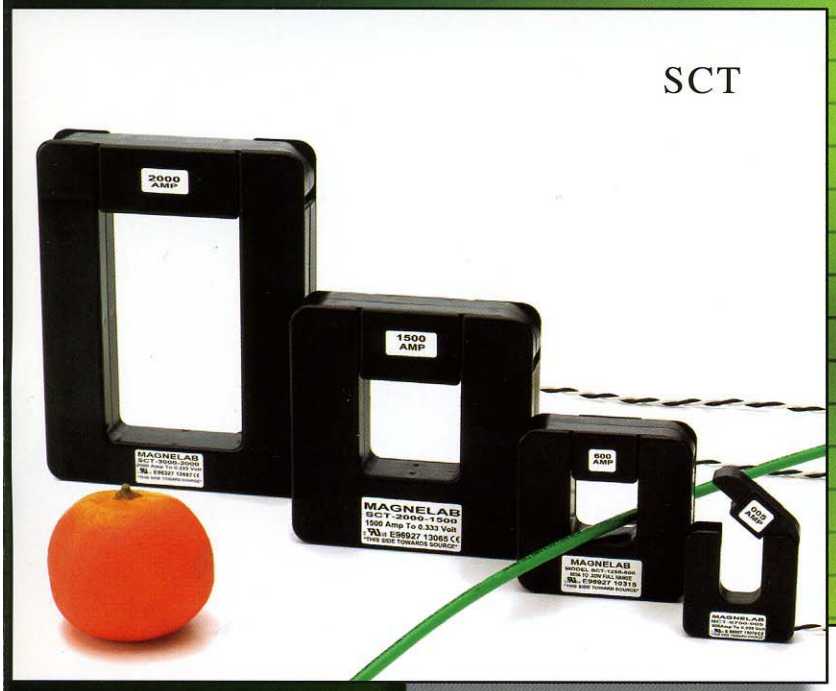
MAGNELAB

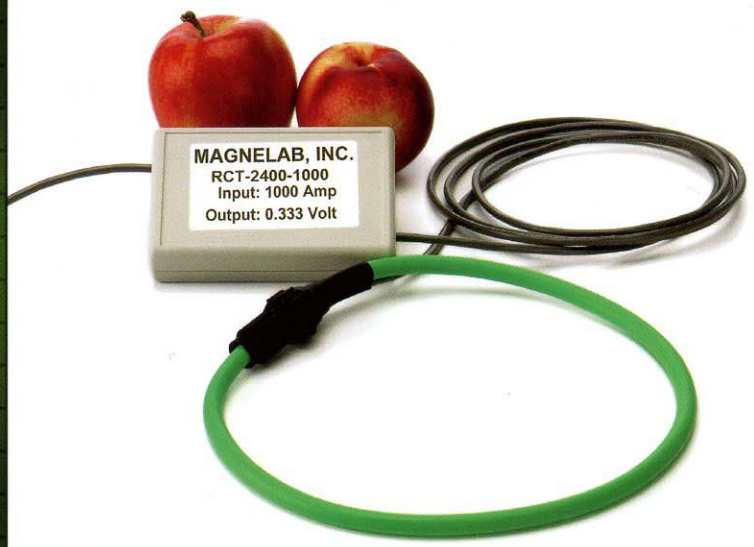
Energy Management Products

ISO 9001:2000 REGISTERED

SCT



RCT



UCT

CURRENT TRANSFORMERS:

- Split Core
- Solid Core
- Flexible Core
- Potential

Current Transformers

Magnelab Current Transformers (CT) operate on the basic principal of the ratio between the primary winding (N_1) and current (I_1) to the secondary winding (N_2) and current (I_2):

$$N_1 I_1 = N_2 I_2$$

In a current transformer, the primary winding is generally a single conductor with a current passing through it. This conductor is passed once through the center of the transformer and therefore $N_1 = 1$. We can then simplify the formula:

$$I_1 = N_2 I_2 \quad \text{or} \quad N_2 = I_1 / I_2$$

To understand this better, we need to look at the theoretical function of a transformer. AC voltage applied to the primary winding of an ideal transformer induces a magnetic field of flux in the core. The magnetic flux then induces a voltage in the secondary winding proportional to the turns ratio between the primary and secondary.

$$V_s = (N_s/N_p) * V_p$$

The current in the secondary winding is inversely affected.

$$V_p I_p = V_s I_s$$

Figure 1 illustrates the operation of a simple power transformer:

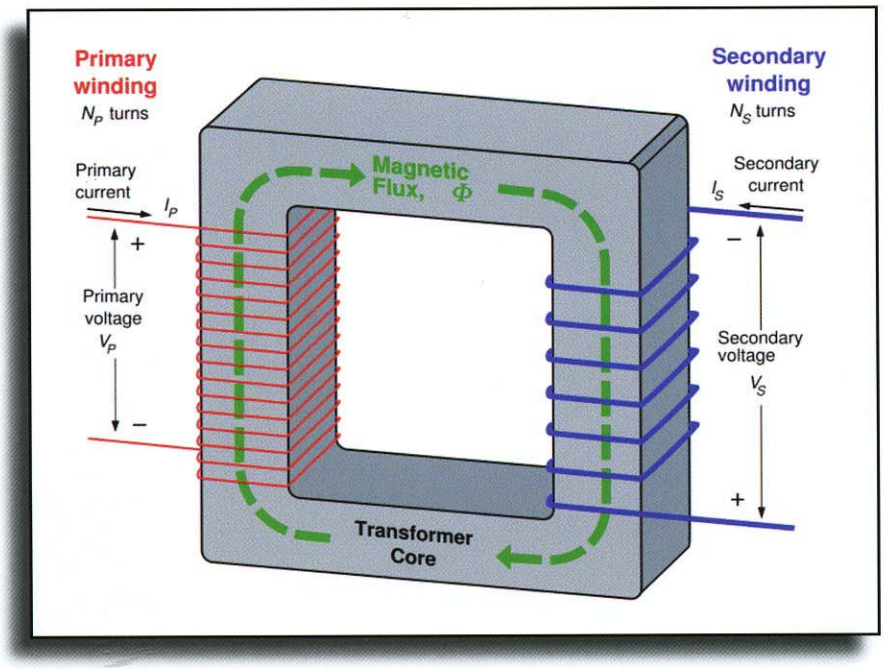


Figure 1: Schematic of an idealized transformer

The main considerations are the required voltage ratios. This is mathematically expressed using Faraday's law of induction:

$$Vout=Nd\Phi/dt$$

Where, Vout is the resulting instantaneous voltage, N is the number of turns on the coil being induced, $d\Phi$ is the amount of change in magnetic flux, and dt is the time of the change in flux.

Opposite of the power transformer described above, a current transformer normally looks more at the turns ratio or current ratio required. For example, to measure a 500 amp conductor using a 5 amp output, the following ratio would be used:

$$500/5 = 100$$

Assuming a 1 turn primary, a 100 turn current transformer would be required around the conductor under test in order to output 5 amps. That output would then need to be conditioned by a circuit to develop a voltage usable for measurement.

Magnelab current transformers are designed with the output pre-set to an ANSI standard of 0.333 volts using a calibrated internal burden resistor. This reduces the number of components required by the user to achieve a usable signal. This also enables control of other aspects of the transformer that affect the phase shift between the input signal and the output, and the linearity of the output signal to the input.

The phase relationship between the voltage and current input signal and output signal is not as simple due to coil and core properties such as hysteresis, and eddy current losses as shown in figure 2. By controlling the burden resistance of the transformer, Magnelab has minimized the affect of these losses and therefore minimized the phase shift of the output signal.

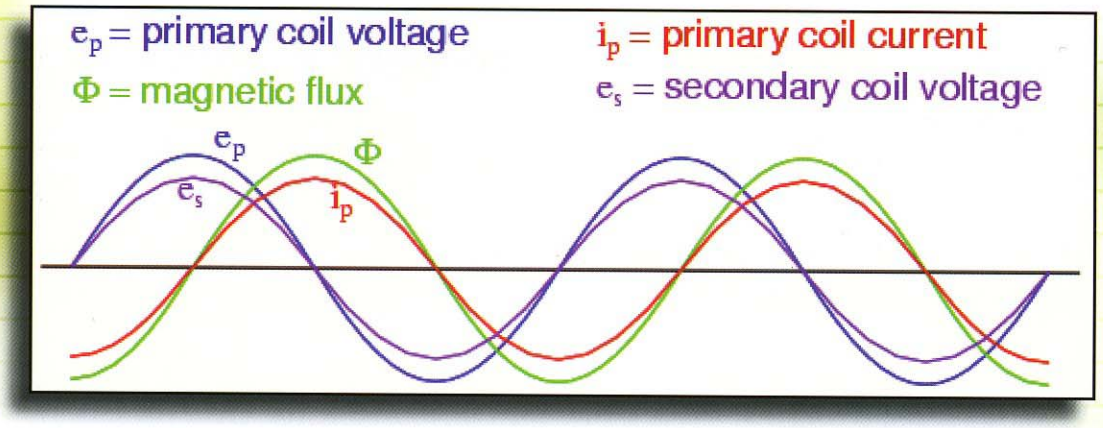


Figure 2: Waveform relationship of transformer parametric currents and voltages

Linearity of output voltage is controlled by using precision burden resistors and reducing the losses in the secondary coil of the transformer. This characteristic, along with the phase shift, are a measure of quality and design of a current transformer when used in the energy management industry.

RopeCt series transformers are current transformers that are characterized by a non-magnetic flexible core design which allows a wide range in the rated current, as well as installation in areas where space is limited. RopeCt transformers are produced in 24" length flexible cables with matched end connectors. The standard output voltage is 0.333 V. Linearity of output and position accuracy make the RopeCt series of transformers a very reliable current sensing device now added to the Magnelab family of CT products.

SPLIT-CORE AC CURRENT SENSOR

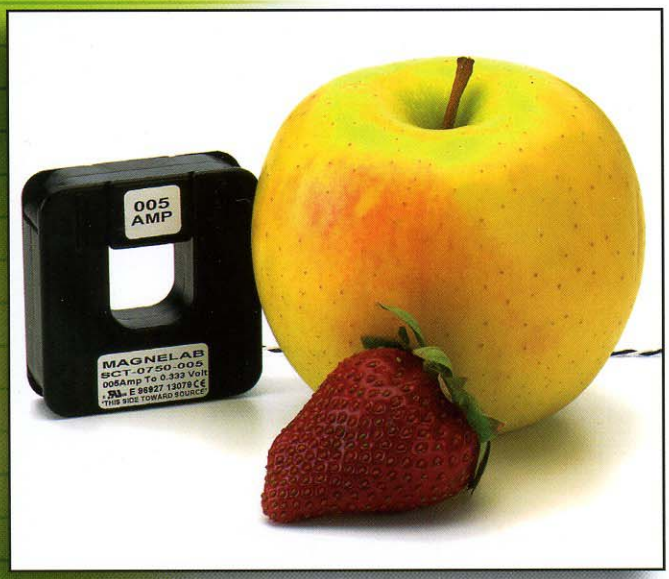
SCT-0750 Series

0.75" ID OPENING WITH 1 TO 200 AMP RATINGS

Split-core current transformers "sense" AC current from 1 to 200 Amps passing through the center conductor. Split-core transformers are ideal for installation on existing electrical wiring by snapping around the conductor. The Magnelab SCT series have of the highest industry standards both for interleaving joints and the self-locking mechanism.

FEATURES

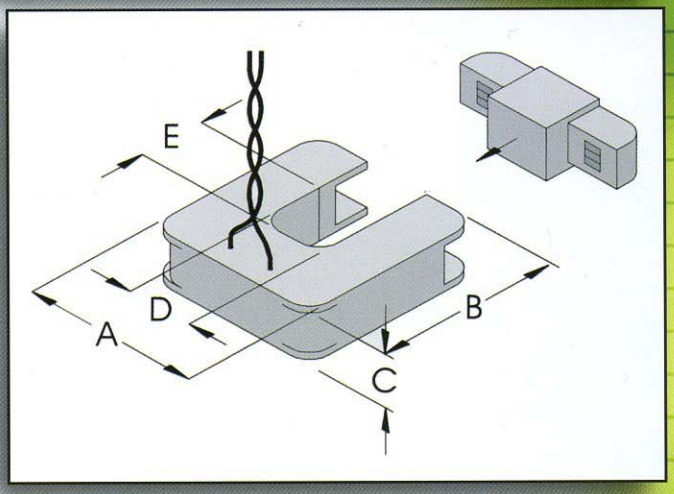
- » Rated input from 1 Amp to 200 Amp
- » 0.333 Volt AC output at rated current
- » Accuracy ± 1%
- » Accuracy at 10% to 130% of rated current
- » Operates from 50 Hz to 400 Hz
- » Phase angle < 2 degrees measured at 50% rated current
- » 8 ft. twisted-pair lead
- » UL recognized
- » Custom output and other parameters are available

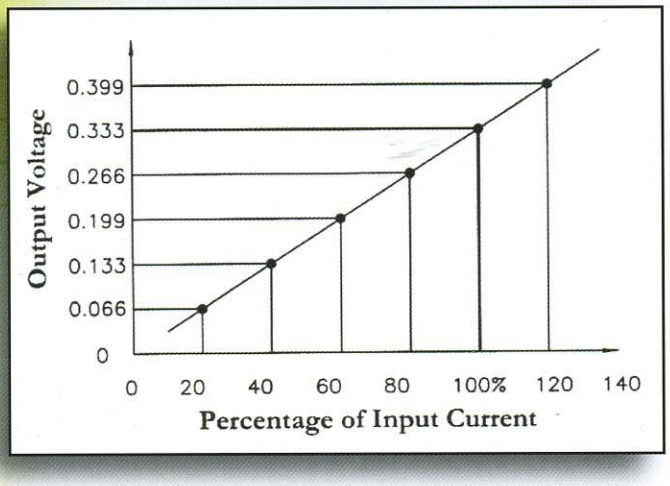


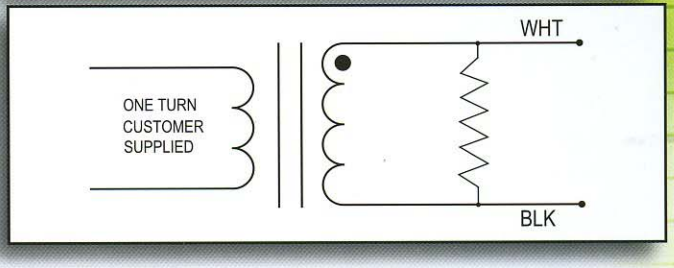
MAGNELAB PART	RATING
SCT-0750-000	NO BURDEN RESISTOR
SCT-0750-005*	5 AMP
SCT-0750-010	10 AMP
SCT-0750-030	30 AMP
SCT-0750-050	50 AMP
SCT-0750-070	70 AMP
SCT-0750-100	100 AMP
SCT-0750-150	150 AMP
SCT-0750-200	200 AMP

* PHASE ANGLE SLIGHTLY HIGHER

ALL DIMENSIONS ARE IN INCHES	
A	2.000"
B	2.100"
C	0.610"
D	**0.750"**
E	0.750"







CE RoHS ISO 9001:2000

MAGNELAB

Magnelab, Inc.
600 Weaver Park Rd.
Longmont, CO 80501
T: (303) 772-9100
F: (303) 772-9400
E: info@magnelab.com

SPLIT-CORE AC CURRENT SENSOR

1.25" ID OPENING WITH 50 TO 600 AMP RATINGS

SCT-1250 Series

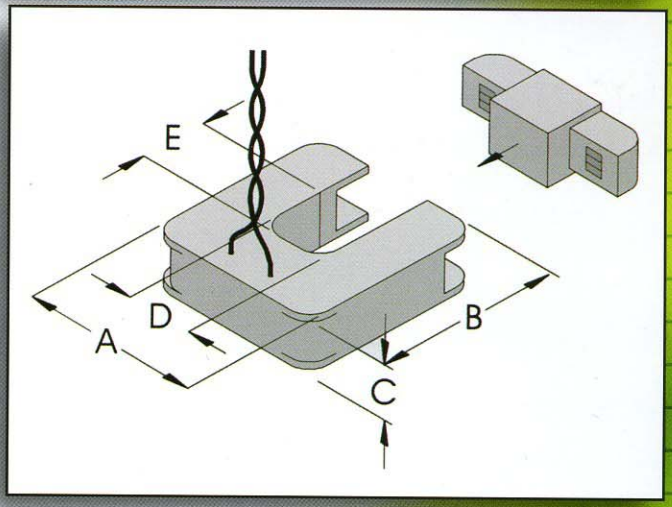
Split-core current transformers "sense" AC current from 50 to 600 Amps passing through the center conductor. Split-core transformers are ideal for installation on existing electrical wiring by snapping around the conductor. The Magnelab SCT series have of the highest industry standards both for interleaving joints and the self-locking mechanism.

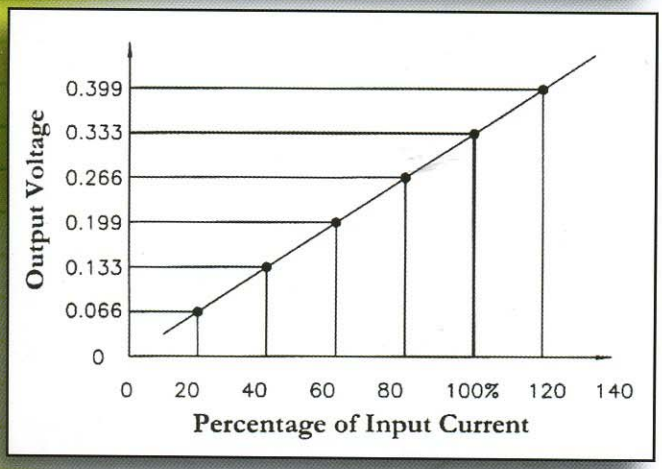
FEATURES

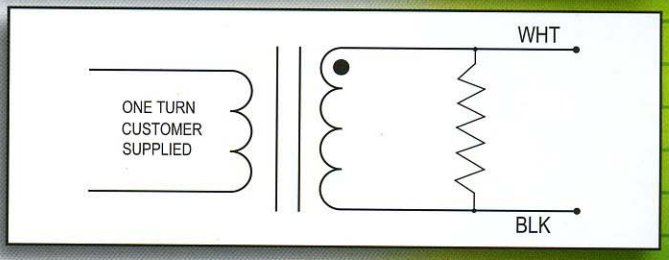
- » Rated input from 50 Amp to 600 Amp
- » 0.333 Volt AC output at rated current
- » Accuracy ± 1%
- » Accuracy at 10% to 130% of rated current
- » Operates from 50 Hz to 400 Hz
- » Phase angle < 2 degrees measured at 50% rated current
- » 8 ft. twisted-pair lead
- » UL recognized
- » Custom output and other parameters are available

MAGNELAB PART	RATING
SCT-1250-050	50 AMP
SCT-1250-070	70 AMP
SCT-1250-100	100 AMP
SCT-1250-150	150 AMP
SCT-1250-200	200 AMP
SCT-1250-250	250 AMP
SCT-1250-300	300 AMP
SCT-1250-400	400 AMP
SCT-1250-600	600 AMP

ALL DIMENSIONS ARE IN INCHES	
A	3.250"
B	3.350"
C	1.000"
D	**1.250"**
E	1.250"







CE RoHS ISO 9001:2000

Magnelab, Inc.
600 Weaver Park Rd.
Longmont, CO 80501
T: (303) 772-9100
F: (303) 772-9400
E: info@magnelab.com

SPLIT-CORE AC CURRENT SENSOR

2.00" ID OPENING WITH 100 TO 1500 AMP RATINGS

SCT-2000 Series

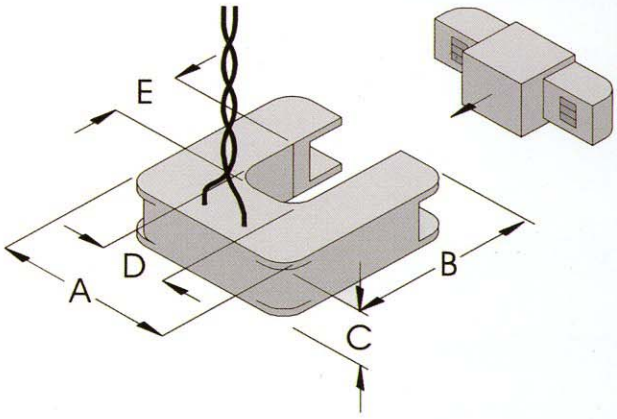
Split-core current transformers "sense" AC current from 100 to 1500 Amps passing through the center conductor. Split-core transformers are ideal for installation on existing electrical wiring by snapping around the conductor. The Magnelab SCT series have of the highest industry standards both for interleaving joints and the self-locking mechanism.

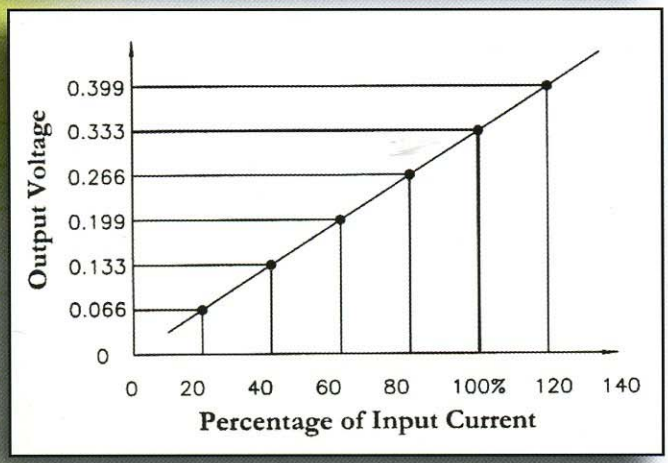
FEATURES

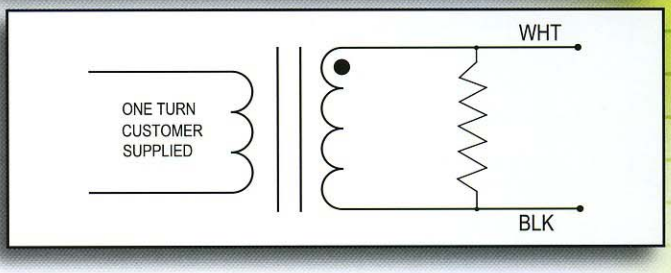
- » Rated input from 100 Amp to 1500 Amp
- » 0.333 Volt AC output at rated current
- » Accuracy ± 1%
- » Accuracy at 10% to 130% of rated current
- » Operates from 50 Hz to 400 Hz
- » Phase angle < 2 degrees measured at 50% rated current
- » 8 ft. twisted-pair lead
- » UL recognized
- » Custom output and other parameters are available

MAGNELAB PART	RATING
SCT-2000-100	100 AMP
SCT-2000-200	200 AMP
SCT-2000-300	300 AMP
SCT-2000-400	400 AMP
SCT-2000-600	600 AMP
SCT-2000-800	800 AMP
SCT-2000-1000	1000 AMP
SCT-2000-1200	1200 AMP
SCT-2000-1500	1500 AMP

ALL DIMENSIONS ARE IN INCHES	
A	4.750"
B	5.000"
C	1.200"
D	**2.000"**
E	2.000"







CE RoHS ISO 9001:2000

MAGNELAB

Magnelab, Inc.
600 Weaver Park Rd.
Longmont, CO 80501
T: (303) 772-9100
F: (303) 772-9400
E: info@magnelab.com

SPLIT-CORE AC CURRENT SENSOR

3.00" ID OPENING WITH 400 TO 3000 AMP RANGES

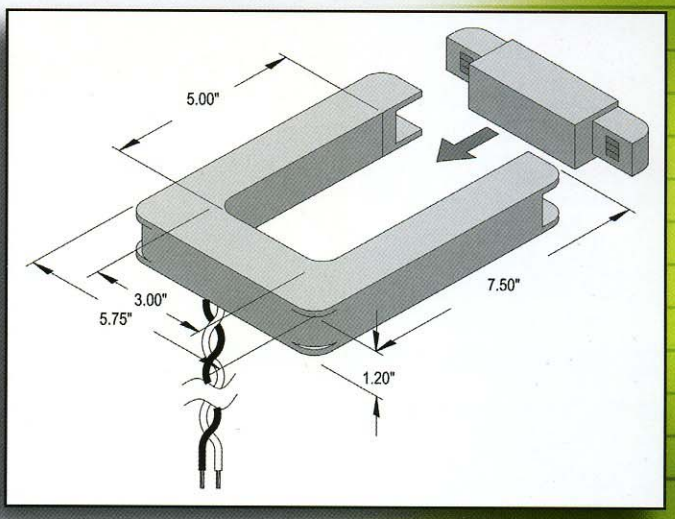
SCT-3000 Series

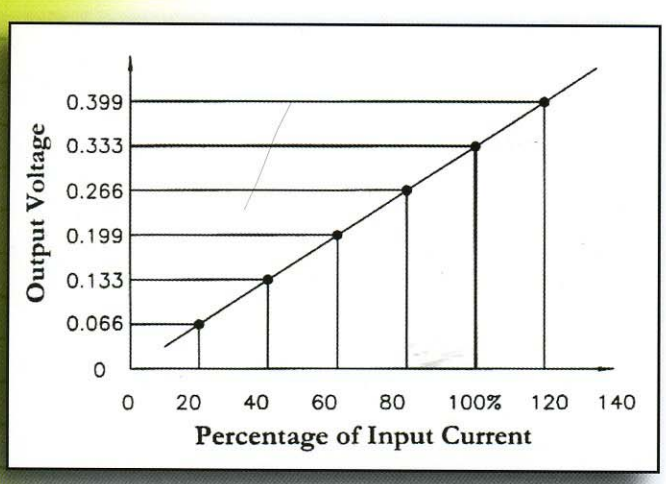
Split-core current transformers "sense" AC current from 400 to 3000 Amps passing through the center conductor. Split-core transformers are ideal for installation on existing electrical wiring by snapping around the conductor. The Magnelab SCT series have of the highest industry standards both for interleaving joints and the self-locking mechanism.

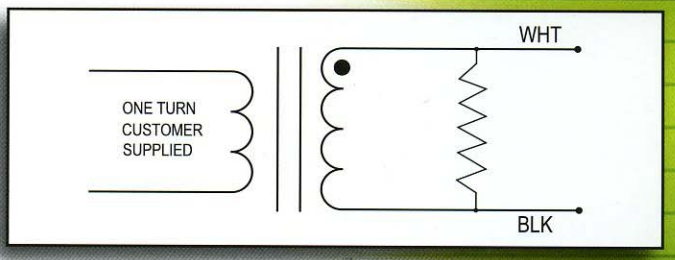
FEATURES

- » Rated input from 400 Amp to 3000 Amp
- » 0.333 Volt AC output at rated current
- » Accuracy ± 1%
- » Accuracy at 10% to 130% of rated current
- » Operates from 50 Hz to 400 Hz
- » Phase angle < 2 degrees measured at 50% rated current
- » 8 ft. twisted-pair lead
- » UL recognized
- » Custom output and other parameters are available

MAGNELAB PART	RATING
SCT-3000-400	400 AMP
SCT-3000-600	600 AMP
SCT-3000-800	800 AMP
SCT-3000-1000	1000 AMP
SCT-3000-2000	2000 AMP
SCT-3000-3000	3000 AMP







CE RoHS ISO 9001:2000

MAGNELAB

Magnelab, Inc.
600 Weaver Park Rd.
Longmont, CO 80501
T: (303) 772-9100
F: (303) 772-9400
E: info@magnelab.com

SOLID-CORE AC CURRENT SENSOR

5 SIZES IN A VARIETY OF CURRENT RATINGS

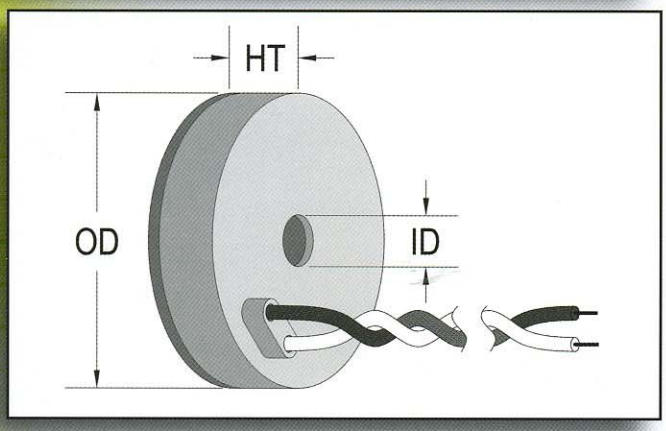
UCT Series

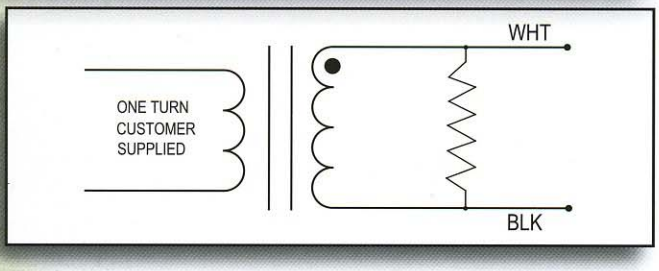
Magnelab offers a series of five AC current sensors with different hole sizes and current ratings. All UCT models are better than one percent accuracy and less than one degree phase angle. Output is controlled by a precision resistor fixed at the industry standard of 0.333 Volt AC. The rugged epoxy encapsulated construction comes with eight feet twisted leads. All closed current sensor models come with UL approval. Please contact Magnelab for other ratings and customized designs.

FEATURES

- » Rated input current from 5 Amp to 400 Amp
- » Phase angle < 1 degree measured at 50% rated current
- » Accuracy at 10% to 130% of rated current
- » Custom output and other parameters are available
- » 0.333 Volt AC output at rated current
- » Accuracy ± 1%
- » 8 ft. twisted pair lead
- » UL recognized

MAGNELAB PART	I.D.	O.D.	HT
UCT-0300-XXX	**0.30"**	1.70"	0.75"
UCT-0500-XXX	**0.50"**	1.90"	0.75"
UCT-0750-XXX	**0.75"**	2.10"	0.75"
UCT-1000-XXX	**1.00"**	2.40"	0.80"
UCT-1250-XXX	**1.25"**	2.70"	0.80"





MAGNELAB PART	RATING
UCT-0300-005	5 AMP
UCT-0300-015	15 AMP
UCT-0300-020	20 AMP
UCT-0300-030	30 AMP
UCT-0500-015	15 AMP
UCT-0500-030	30 AMP
UCT-0500-050	50 AMP
UCT-0500-060	60 AMP
UCT-0750-030	30 AMP
UCT-0750-050	50 AMP
UCT-0750-070	70 AMP
UCT-0750-100	100 AMP
UCT-1000-050	50 AMP
UCT-1000-070	70 AMP
UCT-1000-100	100 AMP
UCT-1000-150	150 AMP
UCT-1000-200	200 AMP
UCT-1250-070	70 AMP
UCT-1250-100	100 AMP
UCT-1250-150	150 AMP
UCT-1250-200	200 AMP
UCT-1250-250	250 AMP
UCT-1250-300	300 AMP
UCT-1250-400	400 AMP

CE RoHS ISO 9001:2000

MAGNELAB

Magnelab, Inc.
600 Weaver Park Rd.
Longmont, CO 80501
T: (303) 772-9100
F: (303) 772-9400
E: info@magnelab.com

POTENTIAL TRANSFORMER

MEASURES 120 TO 460 VOLT AC

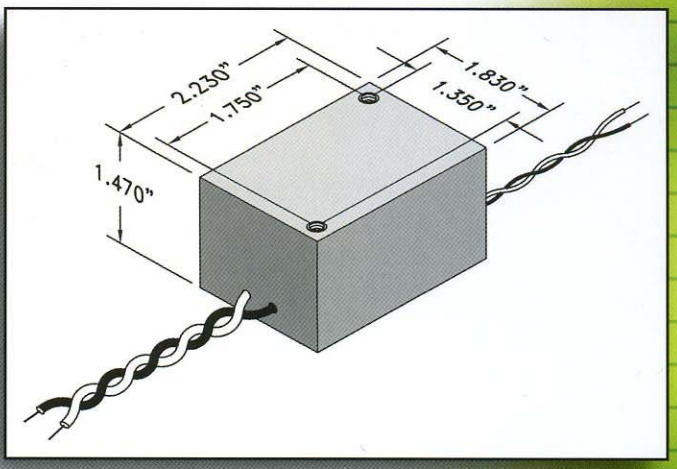
SPT-0375 Series

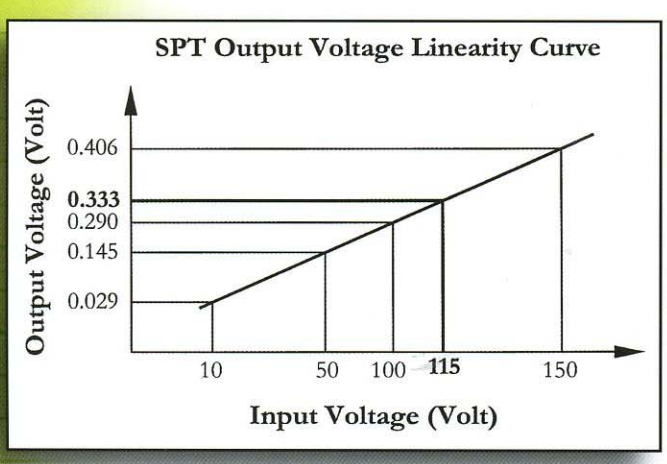
The potential transformer provides a linear output voltage proportional to the input voltage. The SPT potential transformers do not saturate for over 1 KV, and the rugged epoxy potted construction makes it suitable for installation in harsh environments. The output voltage is ANSI standard of 0.333 volt making the SPT series ideal for data loggers and other electronic measuring instrumentation.

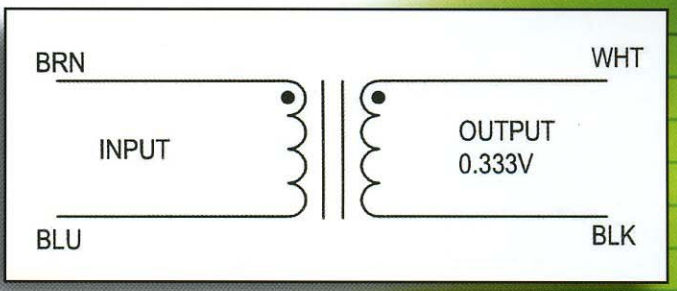
FEATURES

- » Rated input from 115 Volts to 460 Volts
- » 0.333 Volt AC output at rated voltage
- » Accuracy ± 1%
- » Accuracy at 10% to 130% of rated voltage
- » Withstand voltage of 2,500 Vrms primary to secondary
- » Phase angle < 1 degree
- » Input leads 14 AWG 8 ft. long
- » Output leads 22 AWG 8 ft. long
- » UL recognized
- » Two mounting holes using #8/32 blind inserts

MAGNELAB PART	INPUT VOLTAGE RANGE	RATED INPUT	OUTPUT VOLTAGE
SPT-0375-150	0 - 150	115V	0.333V
SPT-0375-300	0 - 300	230V	0.333V
SPT-0375-600	0 - 600	460V	0.333V







CE RoHS ISO 9001:2000

Magnelab, Inc.
600 Weaver Park Rd.
Longmont, CO 80501
T: (303) 772-9100
F: (303) 772-9400
E: info@magnelab.com

Flexible Rogowski Coils : Principles of Operation

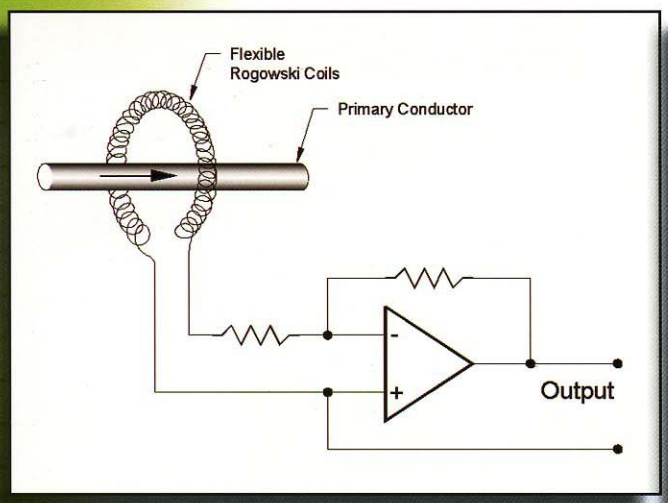
The basic operating principle of a Rogowski coil was first postulated in 1912 by Rogowski et al. It described that a closely wound coil over a nonmagnetic former of constant cross sectional area and closed loop configuration, will detect an induced voltage which is proportional to the rate of change of the current flowing in the wire surrounded by the coil.

In the figure below, the generalized schematic of such a configuration is shown along with the corresponding physical RopeCT® product that is manufactured by Magnelab.

In terms of physical formulation,

$$V = M \, dI/dt$$

Where V=voltage detected; M=mutual inductance of the coil or coil sensitivity (Vs/A); and dI/dt= rate of change of current.



The basic function of a Rogowski coil is to measure current through a conductor placed within its loop and reproduce the current fluctuations over a given time interval of observation. For accurate replication of the current, the raw voltage output needs to be integrated in order to account for the rate of change proportionality that is generating the voltage read out. Amplification of the signal output above noise is also achieved with integration.

RCT advantages:

« RCTs can measure a wide range of amperages without saturation. They can also detect small AC changes in the presence of large DC loads.

« RCTs span a wide range of frequencies from Hz to MHz

« RCTs have the flexibility to intercept cables without power interruption or added power burden to the line being measured.

RopeCT® AC CURRENT SENSOR

24 INCH ROGOWSKI COIL

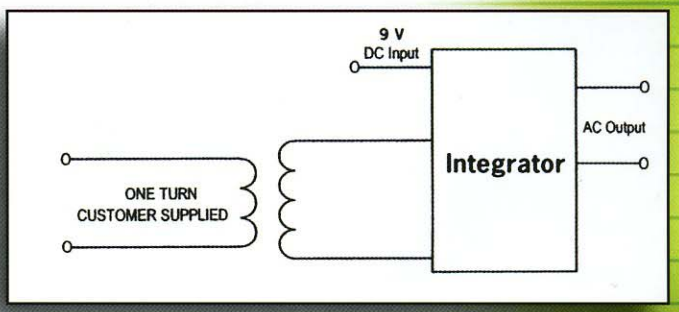
RCT-2400 Series

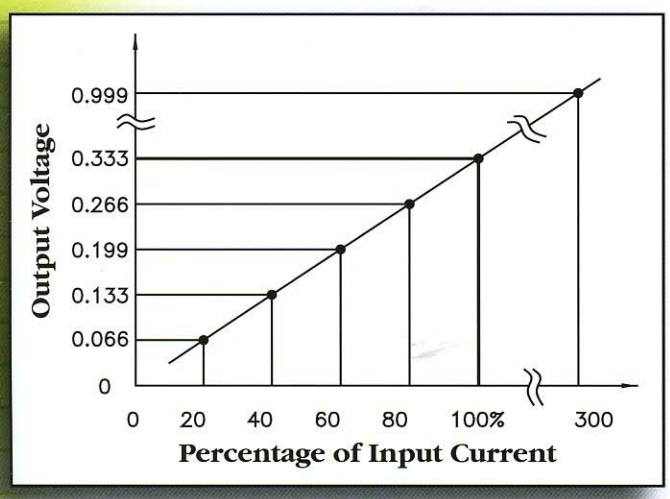
Magnelab flexible RopeCT® measures AC current rated from 500 to 5,000 Amps. The coil opens at the connector junction and can be installed on an existing cable or buss-bar in a matter of seconds.

FEATURES

- » Rated input from 500 Amp to 5000 Amp
- » Output of 0.333 Volt AC at rated current
- » Accuracy ± 1%
- » Accuracy at 10% to 300% of rated current
- » Phase angle < 0.5 degrees measured at 50% rated current
- » 4 ft. insulated leads
- » UL recognized
- » Custom output and other parameters are available

MAGNELAB PART	RATING
RCT-2400-0500	500 AMP
RCT-2400-1000	1000 AMP
RCT-2400-2000	2000 AMP
RCT-2400-3000	3000 AMP
RCT-2400-4000	4000 AMP
RCT-2400-5000	5000 AMP





CE RoHS ISO 9001:2000

MAGNELAB

Magnelab, Inc.
600 Weaver Park Rd.
Longmont, CO 80501
T: (303) 772-9100
F: (303) 772-9400
E: info@magnelab.com

Custom Magnetics

MAGNELAB is a leader in the design and manufacture of custom magnetics. For over thirty years MAGNELAB has served many industries with a commitment to quality and service.

- Medical
- Commercial
- Computer
- Aerospace
- Instrumentation
- Military
- Energy Monitoring
- Audio

MAGNELAB offers a full array of custom magnetics to meet your specific needs.

INDUCTORS

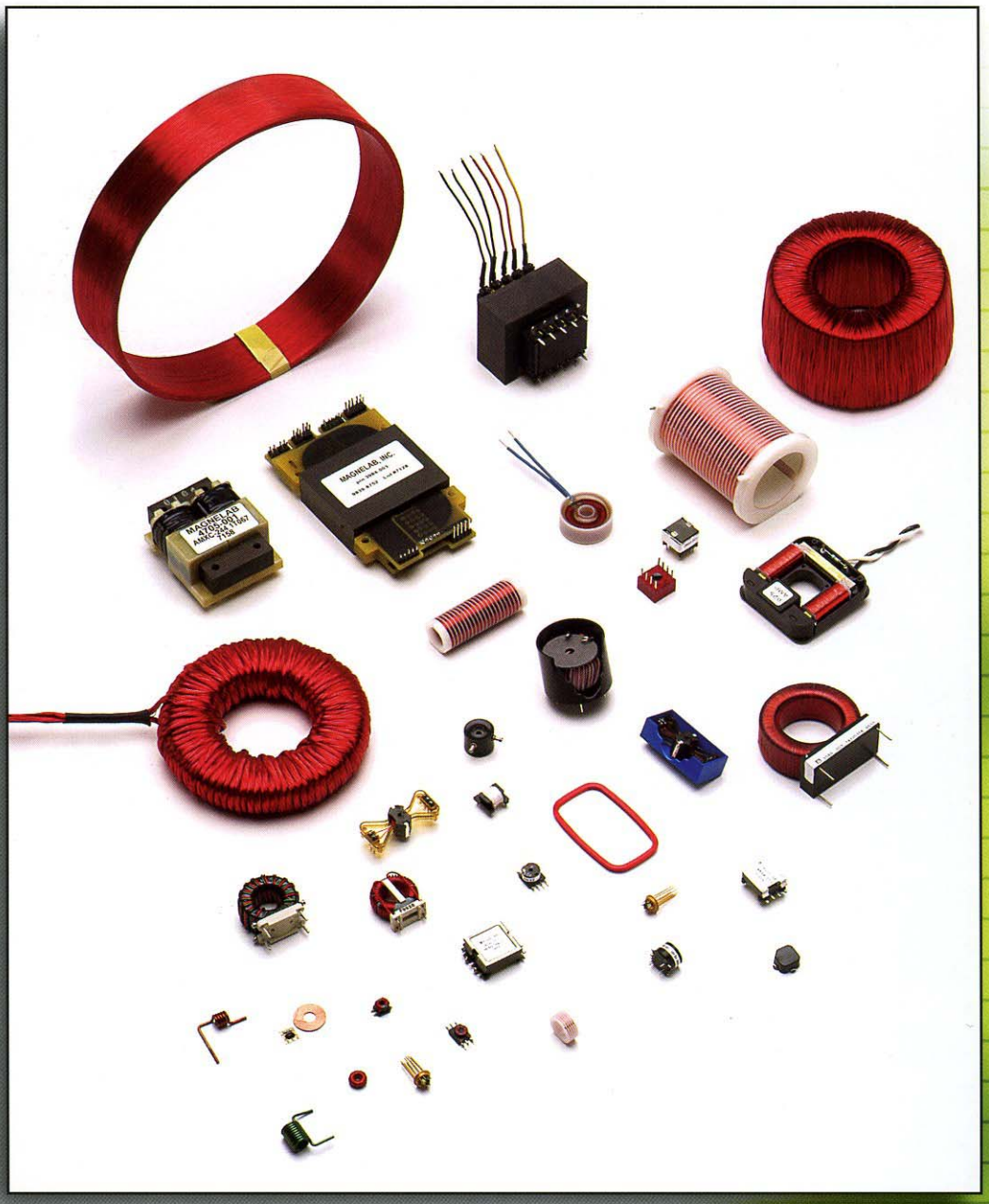
- DIP
- Filter
- Power
- Toroid
- Tuning

TRANSFORMERS

- Audio
- High Isolation
- Power
- Pulse
- Toroid
- Signal
- Switching

COILS

- Antenna
- Free-Form



CE RoHS ISO 9001:2000

MAGNELAB

MAGNELAB, INC.

600 Weaver Park Rd. • Longmont, CO 80501 • T: (303) 772-9100 • F: (303) 772-9400 • E: info@magnelab.com