zero amps but a voltage is developed in the secondary winding. This voltage can be very high and poses a safety hazard to personnel but also can exceed the insulation breakdown rating of the secondary wiring. In extreme cases this can lead to the CT catching fire.

Weidmuller has designed the Emphatec SigNext® - CTSM specifically for this application. It monitors the secondary of the CT and applies a short circuit if it detects a voltage exceeding approximately 2V. The module can apply the short circuit indefinitely and a digital output indicates the module is in shorting mode.

The Emphatec SigNext® - CTSM should be located as close to the CT as possible so that any breaks in the wiring will occur between the module and the ammeter, not between the CT and the module. The terminations on the module are the tension clamp style so that they are vibration proof. The connector used for the CT secondary circuit connections uses locking screws so that it cannot vibrate out or be accidentally removed.

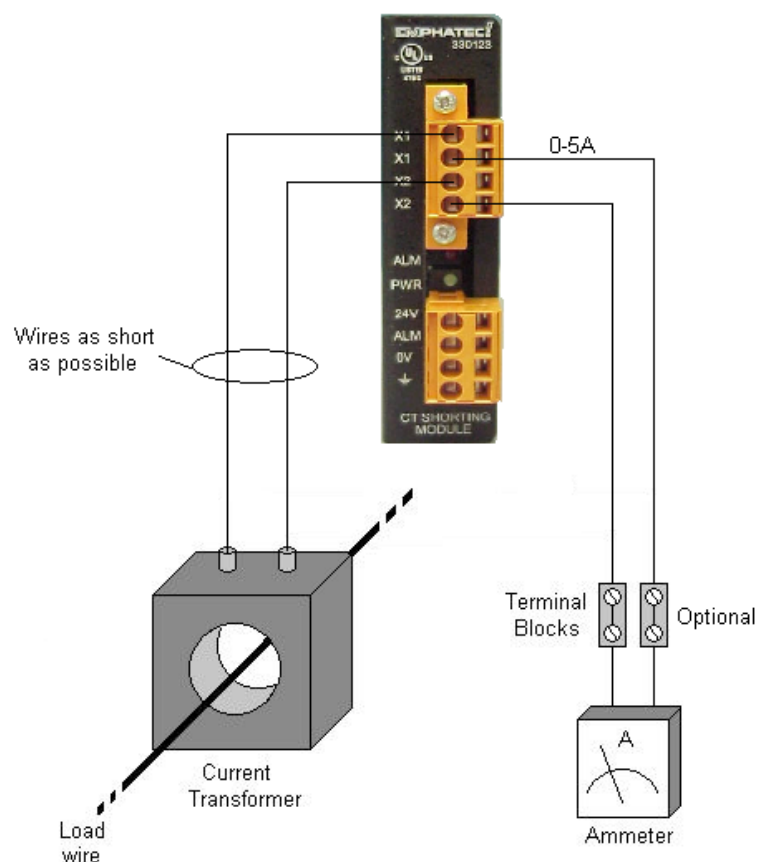


Figure 5 shows an alternative method of installing the Emphatec SigNext® - CTSM. If 16AWG wires are used it is possible to put 2 wires in each termination. This way the module could be disconnected without interrupting the secondary circuit.

Figure 4: Emphatec SigNext® - CT Shorting Module Installation

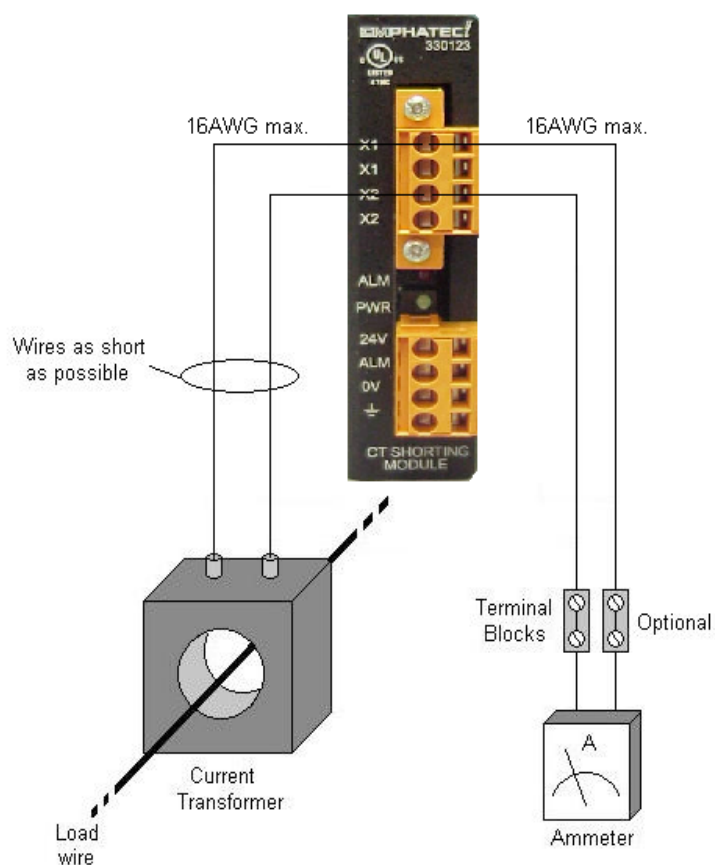
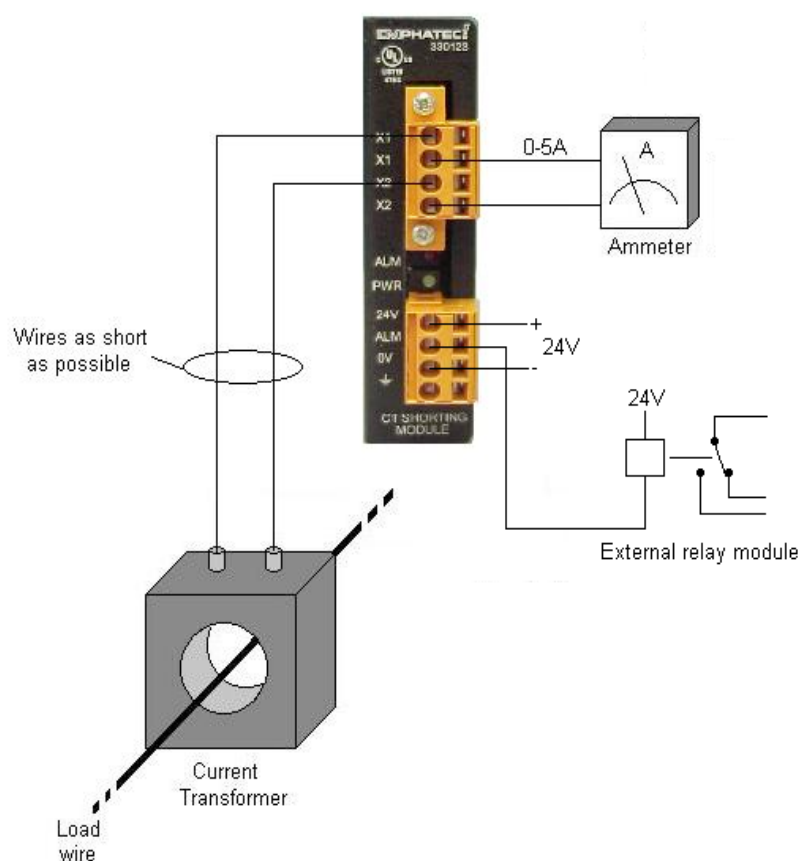


Figure 5: Alternative Installation



The digital output is optional. It requires an external 24Vdc. If the 24Vdc fails, or is not connected, the shorting module still functions – the shorting circuit is powered by the CT secondary. The output is sinking i.e. connects to the negative of the 24V supply when there is a fault. It is intended to control an external relay, such as one of Emphatec SigNext® - ERM relay modules. An LED on the module also indicates if it is in shorting mode.

Figure 6: Optional Alarm Circuit

The housing is compact, requiring just 25mm of DIN rail, and metal so that it can handle the power dissipation from the shorting circuit for extended periods of time. There is also a termination marked with a ground symbol - this is also an optional connection and is provided only because the housing is metal and some users may want to ground it. It has no affect on the operation of the module.

Who should be interested in this module?

Any CT user. Look for process applications such as steel mills, petrochemical facilities, power generation, water treatment, pulp and wood processing, etc.

Ask your distributors where they are selling CT's or motors and you will find potential users for this module.

Does every CT need this module?

There are CT's available today that do not produce hazardous voltages when open circuited. However, the vast majority of users still install shorting terminals as it is accepted practice to short CT's when not loaded. It's like RC snubbers across triacs or cold junction compensation in thermocouple circuits - not required in many applications but still used.

It is important to note that we have not found any other product available that automatically shorts the CT if a secondary voltage is detected. Competitive products require manual operation.

Value Proposition

- Increased safety: Automatically shorts the CT long before the secondary voltage can become hazardous, operator error is eliminated.
- Robust design: Vibration proof terminations so accidental open circuits are eliminated. Metal housing allows for sufficient heat dissipation so the module can remain in the short circuiting mode indefinitely. Suitable for all CT applications.
- Standalone product: Externally powered alarm output is optional, the module still provides the shorting function even if the alarm circuit is not powered.
- Easy installation: Installs in series with existing CT wiring, suitable for retrofits and new installations.

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