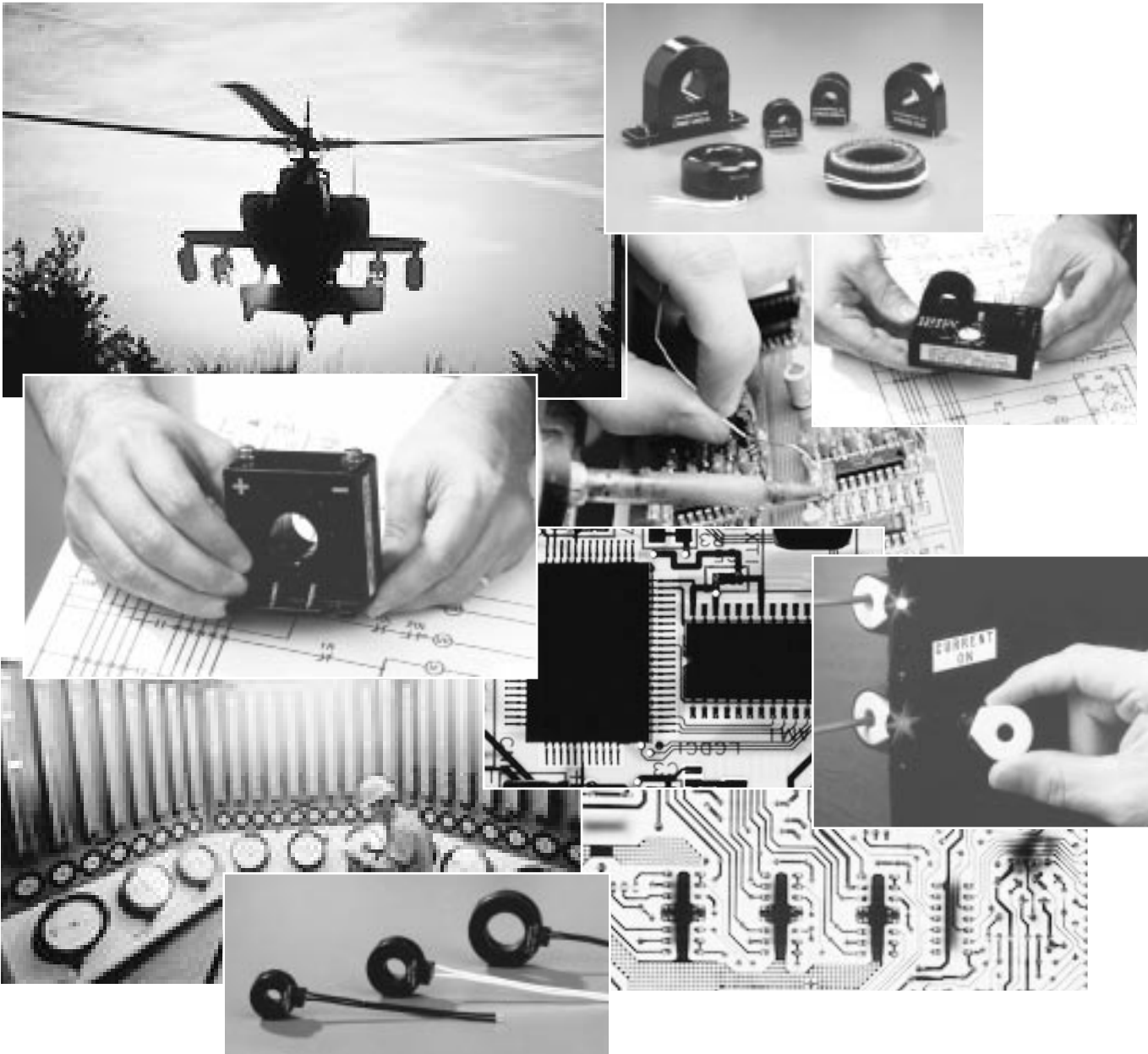
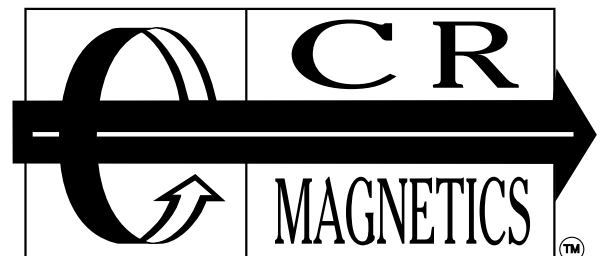


CURRENT MONITORING HANDBOOK

Performance Applications For All Industries



Transducers • Relays • Transformers • Indicators





Specialist in Electrical Current Monitoring

Selection Guide

Transducers and Relays	2
Current Transformers	3
Current Indicators and Voltage Transformers	4
Current Transformer Ratios	5
Transducers	
AC Current to 0-5 / 10 Vdc	6
AC Current to 4-20 mA, 2-wire	8
AC Current to 4-20 mA, 4-wire	10
AC Voltage to 4-20 mA, 3-phase	12
Relays	
AC Current Sensing Relay	14
Current Switch	16
Typical Relay Applications	17
Transformers	
Wire Lead Current Transformers	18
Vertical Mounting, PCB Current Transformers	20
Wire Lead Current Transformers, Series 8400	22
Horizontal Mounting, PCB Current Transformers	25
Commercial and ANSI Metering Class Current Transformers	26
3-Phase Balanced Networks	31
Indicators	
Wire-Mounted Current Indicator	32
Remote Current Indicators	34
Low Cost Remote Current Indicators	36
AC Motor Loads & U.S. Standard Voltages	37

Custom Toroid and Bobbin Wound Transformers	-Contact Factory
Excitation Curves	-Contact Factory
Other CR Magnetics Catalogs	
3-Phase Current Transformers	Section 3
Rectangular Current Transformers	Section 4
Split-Core Current Transformers	Section 5
Breaker Type Current Transformer	Section 6
Wound Primary Current Transformers	Section 7
Bushing Type Current Transformers	Section 8
Ground Fault Sensors	Section 9
Current & Voltage Transformers, IEC Rated, 50 Hz	Section 10
Low Voltage, Voltage Transformers	Section 11
Low Voltage, Control Power Transformers	Section 12
Medium Voltage, Current Transformers	Section 13
Medium Voltage, Current Transformers, IEC Rated, 50 Hz	Section 14
Medium Voltage, Voltage Transformers	Section 15
Medium Voltage, Voltage Transformers, IEC Rated, 50 Hz	Section 16
Medium Voltage, Control Power Transformers	Section 17
Ground Fault Systems	Section 18
Instrumentation Switches	Section 19


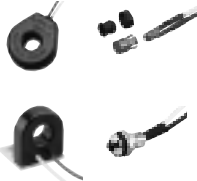



TRANSDUCERS and RELAYS

	Transducers				Relays	
						
Part Number	CR431	CR4320	CR4340	CR473	CR4395	CR9321
Description	AC Current to Voltage	2-Wire AC Current to 4-20	4-Wire AC Current to 4-20	Voltage to 4-20 mA	Current Relay	Current Switch
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	60/400 Hz	50/400Hz
Input Range	5 thru 200 Aac	5 thru 400 Aac	5 thru 600 Aac	90-150 Vac 360-600 Vac	.01-to 100 Aac	0.350 Aac
Output	5/10 Volts DC	4-20 mA	4-20 mA	4-20 mA	Dry Contacts Transistor Triac	Solid State
Accuracy	0.5 thru 1.0% F.S.	0.5% F.S.	0.5% F.S.	0.5% F.S.	—	—
Dimensions (H)x(W)x(D)	2.75x2.69x2.36 (69.9x68.3x59.9)	2.75x2.69x2.36 (69.9x68.3x60)	4.50x2.68x2.37 (114.3x68x60.1)	3.63x4.19x4.38 (92.2x106.4x111.3)	2.13 x 3.50 x 2.5 (54.1x88.9x63.5)	1.50x1.0x.75 (38.1x25.4x19.1)
Power Source	Self-Powered	Loop-Powered	120 Vac	Loop-Powered	120 Vac 240 Vac 24 Vdc	Self Powered
Agency Approval	UL	UL	UL	UL	—	—
Page Number	6	8	10	12	14	16

CURRENT TRANSFORMERS

Current Transformers						
						
17,18, 19	CR8300	CR8400	CR8750			
Wire Lead	Vertical Mount	Wire Lead	Horizontal Mount	Commercial & ANSI Class	Split Core	Medium Voltage
50-400 Hz	50-400 Hz	—	50-400 Hz	50-400 Hz	50-400 Hz	50-400 Hz
Up to 60 Aac	Up to 100 Aac	—	Up to 60 Aac	Up to 4,000 Aac	Up to 10,000 Aac	Up to 3,000 Aac
—	—	—	—	5.0, 1.0 0.2, 0.1 AAC	5.0 Aac & High Ratios	5.0 Aac
—	—	—	—	Up to 0.3%	Up to 0.3%	Up to 0.3%
.29 & .55 (7.4 & 14.0)	.272 to .772 (6.9 to 19.6)	.232 to .610 (5.8 & 15.5)	.250 (6.4)	See Catalog	See Catalog	See Catalog
—	—	—	—	—	—	—
—	—	—	—	UL/CSA	UL/CSA	UL
18	20	22	25	26	Request Catalog Sec 5	Request Catalog Sec 13

CURRENT INDICATORS AND VOLTAGE TRANSFORMERS

	Indicators			Voltage Transformers	
					
Part Number	CR45	Model 18 & 19	CR2550		
Description	Wire Mounted Current Indicator	Remote Current Indicator	Remote Current Indicator	Low Voltage V/T	Medium Voltage V/T
Frequency	50/60 Hz	50/60 Hz	50/400 Hz	60 Hz	60 Hz
Input Range	2 thru 100 Aac	2 thru 100 Aac	2 thru 100 Aac	Up to 600 Vac	Up to 34.5 kV
Output	Visual	Visual	Visual	120 Vac	120 Vac
Accuracy	—	—	—	Up to 0.3%	Up to 0.3%
Dimensions (H)x(W)x(D)	1.04x.95x.46 (26.4x24.1x11.7)	See Page 32	See Page 34	See Catalog	See Catalog
Power Source	Self-Powered	Self-Powered	Self-Powered	—	---
Agency Approval	—	—	—	UL/CSA	UL/CSA
Page Number	32	34	36	Request Catalog Sec 11	Request Catalog Sec 15

Current Transformer Ratios

Changing Current Transformer Ratios

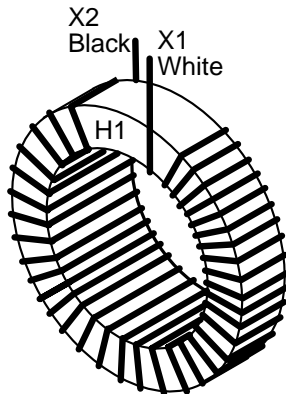
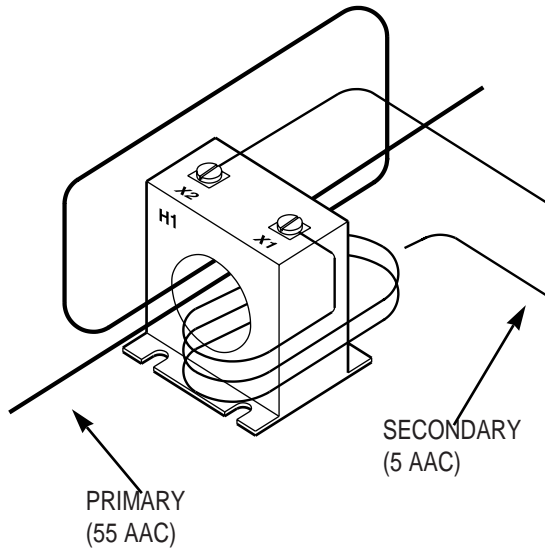
The actual current ratio may be changed from the nameplate ratio by wrapping the primary and/or secondary leads through the window opening.

$$\text{ACTUAL TURNS RATIO} = \frac{\text{NAMEPLATE RATIO} \pm \text{NUMBER OF SECONDARY TURNS THROUGH WINDOW OPENING}}{\text{NUMBER OF PRIMARY TURNS THROUGH WINDOW OPENING}}$$

- Wire from X1 terminal is routed through the H1 side
- + Wire from X1 terminal is routed through the side opposite the H1 side (H2 side)

Examples

This illustration shows how a current transformer with a nameplate turns ratio of 125:5 can be rescaled to operate as a non-standard 55:5 ratio transformer.



WHERE:

Nameplate ratio = 125 (125/5)

Number of secondary turns through window = - 3

Use -3 because the secondary wire is routed from the X1 terminal first through the H1 side.

Use + if the wire was routed first through the side opposite the H1 side.

Number of primary turns through window = 2

$$\frac{\frac{125}{5} - 3}{2} = 11$$

TURNS RATIO = 11:1

CURRENT RATIO = 55:5

This illustration shows the internal construction of a current transformer. The outside face of the transformer is identified as H1. The opposite face is identified as H2. The secondary leads are identified as X1 and X2.

Current flowing out of terminal X1 will have the same polarity as current flowing into terminal H1.

Internet Resources <http://www.crmagnetics.com/>

- Transducer Selection Guide: [transducer.html](#)
- Application Sheet: [pdf/ancrct-1.pdf](#)
[error.html](#)
[appguide.html](#)



Precision, AC Current to Voltage Transducer

The **CR431** series, Current-to-Voltage Transducer produces a 0-5 Vdc or 0-10 Vdc output signal that is directly proportional to the input AC current. The output signal is average-sensing, calibrated for RMS.

This transducer is used with process control and industrial instrumentation equipment. The DC output signal can be connected directly to a high impedance analog input of a computer or PLC without additional signal conditioning.

The series will measure up to 200% of full scale on a short time basis (1 minute or less) and 150% on a continuous basis at its rated accuracy.

To protect external circuits from damage caused by short circuits or motor inrush currents.



Features

- Permanently calibrated
- Output overload protected
- Fully isolated
- 10 different ranges
- Self-powered, requires no external power source



Specifications

Accuracy:

Depends on the range and load resistance, see Part Numbers table

Ripple:

1% Max. peak ripple on output

Calibrated Signal Out:

0-5 Vdc for CR4310

0-10 Vdc for CR4311

Response Time:

250 ms max., 10-90% FS

Max. Signal Out:

16 Vdc for CR4310

33 Vdc for CR4311

Frequency:

50/60 Hz

Continuous Thermal Current Rating Factor:

2.50 @ 30°C

Short Time Thermal Current Rating Factor:

60 x Full Scale (For 1 Second)

Insulation Class:

600 V, BIL 10 kV Full Wave

Operating Temperature Range:

-30°C to +60°C

Storage Temperature Range:

-55°C to +85 °C

Shipping Weight:

1.5 pounds (.68 kg.)

Part Numbers

CR431 - CURRENT TO VOLTAGE TRANSDUCER

	Range in AC Amps	Accuracy % FS *
5	0-5	1.0
10	0-10	0.75
15	0-15	0.75
20	0-20	0.5
30	0-30	0.5
50	0-50	0.5
75	0-75	0.5
100	0-100	0.5
150	0-150	0.5
200	0-200	0.5

0	0-5 Vdc Out
1	0-10 Vdc Out

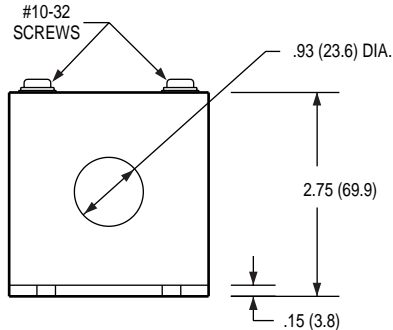
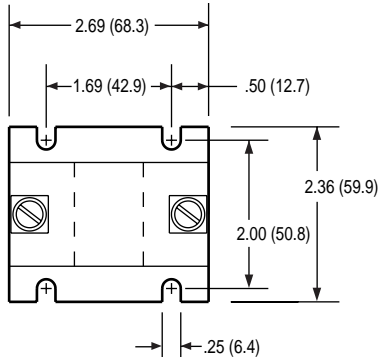
* For total load resistance of:
1.0 megohm or higher for CR4310
150 K ohm or higher for CR4311

Internet Resources <http://www.crmagnetics.com/>

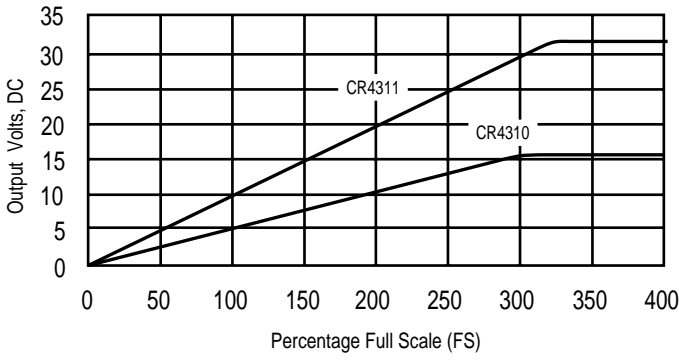
- Transducer Selection Guide: [transducer.html](#)
- Application Sheet: [pdf/ancr4310.pdf](#), [pdf/ancr4310-2](#)
- Pricing: [pricing/4310.html](#)
- External Current Transformers: [cts.html](#)

Precision, AC Current to Voltage Transducer

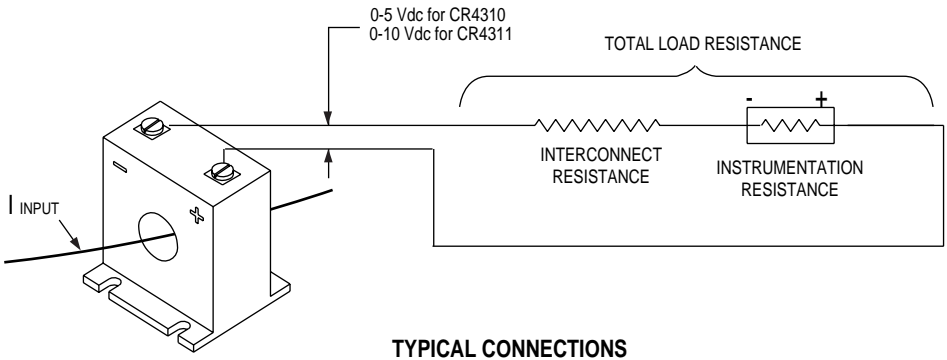
Application Notes



OUTLINE DRAWING



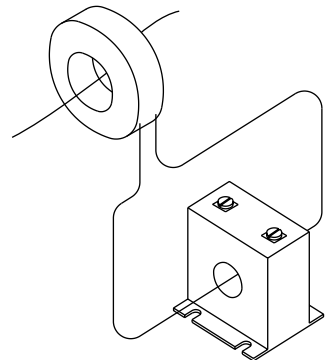
CONTROL VOLTAGE OUT vs FULL-SCALE INPUT CURRENT



TYPICAL CONNECTIONS

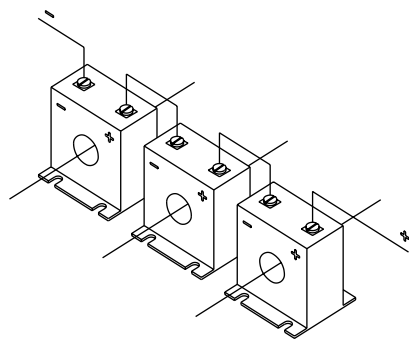
in (mm)

Typical Applications



EXTERNAL CURRENT TRANSFORMER

An external current transformer may be used with the transducer by routing the secondary leads through the window opening. Use the CR4310-5 or CR4311-5 current transducer with a 5 Amp secondary instrument grade current transformer. For additional details on current transformers, see page 25.



3-PHASE SYSTEMS

Three-phase systems may be monitored by attaching three transducers in series. The total output voltage will be the sum of each individual transducer. If each transducer is sized for the full-scale current, the output voltage will be 0-15 Vdc for the CR4310 Series (0-30 Vdc for the CR4311 Series) at 0 to 100% full-scale. As an alternate, each transducer may be sized for three times the full-scale current, then the output voltage for the CR4310 will be 0-5 Vdc for 0 to 100% full-scale.



2-Wire Current Transmitter, 4-20 mA Output

The **CR4320** series, loop-powered, 2-Wire Current Transmitter produces a calibrated 4-20 mA. DC output current directly proportional to the average RMS value of the input alternating current. The controlled current output is unaffected by variations in supply voltage, interconnect and load impedance (within specification limits) to provide a highly accurate means for monitoring alternating current over long distances.

Features

- Permanently calibrated
- Loop-powered
- Fully isolated
- 12 different ranges
- 2 case styles, .93" (23.6 mm) and 1.25" (31.8 mm) window opening
- Output overload protected



Case Style 1

Case Style 2

Specifications

Accuracy:

±0.5% Full-Scale (FS)

Repeatability:

Less than 0.1%

Ripple & Noise:

1% Max., peak to peak

Calibrated Signal Out:

4-20 mA DC

Response Time:

200 ms max., 10-90% FS

Max. Signal Out:

30 mA DC

Temperature Coefficient:

± 0.04%/°C

Supply Voltage:

24 Vdc ±10%

Frequency:

50/60 Hz

Continuous Thermal Current Rating Factor:

1.33 @ 30°C

Short Time Thermal Current

Rating Factor (For 30 Seconds):

6.0 x Full Scale for AC ranges up to 200 Amp.

4.0 x Full Scale for ranges 300 and 400 Amp.

Output Load:

0 to 600 ohms

Insulation Class:

600 V, BIL 10 kV Full Wave

Reverse Polarity Protection:

Yes

Operating Temperature Range:

-30°C to +60°C

Storage Temperature Range:

-55°C to +85°C

Approximate Weight:

1.5 pounds (.68 kg)

Part Numbers

CR4320 - 4-20 MA CURRENT TRANSMITTER

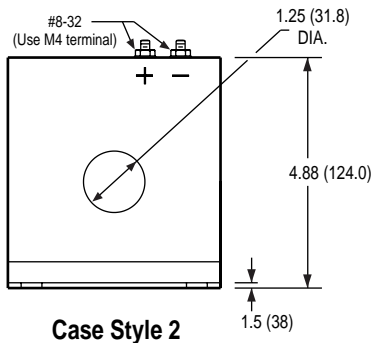
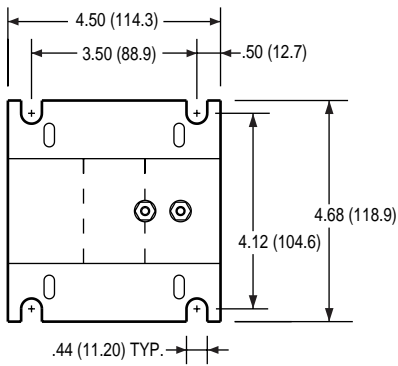
	Full-Scale (FS) Range in AC Amps	Case Style
5	0-5	1
10	0-10	1
15	0-15	1
20	0-20	1
30	0-30	1
50	0-50	1
75	0-75	1
100	0-100	1
150	0-150	1
200	0-200	1
300	0-300	2
400	0-400	2

Internet Resources <http://www.crmagnetics.com/>

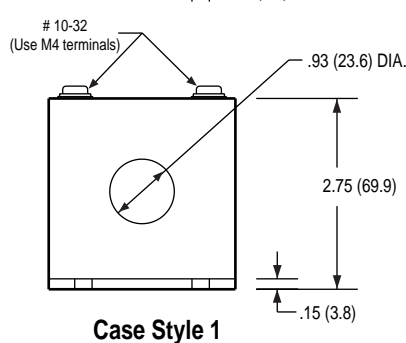
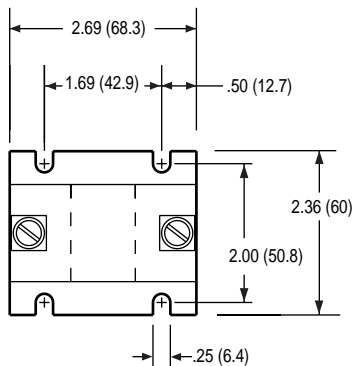
- Transducer Selection Guide: [transducer.html](#)
- Application Sheet: [pdf/ancr4320-1.pdf](#)
- Pricing: [pricing/4320.html](#)
- Motor Loads: [mot_ld_a.pdf](#)

2-Wire Current Transmitter 4-20 mA Output

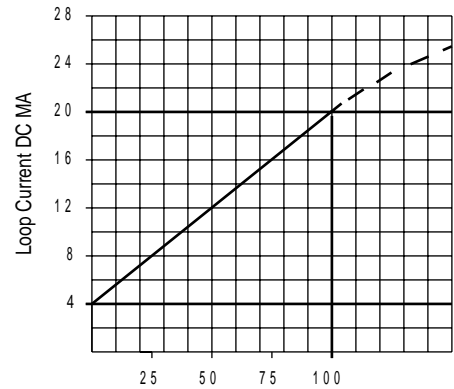
Application Notes



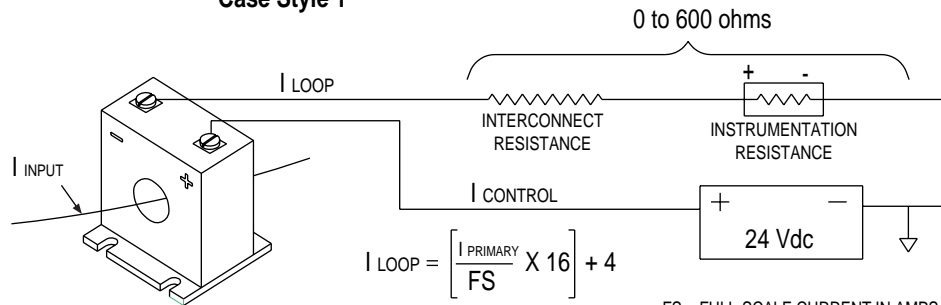
Case Style 2



Case Style 1



**LOOP CURRENT OUT
VS
FULL-SCALE INPUT CURRENT**

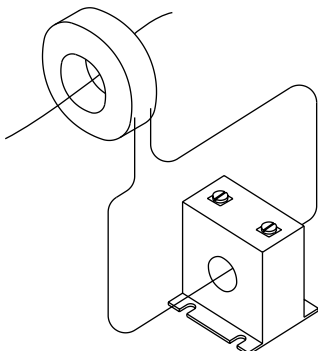


$$I_{LOOP} = \left[\frac{I_{PRIMARY}}{FS} \times 16 \right] + 4$$

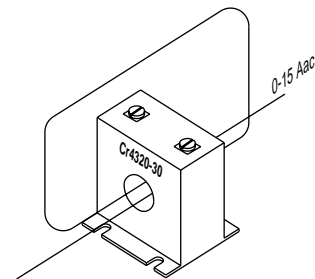
FS = FULL-SCALE CURRENT IN AMPS RMS
I PRIMARY = MONITORED CURRENT IN AMPS RMS
I LOOP = LOOP CURRENT IN mA dc

in (mm)

Typical Applications



An external current transformer may be used with the transmitter by routing the secondary leads through the window opening. Use the CR4320-5 current transmitter when using a 5 Amp secondary instrument grade current transformer. For additional details on current transformers, see page 25.



The scaling factor may be changed by threading the primary current-carrying wire several times through the window opening. The "actual" measurement range will be the name plate range divided by the number of wire passes. For example, the CR4320-30 has the name plate range of 0-30 Aac. Two passes of the wire through the window opening will then provide an effective range of 0-15 Aac (30÷2).



4-Wire Current Transmitter 4-20 mA Output

The **CR4340** series, 4-Wire Current Transmitter produces a calibrated 4-20 mA DC signal proportional to the average RMS value of the input alternating current. The output signal is produced by an internal current generator powered from an external 120 Vac supply. The output signal is unaffected by variations in interconnect and load impedance (within specification limits) thus providing a highly accurate means for monitoring alternating current over long distances.

The 4-wire transmitter allows for direct attachment to instrumentation. There is no need for external DC power as required with 2-wire transmitters.

Features

- Permanently calibrated
- Fully isolated
- Output overload protected
- 13 different ranges - 6 field selectable
- Internal current generator
- 2 case styles, .94" (23.9) and 2.13" (54.1) window opening
- Monitors over long distances

Specifications

Accuracy:

±0.5% Full-Scale (FS)

Ripple & Noise:

1% Max., peak to peak

Calibrated Signal Out:

4-20 mA DC

Response Time:

150 ms max., 10-90% FS

Max. Signal Out:

30 mA DC

Temperature Coefficient:

± 0.02%/°C

Supply Voltage:

120 ±10% Vac

Frequency:

50/60 Hz

Continuous Thermal Current Rating Factor:

1.50 @ 30°C for ranges-All Ranges up to 75 Amp.

1.33 @ 30°C for ranges 100 Amp. and over

Short Time Thermal Current

Rating Factor (For 30 Seconds):

15.0 x Full Scale for AC ranges up to 75 Amp.

4.0 x Full Scale for ranges 400 Amp. and over

Output Load:

0-1000 ohms

Insulation Class:

600 V, BIL 10 kV Full Wave

Operating Temperature Range:

-30°C to +60°C

Storage Temperature Range:

-55°C to +85°C



Case Style 2

Case Style 1

Part Numbers

CR4340 - 4-WIRE CURRENT TRANSMITTER

	Full-Scale (FS) Range in AC Amps	Case Style
5	0-5	1
	0-10*	1
	0-15*	
	0-20*	
20	0-25*	1
	0-50*	
	0-75*	
75	0-100	2
100	0-150	2
150	0-200	2
200	0-300	2
300	0-400	2
400	0-600	2
600		

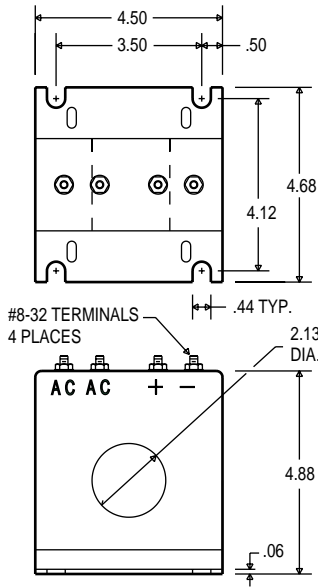
* RANGE SET WITH FIELD SELECTABLE SWITCH

Internet Resources <http://www.crmagnetics.com/>

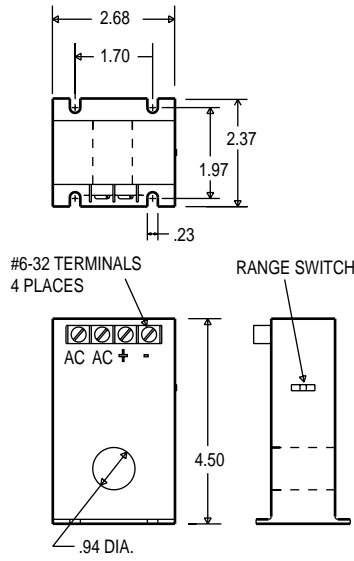
- Transducer Selection Guide: [transducer.html](#)
- Application Sheet: [pdf/ancr4340-1.pdf](#)
- Pricing: [pricing/4340.html](#)

4-Wire Current Transmitter 4-20 mA Output

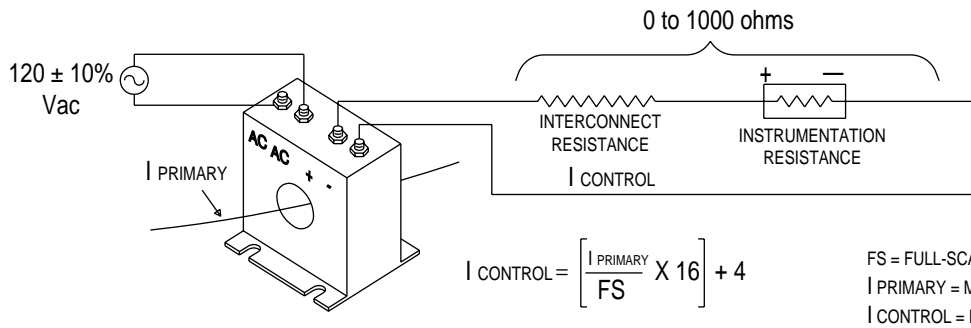
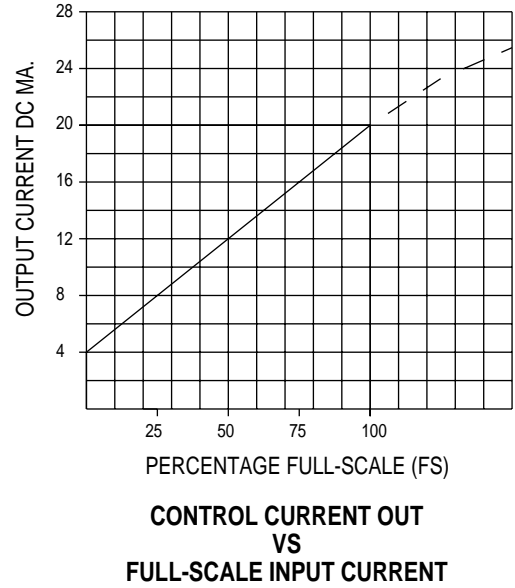
Application Notes



Case Style 2



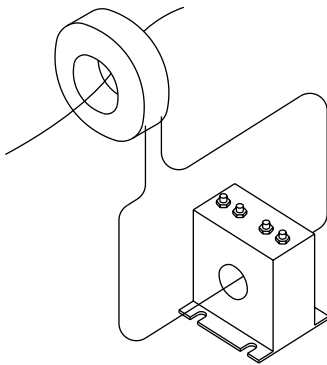
Case Style 1



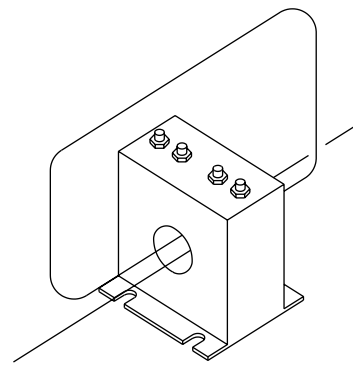
FS = FULL-SCALE CURRENT IN AMPS RMS
 I PRIMARY = MONITORED CURRENT IN AMPS RMS
 I CONTROL = LOOP CURRENT IN mA dc

in (mm)

Typical Applications



An external current transformer may be used with the transmitter by routing the secondary leads through the window opening. Use the CR4340-5 current transmitter when using 5-Amp secondary instrument grade current transformer. For additional details on current transformers, see page 22.



The scaling factor may be changed by threading the primary current-carrying wire several times through the window opening. The "actual" measurement range will be the name plate range divided by the number of wire passes. For example, the CR4340-30 has the name plate range of 0-30 ACA. Two passes of the wire through the window opening will then provide an effective range of 0-15 ACA (30÷2).



3-Phase Voltage Transmitter 4-20 mA Output

The **CR473** series, Voltage Transmitters are expanded scale instruments designed to accurately measure three-phase voltages. Each model produces three discrete 4-20 mA signals which are proportional (across the selected input voltage range) to the three-phase input voltage. The output is a true constant current driver which is unaffected by resistance variations in the output loop of 0-600 ohms. The CR4730 is designed to measure line-to-line voltages and the CR4731 to measure line-to-neutral. Both are average-reading, calibrated to read RMS.

Features

- Permanently calibrated
- Fully isolated
- ANSI/ISO 50.1 Class L3

Internet Resources <http://www.crmagnetics.com/>

- Transducer Selection Guide: [transducer.html](#)
- Application Sheet: [pdf/ancr4730-1.pdf](#)
- Pricing: [pricing/4730.html](#)



E154235

Specifications

Nominal Input Voltages:

120, 240, 277 & 480 Vac

Accuracy:

±0.5% Full-Scale (FS)

Ripple On Output:

Less than 1%

Calibrated Signal Out:

4-20 mA DC

Response Time:

1.50 sec. max., 10-90% FS

Temperature Coefficient:

± 0.03%/°C

Supply Voltage:

24 Vdc ± 10%

Load Resistance:

0-600 ohms

Frequency:

50/60 Hz

Max. Continuous Input Voltage:

600 V

Operating Temperature Range:

-30°C to +60°C

Storage Temperature Range:

-50°C to +85°C

Shipping Weight:

Approx. 1.3 Pounds (.59 kg)

Reverse Polarity Protection:

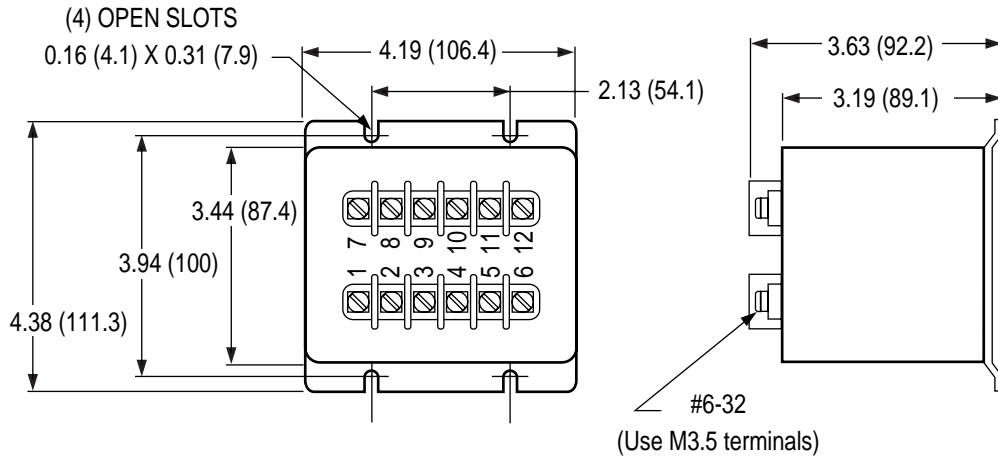
Yes

PART NUMBERS	APPLICATION	NOMINAL VOLTAGE RANGE	INPUT VOLTAGE RANGE	INPUT BURDEN (MAX)	TRANSFER FUNCTION I _{LOOP} MA DC
CR4730-120	Line-to-line	120 V	90 V to 150 V	0.1 VA @ 240 V	$\frac{E_{IN} - 75}{3.75}$
CR4730-480 (Dual Range)	Line-to-line	240 V	180 V to 300 V	0.1 VA @ 265 V	$\frac{E_{IN} - 150}{7.5}$
		480 V	360 V to 600 V	0.1 VA @ 530 V	$\frac{E_{IN} - 300}{15}$
CR4731-120	Phase-to-neutral	120 V	90 V to 150 V	0.1 VA @ 150 V	$\frac{E_{IN} - 75}{3.75}$
CR4731-277	Phase-to-neutral	277 V	180 V to 300 V	0.1 VA @ 300 V	$\frac{E_{IN} - 150}{7.5}$

E_{in}=Volts RMS

3-Phase Voltage Transmitter 4-20 mA Output

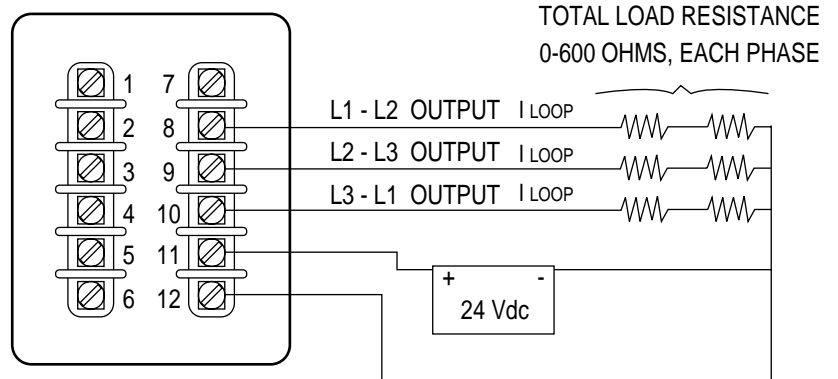
Outline Drawings



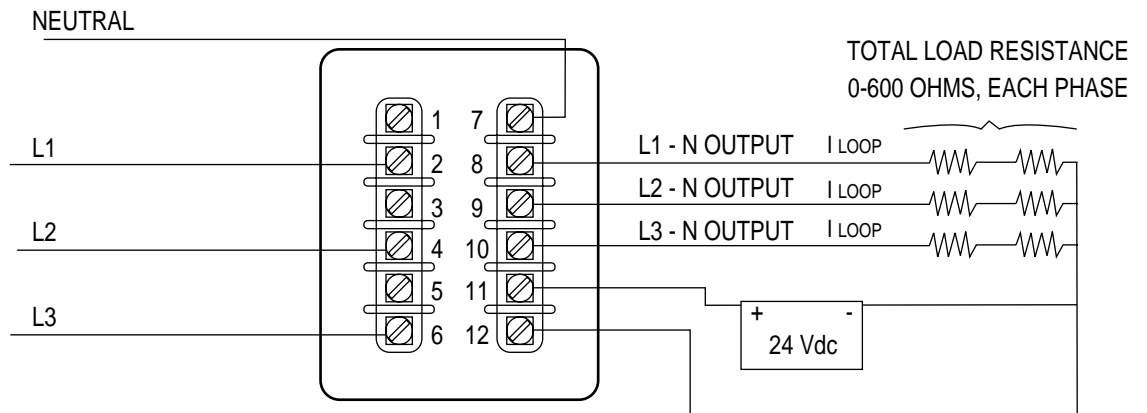
in (mm)

Typical Connection Diagrams

MODEL	RANGE IN VOLTS	CONNECTIONS L1 - L2 - L3
CR4730-480	360 TO 600	1 - 3 - 5
	180 TO 300	2 - 4 - 6
CR4730-120	90 TO 150	2 - 4 - 6



CR4730-120 AND CR4730-480
LINE-TO-LINE



CR4731-120 AND CR4731-277
PHASE-TO-NEUTRAL



Current Sensing Relay

The **CR4395** series, Current Sensing Relay provides an effective and highly stable method for monitoring electrical current. The current-carrying wire is routed through the opening extending from the top of the case. When current reaches the level set by the trip point adjustment, the relay trips and starts the adjustable timer. After the timer cycles the electro-mechanical relay is energized. A precision voltage reference circuit ensures a highly repeatable trip point.



Calibrated Dial
Option Shown

Applications

- Monitor electrical heater elements
- Sense motor over/under loads
- Detect lamp burn-out
- Indicate phase loss

Features

- Variable trip point and time delay
- Monitors currents from 10 mA to 100 AC Amps
- Electrical isolation between circuits
- Output relay rated up to 20 Amps
- LED trip status indicator
- Dead band prevents relay chatter
- Calibrated dial option available
- External current transformers available

Specifications *

Mounting:

3/16" dia. clearance holes on 1 15/16" by 2 15/16" centers

Environmental:

Operating Temperature: -30°C to +60°C
Storage Temperature: -55°C to +85°C

Power-On Delay: 100 ms max

Hysteresis: 5% Max.

Input Supply Power:

Terminals: 2 - 1/4" Male Q C

Sensed Current:

Max. Continuous: 200% Full Scale
Frequency: 60-400 Hz

Internet Resources <http://www.crmagnetics.com/>

- Relay Selection Guide: relays.html
- Application Sheets : pdf/ancr4395-1.pdf, pdf/ancr4395-2.pdf, pdf/ancr4395-3
- Pricing: pricing/4395.html
- External Current Transformers: cts.html

Output Options

The Relay is available with three different output configurations, electromechanical relay, optoisolated NPN transistor or optoisolated triac. Specify desired selection in part number.

Relay

Arrangement: 1 Form C (SPDT)

Contact Material: Silver-cadmium oxide

Terminals: 3 - 1/4" Male Q C

Mechanical Life: 10 million operations, typ. @ rated load

Electrical Life: 100,000 operations, typ. @ rated load

Initial Contact resistance:

50 milliohms max. @ 500 mA, 12 Vdc

Contact Rating: UL508/873 & CSA

VOLTAGE	LOAD TYPE	N.O. CONTACT	N.C. CONTACT
240 Vac	Resistive	20A	10A
240 Vac	Motor	2HP	1/2HP
125 Vac	Motor	1HP	1/4HP
28 Vdc	Resistive	20A	10A

DC Switching (-NPN)

Vce (full off): 30 Vdc max.

Isink (full on): 120 mAdc max. @ rated full-on

Vce (full on): 1.5 Vdc @ 120 mAdc Isink

Off state leakage current: 5ua @ 30 Vdc (typical)

AC Switching (-AAC)

Off state voltage: 240 Vac RMS max.

Minimum switch voltage: 24 Vac RMS

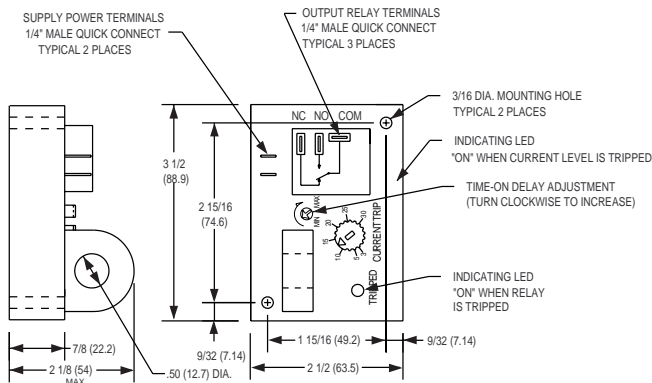
On state current: 0.5 Aac RMS max. continuous

Switching mode: Zero crossing

Off state leakage: 60 ua @ 240 Vac max.

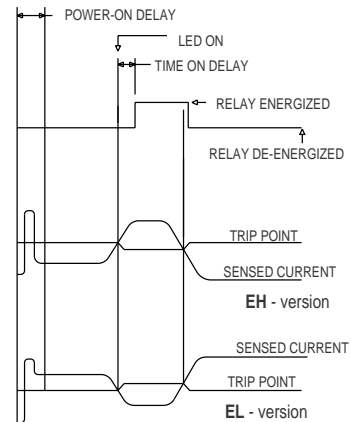
*All specifications for operation at 60 Hz only

Outline Drawing



CALIBRATED DIAL OPTION SHOWN (-CD)

Timing Drawing



Part Numbers

CR4395 - □□ - □□□ - □□□ - □ - □□ - □□□

SUPPLY VOLTAGE
AC
 120 - 120 Vac
 240 - 240 Vac
DC
 24D - 24 Vdc
 All supply voltage tolerances are ± 10 %

TIME ON DELAY
A - .5 to 6 Sec.
B - 2 to 25 Sec.
X - none
 Time-on delay is the time from when the relay trips to when the output energizes. The ranges are guaranteed minimum, actual range may be slightly greater.

OUTPUT OPTIONS
ELR - Electromechanical Relay
NPN - Optoisolated NPN Transistor
TRC - Optoisolated Triac., zero crossing

- ELR - NPN
 - TRC

TRIP STATUS
EH - Energized on High, trips when sense current is above trip point and returns to non-trip status when sense current is below the trip point.
EL - Energized on Low, trips when sense current is below trip point and returns to non-trip status when sense current is above trip point.
LH - Latch on High, trips when sense current is above trip point and remains tripped until supply power is removed.
LL - Latch on Low, trips when sense current is below trip point and remains tripped until supply power is removed.

TRIP RANGE
 .01.1 - .01 to 0.1 AAC
 .11 - 0.1 to 1.0 AAC
 110 - 1.0 to 10 AAC
 330 - 3.0 to 30 AAC
 660 - 6.0 to 60 AAC
 101 - 10 to 100 AAC
 The trip ranges shown are for one wire pass through the window opening. The trip range may be proportionally lowered with additional wire passes through the window.

TRIP POINT DIAL
NC - Non-calibrated Dial
CD - Calibrated Dial
FP - Fixed Trip Point (Specify value of fixed trip point with order)

- NC - CD - FP
 -330 trip range shown
 No adjustment dial provided with the fixed set point option



Low Cost Current Switch

The **CR9321-LC** series is a low cost, self powered, fixed set-point Current Switch designed for applications that require an on-off indication of current flow.

Current levels above the guaranteed full-on level will turn the output to full on. The Current Switch is recommended only for applications where the continuous operating current is above the rated full on level of 350 mA. Operation below this point will not drive the output device full-on and derate the output ratings.

The unit is available with a NPN or PNP output transistor for switching DC and a SCR output for switching AC. Connections can be made directly to items such as a PLC or electromechanical relay. Note that connections made directly to an inductive device such as an electromechanical relay will require a customer supplied clamping diode for DC operation or a snubber network for AC operation.



Specifications *

Rated full-on: 0.350 Aac RMS

Turn-on time:
100 ms max. @ rated full-on

Turn-off time:
250 ms. max. to 80% of Vce

Maximum sense current:
Continuous: 100 Aac
1 Second: 500 Aac

Frequency: *
50 to 400 Hz

Operating Temperature:
-30 °C to +60 °C

Storage Temperature:
-55 °C to +85 °C

DC Switching (-NPN or -PNP)

Vce (full off): 30 Vdc max.

Isink (full on): 120 mAac max. @ rated full-on

Vce (reverse polarity voltage): 1.2 Vdc @ 100 mA dc

Vce (full on): 1.5 Vdc @ 120 mAac Isink

Off state leakage current: 5ua @ 30 Vdc (typical)

AC Switching (-ACA)

Off state voltage: 240 Vac RMS max.

Minimum switch voltage: 24 Vac RMS

On state current: 1.0 Aac RMS max. continuous

Off state leakage: 50 ua @ 240 Vac max.

Peak Non-Repetitive Surge Current:
8 Aac RMS (1 cycle, 60 Hz.)

*All specifications for operation at 60 Hz only

Part Number

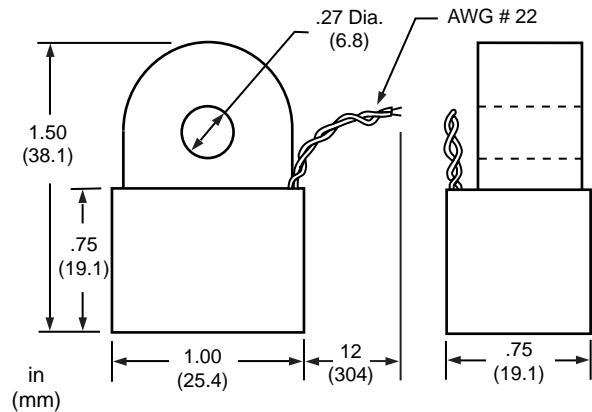
CR9321-LC - [] [] CURRENT SWITCH

NPN - Transistor output
PNP - Transistor output
ACA - AC Output

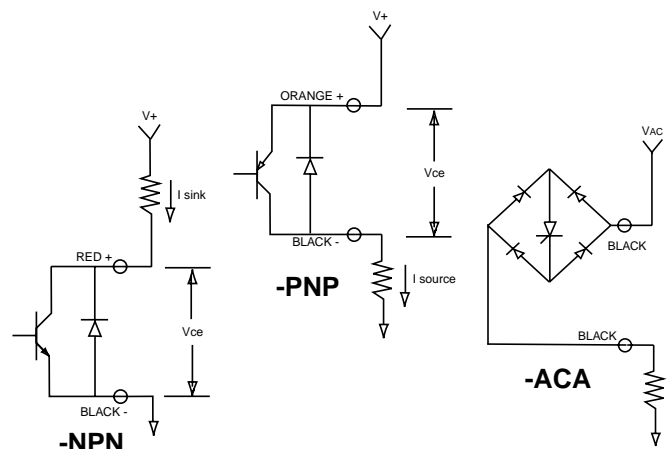
Features

- Low cost
- Low fixed trip point
- Fully isolated
- Reverse output polarity protected
- Self-powered

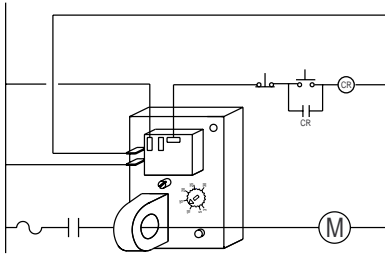
Outline Drawing



Electrical Connections

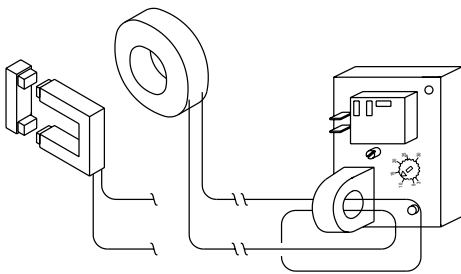


Typical Relay Applications



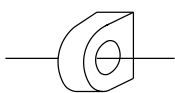
MOTOR OVER / UNDER MONITOR

The relay may be used to monitor the operational load of a motor. One leg of the motor wiring is routed through the window opening. With the "EH" (Energized on High) option, when the motor current draw exceeds the trip point, the relay will energize and open the motor starter. The time delay would be set long enough to inhibit tripping during high inrush starting current. Note that an electrical fuse and other overload devices will still be required for complete motor protection.

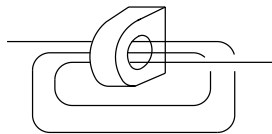


EXTERNAL CURRENT TRANSFORMERS

The relay may be used with an external split or solid-core current transformer. The external transformer can be used to access remote loads or where the current-carrying wire is too large to fit through the window opening in the relay. A standard, 5 Amp secondary, commercial grade current transformer (see page 25) would be attached with the secondary leads threaded twice through the window opening, as illustrated. The trip range option "110" (1.0 to 10 ACA) would then provide full-scale adjustment for the transformer.

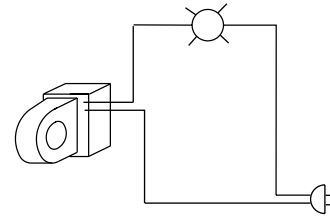


ONE-WIRE PASS



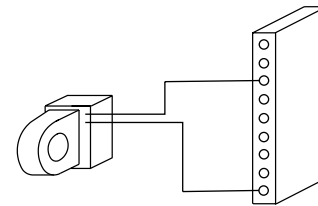
THREE-WIRE PASS

The trip ranges shown on page 15 represent one wire pass through the window opening. The trip range may be changed by threading the current-carrying wire through the window opening several times, as shown above. The "actual" trip range would be the relay name plate range divided by the number of wire passes through the opening. For example, a name plate range of 6.0 to 60 ACA with three wire passes would provide an actual range of 2.0 to 20 ACA ($6 \div 3 = 2.0$ & $60 \div 3 = 20$).



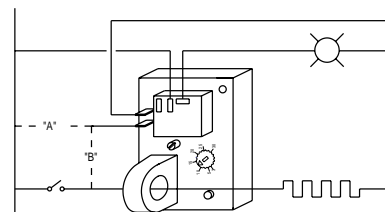
CONNECTION TO INDICATOR LAMP

The current switch may be used to drive directly an indicating lamp. When using the AC output version, either of the two black leads may be attached to the power source. A snubber network is required when connecting to an inductive device such as an electromechanical relay.



CONNECTION TO PLC

The current switch may be connected directly to a PLC. Supply power may be provided from the PLC, as shown, or from an external power source. When using a transistor output, the negative or black lead from the switch is attached to the negative side of the supply.



OPEN HEATER / LAMP DETECTOR

The relay may be used to provide an alarm signal to indicate an open heater element. The current-carrying wire is routed through the window opening. With the "EL" (Energized on Low current) option, when the heater element draws current above the trip point, the relay remains de-energized. If the element becomes open, the current level will be reduced, causing the relay to become energized. Supply power is constantly supplied to the relay with the "A" connection and the relay will cycle every time the temperature controller cycles. Using the alternate connection with line "B", power is provided to the relay only when the temperature controller is cycled on. With this connection, the relay will energize only when the element is open.



Wire Lead Current Transformers

CR Magnetics offers a versatile line of rugged wire lead current transformers. Installed around a current-carrying wire, the sensor provides a current output relative to the AC input current (within specification limits). With the output connected across a resistive load (burden), the voltage developed is proportional to the input current.

Applications

- Remote monitoring of electrical loads
- Input to electrical control system
- Detect open heater elements
- Indicate phase loss
- Monitor motor operation

Features

- Low cost
- Non-contact, isolated current measurement
- Surface mounting bracket available for Model 17 and Model 18
- 2 case sizes, 3 different standard ratios

Specifications

Frequency: 50-60 Hz

Working Class: 600 Vac

Case Material: Black thermoplastic

Part Numbers

Model 17-2000	Current Transformer with wire leads, .55 dia. opening, 2000 turns
Model 17-1000	Current Transformer with wire leads, .55 dia. opening, 1000 turns
Model 18-600	Current Transformer with wire leads, .55 dia. opening, 600 turns
MB-18	Surface Mounting Bracket for Model 17 or Model 18
Model 19	Current Transformer with .29 dia. opening, 230 turns



Model 19



Model 17 & 18

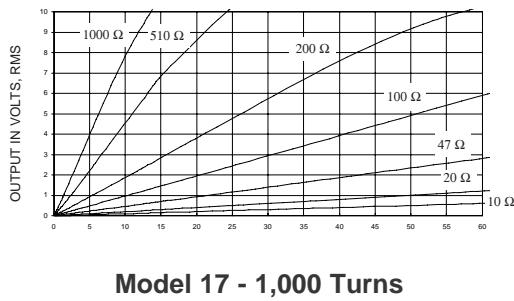
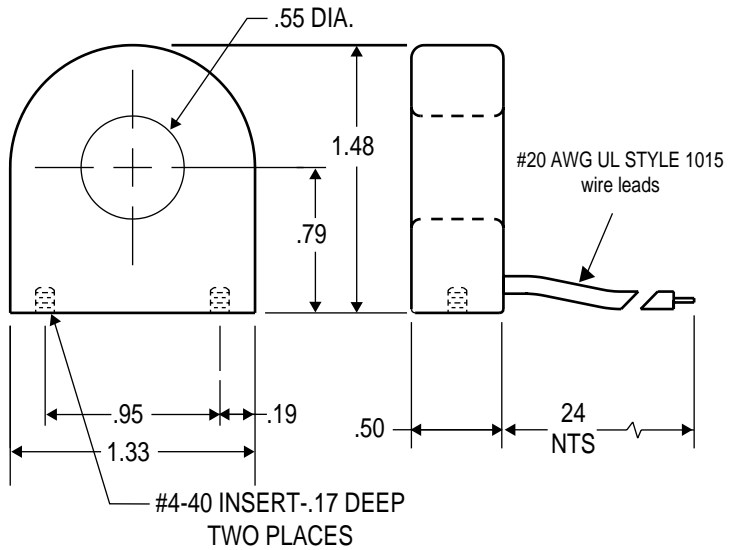
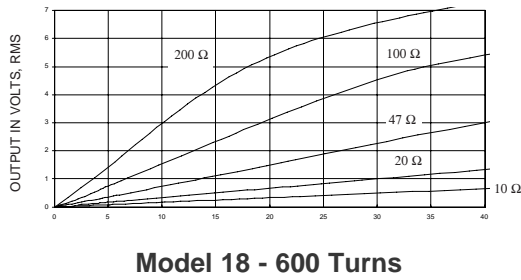
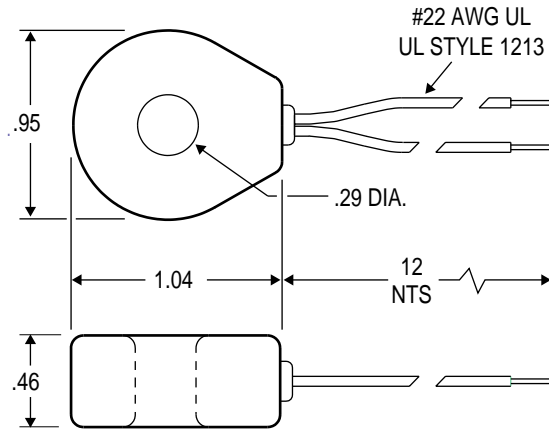
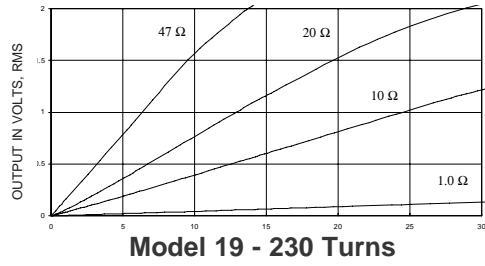
Shown with optional mounting bracket **MB-18**

Internet Resources <http://www.crmagnetics.com/>

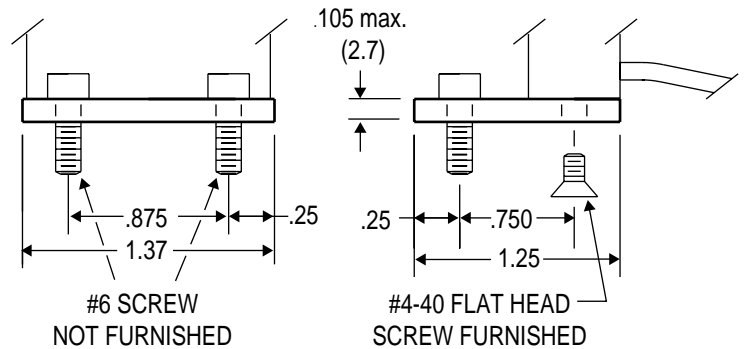
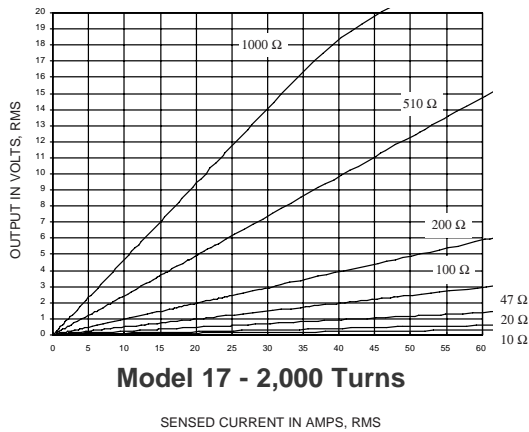
- Transformer Selection Guide: pcb.html

Wire Lead Current Transformers

Outline Drawings



Model 17 & 18: Current Sensing Transformers
Also available with PCB pins





Vertical Mounting, PCB Current Transformers - Series 8300

Features

- Low cost
- 4 standard sizes
- Non-symmetrical mounting pattern
- Silicon Steel & Nickel Alloy cores available

Applications

- **Silicon Steel** cores provide moderate accuracy and lower cost for applications such as current measurement and current relaying.
- **Nickel Alloy** cores are for applications that require highest accuracy with minimal phase angle error and are higher in cost. Applications would include power and energy monitoring devices.

Specifications

Case Material: Polypropylene Resin

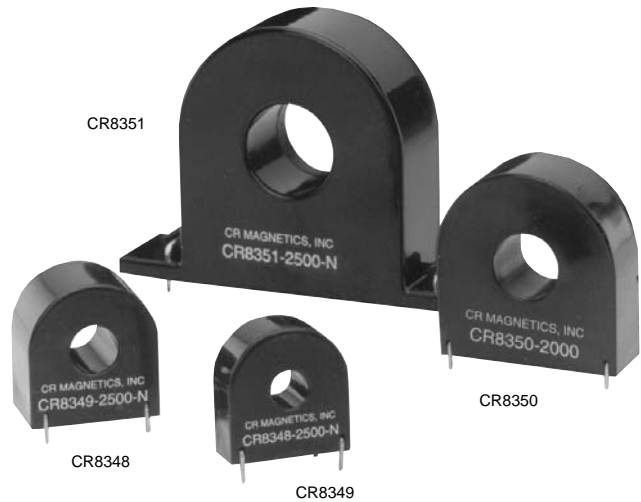
Construction: Epoxy Encapsulated

Operating Temperature: -25°C to +66°C

Insulation Resistance: 100 M ohm @ 500 Vdc

High Potential: 1500 volts x 1 minute

Frequency: 50 to 400 Hz



Outline Dimensions

PART NUMBERS	A	B	C	D	E	F	G	H	I	J	K	L	M	Fig.
	min.	max.	max.	± .04 (±1.0)	max.									
CR8348-xxxx	.265 (6.7)	.925 (23.5)	.433 (11)	.118 (3)	.984 (25)	.040 (1.0)	.075 (1.905)	.60 (15.24)	.75 (19.05)	.374 (9.5)				1
CR8349-xxxx	.354 (9)	1.024 (26)	.669 (17)	.118 (3)	1.102 (28)	.040 (1.0)	.075 (1.905)	.60 (15.24)	.75 (19.05)	.60 (15.24)				1
CR8350-xxxx	.504 (12.8)	1.476 (37.5)	.551 (14)	.118 (3)	1.535 (39)	.040 (1.0)	.15 (3.81)	1.00 (25.4)	1.30 (33.02)	.50 (12.7)				1
CR8351-xxxx	.772 (19.6)	1.969 (50)	.748 (19)	.137 (3.5)	2.204 (56)	.059 (1.5)	.591 (15)	1.181 (30)	2.362 (60)	.394 (10)	.059 (1.5)	3.15 (80)	.040 (1.0)	2

Part Numbers

CR □ □ □ □ - □ □ □ □ - □ □ □ □

Number of Secondary Turns

- 8348** - .272 Window Opening
- 8349** - .354 Window Opening
- 8350** - .504 Window Opening
- 8351** - .772 Window Opening

Leave blank for Silicon Steel Core
N 0.2 - Nickel Alloy Core, 0.2 Accuracy Class
N 0.1 - Nickel Alloy Core, 0.1 Accuracy Class

Internet Resources <http://www.crmagnetics.com/>

- Transformer Selection Guide: [pcb.html](#)
- Pricing: [pricing/8300.html](#)

Standard Configurations

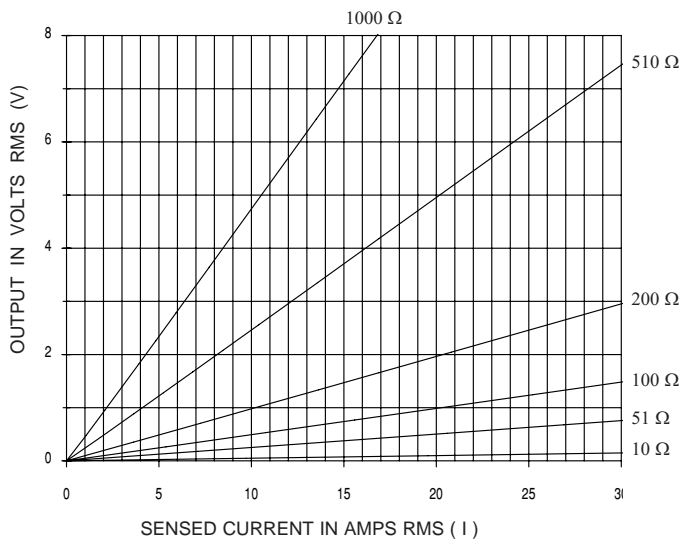
The following are standard configurations that are stocked.

- CR8348-2000
- CR8348-2500-N-0.2
- CR8349-1500
- CR8349-2500-N-0.2
- CR8350-2000
- CR8350-2500-N-0.2
- CR8351-2000-N-0.2

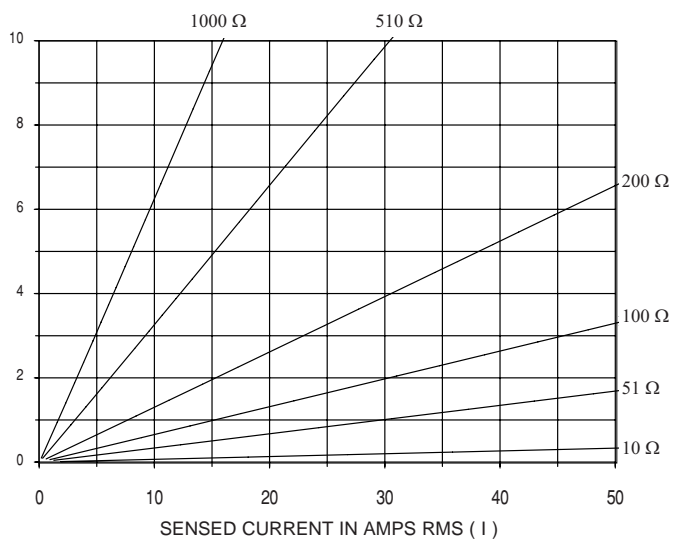
CONTACT FACTORY FOR ADDITIONAL ELECTRICAL SPECIFICATIONS

Output Voltage vs Sensed Current for Different Values Of Burden Resistance (R)

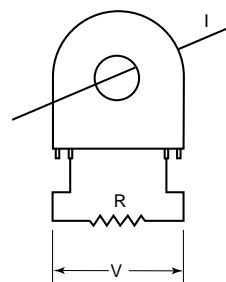
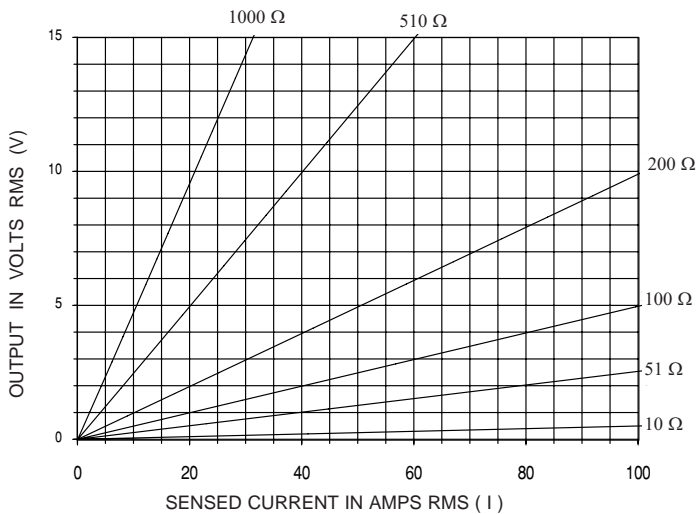
CR8348-2000 (.272 WINDOW)



CR8349-1500 (.354 WINDOW)



CR8350-20000 (.504 WINDOW)



Wire Lead Current Transformers Series 8400



Features

- Low cost
- 5 standard sizes
- Non-contact, isolated measurement

Applications

- Over/under current sensing
- Ground Faults
- Current measurements
- Power monitoring

Specifications

Case Material: Polypropylene Resin
Construction: Epoxy Encapsulated
Operating Temperature: -25°C to +66°C
Insulation Resistance: 100 M ohm @ 500 Vdc
High Potential: 1500 volts x 1 minute
Frequency: 50 to 400 Hz



CR8459



CR8460



CR8401

CR8410

CR8420

Part Numbers And Outline Dimensions

PART NUMBERS	A min.	B max.	C max.	D ±.12 (±3.0)	E max.	Fig.	NOTES
CR8401-xxxx	.232 (5.9)	.827 (21.0)	.315 (8.0)	2.75 (70.0)	.709 (18.0)	3	NICKEL ALLOY CORE WITH MAGNETIC SHIELDS FOR GROUND FAULT APPLICATIONS
CR8410-xxxx	.350 (8.9)	.984 (25.0)	.355 (9.0)	2.87 (73.0)	.866 (22.0)	3	SILICON STEEL CORE FOR GENERAL PURPOSE CURRENT MONITORING
CR8420-xxxx	.610 (15.5)	1.299 (33.0)	.355 (9.0)	2.75 (70.0)	1.181 (30.0)	3	NICKEL ALLOY CORE WITH MAGNETIC SHIELDS FOR GROUND FAULT APPLICATIONS
CR8459-xxxx-N	.760 (19.3)	1.862 (47.3)	.748 (19)			4	NICKEL ALLOY CORE FOR POWER MONITORING APPLICATIONS
CR8460-xxxx-N	1.181 (30)	2.401 (61)	.826 (21)	3.464 (88)		5	NICKEL ALLOY CORE FOR POWER MONITORING APPLICATIONS

Part Numbers

CR □ □ □ □ - □ □ □ □

Number of
Secondary Turns

8401 - .232 Window Opening
8310 - .350 Window Opening
8420 - .610 Window Opening
8459 - .760 Window Opening
8460 - 1.181 Window Opening

CONTACT FACTORY FOR ADDITIONAL ELECTRICAL SPECIFICATIONS

Heaters Controls And Sensors Ltd.,

Internet Resources <http://www.crmagnetics.com/>

- Transformer Selection Guide: pcb.html
- Pricing: pricing/8400.html

Standard Configurations

The following are standard configurations that are normally stocked.

CR8401-1000
 CR8410-1000
 CR8420-1000
 CR8459-2000-N

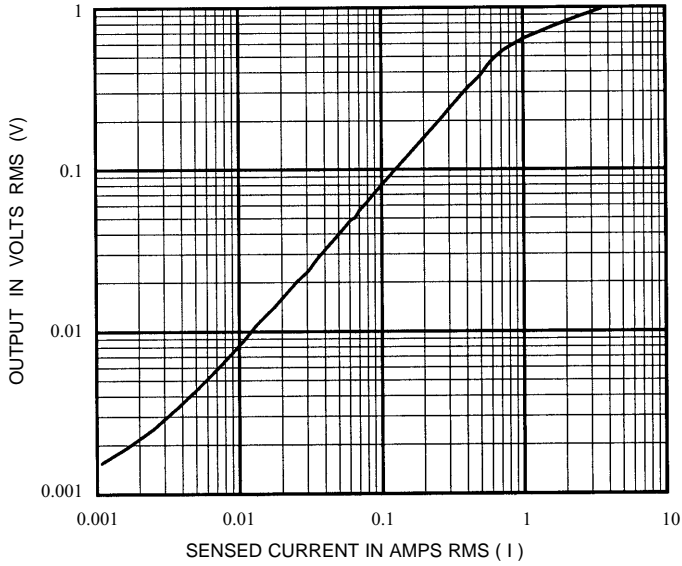
www.hcs77.com

Toll Free: 800 - 279 - 9912

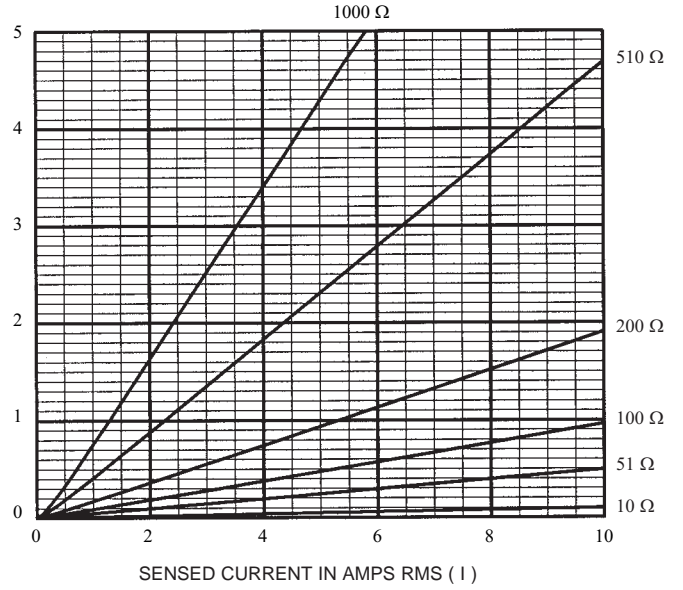
Wire Lead Current Transformers Series 8400

Output Voltage vs Sensed Current for Different Values Of Burden Resistance (R)

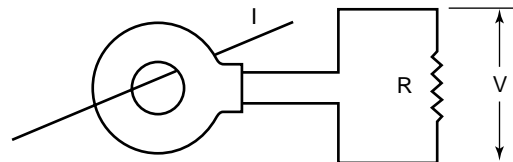
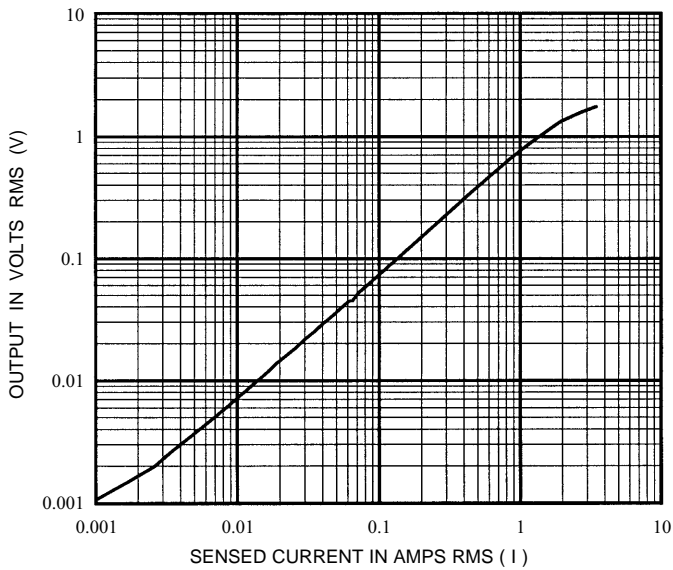
**CR8401-1000 (.232 WINDOW)
R=1,000 ohms**



CR8410-1000 (.350 WINDOW)



**CR8420-1000 (.610 WINDOW)
R=1,000 ohms**



Series 8300 and 8400 Current Transformers

Outline Drawings

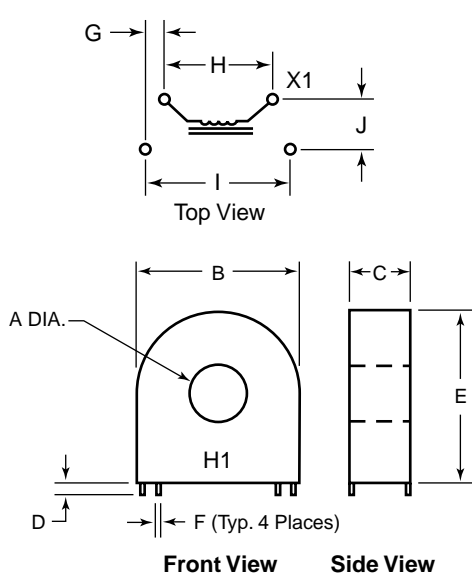


Figure 1

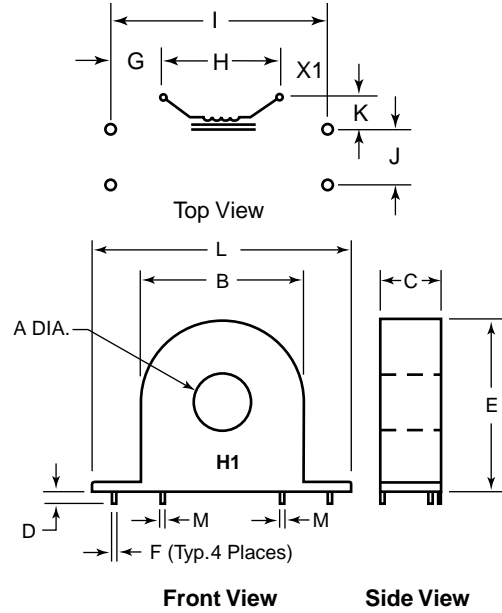


Figure 2

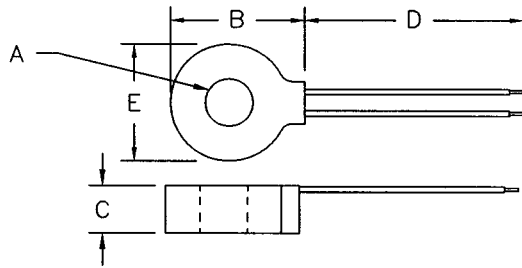


Figure 3

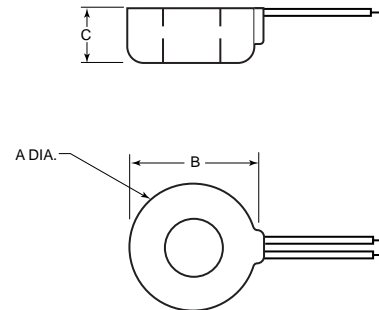


Figure 4

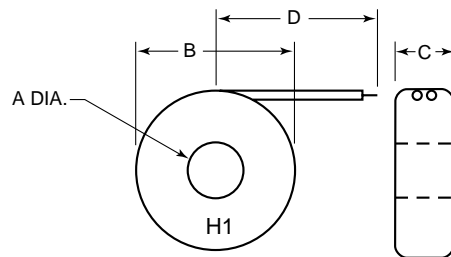
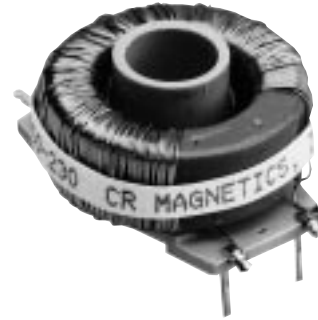


Figure 5



Horizontal Mounting, PCB Current Transformer

The **CR8750** series, PCB Current Transformer provides a low cost method for monitoring electrical current. The transformer is intended to be mounted on a Printed Circuit Board with the current-carrying wire routed through the center window opening. A five-pin, non-symmetrical mounting pattern ensures correct orientation on the PCB. Two different winding ratios are available to accommodate various applications. The graph below illustrates how different values of burden resistors attached to the output terminal will provide a number of different output voltage ranges.



Specifications

Frequency: 60-400 Hz
Insulation Level: 600 V

Internet Resources <http://www.crmagnetics.com/>

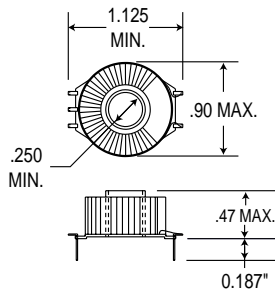
- Transformer Selection Guide: pcb.html
- Pricing: pricing/8750.html

Part Numbers

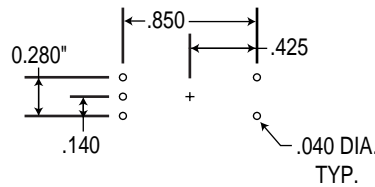
CR8750-□□□□ PCB CURRENT TRANSFORMER

0230 TURNS
1000 TURNS

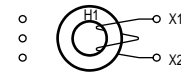
Application Notes



Outline Drawing

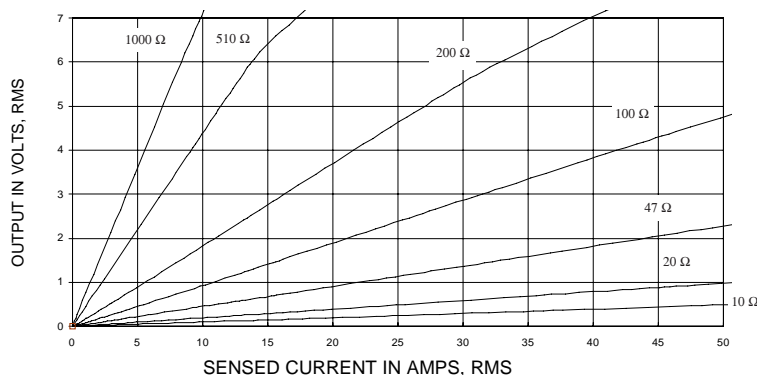


Recommended Mounting Hole Pattern (Top View)



Window Polarity (Top View)

Typical Response



CR8750-1000



Commercial & Metering Class Current Transformers

The CR Magnetics line of Instrumentation Grade Electrical Current Transformers are available in either Commercial or ANSI Metering Class. The commercial class transformers are lower cost and well-suited for current monitoring applications. The ANSI metering class transformers are higher-cost units intended for power monitoring applications where high accuracy and minimum phase angle error are required. Twelve different window openings and eight different mounting styles along with numerous secondary ratios are available to meet most applications. This short form catalog shows an overview of our most popular 5 amp secondary transformers. Contact factory for different sizes or unique electrical requirements.

Applications

- Ammeters
- Energy Management
- Watt/VAR/Watthour Transducers,
- Current Sensing Relays, see pages 14 & 16



Internet Resources <http://www.crmagnetics.com/>

- Application Sheet: pdf/ancrct-2.pdf
- Transformer Selection Guides: transformer.html
cts.html

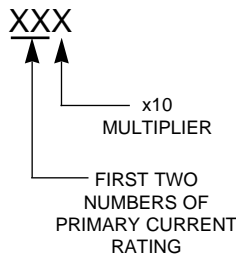
Part Numbers

□ □ □ □ - □ □ □ - □ □ □ □

MOUNTING STYLES

- RL** Round with leads
- SFT** Square with feet & terminals
- SFL** Square with feet & leads
- SHT** Square without feet & with terminals
- SHL** Square without feet & with leads
- RT** Round with terminals
- RBT** Round with bracket & terminals
- RBL** Round with bracket & leads

SERIES	WINDOW DIAMETER
CR1A	0.64 (16.2)
CR2	1.13 (28.7)
CR2DA	1.00 (35.4)
CR5	1.56 (39.6)
CR5A	1.56 (39.6)
CR6A	2.06 (52.3)
CR7	2.50 (63.5)
CR7A	2.50 (63.5)
CR8	3.25 (72.5)
CR56	2.06 (52.3)
CR76	3.00 (76.2)
CR170	4.25 (107.9)



*Example: 50 AMP primary current rating would read 500, 300 AMP would read 301 and 4000 AMP would read 402.



RL



SFT



SFL



SHT



SHL



RT



RBT



RBL

Specifications

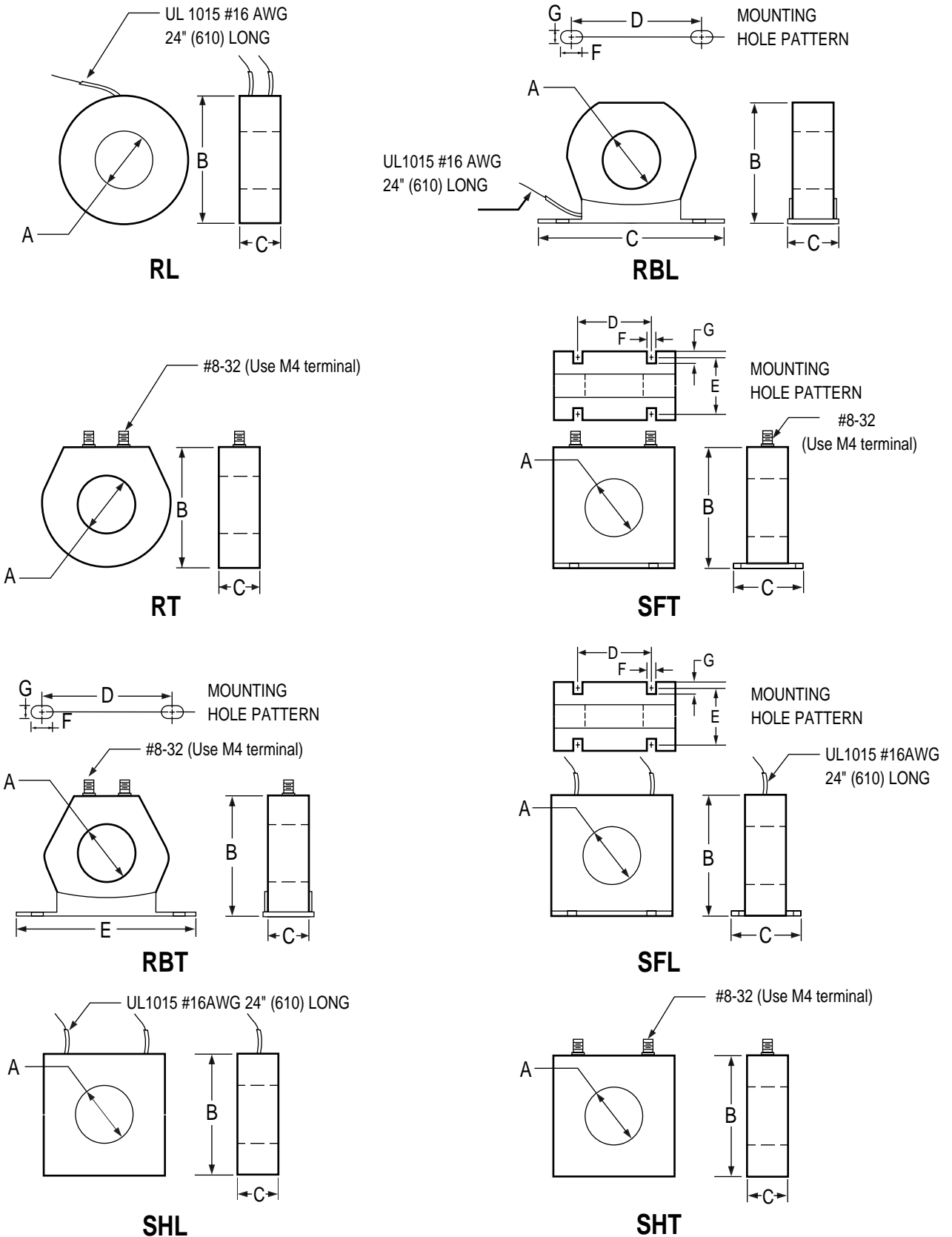
Frequency: 50-400 Hz
Insulation: .6 kV, BIL 10 kV Full Wave

Specials

- Ultra low frequency to 20 Hz
- Water Proof
- High volume, low cost styles
- 1.0, 0.2 & 0.1 AAC secondary ratios available

Commercial & ANSI Metering Class Current Transformers

Outline Drawings



Commercial Class Current Transformers

WINDOW OPENING DIMENSION A	SERIES	MOUNTING STYLE	DIMENSIONS						CURRENT RATIO	ACCURACY AT 60 Hz	BURDEN VA AT 60 Hz								
			B	C	D	E	F	G											
1.13 (28.7)	CR2	RL	2.46 (62.5)	1.05 (26.7)					50:5	±3%	2.0								
		SFT							60:5	±2%	2.0								
		SFL							75:5	±2%	2.0								
		SHT							80:5	±2%	2.0								
		SHL							100:5	±1%	2.0								
									120:5	±1%	2.5								
									125:5	±1%	2.5								
									150:5	±1%	4.0								
									200:5	±1%	4.0								
									250:5	±1%	6.0								
	300:5	±1%	8.0																
1.56 (39.6)	CR5	RL	3.56 (90.4)	1.10 (27.9)					50:5	±2%	1.0								
		SFT							75:5	±2%	1.5								
		SFL							100:5	±2%	2.0								
		SHT							150:5	±1%	5.0								
		SHL							200:5	±1%	5.0								
		RT							250:5	±1%	10.0								
		RBT *							300:5	±1%	12.5								
		RBL *							400:5	±1%	12.5								
									500:5	±1%	20.0								
									600:5	±1%	25.0								
									750:5	±1%	25.0								
									800:5	±1%	25.0								
									1000:5	±1%	25.0								
									1200:5	±1%	30.0								
		2.50 (63.5)							CR7	RL	4.70 (919.4)	1.10 (27.4)					100:5	±2%	2.5
SFT	150:5		±1%	5.0															
SFL	200:5		±1%	5.0															
SHT	250:5		±1%	5.0															
SHL	300:5		±1%	12.0															
RT	400:5		±1%	15.0															
RBT	500:5		±1%	25.0															
RBL	600:5		±1%	30.0															
	750:5		±1%	30.0															
	800:5		±1%	35.0															
	1000:5		±1%	30.0															
	1200:5		±1%	35.0															
	1500:5		±1%	40.0															
	1600:5		±1%	45.0															
2.06 (52.3)	CR56		RL	3.50 (88.9)	1.09 (27.7)												50:5	±3%	0.5
		SFT	75:5						±1%		0.5								
		SFL	100:5						±1%		1.0								
		RT	150:5						±1%		2.5								
		RBT	200:5						±1%		4.0								
		RBL	250:5						±1%		6.0								
			300:5						±1%		7.5								
			400:5						±1%		10.0								
			500:5						±1%		12.5								
			600:5						±1%		15.0								
			750:5						±1%		7.0								
			800:5						±1%		8.0								
			1000:5						±1%		10.0								
			1200:5						±1%		12.5								
		3.00 (76.2)	CR76						RL		4.50 (114.3)	1.09 (27.7)					200:5	±1%	5.0
SFT	250:5			±1%	5.0														
SFL	300:5			±1%	6.0														
RT	400:5			±1%	10.0														
RBT	500:5			±1%	10.0														
RBL	600:5			±1%	10.0														
	750:5			±1%	10.0														
	800:5			±1%	12.5														
	1000:5			±1%	10.0														
	1200:5			±1%	10.0														
	1500:5			±1%	12.5														
	1600:5			±1%	12.5														
	2000:5			±1%	15.0														
.64 (16.3)	CR1A			RL	1.99 (50.5)	1.25 (31.8)											50:5	±2%	1.0
																	60:5	±1%	2.0
			75:5	±1%							2.0								
			80:5	±1%							2.0								
			100:5	±1%							2.5								
			120:5	±1%							3.0								
			125:5	±1%							3.0								
			150:5	±1%							4.0								
			200:5	±1%							5.0								
			250:5	±1%							7.5								

* RBT and RBL mounting styles in the CR5 series are not available in current ratios of 750:5 thru 1200:5

ANSI Metering Class Current Transformers

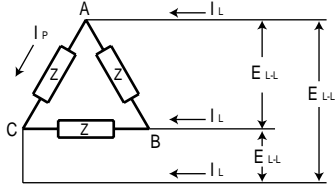
WINDOW OPENING DIMENSION A	SERIES	MOUNTING STYLE	DIMENSIONS					CURRENT RATIO	ANSI METERING CLASS @ 60 Hz					
			B	C	D	E	F		G	B0.1	B0.2	B0.5	B0.9	B1.8
1.0 (25.4)	CR2DA	RL	2.47 (62.7)	1.75 (44.5)					50:5	2.4	-	-	-	-
									60:5	2.4	-	-	-	-
									75:5	2.4	2.4	-	-	-
									80:5	1.2	2.4	-	-	-
									100:5	1.2	1.2	-	-	-
									120:5	1.2	1.2	-	-	-
									125:5	0.6	1.2	-	-	-
									150:5	0.6	1.2	2.4	-	-
									200:5	0.3	0.6	1.2	-	-
									250:5	0.3	0.6	1.2	-	-
300:5	0.3	0.3	0.6	1.2	-									
1.56 (39.6)	CR5A	RL SFT SFL SHT SHL	3.56 (90.4)	1.10 (27.9)					100:5	1.2	-	-	-	-
									150:5	1.2	1.2	-	-	-
									200:5	0.6	0.6	-	-	-
									250:5	0.6	0.6	1.2	-	-
									300:5	0.3	0.3	1.2	-	-
									400:5	0.3	0.3	0.6	1.2	-
									500:5	0.3	0.3	0.6	1.2	-
									600:5	0.3	0.3	0.6	0.6	1.2
									750:5	0.3	0.3	0.6	0.6	-
									800:5	0.3	0.3	0.6	0.6	-
									1000:5	0.3	0.3	0.3	0.6	-
1200:5	0.3	0.3	0.3	0.3	0.6									
2.06 (52.3)	CR6A	RL SFT SFL SHT SHL	4.08 (103.6)	1.10 (27.9)					100:5	2.4	-	-	-	-
									150:5	1.2	1.2	-	-	-
									200:5	0.6	1.2	-	-	-
									250:5	0.3	0.6	2.4	-	-
									300:5	0.3	0.6	1.2	2.4	-
									400:5	0.3	0.3	0.6	1.2	-
									500:5	0.3	0.3	0.6	1.2	-
									600:5	0.3	0.3	0.6	0.6	1.2
									750:5	0.3	0.3	0.6	0.6	-
									800:5	0.3	0.3	0.6	0.6	-
									1000:5	0.3	0.3	0.3	0.6	-
1200:5	0.3	0.3	0.3	0.3	0.6									
1500:5	0.3	0.3	0.3	0.3	0.6									
2.50 (63.5)	CR7A	RL SFT SFL SHT SHL	4.70 (119.4)	1.10 (27.9)					100:5	2.4	-	-	-	-
									150:5	1.2	2.4	-	-	-
									200:5	0.6	1.2	-	-	-
									250:5	0.6	1.2	1.2	-	-
									300:5	0.6	0.6	1.2	2.4	-
									400:5	0.3	0.3	0.6	1.2	-
									500:5	0.3	0.3	0.6	1.2	-
									600:5	0.3	0.3	0.6	0.6	1.2
									750:5	0.3	0.3	0.6	0.6	1.2
									800:5	0.3	0.3	0.6	0.6	1.2
									1000:5	0.3	0.3	0.3	0.6	1.2
1200:5	0.3	0.3	0.3	0.3	0.6									
1500:5	0.3	0.3	0.3	0.3	0.6									
1600:5	0.3	0.3	0.3	0.3	0.6									

ANSI Metering Class Current Transformers

WINDOW OPENING DIMENSION A	SERIES	MOUNTING STYLE	DIMENSIONS						CURRENT RATIO	ANSI METERING CLASS @ 60 Hz				
			B	C	D	E	F	G		B0.1	B0.2	B0.5	B0.9	B1.8
3.25 (82.6)	CR8	RL SHT SHL	5.73 (145.5)	1.15 (29.2)					200:5	1.2	1.2	-	-	-
									250:5	0.6	1.2	2.4	-	-
									300:5	0.6	0.6	1.2	2.4	-
									400:5	0.3	0.6	1.2	1.2	-
									500:5	0.3	0.3	0.6	1.2	2.4
									600:5	0.3	0.3	0.6	1.2	1.2
									750:5	0.3	0.3	0.3	0.6	1.2
									800:5	0.3	0.3	0.3	0.6	1.2
									1000:5	0.3	0.3	0.3	0.6	0.6
									1200:5	0.3	0.3	0.3	0.6	0.6
									1500:5	0.3	0.3	0.3	0.6	0.6
									1600:5	0.3	0.3	0.3	0.6	0.6
									2000:5	0.3	0.3	0.3	0.3	0.3
									2500:5	0.3	0.3	0.3	0.3	-
									3000:5	0.3	0.3	0.3	0.3	-
3200:5	0.3	0.3	0.3	0.3	-									
4000:5	0.3	0.3	0.3	0.3	-									
4.25 (108)	CR170	RL SHT SHL	6.73 (170.9)	1.25 (31.8)					200:5	1.2	1.2	-	-	-
									250:5	1.2	1.2	-	-	-
									300:5	0.6	0.6	1.2	2.4	-
									400:5	0.6	0.6	1.2	1.2	2.4
									500:5	0.3	0.3	0.6	1.2	2.4
									600:5	0.3	0.3	0.6	0.6	1.2
									750:5	0.3	0.3	0.3	0.3	0.6
									800:5	0.3	0.3	0.3	0.3	0.6
									1000:5	0.3	0.3	0.3	0.3	0.6
									1200:5	0.3	0.3	0.3	0.3	0.6
									1500:5	0.3	0.3	0.3	0.6	0.6
									1600:5	0.3	0.3	0.3	0.6	0.6
									2000:5	0.3	0.3	0.3	0.3	0.3
									2500:5	0.3	0.3	0.3	0.3	0.3
									3000:5	0.3	0.3	0.3	0.3	0.3
3500:5	0.3	0.3	0.3	0.3	0.3									
4000:5	0.3	0.3	0.3	0.3	0.3									

3-Phase Balanced Circuits

3-Phase Delta



$$P = 1.73 E_{L-L} I_P \cos \theta = \frac{3(E_{L-L})^2}{Z}$$

$$Z = \frac{1.73 E_{L-L}}{I_L}$$

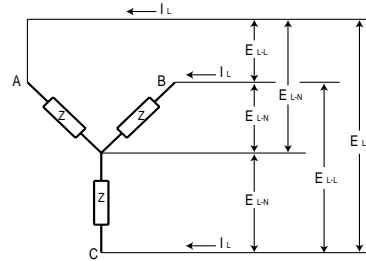
$$I_P = \frac{I_L}{1.73}$$

- The current in each element is equal to the line current I_L divided by $\sqrt{3}$.
- The voltage across each element is equal to the line voltage E_{L-L} .
- The impedance of each element is equal to $\sqrt{3}$ times the voltage across each element divided by the line current.
- The voltage across the elements are 120° out of phase.
- The currents in the elements are 120° out of phase.
- The power is equal to $\sqrt{3}$ times voltage across each element times the current I_L times $\cos \theta$.

P = power in watts

θ = phase angle in degrees

3-Phase WYE



$$P = 3 E_{L-N} I_L \cos \theta = 1.73 E_{L-L} I_L \cos \theta$$

$$I_L = \frac{E_{L-N}}{Z} = \frac{E_{L-L}}{1.73 Z}$$

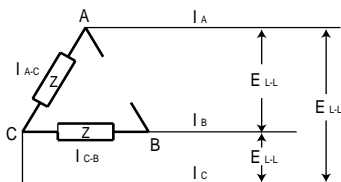
$$E_{L-N} = \frac{E_{L-L}}{1.73}$$

$$Z = \frac{E_{L-L}}{1.73 I_P}$$

- The current in each element is equal to the line current I_L .
- The voltage across each element E_{L-N} is equal to the line voltage E_{L-L} divided by $\sqrt{3}$.
- The impedance of each element is equal to line voltage E_{L-L} divided by $\sqrt{3}$ times the line current.
- The voltages across the elements are 120° out of phase.
- The currents in the elements are 120° out of phase.
- The power is equal to 3 times line voltage E_{L-N} times line current times $\cos \theta$.
- For a balanced load the current in the neutral is equal to zero.

3-Phase Open Leg

3-Phase Delta



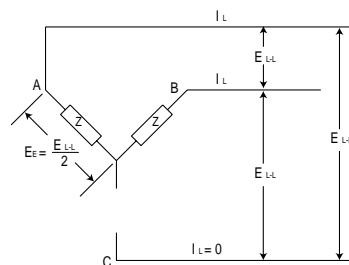
$$P = \frac{2(E_{L-L})^2}{Z}$$

$$I_{A-C} = I_{C-B} = I_A = I_B = \frac{E_{L-L}}{Z}$$

$$I_C = 1.73 I_A = 1.73 I_B$$

- The current in each non-open element is equal.
- The current in the connecting leg of the non-open elements is $\sqrt{3}$ times the current in any other leg.

3-Phase WYE (No neutral)



$$P = E_{L-L} I_L \cos \theta$$

$$I_L = \frac{E_{L-L}}{2 Z}$$

- The current in each non-open element is equal to the line current.
- The voltage across each non-open element is equal to the line voltage divided by 2.
- The power is equal to the line voltage times the line current times $\cos \theta$.



Wire-Mounted Current Indicator

The **CR-45** series, Wire-Mounted Electrical Current Indicators provides an effective method of monitoring electrical current. The indicator is attached directly to a current-carrying wire. When the current exceeds the turn-on point, the LED will illuminate to indicate the presence of current.



CR-45 Current Indicators
(Shown Approx. Full Size)

Applications

- Monitor status of heater elements
- Observe remote loads
- Indicate phase loss
- Monitor motor operation

Features

- Self powered
- Red or green indicator
- Easy to install
- Supplied with plastic tie
- Bright yellow case for easy identification
- Panel mounting bracket available



MB-45 Panel Mounting Bracket
(Shown Approx. Full Size)

Specifications

Min. Turn-on Point

2 Amps for CR-45-R
2.5 Amps for CR-45-G

Indicating Range:

2 to 100 Amps (for CR-45-R)
2.5 to 100 Amps (for CR-45-G)

Max. Continuous Current:

100 Amps

LED Type:

T 1^{3/4} Diffused

LED Color:

Red or Green

Case Material:

Thermoplastic

Case Color:

Bright Safety Yellow

Weight:

.5 oz. (14.2 g)

Frequency:

50-60 Hz

Mounting Bracket Material:

Non-Magnetic Aluminum

WIRE PASSES	TURN-ON POINT		MAX. WIRE DIAMETER
	RED	GREEN	
1	2	2.5	.29
2	1	1.25	.14
3	.66	.83	.13
4	.5	.62	.12
N	2÷N	2.5÷N	

Internet Resources <http://www.crmagnetics.com/>

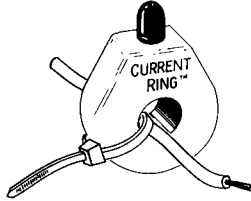
- Indicator Selection Guide: ind.html
- Application Sheet: pdf/ancr450-1.pdf
- Pricing: pricing/cr45.html

Part Numbers

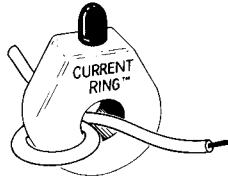
- CR45** - Current Indicator with (Red or Green) LED
 R-Red Indicator
 G-Green Indicator
- MB-45** Panel Mounting Bracket for CR-45

Wire-Mounted Current Indicator

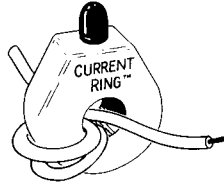
Typical Installation



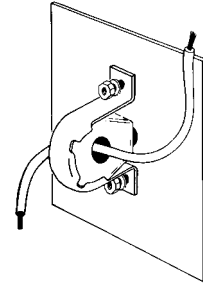
One-Wire Pass



Two-Wire Passes

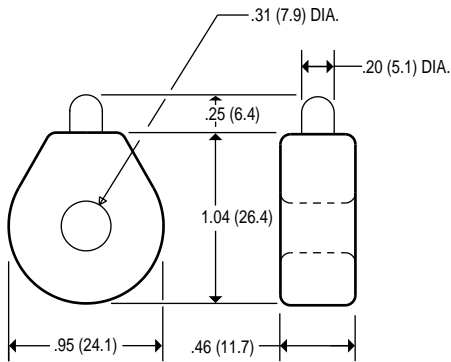


Three-Wire Passes

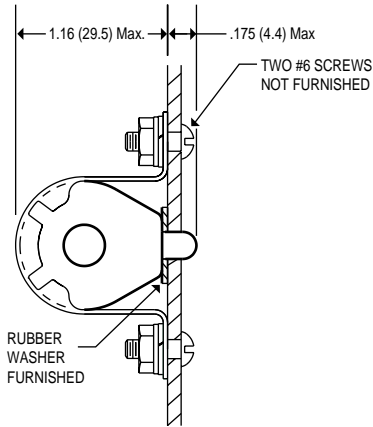


MB-45 with CR-45

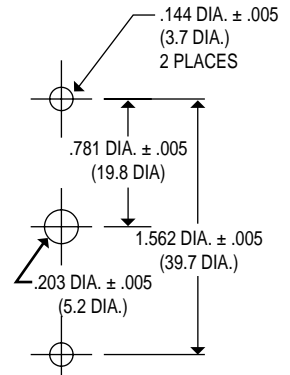
Outline Drawings



CR-45

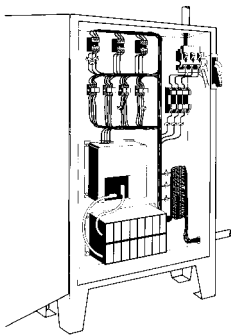


MB-45

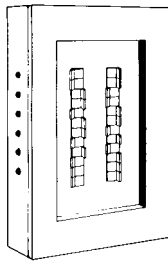


Recommended Mounting Hole Pattern

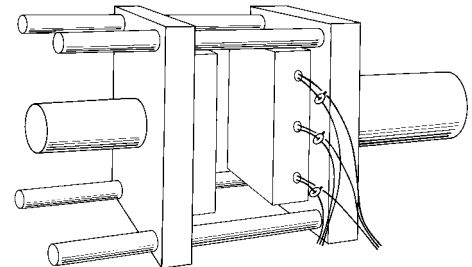
Typical Application



Load Center



Control Panel



Process Heating



Remote Current Indicators

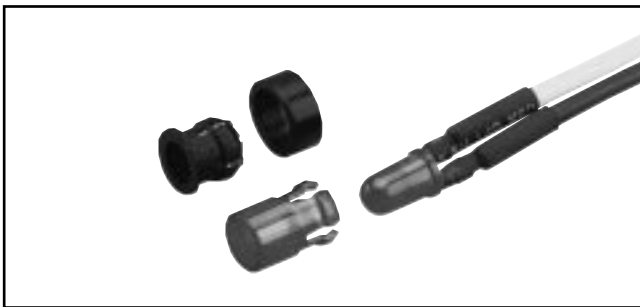
The CR Magnetics line of Remote Electrical Current Indicators provides an effective method for remote monitoring of electrical current. The remote current sensing transformer is installed around the current-carrying wire and is connected directly to the LED panel indicator. When the current exceeds the turn-on point of the sensing transformer, the LED illuminates to indicate the presence of current. Two sizes of remote current sensing transformers are available for use with either one of two types of LED indicators. The panel indicators are available with either red or green LED.



Model 19 Remote Current Transformer

(Connect directly to either PH-25 or PH-31 LED indicator)
 Indicating Range: 2 to 100 Amps (1-Wire Pass)
 Minimum turn-on point: 2 Amps
 Max. Cont. Current: 100 Amps
 Max. Transient Current: 150 Amps for 5 Sec.
 Working Class: 600 Volts, 50-60 Hz

WIRE PASSES	TURN-ON POINT	MAX. WIRE DIAMETER
1	2	.29 (7.4)
2	1	.14 (3.6)
3	.66	.13 (3.3)
N	$2 \div N$	



PH-25 Press-In LED Panel Indicator

(Supplied with two types of mounting hardware)
 LED type: T-1³/₄, Bi-Polar, Red or Green
 Mounting Hole: .250 (6.4) ± .002" Dia.
 Mounting Hardware: Use either one-piece press-in red lens or two-piece mounting clip

Applications

- Indicate open heater elements
- Observe remote loads
- Indicate phase loss
- Monitor motor operation



Model 18-600 Remote Current Transformer

(Connect directly to either PH-25 or PH-31 LED indicator)
SHOWN WITH MB-18, SURFACE MOUNTING BRACKET
 Indicating Range: 2.5 to 100 Amps (1-Wire Pass)
 Minimum turn-on point: 2.5 Amps
 Max. Cont. Current: 100 Amps
 Max. Transient Current: 150 Amps for 5 Sec.
 Working Class: 600 Volts, 50-60 Hz

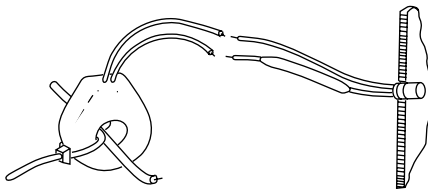
WIRE PASSES	TURN-ON POINT	MAX. WIRE DIAMETER
1	2.5	.55 (14)
2	1.25	.27 (6.9)
3	.83	.25 (6.4)
N	$2.5 \div N$	



PH-31 Splash-Proof LED Panel Indicator

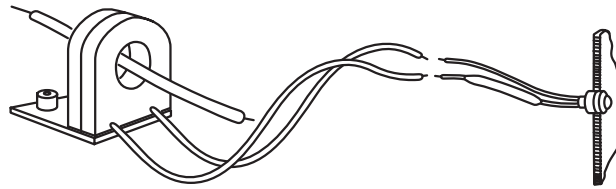
(Supplied with rubber sealing washer)
 LED type: T-1³/₄, Bi-Polar, Red or Green
 Housing Material: Chrome Plated Brass
 Mounting Hole: .312 ± .005" (7.9) Dia.

Outline Drawings



Model 19

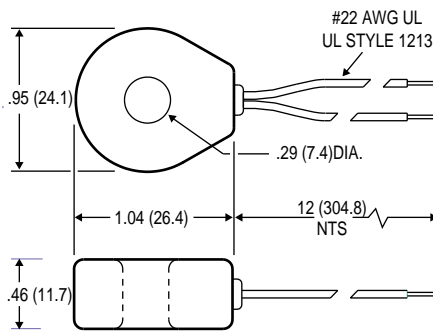
PH-25



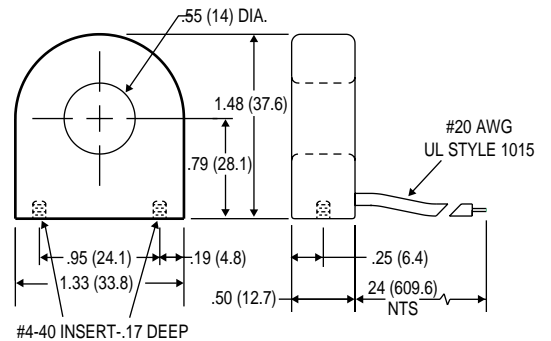
**Model 18
with MB-18**

PH-31

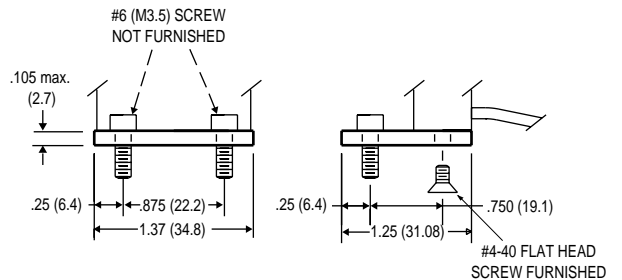
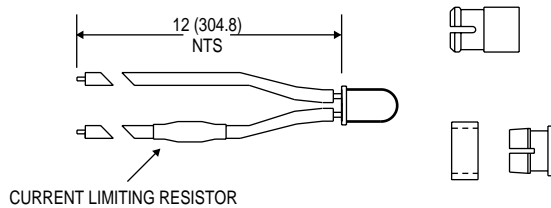
Typical Applications



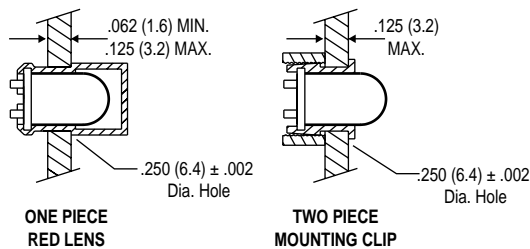
Model 19: Remote Current Transformer



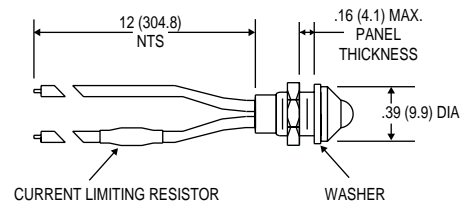
Model 18: Remote Current Transformer



MB 18: Surface Mounting Bracket



PH-25: Press-In LED Panel Indicator



PH-31: Splash-Proof LED Panel Indicator

Internet Resources <http://www.crmagnetics.com/>

- Indicator Selection Guide: ind.html
- Application Sheet: pdf/ancr2550-1.pdf
- Pricing: pricing/remote.html

Part Numbers

Model 19	Current Transformer with .29 dia. opening
Model 18-600	Current Transformer with .55 dia. opening
MB-18	Surface Mounting Bracket for Model 18
PH-25-R	Press-In Panel Indicator with red LED
PH-25-G	Press-In Panel Indicator with green LED
PH-31-R	Splash Proof Panel Indicator with red LED
PH-31-G	Splash-Proof Panel Indicator with green LED



Low Cost Remote Current Indicator

The **CR2550** series Remote Current Indicators are designed as a low cost method for providing a visual indication of electrical current flow. The current-carrying wire is routed through the window opening in the current sensing transformer. Attached to the transformer is a high efficiency, bi-polar LED that illuminates when the current is above the turn-on point. The indicator is available as standard with an 11 inch long lead and a red or green LED indicator.

Features

- Low cost for high volume OEM installations
- Low fixed trip point
- Fully isolated
- Easy to install
- Self-powered

Specifications

Turn-on point: 0.75 Aac RMS for Red LED
1.5 Aac RMS for Green LED

Maximum Continuous Rating:
20 Aac RMS

Frequency:
50 to 400 HZ

Operating Temperature:
-30 °C to +60 °C

Storage Temperature:
-55 °C to +85 °C

LED Indicator type:
T-13/4, Bipolar, Red/Red or Green/Green Diffused, Indicator is supplied with LED attached to current sensing transformer

LED Mounting Hardware:
Supplied with both one-piece press-in lens and two-piece mounting clip



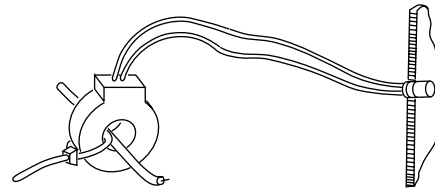
Applications

- Indicate open heater element
- Observe remote loads
- Indicate phase loss
- Monitor motor operation

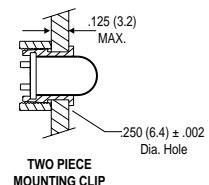
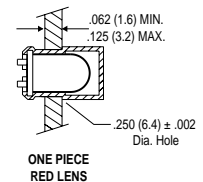
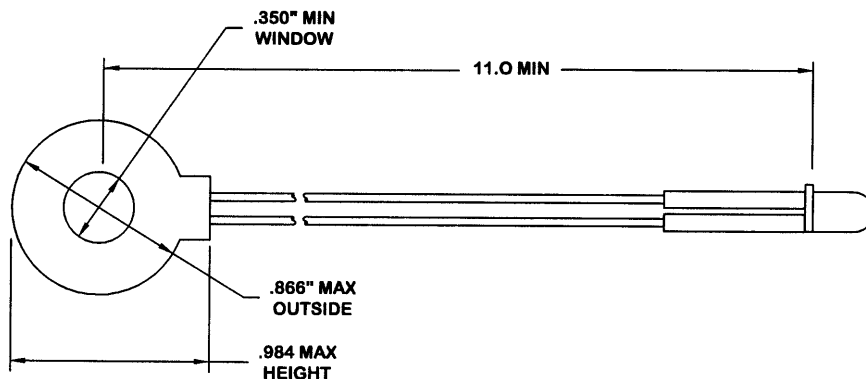
Part Numbers

- CR2550-11-.75 R** CURRENT INDICATOR WITH RED LED
CR2550-11-1.5 G CURRENT INDICATOR WITH GREEN LED

Installation



Outline Drawing



AC Motor Loads & U.S. Standard Voltages

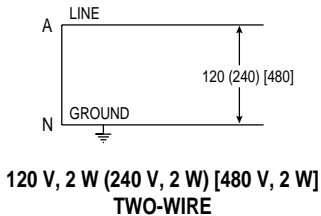
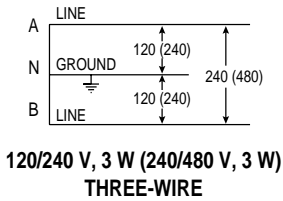
A C Motor Loads *

HP	MOTOR FULL LOAD CURRENTS								MAXIMUM LOCKED ROTOR CURRENTS							
	SINGLE PHASE		3-PHASE A.C. INDUCTION						3-PHASE A.C. INDUCTION							
	115 V	230 V	115 V	200 V	230 V	460 V	575 V	2300 V	4160 V	200 V	220/230 V	440/460 V	550/575 V	2300 V	4160 V	
1/2	9.8	4.9	4	2.3	2	1	.8			23	20	10	8			
3/4	13.8	6.9	5.6	3.2	2.8	1.4	1.1			29	25	12.5	10			
1	16	8	7.2	4.15	3.6	1.8	1.4			34.5	30	15	12			
1 1/2	20	10	10.4	6	5.2	2.6	2.1			46	40	20	16			
2	24	12	13.6	7.8	6.8	3.4	2.7			57.5	50	25	20			
3	34	17		11	9.6	4.8	3.9			73.5	64	32	25			
5	56	28		17.5	15.2	7.6	6.1			106	92	46	37			
7 1/2	80	40		25	22	11	9			146	127	63	51			
10	100	50		32	28	14	11			186	162	81	65			
15				48	42	21	17			267	232	116	93			
20				62	54	27	22			334	290	145	116			
25				78	68	34	27			420	365	182	146	35	19	
30				92	80	40	32			500	435	217	174	41	23	
40				120	104	52	41			667	580	290	232	55	30	
50				150	130	65	52			834	725	362	290	69	38	
60				177	154	77	62	16	8.9	1000	870	435	348	83	46	
75				221	192	96	77	20	11	1250	1085	592	435	104	57	
100				285	248	124	99	26	14.4	1670	1450	725	580	139	76	
125				358	312	156	125	31	17	2085	1815	907	726	173	96	
150				415	360	180	144	37	20.5	2500	2170	1085	870	208	115	
200				550	480	240	192	49	27	3340	2900	1450	1160	278	153	
OVER 200HP APPROX. AMPS/HP				2.75	2.40	1.20	.96	.24	.133							

*This information provided as reference only. Consult motor manufacturer and related standards for additional information.

U.S. STANDARD VOLTAGES

SINGLE-PHASE



POLYPHASE

