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Function

Connect Sepam™ to any standard 1A or 5A CT. Schneider Electric offers a range of current transformers to measure primary currents from 50 A to 2500 A. Contact a Schneider Electric representative for more information.

Current Transformer Sizing

Current transformers should be large enough to minimize saturation. CTs should be selected per ANSI C37.110. This can be critical for high X/R systems with generators larger than 2MW.



Rated Secondary Current (iN)	CT Ratio ⁽¹⁾	Normal Performance			Higher Performance		
		Burden Designation	ANSI Class ⁽²⁾	IEC Class ⁽³⁾	Burden Designation	ANSI Class ⁽⁴⁾	IEC Class ⁽³⁾
5	100/5	B-0.1	C10	2.5VA 5P20	B-0.2	C20	5VA 5P20
5	500/5	B-0.5	C50	15VA 5P20	B-1.0	C100	30VA 5P20
5	1200/5	B-2.0	C200	50VA 5P20	B-4.0	C400	100VA 5P20
1	100/1	B-0.1	C50	2.5VA 5P20	B-0.2	C100	5VA 5P20
1	500/1	B-0.5	C200	10VA 5P20	B-1.0	C400	30VA 5P20
1	1200/1	B-2.0	C1000 ⁽⁵⁾	40VA 5P20	B-4.0	C2000 ⁽⁵⁾	80VA 5P20

Transformer and Transformer-Machine Unit Differential Protection (ANSI 87T)

The phase CT primary currents must adhere to the following rule:

$$0.1 \left(\frac{S}{\sqrt{3} V_{LLn1}} \right) \leq I_N \leq 2.5 \left(\frac{S}{\sqrt{3} V_{LLn1}} \right) \text{ for winding 1.}$$

$$0.1 \left(\frac{S}{\sqrt{3} V_{LLn2}} \right) \leq I'N \leq 2.5 \left(\frac{S}{\sqrt{3} V_{LLn2}} \right) \text{ for winding 2.}$$

where:

S is the transformer's rated power.

I_N and **I'_N** are the phase CT primary currents of winding 1 and 2 respectively.

V_{LLn1} and **V_{LLn2}** are winding 1 and 2 phase-to-phase voltages.

The rule of thumb is to size the primary and secondary CTR to 1.5XFLA. While the relay can accept substantially smaller CTR's, care should be taken when the CTR is below the rated FLA. Smaller CTR's generally result in a higher probability of saturation.

The current transformers should be defined by the knee-point voltage **V_k ≥ (R_{CT} + R_w) (20) i_N**.

The equation applies to the phase current transformer windings 1 and 2, where:

I_N and **I'_N** are the CT rated primary and secondary currents respectively.

R_{CT} is the CT internal resistance.

R_w is the resistance of the CT load and wiring.

Machine Differential (ANSI 87M)

Current transformers should be defined by a minimum knee-point voltage

$$V_k \geq (R_{CT} + R_w) (20) i_N.$$

The equations apply to the phase current transformers placed on either side of the machine.

i_N is the CT rated secondary current

R_{CT} is the CT internal resistance.

R_w is the resistance of the CT load and wiring.

Generators are characterized by large X/R ratio's. The rule of thumb is to use the highest possible accuracy class. A completely offset short circuit current requires the ct to support (1+X/R) times the calculated voltage. In many applications it is not possible to completely avoid saturation. Under these conditions it is helpful to have machine differential ct's with the same knee point voltage

(1) CT ratio rule of thumb is to size primary to be 1.5 x connected load.

Example: 600/5. CT for 400A load.

(2) Typical usual product offering from switchgear manufacturers in North America for 50/51 products.

(3) Highest listed VA in IEC 60044 is 30VA

(4) Suitable for systems with X/R=15, or small generator connected to bus. Minimum for 87 protection.

(5) Not listed in C57.13

Restricted Ground Fault Differential Protection (ANSI 64REF)

- The primary current of the neutral point current transformer used must comply with the following rule:

$$0.1 I_N \leq \text{Neutral Point CT Primary Current} \leq 2 I_N$$

where I_N = primary current of phase CTs on the same winding

Current transformers should be defined by the equation below that produces the highest knee-point voltage:

$$V_k \geq (R_{CT} + R_w) \times 20 I_N$$

$$V_k \geq (R_{CT} + R_w) (1.6 I_{3P}/I_N) \times I_N$$

$$V_k \geq (R_{CT} + R_w) (2.4 I_{1P}/I_N) \times I_N$$

The equations apply to the phase current transformers and the neutral-point current transformer, where

I_N is the CT rated secondary current.

R_{CT} is the CT internal resistance.

R_w is the resistance of the CT load and wiring.

I_{3P} is the maximum current value for a three-phase short circuit.

I_{1P} is the maximum current value for a phase-to-ground short circuit.

CCA630/CCA634 Connector

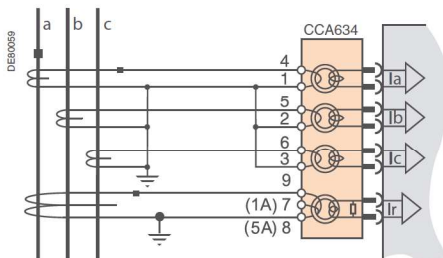
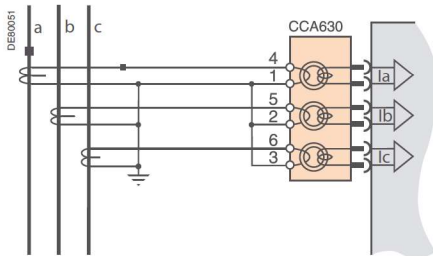
Function

The current transformers (1A or 5A) are connected to the CCA630 or CCA634 connector on the rear panel of Sepam™:

- The CCA630 connector connects three phase current transformers to Sepam™.
- The CCA634 connector connects three phase current transformers and one zero sequence current transformer to Sepam™.

The CCA630 and CCA634 connectors contain interposing ring CTs with through primaries. When measuring phase and zero sequence currents, these primaries provide impedance matching and isolation between the 1A or 5A circuits and Sepam™.

The connectors can be disconnected with the power on since disconnection does not open the CT secondary circuit.



⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Only qualified electrical workers should install this equipment. Such work should only be performed after reading this entire set of instructions.
- NEVER work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Disconnect the Sepam™ unit current inputs by unplugging the CCA630 or CCA634 connector. Do not disconnect the wires from it. The CCA630 and CCA634 connectors ensure continuity of the current transformer secondary circuits.
- Short-circuit the current transformer secondary circuits before disconnecting the wires connected to the CCA630 or CCA634 connector.

Failure to follow these instructions will result in death or serious injury.